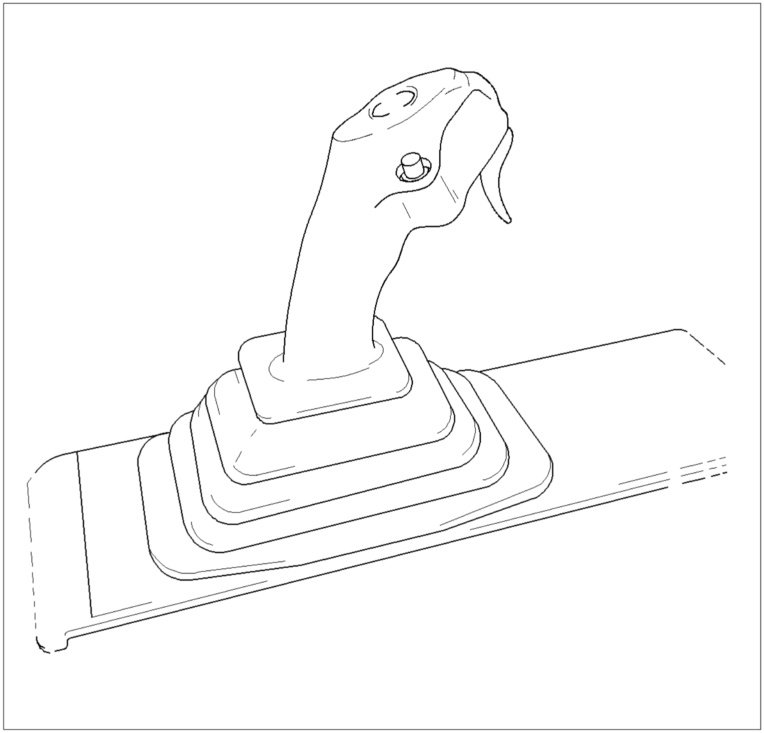
A319/A320/A321

FLIGHT CREW OPERATING MANUAL



FLIGHT OPERATIONS

3

AIRBUS®

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FOREWORD

This manual complements the approved Flight Manual. Airbus has attempted to ensure that the data contained in this manual agrees with the data in the Flight Manual. If there is any disagreement, the Flight Manual is the final authority.

COMMENTS - QUESTIONS - SUGGESTIONS

All manual holders and users are encouraged to submit any Flight Crew Operating Manual questions and suggestions to :

AIRBUS - BP N°33
1 ROND POINT MAURICE BELLONTE
31707 BLAGNAC CEDEX - FRANCE
TELEX TLSBI7X or 530526F
FAX 33.5.61.93.44.65
ATTN. Flight Operations Support
- STL

FOR TECHNICAL OR PROCEDURAL CONTENT

AIRBUS - BP N°33
1 ROND POINT MAURICE BELLONTE
31707 BLAGNAC CEDEX - FRANCE
TELEX TLSBP7X or 530526F
FAX 33.5.61.93.28.06
ATTN. Technical Documentation Services
- SDC

FOR PRINTING AND DISTRIBUTION

NFC5-03-0010-001-A001AA

CONTENT

The Flight Crew Operating Manual is the support documentation for flight crew operations.
The Flight Crew Operating Manual provides operating crews with the technical, procedural and performance characteristics of the A320 family aircraft to ensure a safe and efficient operation during normal and/or abnormal/emergency situations on ground and in flight. However, the Flight Crew Operating Manual is not intended to provide basic jet aircraft piloting techniques or information that are considered as basic airmanship for trained flight crews familiar with that type of aircraft and with its general handling characteristics.
The Flight Crew Operating Manual is intended :

- To be used directly as flight crew operating manual or to be the basis for elaboration of the relevant parts of the "crew manual" by the operations department of the operator in accordance with applicable requirements.
- To be used as a flight crew training manual (initial and refresher).
  However, the Flight Crew Operating Manual is not intended to be used for teaching basic piloting skills.

The content is divided into four volumes :
Vol 1 = Systems' description (description of the aircraft systems).
Vol 2 = Flight preparation (performance information, plus loading data).
Vol 3 = Flight operations (operating procedures, techniques, and performance information).
Vol 4 = FMGS pilot's guide (procedures for FMGS use).

USE

As a comprehensive set of references, the FCOM :
- can be used by an operator's flight operations department to supplement its own crew manual
- can be issued directly to crew members for training and subsequently for line operations.

WARNINGS, CAUTIONS AND NOTES

WARNING : an operating procedure, technique, etc, which may result in personel injury or loss of life if not carefully followed.
CAUTION : an operating procedure, technique, etc, which may result in damage to equipment if not carefully followed.
NOTE : an operating procedure, technique, etc, considered essential to emphasize.

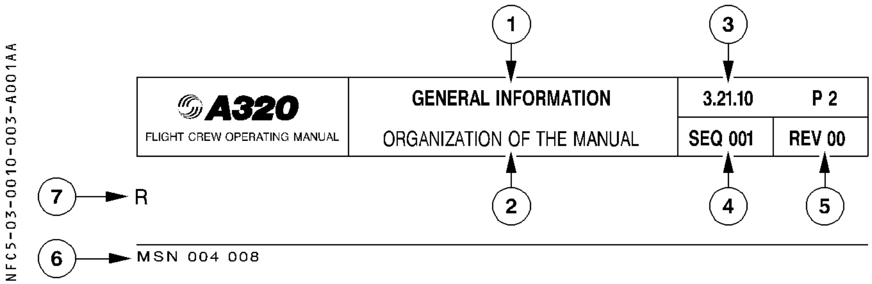
COMPLEMENTARY INFORMATION

The manual includes technical information required for training as well as complementary information.
- Where a paragraph or schematic is preceded by the heading FOR INFO the details given are considered to be "nice to know". Knowledge of these items is not required for the type rating qualification.
- ECAM warnings and cautions are summarized in a table at the end of each chapter of volume 1. Numeric values are given for information only.

OPTIONAL EQUIPMENT

The legend "◁" indicates that a paragraph or a shematic is applicable only if the related equipment is installed.

PAGINATION



1 Chapter title

2 Subchapter title

3 FCOM volume number, Chapter number, Section number, Page number

4 Sequence number is used for Airbus Industrie management of different aircraft configurations and allows to enter into list of effective pages

5 Revision number of the manual at which the page has been revised

6 Aircraft MSN
— 004 008 means that the page is applicable to aircraft MSN 004 and MSN 008
— 010-014 means that the page is applicable to aircraft MSN 010 to MSN 014
— ALL means that the page is applicable to all aircraft covered by the manual.
Correspondance between MSN and registration may be found in the cross reference table

7 An “R” in front of a line indicates that the line has been revised.

REVISIONS

NORMAL REVISIONS

There are issued periodically to cover non-urgent corrections and changes, and to add new data.
They are accompanied by filing instructions and an updated List of Effective Pages that includes customized pages.
A normal revision record sheet is at the front of each volume.
In addition, each volume has a “List of MOD/MP affecting the manual”, that gives a simple explanation of the technical content of each MOD/MP incorporated and its validity per aircraft.

TEMPORARY REVISIONS

Printed on yellow paper these are, issued to cover urgent matters arising between normal revisions. They are accompanied by filing instructions and an updated customized list of effective TR.
A yellow temporary revision record sheet is at the front of each volume.

INCORPORATION OF SERVICE BULLETINS IN THE MANUAL

When a Service Bulletin (SB) has been accomplished on one or more aircraft of the operator fleet, and notified to Airbus Industrie, all affected manuals will reflect the new aircraft configuration at next following revision. If judged necessary by Airbus Industrie, or requested by the operator, a “Temporary Revision” is issued between formal revisions.

OPERATIONS ENGINEERING BULLETINS

These are issued as the need arises to give operators revised or new, but significant, technical and procedural information.
OEBs come with an OEB record sheet. This record sheet is re-issued with each normal revision to update the bulletin embodiment status.
They are accompanied by filling instructions and an updated customized list of effective OEB.

HOW TO INSERT A REVISION

FILING INSTRUCTIONS

Use the filing instructions as follows :
- REMOVE : The page must be removed. It may be replaced by a new page if associated with an "INSERT" instruction. If not, the page is cancelled.
- INSERT : The page must be inserted. If not associated with a "REMOVE" instruction, the page is new for the operator fleet and does not replace an existing one.

The column "NOTE" indicates the reason for change. It states "EFFECTIVITY CHANGE ONLY" if the page is only revised due to effectivity change and not due to technical content.

LIST OF EFFECTIVE PAGES (LEP)

The manual after revision must comply with the LEP, which lists all the pages that are in the manual. The new pages are indicated by "N" and the revised pages by "R".

BEST WAY TO GET UPDATED DOCUMENTATION

The best way to ensure timely receipt of getting correct updated documentation is to advise :
AIRBUS INDUSTRIE
BP 33
31707 BLAGNAC CEDEX
FRANCE
Telex : TLSBP7X.. or 530526F
FAX 33.61.93.28.06
ATTN : Customer Service Directorate – Technical Documentation Services (AI/SE – D)
as soon as any change has been completed on any airplane.

To simplify automatic LEP processing some modifications have been grouped under a common code.

	CODE	DESIGNATION
	0002	Mod : (21678+26377) = (21678+26999) = (21678+26377+26999)
	0003	Mod : (22013+26017+26401) = (22013+25410+26017+26401)
	0004	Mod : (21946+24624) = (21946+26169) = (21946+26169+30299) = (21946+26169+30299+31285)
	0006	Mod : 22013+23208+24077+26017+26401
	0007	Mod : (30748+56-5-B3 = V2533) = (24105+30748)
	0008	Mod : 26377 = 26999 = (26377+26999)
R R R R	0009	Mod : (26117+31896) = (26117+31897) = (26270+31896) = (26270+31897) = (27866+31896) = (27866+31897) = (25529+27866+31896) = (25529+27866+31897) = (25529+27866+32475) = (25529+27866+32929) = (26851+27866+31896) = (25529+26185+27866+31897) = (25529+27866+31896+32402)
	0010	Mod : (23108+27276) = (23109+27276) = (23871+27276)
	0011	Mod : (21054+22013+25199) = (21054+22013+25200)
	0012	Mod : (22461+23426) = (22461+23943) = (23408+23426) = (23408+23943)
	0013	STD = IAE V2500 = Mod : 25404 = 26017
	0014	Mod : (22249+24215) = (22249+24588) = (22249+25534) = (22249+24588+25534) = (22249+24215+24588+25534)
	0016	Mod : (21038+24064+24105+25199) = (21039+24066+24105+25200)
	0017	Mod : (23108+30748)+V2500 = (23109+30748)+V2500 = (23408+30748)+V2500
	0020	Mod : 26017+CFM 56-5-B1 = B2 = B3 = B4 = B5 = B6 = B7
	0021	Mod : 25053 = 26338+CFM 56-5-A1 = A3 = A4 = A5
	0022	Mod : 25871 = 25887 = 25893 = 26338 = (25887+26338)
	0023	Mod : 25205 = (25205+26000) = (26000+26999) = (26000+28382) = (26001+30241) = (24105+26002+26999) = (25205+26000+26002) = (25205+26000+26999) = (26000+26999+28382) = (22013+25205+26000+26002) = (22013+26000+26002+28382) = (22013+26001+28218+30241) = (24105+26000+26002+26999) = (24105+26000+26002+28382) = (24105+26001+28218+30241) = (22013+26000+26001+26002+26999) = (22013+26000+26002+26999+28218) = (24105+26000+26002+26999+28218) = (22013+26000+26002+26999+28218+28382) = (24105+26000+26002+26999+28218+28382)
	0025	Mod : (26017+26377) = (26017+26999) = (26017+26377+26999)
	0026	Mod : 20268 = (20268+25800)
	0027	Mod : 25720 = 26609 = (25720+26609)
	0028	Mod : (26002+26111) = (26002+26999) = (26002+28382) = (22013+28218+30241) = (24105+28218+30241) = (26001+28218+30241) = (26002+26999+28218) = (26002+26999+28382) = (26002+28218+28382) = (22013+26111+26999+28218) = (24105+26002+26999+28218) = (24105+26002+28218+28382) = (26000+26002+2699928218) = (26000+26002+28218+28382) = (26002+26111+26999+28218) = (26002+26111+28218+28382) = (26002+26999+28218+28382) = (24105+26002+26999+28218+28382) = (26111+28218) = (24105+26002+26111) = (26002+26111+28218) = (22013+26002+26111+28218)
	0029	Mod : (20024+22013+24613+26017) = (20024+22013+24613+26017+25410)
	0030	Mod : (20024+22013+26017) = (20024+22013+25410+26017)
	0031	Mod : (20024+26017) = (20024+25410+26017)
	0032	STD = Mod : 20057 = 20059 = 30020 = (20057+20059)
	0035	Mod : 20057+20059+20067+20069+20071
	0036	Mod : 21988 = (21988+22013) = (21988+24105)

CODE	DESIGNATION
0037	Mod : 20059+20067+20069+20071+21708
0038	Mod : 25205 = 26093 = 26111 = 26243 = (25205+26093) = (25205+26243) = (25205+27831) = (26093+26111) = (26111+26243) = (26111+26799) = (26111+27831) = (25205+26093+26799) = (26111+26243+27831)
0039	Mod : (25404+28479) = (25404+28916) = (25404+26017+28479) = (25404+26017+28916) = (25404+28702) = (25404+26017+28702)
0040	Mod : 20057+20059+20067+20069+20071+21708
0041	Mod : (21678+26377) = (21678+26999) = (21678+26377+26999)
0042	Mod : 24064 = 24065 = 24066 = 24067 = (24066+24067)
0043	Mod : 26608 = (25357+26608) = (26149+26608) = (25357+25596+26608) = (25357+26149+26608) = (25596+26149+26608) = (25357+25596+26149+26608+IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533) = (25357+25596+26149+26608+27088+IAE V2522 = V2527 = V2527E = V2530 = V2533)
0044	Mod : 26149 = 26608 = (26149+26608)+IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533
0045	Mod : (21964+22013) = (21964+26334) = (21964+26335) = (21964+24105)
0046	Mod : 23661 = 24783 = (23661+24783)
0047	Mod : (20024+22013+26017) = (20024+22013+25410+26017)
0049	STD = Mod : 25410 = 26017 = (25410+26017)
0050	Mod : (25871+26017) = (25887+26017) = (25893+26017) = (26017+26149) = (26017+25871) = (25410+25871+26017) = (25410+25887+26017) = (25410+25893+26017) = (25410+26017+26149) = (25410+26017+26338) = (26017+26149+26608) = (25410+26017+26608) = (25410+25871+25893+26017) = (25410+25887+26017+26338) = (25410+26017+26149+26608) = (25410+25893+26017+26149+26608)
0051	STD = Mod : 25072 = 27609 = (22562+25072) = (24667+25072) = (25888+27609) = (22562+24667+25072) = (22562+24955+25072)
0052	STD = Mod : 22562 = 25072 = (22562+25072)
0053	Mod : (28160+28479) = (28160+28916)
0054	Mod : 24349 = 24785 = 24852 = (23779+24349) = (23779+24785) = (23779+24852) = (23779+24349+24785) = (23779+24785+24852)
0055	Mod : 27112+27770+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0056	Mod : (21038+22013+24064) = (21039+22013+24066)
0057	Mod : 25649 = (24178+25649)
0058	Mod : 23219 = 25294 = 30400 = (23672+25294) = (23672+25294+25336)
0059	Mod : (23222+CFM 56-5-B4 = IAE V2527) = (22013+26057) = (23222+23871) = (23222+24105) = (24105+26057) = (22013+23222+26057)
0060	Mod : 22562+IAE V2522 = V2524 = V2527 = V2527E = V2527M = V2530 = V2533
0061	Mod : (23108+27276) = (23109+27276) = (23408+27276) = (23871+27276+CFM 56-5-A1 = A3) = (23109+23408+27276) = (23108+23109+23408+27276)
0062	Mod : 20075 = 20219 = 21776 = 24266 = 24267 = 31006 = (20075+20219)
0063	Mod : 22536 = 23227 = 23529 = (22536+23529)
0064	Mod : 25615+27276+30748+CFM 56-5-B4 = IAE V2527 = V2527E
0065	Mod : (23108+20139+27276) = (23109+20139+27276) = (23408+20139+27276)+V2500A1
0066	Mod : 26017 = (25410+26017) = (22013+24044+26017) = (22013+24404+25410+26017)
0067	Mod : (22249+25529) = (22249+26117) = (22249+26270)
0068	Mod : (22249+25529+26017) = (22249+26117+26017) = (22249+26270+26017)
0069	Mod : (27276+30748)+IAE V2500 = CFM 56-5-A1 = A3

CODE	DESIGNATION
0070	Mod : (22249+25529+26401+26017) = (22249+26117+26401+26017) = (22249+26270+2641+26017)
0071	Mod : 25888 = (22562+25072+25888)+IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533
0072	Mod : 22562 = 24498 = 24642 = 25568 = 25888
R 0073	Mod : 27942 = (23264+23900+27942)
0074	Mod : 23264 = (22269+23264+CFM 56-5-A3) = (22461+23264+IAE V2500)
0075	CFM 56-5-B4 = IAE V2527 = V2527M = (23108 = 23109 = 23871+CFM 56-5-B4 = IAE V2527 = V2527E)
0076	Mod : (20139+23108) = (20139+23109) = (20139+23408)+V2500
0077	Mod : (22562+28897) = (22562+24955+28897)
0079	Mod : (22013+24064+24385+25199) = (22013+24066+24386+25200)
0081	Mod : (21678+22013) = (21678+24105) = (21678+28160)
0082	Mod : (20031+26723) = (20047+20063+27410) = (20063+27639) = (20047+20063+27639) = (20047+20063+26723)
0083	Mod : 20139+22129+22461+23408+23426+23943
0085	Mod : 23219 = 23672 = 24579 = 24581
0086	Mod : 25888 = (22562+25888) = (25072+25888) = (25888+30784) = (22562+24955+25888) = (22562+25072+25888) = (22562+24955+25072+25888)
0087	Mod : 27777 = (26608+27777) = (25357+26608+27777) = (26149+26608+27777) = (25357+25596+26149+27777) = (25357+25596+26608+27777) = (25357+26149+26608+27777) = (25596+26149+26608+27777) = (25357+25596+26149+26608+27777) = (25357+25596+26149+26608+27088+27777)+IAE V2522 = V2524 = V2527 = V2527E = V2527M = V2530 = V2533 = (25357+25596+26149+27088+27777)+IAE V2533
0088	STD = Mod : 25410 = 26017 = 26149 = (25410+26017)
0089	STD = Mod : 22190 = (20056+22190)
0090	Mod : 28053+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0091	Mod : (22013+24404) = (22013+24405) = (22013+25530) = (24404+25951) = (24405+25951) = (25530+25951)+CFM
0092	STD = Mod : (24105+31896) = (24105+31897)
0093	STD = Mod : 25072 = (22562+25072) = (25888+27609)
0094	Mod : 28479 = 28916 = (26017+28916) = (28160+28479+28917) = (28160+28916+28917) = (25410+26017+28916)+CFM
0095	Mod : (24349+26526) = (23779+24349+26526) = (23779+24785+26526) = (23779+24852+26526) = (23779+24349+24785+26526) = (23779+24785+24852+26526)
0096	Mod : (26111+28244) = (26999+28244) = (28244+28382) = (25205+28244) = (28244+30241) = (26111+26999+28244) = (26111+28244+28382) = (26999+28244+28382) = (25205+26999+28244+28495) = (26999+28244+28382+28495)
0097	Mod : (25053+26017) = (25053+26338) = (26017+26338) = (25053+26017+26338)
0098	Mod : (25404+25410) = (25404+26017) = (25404+25410+26017+28160+28917)
0099	IAE V2522 = V2524 = V2527 = V2527E = V2527M = V2530 = V2533
0100	Mod : (22562+28160+28479) = (22562+28160+28916) = (25888+28160+28479) = (25888+28160+28916)
0102	CFM 56-5-A1 = A3 = A4 = A5 = CFM 56-5-A4 = A5+US
0103	IAE V2500 = V2522 = V2524 = V2527 = V2527E = V2527M
0105	Mod : 24871 = (24871+25410) = (24871+26017) = (24871+25410+26017)+IAE
0106	Mod : 25410 = 26017 = (25410+26017)+CFM

CODE	DESIGNATION
0107	STD = Mod : (22562+25072)+IAE V2522 = V2524 = V2527M
0110	Mod : (23208+24077+25410) = (23208+24077+26017) = (23208+24077+25410+26017)
0111	Mod : (21678+21858) = (20117+21678+21858)
0112	Mod : (22013+26017) = (22013+25410+26017)
0113	Mod : 26149 = 26608 = (26149+26608) = IAE V2522 = V2524 = V2527 = V2527E = V2527M = V2530 = V2533
0114	Mod : (20024+24613+25410) = (20024+24105+24613+25410)
0115	IAE V2500 = V2522 = V2524 = V2527 = V2527E = V2527M = (V2500 = V2522 = V2524 = V2527 = V2527E = V2527M+US) = (26346+IAE V2500 = V2524 = V2527 = V2527M)
0116	Mod : 25871 = 25887 = 25893 = 26149 = 26338 = 26608 = (26149+26608)
0117	STD = IAE = Mod : 26017 = (26017+IAE)
0118	STD = Mod : 25410 = 26017 = (25410+26017)
0120	CFM 56-5-A1 = A3 = B4 = IAE V2500 = V2527 = V2527E
0121	Mod : 25419 = 27992 = (27992+28377) = (25419+26963+27992)
0122	Mod : (22249+24215+24588+25529) = (22249+24215+24588+26117) = (22249+24215+24588+26270) = (22249+24215+24588+26117+26270)
0123	STD = Mod : 31897 = 31896 = (22013+20586+28652)
0124	Mod : (20024+25410) = (20024+24105+25410)
0126	Mod : (21678+25410) = (20117+25410) = (21678+20117+25410)
0127	Mod : 28479 = 28916 = (26017+28479) = (26017+28916) = (25410+26017+28479) = (25410+26017+28916)
0128	Mod : 22013 = (22013+27846) = (22013+28960) = (22013+28479) = (22013+28916) = (22013+28479+28960) = (22013+27846+28916)
0130	Mod : 26111 = 30631 = 30635 = 26485 = (26999+28218) = (28382+28218) = (30241+28218) = (30631+28218) = (30635+28218) = (24105+26111) = (22013+26111) = (22013+26999+28218) = (22013+28382+28218) = (22013+30241+28218) = (22013+30631+28218) = (22013+30635+28218) = (24105+26999+28218) = (24105+28382+28218) = (24105+30241+28218) = (24105+30631+28218) = (24105+30635+28218)
0131	Mod : 25205 = 30631 = 30635 = 26485 = (26999+26001) = (28382+26001) = (30241+26001) = (30631+26001) = (30635+26001) = (24105+25205) = (22013+25205) = (24105+25205+26002) = (22013+25205+26002) = (24105+26999+26001+26002) = (24105+28382+26001+26002) = (24105+30241+26001+26002) = (24105+30631+26001+26002) = (24105+30635+26000+26002) = (22013+26999+26001+26002) = (22013+28382+26001+26002) = (22013+30631+26001+26002) = (22013+30635+26001+26002)
0134	Mod : (20047+26723) = (20047+27410) = (20047+30277)
0135	Mod : (25404+28479) = (25404+28916) = (25404+28160+28479+28917) = (25404+28160+28916+28917)
0136	Mod : (22269+CFM 56-5-A3) = (22269+22461+IAE V2500) = (22269+26058+CFM 56-5-A3) = (22269+22461+26058+IAE V2500)
0137	Mod : 20063 = (20031+20047) = (20047+20063)
0138	Mod : (20047+20151) = (20047+23092) = (20063+20151) = (20047+20063+20151) = (20047+20063+23092) = (20047+20063+31112)
0139	Mod : 25328+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0140	Mod : 26457+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0141	Mod : (23264+23900) = (22269+23264+23900)
0142	Mod : 27112+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0143	Mod : 21054 = (21054+25199) = (21054+25200)

CODE	DESIGNATION
0144	Mod : 24404 = 24405 = 27640
0145	Mod : 24404 = 24405 = 25530 = 27640
0146	Mod : (25404+26017) = (25404+25410+26017) = (25404+25410+26017+28160+28917)
0147	Mod : (22269+23900+IAE V2527) = (22269+23900+26058+IAE V2527)=(23900+26058+IAE V2527)
0149	IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533
0151	Mod : (22013+26401+25404+28479) = (22013+25404+26401+28916)
0153	Mod : (21678+21706+21766+27498+28479) = (21678+21706+21766+27498+28702) = (21678+21706+21766+27498+28916)
0154	Mod : (21678+21706+21768+27498+28479) = (21678+21706+21768+27498+28702) = (21678+21706+21768+27498+28916)
0155	Mod : (21678+21766+21767+27498+28479) = (21678+21766+21767+27498+28702) = (21678+21766+21767+27498+28916)
0156	Mod : (21678+21706+21766+21768+27498+28479) = (21678+21706+21766+21768+27498+28702) = (21678+21706+21766+21768+27498+28916)
0157	Mod : (21678+21706+21766+21767+21768+27498+28479) = (21678+21706+21766+21767+21768+27498+28702) = (21678+21706+21766+21767+21768+27498+28916)
0158	Mod : (22013+26401+28479) = (22013+26401+28916) = (22013+26017+26401+28479) = (22013+26017+26401+28916)
0163	Mod : (24105+28479) = (24105+28702) = (24105+28916) = (24105+26017+28479) = (24105+26017+28702) = (24015+26017+28916) = (24105+25410+26017+28479) = (24105+25410+26017+28702) = (24015+25410+26017+28916)
0166	Mod : 28479 = 28702 = 28916 = (25951+28702) = (26017+28479) = (26017+28702) = (26017+28916) = (22013+24044+28479) = (22013+24044+28916) = (25410+26017+28479) = (25410+26017+28702) = (25410+26017+28916) = (25951+26017+28702) = (22013+24044+26017+28479) = (22013+24044+26017+28916) = (25410+25951+26017+28702) = (22013+24044+25410+26017+28479) = (22013+24044+25410+26017+28916)
0167	Mod : (22013+28479) = (22013+28916) = (25951+28479) = (25951+28916)
0168	Mod : (22013+25205) = (22013+26111) = (22013+26999) = (22013+28382) = (22013+30631) = (22013+30635) = (22013+26485)
0169	Mod : 25888 = (22562+25888) = (22562+25072+25888)
0170	Mod : (21038+24617+25199) = (21038+24617+25314) = (21038+24617+27780) = (21038+24064+24617+25199) = (21038+24065+24617+25314) = (21038+24065+24617+25314+27780+28416)
0172	Mod : (24064+26526) = (24065+26526) = (24066+26526) = (24067+26526) = (24065+24067+26526) = (24066+24067+26526)
0174	Mod : 28479 = 28702 = 28916 = (25410+28479) = (25410+28702) = (25410+28916)
0175	Mod : (21678+27498+28479) = (21678+27498+28702) = (21678+27498+28916)
0176	Mod : (21768+27498+28479) = (21768+27498+28702) = (21768+27498+28916)
0177	Mod : (21678+21706+27498+28479) = (21678+21706+27498+28702) = (21678+21706+27498+28916)
0178	Mod : (21678+21766+27498+28479) = (21678+21766+27498+28702) = (21678+21766+27498+28916)
R R 0181	Mod : 28136 = (27112+28136+32217)+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0183	Mod : 24105 = (24105+27846) = (24105+27846+28916) = (24105+27846+28479) = (24105+27846+28702)
0184	Mod : 21678+21706+21766+21767+21768

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0185	Mod : 21678+21706+21766+21767+21768+21858
0186	STD = Mod : 26018 = (22707+26018)
0187	CFM = Mod : 24044 = 28307 = (24105+CFM 56-5-B4) = (25530+CFM 56-5-B6) = (24404+28307) = (24405+28307) = (25530+28307) = (22013+24044+28307+CFM)
0188	STD = Mod : 20062+22188
0189	Mod : 24035 = 24160 = 24211 = (24035+24211)
0193	Mod : 26851 = (25529+26185) = (25529+26208) = (25529+26345) = (25529+26851)
0195	Mod : 25240 = 25274 = 28283 = 28711 = (25240+28238+28719) = (25274+28238+28719) = (28238+28283+28719) = (28238+28711+28719)
0196	Mod : (21039+24066) = (21039+24067) = (21039+23893+24067) = (21039+24066+24067) = (21039+24066+25200) = (21039+24067+25200) = (21039+23893+24066+25200) = (21039+24066+24067+25200)
0197	STD = Mod : 28037 = (22013+24044)
0198	Mod : 26017 = (23208+24077+26017) = (22013+23208+24077+26017) = (23208+24077+24105+26017)
0199	Mod : 25205 = 26111 = 26999 = 28382 = 30241 = 30631 = 30635 = 26485 = (26999+28382+28495) = (24075+24077+26999+28495)
0200	Mod : 23208 = 24077 = (23208+24077) = (22013+23208+24077) = (23208+24077+24105)
0201	Mod : 21678+21706+21766+21768+21858
0202	Mod : 25205 = 26111 = 26999 = 28382 = 30241 = (26111+26999) = (26999+28244+30170) = (26999+28244+28382+28495+30170)
0204	Mod : (23264+23900+CFM 56-5-A3) = (22461+23264+23900+IAE V2500) = (22269+23264+23900+CFM 56-5-A3) = (22269+22461+23264+23900+IAE V2500)
0205	Mod : 26876 = 26877 = 27698 = 27740 = 27753 = 28739 = 30163 = 28738 = 31001 = 31699
R 0207	Mod : (24105+25404+28479) = (24105+25404+28702) = (24105+25404+28916) = R (25404+28160+28479) = (25404+28160+28916)
0209	Mod : 22562+25072+28160
0210	Mod : (23219+30206) = (23672+30206) = (24579+30206) = (24581+30206) = (23219+23672+30206) = (23219+23672+24579+30206)
0211	Mod : 26716 = 26799 = 26968 = 27780 = 27831 = 27832 = (26093+26799) = (26243+27831)
0212	Mod : (20966+CFM 56-5-A3) = (20966+22461+IAE V2500)
0213	Mod : 23219 = 23672 = 24579 = 24581 = (23219+23672) = (23219+23672+24579)
0214	Mod : (23900+CFM 56-5-A3) = (22461+23900+IAE V2500)
0215	Mod : 25205 = 26111 = 26999 = 28382 = 30241 = (25205+26999+28495) = (26999+28382+28495)
0217	Mod : (21532+CFM 56-5-A3) = (21532+22461+IAE V2500)
0218	Mod : (22269+23900+CFM 56-5-A3) = (22269+22461+23900+IAE V2500)
0221	Mod : (22013+25415+28479) = (22013+25415+28916)
0222	STD = Mod : 20067+20069+20071+28474+28478
0223	Mod : 22562 = (22562+CFM 56-5-A1 = A3 = A4 = A5 = B1 = B3 = B4 = B5 = B6 = B7 = IAE V2500) = (22562+25888+27609+CFM 56-5 B4)
0224	Mod : (22562+30051) = (24498+30051) = (24642+30051) = (25568+30051) = (25888+30051)

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0225	Mod : (22013+28479) = (22013+28916) = (22013+26017+28479) = (22013+26017+28916) = (22013+25410+26017+28479) = (22013+25410+26017+28916)
0226	Mod : 25951+IAE V2500 = V2522 = V2527 = V2527E
0227	Mod : (23264+23900) = (22269+23264+23900)
0230	STD = Mod : (22553+22889+25081+CFM 56-5-A1 = A3) = (22553+22889+25138+CFM 56-5-A1 = A3) = (22553+22889+25411+CFM 56-5-A1 = A3) = (22553+22889+26577+CFM)
0232	STD = Mod : 25410 = 26017 = (25410+26017)
0234	Mod : (22013+28479+28960) = (22013+28721+28916) = (22013+28916+28960) = (22013+24588+28479+28721) = (22013+24588+28479+28960) = (22013+24588+28479+32011) = (20406+22013+23450+28479+28960) = (20406+22013+23450+28916+28960)
R 0235	Mod : (21678+21858) = (20117+21678+21858)
0236	Mod : 28479 = 28916 = (26017+28479) = (26017+28916)
0237	Mod : (26017+28160+28479) = (26017+28160+28916) = (25410+26017+28160+28479) = (25410+26017+28160+28916)
0238	STD = Mod : (28160+28413) = (28160+28917) = (28160+28413+28917)
0239	Mod : (21678+21706) = (21678+21706+27498)
0240	Mod : (21678+21706+21766) = (21678+21706+21766+27498)
0241	Mod : (21678+21706+21768) = (21678+21706+21768+27498)
0242	Mod : (21678+21766+21767) = (21678+21766+21767+27498)
0243	Mod : (21678+21706+21766+21767+21768) = (21678+21706+21766+21767+21768+27498)
0247	Mod : (20059+20084) = (30020+30066) = (20057+20059+20084)
0248	Mod : 24035 = 24160 = 24189 = (24035+24612) = (24160+24612) = (24189+24612)
0249	STD = Mod : 26346 = (26346+CFM 56-5-A1 = A3 = IAE V2500 = V2527) = (26346+FAA)
0250	Mod : (22013+27846+28479+28960) = (22013+27846+28916+28960) = (22013+27846+28479+28721) = (22013+27846+28916+28721) = (22013+27846+28479+32011) = (22013+27846+28916+32011)
0251	Mod : 24064 = 24065 = 24066 = 24067 = (24064+26346+US) = (24065+26346+US) = (24066+26346+US) = (24067+26346+US)
0254	Mod : (22562+24667) = (22562+24955) = (22562+24667+24955)
0255	Mod : (23742+24064+US) = (23742+24065+US) = (23742+24066+US) = (23742+24067+US)
0258	STD = Mod : (22013+25199) = (22013+25200)
0260	STD = Mod : 25072 = (22562+25072) = (25888+27609)+IAE V2522 = V2524 = V2527 = V2527E = V2527M = V2530 = V2533
0261	Mod : (21533+23222) = (21533+26057) = (21533+23222+26057)
R 0264	Mod : 27698 = 27740 = 27753 = 28739 = 30163 = 28738 = 31001 = 26877 = 26876 = 31699 = (22536+27698) = (22536+27740) = (22536+30163) = (23227+27740) = (23227+28738) = (23227+28739) = (23529+26877) = (23529+27698) = (23529+27740) = (23529+27753) = (23529+31699) = (23227+27698+30163) = (23529+26877+31699)
0271	Mod : (27498+28479) = (27498+28702) = (27498+28916)
0273	Mod : 25357 = 25596 = (25357+25596)+IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533
0274	Mod : 26149 = (25357+26149) = (25596+26149) = (25357+25596+26149)+IAE V2522 = V2524 = V2527 = V2527E = V2530 = V2533

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0275	STD = Mod : (28160+28917) = (25072+28160+28917) = (22562+25072+28160+28917)
0276	STD = Mod : 28479 = 28916 =27846 = (27846+28479) = (27846+28916)
0277	Mod : 28238 = (27846+28238) = (27846+28238+28479) = (27846+28238+28916) = (27846+28238+28702)
0279	Mod : (21678+22013+26017) = (21678+22013+25410+26017)
0280	Mod : (24105+25404+25410+26017+28479) = (24105+25404+25410+26017+28702) = (24105+25404+25410+26017+28916) = (25404+25410+26017+28916+30020)
0292	Mod : 25410 = 26017 = (25410+26017) = (25410+26017+28160+28917)
0293	Mod : 26017 = (25410+26017) = (25410+26017+28160+28917)
0294	STD = Mod : 23450 = 24588 = (20406+23450) = (23450+24588) = (20406+23450+24588) = (20406+23450+24588+28916)
0296	Mod : (22013+24588) = (22013+23450+24588) = (20406+22013+23450+24588)
0306	Mod : (23208+24077+24105+25410) = (23208+24077+24105+25410+26017)
0307	Mod : (22013+23208+24077+25410) = (22013+23208+24077+26017) = (22013+23208+24077+25410+26017)
0309	Mod : (22013+26017) = (22013+25410+26017)
0310	Mod : (24105+26017) = (24105+25410+26017)
0311	Mod : (25410+25871) = (25410+25887) = (25410+25893) = (25410+26338)
0312	Mod : (25871+26017) = (25887+26017) = (25893+26017) = (26017+26338) = (25410+25871+26017) = (25410+25887+26017) = (25410+25893+26017) = (25410+26017+26338) = (25410+25871+25893+26017) = (25410+25887+26017+26338)
0313	Mod : (26017+26149) = (25410+26017+26149)
0314	Mod : 25410 = 26017 = (25410+26017)
0315	Mod : 22562 = (22562+28160+28917)
0317	Mod : 25241 = 25242 = (25241+25242)
0318	CFM 56-5-A1 = A3 = A5 = B2 = B3 = B4 = B5 = B6 = B7 = Mod : 25072 = (25072+CFM 56-5-A1 = A3) = (22562+25072) = (25888+27609) = (22562+25072+CFM 56-5-A1 = A3 = B3 = B4)
0319	STD = Mod : 25072 = 27609 = (22562+25072) = (25888+27609)
0320	Mod : 21533 = (21533+25072) = (21533+22562+25072) = (21533+25888+27609)
0321	Mod : (26149+27777) = (26149+26608+27777)
0322	IAE V2500 = V2522 = V2524 = V2527 = V2527E = V2527M
0327	Mod : (20024+24613+26017) = (20024+24613+25410+26017)
0333	STD = Mod : (20024+22013) = (20024+22013+US)
0335	Mod : (21038+27780) =(21038+24064+25199) = (21038+24064+27780) = (21038+24065+25314) = (21038+24065+27780) = (21038+24065+28416) = (21038+25314+27780) = (21038+25314+28416) = (21038+27780+28416) = (21038+24065+25314+27780) = (21038+24065+27780+28416) = (21038+24064+24065+25199+25314) = (21038+24065+25314+27780+28416)
0340	Mod : (20406+22013+28479+28960) = (20406+22013+28721+28916) = (20406+22013+28916+28960)
0341	Mod : 25205 = 26111 = 26999 = 28382 = 30241 = 30631 = 30635 = 26485 = (24105+25205) = (24105+26111) = (24105+26999) = (24105+28382) = (24105+30631) = (24105+30635) = (24105+26485) = (24105+28238+31897) = (24105+28238+31896)
0342	Mod : (22013+28479+32011) =(22013+27846+28479+28721) = (22013+27846+28479+28960) = (22013+27846+28721+28916) = (22013+27846+28916+28960)

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0344	Mod : (24105+26017+26377) = (24105+26017+26999) = (24105+26017+26377+26999)
0345	Mod : (22013+26017+26377) = (22013+26017+26999) = (22013+26017+26377+26999)
0346	Mod : (21678+26377) = (21678+26377+26999)
0347	Mod : (21678+26017) = (21678+25410+26017)
0348	Mod : (20268+22461) = (20268+23408) = (20268+22461+23408)
0349	Mod : 23108 = 23109 = 23408 = (23109+23408) = (23108+23109+23408)
0350	Mod : (21678+25410) = (21678+26017) = (21678+25410+26017)
0351	Mod : (22013+26017) = (25951+26017) = (22013+25410+26017) = (25410+25951+26017)
0352	Mod : (22013+25410) = (22013+26017) = (24105+25410) = (26017+28160) = (26017+30020) = (22013+25410+26017) = (24105+25410+26017) = (25410+26017+28160)
0354	Mod : (23108+23222+25615+26398) = (23222+24105+25615+26398)
0355	Mod : (24105+26017) = (24105+25410+26017)
0356	Mod : (22013+26017) = (22013+25410+26017)
0357	Mod : (20059+20067+20069+20071) = (20059+20067+20069+20816+27063)
0358	IAE V2527A5 = CFM 56–5–B4 = Mod : 22013 = 23108 = 23109 = 23408 = 23871 = 24105 = (23108+23109) = (24105+32207+CFM 56-5-B7) = (24105 + 32207 + IAE V2527M) = (23108+23109+23408)
0359	Mod : 23699 = 24281 = (23698+23699) = (23698+24281) = (23699+24281)
0360	Mod : (22013+23698) = (22013+23698+23699)
0361	STD = Mod : 25410 = 26017 = (25410+26017)
0362	Mod : (25415+28479) = (25415+28916) = (25415+28916) = MSN 0927
0365	Mod : (20268+24404) = (20268+24404+25800) = (20268+25800+27727) = (20268+24404+25800+27727)
0366	Mod : 20268 = (20268+25800) = (20268+24404+25502) = (20268+24404+25502+25800)
0367	Mod : (20063+26723) = (20047+20063+20151+26723) = (20047+20063+20151+30277) = (20047+20063+20151+27763)
0369	Mod : 23672 = 25108 = 25336 = 27917 = (23672+25336) = (25108+25336) = (23219+23672) = (23219+23672+25336)
0370	Mod : 20268 = (20268+25800) = (20268+24405+25501) = (20268+24405+25501+25800)
0379	Mod : (20268+24405) = (20268+24405+25800) = (20268+25800+27727) = (20268+24405+25800+27727)
0380	Mod : (20268+25530) = (20268+25530+25800) = (20268+25800+27727) = (20268+25530+25800+27727)
0381	Mod : (22013 = 25951+CFM) = (22013+28307+CFM 56-5-B2) = (25951+28307+CFM 56-5-B4)
0382	Mod : 25529 = 26117 = 26270 = 27866 = (26851+27866) = (25529+26185+27866) = (25529+26208+27866) = (25529+26345+27866) = (26270+31896+32332) = (26270+31897+32333)+(27866+31897+32333) = (25529+27866+31896+32332)
0383	Mod : 26526 = (24064+26526) = (24066+26526) = (24067+26526)
0390	Mod : 20057+20067+20069+20071+21708
0391	Mod : (25240+28238) = (25274+28238) = (28238+28711)
0393	Mod : (21678+22013) = (21678+24105) = (21678+28160) =(21678+30020)
0394	Mod : (21678+22013) = (21678+24105) = (21678+28160)

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0395	Mod : 31897 = 32929 = (31897+32333+32929)
0396	Mod : (23742+24064) = (23742+24065) = (23742+24066) = (23742+24067) = (23742+24064+26346+US) = (23742+24065+26346+US) = (23742+24066+26346+US) = (23742+24067+26346+US)
0397	Mod : (20268+28238) = (20268+25800+28238)
0398	STD = Mod : 26000 = 26002 = 28218 = (24105+26002) = (26002+28218) = (24105+26002+28218)
0401	STD = Mod : 25072 = (22562+25072) = (28160+28917) = (25072+28160+28917) = (22562+25072+28160+28917)
0403	Mod : 27650 = (24588+27650) = (24215+24588+27650)
0407	Mod : (27650+28244+28382) = (26999+27650+28244+28382+28495)
0413	Mod : 30310 = (24899+26600)
0416	Mod : 20406 = (20406+24588) = (20406+24588+28916)
0415	Mod : (20024+24105+24613+26017) = (20024+24105+24613+25410+26017)
0417	Mod : 24105+25404+25410+26017
0419	Mod : (28479+30363) = (28702+30363) = (28916+30363) = (25410+28479+30363) = (25410+28702+30363) = (25410+28916+30363)
0420	Mod : (28238+30096) = (24105+26999+28238+30096)
0421	Mod : (25205+30096) = (26111+30096) = (26999+30096) = (28382+30096) = (30096+30241) = (24105+25205+30096) = (24105+26111+30096) = (24105+26999+30096) = (24105+28382+30096) = (24105+25205+30096+28238+31896) = (24105+25205+30096+28238+31897) = (24105+26111+30096+28238+31896) = (24105+26111+30096+28238+31897) = (24105+30241+30096+28238+31896) = (24105+30241+30096+28238+31897) = (24105+26999+30096+28238+31896) = (24105+26999+30096+28238+31897) = (24105+28382+30096+28238+31896) = (24105+28382+30096+28238+31897)
0422	Mod : (22013+25205+30096) = (22013+26111+30096) = (22013+26999+30096) = (22013+28382+30096) = (22013+30096+30631) = (22013+30096+30635) = (22013+30096+26485)
0423	Mod : (25615+27276) = (23108+25615+27276)
0424	Mod : 27112+28238+28951
0425	Mod : 23264+23900+28547
0426	Mod : (21678+25404+26017+26377) = (21678+25404+26017+26999)
0427	Mod : 22013 = 23672 = 24105 = 24581 = 24785 = 25108 = (23672+27620+33497) = (24785+27620+33497)
0429	MSN : 0002 = 0003 = 0004 = 0005 = 0006 = 0007 = 0008 = 0010 = 0011 = 0012 = 0013 = 0014 = 0016 = 0017 = 0018 = 0019 = 0020 = 0021
0430	MSN : 0163 = 0164 = 0168 = 0169 = 0179 = 0193 = 0221 = 0222 = 0230 = 0294 = 0299 = 0301 = 0338 = 0348 = 0349 = 0362 = 0363 = 0424 = 0429 = 0437 = 0444 = 0449 = 0476
0431	Mod : (24852+26858) = (25336+26858) = (26858+27917) = (26858+28218)
0432	Mod : (21678+22013+26377) = (21678+22013+26999) = (21678+22013+26379+26999)
0433	Mod : (21678+22013+25404+26017+26377) = (21678+22013+25404+26017+26999)
0434	Mod : 28258 = 30470 = 26438 = 27624 = 23888 = 25829 = 32015
0435	Mod : (21946+26169+30308) = (21946+26169+30299+30308)
0439	Mod : 31607 = 31701 = 31702+CFM 56-5-B3 = IAE V2533
0440	STD = (24105+31364) = (24105+31365) = (24105+31897) = (24105+31896) = (20105+32475) = (24105+31365+31896+31905)
0450	Mod : (28160+28479) = (28160+28916) = (28160+28479+22562+25072) = (28160+28916+22562+25072)

	CODE	DESIGNATION
	0451	Mod : 22562 = 25888 = (22562+28160+28917) = (25888+28160+28917)
	0452	Mod : (28160+28479) = (28160+28916) = (22562+25072+28160+28479) = (28160+28916+22562+25072)
	0453	Mod : (22562+28160+28479) = (22562+28160+28916)
	0454	Mod : 25888 = (25888+28160+28917)
	0455	Mod : (25888+28160+28479) = (25888+28160+28916)
	0456	Mod : 28238 = (24105+2699+28238) = (24105+30631+28238) = (24105+30635+28238) = (24105+26485+28238)
	0457	Mod : (26017+27276) = (25410+26017+27276)
	0458	Mod : (20586+24105) = (20586+24105+28238)
	0459	Mod : (22013+26057+26398) = (22013+23222+26398)
	0460	Mod : (22269+23900) = (26058+23900)
	0461	STD = Mod : (28238+31897) = (28238+31896)
	0462	STD = Mod : 26963 = 28377 = 28667 = (25419+26963) = (25419+28667) = (27992+28377+28667) = (25419+26963+27992+28667) = (25419+26963+27992+28377)
	0463	Mod : (22013+26017+27276) = (22013+26017+31395) = (22013+26017+27276+31395)
	0464	Mod : (24105+26017+27276) = (24105+26017+27276+31395)
	0465	Mod : (26017+26334+27276) = (26017+26334+31395) = (26017+26335+27276) = (26017+26335+31395) = (26017+26334+27276+31395) = (26017+26335+27276+31395)
	0466	Mod : (26017+27276) = (26017+31395) = (26017+27276+31395)
R R	0467	Mod : (21678+22013+30660) = (21678+24105+30660) = (21678+28160+30660) = (21678+24105+30020+30660)
	0468	Mod : 22013 = (22013+25410) = (22013+25409+25410)
	0469	Mod : (25404+26017) = (25404+25410+26017) = (25404+25410+26017+28160+28917)
	0471	Mod : (22013+25404+28916) = (22013+25404+28479)+CFM = IAE
R R	0472	Mod : (25404+28479) = (25404+28916) = (25404+28160+28479+28917) = (25404+28160+28916+28917)
	0473	Mod : (26017) = (25410+26017) = (26017+25410+28160+28917)
	0474	Mod : (21678+26017) = (21678+25410+26017) = (21678+26017+25410+28160+28917)
	0475	Mod : (21678+22013+25410) = (21678+22013+25410+26017) = (21678+24105+25410+26017) = (21678+25410+26017+28160)
	0476	Mod : (21678+26999) = (21678+27646) = (21678+30631) = (21678+30635) = (21678+26485)
	0477	Mod : 26999 = 27646 = 30631 = 30635 = 26485
	0478	Mod : 31321 = (31321+31607) = (31321+31701) = (31321+31702)
	0479	Mod : 25820+30748+CFM 56-5-A1 = 56-5-A3 = IAE V2500
	0480	Mod : (23108+25820+30748) = (23109+25820+30748) = (23408+25820+30748)+IAE V2500
	0481	Mod : 23871+25820+30748+CFM 56-5-A1 = A3
	0482	Mod : 25820+30748+CFM 56-5-B4 = IAE V2527 = V2527E
	0483	Mod : (23108+25820) = (23109+25820) = (23408+25820)+V2500
	0484	Mod : 23871+25820+27276+30748+CFM 56-5-B4
	0485	Mod : 24178+31810+CFM 56-5-B1 = B2 = IAE V2530
	0486	Mod : 24899+31810+CFM 56-5-B1 = B2 = IAE V2530

CODE	DESIGNATION
0487	Mod : 25649+31810+CFM 56-5-B1 = B2 = IAE V2530
0488	Mod : 30334+31810+CFM 56-5-B1 = B2 = IAE V2530
0489	Mod : 31810 = (26600+30310)+CFM 56-5-B1 = B2 = IAE V2530
0490	Mod : (21678+26999) = (21678+21858+26377) = (21678+21858+26999) = (21678+26377+26999)
0491	STD = Mod : (23219+23672+28785) = (ACA+23219+23672+28785)
0492	Mod : (20268+28342) =(20268+25647+28342)
0493	Mod : 30479 = (23900+30479)
0494	Mod : 31896 = 31897 = (31896+26999+28495) = (31897+26999+28495)
0495	Mod : 25205 = 26111 = 26999 = 28382 = 30241 = 31896 = 31897 = (25205+26999+28495+31896) = (25205+26999+28495+31897) = (26999+28382+28495+31896) = (26999+28382+28495+31897)
0496	IAE V2500 = V2524 = V2527 = V2527M = V2527E = V2530 = V2533
0497	Mod : (20059+20067+20069+20071) = (20059+20067+20069+20816+27063) = (20059+20067+20069+20071+32146)
0498	Mod : (20067+20069+20071+32146) = (20057+20059+20067+20069+20071)
0499	Mod : (25404+26017+24035) = (25404+26017+24160) = (24189+25404+26017)
0500	Mod : (25241+28138) = (25242+28138) = (25241+25242+28138)
0501	Mod : (25241+26963) = (25242+26963) = (25241+25242+26963)
0502	Mod : (25241+26963+28138) = (25242+26963+28138) = (25241+25242+26963+28138)
0503	Mod : (25205+28916) = (26111+28916) = (26485+28916) = (26999+28479) = (26999+28702) = (26999+28916) = (28382+28916) = (28916+30241) = (28916+30631) = (28916+30635) = (26999+28479+28495) = (26999+28382+28479+28495) = (26999+28382+28495+28702) = (26999+28382+28495+28916) = (24075+25205+26999+28495+28916) = (24075+26999+28495+28505+28916)
0504	STD = Mod : (22013+24044) = (25951+32239)
0505	Mod : 28479 = 28702 = 28916 = (22013+24044+28479) = (22013+24044+28916) = (25951+28479+32239) = (25951+28916+32239)
0506	Mod : 26017 = (25410+26017) = (22013+24044+26017) = (25951+26017+32239) = (22013+24404+25410+26017) = (25410+25951+26017+32239)
0507	Mod : (20170+20343) = (20172+20343) = (20343+21858) = (20343+26044) = (20170+31276) = (20172+31276) = (21858+31276) = (26044+31276)
0508	Mod : (20268+24946+26965) = (20268+24946+27773) = (20268+26760+26965) = (20268+26760+27773) = (20268+26965+32150) = (20268+26965+32238) = (20268+26965+32239) = (20268+26965+32311) = (20268+27773+32150) = (20268+27773+32238) = (20268+27773+32239) = (20268+27773+32311)
0509	Mod : 20268 = (20268+25951) = (20268+24946+25951+26965) = (20268+24946+25951+27773) = (20268+25951+26760+26965) = (20268+25951+26760+27773) = (20268+25951+26965+32150) = (20268+25951+26965+32238) = (20268+25951+26965+32239) = (20268+25951+26965+32311) = (20268+25951+27773+32150) = (20268+25951+27773+32238) = (20268+25951+27773+32239) = (20268+25951+27773+32311)
0510	Mod : 20268+V2527E = (20268+25951) = (20268+24946+25951+26965) = (20268+24946+25951+27773) = (20268+25951+26760+26965) = (20268+25951+26760+27773) = (20268+25951+26965+32150) = (20268+25951+26965+32238) = (20268+25951+26965+32239) = (20268+25951+26965+32311) = (20268+25951+27773+32150) = (20268+25951+27773+32238) = (20268+25951+27773+32239) = (20268+25951+27773+32311)
0511	Mod : 24105 = (24105+31364+31906) = (24105+31365+31905)
0512	Mod : (21678+22013+25404+26017+26377+32090) = (21678+22013+25404+26017+26999+32090

CODE	DESIGNATION
0513	STD = Mod : 31896+32332
0514	Mod : 27455 = (27455+31896+32332)
0515	Mod : 25800 = (25800+31896+32332)
R 0516	STD = Mod : (31897+32333)
0517	STD = Mod : 31896+32332+CFM 56-5-A1 = A3 = A4 = A5 = B4 = B5 = B6
0518	Mod : (22013+27620) = (23672+27620) = (24105+27620) = (24581+27620) = (24785+27620) = (25108+27620)
0519	Mod : 31896 = 32475 = (31896+32332+32475)
0520	Mod : (25800+31896) = (25800+32475) = (25800+31896+32332+32475)
0521	Mod : 31896 = 32475 = (31896+32332+32475)
0522	STD = Mod : (31896+32332) = (31897+32333)
0523	Mod : 31896 = 31897 = 32475 = (31896+32332+32475)
0524	Mod : (20057+20067+20069+20071) = (20057+20067+20062+20816+27063)
0525	Mod : (20067+20069+20071+21708) = (20067+20069+20816+21708+27063)
0526	Mod : 20057+20067+20069+20071+21708
0527	Mod : (20059+20067+20069+20071+21708) = (20052+20067+20069+20816+21708+27063)
0528	Mod : 20057+20059+20067+20069+20071+21708
0529	Mod : (20057+20067) = (20057+20069) = (20057+20067+20069)
0530	Mod : (20059+20067) = (20059+20069) = (20059+20067+20069)
0531	STD = Mod : (28360+31371) = (31371+31728) = (P0164+30660+31371) = (28360+30660+31371) = (30660+31371+31728)
0532	Mod : 20059+20067+20069+20071+21195
0533	Mod : (20057+20059+20067+20069+20071) = (20057+20059+20067+20069+20071+32146) = (20057+20059+20067+20069+20816+27063)
0534	STD = Mod : 23885 = (26999+28495) = (26999+27917)
0535	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = (23885+26111) = (25205+26999+28495) = (26999+28382+28495) = (26999+31896+32332) = (26999+31897+32333) = (26999+28382+28495+31897+32333)
0536	Mod : (26999+31896) = (26999+31897) = (28382+31897) = (26999+28382+28495+31896) = (26999+28382+28495+31897)
0537	Mod : (26999+32475) = (26999+32929) = (26999+28382+28495+32929) = (26999+28382+28495+32475) = (26999+31896+32332+32475) = (26999+31897+32333+32929) = (26999+28382+28495+31896+32402)
0538	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = (23885+26111) = (25205+26999+28495) = (26999+28382+28495)
0539	Mod : 31397 = 31896 = 32475 = 32929 = (31896+32402) = (31897+32401) = (26999+28495+31896) = (26999+28495+32475) = (26999+28495+32929) = (31896+32332+32475)
R 0540	Mod : (26999+31896) = (26999+31897) = (28382+31897) = (26999+28382+28495+31896) = (26999+28382+28495+31897)
R 0541	Mod : 31133 = (22269+23900+31133) =(23264+23900+31133) = (23900+26058+31133)
0542	Mod : (26002+26111) = (28218+26999) = (28218+28382) = (28218+30241) = (26999+28218+28382+28495)
0543	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = 30635 = (22013+25204+26999) = (22013+25204+28382) = (24105+25294+26999) = (24105+25294+28382) = (26999+28218+28382) = (26999+28382+28495) = (22013+25204+26999+28382+28495) = (24105+25294+26999+28382+28495)
0544	STD = Mod : (31896+32332) = (31897+32333)

CODE	DESIGNATION
0545	Mod : 31896 = 31897 = 32401 = 32402 = 32475 = (31896+32332+32475)
0546	Mod : 26398 = (26398+31896+32332) = (26398+31897+32333)
0547	Mod : (26398+31896) = (26398+31897) = (26398+32475) = (26398+32401) = (26398+32402) = (26398+31896+32332+32475)
0548	Mod : 28244 = (23885+28244) = (26999+27917+28244) = (26999+28244+28495) = (23885+26111+26999+28244)
0549	Mod : (25205+28244) = (26999+28244) = (28244+28382) = (28244+30631) = (23885+26111+28244) = (26111+26999+28244) = (26111+28244+28382) = (26999+28244+30241) = (26999+28244+28382+28495)
0550	Mod : (26999+27650+28244) = (27650+28244+28382) = (26999+27650+28244+28382+28495)
0551	Mod : (21678+24105+25410+26017) = (21678+25410+26017+30020)
0553	Mod : (24645+28479) = (24645+28702) = (24645+28916)
0554	Mod : (21678+26999) = (21678+21858+26377) = (21678+21858+26999) = (21678+26377+26999)
0556	Mod : (22013+26485) = (22013+26999) = (22013+27646) = (22013+30631)
0557	Mod : 32456+CFM 56-5-B1 = B2 = B3 = IAE V2530 = V2533
0558	Mod : 21615+22269+23264+23900
0559	Mod : (21615+22269) = (21615+26058)
0560	STD = Mod : (26645+31040) = (27846+31040) = (28703+31040) = (30439+31040)
0561	Mod : 30020 = (24105+25410+26017+28479+30020)
0562	Mod : 30020 = (24105+26017+30020)
0563	Mod : 30020 = (23208+24077+24105+30020)
0564	Mod : (24105+25404+28479) = (24105+25404+28702) = (24105+25404+28916) = (25404+28916+30020)
0565	STD = Mod : (26526+28956) = (26526+27046+28956)
0566	Mod : 30020 = (26363+26792+28488+30020)
0567	STD = Mod : (25204+26999+27917) = (26999+28495) = (26999+28218+28495) = (24105+25294+26999+28495)
0568	Mod : 28479 = 28702 = 28916 = (25951+28479+32239) = (25951+28916+32239)
0570	Mod : 26858 = (23219+23672+26858+28785)
0571	Mod : (22013+CFM) = (22013+IAE) = (22013+AUA)
0572	Mod : (22013+24385+CFM) = (22013+24385+IAE) = (22013+24385+AUA)
0573	Mod : (20268) = (20268+25800)
0574	Mod : (30020) = (25800+30020)
0575	STD = Mod : 23885 = (26999+28495) = (26999+27917)
0576	Mod : 26111 = 25205 = 26999 = 28382 = 30241 = 26485 = 30631 = (23885+26111) = (26999+28495+28382) = (25205+26999+28495)
0577	Mod : 28244 = (23885+28244) = (26999+27917+28244) = (26999+28244+28495) = (23885+26111+26999+28244)
0578	Mod : (28244+28382) = (26999+28244) = (25205+28244) = (28244+30631) = (26111+26999+28244) = (26111+28244+28382) = (26999+28244+30241) = (23885+26111+28244) = (26999+28244+28495+28382)
0579	Mod : (26999+27650 28244) = (27650+28244+28382) = (26999+27650+28244+28382+28495)
0580	Mod : (31133+CFM 56-5-A3) = (31133+IAE V2527) = (23408+31133+IAE V2500)
0581	Mod : (22562+25615+28897) = (22562+24955+25615+28897)

CODE	DESIGNATION
0582	Mod : 32619 = (32619+22013+24044) = (32619+25951+32239)
0583	Mod : (32619+22013) = (32619+25951)
0584	Mod : 28479 = 28916 = (26017+28479) = (26017+28916)
0585	Mod : 28238 = (28238+28479) = (28238+28702) = (28238+28916)
0589	Mod : (22249+25529) = (22249+26117) = (22249+26270)
0590	Mod : (22249+25529+26401) = (22249+26117+26401) = (22249+26270+26401)
0592	Mod : (20268+24917) = (20268+24917+31607)
0593	Mod : (25241+32088) = (25241+32090) = (25242+32088) = (25242+32090) = (25241+25242+32088) = (25241+25242+32090)
0594	Mod : (25241+28138+32088) = (25241+28138+32090) = (25242+28138+32088) = (25242+28138+32090) = (25241+25242+28138+32088) = (25241+25242+28138+32090)
0595	Mod : (25241+26963+32088) = (25241+26963+32090) = (25242+26963+32088) = (25242+26963+32090) = (25241+25242+26963+32088) = (25241+25242+26963+32090)
0596	Mod : (21678+21706+28479) = (21678+21706+28916)
0597	Mod : (21678+21706+21766+28479) = (21678+21706+21766+28916)
0598	Mod : (21678+21706+21768+28479) = (21678+21706+21768+28916)
0599	Mod : (25241+26963+28138+32088) = (25241+26963+28138+32090) = (25242+26963+28138+32088) = (25242+26963+28138+32090) = (25241+25242+26963+28138+32088) = (25241+25242+26963+28138+32090)
0600	Mod : 28238 = (27846+28238) = (28238+28479) = (27846+28238+28479) = (27846+28238+26916) = (27846+28238+28702)
0601	Mod : 25888 = (25888+22562+25072)
0602	Mod : 31896 = 31897 = 32475 = 32929 = (31896+32402) = (31897+32401) = (26999+28495+31896) = (26999+28495+32475) = (26999+28495+32929) = (31896+32332+32475)
0603	STD = Mod : 31896 = 31897 = (20586+22013+30422)
0604	Mod : 31896 = 31897 = (26999+31896) = (26999+31897) = (28382+31897) = (26999+28495+31896) = (26999+28382+28495+31896) = (26999+28382+28495+31897)
0605	Mod : 32929 = 32475 = (26999+32475) = (26999+32929) = (31896+32402) = (31897+32402) = (26999+28495+32929) = (26999+31896+32402) = (26999+31897+32401) = (26999+28495+32475) = (31896+32332+32475) = (31897+32333+32929) = (26999+28382+28495+32475) = (26999+28495+31896+32402) = (26999+28382+28495+32929) = (26999+31896+32332+32475) = (26999+31897+32333+32929) = (26999+28382+28495+31896+32402) = (26999+28382+28495+31897+32401) = (26999+28382+28495+31897+32333+32929) = (26999+28382+28495+31896+32332+32475)
0606	Mod : (24785+27620) = (23672+24105+27620) = (24105+24785+27620)
0607	Mod : (25205+28916) = (26111+28916) = (26485+28916) = (26999+28479) = (26999+28702) = (26999+28916) = (28382+28916) = (28916+30241) = (28916+30631) = (28916+30635) = (25205+26999+28495+28916) = (26999+28382+28479+28495) = (26999+28382+28495+28702) = (26999+28382+28495+28916)
0608	Mod : 30020 = (30020+24105) = (30020+24105+US)
0609	Mod : (20268+24917+V2533) = (20268+24917+31607+V2530)
0610	Mod : (20268+24946+26965) = (20268+24946+27773) = (20268+25951+26965) = (20268+25951+27773) = (20268+26760+26965) = (20268+26760+27773) = (20268+26965+32150) = (20268+26965+32238) = (20268+26965+32239) = (20268+26965+32311) = (20268+27773+32150) = (20268+27773+32238) = (20268+27773+32239) = (20268+27773+32311)
0611	Mod : 27522 = (27522+31371+31728) = (27522+30660+P0164+31371+31728)

CODE	DESIGNATION
0612	MSN : 0163 = 0164 = 0168 = 0169 = 0179 = 0193 = 0221 = 0222 = 0230 = 0294 = 0299 = 0301 = 0338 = 0348 = 0349 = 0362 = 0363 = 0424 = 0429 = 0444 = 0449 = 0476
0613	STD = Mod : (26999+27917) = (26999+28495) = (26999+28479+28495)
0614	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = 30635 = (23885+26111) = (26999+28382+28495) = (24075+25205+26999+28495)
0615	Mod : 28347 = 28960 = 32011 = 32456
0619	Mod : 23108 = 23109 = 23408 = 23871 = 24105 = (23108+23109)+IAE V2527M = CFM 56-5-B7
0620	Mod : (22269+CFM56-5-A3) = (22269+22461+IAEV2500) = (22269+26058+CFM56-5-A3) = (22269+22461+26058+IAEV2500A1) = (23264+26058+CFM56-5-A3)
0621	Mod : (25328+CFM56-5-A4) = (25328+CFM56-5-A5) = (25328+CFM56-5-B5) = (25328+CFM56-5-B6) = (25328+IAEV2522) = (25328+IAEV2524) = (25328+26457+CFM56-5-B6)
R 0622	Mod : 27112+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
0623	Mod : (22013+27846+28479+28721) = (22013+27846+28479+28960) = (22013+27846+28479+32011) = (22013+27846+28721+28916) = (22013+27846+28916+28960) = (22013+27846+28916+32011) = (22013+28479+30439+32011) = (22013+28479+30439+32456)
0624	Mod : (22013+27846+28479+28721) = (22013+27846+28479+28960) = (22013+27846+28721+28916) = (22013+27846+28916+28960) = (22013+27846+28479+32011) = (22013+28479+30439+32011) = (22013+28479+30439+32456)
0626	Mod : 23208+24077+24105+26017+30020
0628	Mod : 21678+25404+26017+26377+26999+30020+31283
0629	Mod : (21678+25404+26017+26999+30020+31283) = (21678+25404+26017+26999+30626+31283+33100) = (21678+25404+26017+26999+30626+31283+33300)
0630	Mod : 24105+26017+27276+30020+31395
0631	Mod : (25404+31283) = (25404+26017+28479+31283)
0632	Mod : (30363+31283) = (25410+28479+30363+31283)
0633	Mod : 31283 = (25410+26017+31283)
0634	Mod : (30020+31283) = (26363+26792+28488+30020+31283)
0635	Mod : (24105+26925+30020) = (24105+26911+26925+30020)
0636	Mod : (24035+25404) = (24160+25404) = (24189+25404)
0637	Mod : (22249+25529+30020+31283) = (22249+26270+30020+31283) $$ 0638 Mod : 30626 = (26363+26792+28488+30626)
0639	Mod : (26526+30020+30660) = (26526+26925+30020+30660+31283)
0640	Mod : (22013+26057+32207) = (23222+24105+30020+32207+CFM 56-5-B8)
0641	Mod: (24645+26925+28479) = (24645+28702+26925) = (24645+28916+26925)
0643	Mod : (30020+31283) = (30020+31283+P6911) = (31283+P6911) = (24105+31283+P6911) = (22013+24044+31283+P6911) = (25951+31283+32239+p6911)
0644	Mod : (22013+31283+p6911) = (25951+30020+31283) = (25951+31283+p6911)
0647	Mod : (26526+30660) = (26526+26925+30660+31283)
0648	Mod : 31896 = 31897 = 32475 = 32929 = (31896+32332+32475) = (31897+32333+32929)
0649	Mod : (26398+31896) = (26398+31897) = (26398+32475) = (26398+32929) = (26398+32402) = (26398+31896+32332+32475) = (26398+31897+32333+32929)
0650	Mod : 31897 = 32929 = (31897+32333+32929)
0651	Mod : 31397 = 31896 = (26999+28495+31896)

CODE	DESIGNATION
0652	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = 30635 = (22013+25204+26999) = (22013+25204+28382) = (24105+25294+26999) = (24105+25294+28382) = (26999+28218+28382) = (26999+28382+28495) = (24105+25204+28382) = (22013+25204+26999+28382+28495) = (24105+25294+26999+28382+28495)
0653	STD = Mod : (22013+24785) = (22013+30400) = (24105+25294) = (24105+30020) = (24105+30400) = (25108+30400)
0654	Mod : 22013 = 24105 = 25108 = 27917 = 28218 = (22013+24785+27917) = (24105+25294+27917) = (24105+30020+31070)
0655	Mod : 30660+CFM 56-5-B1= B2 = B3 = B4 =B5 = B6 = B7 = B8
0656	Mod : 24035 = 24160 = 24211 = (24035+24211) = (20406+23450+24035) = (20406+23450+24211)
0657	Mod : (21678+26485+27620) = (21678+26999+27620) = (21678+27620+27646) = (21678+27620+30631) = (21678+27620+30635)
0658	Mod : (24771+30354) = (24771+33100) = (24771+33300) = (24771+33516)
0659	Mod : 30660 = (30660+31283)
0660	Mod : 22562+30660
0661	Mod : 25888+30660
0662	Mod : 22562+28160+30660
0663	Mod : 25888+28160+30660
0665	Mod : 26925 = (26925+27979) = (24266+26925+32310)
0666	Mod : (20075+26925) = (21776+26925) = (24266+26925) = (24267+26925)
0667	Mod :20268 = (20268+25800) = (20268+25530+26505) = (20268+25800+25530+26505)
0668	Mod : (25205+26526) = (26111+26526) = (26526+26999) = (26526+27917) = (26526+28382) = (26526+30241) = (26526+30631) = (26526+30635) = (26526+26999+28382+28495) = (26526+26999+28495+28916)
0669	Mod : (25205+26526+28916) = (26111+26526+28916) = (26526+26999+28479) = (26526+26999+28702) = (26526+26999+28916) = (26526+28382+28916) = (25205+26526+26999+28495+28916) = (26526+26999+28382+28479+28495) = (26526+26999+28382+28495+28702) = (26526+26999+28382+28495+28916)
0670	Mod : (21678+26485) = (21678+26999) = (21678+27646) = (21678+30631) = (21678+30635) = (21678+26999+33497) = (21678+26999+27620+33497) = (21678+26999+27646+33497)
0671	Mod : 20268 = (20268+25800)
0672	Mod : 24105 = 28439 = 30020 = 30203 = 30920
0673	Mod : (20141+20802) = (20141+20802+20966+25865)
0674	Mod : (24511+28479) = (24511+28702) = (24511+28916)
0675	Mod : (24511+26401+28479) = (24511+26401+28916)
0676	CFM 56-5-A3 = IAE V2527 = (Mod : 23408+IAE V2500)
0677	Mod : (31133+IAE V2500) = (20141+20802+31133+CFM 56-5-A1)
0678	Mod : (20966+CFM 56-5-A3) = (20966+23408+IAE V2500)
0679	Mod : (20141+20802+22269) = (20141+20802+26058)
0680	Mod : (21615+21711+IAE V2500) = (20141+20802+21711+CFM 56-5-A1) = (20141+20802+21615+21711+23900+25733+CFM 56-5-A1)
0681	Mod : (31132+IAE V2500) = (20141+20802+31132+CFM 56-5-A1)
0682	Mod : (23264+CFM 56-5-A3 = IAE V2527) = =(22269+23264+CFM 56-5-A3 = IAE V2527) = (23264+23408+IAE V2500)
0683	Mod : (20246+20510+K0860) = (20246+20510+K4355)
0684	Mod : (22269+CFM 56-5-A3 = IAE V2527) = (22269+26058+CFM 56-5-A3) = (22269+23408+IAE V2500) = (23264+26058+CFM 56-5-A3)
0685	Mod : K0860 = K4355 = (26169+30308+K0860) = (26169+30308+K4355)

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R	0686	Mod : (21946+K0860) = (21946+K4355) = (21946+26169+30308+K0860) = (21946+26169+30308+K4355) = (21946+26169+30299+30308+31285+K0860) = (21946+26169+30299+30308+31285+K4355)
R	0687	Mod : (21946+24624+K0860) = (21946+24624+K4355) = (21946+26169+K0860) = (21946+26169+K4355) = (21946+26169+30299+K0860) = (21946+26169+30299+K4355) = (21946+26169+30299+31285+K0860) = (21946+26169+30299+31285+K4355) = (21946+26169+30299+30308+K0860) = (21946+26169+30299+30308+K4355) = (21946+26169+30308+31285+K0860) = (21946+26169+30308+31285+K4355)
R	0688	Mod : (26169+30299+K0860) = (26169+30299+K4355)
R	0689	Mod : (23900+CFM 56-5-A3) = (23900+IAE V2527) = (23408+23900+IAE V2500)
R	0690	Mod : (21532+CFM 56-5-A3) = (21532+23408+IAE V2500)
R	0691	Mod : (27553+CFM 56-5-B3 = IAE V2533) = (31607+31615) = (31615+31701) = (31615+31702)
R	0692	Mod : (31321+31607) = (31321+31701) = (31321+31702)
R	0693	Mod : (30479+31607) = (30479+31701) = (23900+30479+31607) = (23900+30479+31701)
R	0694	Mod : (26600+31810) = (30310+31810)
R	0695	Mod : (21532+IAE V2500) = (20141+20802+21532+21615+CFM 56-5-A1)
R	0696	Mod : (23264+IAE V2500) = (20141+20802+21615+23264+CFM 56-5-A1)
R	0697	Mod : (20966+IAE V2500) = (20141+20802+20966+21615+CFM 56-5-A1)
R	0698	Mod : (23900+IAE V2500) = (20141+20802+21615+23900+CFM 56-5-A1)
R	0699	Mod : (30479+IAE V2500) = (23900+30479+IAE V2500) = (20141+20802+30479+CFM 56-5-A1) = (20141+20802+23900+30479+CFM 56-5-A1)
R	0700	Mod : 31283 = (22013+24044+31283) = (25951+31283+32239)
R	0701	Mod : (22013+28479) = (22013+28916) = (25951+28479) = (25951+28916)
R	0702	IAE V2500 = Mod : (20141+20802+21615+CFM 56-5-A1) = (20141+20802+20966+21615+25865+CFM 56-5-A1)
R	0703	Mod : (31132+CFM 56-5-A3 = IAE V2527) = (23408+31132+IAE V2500)
R	0704	Mod : (21601+CFM 56-5-A3 = IAE V2527) = (21601+23408+IAE V2500)
R	0705	Mod : (21601+IAE V2500) = (20141+20802+21601+21615+CFM 56-5-A1)
R	0706	Mod : (20141+20802+21615+22269+23900) = (20141+20802+21615+26058+23900)
R	0707	Mod : (23264+23900+CFM 56-5-A3 = IAE V2527) = (23264+23408+23900+IAE V2500)
R	0708	Mod : (23264+27920+31701) = (23264+23900+27920+31701)
R	0709	Mod : (20141+20802+21615+22269) = (20141+20802+21615+26058)
R	0710	Mod : (23264+23900+IAE V2500) = (22269+23264+23900+IAE V2500) = (20141+20802+21615+23264+23900+CFM 56-5-A1) = (20141+20802+21615+22269+23264+23900+CFM 56-5-A1)
R	0711	Mod : (22269+23900+IAE V2500) = (23900+26058+IAE V2500) = (20141+20802+22269+23900+CFM 56-5-A1) = (20141+20802+23900+26058+CFM 56-5-A1) = (20141+20802+21615+22269+23264+23900+26058+CFM 56-5-A1)
R	0712	Mod : (22269+23900+IAE V2527) = (22269+23408+23900+IAE V2500) = (22269+23264+23408+23900+26058+IAE V2500)
R	0713	Mod : (20141+20802+23264+23900) = (20141+20802+22269+23264+23900)
R	0714	Mod : (28960+31607) = (28960+31701) = (28960+31702)
R	0715	Mod : (21711+CFM 56-5-A3) = (21711+23408+IAE V2500)
R	0716	Mod : (31607+31839) = (31701+31839) = (31702+31839)
R	0717	Mod : 26925 = (24588+26925) = (24215+24588+26925)

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R	0718	Mod : (31607+32456) = (31701+32456) = (31702+32456)
	0719	Mod : (20141+20802+21615+22269+23900) = (20141+20802+21615+26058+23900)
	0720	Mod :(23264+23900+CFM 56-5-A3 = IAE V2527) = (22269+23264+23900+CFM 56-5-A3 = V2527) = (23264+23408+23900+IAE V2500) = (22269+23264+23408+23900+IAE V2500)
	0721	Mod : (28721+31607) = (28721+31701) = (28721+31702)
	0722	Mod : 26925 = (26925+28479) = (24105+26925+28479) = (24105+26925+28916)
	0723	Mod : (21678+22536+27522) = (21678+23227+27522) = (21678+23529+27522)
	0724	Mod : (21678+22536+27522+33100) = (21678+22536+27522+33300) = (21678+23529+27522+33100) = (21678+23529+27522+33300)
	0725	Mod : 28721 = 28960 = 32011 = 32456
	0726	Mod : (22013+28479) = (22013+28916) = (24105+28479) = (24105+28702) = (24105+28916)
	0728	Mod : (22013+31607) = (22013+31701) = (22013+31702)
	0729	Mod : (22013+26401+28479) = (22013+26401+28916)
	0730	Mod : (20268+V2533) = (20268+31607+V2530)
	0732	Mod : 32475 = 32929 = (31896+32402) = (31897+32401) = (26999+28495+32475) = (26999+28495+32929) = (31896+32332+32475) = (26999+28495+31896+32402)
	0733	Mod : (26999+32475) = (26999+32929) = (26999+31896+32402) = (26999+31897+32401) = (26999+28382+28495+32475) = (26999+28382+28495+32929) = (26999+31896+32332+32475) = (26999+31897+32333+32929) = (26999+28382+28495+31896+32402) = (26999+28382+28495+31897+32401) = (26999+28382+28495+31896+32332+32475) = (26999+28382+28495+31897+32333+32929)
	0734	Mod : 32401 = 32402 = 32475 = 32929 = (31896+32402) = (31897+32401) = (31896+32332+32475) = (31897+32333+32929)
	0735	Mod : (22013+27276) = (22013+31395) = (22013+27276+31395)
	0736	Mod : 27276 = 31395 = (27276+31395)
	0737	Mod : (24105+27276) = (24105+31395) = (26334+27276) = (26334+31395) = (26335+27276) = (26335+31395) = (24105+27276+31395) = (26334+27276+31395) = (26335+27276+31395)
	0738	Mod : (27276+30020+31395) = (24105+27276+30020+31395)
	0739	Mod : (20268+22461+24946+26965) = (20268+22461+24946+27773) = (20268+22461+25951+26965) = (20268+22461+25951+27773) = (20268+22461+26760+26965) = (20268+22461+26760+27773) = (20268+22461+26965+32150) = (20268+22461+26965+32238) = (20268+22461+26965+32239) = (20268+22461+26965+32311) = (20268+22461+27773+32150) = (20268+22461+27773+32238) = (20268+22461+27773+32239) = (20268+22461+27773+32311) = (20268+23408+24946+26965) = (20268+23408+24946+27773) = (20268+23408+25951+26965) = (20268+23408+25951+27773) = (20268+23408+26760+26965) = (20268+23408+26760+27773) = (20268+23408+26965+32150) = (20268+23408+26965+32238) = (20268+23408+26965+32239) = (20268+23408+26965+32311) = (20268+23408+27773+32150) = (20268+23408+27773+32238) = (20268+23408+27773+32239) = (20268+23408+27773+32311) = (20268+22461+23408+24946+26965) = (20268+22461+23408+24946+27773) = (20268+22461+23408+25951+26965) = (20268+22461+23408+25951+27773) = (20268+22461+23408+26760+26965) = (20268+22461+23408+26760+27773) = (20268+22461+23408+26965+32150) = (20268+22461+23408+26965+32238) = (20268+22461+23408+26965+32239) = (20268+22461+23408+26965+32311) = (20268+22461+23408+27773+32150) = (20268+22461+23408+27773+32238) = (20268+22461+23408+27773+32239) = (20268+22461+23408+27773+32311)
	0740	Mod : 21678+21858+25404+30626+31283
	0741	Mod : (21678+25404+26377) = (21678+25404+26999)

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R	0742	Mod : (21678+22013+25404+26377) = (21678+22013+25404+26999)
R	0743	Mod : 21678+25404+26377+26999+31283
R	0744	Mod : 21678+25404+26377+26999+30626+31283
R	0745	Mod : 26485 = 26999 = 27646 = 30631 = (26999+27646)
R	0746	Mod : (26999+31283) = (27646+31283) = (30631+31283) = (2699+27646+31283)
R R	0747	Mod : (26999+30626+31283+33300 = (26999+27646+30626+31283+3310) = (26999+2764630626+31283+33300)
R	0748	Mod : (21678+21858) = (20117+21678+21858)
R	0749	Mod : (21678+24105+26017+33100) = (21678+24105+26017+33300)
R	0750	Mod : 21678+25404+26017+26999+33100
R	0751	Mod : (21678+22013) = (21678+24105) = (21678+28160)
R	0752	Mod : (24105+30020) = (24105+30626+31283) = (24105+30020+30626+31283)
R	0753	Mod : (22013+31283) = (24105+31283) = (28160+31283)
R	0754	STD = Mod : (22013+24044) = (25951+32239)
R R	0755	Mod : (31283+P6911) = (22013+24044+31283+P6911) = (25951+31283+32239+P6911)
R	0756	Mod : (22013+31283+P6911) = (25951+31283+P6911)
R	0757	Mod : 30020 = (24105+30020) = (24105+30020+US)
R	0758	Mod : (21678+22536) = (21678+23227) = (21678+23529)
R	0759	STD = Mod : 32217+CFM 56-5-A4 = A5 = B5 = B6 = IAE V2522 = V2524
R	0760	Mod : (22013+32207) = (24105+30020+32207+CFM 56-5-B8)
R	0761	Mod : 21533+23109+23222+23408+26398
R	0762	Mod : (23222+24105) = (24105+26057) = (23222+24105+26057)
R	0763	Mod : (23222+26398) = (23222+24105+26398)
R	0764	Mod : (23222+25615+26398) = (23222+24105+25615+26398)
R	0765	Mod : (22013+26398) = (24105+26398)
R	0766	Mod : 30020 = (24105+26925+30020) = (24105+26925+28479+30020)
R R R R	0767	Mod : 25529 = 26117 = 26270 = 27866 = (26851+27866) = (25529+26185+27866) = (25529+26208+27866) = (25529+26345+27866) = (26270+31896+32332) = (26270+31897+32333)+(27866+31897+32333) = (25529+27866+31896+32332) = (25529+26185+27866+31897+32333)
R R R R	0768	Mod : (25205+26526) = (26111+26526) = (26526+26999) = (26526+27917) = (26526+28382) = (26526+30241) = (26526+30631) = (26526+30635) = (26526+26999+28495) = (26526+26999+30241) = (26526+26999+28382+28495) = (26526+26999+28495+28916) = (24075+25205+26526+26999+28495)
R R R R R	0769	Mod : (25205+26526+28916) = (26111+26526+28916) = (26526+26999+28479) = (26526+26999+28702) = (26526+26999+28916) = (26526+28382+28916) = (26526+28916+30631) = (23885+26111+26526+28916) = (25205+26526+26999+28495+28916) = (26526+26999+28382+28479+28495) = (26526+26999+28382+28495+28702) = (26526+26999+28382+28495+28916)
R	0770	Mod : 20343 = 31276 = (21858+26347+31276)
R	0771	Mod : 26485 = 26999 = 27646 = 30631 = 30635
R	0772	Mod : (21678+21706+21766+21768+28479) = (21678+21706+21766+21768+28916)
R R R R R	0773	Mod : (22013+27846+28479+28721) = (22013+27846+28479+28960) = (22013+27846+28721+28916) = (22013+27846+28916+28960) = (22013+27846+28479+32011) = (22013+28479+30439+32011) = (22013+28479+30439+32456) = (22013+28479+28721+30439) = (22013+28479+28960+30439)
R	0774	Mod : (21678+21706+21768) = (21678+21706+21768+21858+26347)

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0781	Mod : (22013+27846+28479+28721) = (22013+27846+28479+28960) = (22013+27846+28479+32011) = (22013+27846+28721+28916) = (22013+27846+28916+28960) = (22013+27846+28916+32011) = (22013+28479+30439+32011) = (22013+28479+30439+32456) = (22013+28479+28721+30439) = (22013+28479+28960+30439)
0782	Mod : 31283 = (28479+31283) = (22013+24044+31283) = (25951+31283+32239)
0783	STD = Mod: 31896 = 31897 = 32401 = 32402 = 32929 = 32475 = (31896+32332+32475) = (31897+32333+32929)
0784	STD = Mod: 31896 = 31897 = 32401 = 32402 = 32929 = 32475 = (31896+32332+32475) = (31897+32333+32929) = (20586+22013+30422)
0785	Mod : 25240 = 25274 = 28283 = 28711 = (25240+28238)
0786	Mod : (22249+25529+31283) = (22249+26270+31283) = (22249+26720+31283)
0787	Mod : 28916 = (28160+28479) = (28160+28916) = (22562+25072+28916)
0788	Mod : 30660 = (22562+28479+30660) = (25888+28479+30660)
0789	Mod : 30660 = (30660+31283) = (25888+28479+30660)
0790	Mod : (28160+30660) = (25888+28160+28479+28917+30660)
0791	Mod : (25888+28160+30660) = (25888+28160+28479+30660)
0792	Mod : (22562+25888) = (22562+28160+30660) = (22562+28160+28479+30660)
0793	Mod : (25888+30660) = (25888+28479+30660)
0794	Mod : (28160+30660) = (28160+28479+30660)
0795	Mod : (22562+28160+28916+28917)
0796	Mod : 31897 = 31896 = (26999+28495+31896) = (26999+28495+31897)
0797	STD = (24105+31364) = (24105+31365) = (24105+31897) = (24105+31896) = (20105+32475) = (24105+32929) = (24105+31365+31896+31905) = (24105+31365+31897+31906)
0798	Mod : 25205 = 26111 = 26485 = 26999 = 28382 = 30241 = 30631 = 30635 = (22013+25204+26999) = (22013+25204+28382) = (24105+25294+26999) = (24105+25294+28382) = (26999+28218+28382) = (26999+28382+28495) = (24105+25204+28382) = (22013+25204+26999+28382+28495) = (24105+25294+26999+28382+28495) = (22013+25204+26002) = (24105+25294+26002+26999+28218) = (24105+25294+26002+28218)
0799	Mod : (26002+26111) = (28218+26999) = (28218+28382) = (28218+30241) = (26999+28218+28382+28495) = (25204+26999+27917+28218) = (25204+26002+26999+28218+28382+28495)
0800	Mod : (23222 + 26398 + CFM 56–5–B4) or (23222 + 26398 + IAE V2527A5) = (22013 + 23222 + 26398) = (22013 + 26057 + 26398) = (23222 + 23408 + 26398) = (23222 + 24105 + 26398) = (23222 + 26057 + 26398)

N°	ISSUE DATE	
00	JAN 1987	
01	FEB 1987	
02	SEP 1987	
03	JAN 1988	
04	MAR 1988	
05	MAY 1988	
06	JUL 1988	
07	AUG 1988	
08	OCT 1988	
09	JAN 1989	
10	JAN 1989	
11	APR 1989	
12	JAN 1989	
13	JAN 1990	
14	SEP 1990	
15	FEB 1991	
16	JUL 1991	
17	MAR 1992	
18	DEC 1992	
19	APR 1993	
20	JUL 1993	
21	NOV 1993	
22	JUL 1994	
23	JUL 1995	
24	MAR 1997	
25	JAN 1998	
26	JUL 1998	
27	JAN 1999	

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N°	ISSUE DATE	
28	APR 1999	
29	SEP 1999	
30	MAR 2000	
31	JUL 2000	
32	DEC 2000	
33	JUL 2001	
34	DEC 2001	
35	JUN 2002	
36	MAR 2003	
37	JAN 2004	

N° TITLE	STATUS	LOCATION
To be filled by the operator, if needed.		

THIS TABLE GIVES, FOR EACH AIRCRAFT INCLUDED IN THE MANUAL, THE CROSS REFERENCE BETWEEN :

- THE MANUFACTURING SERIAL NUMBER (MSN) WHICH APPEARS IN THE LIST OF EFFECTIVE PAGES

- THE REGISTRATION NUMBER OF THE AIRCRAFT AS KNOWN BY AIRBUS INDUSTRIE.

MSN	REGISTRATION
0774	D-AICA
0793	D-AICB
0809	D-AICC
0884	D-AICD
0894	D-AICE
0905	D-AICF
0957	D-AICG
0971	D-AICH
1381	D-AICI
1402	D-AICJ
1416	D-AICK
1437	D-AICL

```
V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       ----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 01 20  001        302 REV037  M:23264+23900+27920/56-5-A3

                      - INCORPORATION OF MOD 23900
                      - TECHNICAL AMENDMENT
                         1)No technical change.
                           The sequence number was
                           changed to ensure the
                           correct page validation
                           for all customers.

3 01 20  001        306 REV037  M:23264+23900+26891/56-5-A3

                      - INCORPORATION OF MOD 23900
                      - TECHNICAL AMENDMENT
                         1)No technical change.
                           The sequence number was
                           changed to ensure the
                           correct page validation
                           for all customers.

3 01 20  003        126 REV037  CODE 0059

                      - INCORPORATION OF MOD 22013
                      - INCORPORATION OF MOD 24105
                      - TECHNICAL AMENDMENT
                         1)No technical change. The sequence
                           number was changed to ensure the
                           correct page validation for all
                           customers.

3 01 22  002        105 REV037  CODE 0535

                      - TECHNICAL AMENDMENT
                         1)The limitation concerning NAV use
                           after takeoff has been moved to this
                           page, from page 2a, as it is
                           applicable to this section.
                         2)Addition of information concerning
                           takeoff from airports without WGS84
                           coordinates.
                         3)Addition of RNP accuracy table.

3 01 22  002A       100 REV037  CODE 0538

                      - TECHNICAL AMENDMENT
                         1)The limitation concerning NAV use
                           after takeoff has been moved to
                           page 2, as it is NOT applicable to
                           this section.

3 01 22  004        216 REV037  24617+25225/CFM

                      - TECHNICAL AMENDMENT
                         1)For aircraft not under US regulation,
                           the temperature limitation for
                           automatic landing was removed from
                           this page, as it is the same as the
                           aircraft's general temperature
                           limitation. Refer to the general
                           flight envelope for temperature
                           limitation.

3 01 35  001        105 REV037  CODE 0137

                      - TECHNICAL AMENDMENT
```

```
V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                         ----------------------REASONS OF CHANGE-------------------
-----------------------------------------------------------------------------------
                           1)Page amended to reflect the current
                             configuration concerning the emergency
                             descent time.

3 01 70  002        025 REV037  CFM 56-5-A3/A4/A5

                        - TECHNICAL AMENDMENT
                           1)From the 5 BK ECU Standard, and
                             onwards, a new logic enables the
                             definition of a reduced thrust
                             (through derated or flex), reaching
                             25 percent below TOGA. Flex and derate
                             levels can be lower than the "basic"
                             MCT for Mach Numbers below 0.35 (CFM)
                             or 0.40 (IAE). Therefore, the fact
                             that the N1 takeoff flex is limited by
                             N1 MCL is not applicable in the above
                        - ADDITIONAL INFORMATION
                             conditions. This statement was not a
                             limitation in itself, but rather a
                             specification for previous FADEC
                             standards. It is, therefore, removed
                             from the Operating Limitation chapter
                             for all A318/A319/A320/A321 aircraft.

3 02 00  001        001 REV037

                        - TECHNICAL AMENDMENT
                           1)Page updated to introduce the
                             "CIRCLING APPROACH WITH ONE ENGINE
                             INOPERATIVE" procedure.

3 02 00  004        001 REV037

                        - TECHNICAL AMENDMENT
                           1)The Table of Contents has been updated
                             to reflect FCOM revisions and take
                             into account various pagination
                             changes.

3 02 00  004        100 REV037  M:28479=28702=28916

                        - TECHNICAL AMENDMENT
                           1)The Table of Contents has been updated
                             to reflect FCOM revisions and take
                             into account various pagination
                             changes.

3 02 00  007        001 REV037

                        - TECHNICAL AMENDMENT
                           1)- The "NAVIGATION" listing has been
                               moved to page 8 for pagination
                               purposes.
                             - Introduction of the new "RESIDUAL
                               BRAKING" procedure.

3 02 00  007        100 REV037  28916=28479=28702

                        - TECHNICAL AMENDMENT
                           1)- The "NAVIGATION" listing has been
                               moved to page 8 for pagination
                               purposes.
                             - Introduction of the new "RESIDUAL
                               BRAKING" procedure.
```

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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       -----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 02 00  008       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The "NAVIGATION" listing has been
                           moved from page 7 for pagination
                           purpose.

3 02 00  009       001 REV037  CODE 0531

                      - TECHNICAL AMENDMENT
                         1)No technical change. The "Pneumatic,
                           APU and Doors" listing have been moved
                           from page 8 for pagination purposes.

3 02 00  010       025 REV037  CFM

                      - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE
                      - TECHNICAL AMENDMENT
                         1)The FADEC ALTERNATOR and FLEX TEMP
                           NOT SET procedures have been moved
                           to page 9.
                         2)The "if installed" symbol has been
                           removed for the TYPE DISAGREE caution,
                           as it is now standard throughout the
                           A320 family fleet.

3 02 00  011       100 REV037  M:25529=25819=26117=26270

                      - INCORPORATION OF MOD 25529
                      - INCORPORATION OF MOD 25819
                      - INCORPORATION OF MOD 26117
                      - INCORPORATION OF MOD 26270
                      - TECHNICAL AMENDMENT
                         1)The Table of Contents has been updated
                           to take into account various title and
                           pagination changes to section 3.02.90.

3 02 01  005       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page created for pagination purposes,
                           to provide airlines with the
                           description of the summaries' use.

3 02 01  006       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page created to provide airlines with
                           the description of the summaries' use.
                           Introduction of the TR 835-1.

3 02 01  007       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page created to provide airlines with
                           the description of the summaries' use.
                           Introduction of the TR 835-1.

3 02 10  006A      110 REV037  M:20268/CFM 56-5-A1/A3

                      - INCORPORATION OF MOD 20268
                      - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE
                      - TECHNICAL AMENDMENT
                         1)Introduction of the "CIRCLING APPROACH
                           WITH ONE ENGINE INOPERATIVE"
```

```
V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                          ------------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------
                                procedure. Flight level cannot always
                                be maintained in CONF 3 with landing
                                gear down, depending on aircraft
                                weight, airport elevation and
                                temperature. A table is provided to
                                determine (depending on the landing
                                weight) whether flight level in
                                CONF 3, with the landing gear down can
                             - ADDITIONAL INFORMATION
                                be maintained or not.
                              2)The sequence number has been changed
                                to ensure the correct page validation
                                for all customers.

3 02 22  001        100 REV037  26645=27846=28703=30439

                             - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 22  004        240 REV037  CODE 0589

                             - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 22  007        400 REV037  CODE:0122

                             - INCORPORATION OF MOD 26117
                             - INCORPORATION OF MOD 26270
                             - TECHNICAL AMENDMENT
                              1)Following modification of the FWC Std
                                post D2, the "WINDSHEAR REAC W/S DET
                                FAULT", caution has been replaced by
                                the "AUTO FLT REAC W/S DET" caution.

3 02 23  001        100 REV036  M:28479 OR 28702 OR 28916

                             - INCORPORATION OF MOD 28479
                             - INCORPORATION OF MOD 28702

3 02 24  004        300 REV037  M:21678+21858+25404

                             - INCORPORATION OF MOD 25404
                             - TECHNICAL AMENDMENT
                              1)Page corrected to reflect the fact
                                that "-LDG DIST PROC ... APPLY" is
                                displayed on the ECAM, in the APPR
                                PROC of the AC BUS 1 FAULT procedure.
                              2)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.
                              3)The INOP SYS list has been updated to
                                display REVERSER 1 as inoperative
                             - ADDITIONAL INFORMATION
                                since the aircraft is equipped with
                                the third line of defense, and to
                                suppress the "if installed" symbol
                                for the CTR TK PUMP 1.
```

```
V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       ----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 02 24  005       108 REV037  CODE 0008/CFM

                      - TECHNICAL AMENDMENT
                         1)Page updated to highlight the fact
                           that, due to the loss of one pack
                           controller, the pack outlet
                           temperature is stabilized between
                           5 deg. C (41 deg. F) and 30 deg. C
                           (86 deg. F) within a maximum of 6
                           minutes.

3 02 24  008       200 REV037  CODE 0002

                      - TECHNICAL AMENDMENT
                         1)The note on avionic ventilation has
                           been revised for improved technical
                           understanding.

3 02 24  008       300 REV037  CODE 0741

                      - TECHNICAL AMENDMENT
                         1)The note on avionic ventilation has
                           been revised for improved technical
                           understanding.
                         2)The "if installed" symbol associated
                           with the CTR TK PUMP, has been
                           deleted, since it is installed on the
                           aircraft.

3 02 24  009       105 REV037  CODE 0745

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 24  011       200 REV037  CODE 0748

                      - INCORPORATION OF MOD 21678
                      - INCORPORATION OF MOD 21858
                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.
                         2)The other inoperative systems list has
                           been updated to reflect the fact that,
                           Capt ND is lost, in case of DC ESS BUS
                           FAULT, for ETOPS aircraft. Besides,
                           the "as installed" symbol has been
                           removed for HF 1.

3 02 24  013       200 REV037  M:20024+21678

                      - INCORPORATION OF MOD 20024
                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.
                         2)The "if installed" symbol has been
                           removed from the CTR TK FUEL UNUSABLE
                           status line, since the center tank is
                           installed.
```

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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                         -----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 02 24  018       105 REV037  M:25404=(25404+28160+28917)

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.
                         2)The "as installed" symbol relative to
                           the CTR TK has been deleted, since it
                           is installed on the aircraft in this
                           configuration.

3 02 24  018       340 REV037  CODE 0207

                      - INCORPORATION OF MOD 24105
                      - INCORPORATION OF MOD 28479
                      - INCORPORATION OF MOD 28702
                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 24  022       230 REV027  CODE:0670

                      - INCORPORATION OF MOD 26485
                      - INCORPORATION OF MOD 26999
                      - INCORPORATION OF MOD 30631
                      - INCORPORATION OF MOD 30635

3 02 24  025       200 REV037  CODE 0751

                      - INCORPORATION OF MOD 22013
                      - INCORPORATION OF MOD 24105
                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 26  002       001 REV033

                      - TECHNICAL AMENDMENT
                         1)Page revised to better describe
                           aircraft that are fitted with the
                           EVAC COMMAND pushbutton.

3 02 26  005       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Clarification of the guidelines in
                           determining smoke origin : In the
                           event of an identified ENG or APU
                           failure, smoke may be detected in the
                           cabin and/or cockpit, and will be
                           recirculated throughout the aircraft
                           until it completely disappears from
                           the air conditioning system.

3 02 26  008       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The sequence number was changed to
                           ensure the correct page validation
                           for all customers.
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       -----------------------REASONS OF CHANGE--------------------
------------------------------------------------------------------------------------
                        2)The landing distance coefficient has
                          been removed from this page, since
                          it is already provided in the QRH
                          Part 2, and in the FCOM 3.02.80.

3 02 27  003       001 REV037  STD=M:27846=(27846+28916)

                     - TECHNICAL AMENDMENT
                        1)Text slightly modified : Clarification
                          of the "APPR SPD and LDG DIST" table.

3 02 27  004       100 REV037  M:20024

                     - TECHNICAL AMENDMENT
                        1)The landing distance coefficient has
                          been removed from this page, since
                          it is already provided in the QRH
                          Part 2, and in the FCOM 3.02.80.
                        2)Information has been moved to FCOM
                          3.02.27, page 5, for pagination
                          purposes.

3 02 27  005       001 REV037  STD

                     - TECHNICAL AMENDMENT
                        1)Information moved from FCOM 3.02.27
                          p 4 for pagination purposes.

3 02 27  007       001 REV037

                     - TECHNICAL AMENDMENT
                        1)The landing distance coefficient has
                          been removed from this page, since
                          it is already provided in the QRH
                          Part 2, and in the FCOM 3.02.80.
                        2)Information has been moved to FCOM
                          3.02.27, page 5, for pagination
                          purposes.

3 02 27  008       110 REV037  M:24511

                     - TECHNICAL AMENDMENT
                        1)The landing distance coefficient has
                          been removed from this page, since it
                          is already provided in the QRH Part 2,
                          and in the FCOM 3.02.80.
                        2)Addition of a note to explain how the
                          aircraft reverts to direct law. When
                          the three SECs are lost, the LGCIU
                          information can no longer be sent to
                          the ELAC. This prevents activation of
                          DIRECT law upon landing gear
                     - ADDITIONAL INFORMATION
                          extension. This is why the aircraft
                          will revert to DIRECT law, when slats
                          are extended.

3 02 27  008       200 REV037  CODE 0674

                     - TECHNICAL AMENDMENT
                        1)The landing distance coefficient has
                          been removed from this page, since it
                          is already provided in the QRH Part 2,
                          and in the FCOM 3.02.80.
                        2)Addition of a note to explain how the
                          aircraft reverts to direct law. When
```

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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        ----------------------REASONS OF CHANGE-------------------
-----------------------------------------------------------------------------------
                              the three SECs are lost, the LGCIU
                              information can no longer be sent to
                              the ELAC and prevents activation of
                              DIRECT law upon landing gear
                           - ADDITIONAL INFORMATION
                              extension. This is why the aircraft
                              will revert to DIRECT law, when slats
                              are extended.

3 02 27  009        001 REV037

                           - TECHNICAL AMENDMENT
                             1)The landing distance coefficient has
                               been removed from this page, since it
                               is already provided in the QRH Part 2,
                               and in the FCOM 3.02.80.

3 02 27  010        105 REV037  M:25335=27276

                           - INCORPORATION OF MOD 25335
                           - TECHNICAL AMENDMENT
                             1)The landing distance coefficient has
                               been removed from this page, since it
                               is already provided in the QRH Part 2,
                               and in the FCOM 3.02.80.

3 02 27  012        001 REV037

                           - TECHNICAL AMENDMENT
                             1)The landing distance coefficient has
                               been removed from this page, since it
                               is already provided in the QRH Part
                               2, and in the FCOM 3.02.80.

3 02 27  013        001 REV037

                           - TECHNICAL AMENDMENT
                             1)Information has been moved to the
                               FCOM 3.02.27 page 13a, for pagination
                               purposes.
                             2)The landing distance coefficient has
                               been removed from this page, since it
                               is already provided in the QRH Part 2,
                               and in the FCOM 3.02.80.

3 02 27  013A       100 REV037  M:22013=24105=26334=26335

                           - INCORPORATION OF MOD 22013
                           - INCORPORATION OF MOD 24105
                           - INCORPORATION OF MOD 26334
                           - INCORPORATION OF MOD 26335
                           - TECHNICAL AMENDMENT
                             1)Information has been moved from page
                               13, for pagination purposes.

3 02 27  014        001 REV037

                           - TECHNICAL AMENDMENT
                             1)The landing distance coefficient has
                               been removed from this page, since it
                               is already provided in the QRH Part 2,
                               and in the FCOM 3.02.80.

3 02 27  015        100 REV037  M:22013=24105=26334=26335

                           - INCORPORATION OF MOD 22013
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       ----------------------REASONS OF CHANGE--------------------
-----------------------------------------------------------------------------------

3 02 27  015       100 REV037  M:22013=24105=26334=26335

                      - INCORPORATION OF MOD 24105
                      - INCORPORATION OF MOD 26334
                      - TECHNICAL AMENDMENT
                         Page revised to:
                         1)Remove the landing distance
                           coefficient from this page, since it
                           is provided in the QRH Part 2, and in
                           the FCOM 3.02.80.
                         2)Indicate that "SPD BRK (if SPD BRK
                           3+4 affected)....DO NOT USE" is also
                           displayed in the STATUS part of the
                           "SPD BRK 3+4 FAULT" ECAM caution.

3 02 27  017       001 REV037

                      - TECHNICAL AMENDMENT
                         1)FCOM page revised to clearly show
                           that "MAX SPEED....320 KT" is also
                           displayed in the STATUS page
                           corresponding to the "F/CTL
                           STABILIZER JAM" warning.
                         2)The landing distance coefficient has
                           been removed from this page, since it
                           is already provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 27  019       100 REV037  28479=28702=28916

                      - INCORPORATION OF MOD 28479
                      - INCORPORATION OF MOD 28702
                      - INCORPORATION OF MOD 28916
                      - TECHNICAL AMENDMENT
                         1)Page updated to indicate that the
                           "FLAP LVR NOT ZERO" alert is activated
                           with the installation of the FWC E3
                           std.

3 02 28  009       110 REV037  20024

                      - TECHNICAL AMENDMENT
                         1)The FUEL LEAK procedure was slightly
                           modified to indicate that, as soon as
                           one engine flames out while there is
                           still fuel in the feeding tank, all
                           tank pumps must be switched ON before
                           applying the "LEAK FROM ENGINE"
                           procedure. This also ensures that all
                           tank pumps are ON, when the "LEAK FROM
                           ENGINE proc" is applied.

3 02 29  001       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 29  003       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                         -----------------------REASONS OF CHANGE--------------------
--------------------------------------------------------------------------------------
                              they are provided in the QRH Part 2,
                              and in the FCOM 3.02.80.

3 02 29  004       100 REV037  28916=28479=28702

                           - TECHNICAL AMENDMENT
                              1)Deletion of the "MAX FLT TIME : 2
                                HOURS" line, which was a provision is
                                the FWC and was never installed on
                                single-aisle aircraft. Furthermore,
                                safety margins have been improved by
                                decreasing the inflation pressure of
                                the yellow brake accumulator.

3 02 29  005       001 REV037

                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 29  008       001 REV037

                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 29  008       105 REV037  M:28479=28916

                           - INCORPORATION OF MOD 28479
                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 29  011       203 REV037  CODE 0737

                           - INCORPORATION OF MOD 24105
                           - INCORPORATION OF MOD 26334
                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 29  013       001 REV037

                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.

3 02 29  014       001 REV037

                           - TECHNICAL AMENDMENT
                              1)The landing distance coefficients have
                                been removed from this page, since
                                they are provided in the QRH Part 2,
                                and in the FCOM 3.02.80.
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       -----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 02 29  015       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 29  016       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 30  001       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Deletion of the note concerning the
                           WHC reset, in case of high temperature
                           with the packs selected off : This
                           procedure does not systematically
                           clear the caution. Furthermore, this
                           note hindered the WHC's two-way
                           interchangeability.
                         2)Minor editorial change.

3 02 32  009       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page revised to incorporate a note in
                           the WHEEL N.W STEER FAULT procedure,
                           to indicate that automatic rollout is
                           not permitted.
                         2)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
                           and in the FCOM 3.02.80.

3 02 32  009       100 REV037  M:28479=28916

                      - TECHNICAL AMENDMENT
                         1)Page revised to incorporate a note
                           in the WHEEL N.W STEER FAULT
                           procedure, to indicate that automatic
                           rollout is not permitted.
                         2)The landing distance coefficients
                           have been removed from this page,
                           since they are provided in QRH Part 2
                           and in the FCOM 3.02.80.
                         3)With the FWC E3 standard, the N.W.
                           STEER FAULT alert and NW. STEER INOP
                      - ADDITIONAL INFORMATION
                           SYS are replaced by the N/W STRG
                           FAULT alert and N/W STRG INOPS SYS to
                           be in accordance with wording on the
                           A/SKID or N/W STRG switch.

3 02 32  010       001 REV037  STD=M22013+24044=25951+32239

                      - TECHNICAL AMENDMENT
                         1)The landing distance coefficients have
                           been removed from this page, since
                           they are provided in the QRH Part 2,
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        ----------------------REASONS OF CHANGE-------------------
-----------------------------------------------------------------------------------
                           and in the FCOM 3.02.80.

3 02 32  010       105 REV037  CODE:0568

                        - TECHNICAL AMENDMENT
                          1)The landing distance coefficients have
                            been removed from this page, since
                            they are provided in the QRH Part 2,
                            and in the FCOM 3.02.80.

3 02 32  012       001 REV037

                        - TECHNICAL AMENDMENT
                          1)Page created to introduce the new
                            "RESIDUAL BRAKING PROC" procedure in
                            CASE of residual brake pressure is
                            applied on one or two wheels.

3 02 34  004       105 REV037  M:26526

                        - TECHNICAL AMENDMENT
                          1)The landing distance coefficient has
                            been removed from this page, since
                            it is already provided in the QRH
                            Part 2, and in the FCOM 3.02.80.

3 02 34  006       001 REV037

                        - TECHNICAL AMENDMENT
                          1)The landing distance coefficient has
                            been removed from this page, since
                            it is already provided in the QRH
                            Part 2, and in the FCOM 3.02.80.

3 02 34  009       001 REV037

                        - TECHNICAL AMENDMENT
                          1)The landing distance coefficient has
                            been removed from this page, since
                            it is already provided in the QRH
                            Part 2, and in the FCOM 3.02.80.

3 02 34  011       001 REV037

                        - TECHNICAL AMENDMENT
                          1)The landing distance coefficient has
                            been removed from this page, since
                            it is already provided in the QRH
                            Part 2, and in the FCOM 3.02.80.

3 02 34  013       200 REV037  CODE : 0768

                        - INCORPORATION OF MOD 26526
                        - TECHNICAL AMENDMENT
                          1)Revision of the "NAV FM/GPS POS
                            DISAGREE" procedure to recommend that
                            the EGPWS terrain functions be
                            switched off, when flying with the raw
                            data only.

3 02 34  013       300 REV037  CODE : 0769

                        - INCORPORATION OF MOD 26526
                        - TECHNICAL AMENDMENT
                          1)The "NAV FM/GPS POS DISAGREE"
                            procedure is amended to recommend to
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       ----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------
                           switch the terrain functions of the
                           EGPWS off, when flying with the raw
                           data only.

3 02 34  017       105 REV037  CODE:0205

                       - TECHNICAL AMENDMENT
                          1)FCOM page modified to remove the
                           "Attempt to see the reported traffic"
                           advise for TCAS Resolution Advisory :
                           Pilots must apply RA orders without
                           trying to see the intruder.
                           Indeed, visual acquisition may not be
                           easy and may lead to erroneous
                           information interpretation leading to
                           incorrect pilot reaction.

3 02 34  018       001 REV037

                       - TECHNICAL AMENDMENT
                          1)The landing distance coefficient has
                           been removed from this page, since
                           it is already provided in the QRH
                           Part 2, and in the FCOM 3.02.80.

3 02 36  007       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Page updated to highlight the fact
                           that the ENG 1(2) or 1 + 2 BLEED LO
                           TEMP caution may be triggered due to
                           low outside air temperature. If this
                           is the case, increasing thrust may
                           clear the ECAM caution.

3 02 70  001       025 REV024  CFM ALL

                       - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE

3 02 70  004       015 REV037  CFM 56-5-A1/A3/A4/A5

                       - TECHNICAL AMENDMENT
                          1)With the introduction of DMC V32, the
                           beta and beta target are flagged in
                           case of a reverse unlocked. Since all
                           A320 family aircraft are now retrofit
                           with DMC V32, the note requesting to
                           disregard the beta and beta target,
                           if displayed, has been deleted.

3 02 70  009       020 REV037  CFM

                       - TECHNICAL AMENDMENT
                          1)The "ENG FLEX TEMP NOT SET" procedure,
                           and the "ENG 1(2) FADEC ALTERNATOR"
                           procedure have been moved to page 9
                           for pagination purposes.

3 02 70  010       020 REV037  CFM 56-5-A1/A3/A4/A5

                       - TECHNICAL AMENDMENT
                          1)FCOM updated to reflect the Flight
                           Manual procedure : Engine light-up
                           must be achieved within 30 seconds
                           after fuel flow increases. (Not
                           18 seconds, as previously stated).
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        -----------------------REASONS OF CHANGE--------------------
------------------------------------------------------------------------------------

3 02 70  014       001 REV037

                      - TECHNICAL AMENDMENT
                         1)FCOM page revised to clarify when the
                           XBLEED valve can be opened :
                           - Wing Anti-Ice must be off, and the
                           ENG 1(2) FIRE pushbutton must not be
                           pushed.
                           - There should be no obstacle
                           constraint.
                         2)A number of landing distance
                           coefficients will be updated for
                           upcoming revisions. To take this into
                      - ADDITIONAL INFORMATION
                           account, and due to the fact that they
                           are all provided in the QRH Part 2,
                           and in the FCOM 3.02.80, they have
                           been removed from this page to avoid
                           unnecessary duplication of information
                           and facilitate the FCOM updating
                           process. This page now provides the
                           QRH and 3.02.80 cross-references
                           instead.

3 02 70  015       040 REV037  CFM

                      - TECHNICAL AMENDMENT
                         1)The ENG FLEX TEMP NOT SET procedure
                           has been moved from page 15 to page 9
                           for pagination purposes.

3 02 70  018       020 REV037  CODE 0361/CFM

                      - TECHNICAL AMENDMENT
                         1)The ENG 1(2) FADEC ALTERNATOR
                           procedure has been moved to page 9
                           for pagination purposes.

3 02 70  025       020 REV037  CFM ALL

                      - TECHNICAL AMENDMENT
                         1)Page updated to add an action
                           requiring that the beacon light be
                           switched ON during the ENG TAILPIPE
                           FIRE procedure to warn ground
                           personnel.

3 02 80  018       200 REV036  M:23208+24077

                      - TECHNICAL AMENDMENT
                         1)Page revised to provide A320 landing
                           distance coefficients corresponding
                           to the latest calculation process
                           (new braking model, altitude envelope
                           up to 14000 ft and Min RAT speed of
                           140 kt).

3 02 90  002       001 REV037  STD=M:32208+24105

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       -----------------------REASONS OF CHANGE--------------------
------------------------------------------------------------------------------------

3 02 90  003       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 02 90  004       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 02 90  005       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 02 90  006       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 02 90  007       001 REV037  STD

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 02 90  008       001 REV037  STD

                      - TECHNICAL AMENDMENT
                         1)Update of the emergency evacuation
                           procedure to be in accordance with
                           the Cabin Crew Operating Manual
                           (CCOM).

3 03 06  002       100 REV037  CODE 0435

                      - TECHNICAL AMENDMENT
                         1)Page revised to eliminate the "if
                           installed" symbol, to indicate that
                           the EVAC COMMAND pushbutton is
                           installed.

3 03 06  006       100 REV037  M:21125

                      - INCORPORATION OF MOD 21125

3 03 06  006       100 REV036  MOD 22031=25440

                      - DELETION OF MOD 22031
                      - DELETION OF MOD 25440
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                         -----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 03 06  006       100 REV037  M:21125

                      - TECHNICAL AMENDMENT
                         1)The reason why the RESET IRS TO NAV
                           message may be displayed on MCDU, is
                           clarified.

3 03 06  010       100 REV037  M:26358

                      - INCORPORATION OF MOD 26358
                      - TECHNICAL AMENDMENT
                         1)Page created to further specify the
                           exact Flight Control Unit (FCU)
                           definition : The LS pushbutton is
                           installed with this FCU standard.

3 03 08  001       020 REV034  56-5-A1/A3/A4/A5/B5/B6/B7/B8

                      - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE

3 03 08  002       020 REV032  CFM ALL

                      - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE

3 03 10  002       001 REV037

                      - TECHNICAL AMENDMENT
                         1)In service experience and training
                           feedback have shown the importance of
                           carefully performing the flight
                           control checks, in case flight control
                           computers do not detect a failure.
                           Therefore, to reinforce the efficiency
                           of the flight controls checks, the
                           flight control check procedure has
                           been modified for the entire
                           A320/A330/A340 family of aircraft.

3 03 10  004       001 REV037  CODE 0783

                      - TECHNICAL AMENDMENT
                         1)Page revised to emphasize the need to
                           preselect a heading, in case of a
                           radar vector departure.

3 03 12  006       001 REV037

                      - TECHNICAL AMENDMENT
                         1)The rotation technique recommendation
                           has been harmonized with the FCOM
                           3.03.12, p. 3 : At VR, rotate the
                           aircraft to 15 degrees and, after
                           lift-off, follow the Speed Reference
                           System (SRS).

3 03 16  002       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page revised to indicate that the
                           inserted  MDA (MDH) should be greater
                           than the published MDA (MDH), this is
                           to avoid undershooting the MDA during
                           go-around due to resulting aircraft
                           inertia during pull-up action.
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       ----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 03 17  002       100 REV024  STD

                      - INCORPORATION OF MOD 25205
                      - INCORPORATION OF MOD 26111
                      - INCORPORATION OF MOD 26485
                      - INCORPORATION OF MOD 26999
                      - INCORPORATION OF MOD 28382
                      - INCORPORATION OF MOD 28495
                      - INCORPORATION OF MOD 30241
                      - INCORPORATION OF MOD 30631
                      - INCORPORATION OF MOD 30635

3 03 17  003       100 REV037  CODE:0656

                      - TECHNICAL AMENDMENT
                         1)Page updated to further specify the
                           exact barometric setting on EFIS
                           control panel.

3 03 17  004       001 REV035  STD OR M:(26358+30980)

                      - INCORPORATION OF MOD 26358
                      - INCORPORATION OF MOD 30980

3 03 18  004       103 REV037  M:26497

                      - INCORPORATION OF MOD 26497
                      - TECHNICAL AMENDMENT
                         1)With GLOBAL SPEED PROTECTION, the
                           AP does not revert to OP CLB when
                           reaching VFE. Instead, it maintains
                           VFE and reduces V/S, without MODE
                           REVERSION.

3 03 18  007       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page updated to add cross-reference
                           to the new "RESIDUAL BRAKING PROC"
                           instead of the description given on
                           this page.

3 03 19  001       105 REV037  CODE 0535

                      - TECHNICAL AMENDMENT
                         Page revised to :
                         1)Specify that OAT is one of the
                           parameters used for final approach
                           validation.
                         2)Reformat the note paragraphs, for
                           improved technical understanding and
                           standardization.
                         3)Update the FMGS Pilot Guide
                           references.

3 03 19  002       001 REV037

                      - TECHNICAL AMENDMENT
                         Page revised to :
                         1)Specify that OAT is one of the
                           parameters used for final approach
                           validation.
                         2)Reformat the note paragraphs, for
                           improved technical understanding and
                           standardization.
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        ----------------------REASONS OF CHANGE-------------------
-----------------------------------------------------------------------------------
                         3)Update the FMGS Pilot Guide
                           references.

3 03 19  008       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Page updated to add cross-reference
                            to the new "RESIDUAL BRAKING PROC"
                            instead of the description given on
                            this page.

3 03 19  010       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Page revised to be in accordance with
                            the Standard Calls' chapter.

3 03 19  011       100 REV037  M:24064=24065=24066=24067

                       - TECHNICAL AMENDMENT
                          1)Page revised to indicate that the
                            monitored MDA (MDH) values are the
                            ones entered on the PERF APPROACH
                            page.

3 03 22  004       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Page corrected to reflect the fact
                            that the PNF should call out "PITCH,
                            PITCH" when the pitch attitude reaches
                            10 degrees, not 7.5 degrees, as
                            previously written.
                          2)The height for beginning a flare has
                            been increased to approximately 30
                            feet. Experience has shown that it is
                            a preferable average for the entire
                            A320 familly.

3 04 10  003       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Addition of the VMCL definition to the
                            limit speeds' list.

3 04 24  003       001 REV037  STD OR M:26792+28488

                       - INCORPORATION OF MOD 26792
                       - INCORPORATION OF MOD 28488
                       - TECHNICAL AMENDMENT
                          1)Page updated to further reflect the
                            exact aircraft definition :
                            - No pack controller reset is
                            necessary.

3 04 24  004       001 REV037

                       - TECHNICAL AMENDMENT
                          1)Page amended to reflect the
                            appropriate FAP reset procedure : the
                            FAP freezing is either due to the FAP
                            itself, or to the tape
                            reproducer/PRAM.
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                       -----------------------REASONS OF CHANGE--------------------
-------------------------------------------------------------------------------------

3 04 24  005       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page modified to indicate that the
                           pitch trim position should be checked,
                           after an ELAC reset.

3 04 24  006       200 REV037  CODE 0758

                      - INCORPORATION OF MOD 21678
                      - INCORPORATION OF MOD 22536
                      - INCORPORATION OF MOD 23227
                      - INCORPORATION OF MOD 23529
                      - TECHNICAL AMENDMENT
                         1)The "if installed" symbol, associated
                           with the FWC 1 C/B, has been removed,
                           in order to correspond to the actual
                           aircraft design, and customize the
                           reset procedure.

3 04 24  006       300 REV037  CODE 0723

                      - INCORPORATION OF MOD 21678
                      - INCORPORATION OF MOD 22536
                      - INCORPORATION OF MOD 23227
                      - INCORPORATION OF MOD 23529
                      - INCORPORATION OF MOD 27522
                      - TECHNICAL AMENDMENT
                         1)Page created to introduce the ATSU
                           reset.
                         2)The "if installed" symbol, associated
                           with the FWC 1 C/B, has been removed,
                           in order to correspond to the actual
                           aircraft design, and customize the
                           reset procedure.

3 04 27  011       001 REV037

                      - TECHNICAL AMENDMENT
                         1)FCOM page revised to specify that
                           a typical alpha for alpha prot in
                           cruise is 3.5 deg. for the A318, and
                           4.5 deg. for the A319.

3 04 30  001       001 REV037

                      - TECHNICAL AMENDMENT
                         1)Page created to standardize the
                           landing procedure linked to icing
                           conditions. In case of ice accretion,
                           the approach speed must not be lower
                           than :
                           -VLS + 5 knots in Configuration FULL.
                           -VLS + 10 knots in Configuration 3.
                           The associated landing distance
                           penalties are :
                           -Landing distance multiplied by 1.10,
                      - ADDITIONAL INFORMATION
                            in Configuration FULL.
                           -Landing distance multiplied by 1.15,
                            in Configuration 3.

3 04 32  004       001 REV037  STD

                      - TECHNICAL AMENDMENT
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        ----------------------REASONS OF CHANGE-------------------
------------------------------------------------------------------------------------
                         1)Page created to indicate A320 tire
                           pressures corresponding to all
                           certified maximum takeoff weight
                           variants.

3 04 34  011        100 REV037  CODE:0063

                      - TECHNICAL AMENDMENT
                         1)TCAS operational recommendations
                           revised to improve safety :
                           Pilots must follow the RA orders,
                           even if they believe that it is unsafe
                           or if they have a visual acquisition
                           of the intruder.

3 04 34  013        105 REV029  CODE 0264

                      - INCORPORATION OF MOD 26877
                      - INCORPORATION OF MOD 27698
                      - INCORPORATION OF MOD 27740
                      - INCORPORATION OF MOD 28738
                      - INCORPORATION OF MOD 30163

3 04 34  014        105 REV029  CODE 0264

                      - INCORPORATION OF MOD 26877
                      - INCORPORATION OF MOD 27698
                      - INCORPORATION OF MOD 27740
                      - INCORPORATION OF MOD 28738
                      - INCORPORATION OF MOD 30163

3 04 46  002        100 REV037  M:27522=(27522+31371+31728)

                      - TECHNICAL AMENDMENT
                         1)Page revised to recommend that the
                           crew not modify the SCAN MASK setting,
                           unless they have been instructed to do
                           so.
                         2)Typing error for priority number
                           selection has been corrected.

3 04 70  002        001 REV037

                      - TECHNICAL AMENDMENT
                         1)Harmonize the following autothrust
                           disconnect conditions with the FCOM
                           1.22.30 : "When the radio altitude is
                           below 100 feet, and both thrust levers
                           are above CL detent, or one thrust
                           lever is above MCT detent".
                         2)Add a cross-reference to the FCOM
                           1.22.30.

3 04 70  003        020 REV037  CFM=PW

                      - VERSION AND/OR ENGINE INCORPORATION, DELETION OR CHANGE
                      - TECHNICAL AMENDMENT
                         Page revised in order to :
                         1)Harmonize the autothrust disconnect
                           conditions with the FCOM 1.22.30.
                         2)Add a cross-reference to the FCOM
                           Bulletin No. 54.

3 04 80  001        001 REV037

                      - TECHNICAL AMENDMENT
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V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA-----
                        ----------------------REASONS OF CHANGE--------------------
-----------------------------------------------------------------------------------
                          1)Deletion of the reference to speed
                            bugs, in order to be consistent with
                            the SOP.

3 04 80  002       100 REV037  M:32088=32090

                        - INCORPORATION OF MOD 32088
                        - INCORPORATION OF MOD 32090
                        - TECHNICAL AMENDMENT
                          1)Introduction of the cockpit door
                            security system.

3 04 90  002       020 REV037  CFM ALL

                        - TECHNICAL AMENDMENT
                          1)Page updated to further specify that a
                            3-minute countdown is required, prior
                            to shutting down the engine, after
                            high thrust operations, to thermally
                            stabilize the engine hot section.

3 04 91  009       001 REV037

                        - TECHNICAL AMENDMENT
                          1)Page revised to provide an easier and
                            more standardized procedure for
                            securing the aircraft, in the event of
                            cold soak : The procedure now
                            indicates that the ditching pushbutton
                            should be switched ON, in order to
                            close the valves.
                          2)The PARKING BRAKE .... OFF action line
                            has been placed before the "After
                            switching off the batteries" line,
                        - ADDITIONAL INFORMATION
                            since the batteries must be on, in
                            order for triple indicator to still be
                            available to the crew.
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M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	00	00	001-2	001	REV024	CONTENT	ALL
	3	00	10	001	001	REV035	ORGANIZATION OF THE MANUAL	ALL
	3	00	10	002	001	REV035	ORGANIZATION OF THE MANUAL	
	3	00	10	003	001	REV024	ORGANIZATION OF THE MANUAL	ALL
	3	00	10	004	001	REV024	ORGANIZATION OF THE MANUAL	
	3	00	10	005	001	REV024	ORGANIZATION OF THE MANUAL	ALL
R	3	00	20	001	001	REV037	LIST OF CODES	ALL
R	3	00	20	002	001	REV037	LIST OF CODES	
R	3	00	20	003	001	REV037	LIST OF CODES	ALL
R	3	00	20	004	001	REV037	LIST OF CODES	
R	3	00	20	005	001	REV037	LIST OF CODES	ALL
R	3	00	20	006	001	REV037	LIST OF CODES	
R	3	00	20	007	001	REV037	LIST OF CODES	ALL
R	3	00	20	008	001	REV037	LIST OF CODES	
R	3	00	20	009	001	REV037	LIST OF CODES	ALL
R	3	00	20	010	001	REV037	LIST OF CODES	
R	3	00	20	011	001	REV037	LIST OF CODES	ALL
R	3	00	20	012	001	REV037	LIST OF CODES	
R	3	00	20	013	001	REV037	LIST OF CODES	ALL
R	3	00	20	014	001	REV037	LIST OF CODES	
R	3	00	20	015	001	REV037	LIST OF CODES	ALL
R	3	00	20	016	001	REV037	LIST OF CODES	
N	3	00	20	017	001	REV037	LIST OF CODES	ALL
N	3	00	20	018	001	REV037	LIST OF CODES	
N	3	00	20	019	001	REV037	LIST OF CODES	ALL
N	3	00	20	020	001	REV037	LIST OF CODES	
N	3	00	20	021	001	REV037	LIST OF CODES	ALL
R	3	00	30	001	001	REV027	LIST OF NORMAL REVISION	ALL
R	3	00	30	002	001	REV037	LIST OF NORMAL REVISION	
	3	00	35	001	001	REV025	RECORD OF TEMPORARY REVISION	ALL
R	3	00	36	001	001	REV037	LIST OF EFFECTIVE TEMPO.REVI	ALL
R	3	00	70	001	001	REV037	CROSS REFERENCE TABLE	ALL
R	3	00	75	001	001	REV037	HIGHLIGHTS	ALL
R	3	00	80	001	001	REV037	LIST OF EFFECTIVE PAGES	ALL
R	3	00	85	001	001	REV037	LIST OF MODIFICATIONS	ALL
	3	01	00	001	001	REV032	CONTENTS	ALL
	3	01	00	002	001	REV028	CONTENTS	

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	01	10	001	001	REV024		ALL
N	3	01	20	001	302	REV037	M:23264+23900+27920/56-5-A3	0884-0971
N	3	01	20	002	150	REV028	M:27276/V2500=56-5-A1/A3	
N	3	01	20	001	302	REV037	M:23264+23900+27920/56-5-A3	1381-1437
N	3	01	20	002	261	REV029	CODE 0061	
N	3	01	20	001	306	REV037	M:23264+23900+26891/56-5-A3	0774-0809
N	3	01	20	002	150	REV028	M:27276/V2500=56-5-A1/A3	
	3	01	20	003	110	REV036	23222=26057=(23222+26057)	0774-0971
	3	01	20	004	001	REV026		
N	3	01	20	003	126	REV037	CODE 0059	1381-1437
N	3	01	20	004	001	REV026		
	3	01	20	005	001	REV027		0774-0971
	3	01	20	006	025	REV035	CFM 56-5-A3	
	3	01	20	005	001	REV027		1381-1437
	3	01	20	006	110	REV035	23871/CFM 56-5-A3	
	3	01	20	007	001	REV031		ALL
	3	01	20	008	001	REV024		
	3	01	20	009	110	REV024	MOD:20268 CFM 56-5-A1/A3/B4	ALL
	3	01	20	010	120	REV026	MOD:20268 CFM 56-5-A1/A3/B4	
	3	01	21	001	001	REV034		ALL
	3	01	21	002	001	REV024		
R	3	01	22	001	002	REV036	STD=M:24105	ALL
R	3	01	22	002	105	REV037	CODE 0535	
R	3	01	22	002A	100	REV037	CODE 0538	ALL
	3	01	22	003	007	REV036	CFM	0774-0971
	3	01	22	004	100	REV036	25225	
R	3	01	22	003	007	REV036	CFM	1381-1437
R	3	01	22	004	216	REV037	24617+25225/CFM	
	3	01	24	001	001	REV024		0774-0971
	3	01	24	002	001	REV024		
	3	01	24	001	105	REV036	M:28568	1381-1437
	3	01	24	002	001	REV024		
	3	01	27	001	001	REV024		ALL
	3	01	27	002	001	REV024		
	3	01	28	001	001	REV026		ALL
	3	01	28	002	100	REV024	MOD:20024	
	3	01	29	001	001	REV024		ALL
	3	01	29	002	001	REV024		
	3	01	32	001	040	REV035	STD OR (25951+32239)CFM ENG	ALL

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R	3	01	35	001	105	REV037	CODE 0137	ALL
	3	01	49	001	110	REV034	22562=(22562+25888+27609)	ALL
	3	01	49	002	204	REV032	CODE 0077	
	3	01	49	003	105	REV024	CODE 0223	ALL
R	3	01	70	001	020	REV033	CODE 0102	ALL
R	3	01	70	002	025	REV037	CFM 56-5-A3/A4/A5	
R	3	02	00	001	001	REV037		0774-0971
R	3	02	00	002	001	REV027		
R	3	02	00	001	001	REV037		1381-1437
R	3	02	00	002	100	REV030	M:28479=28702=28916	
R	3	02	00	003	100	REV036	32088=32090	0774-0971
R	3	02	00	004	001	REV037		
R	3	02	00	003	100	REV036	32088=32090	1381-1437
R	3	02	00	004	100	REV037	M:28479=28702=28916	
	3	02	00	005	001	REV026		ALL
	3	02	00	006	103	REV035	25590	
R	3	02	00	007	001	REV037		0774-0971
R	3	02	00	008	001	REV037		
R	3	02	00	007	100	REV037	28916=28479=28702	1381-1437
R	3	02	00	008	001	REV037		
N	3	02	00	009	001	REV037	CODE 0531	ALL
N	3	02	00	010	025	REV037	CFM	
N	3	02	00	011	100	REV037	M:25529=25819=26117=26270	ALL
	3	02	01	001	001	REV024		ALL
	3	02	01	002	001	REV030		
	3	02	01	003	001	REV033		ALL
	3	02	01	004	001	REV032		
N	3	02	01	005	001	REV037		ALL
N	3	02	01	006	001	REV037		
N	3	02	01	007	001	REV037		ALL
	3	02	10	001	001	REV024		ALL
	3	02	10	002	100	REV036	M:26017	
	3	02	10	003	001	REV036		ALL
	3	02	10	004	001	REV030	CODE 0249	
	3	02	10	005	200	REV036	CODE 0396	ALL
	3	02	10	006	100	REV030	M:23742	
N	3	02	10	006A	110	REV037	M:20268/CFM 56-5-A1/A3	ALL

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	3	02	10	008	001	REV033	CODE 0276	
	3	02	21	001	001	REV028		0774-0809
	3	02	21	002	001	REV035	STD=26792+28488	
	3	02	21	001	001	REV028		0884-1437
	3	02	21	002	320	REV035	26363+26792+28488	
	3	02	21	003	001	REV024	CODE 0032	ALL
	3	02	21	004	001	REV036		
	3	02	21	005	001	REV024		ALL
	3	02	21	006	110	REV036	MOD:22561	
	3	02	21	007	100	REV024	MOD:24794	ALL
	3	02	21	008	001	REV025		
	3	02	21	009	001	REV024		ALL
	3	02	21	010	001	REV024		
	3	02	21	011	001	REV024		ALL
	3	02	21	012	001	REV024		
	3	02	21	013	200	REV032	M:21899+30363	ALL
	3	02	21	014	001	REV025	CODE 0089	
R	3	02	22	001	100	REV037	26645=27846=28703=30439	ALL
R	3	02	22	002	001	REV036		
R	3	02	22	003	001	REV024		ALL
R	3	02	22	004	240	REV037	CODE 0589	
	3	02	22	005	001	REV028		ALL
	3	02	22	006	100	REV024	CODE 0248	
R	3	02	22	007	400	REV037	CODE:0122	ALL
	3	02	23	001	001	REV036		0774-0971
	3	02	23	001	100	REV036	M:28479 OR 28702 OR 28916	1381-1437
	3	02	24	001	002	REV034	STD=24105	ALL
	3	02	24	002	100	REV031	CODE:0072	
N	3	02	24	003	008	REV029	CFM ALL	ALL
N	3	02	24	004	300	REV037	M:21678+21858+25404	
R	3	02	24	005	108	REV037	CODE 0008/CFM	ALL
R	3	02	24	006	215	REV036	CODE:0554	
N	3	02	24	007	200	REV027	CODE 0111	1381-1437
N	3	02	24	008	200	REV037	CODE 0002	
N	3	02	24	007	200	REV027	CODE 0111	0774-0971
N	3	02	24	008	300	REV037	CODE 0741	
R	3	02	24	009	105	REV037	CODE 0745	ALL
R	3	02	24	010	001	REV028		

M	V	CH	SEC	PAGE	SEQ	REV	VALIDATION CRITERIA	EFFECTIVITY
N	3	02	24	011	200	REV037	CODE 0748	ALL
N	3	02	24	012	240	REV026	21678+26017	
N	3	02	24	013	200	REV037	M:20024+21678	ALL
N	3	02	24	014	400	REV036	CODE 0426	
	3	02	24	015	160	REV026	M:21678=(21678+28160+28917)	0774-0971
	3	02	24	016	125	REV026	M:21678=(21678+28160+28917)	
	3	02	24	015	200	REV026	CODE 0393	1381-1437
	3	02	24	016	220	REV035	CODE 0393	
N	3	02	24	017	250	REV033	CODE:0350	0774-0971
N	3	02	24	018	105	REV037	M:25404=(25404+28160+28917)	
R	3	02	24	017	250	REV033	CODE:0350	1381-1437
R	3	02	24	018	340	REV037	CODE 0207	
	3	02	24	019	001	REV036	CODE 0238	0774-0971
	3	02	24	020	200	REV035	21678+21858	
	3	02	24	019	100	REV036	M:22013=24105=28160	1381-1437
	3	02	24	020	200	REV035	21678+21858	
	3	02	24	021	100	REV035	21678	ALL
	3	02	24	022	230	REV027	CODE:0670	
	3	02	24	023	310	REV031	M:21285+21678+25404/CFM	0774-0971
	3	02	24	024	100	REV032	M:21678 OR (21678+27498)	
	3	02	24	023	310	REV031	M:21285+21678+25404/CFM	1381-1437
	3	02	24	024	305	REV032	CODE 0175	
N	3	02	24	025	115	REV029	26017	0774-0971
N	3	02	24	026	001	REV029	STD=M:28160+28917	
N	3	02	24	025	200	REV037	CODE 0751	1381-1437
N	3	02	24	026	110	REV030	M:24105=28160	
	3	02	24	027	001	REV030	STD OR M:(28160+28917)	0774-0971
	3	02	24	028	001	REV032		
	3	02	24	027	100	REV030	M:22013=24105=28160	1381-1437
	3	02	24	028	001	REV032		
	3	02	25	001	100	REV036	MOD 32088 OR 32090	ALL
	3	02	26	001	001	REV032		ALL
	3	02	26	002	001	REV033		
	3	02	26	003	001	REV033		0774-0971
	3	02	26	004	001	REV035		
	3	02	26	003	001	REV033		1381-1437
	3	02	26	004	100	REV035	27498=31891	
R	3	02	26	005	001	REV037		ALL
R	3	02	26	006	001	REV035		

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N	3	02	26	007	220	REV034	CODE 0474	0774-0971
N	3	02	26	008	001	REV037		
N	3	02	26	007	300	REV036	CODE 0475	1381-1437
N	3	02	26	008	001	REV037		
	3	02	26	009	001	REV032		ALL
	3	02	26	010	001	REV036		
	3	02	26	011	300	REV036	M:20067+20069+20071	ALL
	3	02	26	012	200	REV036	M:20067+20069=20069+20071	
	3	02	27	001	200	REV024	24612+26017	ALL
	3	02	27	002	350	REV032	CODE 0327	
N	3	02	27	003	001	REV037	STD=M:27846=(27846+28916)	ALL
N	3	02	27	004	100	REV037	M:20024	
N	3	02	27	005	001	REV037	STD	0774-1416
N	3	02	27	006	001	REV033		
N	3	02	27	005	001	REV037	STD	1437
N	3	02	27	006	100	REV033	M:26910	
N	3	02	27	007	001	REV037		0774-0971
N	3	02	27	008	110	REV037	M:24511	
N	3	02	27	007	001	REV037		1381-1437
N	3	02	27	008	200	REV037	CODE 0674	
N	3	02	27	009	001	REV037		ALL
N	3	02	27	010	105	REV037	M:25335=27276	
N	3	02	27	011	110	REV031	25410	ALL
N	3	02	27	012	001	REV037		
N	3	02	27	013	001	REV037		ALL
N	3	02	27	013A	100	REV037	M:22013=24105=26334=26335	ALL
N	3	02	27	014	001	REV037		ALL
N	3	02	27	015	100	REV037	M:22013=24105=26334=26335	ALL
N	3	02	27	016	240	REV033	M:21964+22087	
N	3	02	27	017	001	REV037		ALL
N	3	02	27	018	001	REV024		
	3	02	27	019	001	REV024		0774-0971
	3	02	27	020	200	REV028	CODE 0045	
N	3	02	27	019	100	REV037	28479=28702=28916	1381-1437
N	3	02	27	020	200	REV028	CODE 0045	
	3	02	27	021	001	REV024		ALL
	3	02	27	022	001	REV024		
	3	02	28	001	100	REV033	M:20024	ALL
	3	02	28	002	002	REV033		

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	3	02	28	004	001	REV024		
	3	02	28	005	001	REV026		ALL
	3	02	28	006	100	REV026	CODE 0359/CFM ALL	
	3	02	28	007	100	REV024	MOD 20024	ALL
	3	02	28	008	001	REV036	STD=M:32650+32651	
R	3	02	28	009	110	REV037	20024	ALL
R	3	02	28	010	100	REV036	20024	
N	3	02	29	001	001	REV037		ALL
N	3	02	29	002	001	REV024		
N	3	02	29	003	001	REV037		0774-0971
N	3	02	29	004	001	REV024		
N	3	02	29	003	001	REV037		1381-1437
N	3	02	29	004	100	REV037	28916=28479=28702	
N	3	02	29	005	001	REV037		ALL
N	3	02	29	006	001	REV025		
N	3	02	29	007	002	REV024		0774-0971
N	3	02	29	008	001	REV037		
R	3	02	29	007	002	REV024		1381-1437
R	3	02	29	008	105	REV037	M:28479=28916	
	3	02	29	009	001	REV024		ALL
	3	02	29	010	001	REV024		
N	3	02	29	011	203	REV037	CODE 0737	ALL
N	3	02	29	012	001	REV024		
N	3	02	29	013	001	REV037		ALL
N	3	02	29	014	001	REV037		
N	3	02	29	015	001	REV037		ALL
N	3	02	29	016	001	REV037		
N	3	02	30	001	001	REV037		ALL
N	3	02	30	002	001	REV024		
	3	02	30	003	001	REV027		ALL
	3	02	30	004	001	REV024		
	3	02	30	005	001	REV024	STD=M:22875+25398	ALL
	3	02	30	006	001	REV027		
	3	02	30	007	001	REV024		ALL
	3	02	30	008	130	REV028	M:26017	
	3	02	31	001	100	REV024	MOD:25590	ALL
	3	02	31	002	001	REV032		
	3	02	31	003	001	REV024		ALL
	3	02	31	004	001	REV033		

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	3	02	32	003	110	REV036	24645	0774-0971
	3	02	32	004	002	REV033	STD=(20139+22129)	
	3	02	32	003	200	REV036	CODE 0553	1381-1437
	3	02	32	004	002	REV033	STD=(20139+22129)	
	3	02	32	005	001	REV024		ALL
	3	02	32	006	001	REV032		
	3	02	32	007	001	REV031		ALL
	3	02	32	008	001	REV035		
R	3	02	32	009	001	REV037		0774-0971
R	3	02	32	010	001	REV037	STD=M22013+24044=25951+32239	
R	3	02	32	009	100	REV037	M:28479=28916	1381-1437
R	3	02	32	010	105	REV037	CODE:0568	
N	3	02	32	011	001	REV033	STD=27979=(24266+32310)	ALL
N	3	02	32	012	001	REV037		
	3	02	34	001	001	REV024	CODE:0294	ALL
	3	02	34	002	223	REV030	CODE 0095	
N	3	02	34	003	100	REV033	26526	ALL
N	3	02	34	004	105	REV037	M:26526	
N	3	02	34	005	001	REV036		ALL
N	3	02	34	006	001	REV037		
	3	02	34	007	200	REV035	CODE 0172	ALL
	3	02	34	008	105	REV031	CODE 0383	
N	3	02	34	009	001	REV037		ALL
N	3	02	34	010	100	REV036	CODE:0767	
N	3	02	34	011	001	REV037		ALL
N	3	02	34	012	001	REV036		
N	3	02	34	013	200	REV037	CODE : 0768	0774-0971
N	3	02	34	014	105	REV035	22769	
N	3	02	34	013	300	REV037	CODE : 0769	1381-1437
N	3	02	34	014	105	REV035	22769	
	3	02	34	015	100	REV036	M:26526	ALL
	3	02	34	016	100	REV025	M:26526	
N	3	02	34	017	105	REV037	CODE:0205	ALL
N	3	02	34	018	001	REV037		
	3	02	34	019	001	REV035		ALL
	3	02	34	020	001	REV035		
	3	02	34	021	001	REV035		ALL
	3	02	34	022	001	REV035		

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	3	02	34	025	011	REV035	CFM 56-5-A3	ALL
	3	02	36	001	001	REV024		ALL
	3	02	36	002	001	REV034		
	3	02	36	003	001	REV036		ALL
	3	02	36	004	100	REV028	M:22562	
	3	02	36	005	100	REV036	MOD:22562	ALL
	3	02	36	006	001	REV024		
R	3	02	36	007	001	REV037		ALL
	3	02	49	001	001	REV024		ALL
	3	02	52	001	001	REV024	CODE 0188	ALL
	3	02	70	001	025	REV024	CFM ALL	ALL
	3	02	70	002	120	REV024	CODE:0046/56-5-A1/A3/A4/A5	
N	3	02	70	003	025	REV024	CFM 56-5-A1/A3/A4/A5	ALL
N	3	02	70	004	015	REV037	CFM 56-5-A1/A3/A4/A5	
	3	02	70	005	020	REV024	CFM ALL	ALL
	3	02	70	006	010	REV026	CFM ALL	
	3	02	70	007	020	REV032	CFM	ALL
	3	02	70	008	010	REV032	CFM	
R	3	02	70	009	020	REV037	CFM	ALL
R	3	02	70	010	020	REV037	CFM 56-5-A1/A3/A4/A5	
	3	02	70	011	035	REV032	CFM ALL	0774-0971
	3	02	70	012	200	REV030	M:25404+26017	
	3	02	70	011	035	REV032	CFM ALL	1381-1437
	3	02	70	012	210	REV030	CODE:0039	
R	3	02	70	013	200	REV033	M:25410+30363	0774-0971
R	3	02	70	014	001	REV037		
R	3	02	70	013	205	REV036	CODE 0419	1381-1437
R	3	02	70	014	001	REV037		
R	3	02	70	015	040	REV037	CFM	ALL
R	3	02	70	016	230	REV034	CODE 0312/CFM ALL	
R	3	02	70	017	220	REV026	CODE 0050	ALL
R	3	02	70	018	020	REV037	CODE 0361/CFM	
	3	02	70	019	030	REV024	CFM ALL	ALL
	3	02	70	020	001	REV028	CODE 0117	
	3	02	70	021	015	REV034	CODE 0275/CFM A1/A3/B4	ALL
	3	02	70	022	130	REV024	CODE 0106	

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	3	02	70	024	120	REV024	M:24035=24160=24189 CFM ALL	
R	3	02	70	025	020	REV037	CFM ALL	ALL
R	3	02	70	026	020	REV024	CFM ALL	
	3	02	80	001	001	REV035		ALL
	3	02	80	002	100	REV031	M:26526	
	3	02	80	003	001	REV036		0774-0971
	3	02	80	004	001	REV024		
	3	02	80	003	001	REV036		1381-1437
	3	02	80	004	100	REV034	CODE 0434	
	3	02	80	005	100	REV036	26526	0774-0971
	3	02	80	006	001	REV035		
	3	02	80	005	100	REV036	26526	1381-1437
	3	02	80	006	100	REV035	CODE 0434	
	3	02	80	007	001	REV034		ALL
	3	02	80	008	020	REV025	56-5-A1/A3/B4/T=L	
	3	02	80	009	001	REV025		ALL
	3	02	80	010	001	REV034		
	3	02	80	010A	001	REV031		ALL
	3	02	80	011	001	REV035		ALL
	3	02	80	011A	001	REV034		ALL
	3	02	80	012	001	REV034		ALL
	3	02	80	013	001	REV030		ALL
	3	02	80	014	001	REV033		
	3	02	80	015	100	REV032	MOD:22562	ALL
	3	02	80	016	025	REV027	CFM ALL	
	3	02	80	017	001	REV036	STD	ALL
	3	02	80	018	200	REV036	M:23208+24077	
	3	02	80	019	100	REV035	22249	ALL
	3	02	80	020	100	REV035	25529=25819=26117=26270	
R	3	02	90	001	001	REV028		ALL
R	3	02	90	002	001	REV037	STD=M:32208+24105	
R	3	02	90	003	001	REV037		ALL
R	3	02	90	004	001	REV037		
N	3	02	90	005	001	REV037		ALL
N	3	02	90	006	001	REV037		
N	3	02	90	007	001	REV037	STD	ALL
N	3	02	90	008	001	REV037	STD	

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	03	00	001-2	001	REV027		ALL
	3	03	01	001	001	REV035		ALL
	3	03	01	002	001	REV035		
	3	03	01	003	001	REV034		ALL
	3	03	01	004	001	REV034		
	3	03	01	005	001	REV024		ALL
	3	03	02	001	001	REV034		ALL
	3	03	02	002	001	REV025		
	3	03	03	001	001	REV024		ALL
	3	03	04	001	001	REV024		ALL
	3	03	04	002	001	REV025		
	3	03	04	003	200	REV036	22373+28897	ALL
	3	03	04	004	001	REV033		
	3	03	04	005	001	REV036		ALL
	3	03	04	006	100	REV025	MOD 22013 OR 24105 OR 24701	
	3	03	04	007	110	REV030	M:22013=24105=24701/CFM ALL	ALL
	3	03	04	008	001	REV024	CODE 0462	
	3	03	05	001	001	REV024		ALL
	3	03	05	002	001	REV024		
	3	03	05	003	105	REV036	22199=24105	ALL
	3	03	05	004	001	REV024		
	3	03	05	005	001	REV033		ALL
	3	03	05	006	001	REV032		
R	3	03	06	001	001	REV024		ALL
R	3	03	06	002	100	REV037	CODE 0435	
	3	03	06	003	001	REV031	CODE 0491	ALL
	3	03	06	004	105	REV032	M:24373	
R	3	03	06	005	001	REV031		ALL
R	3	03	06	006	100	REV037	M:21125	
	3	03	06	007	001	REV025		ALL
	3	03	06	008	001	REV033	CODE 0783	
	3	03	06	009	001	REV024	STD	0774-0971
	3	03	06	010	001	REV024	STD OR M:(20406+23450)	
N	3	03	06	009	001	REV024	STD	1381-1437
N	3	03	06	010	100	REV037	M:26358	
	3	03	06	011	001	REV035		ALL
	3	03	06	012	100	REV034	M:21946=(21946+27620+33497)	
	3	03	06	013	001	REV030	STD OR 24588 OR(24215+24588)	ALL
	3	03	06	014	001	REV030		

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	03	06	015	001	REV028		ALL
	3	03	06	016	001	REV029		
	3	03	07	001	001	REV033		ALL
	3	03	07	002	100	REV036	M:32088=32090	
	3	03	07	003	001	REV033		ALL
	3	03	08	001	020	REV034	56-5-A1/A3/A4/A5/B5/B6/B7/B8	ALL
	3	03	08	002	020	REV032	CFM ALL	
	3	03	08	003	020	REV025	CFM 56-5-A1/A3/A4	ALL
	3	03	09	001	020	REV029	CFM ALL	ALL
	3	03	09	002	025	REV030	CFM ALL	
R	3	03	10	001	001	REV034		ALL
R	3	03	10	002	001	REV037		
R	3	03	10	003	200	REV024	MOD:21964+22087	ALL
R	3	03	10	004	001	REV037	CODE 0783	
	3	03	10	005	001	REV026	CODE 0783	ALL
	3	03	10	006	001	REV034	STD = (20139+22129)	
	3	03	11	001	040	REV036	CODE:0504/CFM	ALL
	3	03	11	002	100	REV035	20081	
	3	03	12	001	001	REV030		ALL
	3	03	12	002	120	REV025	CODE 0189 CFM ALL	
	3	03	12	003	001	REV036		ALL
	3	03	12	004	100	REV032	CODE 0189	
R	3	03	12	005	001	REV033	STD	ALL
R	3	03	12	006	001	REV037		
	3	03	13	001	001	REV036		ALL
	3	03	14	001	100	REV027	CODE 0189	ALL
	3	03	14	002	100	REV027	MOD:24035 OR 24160 OR 24211	
	3	03	15	001	001	REV035	CODE 0784	ALL
	3	03	15	002	001	REV036		
R	3	03	16	001	100	REV025	CODE:0785	ALL
R	3	03	16	002	001	REV037		
	3	03	16	003	001	REV035	CODE 0230	ALL
N	3	03	17	001	100	REV025	CODE 0036	ALL
N	3	03	17	002	100	REV024	STD	
R	3	03	17	003	100	REV037	CODE:0656	ALL
R	3	03	17	004	001	REV035	STD OR M:(26358+30980)	
	3	03	18	001	100	REV027	M: 26018	ALL
	3	03	18	002	210	REV036	CODE:0578	

M V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA----- -----EFFECTIVITY-----

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
N	3	03	18	003	001	REV036	CODE 0797	ALL
N	3	03	18	004	103	REV037	M:26497	
	3	03	18	005	001	REV030		ALL
	3	03	18	006	001	REV036		
R	3	03	18	007	001	REV037		ALL
R	3	03	18	008	001	REV036		
	3	03	18	009	001	REV036		ALL
R	3	03	19	001	105	REV037	CODE 0535	ALL
R	3	03	19	002	001	REV037		
	3	03	19	003	120	REV036	CODE 0798	ALL
	3	03	19	004	001	REV036	CODE 0544	
	3	03	19	005	001	REV036		ALL
	3	03	19	006	200	REV036	CODE 0549	
R	3	03	19	007	100	REV036	CODE 0538	ALL
R	3	03	19	008	001	REV037		
R	3	03	19	009	001	REV036	STD=M:24105	ALL
R	3	03	19	010	001	REV037		
R	3	03	19	011	100	REV037	M:24064=24065=24066=24067	ALL
R	3	03	19	012	100	REV036	M:23742	
	3	03	19	013	001	REV036		ALL
	3	03	20	001	001	REV035		ALL
	3	03	20	002	001	REV024		
	3	03	21	001	001	REV024		ALL
	3	03	22	001	040	REV032	CODE 0120	ALL
	3	03	22	002	040	REV032	CODE 0120	
R	3	03	22	003	001	REV035		ALL
R	3	03	22	004	001	REV037		
	3	03	22	005	001	REV033		ALL
	3	03	22	006	001	REV027		
	3	03	23	001	110	REV036	25863	ALL
	3	03	23	002	001	REV036		
	3	03	23	003	100	REV036	MOD:25863=(ACA/25863)	ALL
	3	03	23	004	100	REV036	M:25863	
	3	03	24	001	100	REV035	20081	ALL
	3	03	24	002	001	REV034	CODE 0754	
	3	03	25	001	020	REV035	CODE 0186/CFM ALL	ALL
	3	03	25	002	001	REV035		
	3	03	25	003	170	REV035	22013=23119/CFM ALL	ALL

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	03	26	001	001	REV034		ALL
	3	03	90	001	001	REV035		ALL
	3	03	90	002	001	REV034		
	3	03	90	003	001	REV027		ALL
	3	03	90	004	001	REV027		
	3	03	90	005	001	REV027		ALL
	3	03	90	006	001	REV030		
	3	03	90	007	001	REV033		ALL
	3	04	00	001	315	REV036	CODE 0595	ALL
	3	04	00	002	001	REV032		
	3	04	00	003	001	REV033		ALL
	3	04	10	001	001	REV024		ALL
	3	04	10	002	005	REV028	CFM ALL	
R	3	04	10	003	001	REV037		ALL
R	3	04	10	004	110	REV024	MOD:25225	
	3	04	21	001	001	REV032		ALL
	3	04	21	002	001	REV024		
	3	04	23	001	001	REV036		ALL
	3	04	23	001A	001	REV036		ALL
	3	04	23	002	100	REV024	20137=(20137+28360+30239)	0774-0971
	3	04	23	002	201	REV033	20137+30239	1381-1437
	3	04	23	003	100	REV024	CODE 0317	ALL
	3	04	24	001	001	REV035		ALL
	3	04	24	002	001	REV033		
R	3	04	24	003	001	REV037	STD OR M:26792+28488	ALL
R	3	04	24	004	001	REV037		
N	3	04	24	005	001	REV037		0774-0971
N	3	04	24	006	200	REV037	CODE 0758	
N	3	04	24	005	001	REV037		1381-1437
N	3	04	24	006	300	REV037	CODE 0723	
	3	04	25	001	100	REV036	32088=32090	ALL
	3	04	25	002	100	REV036	32088=32090	
	3	04	25	003	100	REV036	32088=32090	ALL
	3	04	27	001	001	REV028		ALL
	3	04	27	002	001	REV036		
	3	04	27	003	001	REV036		ALL
	3	04	27	004	001	REV036		

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	04	27	005	001	REV036		ALL
	3	04	27	006	001	REV036		
	3	04	27	007	001	REV036		ALL
	3	04	27	008	001	REV036		
	3	04	27	009	001	REV036		ALL
	3	04	27	010	001	REV036		
R	3	04	27	011	001	REV037		ALL
R	3	04	27	012	001	REV036		
	3	04	28	001	100	REV024	MOD:20024	ALL
R	3	04	30	001	001	REV037		ALL
R	3	04	30	002	001	REV024		
	3	04	31	001	001	REV024		ALL
	3	04	31	002	001	REV024		
	3	04	32	001	001	REV031		ALL
	3	04	32	002	001	REV031	STD OR (25951 + 32239)	
N	3	04	32	003	001	REV034		ALL
N	3	04	32	004	001	REV037	STD	
	3	04	34	001	001	REV030		ALL
	3	04	34	002	100	REV032	CODE:0317	
	3	04	34	003	001	REV031		ALL
	3	04	34	004	001	REV035		
	3	04	34	005	001	REV026		0774-0971
	3	04	34	006	001	REV032		
	3	04	34	005	001	REV026		1381-1437
	3	04	34	006	100	REV035	31039=31528	
	3	04	34	007	001	REV031	CODE 0653	ALL
	3	04	34	008	001	REV034		
	3	04	34	009	100	REV034	23672=24581=24785=25108	ALL
	3	04	34	010	001	REV024		
R	3	04	34	011	100	REV037	CODE:0063	ALL
R	3	04	34	012	120	REV024	CODE 0063	
	3	04	34	013	105	REV029	CODE 0264	ALL
	3	04	34	014	105	REV029	CODE 0264	
	3	04	34	015	120	REV024	CODE 0063	ALL
	3	04	34	016	001	REV029		
	3	04	34	017	001	REV026		ALL
	3	04	34	018	001	REV026		
	3	04	34	019	001	REV028	CODE 0258	ALL
	3	04	34	020	001	REV028		

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	04	34	021	100	REV031	M:26526	ALL
R	3	04	46	001	100	REV029	CODE:0611	1381-1437
R	3	04	46	002	100	REV037	M:27522=(27522+31371+31728)	
N	3	04	70	001	001	REV024		ALL
N	3	04	70	002	001	REV037		
R	3	04	70	003	020	REV037	CFM=PW	ALL
R	3	04	70	004	020	REV027	CFM ALL	
	3	04	70	005	020	REV029	CFM ALL	ALL
	3	04	70	006	020	REV033	STD=M:30439+31040/CFM	
	3	04	70	007	020	REV028	CFM ALL	ALL
	3	04	70	008	007	REV030	CFM ALL	
	3	04	70	009	001	REV030		ALL
	3	04	70	010	001	REV030		
N	3	04	80	001	001	REV037		ALL
N	3	04	80	002	100	REV037	M:32088=32090	
	3	04	80	003	001	REV032		ALL
R	3	04	90	001	020	REV024	CFM ALL	ALL
R	3	04	90	002	020	REV037	CFM ALL	
	3	04	91	001	100	REV033	20268	ALL
	3	04	91	002	210	REV028	M:20268+24917 CFM 56-5-A1/A3	
	3	04	91	003	100	REV025	M:24917	ALL
	3	04	91	004	001	REV036		
	3	04	91	005	001	REV036		ALL
	3	04	91	006	001	REV026		
	3	04	91	007	001	REV036		ALL
	3	04	91	008	001	REV036		
	3	04	91	008A	001	REV033		ALL
R	3	04	91	009	001	REV037		ALL
R	3	04	91	010	001	REV028		
	3	04	91	011	001	REV028		ALL
	3	04	91	012	001	REV028		
	3	04	91	013	100	REV028	M:21729	ALL
	3	04	91	014	001	REV028		
	3	04	91	015	001	REV028		ALL
	3	04	92	001	001	REV036		ALL
	3	04	92	002	001	REV036		
	3	04	92	003	001	REV033		ALL
	3	04	92	004	001	REV036		

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
3		04	92	005	001	REV036		ALL
3		04	92	006	001	REV036		
3		05	00	001	001	REV025		ALL
3		05	00	002	001	REV024		
3		05	05	001	001	REV024		ALL
3		05	05	002	001	REV025		
3		05	05	003	001	REV024		ALL
3		05	05	004	001	REV024		
3		05	05	005	001	REV032		ALL
3		05	05	006	001	REV024		
3		05	06	001	020	REV024	CODE:0517	ALL
3		05	06	002	025	REV026	CFM 56-5-A3	
3		05	06	003	025	REV025	CFM 56-5-A3	ALL
3		05	06	004	001	REV024		
3		05	06	005	035	REV027	CFM 56-5-A3	ALL
3		05	06	006	001	REV024		
3		05	06	007	020	REV025	CFM 56-5-A1/A3	ALL
3		05	06	008	020	REV025	CFM 56-5-A1/A3	
3		05	06	009	020	REV025	CFM 56-5-A1/A3	ALL
3		05	06	010	020	REV025	STD=M:28238/CFM ALL/T=L	
3		05	10	001	001	REV024		ALL
3		05	10	002	100	REV025	MOD 20268 CFM 56-5-A1/A3	
3		05	10	003	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	10	004	100	REV025	MOD 20268 CFM 56-5-A1/A3	
3		05	10	005	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	10	006	100	REV025	MOD 20268 CFM 56-5-A1/A3	
3		05	10	007	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	10	008	100	REV025	MOD 20268 CFM 56-5-A1/A3	
3		05	10	009	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	15	001	020	REV024	CODE 0513/56-5-A1/A3	ALL
3		05	15	002	020	REV024	CODE 0513/56-5-A1/A3	
3		05	15	003	020	REV024	CODE 0513/56-5-A1/A3	ALL
3		05	15	004	020	REV024	CODE 0513/56-5-A1/A3	
3		05	15	005	105	REV035	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	15	006	105	REV025	MOD 20268 CFM 56-5-A1/A3	
3		05	15	007	110	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	15	008	001	REV025		
3		05	15	009	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		05	15	010	100	REV025	MOD 20268 CFM 56-5-A1/A3	

M V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA----- -----EFFECTIVITY-----
M V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA----- -----EFFECTIVITY-----

M	V	CH	SEC	PAGE	SEQ	REV	VALIDATION CRITERIA	EFFECTIVITY
	3	05	15	011	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	05	15	012	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	05	15	013	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	05	15	014	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	05	15	015	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	05	15	016	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	05	15	017	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	05	15	018	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	05	15	019	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	05	15	020	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	05	20	001	001	REV025		ALL
	3	05	20	002	105	REV026	M:20268 CFM 56-5-A1/A3	
	3	05	20	003	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	004	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	005	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	006	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	007	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	008	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	009	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	010	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	011	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	012	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	013	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	014	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	015	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	20	016	100	REV025	M:20268 CFM 56-5-A1/A3	
	3	05	20	017	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
	3	05	25	001	001	REV024		ALL
	3	05	25	002	100	REV031	M:202687CFM 56-5-A1/A3	
	3	05	25	003	100	REV031	M:20268/CFM 56-5-A1/A3	ALL
	3	05	25	004	100	REV031	M:20268/CFM 56-5-A1/A3	
	3	05	25	005	100	REV031	M:20268/CFM 56-5-A1/A3	ALL
	3	05	30	001	001	REV024		ALL
	3	05	30	002	100	REV025	MOD:20268 CFM 56-5-A1/A3	
	3	05	30	003	100	REV025	MOD:20268 CFM 56-5-A1/A3	ALL
	3	05	35	001	001	REV036		ALL
	3	05	35	002	110	REV026	MOD:20268 CFM 56-5-A3	
	3	05	35	003	110	REV026	MOD:20268 CFM 56-5-A3	ALL
	3	05	35	004	001	REV026		

M	V	CH	SEC	PAGE	SEQ	REV	VALIDATION CRITERIA	EFFECTIVITY
3		05	35	005	105	REV030	MOD 20268 CFM 56-5-A3	ALL
3		05	35	006	001	REV026		
3		05	35	007	105	REV030	MOD 20268 CFM 56-5-A3	ALL
3		05	35	008	001	REV026		
3		05	35	009	001	REV029		ALL
3		05	35	010	001	REV029		
3		05	35	011	001	REV029		ALL
3		05	35	012	001	REV029		
3		05	40	001	001	REV025		ALL
3		05	40	002	100	REV030	M:20268 CFM 56-5-A1/A3	
3		05	40	003	100	REV030	M:20268 CFM 56-5-A1/A3	ALL
3		05	50	001	001	REV025		ALL
3		05	50	002	001	REV026		
3		05	50	003	001	REV024		ALL
3		05	50	004	001	REV024		
3		06	00	001	001	REV024		ALL
3		06	10	001	001	REV026		ALL
3		06	10	002	001	REV024		
3		06	20	001	105	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
3		06	30	001	001	REV024		ALL
3		06	30	002	120	REV025	M:20268 CFM 56-5-A1/A3	
3		06	30	003	100	REV025	M:20268 CFM 56-5-A1/A3	ALL
3		06	30	004	120	REV033	M:20268/56-5-A1/A3	
3		06	30	005	120	REV033	M:20268/56-5-A1/A3	ALL
3		06	30	006	120	REV033	M:20268/56-5-A1/A3	
3		06	30	007	120	REV033	M:20268/56-5-A1/A3	ALL
3		06	30	008	120	REV033	M:20268/56-5-A1/A3	
3		06	30	009	120	REV033	M:20268/56-5-A1/A3	ALL
3		06	30	010	120	REV033	M:20268/56-5-A1/A3	
3		06	30	011	120	REV033	M:20268/56-5-A1/A3	ALL
3		06	30	012	001	REV025		
3		06	30	013	105	REV025	M:20268 CFM 56-5-A1/A3	ALL
3		06	40	001	001	REV032		ALL
3		06	40	002	105	REV025	MOD 20268 CFM 56-5-A1/A3	
3		06	40	003	105	REV031	M:20268/56-5-A1/A3	ALL
3		06	40	004	105	REV031	M:20268/56-5-A1/A3	
3		06	40	005	110	REV031	M:20268/56-5-A1/A3	ALL
3		06	40	006	105	REV031	M:20268/56-5-A1/A3	

M	V	CH	SEC	---PAGE--	SEQ	--REV--	----VALIDATION CRITERIA-----	-----EFFECTIVITY-----
	3	06	40	007	001	REV024		ALL
	3	06	50	001	001	REV024		ALL
	3	06	50	002	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	003	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	50	004	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	005	100	REV031	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	50	006	100	REV031	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	007	110	REV031	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	50	008	100	REV031	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	009	100	REV031	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	50	010	100	REV031	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	011	110	REV031	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	50	012	100	REV031	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	013	001	REV025		ALL
	3	06	50	014	100	REV025	MOD 20268 CFM 56-5-A1/A3	
	3	06	50	015	100	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	55	001	105	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	60	001	105	REV025	MOD 20268 CFM 56-5-A1/A3	ALL
	3	06	70	001	002	REV024		ALL
	3	06	70	002	001	REV024		
	3	06	70	003	001	REV026		ALL
	3	07	00	001-2	001	REV024		ALL
	3	07	10	001-2	001	REV024		ALL
	3	07	20	001	001	REV030	LIST OF EFFECTIVE OEBS	ALL
	3	07	30	001	001	REV025		ALL
	3	07	30	002	001	REV025		

M V CH SEC ---PAGE-- SEQ --REV-- ----VALIDATION CRITERIA----- -----EFFECTIVITY-----

M V T	REV	MOD SB	MP	TITLE / VALIDITY
.	036	....	P0164	COMMUNICATIONS - DATA LINK SYSTEM - DEFINE PIN PROGRAMMING ALL
.	024A	20024	......	FUEL- INSTALL A CENTRE TANK SYSTEM- ALL
.	024A	20047	......	EQUIPMENT/FURNISHINGS - FLIGHT COMPARTMENT - INSTALL A 4TH OCCUPANT SEAT - ALL
.	024A	20063	......	OXYGEN - FLIGHT CREW SYSTEM - INSTALL A 77.1 CU/FT BOTTLE IN COMPOSITE MATERIAL - ALL
.	024A	20067	......	FIRE PROTECTION - FWD CARGO COMPARTMENT - INSTALL SMOKE DETECTION SYSTEM - ALL
.	024A	20069	......	FIRE PROTECTION - AFT CARGO COMPARTMENT - INSTALL SMOKE DETECTION SYSTEM - ALL
.	031	20071 26-1020 15	......	FIRE PROTECTION - CARGO COMPARTMENT FIRE EXTINGUISHING - INSTALL A SINGLE SHOT SYSTEM - ALL
.	035	20081	......	LIGHTS - EXTERIOR LIGHTS - INSTALL SYNCHRONIZED STROBE LIGHTS ALL
.	024A	20137	......	COMMUNICATIONS - RADIO MANAGEMENT - INSTALL A 3RD RMP - ALL
.	024A	20268	......	WINGS-WING TIP FENCES-INTRODUCE WING TIPS INCLUDING FENCES- ALL
N	037	20802	......	GENERAL - REINFORCE STRUCTURE FOR MTOW 73,5 T / MLW 64,5 T AND MZFW 60,5 T - ALL

M V T	REV	MOD MP SB		TITLE	VALIDITY
N	037	21125		NAVIGATION - ATC MODE "S" - ACTIVATE SELECTIVE INTERROGATION FUNCTION -	ALL
.	024A	21285		ENGINE CONTROLS-MODIFY POWER SUPPLY FOR HP FUEL SOLENOID	ALL
.	024A	21678		ELECTRICAL POWER-AC/DC ESSENTIAL POWER DISTRIBUTION-PROVIDE PROVISIONS FOR ETOPS-	ALL
.	024A	21729		AIR CONDITIONING -AVIONICS VENTILATION- IMPROVE ACCURANCY OF SKIN TEMPERATURE READING	ALL
.	024A	21812		ICE AND RAIN PROTECTION - WING ANTI-ICING - INSTALL MODIFIED VALVES	ALL
.	024A	21858		COMMUNICATIONS - INSTALL HF1 FOR EROPS	ALL
.	024A	21899		AIR CONDITIONING-AVIONICS VENTILATION- INSTALL A NRV AT AIR INLET	ALL
.	024A	21946		OXYGENE - COCKPIT - INSTALL MODIFIED LP OXYGEN SUPPLY SOLENOID VALVE	ALL
.	024A	21964		FLIGHT CONTROLS - ELAC/EFCS SYSTEM - INTRODUCE SOFTWARE L62	ALL
.	024A	21988		FUEL - IMPROVE LOW LEVEL WARNING	ALL
.	027	21992		INDICATING/RECORDING SYSTEMS - INTRODUCE CFDIU BATCH 2	ALL

M V T	REV	MOD MP SB	TITLE / VALIDITY
.	024A	22087	FLIGHT CONTROLS - FCDC - INSTALL SOFTWARE L45 ALL
.	024A	22093	POWER PLANT - ENGINE - INSTALL CFM 56-5-A3 ENGINE RATED AT 26.500 LBS ALL
.	036	22199	WINGS - REMOVE LEADING EDGE VENTILATION SYSTEM ALL
.	024A	22249	AUTO FLIGHT - ACTIVATE WINDSHEAR FUNCTION ALL
.	024A	22373	ELECTRICAL POWER - DC GENERATION - INTRODUCE IMPROVED BCL ALL
.	024A	22450	ICE AND RAIN PROTECTION - WING ICE PROTECTION - INTRODUCE AN IMPROVED LOW PRESSURE WARNING SWITCH ALL
.	024A	22553	ENGINE-CFM-FAN AND BOOSTER ASSEMBLY- INTRODUCE 12 DOORS SYSTEM OF LP COMPRESSOR DISCHARGE BLEED ALL
.	024A	22561	FIRE PROTECTION - LAVATORY SMOKE DETECTION - INTRODUCE AMBIENT SYSTEM ALL
.	024A	22562	AIRBORNE AUXILIARY POWER UNIT - INTRODUCE APIC APS-3200 ALL
.	024A	22707	INDICATING RECORDING SYSTEMS - EIS - DEFINE COF A STANDARD FOR A320/A321 DMC ALL
.	024A	22769	NAVIGATION - GPWS - INSTALL GPWC MARK V WITH INTERFACE WITH CFDS ALL

M V T	REV	MOD MP SB	TITLE	VALIDITY
.	024A	22889	ENGINE-FAN AND BOOSTER ASSEMBLY-SCOOP TOBOGGAN AND DEFLECTOR-INTRODUCTION OF VBV DOORS ON CFM 56-5A ENGINES	ALL
.	024A	23119	HYDRAULIC POWER-BLUE MAIN HYDRAULIC POWER-IMPROVE MAINTENANCE STATUS OF BLUE HYDRAULIC RESERVOIR	ALL
.	024A	23208	LANDING GEAR - WHEELS AND BRAKES - INTRODUCE BSCU STD 6	ALL
.	024A	23222	CERTIFICATION DOCUMENTS - GENERAL - CERTIFICATION FOR TAKE-OFF WITH 15 KNOT TAILWIND	ALL
.	024A	23227	NAVIGATION - INSTALL A TCAS II COLLISION AVOIDANCE SYSTEM (HONEYWELL)	ALL
.	024A	23264	GENERAL - INCREASE DESIGN WEIGHT TO 77T MTOW	ALL
.	024A	23661	ENGINE FUEL AND CONTROL - CFM 56 - EIU - INTRODUCE VERSION 13	ALL
.	026	23698	AUXILIARY POWER UNIT - CONTROL AND MONITORING - INTRODUCE A NEW ECB	ALL
.	026	23699	AUXILIARY POWER UNIT - CONTROL AND MONITORING - MODIFY WIRE HARNESSES FOR NEW ECB 817-1	ALL
.	024A	23742	AUTO FLIGHT - FCU - INTRODUCE FCU STANDARD M10	ALL

M V T	REV	MOD	MP SB	TITLE / VALIDITY
.	024A	23779	....	MINOR IMPROVEMENTS INTRODUCED FROM A/C 508 (ST2) TO A/C 521 (ST2) ALL
.	031	23871	....	GENERAL - OPERATIONS FROM HIGH ALTITUDE AIRPORT (CFM ENGINES)(PRESSURE ALTITUDE LIMI 9.200 FT) D-AICI D-AICJ D-AICK D-AICL
.	024A	23900	....	GENERAL - INCREASE DESIGN WEIGHT TO 61T MZFW ALL
.	024A	23901	....	LANDING GEAR - WHEELS AND BRAKES - INTRODUCE MODIFIED ALTERNATE BRAKE DISTRIBUTION DUAL VALVE ALL
.	024A	24035	....	INDICATING/RECORDING SYSTEMS - GENERAL- DEFINE CPIP3 ALL
.	024A	24064	....	AUTO FLIGHT-FMS-INTRODUCE FMGC A320/321 B1 STD WITH OPTIONS AND 400 KILOWORDS FOR CFM 56 VERSIONS ALL
.	024A	24077	....	LANDING GEAR - BSCU - TWIN WHEEL - INTRODUCE A320/A321 STD 6 VERSION 60C ALL
.	024A	24215	....	AUTO FLIGHT - FAC - INSTALL TWO FACS P/N BAM 0509 ALL
.	024A	24349	....	NAVIGATION - ADIRS - INTRODUCE STD P/N AC06 ALL
.	030	24373	....	FUEL - TANK LEVEL SENSING - INTRODUCE MODIFIED LOW FUEL PRESSURE WARNING CONTROL ALL

M V T	REV	MOD MP SB	TITLE	VALIDITY
.	025	24440	LANDING GEAR-NOSE LANDING GEAR- SHOCK ABSORBER-INTRODUCE MODIFIED THROTTLING ROD GUIDE	ALL
.	024A	24449	LANDING GEAR - A320/A321 TWIN WHEELS - INTRODUCE BSCU STANDARD 7 (70B VERSION)	ALL
.	031	24498	APU - STORAGE AND DISTRIBUTION - MODIFY APU COMMON LUBRICATION SYSTEM	ALL
.	024A	24511	FLIGHT CONTROLS -S.E.C. SYSTEM INTRODUCE A320/A321 S.E.C STANDARD P/N BAM0508	ALL
.	024A	24588	AUTO FLIGHT-FAC-INTRODUCE FAC P/N BAM 510	ALL
.	024A	24612	INDICATING/RECORDING SYSTEMS - FWC - INTRODUCE FWC D2 STD	ALL
.	024A	24613	FLIGHT CONTROLS - ELAC - INTRODUCE ELAC STD P/N L69	ALL
.	031	24617	AUTO FLIGHT - GENERAL - EXTEND CAT III B AUTOMATIC LANDING CAPABILITY (FOR CFM ENGINES)	D-AICI D-AICJ D-AICK D-AICL
.	031	24642	ELECTRICAL POWER - AC AUXILIARY GENERATION (APU GENERATOR) - INTRODUCE MODIFIED GENERATOR	ALL
.	025	24645	LANDING GEAR-MLG-LGCIU-INTRODUCTION OF STANDARD UNIT P/N A4C	ALL

M V T	REV	MOD	MP SB	TITLE	VALIDITY
.	024A	24701	....	HYDRAULIC POWER-AUXILIARY HYDRAULIC POWER-RAT-INTRODUCE MODIFIED RAT (NEW BEARING)	ALL
.	024A	24783	....	ENGINE FUEL AND CONTROL-FUNCTIONAL INTERFACE-INTRODUCE EIU VERSION 14 ON CFM56 ENGINES	ALL
.	024A	24785	....	NAVIGATION-ADIRS-INTRODUCE 4MCU ADIRU HONEYWELL P/N C06	ALL
.	024A	24794	....	AIR CONDITIONING-COCKPIT AND CABIN TEMPERATURE CTRL-INTRODUCE MODIFIED TEMPERATURE SENSOR P/N-02.0N MIXER UNIT	ALL
.	024A	24805	....	PNEUMATIC-ENGINE BLEED AIR SUPPLY- INTRODUCE A BLEED AIR MONITORNG COMPUTER STD6	ALL
.	024A	24917	....	FLIGHT CONTROLS-INTRODUCE ELAC STD L69J	ALL
.	034A	24946	....	LANDING GEAR - MLG - MESSIER - INTRODUCE BRAKES P/N C202253	ALL
.	024A	24955	....	AIRBORNE AUXILIARY POWER-ENGINE- APIC APS 3200-INTRODUCE MODIFIED PRESS REGULATOR ON FCU	ALL
.	024A	25094	....	FLIGHT CONTROLS - FLAPS ELECTRICAL CONTROL AND MONITORING - INTRODUCE SLAT/FLAP CONTROL COMPUTER OF STANDARD -10	ALL
.	024A	25199	....	FLIGHT MANAGEMENT AND GUIDANCE SYSTEM- INSTALL FMGC ON A320/321 (CFM 56-5A/5B)	ALL

M V T	REV	MOD	MP SB	TITLE	VALIDITY
.	036	25204	....	NAVIGATION-ADIRS-INSTALL HONEYWELL ADIRS WITH GPS PRIMARY NAVIGATION CAPABILITY	ALL
.	031	25225	...... 22-1057 04	AUTO FLIGHT-FMGC-REDUCE VAPP FOR A320 CFM/IAE	ALL
.	024A	25240	....	AUTO FLIGHT - FMGC - PROVIDE ACARS AND PRINTER INTERFACES IN FMS (CFM VERSION)	ALL
.	024A	25241	....	COMMUNICATIONS - RADIO MANAGEMENT - INSTALL A NEW STD RMP1 AND RMP2 WITH VHS SPACING 8, 33KHZ	ALL
.	024A	25242	....	COMMUNICATIONS - RADIO MANAGEMENT - INSTALL A NEW STD RMP3 (3°) WITH VHF SPACING 8, 33KHZ	ALL
.	029	25404	....	EXHAUST-THRUST REVERSER CONTROL AND INDICATING-ACTIVATE ADDITIONAL THRUST REVERSER LOCK CONTROL	ALL
.	024A	25410	....	INDICATING RECORDING SYSTEM-FWC-INTRODUCE F.W.C. E1 STANDARD	ALL
.	026	25411	....	ENGINE FUEL AND CONTROL-CONTROLLING INTRODUCE ECU SOFTWARE STD P21/P08/P05 (5AE) FOR CFM56-5A1-A3	ALL
.	024A	25419	....	ICE AND RAIN PROTECTION-WINDSHIELD RAIN PROTECTION-DESACTIVATION OF RAIN REPELLENT SYSTEM	ALL
.	024A	25529	....	NAVIGATION - WEATHER RADAR SYSTEM - ACTIVATE PREDICTIVE WINDSHEAR FUNCTION	ALL

M V T	REV	MOD MP SB	TITLE	VALIDITY
.	024A	25590	INDICATING/RECORDING SYSTEMS - FWC - DEFINE OEB REMINDER WITHIN FWC STD -E1 AND SUBSEQUENT	ALL
.	026	25613	NAVIGATION - ILS - INSTALL BENDIX RIA 35B (QUANTUM LINE) ILS RECEIVERS	D-AICA D-AICB D-AICC D-AICE D-AICF
.	031	25863 ...... 22-1058 25	AUTO FLIGHT - FCU - DEFINE FLIGHT DIRECTOR ENGAGEMENT IN CROSSED BARS AT GO AROUND	ALL
.	024A	25887	ENGINE FUEL AND CONTROL-CONTROLLING- INTRODUCE ECU SOFTWARE STD 5AG (P25/P12/P09) FOR CFM56-5A1/A3 ENGINES	ALL
.	024A	26017	INDICATING/RECORDING SYSTEMS-FLIGHT WARNING COMPUTER (FWC)-INTRODUCE FWC ST2 E2	ALL
.	026	26018	INDICATING/RECORDING SYSTEMS-DISPLAY MANAGEMENT COMPUTER (DMC)-INTRODCUE DMC V32 STD	ALL
.	036	26044	COMMUNICATIONS - HF SYSTEM - INSTALL ONE ALLIED SIGNAL HF VOICE SYSTEM	ALL
.	033	26169	COM-CVR-INSTALL A SOLID STATE COCKPIT VOICE RECORDER (SSCVR) LORAL FAIRCHILD P/N 200-0012-00 (SFE)	D-AICI D-AICJ D-AICK D-AICL
.	029	26187	NAVIGATION - VOR - INSTALL VOR RECEIVERS ALLIED SIGNAL QUANTUM LINE P/N 066-50012-0202	ALL

M V T	REV	MOD MP SB	TITLE	VALIDITY
.	036A	26229	AIR CONDITIONING - PRESSURE CONTROL - INTRODUCE MODIFIED CABIN PRESSURE CONTROLLER P/N 20791	D-AICI D-AICJ D-AICK D-AICL
.	025	26335	FLIGHT CONTROLS-GENERAL- DELETION OF L.A.F. FEATURE FROM A320 A/C (SERIAL SOLUTION)	ALL
.	025	26338	ENGINE FUEL AND CONTROL-CONTROLLING FADEC SYSTEM-INTRODUCE ECU STD "5AH" P27-P14-P11 ON A319/A320 A/C	ALL
N	037	26358	AUTOFLIGHT-FLIGHT CONTROL UNIT- (FCU) INTRODUCE SEXTANT MODULAR FCU	D-AICI D-AICJ D-AICK D-AICL
.	035	26363	AIR CONDITIONING-AIR COOLING SYSTEM- INTRODUCE MODIFIED RAM AIR OUTLET	D-AICD D-AICE D-AICF D-AICG D-AICH D-AICI D-AICJ D-AICK D-AICL
.	026	26377 ...... 34-1147 09	NAVIGATION - ILS - INSTALL ADDITIONAL WIRING PROVISIONS FOR MMR INSTALLATION	ALL
.	031	26443	NAVIGATION - VOR/MARKER - INSTALL TWO VOR/MARKER RECEIVERS 900 COLLINS P/N 822-0297-020	D-AICI D-AICJ D-AICK D-AICL
N	037	26497 ...... 22-1072 02	AUTO FLIGHT-GENERAL-ACTIVATE GLOBAL SPEED PROTECTION AND F/D DISENGAGEMENT UPON SPEED CONSTRAINTS	ALL
.	024A	26526	NAVIGATION - GPWS - ACTIVATE ENHANCED FUNCTIONS OF THE EGPWS	ALL

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M
V REV   MOD  MP        TITLE
T          SB                              VALIDITY



. 026A 26577  ......  ENGINE FUEL AND CONTROL-CFM56-5A-
     73-1057 05        CONTROLLING-FADEC INTRODUCE ECU
                       STANDARD "5AH" +(P28-P15-P12) SOFTWARE
                             ALL

. 034A 26645  ......  AUTO-FLIGHT-FAC INTRODUCE FAC STD BAM
     ...........       0513
                             ALL

N 037  26720  ......  FUSELAGE-CENTER FUSELAGE-MLG DOOR
     ...........       ACTUATOR (KEEL BEAM) STRUCTURE
                       REINFORCEMENT (TWIN WHEEL)
                             D-AICG      D-AICH      D-AICI
                             D-AICJ      D-AICK      D-AICL

. 031  26726  ......  INDICATING/RECORDING SYSTEM-SDAC-
     ...........       INTRODUCE SDAC (NEW TECHNOLOGY )
                             D-AICI      D-AICJ      D-AICK
                             D-AICL

. 027  26785  ......  PNEUMATIC-ENG BLEED AIR SYS-INTRODUCE
     ...........       A TEMP THERMOSTAT WITH MODIFIED
                       LIMITATION SETTINGS (P/N 341E020000)
                             D-AICB      D-AICC      D-AICD
                             D-AICE      D-AICF      D-AICG
                             D-AICH      D-AICI      D-AICJ
                             D-AICK      D-AICL

. 027  26792  ......  AIR CONDITIONING-PACK TEMPERATURE CTRL-
     ...........       INTRODUCE MODIFIED PACK TEMPERATURE
                       CONTROLLER
                             D-AICD      D-AICE      D-AICF
                             D-AICG      D-AICH      D-AICI
                             D-AICJ      D-AICK      D-AICL

. 032  26891  ......  GENERAL - DESIGN WEIGHT - OPERATE A320
     ...........       WITH DUAL MTOW (69,99T OR 76,99T)
                             D-AICA      D-AICB      D-AICC

. 031  26910  ......  FLIGHT CONTROL -ELAC SYSTEM-
     ...........       INTRODUCE E.L.A.C. WITH ENHANCED RELAYS
                             D-AICL
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M V T	REV	MOD MP SB	TITLE	VALIDITY
.	033	26963 ...... 30-1037 02	ICE AND RAIN PROTECTION-WINSHIELD RAIN PROTECTION-ACTIVATION OF RAIN REPELLENT SYS.(FLUID COMPATIBLE WITH OZONE RULES)	ALL
.	027	26968 22-1064	AUTO FLIGHT-FMGC-INTRODUCE FMGC CAM0102 FOR A319 AUTOLAND AND GPS/ACARS FOR CFM ENGINES	ALL
.	031	26999	NAVIGATION - MMR - INSTALL COLLINS MMR PROVIDING ILS AND GPS FUNCTION	D-AICI D-AICJ D-AICK D-AICL
.	026	27251 ...... 34-1163 04	NAVIGATION-ILS-INTRODUCE BENDIX ILS RECEIVERS RIA 35B "QUANTUM LINE" (P/N-1202)	D-AICA D-AICB D-AICC D-AICE D-AICF
.	026	27276 ...... 27-1121 01	FLIGHT CONTROLS-ELAC SYSTEM-INTRODUCE ELAC SOFTWARE "L80"	ALL
.	031	27498	ELECTRICAL POWER - GENERAL - AC-DC MAIN DISTRIBUTION - INSTALL AC-DC SHEDDABLE BUSBARS	D-AICI D-AICJ D-AICK D-AICL
.	031	27522	INFORMATION SYSTEM - AIR TRAFFIC AND INFORMATION SYSTEM (ATIMS) - INSTALL ATSU COMPUTER FOR ACARS	D-AICI D-AICJ D-AICK D-AICL
.	028	27572	OXYGEN-PASSENGER OXYGEN-INTRODUCE MODIFIED CHEMICAL OXYGEN CONTAINER -15 MIN- PURITAN	D-AICF D-AICG D-AICH D-AICI D-AICJ D-AICK D-AICL

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M
V REV   MOD  MP        TITLE
T          SB                              VALIDITY


. 034  27624  ......  EQUIPMENT/FURNISHINGS-MISCELLANEOUS
     ...........       EMERGENCY EQUIPMENT-INSTALL ELT CEIS
                       A06V2 WITH CONTROL PANEL IN COCKPIT
                             D-AICI      D-AICJ      D-AICK
                             D-AICL

. 027  27646  ......  NAVIGATION - MMR - INSTALL SEXTANT MMR
     34-1184 03        PROVIDING ILS (FM IMMUNE)
                             ALL

. 035A 27723  ......  PNEUMATIC-ENGINE BLEED AIR SUPPLY
     36-1038           SYSTEM-INTRODUCE NEW TEMPERATURE CTL
                       THERMOSTATS (SERIAL AND RETROFIT)
                             ALL

N 037  27773  ......  LANDING GEAR-NORMAL BRAKING-
     32-1232 01        INTRODUCE STD 8 BSCU (TWIN
                       VERSION)
                             ALL

. 033  27845  ......  FLIGHT CONTROLS-ELAC-INTRODUCE
     ...........       ELAC WITH ADVANCED ELAC POWER SUPPLY
                       BOARD
                             D-AICL

. 031  27866  ......  NAVIGATION - WEATHER RADAR SYSTEM -
     34-1178 06        INSTALL ALLIED SIGNAL WEATHER RADAR
                       TRANSCEIVER P/N 066-50008-0405
                             ALL

. 027  27920  ......  GENERAL - DESIGN WEIGHT - OPERATE A320
     ...........       WITH DUAL MTOW (72,99T OR 76,99T)
                             D-AICD      D-AICE      D-AICF
                             D-AICG      D-AICH      D-AICI
                             D-AICJ      D-AICK      D-AICL

. 027  27952  ......  PNEUMATIC-ENGINE BLEED AIR SYSTEM-
     ...........       INTRODUCE TLT P/N 341E030000
                             D-AICH      D-AICI      D-AICJ
                             D-AICK      D-AICL

. 031  28009  ......  AIR CONDITIONING-PRESSURE CONTROL AND
     21-1116 04        MONITORING-INTRODUCE PRESSURE
                       CONTROLLER P/N 9022-15702-10
                             ALL
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M V T	REV	MOD SB	MP	TITLE / VALIDITY
.	031	28160	......	ELEC PWR-AC EMERGENCY GENERATION- ACTIVATE A319/A321 ELECTRICAL EMERGENCY CONFIGURATION ON A320 A/C D-AICI D-AICJ D-AICK D-AICL
.	034A	28164	......	LANDING GEAR - WHEELS AND BRAKES - INSTALL CARBON BRAKES TYPE SEPCARB III PLUS - MESSIER BUGATTI D-AICI D-AICJ D-AICK D-AICL
.	029B	28244 34-1193 21	......	NAVIGATION-GPWS-INTRODUCE EGPWS P/N 206-206 AND INHIBIT AUTOMATIC DEACTIVATION ENHANCED FUNCTIONS ALL
.	029	28284 34-1184 03	......	NAVIGATION-ILS-INSTALL SEXTANT MMR PROVIDING ILS (FM IMMUNE) P/N TLS 755.01.0101B ALL
.	034	28377 30-1037 02	......	ICE AND RAIN PROTECTION-WINSHIELD- RAIN PROTECTION-INTRODUCE MODIFIED GAGE ASSY -P/N 4020W35-2 ALL
.	029A	28382 34-1186 02	......	NAVIGATION - MMR - ACTIVATE GPS PRIMARY FUNCTION (HYBRID) IN SEXTANT MMR (WITH HONEYWELL OR LITTON ADIRU) ALL
.	031	28488 21-1118	......	AIR CONDITIONING-PACK TEMP.CTRL INTRODUCE MODIFIED PACK TEMP. CTRL P/N 759D0000-02 D-AICD D-AICE D-AICF D-AICG D-AICH D-AICI D-AICJ D-AICK D-AICL
.	031	28495	......	NAVIGATION - MMR - REMOVE COLLINS MMR PROVIDING ILS (FM IMMUNE) AND GPS PRIMARY FUNCTION (PREVIOUS SPEC.) D-AICI D-AICJ D-AICK D-AICL

M V T	REV	MOD MP SB	TITLE	VALIDITY
.	036	28568	ELECTRICAL POWER - AC GENERATION - INSTALL ELECTRICAL OUTLETS IN COCKPIT	D-AICI D-AICJ D-AICK D-AICL
.	034	28667 ...... 30-1037 02	ICE AND RAIN PROTECTION-WINDSHIELD RAIN PROTECTION-INTRODUCE MODIFIED GAGE ASSY WITH INPUT VALUE FUNCTION SUPPRESSED	ALL
.	034	28738 ...... 34-1206 07	NAVIGATION - TCAS - INSTALL HONEYWELL COMPUTER TCAS 2000 CHANGE 7.0 WITH HONEYWELL ATC	ALL
.	033	28739 ...... 34-1206 07	NAVIGATION - TCAS - INSTALL HONEYWELL TCAS 2000 COMPUTER (WITH CHANGE 7.0) WITH COLLINS ATC TPR720 OR TPR900	D-AICA D-AICB D-AICC D-AICD D-AICE D-AICF D-AICG D-AICH
.	035A	28897 ...... 49-1061 03	APU-CONTROL AND MONITORING-INTRODUCE APIC ECB SOFWARE VERSION 5	ALL
.	031	28916	INDICATING RECORDING SYSTEM-FWS INTRODUCE FWC STANDARD H1PE3P	D-AICI D-AICJ D-AICK D-AICL
.	031	30239	INFORMATION SYSTEM - ATIMS - MODIFY ATSU AIRCRAFT INTERFACE SOFTWARE ACCORDING TO SERVICE PROVIDERS LIST	D-AICI D-AICJ D-AICK D-AICL
.	034	30308	COMMUNICATIONS - COCKPIT VOICE RECORDER - REINTRODUCE SSCVR ALLIED SIGNAL P/N 980-6022-001	D-AICI D-AICJ D-AICK D-AICL
.	032	30363 31-1153	INDICATING/RECORDING SYSTEMS - FWC - ACTIVATE SPECIFIC FWC PROCEDURE	ALL

M V T	REV	MOD / SB	MP	TITLE	VALIDITY
.	031	30365	......	INDICATING RECORDING SYSTEM-SDAC-INTRODUCE STANDARD SDAC P/N 350E5500202	D-AICI D-AICJ D-AICK D-AICL
.	032A	30797	......	INDICATING/RECORDING SYSTEM-FWC-INTRODUCE NEW FWC STANDARD H1PE3Q	D-AICI D-AICJ D-AICK D-AICL
.	036A	30941 34-1249	......	NAVIGATION-ADIRU-INSTALL HONEYWELL ADIRU 4 MCU AD11 (NEW HARD)	ALL
N	037	30980	......	AUTO FLIGHT-FLIGHT CONTROL UNIT (FCU)-REINTRODUCE SEXTANT FCU P/N K217ABM11 OR K217BBM11	D-AICI D-AICJ D-AICK D-AICL
N	037	31106 32-1232 01	......	LANDING GEAR - NORMAL BRAKING - INTRODUCE STD 9 BSCU (TWIN VERSION)	ALL
.	035A	31365 22-1084 06	......	AUTO-FLIGHT-FMGC-INSTALL FMGC P/N B546CAM0103 (CFM GPS/ACARS)	ALL
.	034	31395 27-1135 02	......	FLIGHT CONTROLS - ELAC SYSTEM - INTRODUCE ELAC STD L81	ALL
.	034A	31528 34-1252	......	NAVIGATION-ADIRU-RESTORE RVSM 3 CIRCUIT CAPABILITIES (SERIAL SOLUTION)	D-AICI D-AICJ D-AICK D-AICL
.	036A	32088	......	EQUIPMENT FURNISHINGS-CURTAINS AND PARTITIONS-MODIFIED INTRUSION AND PENETRATION RESISTANT COCKPIT DOOR	ALL

M V T	REV	MOD	MP SB	TITLE	VALIDITY
.	036A	32090	....	DOORS-PASSENGER COMPARTMENT FIXED INTERIOR DOORS-INSTALL ELECTRICAL COCKPIT DOOR RELEASE SYSTEM	ALL
N	037	32500	 32-1254	LANDING GEAR - NORMAL BRAKING - INSTALL BSCU 9.1	ALL

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GENERAL

This section includes the limitations required by the regulations and contained in the Flight Manual.
All references to airspeed, Mach and altitude relate to indicated airspeed, indicated Mach and pressure altitude, unless otherwise noted.

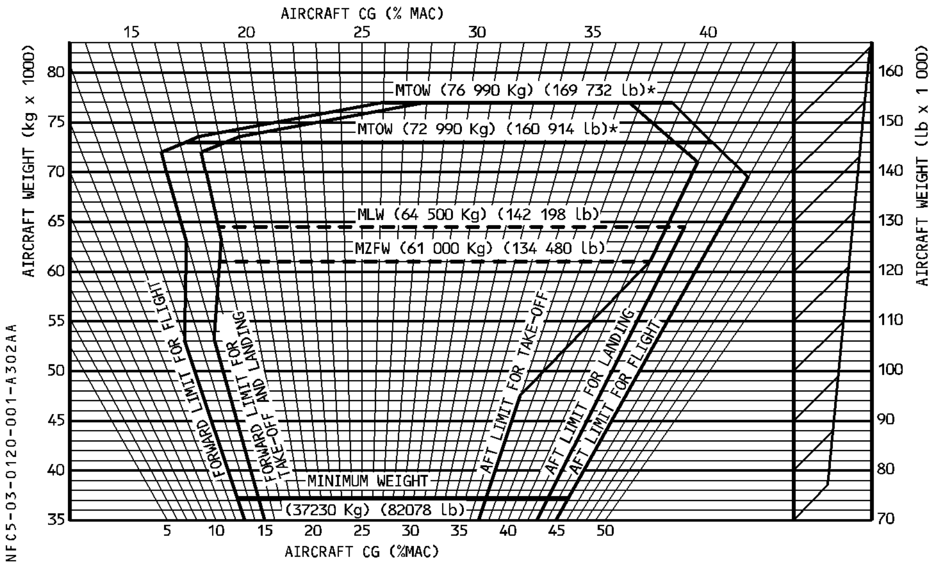
KIND OF OPERATIONS

This airplane is certified in the public transport category (passengers and freight) for day and night operations, in the following conditions when the appropriate equipment and instruments required by the airworthiness and operating regulations are approved, installed and in an operable condition :
- VFR and IFR
- Extended overwater flight
- Flight in icing conditions
- Maximum number of passenger seats : 180

MINIMUM FLIGHT CREW

The minimum flight crew consists of 2 pilots.

CENTER OF GRAVITY LIMITS



— CG limits are given in percentage of the reference chord length aft of the leading edge.
— The reference chord length is 4.193 m (13.76 ft). It is 16.31 m (53.51 ft) aft of the aircraft nose.
— The CG must always be within these limits, regardless of fuel load.

WEIGHT LIMITATIONS

Maximum taxi weight . . . . 77 390 kg (170 614 lb)
Maximum takeoff weight (brake release)* . . . . 76 990 kg (169 732 lb)
Maximum takeoff weight (brake release)* . . . . 72 990 kg (160 914 lb)
Maximum landing weight . . . . 64 500 kg (142 198 lb)
Maximum zero fuel weight . . . . 61 000 kg (134 480 lb)
Minimum weight . . . . 37 230 kg (82 078 lb)

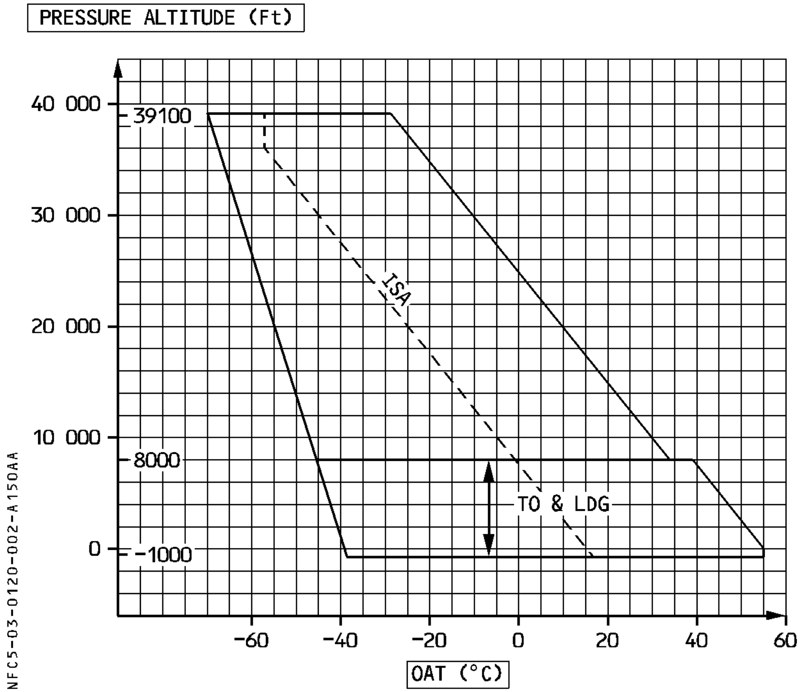
In exceptional cases (in flight turn back or diversion), an immediate landing at weight above maximum landing weight is permitted, provided the pilot follows the overweight landing procedure.

* Dual MTOW is certified. A placard fitted on the aircraft must reflect the current MTOW.

FLIGHT MANEUVERING LOAD ACCELERATION LIMITS

Clean configuration . . . . – 1 g to + 2.5 g
Slats and flaps extended . . . . 0 g to + 2 g
Slats extended and flaps retracted . . . . 0 g to + 2 g

ENVIRONMENTAL ENVELOPE



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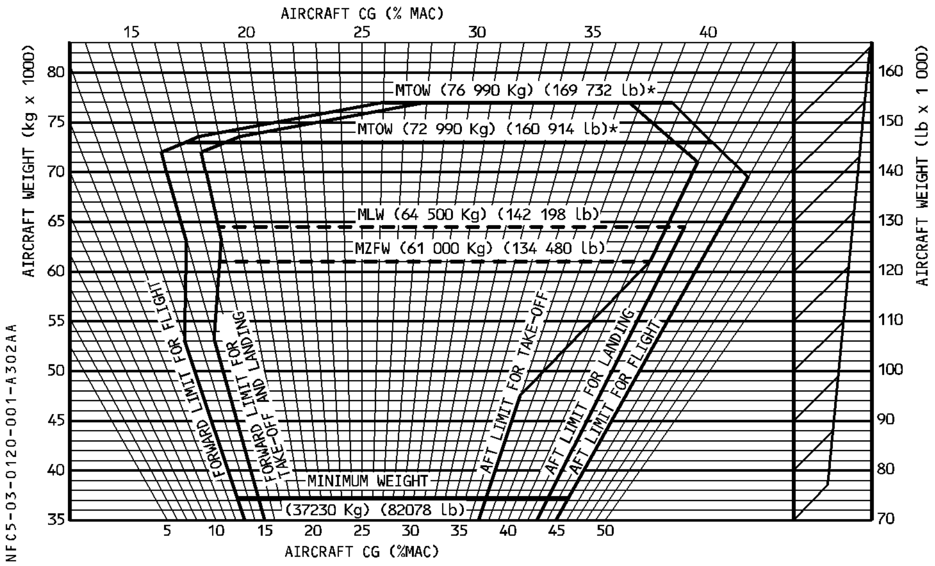

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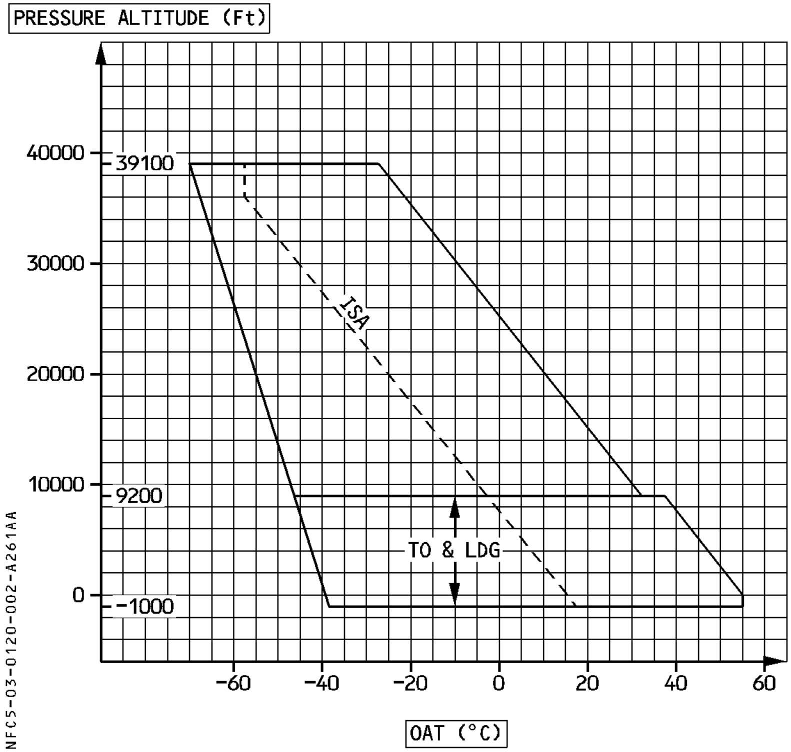

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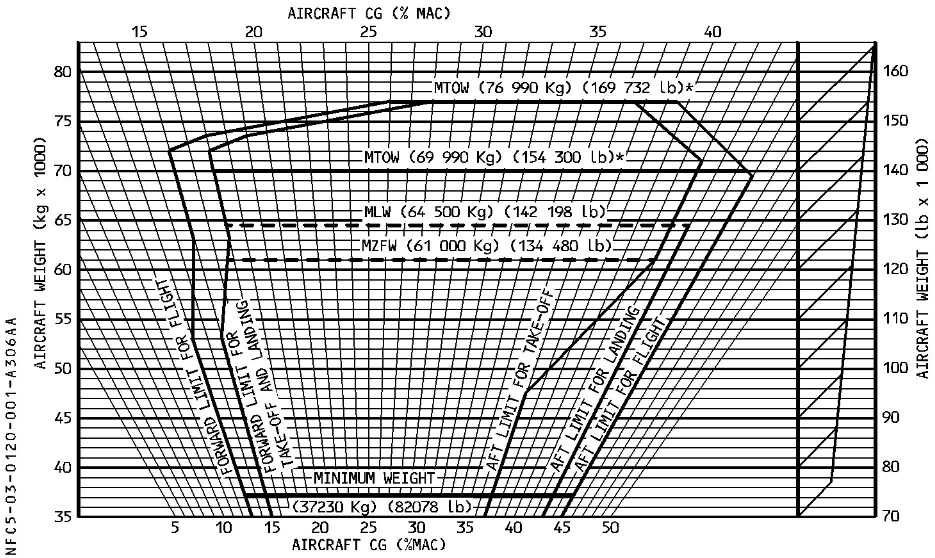

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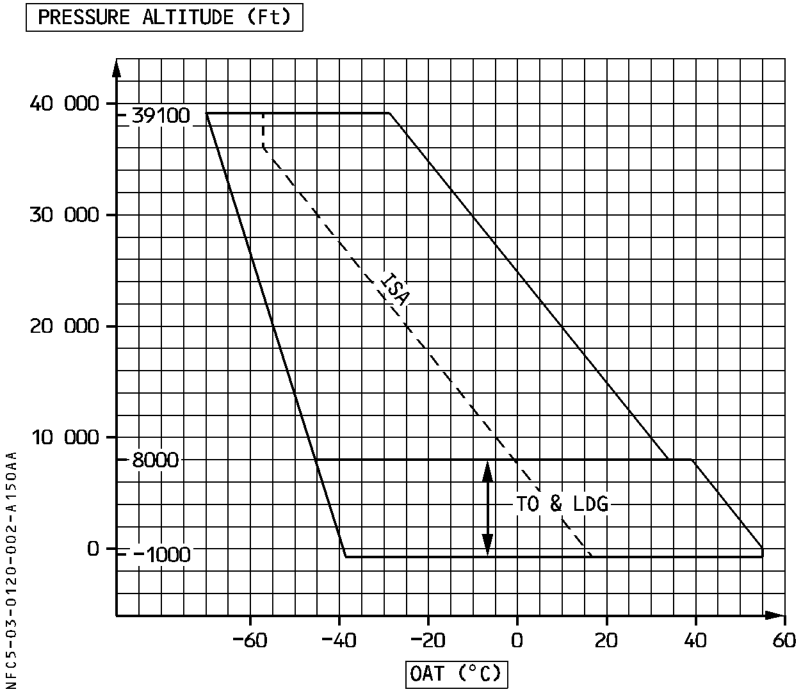


AIRPORT OPERATIONS

- Runway slope (mean) . . . . ± 2 %
- Runway altitude . . . . 8000 feet
- Nominal runway width . . . . 45 meters
- Wind for takeoff and landing :
  - · Maximum crosswind demonstrated for takeoff . . 29 knots gusting up to 38 knots*
  - · Maximum crosswind demonstrated for landing . . 33 knots gusting up to 38 knots*
  - · Maximum tailwind for takeoff . . . . 15 knots
  - · Maximum tailwind for landing . . . . 10 knots

    * : Maximum crosswind values have been demonstrated with flight controls in normal law, as well as in direct law with and without yaw damper.

R — Wind for passenger / cargo door operation :

R · Maximum wind for passenger door operation : . . . . 65 knots

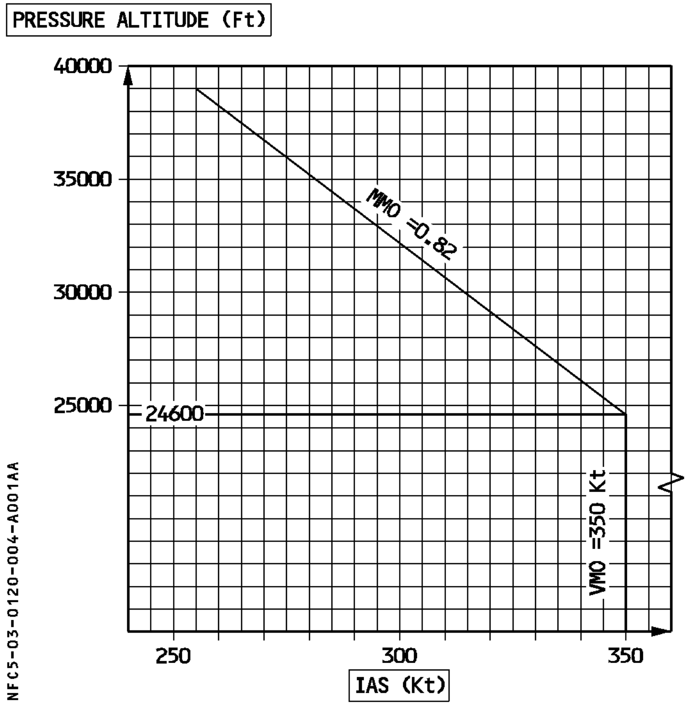
R · Maximum wind for cargo door opening : . . . . 40 knots

R · The cargo door must be closed, before the wind speed exceeds 65 knots.

SPEED LIMITATIONS

MAXIMUM OPERATING SPEED VMO/MMO

R



The maximum operating limit speed VMO/MMO may not be exceeded deliberately in any regime of flight.

AIRPORT OPERATIONS

- Runway slope (mean) . . . . ± 2 %
- Runway altitude . . . . 9200 feet
- Nominal runway width . . . . 45 meters
- Wind for takeoff and landing :
  - · Maximum crosswind demonstrated for takeoff . . 29 knots gusting up to 38 knots*
  - · Maximum crosswind demonstrated for landing . . 33 knots gusting up to 38 knots*
  - · Maximum tailwind for takeoff . . . . 15 knots
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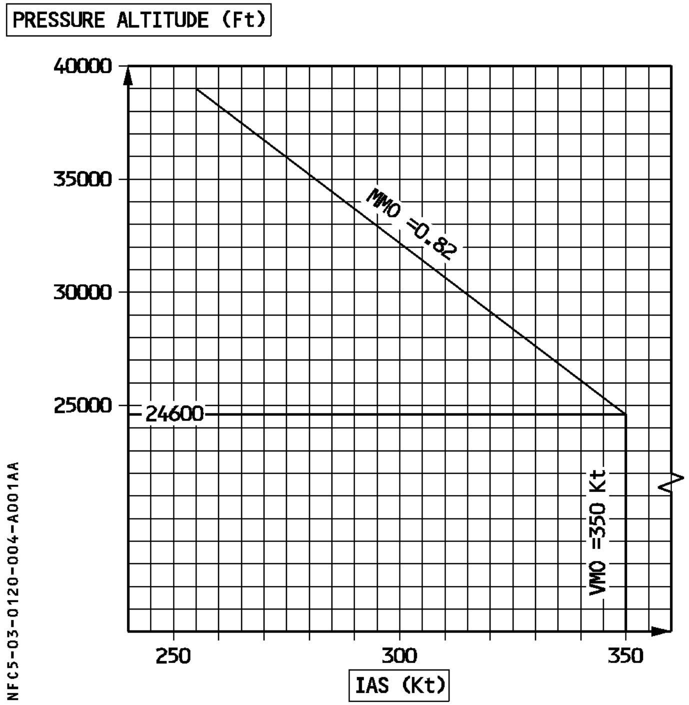

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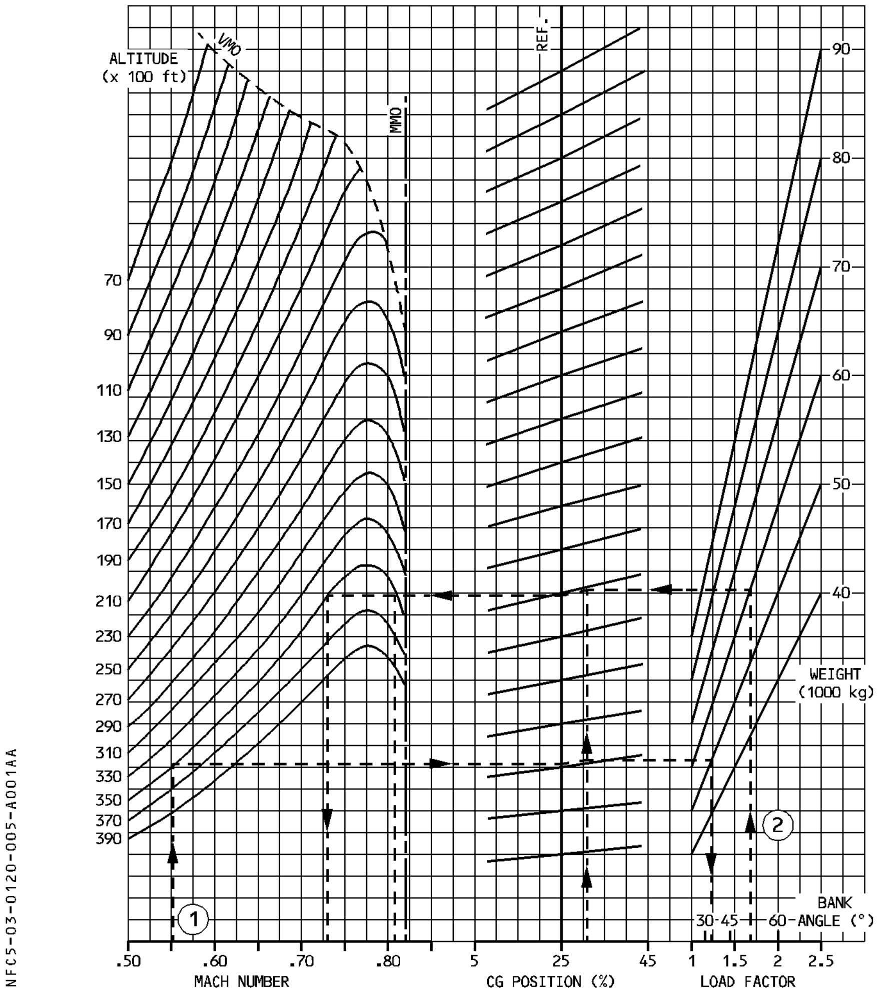
R
BUFFET ONSET



R Examples :

R 1. Determine Maximum Bank Angle limited by buffet :

R DATA : M = 0.55, FL = 350, CG = 31 %, WEIGHT = 50000 kg

R RESULT : load factor = 1.25 g or 35° bank

R 2. Determine low and high speed limited by buffet :

R DATA : 52° bank or 1.7 g, WEIGHT = 60000 kg, CG = 31%, FL = 350

R RESULT : M = 0.73 (low speed buffet) and M = 0.81 (high speed buffet).

MINIMUM CONTROL SPEEDS

R

Altitude (ft)	VMCA (KT CAS)	VMCG (KT IAS)		
		CONF 1 + F	CONF 2	CONF 3
0	108.5	108.5	106.5	106
2000	106	106	104	103.5
4000	104.5	104	102	101.5
6000	102.5	102.5	100.5	100
8000	99.5	99.5	97.5	97

MAXIMUM FLAPS/SLATS SPEEDS

LEVER POSITION	SLATS	FLAPS	Ind. on ECAM	MAX SPD	FLIGHT PHASE
1	18	0	1	230	HOLDING
1	18	10	1 + F	215	TAKEOFF
2	22	15	2	200	TAKEOFF/APPROACH
3	22	20	3	185	TAKEOFF/APPROACH/LANDING
FULL	27	35	FULL	177	LANDING

GEAR DOWN SPEEDS

- Maximum speed with landing gear extended (VLE) 280 kt/M.67
- Maximum speed at which the landing gear may be extended (VLO extension) . 250 kt
- Maximum speed at which the landing gear may be retracted (VLO retraction) . 220 kt
- Maximum altitude at which the landing gear may be extended . . . . 25 000 ft

MAXIMUM TIRE SPEED

- Ground speed . . . . 195 knots

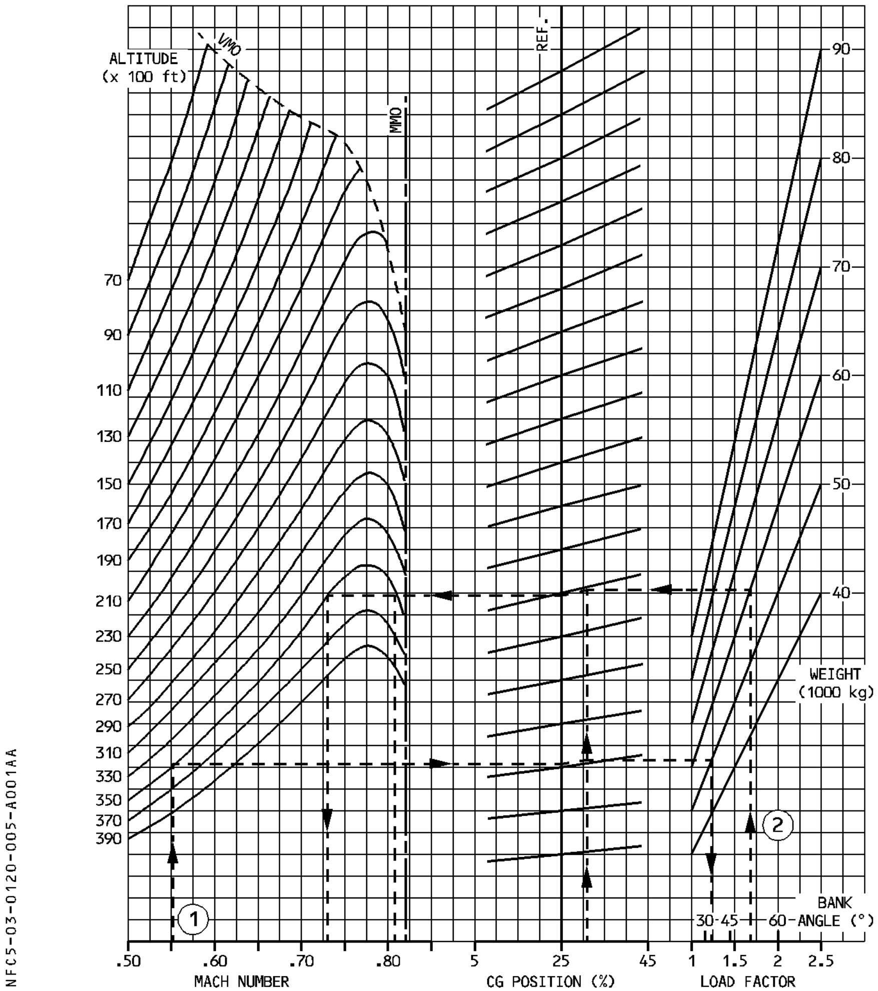
WINDSHIELD WIPERS IN USE

- Maximum speed . . . . 230 knots

COCKPIT WINDOW OPEN

- Maximum speed . . . . 200 knots

R **BUFFET ONSET**



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9200	98	97.5	95.5	95

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- Ground speed . . . . 195 knots

WINDSHIELD WIPERS IN USE

- Maximum speed . . . . 230 knots

COCKPIT WINDOW OPEN

- Maximum speed . . . . 200 knots

TAXI SPEED

R When the taxi weight is higher than 76 000 kg (167 550 lb), do not exceed a taxi speed of 20 kt during a turn.

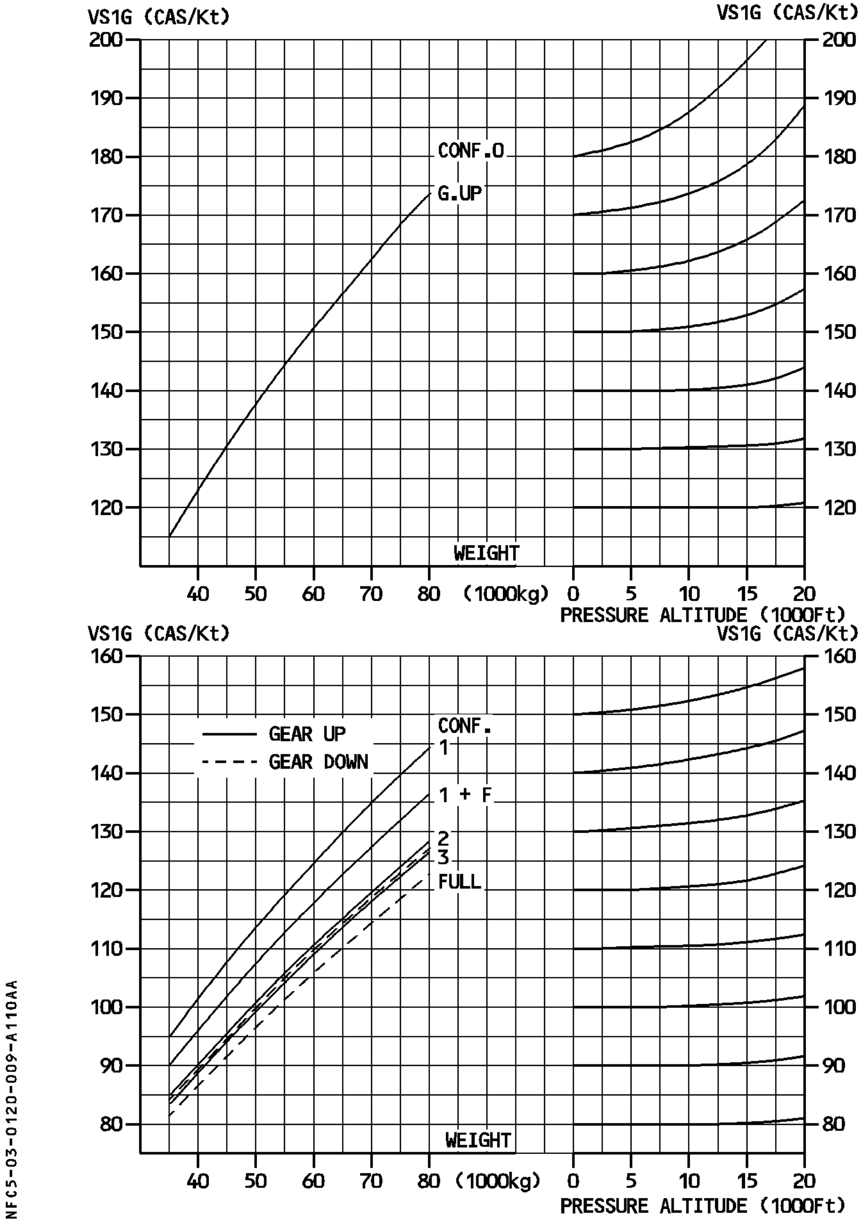
STALLING SPEEDS

The following graphs serve to determine the VS according to the configuration.
These graphs have been established for

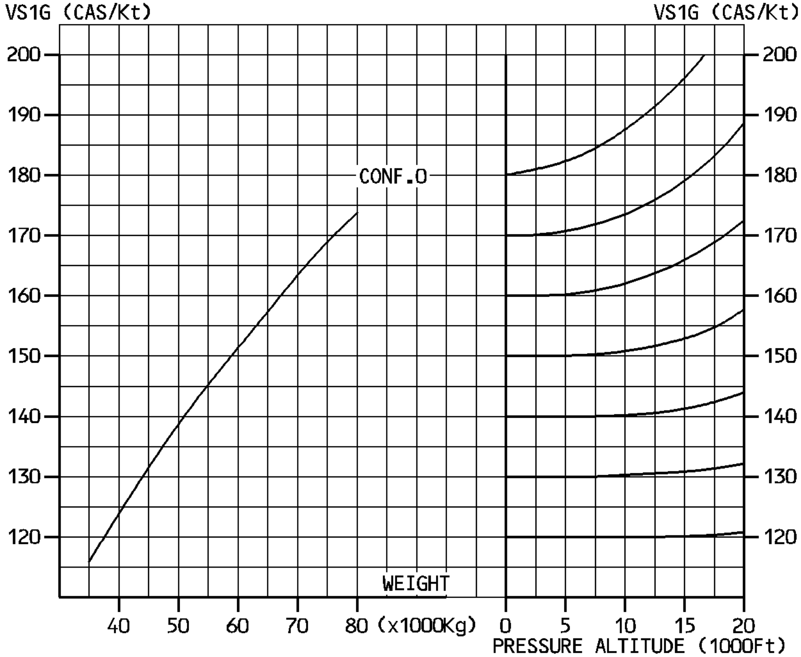
· Basic forward CG
  – 23 % CG location in clean configuration
  – 25 % CG location in takeoff, approach and landing configuration
· Alternate forward CG
  – forward CG limit. See 3.01.20 p 1.

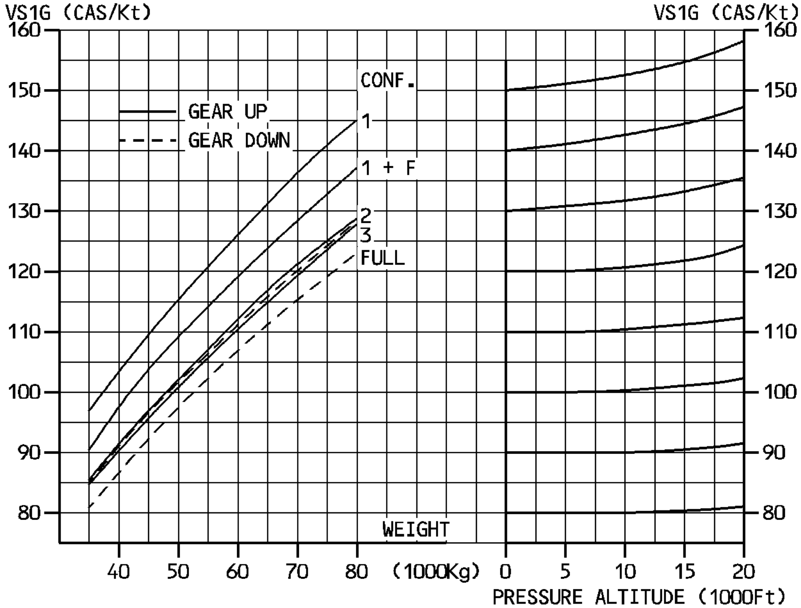
In most cases the CG location remains within the CG envelope below. Consequently the basic forward CG must be retained for any performance determination.
In some rare cases, if more forward CG is anticipated during any part of the flight, the alternate forward CG must be retained for any performance determination.

STALLING SPEEDS (BASIC FORWARD C.G.)



STALLING SPEEDS (ALTERNATE FORWARD C.G.)

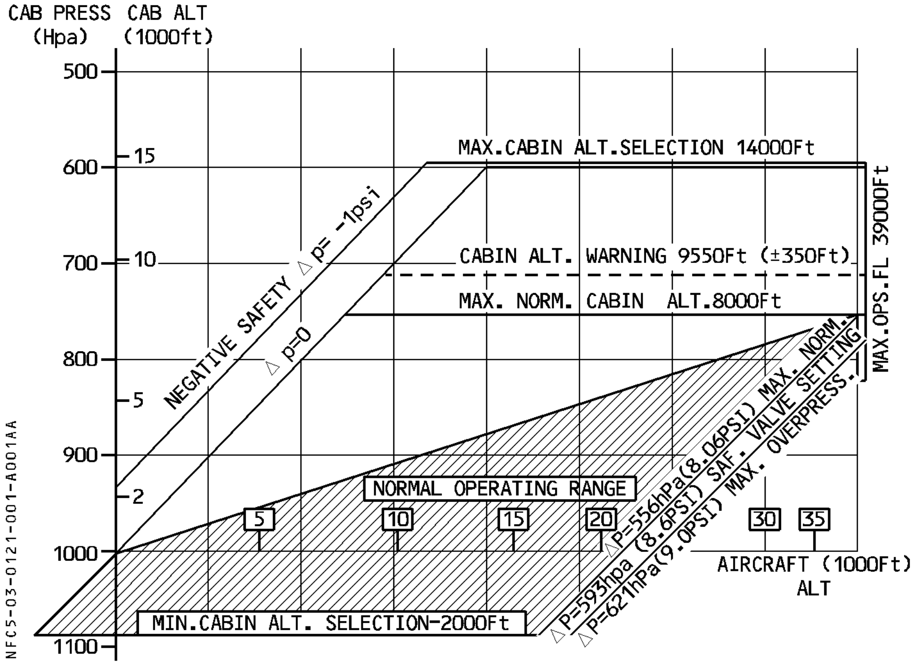




NFC5-03-0120-010-A120AB

CABIN PRESSURE

- Maximum positive differential pressure . . . . 8.6 psi
- Maximum negative differential pressure . . . . - 1 psi



Note : Max △p and safety valve setting tolerance = ± 7 hPa (0.1 psi)

RAM AIR INLET

Only open if differential pressure is lower than 1 psi.

AIR CONDITIONING WITH LP GROUND UNIT

- Do not use conditioned air simultaneously from packs and LP ground unit (to avoid chattering of the non return valves).
- Airflow supplied by the ground cart shall not exceed 1.2 kg/s (2.60 lb/s).

R **AIR CONDITIONING WITH HP GROUND UNIT**

R – Do not use HP ground unit when APU supplies bleed air to avoid bleed system damage.

AVIONICS VENTILATION

During ground operations, limit the aircraft electric power supply with avionics ventilation system in normal configuration as follows :
OAT = 49°C no limitation
OAT = 55°C time limit 2 hours
OAT = 60°C time limit 1 hour
OAT = 64°C time limit 1/2 hour

GENERAL

AUTO PILOT FUNCTION

Minimum height for use of autopilot on takeoff with SRS mode . . . . 100 ft AGL
(An internal FMGS logic prevents the autopilot from engaging during the 5 seconds after liftoff).
Minimum height for use of the autopilot in :
Straight-in non precision approach . . . . applicable MDA (MDH)
Circling approach . . . . applicable MDA - 100 ft (or MDH - 100 ft)
ILS approach with CAT 1 displayed on FMA . . . . 160 ft AGL
Go-around (AP or FD engagement) . . . . 100 ft AGL
All other phases . . . . 500 ft AGL
Use of the AP or FD in OPEN DES or DES mode is not permitted in approach, unless the FCU altitude is set to, or above, MDA (MDH) or 500 feet, whichever is the highest.

AUTOTHRUST FUNCTION

R Use of the autothrust is approved with, or without, AP/FD in selected or managed mode.

FLIGHT MANAGEMENT FUNCTION

FMGS lateral and vertical navigation has been certified for after takeoff, en route, and terminal area operations, for instrument approach procedures (except ILS, LOC, LOC-BC, LDA, SDF and MLS), and for missed approach procedures.
R RNP accuracy with GPS PRIMARY, or radio updating, has been demonstrated to be :
R

	With AP ON in NAV	With AP OFF and FD ON in NAV	With AP OFF and FD OFF
En route	5 NM	5 NM	5 NM
In terminal area	0.5 NM	0.6 NM	0.6 NM
In approach	0.3 NM	0.3 NM with GPS 0.37 NM without GPS	Not authorized

Without GPS PRIMARY (or GPS deselected or inoperative), the accuracy has been demonstrated, provided the appropriate RNP value is checked or entered on the MCDU, and HIGH accuracy is displayed.
Without GPS PRIMARY (or GPS deselected or inoperative), navigation accuracy is a function of ground radio navaid infrastructure, or elapsed time since the last radio update.
The FMGS is also certified for navigation within BRNAV, PRNAV, and RNP 10 airspace.
RNP10 oceanic/remote area operations are approved with GPS PRIMARY, or without GPS PRIMARY (or GPS deselected or inoperative), provided time limitations in IRS only navigation (acceptable to operational authorities), are established.
FMGS approval is based on the assumption that the navigation database has been validated for intended use.
Obstacle clearance and adherence to airspace constraints remains the flight crew's responsibility.
Fuel, time predictions/performance information is provided for advisory purposes only.
R NAV mode may be used after takeoff, provided FMGS runway updating has been checked.

TAKEOFF IN GPS PRIMARY

R For certain airports, where the difference between the local coordinate system and WGS
R 84 (geodesic standard used by GPS, FMS) is not negligible, a map shift may occur after
R takeoff.
R GPS must be deselected for takeoff from these airports, until a safe altitude is reached.

USE OF NAV AND FINAL APP MODES FOR NON PRECISION APPROACH

NAV, or NAV and FINAL APP mode may be used for VOR, VOR/DME, NDB, NDB/DME or RNAV (including GPS) approach, but not for ILS, LOC, LOC-BC, LDA, SDF, or MLS final approach.
GPS must be deselected for instrument approach procedures not coded in the WGS 84 (or equivalent) coordinate system.
FINAL APP mode guidance capability with GPS PRIMARY has been demonstrated down to MDH/DH (barometric) 250 feet.
VOR, VOR/DME, NDB or NDB/DME approach procedures may be performed, in NAV, or NAV and FINAL APP mode, provided AP or FD is used, and :

- GPS PRIMARY is available. In this case, the reference navaid may be unserviceable, or the airborne radio equipment may be inoperative, or not installed, provided operational approval is obtained.
- Without GPS PRIMARY :
  - The reference navaid and the corresponding airborne equipment is serviceable, tuned, and monitored during the approach, or
  - The radio navaid coverage supports the RNP value, specified for the approach procedure, and an operational approval is obtained.

For GPS approach, GPS PRIMARY must be available.
RNAV approach without GPS PRIMARY may be performed only if the radio navaid coverage supports the RNP value and HIGH accuracy is displayed on the MCDU with the specified RNP, and operational approval is obtained.
NAV mode may be used in the terminal area, provided :

- GPS PRIMARY is available, or
- HIGH accuracy is displayed, and the appropriate RNP is checked or entered on the MCDU, or
- R Navaid raw data is monitored.

Non Precision Approaches with engine-out

If one engine is inoperative, it is not permittted to use the autopilot to perform NPAs in the following modes : FINAL APP, NAV V/S, NAV/FPA.
Only FD use is permitted.

AUTOMATIC APPROACH, LANDING AND ROLL OUT

CATEGORY II

Minimum decision height . . . . 100 feet AGL
At least one autopilot must be engaged in APPR mode, and CAT 2, CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
If the crew performs an automatic approach without autoland, the autopilot must be disengaged no later than at 80 feet AGL.

CATEGORY III FAIL PASSIVE (SINGLE)

Minimum decision height . . . . 50 feet
At least one autopilot must be engaged in APPR mode, and CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
A/THR must be used in selected or managed speed.

CATEGORY III FAIL OPERATIONAL (DUAL)

A/THR must be used in selected or managed speed.
Alert height . . . . 100 feet
- CAT III with DH :
  Minimum decision height . . . . 20 feet
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on the FMA.
- CAT III without DH :
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on the FMA.
  Minimum Runway Visual Range . . . . 75 meters

ENGINE OUT

CAT II and CAT III fail passive autoland are only approved in configuration FULL, and if engine-out procedures are completed before reaching 1000 feet in approach.

MAXIMUM WIND CONDITIONS FOR CAT II OR CAT III AUTOMATIC APPROACH LANDING AND ROLL OUT

Headwind : 30 knots
Tailwind : 10 knots
Crosswind : 20 knots

Note : *Wind limitation is based on the surface wind reported by the tower. If the wind displayed on ND exceeds the above–noted autoland limitations, but the tower reports a surface wind within the limitations, then the autopilot can remain engaged. If the tower reports a surface wind beyond limitations, only CAT I automatic approach without autoland can be performed.*

AUTOMATIC LANDING

CAT II and CAT III autoland are approved in CONF 3 and CONF FULL.
Automatic landing is demonstrated :
- With CAT II and CAT III ILS beam.
- With slope angle within (– 2.5°, – 3.15°) range.
- For airport altitude at or below 2500 feet.
- At or below the maximum landing weight.
- R At approach speed (VAPP) = VLS + wind correction.
R Minimum wind correction 5 knots ; maximum 15 knots.

Automatic rollout performance has been approved on dry and wet runways, but performance on snow-covered or icy runways has not been demonstrated.

AUTOMATIC LANDING IN CAT I OR BETTER WEATHER CONDITIONS

The automatic landing system's performance has been demonstrated on runways equipped with CAT II or CAT III ILS approaches. However automatic landing in CAT I or better weather conditions is possible on CAT I ground installations or when ILS sensitive areas are not protected, if the following precautions are taken :
- The airline has checked that the ILS beam quality and the effect of terrain profile before the runway have no adverse effect on AP/FD guidance. In particular the effect of terrain discontinuities within 300 meters before the runway threshold must be evaluated.
- The crew is aware that LOC or GS beam fluctuations, independent of the aircraft systems, may occur and the PF is prepared to immediately disconnect the AP and take appropriate action, should unsatisfactory guidance occur.
- At least CAT2 capability is displayed on the FMA and CAT II/CAT III procedures are used.
- Visual references are obtained at an altitude appropriate to the performed CAT I approach, otherwise go–around is initiated.
- When the crew does not intend to perform an autoland, they should disconnect the AP at or above 80 feet : this altitude being the minimum to take over and feel comfortable. Nevertheless, for safety purposes, the AP may be disconnected at anytime.

AUTOMATIC APPROACH, LANDING AND ROLL OUT

CATEGORY II

Minimum decision height . . . . 100 feet AGL
At least one autopilot must be engaged in APPR mode, and CAT 2, CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
If the crew performs an automatic approach without autoland, the autopilot must be disengaged no later than at 80 feet AGL.

CATEGORY III FAIL PASSIVE (SINGLE)

Minimum decision height . . . . 50 feet
At least one autopilot must be engaged in APPR mode, and CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
A/THR must be used in selected or managed speed.

CATEGORY III FAIL OPERATIONAL (DUAL)

A/THR must be used in selected or managed speed.
Alert height . . . . 100 feet

- CAT III with DH :
  Minimum decision height . . . . 20 feet
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on the FMA.
- CAT III without DH :
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on the FMA.
  Minimum Runway Visual Range . . . . 75 meters

ENGINE OUT

CAT II and CAT III fail passive autoland are only approved in configuration FULL, and if engine-out procedures are completed before reaching 1000 feet in approach.

MAXIMUM WIND CONDITIONS FOR CAT II OR CAT III AUTOMATIC APPROACH LANDING AND ROLLOUT

Headwind : 30 knots
Tailwind : 10 knots
Crosswind : 20 knots

Note : *Wind limitation is based on the surface wind reported by the tower. If the wind displayed on ND exceeds the above-noted autoland limitations, but the tower reports a surface wind within the limitations, then the autopilot can remain engaged. If the tower reports a surface wind beyond limitations, only CAT I automatic approach without autoland can be performed.*

AUTOMATIC LANDING

CAT II and CAT III autoland are approved in CONF 3 and CONF FULL.
Automatic landing is demonstrated :
- With CAT II and CAT III ILS beam.
- With slope angle within (– 2.5°, – 3.15°) range.
- At or below the maximum landing weight.
- R For airport altitude at or below 9200 feet (8000 feet for A320–111).
- At approach speed (VAPP) = VLS + wind correction.
  Minimum wind correction 5 knots ; maximum wind correction 15 knots.

Automatic rollout performance has been approved on dry and wet runways, but performance on snow-covered or icy runways has not been demonstrated.

AUTOMATIC LANDING IN CAT I OR BETTER WEATHER CONDITIONS

The automatic landing system's performance has been demonstrated on runways equipped with CAT II or CAT III ILS approaches. However automatic landing in CAT I or better weather conditions is possible on CAT I ground installations, or when ILS-sensitive areas are not protected, if the following precautions are taken :
- The airline has checked that the ILS beam quality and the effect of terrain profile before the runway have no adverse effect on AP/FD guidance. In particular, the effect of terrain discontinuities within 300 meters before runway threshold must be evaluated.
- The crew is aware that LOC or GS beam fluctuations, independent of the aircraft systems, may occur and the PF is prepared to immediately disconnect the AP and take appropriate action, should unsatisfactory guidance occur.
- At least CAT2 capability is displayed on the FMA and CAT II/III procedures are used.
- Visual references are obtained at an altitude appropriate to the performed CAT I approach, otherwise go–around is initiated.
- When the crew does not intend to perform an autoland, they should disconnect the AP at or above 80 feet : this altitude being the minimum to take over and feel comfortable. Nevertheless, for safety purposes, the AP may be disconnected at anytime.

ELECTRICAL

- MAX continuous load per generator . . . . 100 % (90 kVA)
- MAX continuous load per TR (continuous) . . . . 200 A

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ELECTRICAL

· MAX continuous load per generator . . . . 100 % (90 kVA)
· MAX continuous load per TR (continuous) . . . . 200 A

Electrical Outlets

It is forbidden to use the electrical outlets during takeoff and landing.

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FLIGHT CONTROL

Flaps and slats :
Max operating altitude with slats or slats and flaps extended is 20 000 feet.

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GENERAL

FUEL AND ADDITIVE SPECIFICATIONS

- See engine manufacturer specification
- The fuel system has been certified for JET A1, JP 8, JET A, JP 5, RT, TS-1, JET B or JP 4.

MAXIMUM ALLOWED WING FUEL IMBALANCE

· INNER TANKS

Tank Fuel Quantity (Heavier tank)	Maximum allowed imbalance
Full (5 350 kg) (11 795 lb)	1 500 kg (3 307 lb)
4 300 kg (9 480 lb)	1 600 kg (3 520 lb)
2 250 kg (4 960 lb)	2 250 kg (4 960 lb)

R The variation is linear between these values
(No limitation below 2 250 kg/4 960 lb)
· OUTER TANKS

Maximum allowed imbalance	530 kg (1 168 lb)*

R * Maximum outer wing tank imbalance (one full/one empty) is allowed provided :
· Fuel content of one side (outer + inner) is equal to the fuel content of the other side (outer + inner),
or
· On the side of the lighter outer tank, the inner tank fuel quantity is higher than the opposite inner tank quantity, up to a maximum of 3000 kg/6614 lb higher.

FUEL TEMPERATURE

	JET A1/ JP 8	JET A	JP 5	RT	TS-1	JET B	JP 4
MINI	– 43°C	– 36°C (1)	– 42°C	– 45°C	– 45°C	– 46°C	– 54°C
MAXI	54°C					49°C	

(1) : For JET A only, if TAT reaches – 34°C, monitor on ECAM FUEL page that fuel temperature remains higher than – 36°C.

MINIMUM FUEL QUANTITY FOR TAKEOFF : 1 500 kg/3 307 lb

WING TK LO LVL warning must not be displayed on ECAM for takeoff.

WHEN USING JP 4 or JET B

Fuel in center tank is to be regarded as unusable if the wing fuel temperature exceeds the following values before engine start and if the given flight level is exceeded before the center tank fuel has been used :

\+ 30°C not above FL 350
\+ 40°C not above FL 300
\+ 49°C not above FL 250

Reason : At high altitude with high fuel temperature, the pressure delivered by the center tank pumps becomes lower than the pressure delivered by the wing tank pumps.

FUEL MANAGEMENT

- Tanks must be emptied in the following order :
  · center tank then wing tanks
- Takeoff on center tank is prohibited

HYDRAULIC

Normal operating pressure 3000 psi ± 200

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GENERAL

BRAKES

Maximum brake temperature for takeoff (brake fans (◁) off) . . . . 300° C

AUTOBRAKE

Use of the autobrake does not relieve the pilot of his responsibility to safely stop within the available runway length, by taking over brake control with brake pedals, if necessary.
The pilot may disengage the automatic braking system, either by pressing the armed mode pushbutton, or by applying firm action on the brake pedals.

PARKING BRAKE

CAUTION
Do not set N1 above 75 % on both engines with the parking brake ON.

TAXI WITH DEFLATED TIRES

R If tire damage is suspected after landing or after a rejected takeoff, an inspection of the tires is required before taxi. If the tire is deflated but not damaged, the aircraft can be taxied at low speed with the following limitations :

1. If one tire is deflated on one or more gears (ie. a maximum of three tires), the speed should be limited to 7 knots when turning.
R 2. If two tires are deflated on the same main gear (the other main gear tires not being
R deflated), speed should be limited to 3 knots and the nose wheel steering angle limited to 30 degrees.

INERTIAL REFERENCE SYSTEM

IRS ground alignment is possible up to 82 degrees latitude.
In NAV mode, the IRS will not provide a valid magnetic heading :
· Above 82 degrees North
· Above 73 degrees North, between 90 degrees and 120 degrees West (magnetic polar region)
· Above 60 degrees South.
Flight outside the above-noted limits is prohibited.

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS) ◁

· Aircraft navigation is not to be predicated on the use of the terrain display.
The terrain display is only intended as a situational awareness tool, and may not provide the accuracy on which to solely base terrain avoidance maneuvers.
The EGPWS database, display, and alerting algorithms, do not currently take into account man-made obstructions.
R · The EGPWS enhanced function should be inhibited (TERR pushbutton to OFF, on the
R GPWS panel) when the aircraft position is less than 15 NM from the airfield :
R — For operations to/from runways not incorporated in the EGPWS database.
R — For specific approach procedures, which have previously been identified as potentially
R producing false terrain alerts.

COCKPIT FIXED OXYGEN SYSTEM

MINIMUM FLIGHT CREW OXYGEN PRESSURE

REF TEMPERATURE *		°C	– 10	0	10	20	30	40	50
		°F	14	32	50	68	86	104	122
MIN ** BOTTLE PRESSURE (PSI)	2 CREW MEMBERS		656	681	706	731	756	781	806
	2 CREW MEMBERS	+1 OBS	861	893	926	959	992	1024	1057
	2 CREW MEMBERS	+2 OBS	1090	1132	1173	1215	1256	1298	1339

* REF TEMPERATURE :
. on ground : (OAT + COCKPIT TEMP) / 2
. in flight : CAB TEMP (°C) – 10°C
or
CAB TEMP (°F) – 18° F

** MINIMUM BOTTLE PRESSURE TO COVER :
— Preflight checks
— Use of oxygen when only one pilot is in the cockpit
— Unusable quantity (to ensure regulator functioning with minimum pressure)
— Normal system leakage

and

· Protection after loss of cabin pressure with mask regulator on NORMAL (diluted oxygen):
  — During emergency descent for all crew members for 13 minutes
R — During cruise at FL 100 for 2 crew members for 107 minutes (or during cruise at FL
R 140 for 4 crew members for 103 minutes).

or

· Protection against smoke with 100 % oxygen for all crew members during 15 minutes at 8000 feet cabin altitude.

Note : The above times, which are based on the use of a sealed mask, may be shorter for bearded crew.

GENERAL

OIL QUANTITY

Minimum level before start . . . . APU level indicator at "ADD"

Note : When the "LOW OIL LEVEL" message appears on the ECAM APU page, sufficient oil is available to operate the APU for the next 10 hours.

APU STARTER

R After 3 starter motor duty cycles, wait 60 minutes before attempting 3 more cycles.

ROTOR SPEED

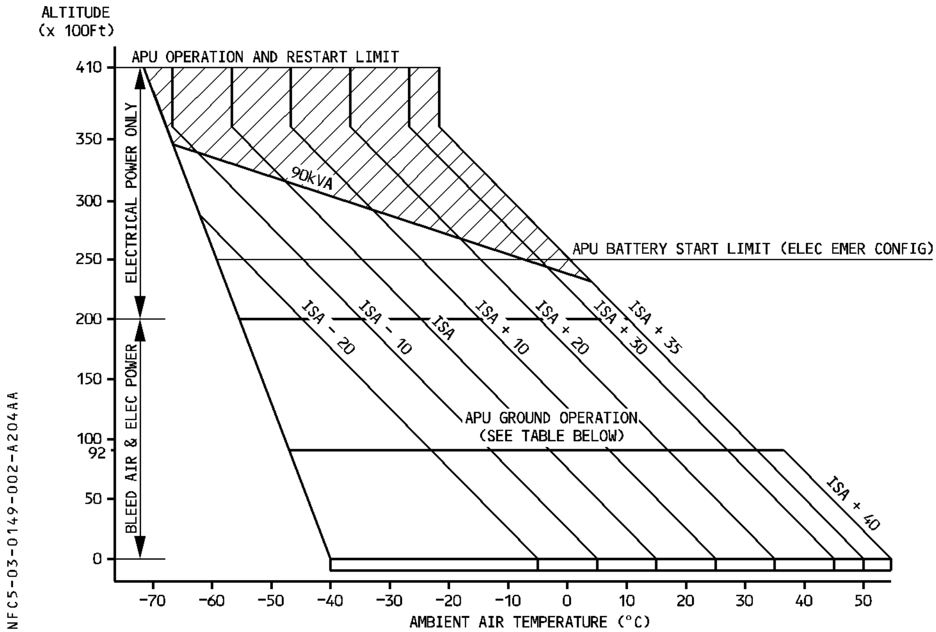
· Maximum N (ECAM display) . . . . 107 %

Note : The APU automatically shuts down at 107 % N speed displayed on the ECAM. This corresponds to an actual N speed of 105 %.

EGT

Maximum EGT for start :
· Below 25000 feet . . . . 900° C
· Above 25000 feet . . . . 982° C
Maximum EGT, with APU running :
— 682°C, with 5 seconds confirmation time for shutdown, or
— From 700°C to 742°C for immediate shutdown, depending on the ambient temperature.

ENVELOPE



GENERATOR LOAD IN FLIGHT			
TEMP ▶ MAX ALT (FT) ▼	ISA	ISA + 20	ISA + 35
25000	100 % (90 KVA)	100 % (90 KVA)	100 % (90 KVA)
30000	100 % (90 KVA)	92 % (83 KVA)	84 % (76 KVA)
35000	86 % (78 KVA)	71 % (64 KVA)	67 % (60 KVA)
39000	70 % (63 KVA)	56 % (51 KVA)	53 % (48 KVA)

<table>
<tr><th colspan="5">GENERATOR LOAD ON THE GROUND</th></tr>
<tr><th>TEMP ▶
ALT (FT) ▼</th><th></th><th>ISA</th><th>ISA + 20</th><th>ISA + 40</th></tr>
<tr><td rowspan="2">0</td><td>ENG START</td><td rowspan="4">100 % (90 KVA)</td><td rowspan="4">100 % (90 KVA)</td><td>71 % (64 KVA)</td></tr>
<tr><td>PACKS</td><td>39 % (35 KVA*)</td></tr>
<tr><td rowspan="2">9200</td><td>ENG START</td><td>57 % (51 KVA)</td></tr>
<tr><td>PACKS</td><td>60 % (54 KVA)</td></tr>
</table>

(*) : generator load with maximum air conditioning demand.

— Electric power extraction :
At or below 25000 ft :
· ISA + 35° and below . . . . 90 kVA

— Air bleed and generator load in flight :

MAXIMUM ALTITUDE FOR BLEED AIR AND GENERATOR LOAD IN FLIGHT			
TEMP ▶ MAX ALT (FT) ▼	ISA	ISA + 20	ISA + 35
ENG START UP TO 20000 ft	58 % (53 KVA)	51 % (46 KVA)	45 % (41 KVA)
ONE PACK UP TO 20000 ft	71 % (64 KVA)	64 % (58 KVA)	61 % (55 KVA)
TWO PACKS UP TO 15000 ft	88 % (80 KVA)	76 % (69 KVA)	64 % (58 KVA)

— Air bleed extraction for wing anti-icing is not permitted.

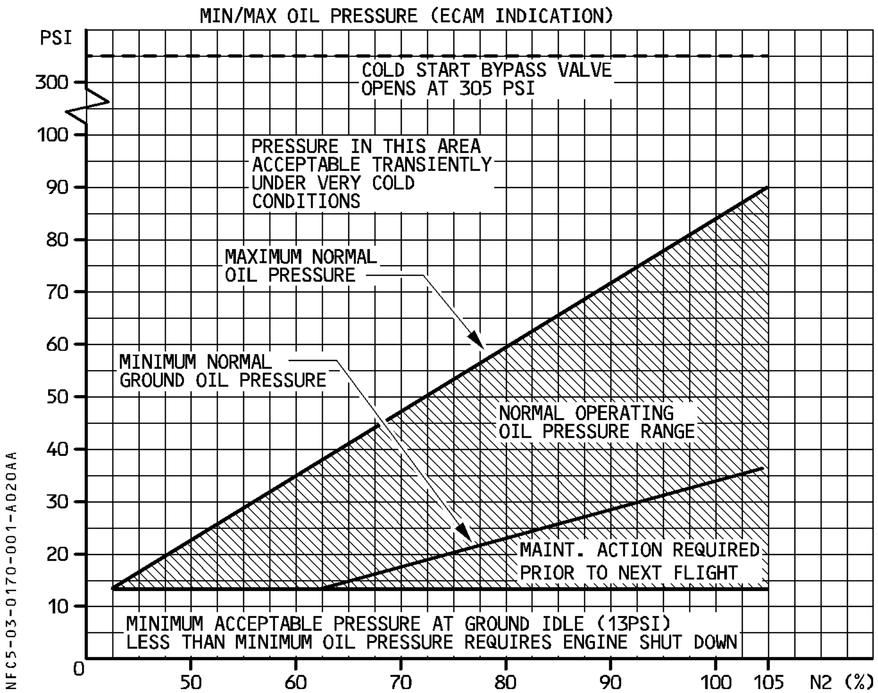
THRUST SETTING/EGT LIMITS

R

OPERATING CONDITION	TIME LIMIT	EGT LIMIT	NOTE
TAKEOFF and GO-AROUND	5 mn	890° C	
	10 mn		Only in case of engine failure
MCT	Unlimited	855° C	
STARTING		725° C	

OIL

Maximum continuous temperature . . . . 140° C
Maximum transient temperature (15 minutes) . . . . 155° C
Minimum starting temperature . . . . – 40° C
R Minimum temperature for takeoff . . . . – 10° C
Minimum oil quantity . . . . refer to 3.03.04



RPM

N1 max . . . . 102 %

Note : *The N1 limit depends upon ambient conditions and engine airbleed configuration. These may limit N1 to a value lower than the one noted above (see 3.05.06).*

N2 max . . . . 105 %

STARTER

- 4 consecutive cycles : Each lasts a maximum of 2 minutes.
- Pause between start attempts : 20 seconds.
- Cooling period, after 4 start attempts : 15 minutes.
- No running engagement of the starter, when N2 is above 20 %.

REVERSE THRUST

- It is not permitted to select reverse thrust in flight.
- It is not permitted to back up the aircraft with reverse thrust.
- Maximum reverse should not be used below 70 knots. (Idle reverse is permitted down to aircraft stop).

REDUCED THRUST TAKEOFF

- Takeoff at reduced thrust is only permitted, if the airplane meets all applicable performance requirements at the planned takeoff weight, with the operating engines at the thrust available for the assumed temperature.
- Thrust reduction must not exceed 25 % of the full rated takeoff thrust. To meet this requirement, the flexible temperature must not be higher than ISA + 45° C (T MAX
R FLEX).
- The assumed temperature must not be lower than the flat rating temperature, or the actual OAT.
- Takeoff at reduced thrust is not permitted on contaminated runways.
- Takeoff at reduced thrust is permitted with any inoperative item affecting the performance, only if the associated performance shortfall has been applied to meet all performance requirements at the takeoff weight, with the operating engines at the thrust available for the flex temperature.

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RUD TRV LIM SYS 2
WINDSHEAR DET FAULT (⊲*) 7
YAW DAMPER 1(2) 1
YAW DAMPER SYS 1

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02.21 AIR/PRESS/VENT

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CABIN OVERPRESSURE 10
CRG HEAT FAULT (⊲) 5
CRG ISOL VALVE (⊲) 5
CRG VENT FAULT (⊲) 5
DUCT OVHT 3
EXCESS CAB ALT 8
EXTRACT FAULT 13
GND COOL FAULT(⊲) 14
HOT AIR FAULT 4
L + R CAB FAN FAULT 6
LAV + GALLEY FAN FAULT 6
LDG ELEV FAULT 11
LO DIFF PR 11
OUTFLOW VALVE NOT OPEN 11
PACK 1 + 2 FAULT 2
PACK 1(2) FAULT or OVHT or OFF 1
PACK 1(2) REGUL FAULT 2
SAFETY VALVE OPEN 12
SKIN VALVE FAULT 13
SYS 1(2) (1 + 2) FAULT 9
TOO HOT/COLD COCKPIT AND CABIN TEMPERATURE IN FLIGHT (⊲) 7
TRIM AIR SYS FAULT 4
ZONE REGUL FAULT 6

02.22 AUTO FLT

A / THR OFF / AP OFF/A/THR LIMITED (◁*) 6
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FAC 1 + 2 FAULT 4
FCU 1(2) (1 + 2) FAULT 5
LOW ENERGY WARNING (◁*) 7
RUD TRIM 1(2) FAULT 2
RUD TRIM SYS 2
RUD TRV LIM 1(2) 2
RUD TRV LIM SYS 2
WINDSHEAR DET FAULT (◁*) 7
YAW DAMPER 1(2) 1
YAW DAMPER SYS 1

02.23 COMUNICATIONS

ACARS FAULT (◁*) 1
CIDS 1 + 2 FAULT 1
HF EMITTING (◁*) 1
R SATCOM FAULT (◁*) 1
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AC ESS BUS SHED 7
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BCL 1(2) FAULT 2
C / B TRIPPED 28
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STAT INV FAULT 27
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02.25 COCKPIT DOOR

COCKPIT DOOR FAULT 1

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FWD (AFT) CARGO SMOKE 11
FWD (AFT) CRG DET FAULT (◁*) 11
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SPD BRK FAULT 15
R SPLR FAULT 13a
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02.24 ELECTRICAL

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AC BUS 2 FAULT 5
AC ESS BUS FAULT 6
AC ESS BUS SHED 7
APU GEN FAULT 2
BAT 1(2) FAULT/OFF 2
BCL 1(2) FAULT 2
C / B TRIPPED 28
DC BAT BUS FAULT 24
DC BUS 1 + 2 FAULT 13
DC BUS 1 FAULT 8
DC BUS 2 FAULT 9
DC EMER CONFIG 25
DC ESS BUS FAULT 10
DC ESS BUS SHED 12
EMER CONFIG 15
ELEC EMER CONFIG – SYS REMAINING 20
EMER GEN 1 LINE OFF 27
ESS BUSSES ON BAT 19
FLT ON BAT ONLY (◁*) 19
GEN 1(2) FAULT 1
GEN 1(2) OFF 1
GEN 1(2) or APU GEN OVER LOAD 24
IDG 1(2) OIL PR / OVHT 1
STAT INV FAULT 27
TR 1(2) or ESS TR FAULT 24

02.25 COCKPIT DOOR

COCKPIT DOOR FAULT 1

02.26 FIRE PROTECTION

APU FIRE 3
SMOKE/AVNCS SMOKE 4
ENG 1(2) FIRE (IN FLIGHT). 3
ENG 1(2) FIRE (ON GROUND) 2
ENG 1(2) / APU FIRE DET FAULT 1
ENG 1(2) / APU FIRE LOOP A(B) FAULT 1
FWD (AFT) BTL SQUIB FAULT (◁*) 11
FWD (AFT) CARGO SMOKE 11
FWD (AFT) CRG DET FAULT (◁*) 11
LAV + CRG DET FAULT 12
LAVATORY DET FAULT 12
LAVATORY SMOKE (◁*) 12
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L(R) INNER (OUTER) TK HI TEMP 6
L(R) INNER (OUTER) TK LO TEMP 5
L(R) TK PUMP 1(2) LO PR 2
L(R) TK PUMP 1 + 2 LO PR 1
L(R) WING TK LO LVL 3
L(R) XFR VALVE CLOSED or OPEN 4
L + R WING TK LO LVL 3
XFEED VALVE FAULT 5

02.29 HYDRAULIC

B ELEC PUMP LO PR or OVHT 16
B RSVR LO AIR PR / OVHT / LO LVL 1
B + Y SYS LO PR 12
G RSVR LO AIR PR / OVHT / LO LVL 2
G(Y) ENG PUMP LO PR 15
G + B SYS LO PR 6
G + Y SYS LO PR 9
PTU FAULT 16
RAT FAULT 16
Y RSVR LO AIR PR / OVHT / LO LVL 4
Y ELEC PUMP LO PR or OVHT 14

02.30 ICE AND RAIN PROTECTION

CAPT (F / O) (STBY) PROBES 4
CAPT (F / O) AOA or TAT 3
CAPT PITOT or L(R) STAT 2
DOUBLE PROBE HEAT FAILURE 3
ENG 1(2) VALVE CLSD or OPEN 5
F / O PITOT or L(R) STAT 2
L(R) WINDSHIELD (WINDOW) 1
L + R WINDSHIELD 1
STBY PITOT or L(R) STAT or AOA 3
WING A ICE L(R) HI PR 8
WING A ICE L(R) VALVE OPEN 6
WING A ICE OPEN ON GND 8
WING A ICE SYS FAULT 8

02.31 INDICATING/RECORDING

DFDR or FDIU FAULT 1
DISPLAY UNIT FAILURE 4
DMC FAULT 3
ECAM SINGLE DISPLAY 4
FWC 1(2) FAULT 3
FWC 1 + 2 FAULT 3
FWS OEB/FWC DISCREPANCY 1
SDAC 1(2) FAULT 2
SDAC 1 + 2 FAULT 2

02.32 LANDING GEAR

BRAKES
A/SKID NWS FAULT 9
ANTI SKID / NWS OFF 9
AUTOBRK FAULT 10
BSCU CH 1(2) FAULT 9
CONFIG PARK BRAKE ON 9
HOT 10
LOSS OF BRAKING 11
R RESIDUAL BRAKING PROC 12

L/G
BOGIE ALIGN FAULT(⊲) 4
DOORS NOT CLOSED 4
GEAR NOT DOWN 5
GEAR NOT DOWNLOCKED 2
GEAR NOT UPLOCKED 1
GEAR UPLOCK FAULT 4
GRAVITY EXTENSION 3
LDG WITH ABNORMAL L / G 6
LGCIU FAULT 5
SHOCK ABSORBER FAULT 1
SYS DISAGREE 4

WHEEL
HYD SEL FAULT 11
N.W. STEER FAULT 9
TYRE LO PR (⊲) 11

02.34 NAVIGATION

ADR CHECK PROC 19
ADR DISAGREE 18
ADR FAULT 2
ADR 1 + 2 + 3 FAULT 4
BARO REF DISCREPANCY (◁*) 1
EGPWS ALERTS (◁*) 15
FM/GPS POS DISAGREE (◁*) 13
GPS 1(2) FAULT (◁*) 13
GPWS ALERTS (◁*) 15
GPWS FAULT (◁*) 14
GPWS TERR DET FAULT (◁*) 16
HDG / ATT / ALTI DISCREPANCY 1
ILS 1(2) FAULT 14
IR ALIGNMENT IN ATT MODE 10
IR DISAGREE 11
IR FAULT 7
OVER SPEED 1
PRED W/S DET FAULT (◁*) 10
RA 1(2) FAULT 12
TCAS FAULT (◁*) 12
TCAS WARNINGS (◁*) 17
UNRELIABLE SPEED INDICATION 20

02.32 LANDING GEAR

BRAKES	A/SKID NWS FAULT	9
	ANTI SKID / NWS OFF	9
	AUTOBRK FAULT	10
	CONFIG PARK BRAKE ON	9
	HOT	10
	LOSS OF BRAKING	11
R	RESIDUAL BRAKING PROC	12
	SYS 1(2) FAULT	9
L/G	BOGIE ALIGN FAULT(⊲)	4
	DOORS NOT CLOSED	4
	GEAR NOT DOWN	5
	GEAR NOT DOWNLOCKED	2
	GEAR NOT UPLOCKED	1
	GEAR UPLOCK FAULT	4
	GRAVITY EXTENSION	3
	LDG WITH ABNORMAL L / G	6
	LGCIU FAULT	5
	SHOCK ABSORBER FAULT	1
	SYS DISAGREE	4
WHEEL	HYD SEL FAULT	11
	N/W STRG FAULT	9
	TYRE LO PR (⊲)	11

02.34 NAVIGATION

ADR CHECK PROC 19
ADR DISAGREE 18
ADR FAULT 2
ADR 1 + 2 + 3 FAULT 4
BARO REF DISCREPANCY (*) 1
EGPWS ALERTS (*) 15
FM/GPS POS DISAGREE (*) 13
GPS 1(2) FAULT (*) 13
GPWS ALERTS (*) 15
GPWS FAULT (*) 14
GPWS TERR DET FAULT (*) 16
HDG / ATT / ALTI DISCREPANCY 1
ILS 1(2) FAULT 14
IR ALIGNMENT IN ATT MODE 10
IR DISAGREE 11
IR FAULT 7
OVER SPEED 1
PRED W/S DET FAULT (*) 10
RA 1(2) FAULT 12
TCAS FAULT (*) 12
TCAS WARNINGS (*) 17
UNRELIABLE SPEED INDICATION 20

02.36 PNEUMATIC

AIR
- APU BLEED FAULT 5
- APU BLEED LEAK 5
- BLEED 1(2) OFF 1
- DUAL BLEED FAULT 3
- ENG 1(2) BLEED ABNORM PR 1
- ENG 1(2) BLEED FAULT 2
- ENG 1(2) BLEED LEAK 4
- ENG 1(2) BLEED NOT CLSD 1
- ENG 1(2) (1 + 2) BLEED LO TEMP 7
- ENG HP VALVE FAULT 6
- L(R) WING LEAK 4
- L(R) WNG LEAK DET FAULT 6
- XBLEED FAULT 5

BLEED
- MONITORING FAULT 6

02.49 APU

- APU AUTO (EMER) SHUT DOWN 1

02.52 DOORS

- DOORS NOT CLOSED 1

02.70 POWER PLANT

After ENG SHUT DOWN 13
BLEED STATUS FAULT 22
COMPRESSOR VANE 18
CTL VALVE FAULT 19
EIU FAULT 1
ENG DUAL FAILURE 20
ENG FAIL 11
ENG RELIGHT (in flight) 10
ENG STALL 5
ENG TAILPIPE FIRE 25
FADEC A(B) FAULT 23
R FADEC ALTERNATOR 9
FADEC FAULT 23
FADEC HI TEMP 23
R FLEX TEMP NOT SET 9
FUEL CTL FAULT 18
FUEL FILTER CLOG 1
FUEL RETURN VALVE 19
HIGH ENGINE VIBRATION 26
HP FUEL VALVE 6
IGN FAULT 15
LOW N1 8
N1 / N2 / EGT OVERLIMIT 3
N1 / N2 / EGT / FF DISCREPANCY 9
OIL FILTER CLOG 2
OIL HI TEMP 2
OIL LO PR 2
ONE TLA FAULT 15
OVSPD PROT FAULT 18
REV ISOL FAULT ⊲* 12
REV PRESSURIZED 1
REV SWITCH FAULT 1
REVERSE UNLOCKED 4
REVERSER FAULT 1
SENSOR / PROBES FAULT 19
START FAULT 7
START VALVE FAULT 6
THR LEVER DISAGREE 16
THR LEVER FAULT 17
THRUST LOCKED (⊲*) 24
R TYPE DISAGREE 23
VIB SYS FAULT 2

02.80 MISCELLANEOUS

BOMB ON BOARD 10
COCKPIT WINDSHIELD/WINDOW CRACKED 14
COCKPIT WINDSHIELD/WINDOW ARCING 14
CREW INCAPACITATION 9
DITCHING 2
ECAM ADVISORY CONDITIONS 15
EMER DESCENT 7
FORCED LANDING 5
LDG CONF – APPR SPD – LDG DIST – CORRECTIONS FOR FAILURE 17
ON GROUND EMER / EVACUATION 1
OVERWEIGHT LANDING 8
UNRELIABLE SPEED INDICATION . . . . REFER TO 02.34
VOLCANIC ASH ENCOUNTER 13
WINDSHEAR 19
WINDSHEAR AHEAD 20

02.90 DETAILED CABIN/COCKPIT EVAC PROC

GENERAL 1
COCKPIT ASSIGNED AREAS FOR EVACUATION 2
COMMUNICATIONS 3
R ON GROUND EMER/EVACUATION 5
R EVACUATION AFTER DITCHING 7

GENERAL

Abnormal and emergency procedures are the actions the crew must take after a failure. These actions retain adequate safety and make the further conduct of the flight easier. The crew uses the "READ and DO" principle (oral reading) in performing them.

PRESENTATION

The presentation of procedures is, as far as practicable, identical to the presentation on ECAM. The abbreviations are identical to those used on the cockpit panels. All actions and information displayed on ECAM are printed in large letters. Other information, not on ECAM, is printed in small letters.
Expanded information, when inserted in the procedure, appears in italics. This information:
— identifies the particular failure
— explains actions for which the reason is not self-evident
— furnishes additional background.
When several procedures appear under the same title, a black square marks the starting point of each procedure.
Only one procedure is applicable at a time.
For example :

ANTI ICE CAPT (F/O) (STBY) PROBES

■ **CAPT PROBES** } a

■ **F / O PROBES** } b

■ **STBY PROBES** } c

procedure to be applied:
a or b or c

NFC5-03-0201-001-A001AA

Black squares also indicate parts of a procedure among which only one is applicable.
For example :

BRAKES HOT

— BRK FAN (if installed) . . . . ON } a

■ **ON GROUND** } b

■ **IN FLIGHT** } c

procedure to be applied
(a + b) or (a + c)

NFC5-03-0201-001-B001AA

The ECAM does not display black squares.

· If an action depends on a precondition, a black dot identifies the precondition. If the precondition appears on ECAM, it appears in large letters. If not, it appears in small letters.
For example :

NFC5-03-0201-002-A001AA

F / CTL FLAPS FAULT

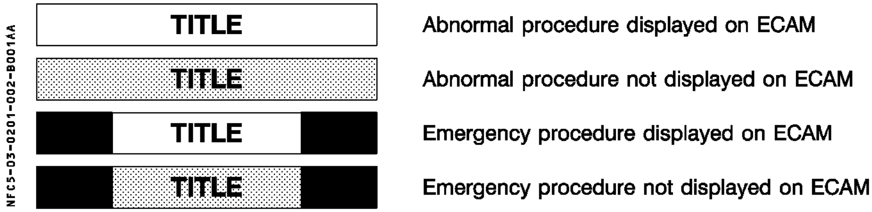
— FLAPS LEVER . . . . RECYCLE

• **If unsuccessful :**

— GPWS FLAP MODE . . . . OFF

"If unsuccessful" does not appear on ECAM

· Titles of the procedures appear in the following ways :



TASK SHARING

The general task sharing shown below applies to all procedures.
The pilot flying remains pilot flying throughout the procedure.
PF, the pilot flying, is responsible for :
— thrust levers
— control of flight path and airspeed
— aircraft configuration (request configuration change)
— navigation
— communications.
PNF, the pilot not flying, is responsible for :
— reading aloud the ECAM and checklists
— executing required actions or actions requested by the PF, if applicable
— operating the engine master switch and ENG FIRE pushbutton (monitored by the PF).

R **MEMORY ITEMS**

R The following procedures are to be applied without referring to paper : Windshear ⊲ ,
R windshear ahead ⊲ , TCAS ⊲ , EGPWS ⊲ , loss of braking, beginning of EMER DESCENT,
R beginning of UNRELIABLE SPEED INDICATION.

USE OF AUTOPILOT

The autopilot may be used in most failure cases, when available :
- in case of engine failure, including autoland or CAT II/CAT III ILS.
R When performing an engine-out non precision approach, the use of autopilot is not
R permitted in the following modes : FINAL APP, NAV V/S, NAV FPA.
- in case of other failures, down to 500 ft AGL in all modes.
  However, the AP has not been certified in all configurations and its performance cannot be guaranted. If the pilot chooses to use the AP in such circumstances, extra vigilance is required and the AP must be disconnected if the aircraft deviates from the desired or safe flight path.

INITIATION OF PROCEDURES

Procedures are initiated on the pilot flying's command.
No action is taken (apart from cancelling audio warnings through the MASTER WARN light) until :
- the appropriate flight path is established,
- the aircraft is at least 400 feet above the runway if a failure occurs during takeoff, approach or go-around.

A height of 400 feet is recommended because it gives a good compromise between time necessary for stabilization and excessive delay for procedure initiation.
In some emergency cases, provided the appropriate flight path is established, the pilot flying may initiate actions before this height.
If an emergency causes LAND ASAP to appear in red on the ECAM, the pilot flying should land at the nearest suitable airport.
If an abnormal procedure causes LAND ASAP to appear in amber on the ECAM, the crew should consider the seriousness of the situation and the selection of a suitable airport.

LANDING DISTANCE

Any increase in landing distance resulting from an emergency or abnormality must be based on the actual landing distance in configuration FULL (Refer to 3.02.80).

ECAM

Warning inhibition during takeoff

Some warnings (non-inhibited) appear whenever the prompting situation arises ; others (inhibited) do not appear at once if the prompting situation arises during takeoff.

CREW COORDINATION

When carrying out a procedure displayed on ECAM, both pilots must be aware of the present display. Before any "CLEAR" action, the pilots should crosscheck to confirm that there remains no blue message (except in case of no action feedback) that they can eliminate by a direct action.

NO CLEAR ACTION BEFORE CROSS CONFIRMATION

Example of crew coordination and cross confirmation :

WARNING DISPLAY		PILOT FLYING	PILOT NOT FLYING
HYD B RSVR OVHT BLUE ELEC PUMP.....OFF		READ FAILURE TAKE ATC RADIO CTL – REQUEST ECAM ACTION (1)	READ FAILURE – READ ACTION (full line) – PERFORM ECAM ACTION OR REQUEST EXECUTION BY THE PF (thrust levers)
HYD B RSVR OVHT B SYS LO PR	* F/CTL	– CHECK ECAM ACTION COMPLETED – CONFIRM CLEAR	– REQUEST CLEAR
SEAT BELTS	* F/CTL	– CONFIRM CLEAR	– REVIEW ALL AFFECTED EQUIPMENT SHOWN IN AMBER ON F/CTL PAGE – REQUEST CLEAR
STATUS APPR PROC HYD LO PR IF BLUE OVHT OUT : BLUE ELEC PUMP .... ON CAT 2 ONLY SLATS SLOW	INOP SYS CAT 3 BLUE HYD SPLR 3	– CONFIRM CLEAR	– READ STATUS LINE BY LINE – REQUEST CLEAR

For standard calls, refer to 3.03.90.

(1) Although it is the responsibility of the pilot flying to request ECAM actions, this does not preclude the captain from either taking control of the aircraft or ordering ECAM actions he considers to be necessary.

R *Note : ECAM procedures and, STATUS information, supplemented by a PFD/ND check*
R *suffice for handling the fault. However, before applying the ECAM procedures,*
R *the fault should be confirmed on the system display. When ECAM actions have*
R *been performed, and the ECAM STATUS has been reviewed, the crew may refer*
R *to FCOM procedure (3.02) for supplementary information, if time permits.*

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USE OF SUMMARIES

GENERAL

The summaries consist of QRH procedures. They have been created to help the crew handle the actions to be carried out, in the event of an electrical emergency configuration or dual hydraulic failure.
In any case, the ECAM should be applied first.
This includes both the procedure and the STATUS review.
Only after announcing “ECAM ACTIONS COMPLETED”, should the PNF refer to the corresponding QRH summary.
When the failure occurs, and after performing the ECAM actions, the PNF should refer to the “CRUISE” portion of the summary, in order to determine the landing distance coefficient.
Since normal landing distances are also given on this page, the PNF will be able to compute the landing distance taking failure(s) into account, in order for the pilot to decide whether to divert or not.

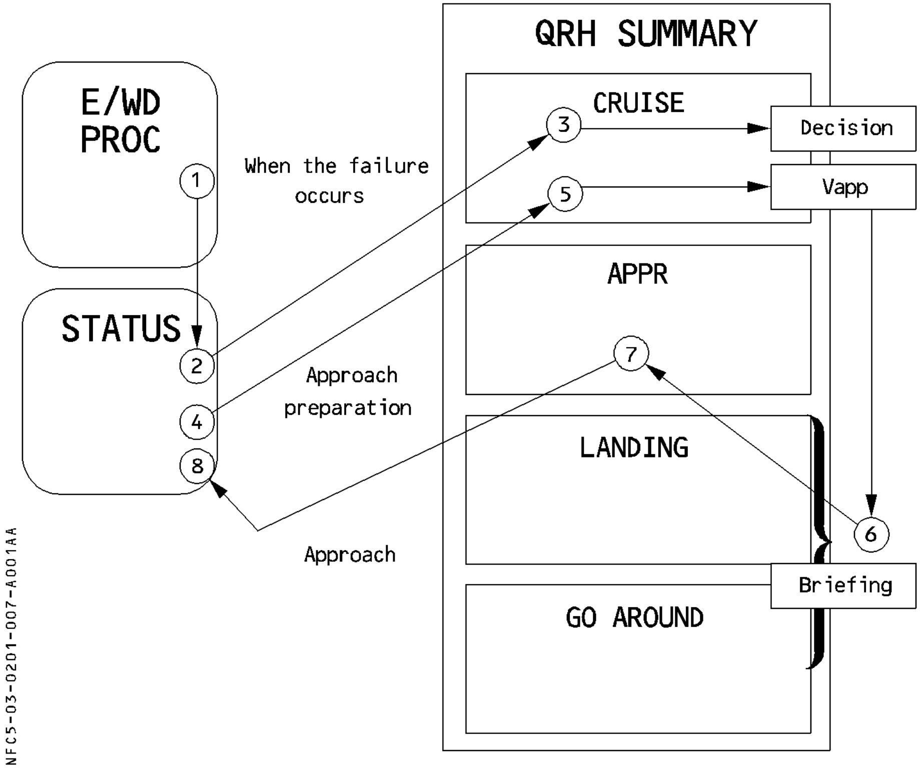
APPROACH PREPARATION

As always, approach preparation includes a review of the ECAM STATUS.
After reviewing the STATUS, the PNF should refer to the “CRUISE” portion of the summary to determine the VREF correction, and compute the VAPP.
The pilot is presumed to know the computation method, and use the VREF given on the MCDU (the destination having been previously updated).
A VREF table is provided in the summary, for failure cases leading to the loss of the MCDU.
The LANDING and GO-AROUND portions of the summary should be used for the approach briefing.

APPROACH

The APPR PROC actions should be performed by reading the APPROACH portion of the summary. This portion has primarily been added due to the flap extension procedure, which is not fully addressed on the ECAM.
As the recommendations provided in this portion of the summary are deemed sufficient, it is not necessary to refer to the "LANDING WITH FLAPS (SLATS) JAMMED" paper procedure.
After referring to the APPROACH portion of the summary, the PNF should then review the ECAM STATUS, and check that all APPR PROC actions have been completed.

SEQUENCE



REJECTED TAKEOFF

GENERAL

The decision to reject the takeoff and the stop action is made by the captain.
Therefore the captain should keep his hand on the thrust levers until V1 is reached whether he is PF or PNF. As soon as he decides to abort, he calls "stop", takes over, and performs the stop actions.
It is impossible to list all the factors that could lead to the decision to abort the takeoff, but in order to help in the decision process, the ECAM inhibits the warnings that are not paramount from 80 knots to 1500 feet (or 2 minutes after lift-off, whichever occurs first).
Rejected takeoffs have sometimes been hazardous even though the performance was correctly calculated, based on flight tests.
This may be due to the following :

- delay in initiating the stopping procedure,
- tires damaged,
- brakes worn or not working correctly, initial temperature higher than normal,
- brakes not fully applied,
- runway friction coefficient lower than expected,
- error in gross weight determination,
- runway line-up not considered.

The aircraft is certificated according to FAR amendment 25-42, which allows 2 seconds between decision and action, thus improving the safety margin.
Above 100 knots, rejecting the takeoff becomes a serious action that may lead to a hazardous situation. Therefore, as speed approaches V1, the pilot should be "go-minded" if none of the main failures cited below ("Above 100 knots and below V1") has occurred.

REJECTED TAKEOFF (CONT'D)

DECISION MANAGEMENT

- **Below 100 knots** :
  The decision to reject the takeoff may be taken at the Captain's discretion, depending on the circumstances.
  Although we cannot list all the causes, the Captain should seriously consider discontinuing the takeoff, if any ECAM warning is activated.
  Note : The speed of 100 knots is not critical : It was chosen in order to help the Captain make his decision, and to avoid unnecessary stops from high speed.
- **Above 100 knots and below V1** :
  Rejecting the takeoff at these speeds is a more serious matter, particularly on slippery runways. It could lead to a hazardous situation, if the speed is approaching V1. Very few situations should lead to the decision to reject the takeoff. The main ones are:
  1. Fire warning or severe damage.
  2. Sudden loss of engine thrust.
  3. Malfunctions or conditions that give unambiguous indications that the aircraft will not fly safely.
  4. ECAM warnings such as :
     . ENG or APU FIRE
     . ENG FAIL
     . CONFIG. (MAIN WARNINGS ONLY)
     . ENG OIL LO PR
     . ENG REV UNLOCKED
     . L + R ELEV FAULT

  Nose gear vibration should not lead to an RTO above 100 knots.
  In case of tire failure between V1 minus 20 knots and V1 :
  Unless debris from the tires has caused serious engine anomalies, it is far better to get airborne, reduce the fuel load, and land with a full runway length available.
  The V1 call has precedence over any other call.
- **Above V1**
  Takeoff must be continued, because it may not be possible to stop the aircraft on the remaining runway.

REJECTED TAKEOFF (CONT'D)

PROCEDURE DURING A REJECTED TAKEOFF

R

CAPT	F/O
Phase 1 – CALL . . . . "STOP" Simultaneously : – THRUST LEVERS . . . . IDLE – REVERSE THRUST . . . . MAX AVAIL.	– BRAKE RESPONSE . . . . . MONITOR – REVERSE . . . . CONFIRM – ANY AUDIO . . . . CANCEL – ATC . . . . INFORM – ON GROUND EMER/EVACUATION Checklist . . . . LOCATE
Phase 2 Consider positioning the aircraft to keep any possible fire away from the fuselage. – PARKING BRAKE . . . . APPLY *Set parking brake ON after aircraft stops.* – PA call . "ATTENTION CREW!AT STATIONS" – CALL . . . . "ECAM ACTIONS" The aircraft should remain stationary while the crew evaluates the situation.	– ECAM ACTIONS . . . . INITIATE
Evacuation phase If required, refer to the ON GROUND EMER/EVACUATION Checklist for evacuation.	Inform ATC of intention and required assistance.

REVERSERS : Full reverse may be used until coming to a complete stop. But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 knots.

Note : 1. If the brake response does not seem appropriate for the runway condition, FULL manual braking should be applied and maintained. If IN DOUBT, TAKE OVER MANUALLY. Do not attempt to clear the runway, until it is absolutely clear that an evacuation is not necessary and that it is safe to do so.

2. If the autobrake is unserviceable, the Captain simultaneously reduces thrust and applies maximum pressure on both pedals.
The aircraft will stop in the minimum distance, only if the brake pedals are maintained fully pressed until the aircraft comes to a stop.

3. If normal braking is inoperative, immediately switch the A/SKID & NOSE WHEEL switch OFF and modulate brake pressure, as required, at or below 1000 PSI.
If the brake pedals were fully pressed when switching the A/SKID & NOSE WHEEL switch OFF, full pressure would be applied to the brakes.

4. After a rejected takeoff, if the aircraft comes to a complete stop using autobrake MAX, release brakes prior to taxi by disarming spoilers.

ENG FAILURE AFTER V1 – CONTINUED TAKEOFF

- If an engine fails after the aircraft passes V1, the takeoff must be continued.
- Use rudder conventionally to stay on the runway centerline.
- At VR, rotate the aircraft smoothly using a continuous pitch rate to a pitch attitude of 12.5 degrees. After lift-off, follow the Speed Reference System (SRS).
- When airborne with a positive rate of climb, select the landing gear up.
- Use rudder to prevent yaw. Shortly after lift-off, β target will appear. Adjust rudder position to zero the β target. Control heading conventionally with bank, keeping the β target at zero with rudder.
- Consider the use of TOGA thrust.
- Consider the use of autopilot.
- At 400 feet minimum, apply the ECAM procedure
- At acceleration height, level off and allow the speed to increase.
  · At F speed select CONF 1.
  · At S speed select CONF 0.
- When the flap handle is at zero, β target reverts to side-slip indication. Center the sideslip indication conventionally.
- At green dot speed (engine-out operating speed in clean configuration) resume the climb using maximum continuous thrust and maintain green dot speed.
  (If already in the FLX/MCT gate, move to CL and back to MCT).
- MAXIMUM TAKEOFF THRUST IS ONLY ALLOWED FOR 10 MINUTES.

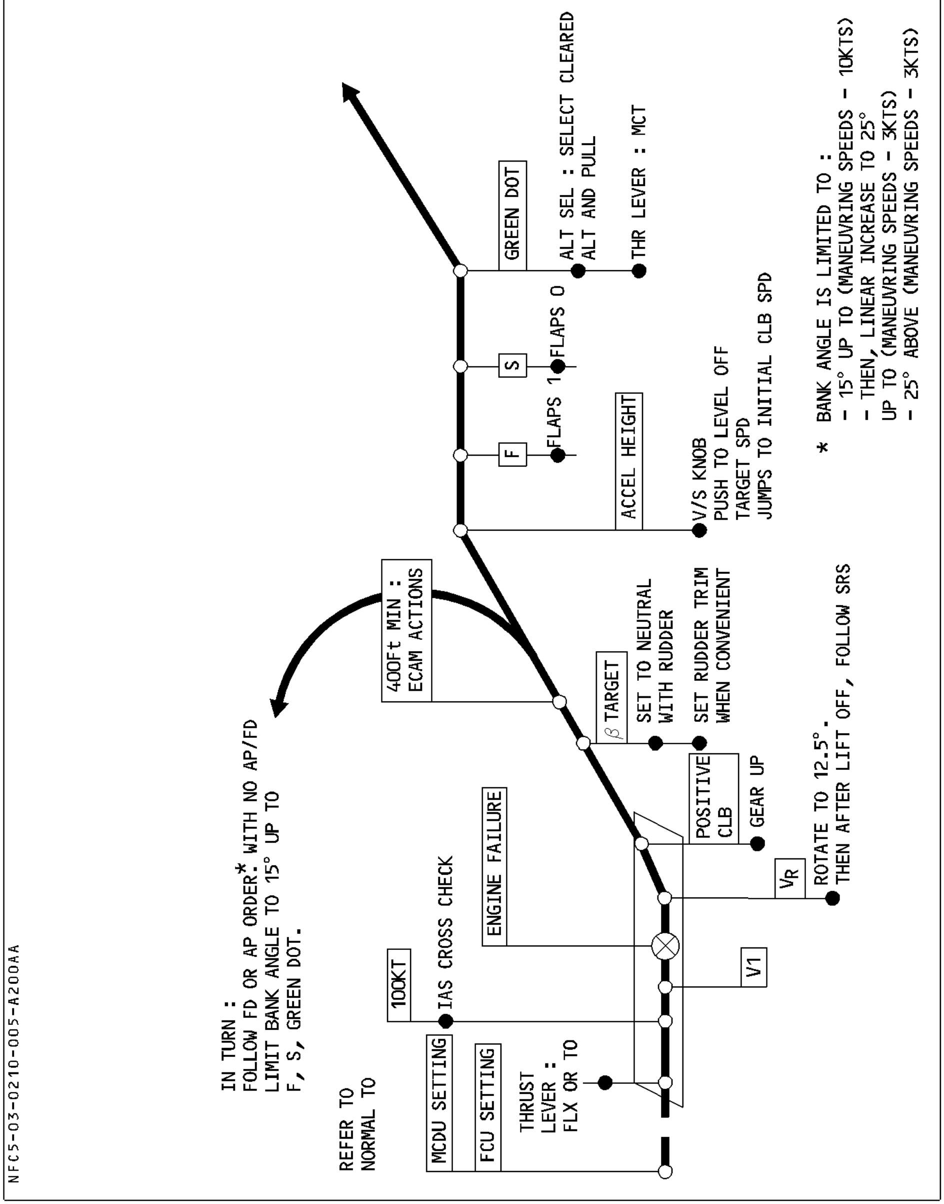
ENGINE FAILURE DURING INITIAL CLIMB-OUT

- Proceed as above. However, if the failure occurs above V2 maintain the SRS commanded attitude (or the speed reached after recovery). In any case, the minimum speed must be equal to V2.

ENG FAILURE AFTER V1 – CONTINUED TAKEOFF (CONT'D)

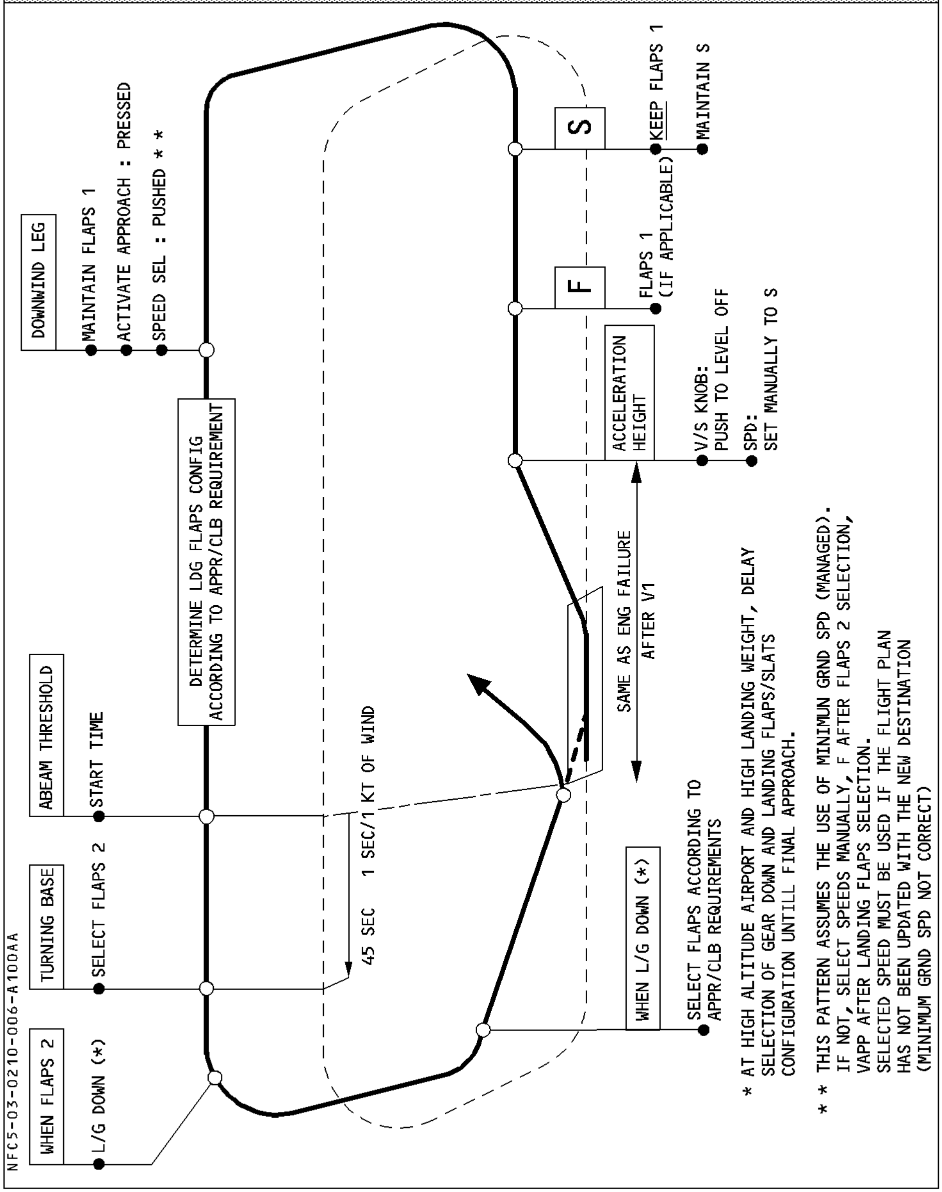
ENGINE OPERATION AT MAX T.O. THRUST IS LIMITED TO 10 MINUTES

R



IMMEDIATE VMC LDG FOLLOWING ENG FAILURE ON TO

R



STRAIGHT-IN APPROACH WITH ONE ENGINE INOPERATIVE

For performance reasons, do not extend flaps full until established on a final descent to landing.
If a level off is expected during the final approach, perform the approach and landing in CONF 3.

CIRCLING APPROACH WITH ONE ENGINE INOPERATIVE

– LANDING WEIGHT . . . . CHECK

● **If the aircraft weight is above the maximum weight for circling in CONF 3 (given in the table below) :**

The aircraft cannot maintain flight level with CONF 3 and the landing gear down.

– FOR LDG . . . . USE FLAP 3

Conf 3 is preferred, to minimize a configuration change in short final.

– GPWS LDG FLAP 3 . . . . ON

– Delay gear extension.

Note : – If the approach is flown at less than 750 feet RA, the "L/G NOT DOWN" warning will be triggered. The pilot can cancel the aural warning by pressing the EMER CANC pushbutton, located on the ECAM control panel.
– A "TOO LOW GEAR" warning is to be expected, if the landing gear is not downlocked at 500 feet RA.

MAXIMUM WEIGHT FOR CIRCLING IN CONF 3 (1000 KG)

OAT (°C)	AIRPORT ELEVATION (feet)							
	0	2000	4000	6000	8000	10000	12000	14000
0	77.0	76.0	69.0	63.0	58.0	53.0	48.0	45.0
5	77.0	76.0	69.0	63.0	58.0	53.0	48.0	45.0
10	77.0	76.0	69.0	63.0	58.0	53.0	48.0	45.0
15	77.0	76.0	69.0	63.0	58.0	53.0	48.0	45.0
20	77.0	76.0	69.0	63.0	58.0	53.0	48.0	45.0
25	77.0	74.0	68.0	63.0	58.0	53.0	48.0	45.0
30	76.0	71.0	66.0	61.0	56.0	52.0	48.0	
35	74.0	68.0	63.0	58.0	54.0	50.0		
40	70.0	65.0	61.0	56.0				
45	67.0	63.0	58.0					
50	64.0	60.0						
55	61.0							

LANDING WITH SLATS OR FLAPS JAMMED

– LANDING CONF . . . . CONF 3

■ **Repeat the following until landing configuration is reached :**

– SPEED SEL . . . . VFE NEXT – 5 KT

Decelerate towards VFE NEXT – 5 KT but not below VLS. In case of turbulence, to avoid VFE exceedance, the pilot may decide to decelerate to a lower speed, but not below VLS.

Note : · *The autopilot may be used down to 500 feet AGL. As it is not tuned for abnormal configurations, its behavior can be less than optimum and must be monitored.*
· *Approach with selected speed is recommended.*
· *A/THR is recommended, except in the case of a G+B SYS LO PR warning.*
· *OVERSPEED warning and VLS, displayed on the PFD, are computed according to the actual flaps/slats position.*
· *VFE and VFE NEXT are displayed on the PFD according to the FLAPS' lever position. If not displayed, use the placard speeds.*
· *If VLS is greater than VFE NEXT (overweight landing case), the FLAPS lever can be set in the required next position, while the speed is reduced to follow VLS reduction as surfaces extend. The VFE warning threshold should not be triggered.*
In this case, disconnect the A/THR. A/THR can be re-engaged when the landing configuration is established.

As speed reduces through VFE NEXT :

– FLAPS LEVER . . . . ONE STEP DOWN

● **When landing configuration is established :**

– DECELERATE TO CALCULATED APPROACH SPEED IN FINAL APPROACH

FOR GO AROUND

The table on page 8 provides the MAX SPEEDS for the abnormal configurations.

■ **IF SLATS FAULT :**

● **FOR CIRCUIT :**

– MAINTAIN SLATS/FLAPS CONFIGURATION
– Recommended speed : MAX SPEED – 10 KT

R ● **FOR DIVERSION**

R – SELECT CLEAN CONFIGURATION
R *Recommended flaps retraction speed is between MAX SPEED – 10 knots and*
R *MAX SPEED.*
R – Recommended diversion speed : MAX SPEED – 10 KT.

LANDING WITH SLATS OR FLAPS JAMMED (CONT'D)

■ IF FLAPS FAULT :

- **FOR CIRCUIT :**
  - MAINTAIN SLATS/FLAPS CONFIGURATION
  - Recommended speed : MAX SPEED – 10 KT
- **FOR DIVERSION :**
  - **If FLAPS jammed at 0**
    - SELECT CLEAN CONFIGURATION

      Note : Recommended speed for slats retraction is between MAX SPEED – 10 KT and MAX SPEED of actual slat/flap position.
    - Normal operating speeds
  - **If FLAPS jammed > 0**
    - MAINTAIN SLAT/FLAP CONFIGURATION
    - Recommended speed for diversion : MAX SPEED – 10 KT

      Note :
      - *In the majority of cases, VFE on PFD is equal to the MAX SPEED. In this case, VFE can be used as MAX SPEED. In case the SPD LIM flag is displayed on the PFD, use the MAX SPEED displayed on the ECAM status page.*
      - R R *In some cases, MAX SPEED – 10 knots may be a few knots higher than the VFE. In this situation, pilot may follow the VFE.*
      - *In case of a go-around with CONF FULL selected, the L/G NOT DOWN warning is triggered at landing gear retraction.*

<table>
<tr><th colspan="6">MAX SPEED</th></tr>
<tr><th>Flaps
Slats</th><th>F = 0</th><th>0 < F ≤ 1</th><th>1 < F ≤ 2</th><th>2 < F ≤ 3</th><th>F > 3</th></tr>
<tr><td>S = 0</td><td>NO LIMITATION</td><td rowspan="2">215 knots</td><td rowspan="2">200 knots</td><td rowspan="2">185 knots</td><td rowspan="2">Not allowed
(177 knots)</td></tr>
<tr><td>0 < S ≤ 1</td><td>230 knots</td></tr>
<tr><td>1 < S ≤ 3</td><td colspan="2">200 knots</td><td>200 knots</td><td>185 knots</td><td>177 knots</td></tr>
<tr><td>S > 3</td><td colspan="2">177 knots</td><td>177 knots</td><td>177 knots</td><td>177 knots</td></tr>
</table>

CAUTION

For flight with SLATS or FLAPS extended, fuel consumption is increased. Refer to the fuel flow indication. As a guideline, determine the fuel consumption in clean configuration at the same altitude without airspeed limitation (e.g. From ALTERNATE FLIGHT PLANNING tables, refer to 2.05.50) and multiply this result by 1.6 (SLATS EXTENDED), or 1.8 (FLAPS EXTENDED, or 2 (SLATS and FLAPS EXTENDED), to obtain the fuel consumption required to reach the destination in the current configuration.

AIR PACK 1(2) OVHT

– PACK (affected) . . . . OFF

High flow is automatically selected on the remaining pack.
Fault light goes out when the overheat disappears.

● **WHEN PACK OVHT OUT :**

– PACK (affected) . . . . ON

STATUS

● **WHEN PACK OVHT OUT :**

– PACK (affected) . . . . ON

INOP SYS

● **If pack not recovered :**

INOP SYS
PACK 1(2)

R

AIR PACK 1(2) FAULT

– PACK (affected) . . . . OFF

STATUS

INOP SYS
PACK 1(2)

AIR PACK 1(2) OFF

R Crew awareness.

One pack is abnormally selected off

STATUS

INOP SYS
PACK 1(2)

AIR PACK 1 + 2 FAULT

– PACK (affected) . . . . OFF

The fault light goes off, when the failure disappears.

– DESCENT TO FL 100/MEA.

Descend to FL 100, or MEA, whichever is higher.

● **WHEN DIFF PR < 1 PSI AND FL BELOW 100 :**

– RAM AIR . . . . ON

MAX FL 100/MEA

● **If FAULT was due to an overheat :**

AIR PACK 1 (2) OVHT

● **WHEN PACK OVHT OUT :**

– PACK (affected) . . . . ON

STATUS

● **If packs not recovered :**

MAX FL 100/MEA

● **If FAULT was due to an overheat :**

● **WHEN PACK OVHT OUT :**

– PACK (affected) . . . . ON

INOP SYS

PACK 1 + 2

AIR PACK 1(2) REGUL FAULT

Pack primary channel, or pack primary and secondary channels fault.

Crew awareness.

STATUS

■ **If the primary channel fails :**

The pack air inlet and outlet flaps fully open ; pack flow is fixed at the previous setting.

■ **If the primary and secondary channels fail :**

PACK 1(2) AT FIXED TEMP

R *The pack outlet temperature is controlled by the pack*
R *anti-ice valve and is stabilized to a temperature between*
R *5°C (41°F) and 30°C (86°F) within a maximum of 6 minutes.*

INOP SYS

PACK 1(2) REGUL

AIR PACK 1(2) OVHT

– PACK (affected) .... OFF

High flow is automatically selected on the remaining pack.
Fault light goes out when the overheat disappears.

● **WHEN PACK OVHT OUT :**
– PACK (affected) .... ON

STATUS

● **WHEN PACK OVHT OUT :**
– PACK (affected) .... ON

INOP SYS

● **If pack not recovered :**

INOP SYS
PACK 1(2)

R

AIR PACK 1(2) FAULT

– PACK (affected) .... OFF

STATUS

INOP SYS
PACK 1(2)

AIR PACK 1(2) OFF

R Crew awareness.
One pack is abnormally selected off

STATUS

INOP SYS
PACK 1(2)

AIR PACK 1 + 2 FAULT

– PACK (affected) .... OFF

The fault light goes off, when the failure disappears.

– DESCENT TO FL 100/MEA.

Descend to FL 100, or MEA, whichever is higher.

● **WHEN DIFF PR < 1 PSI AND FL BELOW 100 :**

– RAM AIR .... ON

MAX FL 100/MEA

● **If FAULT was due to an overheat :**

AIR PACK 1 (2) OVHT

● **WHEN PACK OVHT OUT :**

– PACK (affected) .... ON

STATUS

● **If packs not recovered :**

MAX FL 100/MEA

● **If FAULT was due to an overheat :**

● **WHEN PACK OVHT OUT :**

– PACK (affected) .... ON

INOP SYS

PACK 1 + 2

AIR PACK 1(2) REGUL FAULT

Pack primary channel, or pack primary and secondary channels fault.

Crew awareness.

STATUS

■ **If the primary channel fails :**

The pack air inlet flap fully opens ; pack flow is fixed at the previous setting.

■ **If the primary and secondary channels fail :**

PACK 1(2) AT FIXED TEMP

The pack outlet temperature is controlled by the pack anti-ice valve and is stabilized to a temperature between 5°C (41°F) and 30°C (86°F) within a maximum of 6 minutes.

INOP SYS

PACK 1(2) REGUL

COND FWD CAB/AFT CAB/CKPT DUCT OVHT

- **WHEN DUCT TEMP < 70 DEG C :**
  - HOT AIR . . . . OFF THEN ON

    Hot air pressure regulating valve reopens.

- **If system not recovered :**

  CAB TEMP BY PACK ONLY

  Basic temperature regulation is by packs only (remains automatic).

STATUS

INOP SYS

HOT AIR

COND HOT AIR FAULT

– HOT AIR (if not closed) . . . . OFF

● **IF HOT AIR STILL OPEN and DUCT OVHT persists :**

– PACK 1 . . . . OFF

– PACK 2 . . . . OFF

– DESCENT TO FL 100/MEA

Descend to FL 100, or MEA, whichever is higher.

● **WHEN DIFF PR < 1 PSI AND FL BELOW 100**

– RAM AIR . . . . ON

MAX FL 100/MEA

STATUS

	INOP SYS
CAB TEMP BY PACK ONLY (only if HOT AIR closed) *Basic temperature regulation by packs only (remains automatic).*	PACK 1 + 2 (if PACKS closed) HOT AIR

R

COND TRIM AIR SYS FAULT

■ **One trim valve failed :**

A message corresponding to the affected valve is displayed :
AFT CAB TRIM VALVE
FWD CAB TRIM VALVE
CKPT TRIM VALVE

■ **High pressure detected downstream of the hot air pressure regulating valve :**

TRIM AIR HI PR

Note : *If the warning and the TRIM AIR HI PR message are triggered when all trim air valves are closed (during the first 30 seconds after the packs are selected on, or in flight, if all zone heating demands are fulfilled), disregard them.*

LEFT INTENTIONALLY BLANK

COND ZONE REGUL FAULT

Crew awareness.
The hot air pressure regulating valve and trim air valves close.

STATUS

■ **If primary channel failed :**

INOP SYS

R CAB ZONE AT FIXED TEMP
Zones are controlled to 24°C (75°F) by the packs through the zone controller secondary channel :
· Pack 1 controls the cockpit.
· Pack 2 controls the cabin.

■ **If primary and secondary channels failed:**

INOP SYS
ZONE REGUL

ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
R *As the FADEC no longer receives a bleed demand correction, only approach idle can be selected.*
PACKS AT FIXED TEMP
The packs are controlled to deliver a fixed temperature of 20°C (68°F) for pack 1, and 10°C (50°F) for pack 2.

COND L + R CAB FAN FAULT

Both cabin fan motors overheat. Cabin fans stop.
– PACK FLOW . . . . HI

STATUS

INOP SYS
L + R CAB FAN

COND LAV + GALLEY FAN FAULT

Crew awareness.
Cabin zone temperature sensors are normally ventilated by the air extracted by the fan. Therefore, cabin zone temperature regulation is lost.

STATUS

CAB ZONE AT FIXED TEMP
· Cabin zone inlet duct temperature is constant (15°C or 59°F).
R *· Cockpit temperature regulation is normal.*

INOP SYS
GALLEY FAN

LEFT INTENTIONALLY BLANK

CAB PR EXCESS CAB ALT

– CREW OXY MASK (if above FL100) . . . . ON

The recommendation is to descend with autopilot engaged :
· turn ALT selector knob and pull
· turn HDG selector knob and pull
· set target SPD/MACH.

The use of autopilot is also permitted in EXPEDITE mode (◁).

– DESCENT (if above FL100) . . . . INITIATE

● **IF RAPID DECOMPRESSION**

EMER DESCENT FL100/MEA (or minimum obstacle clearance altitude)

– THR LEVERS (if A/THR not engaged) . . . . IDLE

– SPD BRK . . . . FULL

R *Extension of speedbrakes will significantly increase VIs.*
R *In order to avoid autopilot disconnection and automatic retraction of speedbrakes due*
R *to possible activation of angle of attack protection, allow the speed to increase before*
R *starting to use speedbrakes.*

– SPD . . . . MAX/APPROPRIATE

Descend at maximum appropriate speed or, if structural damage is suspected use the flight controls with care and reduce speed as appropriate. Landing gear may be extended below 25000 feet ; speed must be reduced to VLO/VLE.

– SIGNS . . . . ON

– ENG MODE . . . . IGN

– ATC . . . . NOTIFY

Notify ATC of the nature of the emergency and state the intentions.
If ATC cannot be contacted, select ATC code A7700 or transmit a distress message on one of the following frequencies :
(VHF) 121.5 MHz or (HF) 2.182 KHz or 8364 KHz.
To save oxygen, set oxygen diluter selector to N position.
With oxygen diluter left to 100%, oxygen quantity may not be sufficient to cover the entire descent profile.
Ensure that the crew can communicate wearing oxygen masks. Avoid the continuous use of interphone position to minimize the interference from oxygen mask breathing noise.

● **IF CAB ALT > 14 000 FT :**

– PAX OXY MASKS . . . . MAN ON

Note : When descent is established and if time permits select manual mode and check parameters on ECAM CAB PRESS.
R *Notify the cabin crew when a safe flight level has been reached and oxygen*
R *mask use can be stopped.*

CAB PR SYS 1 (2) (1 + 2) FAULT

■ **if one system affected :**

Crew awareness

STATUS

INOP SYS
CAB PR 1 (2)

■ **if both systems affected :**

R *Due to the slow closure of the outflow valve in manual pressurization mode and*
R *depending on the failure, the following procedure may not avoid the depressurization.*

– MODE SEL . . . . MAN

– MAN V/S CTL . . . . AS RQRD

R · *It may take 10 seconds in manual mode before the crew notices a change of the*
R *outflow valve position. Use the cabin V/S indication to confirm the outlfow valve*
R *operation.*

· *Monitor cabin V/S and CAB ALT frequently and adjust as necessary.*
Maintain aircraft altitude at or above cabin altitude.

· *The two safety valves limit △P to 8.6 psi.*

STATUS

MAN CAB PR CTL

TGT V/S :
CLIMB 500 FT/MIN
DESC 300 FT/MIN

A/C FL	CAB ALT TGT
390	8 000
350	6 500
300	5 000
250	2 500
< 200	0

DURING FINAL APPR :

– V/S CTL . . . . FULL UP

CAUTION
Check that △P is zero before opening the doors.

INOP SYS
CAB PR 1 + 2

R
CABIN OVERPRESSURE

R *Apply the following procedure (not displayed on ECAM) in case of total loss of cabin*
R *pressure control leading to overpressure.*

– PACK 1 or 2 .... OFF
– BLOWER + EXTRACT .... OVRD
  Cabin air is extracted overboard
– △P .... FREQUENTLY MONITOR

● **If △P > 9 PSI**
  – PACK 1 + 2 .... OFF
  LAND ASAP

Before 10 minutes from landing :
– PACK 1 + 2 .... OFF
– BLOWER + EXTRACT .... AUTO

CAUTION
Check that △P is zero before opening the doors.

CAB PR LO DIFF PR

– EXPECT HI CAB RATE
– A/C V/S .... REDUCE

CAB PR OUTFLOW VALVE NOT OPEN (on ground)

– MODE SEL .... MAN
– MAN V/S CTL .... FULL UP
R *It may take 10 seconds in manual mode before the crew notices a change of the outflow*
R *valve position.*

● **IF UNSUCCESSFUL :**
– PACK 1 and 2 .... OFF

CAB PR LDG ELEV FAULT

– LDG ELEV .... MAN ADJUST
Landing field elevation from FMGC is not available. Landing elevation must be manually
R *selected with LDG ELEV selector. Refer to the LDG ELEV indication on the CRUISE page*
R *or CAB PRESS page to adjust the required landing elevator.*
Note : If the landing is performed on QFE, set 0 feet on LDG ELEV selector.

CAB PR SAFETY VALVE OPEN

The failure is probably due to an overpressure.

● **IF DIFF PR ABV 8 PSI :**

– MODE SEL . . . . MAN
– MAN V/S CTL . . . . AS RQRD

If overpressure is confirmed, reduce cabin △P.
R *It may take 10 seconds in manual mode before the crew notices a change of the*
R *outflow valve position.*

● **IF UNSUCCESSFUL :**

– A/C FL . . . . REDUCE

STATUS

MAN CAB PR CTL
TGT V/S :
CLIMB 500 FT/MIN
DESC 300 FT/MIN

A/C FL	CAB ALT TGT
390	8 000
350	6 500
300	5 000
250	2 500
< 200	0

● **DURING FINAL APPR :**

– V/S CTL . . . . FULL UP

CAUTION
Check that △P is zero before opening the doors.

VENT BLOWER FAULT

● **If NO DC ESS BUS FAULT**

– BLOWER . . . . OVRD

The ventilation system is in closed circuit configuration, and air from the air conditioning is added to the ventilation air.

● **If DC ESS BUS FAULT**

– MAX FLT TIME : 2 HOURS

STATUS

● **If DC ESS BUS FAULT**

– MAX FLT TIME : 2 HOURS

INOP SYS

VENT BLOWER

VENT EXTRACT FAULT

– EXTRACT . . . . OVRD

The ventilation system is in closed circuit configuration and air from air conditioning is added to the ventilation air.

STATUS

INOP SYS

VENT EXTRACT

VENT SKIN VALVE FAULT

● **If INLET valve not fully closed in flight** :

Crew awareness

No action is required, since there is a non-return valve at the air inlet.

● **If EXTRACT valve affected** :

– BLOWER . . . . OVRD

– EXTRACT . . . . OVRD

These actions send additional closure signals to the inlet and extract valves.

The weather radar image on both NDs may be lost, in case of insufficient ventilation.

● **IF UNSUCCESSFUL** :

MAX FL 100/MEA

– CAB PR MODE SEL . . . . MAN

– MAN V/S CTL . . . . FULL UP

The aircraft is manually depressurized.

It may take 10 seconds in manual mode before the crew notices a change of the outlfow valve position.

STATUS

MAX FL : 100/MEA (or minimum obstacle clearance altitude)

INOP SYS

AVNCS VALVE

VENT AVNCS SYS FAULT

Triggered when the AEVC is not supplied or when valve position disagrees with the commanded position or when the power-up test is not satisfactory.

STATUS

INOP SYS
AVNCS VENT
VENT BLOWER (a)
VENT EXTRACT(a)

(a) If AEVC not supplied.

AUTO FLT YAW DAMPER 1(2)

Crew awareness.

Note : The crew can try to reset the affected FAC by using the FAC pushbutton. On ground only, if the reset is unsuccessful, the taxi and takeoff can be continued with the failed yaw damper inoperative.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
CAT 3 DUAL
YAW DAMPER1(2)

AUTO FLT YAW DAMPER SYS

Loss of yaw dampers 1 + 2.

– FAC 1 + 2 .... OFF THEN ON

● **If fault remains :**

F/CTL ALTN LAW
(PROT LOST)

F/CTL normal laws are lost. All protections, except maneuver protections, are lost.

MAX SPEED .... 320 KT

STATUS

MAX SPEED .... 320 KT

Speed is limited, due to the loss of high-speed protections.

APPR PROC

– FOR LDG .... USE FLAP 3

– GPWS LDG FLAP 3 .... ON

Will be displayed, when flaps in CONF 3.

APPR SPD .... VREF + 10 KT

LDG DIST PROC .... APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll (refer to the DIRECT LAW procedure 3.02.27).

CAT 1 ONLY

INOP SYS
F/CTL PROT
YAW DAMPER
AP 1 + 2

AUTO FLT RUD TRIM 1(2) FAULT

Crew awareness.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
CAT 3 DUAL
RUD TRIM 1(2)

AUTO FLT RUD TRIM SYS

– FAC 1 + 2 . . . . OFF THEN ON

STATUS

CAT 1 ONLY

INOP SYS
RUD TRIM
AP 1 + 2

AUTO FLT RUD TRV LIM 1(2)

Crew awareness.

STATUS

INOP SYS
RUD TRV LIM 1(2)

AUTO FLT RUD TRV LIM SYS

RUD WITH CARE ABV 160 KT

Depending on when the failure occurs, the rudder travel limiter system may not be in the correct position for the flight speed. Therefore, rudder inputs must be limited at speeds above 160 knots, so as not to damage structure.

R *At slats' extension, full rudder travel authority may be recovered.*

– FAC 1 + 2 . . . . OFF THEN ON

STATUS

RUD WITH CARE ABV 160 KT

Note : A CAT 3 approach, without DH, is not permitted.

INOP SYS
RUD TRV LIM

AUTO FLT FAC 1 (2) FAULT

– FAC (affected) . . . . OFF THEN ON

● **IF UNSUCCESSFUL** :

– FAC (affected) . . . . OFF

All functions are performed by the remaining FAC.

STATUS

BOTH PFD ON SAME FAC R *Characteristics speeds displayed on the two PFDs are* R *computed in the same FAC.* CAT 3 SINGLE ONLY	INOP SYS CAT 3 DUAL FAC 1(2)

AUTO FLT FAC 1 + 2 FAULT

RUD WITH CARE ABV 160 KT

Depending on when the failure occurs, the rudder travel limiter system may not be in the correct position for the flight speed. Therefore, rudder inputs must be limited at speeds above 160 knots, so as not to damage structure.

At slats' extension, full rudder travel authority is recovered.

– FAC 1 + 2 .... OFF THEN ON

● **IF UNSUCCESSFUL :**

– FAC 1 + 2 .... OFF

With FAC 1 + 2 inoperative, the rudder travel limit system, rudder trim control, yaw damper and PFD characteristic speeds are lost.

F/CTL ALTN LAW

(PROT LOST)

F/CTL normal laws are lost. All protections, except maneuver protections, are lost.

MAX SPEED .... 320 KT

Speed is limited, due to the loss of high-speed protections.

STATUS

MAX SPEED .... 320 KT
RUD WITH CARE ABV 160 KT
APPR PROC
– FOR LDG .... USE FLAP 3
– GPWS LDG FLAP 3 .... ON
Displayed, when flaps in CONF 3.
APPR SPD .... VREF + 10 KT
LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll (refer to the DIRECT LAW procedure 3.02.27).
CAT 1 ONLY

INOP SYS
REAC W/S DET
F/CTL PROT
FAC 1 + 2
AP 1 + 2
A/THR

AUTO FLT FCU 1 + 2 FAULT

– PFD BARO REF : STD ONLY

With both FCU channels failed, the barometer reference automatically goes to 1013 hPa. Use standby altimeter to change this to the actual barometer setting.

In addition :

- *All FCU controls are inoperative.*
- *A/THR, AP 1 + 2, and FD 1 + 2 are not available.*
  (except in LAND or GO AROUND mode where only A/THR is lost).
- *On PFD :*
  - *Altitude alert is inoperative.*
  - *ILS deviation scales are displayed.*
  - *Flight path vector is displayed.*
  - *Mach indication is inoperative.*
  - *FMA is lost except in LAND or GA mode.*
- *On ND :*
  - *ROSE NAV mode with map (80 NM range) is displayed.*
  - *VOR/ADF needles:*
    Needle 1 is related to VOR1 only.
    Needle 2 is related to ADF2 only (ADF1 if ADF2 not installed).
    (VOR selection on DDRMI is not affected)
    (ADF selection on DDRMI (if available) is not affected).
  - *The weather radar image may be lost. If the image remains displayed it must be disregarded. In all cases, red "WXR RNG" message is displayed.*

STATUS

PFD BARO REF : STD ONLY

- **if not in LAND or GA**
  CAT 1 ONLY
- **if in LAND or GA**
  CAT 2 ONLY

R

INOP SYS

FCU 1 + 2
AP 1 + 2 (if not LAND or GA)
A/THR
CAT 3 (if in LAND or GA mode)

AUTO FLT FCU 1 (2) FAULT

– BARO REF . . . . X CHECK

As one FCU channel is lost the barometer reference settings on the FCU and PFDs must be crosschecked.

STATUS

INOP SYS

FCU 1 (2)

AUTO FLT AP OFF

This warning is displayed only for involuntary disconnection. For voluntary disconnection a red AP OFF message is displayed in the right lower part of ECAM upper DU.

Crew awareness

STATUS

CAT 1 ONLY
(if both AP lost)

INOP SYS
(affected) AP

AUTO FLT A/THR OFF

In case of involuntary disconnection, amber "A/THR OFF" and "ENG THRUST LOCKED" messages are displayed in the left lower part of ECAM upper DU.
R *For voluntary disconnection, an amber A/THR OFF message is displayed on the right lower*
R *part of ECAM upper DU.*

– THR LEVERS .... MOVE

If the thrust levers are not moved within 5 seconds, the "ENG THRUST LOCKED" warning is displayed (refer to 3.02.70).

STATUS

CAT 2 ONLY

INOP SYS
A/THR
CAT 3

AUTO FLT A/THR LIMITED

This warning is displayed when A/THR is active and the thrust levers are below the CL detent (or the MCT detent when one engine is out). The caution is repeated every 5 seconds as long as the thrust levers are not moved.

– THR LEVERS .... MOVE

Thrust lever(s) must be set in the relevant detent.

R

AUTO FLT REAC W/S DET FAULT

Crew awareness.

STATUS

INOP SYS
REAC W/S DET

Note : On ground, this warning may appear spuriously. This warning is cancelled by resetting both FACs, one after the other.
- *FAC 1: Pull then push AUTO FLT/FAC 1/26VAC and 28VDC circuit breakers B03 and B04 on 49VU.*
- *FAC 2: Pull then push AUTO FLT/FAC 2/26VAC and 28VDC circuit breakers M18 and M19 on 121VU.*

LOW ENERGY WARNING

The "SPEED SPEED SPEED" synthetic voice sounds every 5 seconds, whenever the aircraft's energy goes below a threshold under which the thrust must be increased in order to recover a positive flight path angle.

– THR LEVERS .... MOVE FORWARD
Increase thrust until the warning disappears.

COM CIDS 1 + 2 FAULT

Crew awareness.

Passenger address, cabin and service interphone, and passenger signs are inoperative.

STATUS

INOP SYS

CIDS

◁ COM VHF 1(2)(3)/HF 1(2) EMITTING

1. If any Push To Talk (PTT) transmission selector (sidestick radio selector, hand mike selector, or PTT switch ◁) is jammed in the transmit position, try to release it in order to remove the caution.

R *2. If unsuccessful, deselect the identified failed VHF/HF transmission keys on the associated*
R *Audio Control Panel (ACP) to remove the caution. This ACP should only be used in*
R *reception mode. The associated PTT transmission selectors must not be used.*

Note : In this case, the ACP of the unaffected side may be used to recover the deselected
R *VHF/HF channel.*

3. If no transmission key on the ACP is found in the "transmit" position, pull the affected VHF/HF C/B associated to the ECAM message : COM\HF1 C/B HA 14 on 49 VU, COM NAV\HF2 C/B L13 on 121 VU, COM\VHF\1 C/B G09 on 49 VU, COM NAV\VHF\2 C/B L04 on 121 VU, COM\VHF\3 C/B L05 on 121 VU.

◁ COM ACARS FAULT

No crew action required.

STATUS

INOP SYS

ACARS

COM CIDS 1 + 2 FAULT

Crew awareness.

Passenger address, cabin and service interphone, and passenger signs are inoperative.

STATUS

INOP SYS

CIDS

⊲ COM VHF 1(2)(3)/HF 1(2) EMITTING

1. *If any Push To Talk (PTT) transmission selector (sidestick radio selector, hand mike selector, or PTT switch ⊲) is jammed in the transmit position, try to release it in order to remove the caution.*
R 2. *If unsuccessful, deselect the identified failed VHF/HF transmission keys on the associated*
R *Audio Control Panel (ACP) to remove the caution. This ACP should only be used in*
R *reception mode. The associated PTT transmission selectors must not be used.*

Note : In this case, the ACP of the unaffected side may be used to recover the deselected
R *VHF/HF channel.*

3. *If no transmission key on the ACP is found in the "transmit" position, pull the affected VHF/HF C/B associated to the ECAM message : COM\HF1 C/B HA 14 on 49 VU, COM NAV\HF2 C/B L13 on 121 VU, COM\VHF\1 C/B G09 on 49 VU, COM NAV\VHF\2 C/B L04 on 121 VU, COM\VHF\3 C/B L05 on 121 VU.*

⊲ COM ACARS FAULT

Crew awareness.

STATUS

INOP SYS

ACARS

⊲ COM SATCOM FAULT

Crew awareness.

ACARS ⊲ and telephone communications are inoperative.

STATUS

INOP SYS

SATCOM

ELEC IDG 1(2) OIL LO PR/OVHT

– IDG (affected) . . . . OFF

If the associated engine is running, the IDG (integrated drive generator) must be disconnected from the engine at, or above, idle to prevent damage to the disconnect mechanism.

Press the IDG pushbutton until the GEN FAULT light comes on. However, do not press for more than 3 seconds, to avoid damage to the disengage solenoid.

The IDG FAULT light goes off, when the IDG is disconnected.

STATUS

Note : If available, the APU may be started and the APU GEN used.

R CAT 3 SINGLE ONLY

INOP SYS

MAIN GALLEY (only if APU GEN is not online)

GEN 1(2)

R CAT 3 DUAL

ELEC GEN 1(2) FAULT

– GEN (affected) . . . . OFF THEN ON

● **IF UNSUCCESSFUL** :

– GEN (affected) . . . . OFF

STATUS

Note : If available, the APU may be started, and the APU GEN used.

CAT 3 SINGLE ONLY

INOP SYS

MAIN GALLEY (only if APU GEN is not online)

GEN 1(2)

CAT 3 DUAL

ELEC GEN 1(2) OFF

Crew awareness

Turn affected GEN ON, with the applicable pushbutton.

STATUS

CAT 3 SINGLE

INOP SYS

MAIN GALLEY (only if APU GEN is not online)

GEN 1(2)

CAT 3 DUAL

ELEC APU GEN FAULT

– APU GEN . . . . OFF THEN ON

● **IF UNSUCCESSFUL** :

– APU GEN . . . . OFF

STATUS

INOP SYS

MAIN GALLEY (when only one gen operating)

APU GEN

ELEC BAT 1(2) FAULT

Crew awareness

Battery contactor is opened automatically by battery charge limiter.

STATUS

APU BAT START NOT AVAIL

INOP SYS

BAT 1(2)

ELEC BAT 1(2) OFF

Crew awareness

Battery is abnormally selected off.

STATUS

APU BAT START NOT AVAIL

ELEC BCL 1(2) FAULT

Crew awareness

STATUS

APU BAT START NOT AVAIL

INOP SYS

BCL 1(2)

ELEC AC BUS 1 FAULT

– BLOWER . . . . OVRD

The avionics ventilation system is in the closed circuit configuration.
Air conditioning is added to the ventilation air.

WHEEL N.W. STEER FAULT

VENT EXTRACT FAULT

R – EXTRACT . . . . OVRD

Affected systems
* AVNCS VENT
* HYD
* FUEL
* F/CTL

ELEC AC BUS 1 FAULT (CONT'D)

STATUS

– LDG DIST PROC . . . . APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

CAB ZONE AT FIXED TEMP

Due to the loss of the galley fan, the Pack 1 controller, and the primary zone controller channel. (See associated procedures).

SLATS SLOW

CAT 2 ONLY

INOP SYS

See below

INOP SYS displayed on ECAM

BLUE HYD	L+R TK PUMP 1	MAIN GALLEY
SPLR 3	CTR TK PUMP 1	B ELEC PUMP
ADR 3	VENT BLOWER	BSCU CH 1
RA 1	GALLEY FAN	DMC 3
CAPT TAT	CRG VENT ◁	GPWS
L WSHLD HEAT	GND COOL ◁	LAV DET
L WNDW HEAT	N.W. STEER	PACK 1 REGUL
CAT 3	REVERSER 1	

Other inoperative systems

Left cabin fan	Engine 1 ignition B	Zone controller prim channel
Radar 1	EVMU eng 1 and eng 2	Hydraulic quantity indication
Stby Pitot/AOA		Partial galley
ACARS ◁	Printer	PVI ◁
Brake fans 5, 6, 7 and 8 ◁	MCDU 3 ◁	TCAS ◁
HUD ◁		

Note : *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

ELEC AC BUS 2 FAULT

– EXTRACT . . . . OVRD

The avionics ventilation system is in the closed circuit configuration.
Air conditioning is added to the ventilation air.

L/G LGCIU 2 FAULT

Affected systems
* AVNCS VENT
* FUEL

STATUS

PACK 2 AT FIXED TEMP

R *Due to the loss of Pack 2 controller, the pack outlet*
R *temperature is controlled by the pack anti-ice valve and is*
R *stabilized to a temperature between 5°C (41°F) and 30°C*
R *(86°F) within a maximum of 6 minutes.*

CAT 1 ONLY

INOP SYS
See below

INOP SYS displayed on ECAM

ADR 2	CTR TK PUMP 2	RUD TRV LIM 2
ILS 2	LGCIU 2	BSCU CH 2
GPS 2	RA 2	REVERSER 2
Y ELEC PUMP	F/O PITOT	VENT EXTRACT
SDAC 2	F/O AOA	GND COOL ◁
FWC 2	F/O TAT	PACK 2 REGUL
DMC 2	R WNDW HEAT	MAIN GALLEY
FDIU	CAT 2	YAW DAMPER 2
R WSHLD HEAT	L+R TK PUMP 2	RUD TRIM 2

OTHER INOP SYS

Right cabin fan	MCDU 2	QAR
Brake fans 1, 2, 3 and 4 ◁	ENG 2 ignition B	ATC 2
ADF 2 ◁	VOR 2	ECAM lower DU
DME 2	F/O PFD and ND	HF 2 ◁
RADAR 2 ◁		

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC AC ESS BUS FAULT

– AC ESS FEED . . . . ALTN

AC BUS 2 supplies AC ESS BUS.

– ATC . . . . SYS 2

AUTO FLT YAW DAMPER 1

AUTO FLT RUD TRIM 1 FAULT

R
AUTO FLT RUD TRV LIM 1

STATUS

CAT 1 ONLY	INOP SYS See below

INOP SYS displayed on ECAM

ADR 1 ILS 1 GPS 1 RUD TRIM 1 RUD TRV LIM 1	CAT 2 SDAC 1 CAPT PITOT CAPT AOA	GPWS YAW DAMPER 1 FWC 1 DMC 1

Other inoperative systems

RMP's lighting (RMP's still operative)	ECAM upper display	DDRMI
VOR 1	CAPT PFD	ENG 1 + 2 IGN A
MCDU 1	ATC 1	APU fuel pump
CAPT ND	DME 1	Passenger oxygen masks (auto + manual)
CVR	HF 1	ADF 1 ◁

Note : *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

ELEC AC ESS BUS SHED

ATC . . . . SYS 2

STATUS

INOP SYS
CAPT AOA
See below

Other inoperative systems

MCDU 1	ATC 1	APU fuel pump
CAPT ND	DME 1	Passenger oxygen masks (auto + manual)
CAPT AOA heat	CVR	HF 1
R ADF 1 ◁		

Note : The warning may be caused by a failure in a sub BUS. Consequently only a part of the systems listed above may be lost.

ELEC DC BUS 1 FAULT

– BLOWER . . . . OVRD
– EXTRACT . . . . OVRD

R *Avionic ventilation air is supplied to the air conditioning, and exhausted overboard.*

Affected systems
* FUEL
* AVNCS VENT

STATUS

CAB ZONE AT FIXED TEMP
Due to the loss of the galley fan, the Pack 1 controller, and the primary zone controller channel. (See associated procedures).

INOP SYS
See below

INOP SYS displayed on ECAM

ACP 3	CTR TK PUMP 1	BSCU CH 1
CAPT STAT heat	AVNCS VENT	STBY STAT heat
GALLEY FAN	LAV DET	L. WSHLD HEAT
GND COOL ◁	PACK 1 REGUL	L. WNDW HEAT

Other inoperative systems

Left cab fan	VHF 3 ◁	Eng 1 oil press and qty ind.
Zone controller primary channel	RMP 3 ◁	TPIS ◁
	CTR TK XFR valve L	
Sel cal	Hot air	Brake temps ind.
CFDIU	Capt wiper	

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC AC ESS BUS SHED

ATC . . . . SYS 2

STATUS

INOP SYS
CAPT AOA
See below

Other inoperative systems

MCDU 1	ATC 1	APU fuel pump
CAPT ND	DME 1	Passenger oxygen masks (auto + manual)
CAPT AOA heat	CVR	HF 1
R ADF 1 ⊲		

Note : The warning may be caused by a failure in a sub BUS. Consequently only a part of the systems listed above may be lost.

ELEC DC BUS 1 FAULT

– BLOWER . . . . OVRD
– EXTRACT . . . . OVRD

Avionic ventilation air is supplied to the air conditioning, and exhausted overboard.

Affected systems
* AVNCS VENT
* FUEL

STATUS

CAB ZONE AT FIXED TEMP

Due to the loss of the galley fan, the Pack 1 controller, and the primary zone controller channel. (See associated procedures).

INOP SYS
See below

INOP SYS displayed on ECAM

ACP 3	CTR TK PUMP 1	BSCU CH 1
CAPT STAT heat	AVNCS VENT	LAV DET
STBY STAT heat	GALLEY FAN	PACK 1 REGUL
L. WSHLD HEAT	GND COOL ◁	L. WNDW HEAT
REVERSER 1		

Other inoperative systems

Left cab fan	VHF 3 ◁	Eng 1 oil press and qty ind.
Zone controller primary channel	RMP 3 ◁	TPIS ◁
Sel cal	Hot air	Brake temps ind.
CFDIU	Capt wiper	

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC BUS 2 FAULT

– AIR DATA SWTG . . . . F/O
– BARO REF . . . . CHECK

Since one FCU channel is lost, crosscheck the barometer reference settings on the FCU and PFD.

Affected systems
* CAB PRESS
* FUEL
* WHEEL
* F/CTL

STATUS

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ENG 2 APPR IDLE ONLY
BOTH PFD ON SAME FAC
PACK 2 AT FIXED TEMP
SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS
See below

INOP SYS displayed on ECAM

SPLR 1+2+5	CAT 3 DUAL	MAIN GALLEY
ELAC 2 (a)	FAC 2	Y ELEC PUMP (if selected ON)
SEC 2 + 3	L TK PUMP 2	BSCU CH 2
VHF 2	R TK PUMP 2	F/O STAT
CTR TK PUMP 2 ◁	ENG 1 LOOP B	R WSLHD HEAT
LGCIU 2	ENG 2 LOOP A	R WNDW HEAT
REVERSER 2	PACK 2 REGUL	AP 2
CAB PR 2	FCDC 2	FCU 2

Other inoperative systems

SFCC 2	BMC 2	Brake fan ◁
R cabin fan	Bleed X feed auto control	Eng 2 oil low press and qty ind
F/O wiper	RMP 2	R loudspeaker
F/O rain rplnt	FQI channel 2	rudder trim ind
Eng 1 and 2 fire ext btl 2	zone controller sec	FMGC 2
Autobrake (due to loss of 2 SECs)	SDCU 2	CDLS ◁

(a) Lost after 30 seconds, but recovered at landing gear extension.

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC ESS BUS FAULT

– VHF 2 or 3 . . . . USE
– AUDIO SWTG . . . . SELECT
Since ACP 1 and 2 are lost, set AUDIO SWTG selector at CAPT 3 or F/O 3 to recover communications.
– BARO REF . . . . CHECK
Crosscheck the barometer reference settings on FCU and PFD.
– GPWS . . . . OFF

NAV GPWS FAULT

– GPWS . . . . OFF

FUEL L TANK PUMP 1 LO PR

FUEL R TANK PUMP 1 LO PR

VENT BLOWER FAULT

R Affected systems
* CAB PRESS
* HYD
* F/CTL

ELEC DC ESS BUS FAULT (CONT'D)

STATUS

LDG DIST PROC .... APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
BOTH PFD ON SAME FAC
SLATS/FLAPS SLOW
CAT 2 ONLY

INOP SYS
See below

INOP SYS displayed on ECAM

B HYD	FAC 1	VENT EXTRACT
SPLR 3	L TK PUMP 1	B ELEC PUMP
VHF 1	R TK PUMP 1	GPWS
ACP 1+2	REV 2	ENG 1 LOOP A
WING A. ICE	ENG 2 START	ENG 2 LOOP B
AP 1	CAB PR 1	FCDC 1
A/THR		CAT 3
FCU 1		

Other inoperative systems

BRK PRESS indicator	DME 1	Hyd fire valves Eng 1 and 2
Flight interphone	Standby Horizon	Ram air inlet
EIU 2 (autothrust, eng start and reverser inop)	Standby compass light	ECAM control Panel
	CVR	ATC 1
Capt rain repellent ◁	HP fuel shut-off valves	MCDU 1
Avionics air cond valve	SFCC 1	Left loudspeaker
Passenger oxygen masks (auto + manual)	RMP 1	DC SHED ESS BUS
CAPT ND	CAPT AOA	APU fuel Pump
	HF 1	ADF 1

Note : *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

ELEC DC ESS BUS SHED

– EXTRACT . . . . OVRD

Cooling air is supplied by the air conditioning system, without overboard extraction.

AVOID ICING CONDITIONS

Affected systems
* AVNCS VENT

STATUS

AVOID ICING CONDITIONS
BOTH PFD ON SAME FAC
CAT 3 SINGLE ONLY

INOP SYS
WING A. ICE
AP 1
CAT 3 DUAL
FAC 1
VENT EXTRACT
AVNCS VALVE
R AFT CRG HEAT◁
R FWD CRG HEAT◁
R AFT CRG VENT◁
R FWD CRG VENT◁
FCDC 1
See below

OTHER INOP SYS

Cabin oxygen mask (auto drop out)	STBY ALTI vib	BMC 1
R X BLEED valve man ctl	Crew oxygen valve	SDCU 1
FQI channel 1	FMGC 1	

Note : The warning may be caused by a failure in a sub BUS. Consequently only a part of the systems listed above may be lost.

ELEC DC BUS 1 + 2 FAULT

– BLOWER .... OVRD
– EXTRACT .... OVRD
– BARO REF .... CHECK

Crosscheck the barometer reference settings on the FCU and PFDs.

MAX BRK PR .... 1000 PSI

Brake pressure must be limited to approximately 1000 psi, since antiskid is lost.

ELEC DC BAT BUS FAULT

Affected systems
* CAB PRESS
* FUEL
* AIR COND
* BRAKES
* WHEEL
* F/CTL

STATUS

– MAX BRK PR .... 1000 PSI
LDG DIST PROC .... APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
BOTH PFD ON SAME FAC
CTR TK FUEL UNUSABLE

ELEC DC BUS 1 + 2 FAULT (CONT'D)

STATUS

APU BAT START NOT AVAIL CAB ZONE AT FIXED TEMP PACKS AT FIXED TEMP SLATS/FLAPS SLOW CAT 2 ONLY	INOP SYS See below

INOP SYS displayed on ECAM

SPLR 1 + 2 + 5	CAT 3	GND COOL ◁
ELAC 2 (a)	FAC 2	MAIN GALLEY
SEC 2 + 3		Y ELEC PUMP
VHF 2	ANTI SKID	BSCU CH 1
ACP 3	N.W. STEER	BSCU CH 2
CAPT STAT heat	LGCIU 2	APU FIRE DET
F/O STAT heat	REVERSER 1 + 2	LAV DET
STBY STAT heat	CAB PRESS 2	ENG 1 LOOP B
WSHLD HEAT	AVNCS VENT	ENG 2 LOOP A
WNDW HEAT	L + R CAB FAN	PACK 1 REGUL
AP 2	GALLEY FAN	PACK 2 REGUL
R FCU 2		L TK PUMP 2
FCDC 2		R TK PUMP 2
		CTR TK PUMPS

Other inoperative systems

Selcal	VHF 3 ◁	FMGC 2
Brake temp indication	RMP 2	Rudder trim indication
Brake fans ◁	RMP 3 ◁	BMC 2
TPIS ◁	CFDIU	FQI channel 2
Capt and F/O wipers	Right loudspeakers	Eng 1 and 2 fire ext btl 2
Eng 1 and 2 oil pressure and	SFCC 2	X Bleed auto control
R quantity indication	CDLS ◁	
Autobrake	APU ECB	APU fuel LP valve
Stick and rudder pedals lock	Manual pressure control	SDCU 2
(by AP)		

(a) Lost after 30 seconds, but is recovered at landing gear extension.

Note : The warning may be caused by a failure in a sub BUS. Consequently, only a part of the above-listed systems may be lost.

ELEC EMER CONFIG

LAND ASAP

MIN RAT SPEED .... 140 KT

> CAUTION
> At a speed below 140 KT the RAT will stall, and the aircraft electrical supply will be from batteries only.

– GEN 1 + 2 .... OFF THEN ON

● **IF UNSUCCESSFUL :**

– BUS TIE .... OFF

Setting BUS TIE pushbutton switch to OFF segregates both generator channels.

– GEN 1 + 2 .... OFF THEN ON

Note : If any generator reset is successful, reset both FAC's.

· DC and AC ESS BUSES are still supplied by EMER GEN. After landing gear extension emergency generator is no longer powered ; DC and AC ESS BUSES are supplied by normal electrical network. If landing gear is reselected up, essential bus bars remain supplied by the restored generator(s).

– EMER ELEC PWR (if EMER GEN not in line) ..... MAN ON

> CAUTION
> In case of simultaneous engine generator failure, the probability of a successful APU GEN coupling is low. Therefore APU start attempts should be avoided, as this will consequently reduce the flight time on batteries only (by about 3.5 minutes for one start attempt).

– ENG MODE SEL .... IGN

Engines are fed by gravity only.

R – VHF1/HF1 ◁/ATC1 .... USE

Only VHF 1, HF1 and ATC 1 are supplied in the electrical emergency configuration.

Note : FMGC 1, which is lost temporarily, can be regained by flight crew passing through the MCDU MENU page.

– APPR NAVAID .... ON RMP1

– IR 2 + 3 (IF IR 1 OK) .... OFF

ADIRS 2 and 3 will be lost 5 minutes after the loss of both engine generators. Therefore switching them off will save battery charge.

⇩

ELEC EMER CONFIG (CONT'D)

FUEL GRVTY FEED
Engines are fed by gravity only. Avoid negative Gs.
PROC : GRVTY FUEL FEEDING
Apply GRVTY FUEL FEEDING procedure (3.02.28).

● **IF TIME TO LDG > 5 MN and landing gear is down**

With landing gear down, batteries only supply the aircraft. If landing cannot be made within 5 minutes, emergency generator must be connected to avoid excessive batteries discharge.

– L/G . . . . UP
Select landing gear up to allow EMER GEN operation.
– EMER ELEC PWR . . . . MAN ON
Depress the EMER ELEC PWR MAN ON pushbutton to reset the emergency generator.

– APU MASTER SW (if APU not running) . . . . CHECK OFF
Make sure that the APU master switch is off.
With the APU master switch ON, batteries supply the DC BAT BUS for 3 minutes.
– FAC 1 . . . . OFF THEN ON
The rudder trim is recovered, although no indication is available.
– BLOWER + EXTRACT . . . . OVRD
Cooling air is supplied by the air conditioning system and exhausted overboard through the extract valve.
– LDG ELEV . . . . MAN ADJUST
Landing elevation has to be manually set since no FMGC is supplied after landing gear extension.

Note : On IAE powered aircraft, the warning "EPR MODE FAULT N1 DEGRADED MODE" is displayed.

FLT CTL ALTN LAW

(PROT LOST)
MAX SPEED . . . . 320 KT
Speed limited due to loss of flight control normal laws.

ELEC EMER CONFIG

LAND ASAP

MIN RAT SPEED .... 140 KT

CAUTION
The RAT is capable of supplying the EMER GEN down to 125 kt, except during flare.

– GEN 1 + 2 .... OFF THEN ON

● **IF UNSUCCESSFUL :**

– BUS TIE .... OFF

Setting BUS TIE pushbutton switch to OFF segregates both generator channels.

– GEN 1 + 2 .... OFF THEN ON

Note : If any generator reset is successful, reset both FAC's.

– EMER ELEC PWR (if EMER GEN not in line) ..... MAN ON

– ENG MODE SEL .... IGN

Engines are fed by gravity only.

R – VHF1/HF1 ◁ /ATC1/ .... USE

Only VHF 1, HF 1 and ATC 1 are supplied in the electrical emergency configuration.

Note : FMGC1, which is lost temporarily, can be regained by flight crew passing through the MCDU MENU page.

ELEC EMER CONFIG (CONT'D)

FUEL GRVTY FEED

Engines are fed by gravity only. Avoid negative Gs.

PROC : GRVTY FUEL FEEDING

Apply the GRVTY FUEL FEEDING procedure (3.02.28).

– FAC 1 . . . . OFF THEN ON

The rudder trim is recovered, although no indication is available.

– BUS TIE . . . . ON

– APU (IF AVAIL) . . . . START

APU start is not available for 45 seconds after the loss of both engine generators. This 45-second delay prevents any interference with emergency generator coupling.

R *If the APU is available, the APU may be started when below FL 250.*

– BLOWER + EXTRACT . . . . OVRD

Cooling air is supplied by the air conditioning system, and exhausted overboard through the extract valve.

Note : On IAE-powered aircraft, the "EPR MODE FAULT N1 DEGRADED MODE" warning is displayed.

FLT CTL ALTN LAW

(PROT LOST)

MAX SPEED . . . . 320 KT

Speed limited due to the loss of flight control normal laws.

ELEC EMER CONFIG (CONT'D)

STATUS

ECAM lower display is not available. STATUS page is displayed on the upper ECAM display, as long as the STATUS pushbutton is pressed.

MIN RAT SPEED . . . . 140 KT
MAX SPEED . . . . 320 KT
MAX BRK PR . . . . 1000 PSI
FUEL GRVTY FEED
AVOID NEGATIVE G FACTOR

Note : If there are discrepancies between airspeed indications on the Captain's PFD and on the STBY indicator, disregard the STBY indication (probe not deiced).

APPR PROC :
– FOR LDG . . . . USE FLAP 3

ELEC EMER CONFIG (CONT'D)

STATUS

● **AT 1000 FT AGL :**

– L/G . . . . DN

Note : 1. With the landing gear down, electrical power is supplied by batteries only. Battery endurance time is approximately 22 minutes.

2. Both FACs are not supplied after landing gear extension. Check the approach speed on the QRH.

APPR SPD . . . . VREF + 10 kt

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

BAT ONLY

R CTR TK FUEL UNUSABLE

SLATS/FLAPS SLOW

INOP SYS

See below

INOP SYS displayed on ECAM

F/CTL PROT	SPLR 1 + 2 + 5	A/THR
REVERSER 1 + 2	ELAC 2	FUEL PUMPS
ADR 2 + 3	SEC 2 + 3	ANTI SKID
IR 2 + 3	A/CALL OUT	N.W. STEER
RA 1 + 2	AP 1 + 2	

For other systems' status : Refer to the "ELEC EMER CONFIG SYS REMAINING" table.

Note : For go-around procedure, refer to the ESS BUSES ON BAT procedure (see next page).

ELEC EMER CONFIG (CONT'D)

STATUS

ECAM lower display is not available. STATUS page is displayed on the upper ECAM display, as long as the STATUS pushbutton is pressed.

MIN RAT SPEED . . . . 140 KT
MAX SPEED . . . . 320 KT
MAX BRK PR . . . . 1000 PSI
FUEL GRVTY FEED
AVOID NEGATIVE G FACTOR

Note : If there are discrepancies between airspeed indications on the Captain's PFD and on the STBY indicator, disregard the STBY indication (probe not deiced).

APPR PROC :
– FOR LDG . . . . USE FLAP 3

ELEC EMER CONFIG (CONT'D)

STATUS

APPR SPD . . . . VREF + 10/140 kt	INOP SYS
Approach speed must be at least minimum RAT speed (140 knots).	See below
LDG DIST PROC . . . . APPLY	
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*	
ALTN LAW : PROT LOST	
WHEN L/G DN : DIRECT LAW	
CTR TK FUEL UNUSABLE	
SLATS/FLAPS SLOW	

INOP SYS displayed on ECAM

F/CTL PROT	SPLR 1 + 2 + 5	A/THR
REVERSER 1 + 2	ELAC 2	FUEL PUMPS
ADR 2 + 3	SEC 2 + 3	ANTI SKID
IR 2 + 3	A/CALL OUT	N.W. STEER
RA 1 + 2	AP 1 + 2	

For other systems' status : Refer to the "ELEC EMER CONFIG SYS REMAINING" table.

Note : For go-around procedure, refer to ESS BUSES ON BAT procedure (see next page).

FLT ON BAT ONLY

Flight time on batteries only may be increased to at least 30 minutes, as follows:

- ENG MODE SEL . . . . NORM
- ANTI ICE PITOT 1 C/B (D 02) . . . . PULL
- 26 V ADIRU 1 C/B (F 07) . . . . PULL

  Loss of the CM1 altitude speed, and vertical speed indication on the PFD. Use standby instruments.

● **7 minutes before landing** :

- ANTI ICE PITOT 1 C/B (D02) . . . . RESET

● **After 1 minute** :

CAUTION
This time delay is necessary to ensure reliable speed information even in icing conditions, when the ADIRU is reset to ON.

- 26 V ADIRU 1 C/B (F07) . . . . RESET

ELEC ESS BUSES ON BAT

R *DC ESS BUS is supplied by the batteries. AC ESS BUS is also supplied by the batteries, via*
R *the STATIC INVERTER.*

LAND ASAP

■ **WHEN L/G UPLOCKED** :

- EMER ELEC PWR . . . . MAN ON

  ESS BUSES are supplied by the emergency generator.

■ **IF L/G RETRACT FAULT** :

If the landing gear fails to retract during a go-around, when in emergency configuration, the emergency generator can be recovered as follows :

MIN RAT SPD . . . . 180 KT

Accelerate to 180 knots to recover RAT operation, with the landing gear down.

- LGCIU 1 C/B (C09) . . . . PULL

  Pull LGCIU 1 C/B to simulate the landing gear up condition, in order to allow emergency generator operation.
- EMER ELEC PWR . . . . MAN ON

  Allows coupling of the emergency generator.
  When the emergency generator is in line, reset FAC 1.
  During final approach, reset the C/B.

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
AIR COND PRESS	PRESS AUTO SYS 1	Norm	Norm	Norm
	MAN PRESS CTL	Inop	Inop	Inop (1)
	RAM AIR	Norm	Norm	Norm
	PACK VALVE 1	Norm	Closure Inop	Closure Inop
	PACK VALVE 2	Closure Inop	Closure Inop	Closure Inop (1)
	AVIONIC VENT	Norm	Norm	Partial
APU	ECB-STARTER	Norm (3)	Inop	Inop (1)
	FUEL LP VALVE	Norm	Norm	Norm
	FUEL PUMP	Norm	Norm	Norm
COM	VHF 1	Norm	Norm	Norm
	HF 1	Norm	Inop	Inop
	RMP 1	Norm	Norm	Norm
	ACP (capt., F/O)	Norm	Norm	Norm
	CIDS	Norm	Norm	Norm
	INTERPHONE	Norm	Norm	Norm
	CVR	Norm	Inop	Inop
	LOUDSPEAKER 1	Norm	Norm	Norm
EIS	PFD 1	Norm	Norm	Norm (2)
	ND 1	Norm	Inop	Inop
	ECAM upper disp.	Norm	Norm	Norm (2)
	DMC 1 or 3	Norm	Norm	Norm (2)
	SDAC 1, FWC 1	Norm	Norm	Norm (2)
	ECAM cont. panel	Norm	Norm	Norm

(1) Restored, when the speed is below 100 knots.
R (2) Lost, when the speed is below 50 knots.
(3) For APU start only.

ELEC ESS BUSES ON BAT

R *DC ESS BUS is supplied by the batteries. AC ESS BUS is also supplied by the batteries, via*
R *the STATIC INVERTER.*

LAND ASAP

– MIN RAT SPD . . . . 140 KT

Displayed, if the RAT is extended.

– EMER ELEC PWR . . . . MAN ON

ESS BUSES are supplied by the emergency generator.

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
AIR COND PRESS	PRESS AUTO SYS 1	Norm	Norm	Norm
	MAN PRESS CTL	Inop	Inop	Inop (1)
	RAM AIR	Norm	Norm	Norm
	PACK VALVE 1	Norm	Closure Inop	Closure Inop
	PACK VALVE 2	Closure Inop	Closure Inop	Closure Inop (1)
	AVIONIC VENT	Norm	Norm	Partial
APU	ECB-STARTER	Norm (3)	Inop	Inop (1)
	FUEL LP VALVE	Norm	Norm	Norm
	FUEL PUMP	Norm	Norm	Norm
COM	VHF 1	Norm	Norm	Norm
	HF 1	Norm	Inop	Inop
	RMP 1	Norm	Norm	Norm
	ACP (capt., F/O)	Norm	Norm	Norm
	CIDS	Norm	Norm	Norm
	INTERPHONE	Norm	Norm	Norm
	CVR	Norm	Inop	Inop
	LOUDSPEAKER 1	Norm	Norm	Norm
EIS	PFD 1	Norm	Norm	Norm (2)
	ND 1	Norm	Inop	Inop
	ECAM upper disp.	Norm	Norm	Norm (2)
	DMC 1 or 3	Norm	Norm	Norm (2)
	SDAC 1, FWC 1	Norm	Norm	Norm (2)
	ECAM cont. panel	Norm	Norm	Norm

(1) Restored, when the speed is below 100 knots.
R (2) Lost, when the speed is below 50 knots.
(3) For APU start only.

ELEC EMER CONFIG SYS REMAINING CONT'D		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
EMER EQPT	CREW OXY	Norm	Norm (4)	Norm (4)
	PAX OXY mask release (auto + man)	Norm	Inop	Inop
	SLIDES ARM/WARN	Norm	Norm	Norm
FLT INS	CLOCKS	Norm	Norm	Norm
FIRE	ENG 1 LOOP	A only	A only	A only
	ENG 2 LOOP	B only	B only	B only
	APU LOOP	Inop	Inop	Inop (1)
	CARGO SMOKE DET	Channel 1	Inop	Inop
	ENG FIRE EXT.	Bottle 1 only	Bottle 1 only	Bottle 1 only
	APU FIRE EXT.	Squib A only	Squib A only	Squib A only
	CARGO FIRE EXT.	Inop	Inop	Inop (1)
	APU AUTO EXT.	Inop	Inop	Inop (1)
FLT CTL	ELAC	N°1 only	N°1 + 2	N°1 + 2 (3)
	SEC	N°1 only	N°1	N°1 (3)
	FCDC	N°1 only	Inop	Inop
	SFCC	N°1 only	N°1 only	N°1 only
	Flaps pos ind	Norm	Norm	Norm (2)
FMGS	FMGC (NAV FUNCTION)	N°1 only	Inop	Inop
	MCDU	N°1 only	Inop	Inop
	FAC	N°1 only	Inop	Inop
	FCU	ch 1 only	ch 1 only	ch 1 only
FUEL	LP VALVE	Norm	Norm	Norm
	FQI channel 1	Norm	Inop	Inop
	X FEED VALVE	Norm	Inop	Inop
	TRANSFER VALVE	Norm	Inop	Inop

(1) Restored, when the speed is below 100 knots.
R (2) Lost, when the speed is below 50 knots.
(3) Lost, 30 seconds after the last engine shutdown.
(4) Crew oxygen valve inoperative.

R

ELEC EMER CONFIG SYS REMAINING (cont'd)		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
HYD	FIRE VALVES	Norm	Norm	Norm
ICE-RAIN	WING A. ICE	Norm	Inop	Inop
	ENG A.ICE VALVE	OPEN	OPEN	OPEN
	CAPT PITOT	Norm	Norm	Norm (1)
	CAPT AOA	Norm	Inop	Inop
	RAIN REPELLENT (Capt)	Norm	Norm	Norm
L/G	LGCIU SYS 1	Norm	Norm	Norm
	BRK PRESS IND	Norm	Norm	Norm
	PARK BRK	Norm	Norm	Norm
LIGHTS	EMER CKPT	Norm	Norm	Norm
	EMER CAB	Norm	Norm	Norm
NAV	IR	N°1 only (2)	N°1 only (2)	N°1 only (2)
	ADR	N°1 only	N°1 only	N°1 only
	ADF ◁	N°1 only	Inop	Inop
	VOR/MMR	N°1 only	N°1 only	N°1 only (1)
	DME	N°1 only	Inop	Inop
	VOR/DDRMI	Norm	Norm	Norm (1)
	ATC	N°1 only	Inop	Inop
	STBY HORIZON	Norm	Norm	Norm
	STBY COMP (LT)	Norm	Norm	Norm
	STBY ALTI (VIB)	Norm	Inop	Inop

(1) lost when speed below 50 kt

(2) IR 2 and IR 3 are lost 5 minutes after failure of main generators but if IR 3 replaces IR 1 (ATT-HDG selector at CAPT 3), IR 3 remains supplied.

ELEC EMER CONFIG SYS REMAINING (cont'd)		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
PNEU	ENG 1 BLEED	Norm	BMC 1 inop	BMC 1 inop
	ENG 2 BLEED	BMC 2 inop	BMC 2 inop	BMC 2 inop
	APU BLEED	Inop	Inop	Inop (1)
	X BLEED (man ctl)	Norm	Inop	Inop
PWR PLT	FADEC	A + B (2)	A + B (2)	A + B (2)
	IGNITION	A only	A only	A only
	HP FUEL VALVE closure	Norm	Norm	Norm
MISC	MECH HORN	Norm	Norm	Norm

(1) restored when speed below 100 kt
(2) channels A and B self powered above 12 % N2. If N2 below 12 % only channel A is powered.

ELEC GEN 1(2) or APU GEN OVERLOAD

– GALLEY . . . . OFF

STATUS

INOP SYS
GALLEY

ELEC TR 1(2) or ESS TR FAULT

CAT 3 SINGLE (if TR2 FAULT)

STATUS

INOP SYS
ESS TR or TR1(2)
CAT 3 DUAL (if TR2 FAULT)

R

ELEC DC BAT BUS FAULT

Crew awareness

STATUS

APU BAT START NOT AVAIL
ECB is no longer supplied

INOP SYS
APU FIRE DET
See below

OTHER INOP SYS

APU ECB	Fwd (aft) cargo heat controller ◁	APU fuel LP valve
Stick and rudder pedals lock (by AP)	Fwd (aft) cargo isol valves ◁	Manual pressure control
Fwf (aft) cargo fire ext ◁		

Note : The warning may be caused by a failure in a sub BUS. Consequently, only a part of the above-listed systems may be lost.

ELEC EMER CONFIG SYS REMAINING (cont'd)		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND
PNEU	ENG 1 BLEED	Norm	BMC 1 inop	BMC 1 inop
	ENG 2 BLEED	BMC 2 inop	BMC 2 inop	BMC 2 inop
	APU BLEED	Inop	Inop	Inop (1)
	X BLEED (man ctl)	Norm	Inop	Inop
PWR PLT	FADEC	A + B (2)	A + B (2)	A + B (2)
	IGNITION	A only	A only	A only
	HP FUEL VALVE closure	Norm	Norm	Norm
MISC	MECH HORN	Norm	Norm	Norm

(1) restored when speed below 100 kt
(2) channels A and B self powered above 12 % N2. If N2 below 12 % only channel A is powered.

ELEC GEN 1(2) or APU GEN OVERLOAD

– GALY/CAB . . . . OFF

STATUS

INOP SYS

GALY/CAB

ELEC TR 1(2) or ESS TR FAULT

CAT 3 SINGLE (if TR2 FAULT)

STATUS

INOP SYS

ESS TR or TR1(2)
CAT 3 DUAL (if TR2 FAULT)

R

ELEC DC BAT BUS FAULT

Crew awareness

STATUS

APU BAT START NOT AVAIL

ECB is no longer supplied

INOP SYS

APU FIRE DET
See below

OTHER INOP SYS

APU ECB	Fwd (aft) cargo heat controller ◁	APU fuel LP valve
Stick and rudder pedals lock (by AP)	Fwd (aft) cargo isol valves ◁	Manual pressure control
Fwf (aft) cargo fire ext ◁		

Note : The warning may be caused by a failure in a sub BUS. Consequently, only a part of the above-listed systems may be lost.

ELEC DC EMER CONFIG

LAND ASAP

Triggered if DC BUS 1, DC BUS 2 and DC ESS BUS are lost. In addition, DC BAT BUS is lost.

– EMER ELEC PWR .... MAN ON

R *Emergency generator supplies DC ESS BUS as long as the landing gear is up.*
But DC BUS 1, DC BUS 2 and DC BAT BUS are still not supplied.

ELEC DC BUS 1 + 2 FAULT

– BLOWER .... OVRD
– EXTRACT .... OVRD
– BARO REF .... CHECK

Crosscheck the barometer reference settings on FCU and PFD's.

AVOID ICING CONDITIONS

Windows, windshields heat, and static ports heat are lost.

MAX BRK PR .... 1000 PSI

Brake pressure must be limited to approximately 1000 psi since antiskid is lost.

ELEC DC BAT BUS FAULT

Affected systems
* CAB PRESS
* HYD
* FUEL
* AIR COND
* BRAKES
* WHEEL
* F/CTL

STATUS

R MIN RAT SPEED .... 140 KT
R PROC : GRVTY FUEL FEEDING
R MAX BRK PR .... 1000 PSI
R FUEL GRVTY FEED
R AVOID ICING CONDITIONS
R LDG DIST PROC .... APPLY
R *Multiply the landing distance by 1.7.*
R *Ground spoilers 1 + 2 + 5 and antiskid are inoperative.*
R ENG 1 APPR IDLE ONLY
R ENG 2 APPR IDLE ONLY

ELEC DC EMER CONFIG (CONT'D)

STATUS

BOTH PFD ON SAME FAC
CTR TK ⩤ FUEL UNUSABLE
APU BAT START NOT AVAIL
CAB ZONE AT FIXED TEMP
PACKS AT FIXED TEMP
SLATS/FLAPS SLOW
CAT 2 ONLY

Note : DC ESS BUS is lost at landing gear extension. Consequently, all means of communications are lost since all ACPs are lost.

ELEC DC EMER CONFIG

LAND ASAP

Triggered, if DC BUS 1, DC BUS 2 and DC ESS BUS are lost. In addition, DC BAT BUS is lost.

– EMER ELEC PWR . . . . MAN ON

The emergency generator supplies DC ESS BUS.
But, DC BUS 1, DC BUS 2, and DC BAT BUS are still not supplied.

ELEC DC BUS 1 + 2 FAULT

– BLOWER . . . . OVRD
– EXTRACT . . . . OVRD
– BARO REF . . . . CHECK

Crosscheck the barometer reference settings on the FCU and PFDs.

MAX BRK PR . . . . 1000 PSI

Brake pressure must be limited to approximately 1000 psi, since antiskid is lost.

ELEC DC BAT BUS FAULT

Affected systems
* CAB PRESS
* HYD
* FUEL
* AIR COND
* BRAKES
* WHEEL
* F/CTL

STATUS

MIN RAT SPEED . . . . 140 KT
PROC : GRVTY FUEL FEEDING
MAX BRK PR . . . . 1000 PSI
FUEL GRVTY FEED
LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY

ELEC DC EMER CONFIG (CONT'D)

STATUS

BOTH PFD ON SAME FAC
CTR TK ⩤ FUEL UNUSABLE
APU BAT START NOT AVAIL
CAB ZONE AT FIXED TEMP
PACKS AT FIXED TEMP
SLATS/FLAPS SLOW
CAT 2 ONLY

ELEC DC EMER CONFIG (CONT'D)

STATUS

INOP SYS
See below

INOP SYS displayed on ECAM

R	FCU 2	GALLEY FAN	SPLR 1 + 2 + 5
	CAT 3	CRG HEAT ◁	ELAC 2
	FAC 2	GND COOL ◁	SEC 2 + 3
	FUEL PUMPS	MAIN GALLEY	VHF 2
R	ANTI SKID	ACP 3	N.W. STEER
	Y ELEC PUMP	CAPT STAT	LGCIU 2
	BSCU CH 1	F/O STAT	REVERSER 2
R	BSCU CH 2	STBY STAT	CAB PRESS 2
	APU FIRE DET	WSHLD HEAT	AVNCS VENT
	LAV DET	WNDW HEAT	VENT BLOWER
R	ENG 1 LOOP B	PACK 1 REGUL	ENG 2 LOOP A
	L+R CAB FAN	PACK 2 REGUL	AP2
		FCDC 2	
R		GPS 1 + 2 ◁	

INOP SYS displ on ECAM after L/G extension (DC ESS BUS Lost)

	BLUE HYD	FCU 1	GALLEY FAN
	SPLR 3	FCU 2	CRG HEAT ◁
	SPLR 1 + 2 + 5	CAT 3	GND COOL ◁
	ELAC 2	FAC 1	MAIN GALLEY
R	SEC 2 + 3	FAC 2	B ELEC PUMP
	VHF 1	FUEL PUMPS	Y ELEC PUMP
	VHF 2	ANTI SKID	BSCU CH 1
R	ACP 1 + 2 + 3	N.W. STEER	BSCU CH 2
	LGCIU 2	GPWS	CAPT STAT
	REVERSER 2	APU FIRE DET	F/O STAT
	ENG 2 START	LAV DET	STBY STAT
	CAB PRESS 1	ENG 1 LOOP A	WING A. ICE
	CAB PRESS 2	ENG 1 LOOP B	WSHLD HEAT
	AVNCS VENT	ENG 2 LOOP A	WNDW HEAT
R	VENT BLOWER	ENG 2 LOOP B	VENT EXTRACT
	PACK 1 REGUL	AP 1 + 2	L + R CAB FAN
	PACK 2 REGUL	A/THR	
	FCDC 1		
	FCDC 2		
	GPS 1 + 2 ◁		

R *Note : To verify the other INOP SYS not displayed on the ECAM, refer to the DC BUS 1+2,*
R *DC BAT BUS procedure and after L/G extension also to the DC ESS BUS procedures.*

ELEC STAT INV FAULT

Crew awareness.

ELEC EMER GEN 1 LINE OFF

With the GEN 1 LINE pushbutton (on EMER ELEC PWR panel) at the OFF position, GEN 1 line contactor is open and GEN 2 supplies the AC BUS 1 channel.

Crew awareness.

Select GEN 1 LINE pushbutton to ON.

C/B TRIPPED

If one green circuit breaker is tripped, one of the following warning messages appears after one minute, depending on the location of the affected C/B.

C/B TRIPPED ON OVHD PNL

C/B TRIPPED ON L(R) ELEC BAY

C/B TRIPPED REAR PNL J-M or N-R or S-V or W-Z

R *Note : Do not re-engage a circuit breaker that has tripped by itself, unless the Captain (using
R his/her emergency authority) judges it necessary for the safe continuation of the
R flight. This procedure should be adopted only as a last resort, and only one
R re-engagement should be attempted.*
R *On the ground, do not re-engage any wing tank fuel pump circuit breaker. For all other
R circuit breakers, if the flight crew coordinates the action with maintenance, they may
R re-engage a tripped C/B, provided the cause of the tripped C/B is identified.*

ELEC DC EMER CONFIG (CONT'D)

STATUS

INOP SYS
See below

INOP SYS displayed on ECAM

R FCU 2	GALLEY FAN	SPLR 1 + 2 + 5
CAT 3	CRG HEAT ◁	ELAC 2
FAC 2	GND COOL ◁	SEC 2 + 3
FUEL PUMPS	MAIN GALLEY	VHF 2
R ANTI SKID	ACP 3	N.W. STEER
Y ELEC PUMP	CAPT STAT	LGCIU 2
BSCU CH 1	F/O STAT	REVERSER 2
R BSCU CH 2	STBY STAT	CAB PRESS 2
APU FIRE DET	WSHLD HEAT	AVNCS VENT
LAV DET	WNDW HEAT	VENT BLOWER
R ENG 1 LOOP B	PACK 1 REGUL	ENG 2 LOOP A
L+R CAB FAN	PACK 2 REGUL	AP2
R FCDC 2	GPS 1 + 2 ◁	

R *Note : To verify the other INOP SYS not displayed on the ECAM, refer to the DC BUS 1+2*
R *and DC BAT BUS procedures.*

ELEC STAT INV FAULT

Crew awareness.

ELEC EMER GEN 1 LINE OFF

With the GEN 1 LINE pushbutton (on EMER ELEC PWR panel) at the OFF position, GEN 1 line contactor is open and GEN 2 supplies the AC BUS 1 channel.

Crew awareness.

Select GEN 1 LINE pushbutton to ON.

C/B TRIPPED

If one green circuit breaker is tripped, one of the following warning messages appears after one minute, depending on the location of the affected C/B.

C/B TRIPPED ON OVHD PNL

C/B TRIPPED ON L(R) ELEC BAY

C/B TRIPPED REAR PNL J-M or N-R or S-V or W-Z

R *Note : Do not re-engage a circuit breaker that has tripped by itself, unless the Captain (using*
R *his/her emergency authority) judges it necessary for the safe continuation of the*
R *flight. This procedure should be adopted only as a last resort, and only one*
R *re-engagement should be attempted.*
R *On the ground, do not re-engage any wing tank fuel pump circuit breaker. For all other*
R *circuit breakers, if the flight crew coordinates the action with maintenance, they may*
R *re-engage a tripped C/B, provided the cause of the tripped C/B is identified.*

COCKPIT DOOR FAULT

This procedure should be applied, if the Cockpit Door Locking System (CDLS) fails. This failure is indicated when the FAULT light on the center pedestal's CKPT DOOR panel comes on.

– CKPT DOOR CONT PANEL . . . . CHECK

This panel is located on the overhead panel. It is used to identify the faulty CDLS item, and to verify the status of the pressure sensors and the three electrical latches (referred to as strikes).

● **If two or more electrical latches (strikes) are faulty :**

The cockpit door is not intrusion-proof.

● **If two pressure sensors are faulty :**

Automatic latch release is unavailable, in case of cockpit decompression.

● **If no LED on the CKPT DOOR CONT panel is on :**

The CDLS control unit is faulty ; therefore, the cockpit door might unlock automatically. If it does not, consider using the mechanical override system to unlock the door.

Note : In case of a DC BUS 2 fault, no FAULT indication appears on the center pedestal's CKPT DOOR panel. The CDLS is not electrically-supplied, and is inoperative.

ENG 1(2)/APU FIRE LOOP A (B) FAULT

No crew action required in flight.

STATUS

INOP SYS
R ENG 1(2) LOOP A(B)
or APU LOOP A(B)

ENG 1(2)/APU FIRE DET FAULT

Loss of both fire detection loops.

Crew awareness.

STATUS

INOP SYS
FIRE DET 1(2)
or APU FIRE DET

ENG 1(2) FIRE (on ground)

R – THR LEVERS .... IDLE

Full reverse may be used to stop the aircraft.

● **WHEN A/C IS STOPPED** :

- PARKING BRK .... ON
- ENG MASTER (affected) .... OFF

  Associated LP and HP valves close.
- ENG FIRE P/B (affected) .... PUSH

  · Aural warning stops.

  · ENG FIRE pushbutton remains on, as long as a fire is detected.

  · FADEC is no longer supplied. So, the THR LEVERS .... IDLE line reappears, even if the thrust levers are at idle.
- AGENT 1 + 2 .... DISCH
- ENG MASTER (opposite side) .... OFF

The following items are not displayed on the ECAM, if the APU is not running :

- ATC (VHF 1) .... NOTIFY

  Notify ATC of the nature of the emergency, and state intentions.

  Only VHF1 is available on batteries.
- CABIN CREW (PA) .... ALERT

● **IF EVAC RQRD** :

- EVAC COMMAND .... ON
- APU MASTER SW .... OFF
- BAT 1 + 2 (if time permits before leaving aircraft) .. OFF

  Batteries are left ON, until leaving the aircraft, to ensure cabin communications.

  Note : Keep the batteries on, for at least 10 seconds after switching the 2nd ENG MASTER to OFF, to allow the fuel LP valves to close completely.

R

ENG 1(2) FIRE (in flight)

LAND ASAP

– THR LEVER (affected) .... IDLE
– ENG MASTER (affected) .... OFF
LP and HP valves close.
– ENG FIRE P/B (affected) .... PUSH
· Aural warning stops.
· ENG FIRE pushbutton remains on, as long as a fire is detected.
· FADEC is no longer supplied. So, the THR LEVER ... IDLE line reappears, even if the thrust lever is at idle.
– AGENT 1 AFT 10 S .... DISCH
The 10–second delay allows N1 to decrease, reducing nacelle ventilation, and thereby increasing the effect of the agent.
Automatic countdown on the ECAM.
– ATC .... NOTIFY
Notify ATC of the nature of the emergency, and state intentions

● **IF FIRE AFTER 30 S :**
– AGENT 2 .... DISCH
Discharge the second agent, if the fire warning remains 30 seconds after the discharge of the first agent.

ENG 1(2) **SHUTDOWN**

Do not attempt to restart the engine.
For the after ENG SHUTDOWN procedure, see the ENG section. (Refer to 3.02.70).

APU FIRE

LAND ASAP

– APU FIRE P/B .... PUSH
· APU LP valve closes.
· Aural warning stops.
· APU FIRE pushbutton remains on, as long as a fire is detected.
– AGENT AFT 10 S .... DISCH
The 10–second delay allows the airflow to decrease, which increases the effect of the agent.
Automatic countdown on the ECAM.
– MASTER SW .... OFF
Do not attempt to restart the APU.

STATUS

INOP SYS
APU

SMOKE/AVNCS SMOKE

This procedure is applicable in case of suspected smoke from the avionics compartment, air conditioning, or cabin equipment. The flight crew should apply this paper procedure, if smoke is detected with or without "AVIONICS SMOKE" ECAM activation.

This paper procedure includes all the steps of the AVIONICS SMOKE ECAM procedure. Therefore, if the ECAM procedure is displayed, it may be applied, if smoke from avionics is suspected. However, if non-avionics smoke is suspected, the flight crew will refer to the paper procedure.

The procedure layout is organized as follows :

- *The first lines (before the text box) correspond to immediate actions, which must be performed by the crew as soon as smoke is detected (with or without ECAM activation, whatever the smoke source). These immediate actions enable the crew to quickly refer to the steps, most commonly adopted in smoke-related cases.*
- *The text box indicates the immediate procedure to be applied by the crew when, at any time of the procedure, the smoke is so dense that they are no longer able to determine the smoke source and smoke removal is required.*
- *The last part of the procedure corresponds to specific actions to be applied by the crew, once the smoke source has been identified.*

R *In case of a CARGO or LAVATORY SMOKE ECAM warning, without any smoke detected in the cockpit/cabin, directly apply the CARGO or LAVATORY ECAM procedure. Note that these warnings may be caused by some other source, that should ordinarily, first be detected by the flight crew/avionics smoke detector.*

LAND ASAP

● **IF PERCEPTIBLE SMOKE APPLY IMMEDIATELY :**

If smoke is confirmed, the following procedure must be applied.

- OXY MASK/GOGGLE ON/100%/EMERG
  Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
  Turn the emergency knob to remove condensation or smoke from the mask.
- CAB FANS . . . . OFF
  To prevent smoke from entering the cockpit and cabin.
- BLOWER . . . . OVRD
- EXTRACT . . . . OVRD
  Avionics ventilation air is supplied by the air conditioning system and extracted overboard.
- GALLEY . . . . OFF
- FAULTY EQUIPT (if identified) . . . . ISOLATE

R

ENG 1(2) FIRE (in flight)

LAND ASAP

- THR LEVER (affected) . . . . IDLE
- ENG MASTER (affected) . . . . OFF

  LP and HP valves close.
- ENG FIRE P/B (affected) . . . . PUSH

  · Aural warning stops.

  · ENG FIRE pushbutton remains on, as long as a fire is detected.

  · FADEC is no longer supplied. So, the THR LEVER ... IDLE line reappears, even if the thrust lever is at idle.
- AGENT 1 AFT 10 S . . . . DISCH

  The 10–second delay allows N1 to decrease, reducing nacelle ventilation, and thereby increasing the effect of the agent.

  Automatic countdown on the ECAM.
- ATC . . . . NOTIFY

  Notify ATC of the nature of the emergency, and state intentions

● **IF FIRE AFTER 30 S :**

  - AGENT 2 . . . . DISCH

    Discharge the second agent, if the fire warning remains 30 seconds after the discharge of the first agent.

ENG 1(2) **SHUTDOWN**

Do not attempt to restart the engine.

For the after ENG SHUTDOWN procedure, see the ENG section. (Refer to 3.02.70).

APU FIRE

LAND ASAP

- APU FIRE P/B . . . . PUSH

  · APU LP valve closes.

  · Aural warning stops.

  · APU FIRE pushbutton remains on, as long as a fire is detected.
- AGENT AFT 10 S . . . . DISCH

  The 10–second delay allows the airflow to decrease, which increases the effect of the agent.

  Automatic countdown on the ECAM.
- MASTER SW . . . . OFF

  Do not attempt to restart the APU.

STATUS

INOP SYS

APU

SMOKE/AVNCS SMOKE

This procedure is applicable in case of suspected smoke from the avionics compartment, air conditioning, or cabin equipment. The flight crew should apply this paper procedure, if smoke is detected with or without "AVIONICS SMOKE" ECAM activation.
This paper procedure includes all the steps of the AVIONICS SMOKE ECAM procedure. Therefore, if the ECAM procedure is displayed, it may be applied, if smoke from avionics is suspected. However, if non-avionics smoke is suspected, the flight crew will refer to the paper procedure.
The procedure layout is organized as follows :
- *The first lines (before the text box) correspond to immediate actions, which must be performed by the crew as soon as smoke is detected (with or without ECAM activation, whatever the smoke source). These immediate actions enable the crew to quickly refer to the steps, most commonly adopted in smoke-related cases.*
- *The text box indicates the immediate procedure to be applied by the crew when, at any time of the procedure, the smoke is so dense that they are no longer able to determine the smoke source and smoke removal is required.*
- *The last part of the procedure corresponds to specific actions to be applied by the crew, once the smoke source has been identified.*

In case of a CARGO or LAVATORY SMOKE ECAM warning, without any smoke detected in the cockpit/cabin, directly apply the CARGO or LAVATORY ECAM procedure. Note that these warnings may be caused by some other source, that should ordinarily, first be detected by the flight crew/avionics smoke detector.

LAND ASAP

● **IF PERCEPTIBLE SMOKE, APPLY IMMEDIATELY :**

If smoke is confirmed, the following procedure must be applied.
- OXY MASK/GOGGLE ON/100%/EMERG
  Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
  Turn the emergency knob to remove condensation or smoke from the mask.
- CAB FANS . . . . OFF
  To prevent smoke from entering the cockpit and cabin.
- BLOWER . . . . OVRD
- EXTRACT . . . . OVRD
  Avionics ventilation air is supplied by the air conditioning system and extracted overboard.
- GALLEY & CAB . . . . OFF
- FAULTY EQUIPT (if identified) . . . . ISOLATE

SMOKE/AVNCS SMOKE (CONT'D)

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● IF DENSE SMOKE, at any time of the procedure :
- DESCENT for smoke removal........................INITIATE
- SMOKE/TOXIC FUMES REMOVAL..........................APPLY
- ELEC EMER CONFIG................................CONSIDER
Refer to the end of the procedure to set ELEC EMER CONFIG.

Guidelines to determine smoke origin :

– *If smoke initially comes out of the ventilation outlets, the crew may suspect AIR COND SMOKE. In addition, very shortly thereafter, several SMOKE warnings (cargo, lavatory, avionics) will be triggered. The displayed ECAM procedures must be applied.*

R – *Following an identified ENG or APU failure, smoke may emanate from the faulty item*
R *through the bleed system and be perceived in the cockpit, and/or in the cabin. In such a*
R *case, it will be recirculated throughout the aircraft, until it completely disappears from the*
R *air conditioning system.*

– *If only the AVIONICS SMOKE warning is triggered, the crew may suspect AVIONICS SMOKE.*

– *If the AVIONICS SMOKE warning is triggered while an equipment is declared faulty, the crew may suspect that smoke is coming from this equipment.*

– *Avionics or forward galley smoke may be smelt, or may enter in the cockpit before ECAM warning activation.*

■ **IF AIR COND SMOKE SUSPECTED :**
– APU BLEED . . . . OFF
– EXTRACT . . . . AUTO
– BLOWER . . . . AUTO

Note : When both BLOWER and EXTRACT are in the OVRD position, a single pack may not be able to maintain the cabin pressure.

– PACK 1 . . . . OFF

● **If smoke persists :**
– PACK 1 . . . . ON
– PACK 2 . . . . OFF

● **If smoke still persists :**
– PACK 2 . . . . ON

Restore normal configuration if PACK 2 is not suspected to cause smoke.

– EXTRACT . . . . OVRD
– BLOWER . . . . OVRD

– SMOKE/TOXIC FUMES REMOVAL . . . . CONSIDER

SMOKE/AVNCS SMOKE (CONT'D)

R ■ **IF CAB EQUIPMENT SMOKE SUSPECTED :**

● **If smoke persists :**
– EMER EXIT LIGHT .... ON
– BUS TIE .... OFF
– GEN 2 .... OFF
Loss of the ECAM lower display, and the F/O's PFD and ND.

● **If smoke still persists, or before L/G extension:**
– GEN 2 .... ON
– BUS TIE .... AUTO
All busbars recovered when GEN 2 restored. But, TR2 remains inop.

– SMOKE/TOXIC FUMES REMOVAL .... CONSIDER

● **IF AVIONICS SMOKE WARNING still persists after 5 min :**
– ELEC EMER CONFIG .... SET

● **IF SMOKE disappears within 5 minutes :**
– NORMAL VENTILATION .... RESTORE

To set EMER ELEC CONFIG :

– EMER ELEC GEN 1 LIN .... OFF
GEN 1 LINE contactor opens. GEN 1 remains running and supplies one fuel pump in each wing tank. AC BUS 1 is supplied by GEN 2 through the bus tie contactor.
– EMER ELEC PWR .... MAN ON
RAT is extended and the emer gen is connected to the aircraft network. Check emergency generator parameters on the ECAM ELEC page (displayed automatically).

● **WHEN EMER GEN AVAIL :**
– APU GEN .... OFF
– GEN 2 .... OFF

ELEC **EMER CONFIG**

MIN RAT SPEED .... 140 KT
Note : *The electrical configuration is the same as for loss of both generators (except that one fuel pump in each wing tank remains supplied).*
– VHF 1/HF1 (◁)/ATC 1 .... USE
Only VHF 1, HF 1 ◁, and ATC 1 are supplied in this configuration. Notify the ATC of the nature of the emergency, and state intentions. If there is no contact with the ATC, switch to code A7700, or transmit a distress message on one of the following frequencies : VHF 121.5 MHz, HF 2182 kHz, or 8364 kHz.

⇩

SMOKE/AVNCS SMOKE (CONT'D)

– APU MASTER switch (if APU not running) . . . . OFF
With the APU master switch ON, the DC BAT BUS is supplied by the batteries.
– FAC 1 . . . . OFF THEN ON
Rudder trim is recovered, despite the fact that no indication is available.
– LDG ELEV . . . . MAN ADJUST
The LDG ELEV may be manually adjusted since, if the normal electrical supply is not restored before landing gear extension, the FMGC is no longer supplied.

● **BEFORE L/G EXTENSION**

Restore normal electrical supply for landing.
– GEN 2 . . . . ON
– EMER ELEC GEN 1 LIN . . . . ON

F/CTL ALTN LAW

(PROT LOST)
Flight control normal laws and associated protections are lost. Only the load factor limitation, and the high and low speed stability remain (ALTN law with reduced protection).
MAX SPEED . . . . 320 KT
Note : On IAE-powered aircraft (◁), the "EPR MODE FAULT N1 DEGRADED MODE" warning is triggered.

STATUS

ECAM lower display is not available. STATUS page is displayed on the upper ECAM display, as long as STATUS pushbutton is pressed.
MIN RAT SPEED . . . . 140 KT
MAX SPEED . . . . 320 KT
MAX BRK PR . . . . 1000 PSI

SMOKE/AVNCS SMOKE (CONT'D)

STATUS

– FOR LDG . . . . USE FLAPS 3
– GPWS LDG FLAP 3 . . . . ON
APPR SPD . . . . VREF + 10 KT
LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80
ENG 1 + 2 APPR IDLE ONLY
ENG 1 + 2 N1 DEGRADED MODE
(IAE–powered aircraft ◁)
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
CTR TK (◁) FUEL UNUSABLE
INCREASED FUEL CONSUMP
SLATS/FLAPS SLOW
CAT 1 ONLY
APPR PROC

- **BEFORE L/G EXTENSION**
  – GEN 2 . . . . ON
  – EMER ELEC GEN 1 LINE . . . . . . ON
- **After recovery of normal electrical supply, the following STATUS will be displayed :**
  MIN RAT SPEED . . . . 140 KT
  Will disappear at landing gear extension.
  MAX SPEED . . . . 320 KT
  – FOR LDG . . . . USE FLAPS 3
  – GPWS LDG FLAP 3 . . . . ON
  Will be displayed when flaps in CONF3.
  APPR SPD . . . . VREF + 10 KT
  LDG DIST PROC . . . . APPLY
  Refer to the QRH Part 2, or to the FCOM 3.02.80
  ALTN LAW : PROT LOST
  Flight controls remain in alternate law, due to the loss of IR 2 and 3.
  WHEN L/G DN : DIRECT LAW
  At landing gear extension, control reverts to direct law in pitch, as well as in roll (refer to the DIRECT LAW procedure 3.02.27).

INOP SYS

See ELEC EMER CONFIG SYS REMAINING, 3.02.24 (except for fuel pumps)

SMOKE/AVNCS SMOKE (CONT'D)

– FAC 1 . . . . OFF THEN ON

Rudder trim is recovered, despite the fact that no indication is available.

● **BEFORE L/G EXTENSION**

Restore normal electrical supply for landing.

– GEN 2 . . . . ON
– EMER ELEC GEN 1 LIN . . . . ON

F/CTL ALTN LAW

(PROT LOST)

Flight control normal laws and associated protections are lost. Only the load factor limitation, and the high and low speed stability remain (ALTN law with reduced protection).

R MAX SPEED . . . . 320 KT

STATUS

ECAM lower display is not available. STATUS page is displayed on the upper ECAM display, as long as the STATUS pushbutton is pressed.

MIN RAT SPEED . . . . 140 KT
MAX SPEED . . . . 320 KT
MAX BRK PR . . . . 1000 PSI

SMOKE/AVNCS SMOKE (CONT'D)

STATUS

– FOR LDG . . . . USE FLAPS 3
– GPWS LDG FLAP 3 . . . . ON
APPR SPD . . . . VREF + 10 KT
LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80
ENG 1 + 2 APPR IDLE ONLY
ENG 1 + 2 N1 DEGRADED MODE
(IAE–powered aircraft ◁)
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
CTR TK (◁) FUEL UNUSABLE
INCREASED FUEL CONSUMP
SLATS/FLAPS SLOW
CAT 1 ONLY
APPR PROC

- **BEFORE L/G EXTENSION**
  – GEN 2 . . . . ON
  – EMER ELEC GEN 1 LINE . . . . . . ON
- **After recovery of normal electrical supply, the following STATUS will be displayed :**
  MIN RAT SPEED . . . . 140 KT
  Will disappear at landing gear extension.
  MAX SPEED . . . . 320 KT
  – FOR LDG . . . . USE FLAPS 3
  – GPWS LDG FLAP 3 . . . . ON
  Will be displayed when flaps in CONF3.
  APPR SPD . . . . VREF + 10 KT
  LDG DIST PROC . . . . APPLY
  Refer to the QRH Part 2, or to the FCOM 3.02.80
  ALTN LAW : PROT LOST
  Flight controls remain in alternate law, due to the loss of IR 2 and 3.
  WHEN L/G DN : DIRECT LAW
  At landing gear extension, control reverts to direct law in pitch, as well as in roll (refer to the DIRECT LAW procedure 3.02.27).

INOP SYS

See ELEC EMER CONFIG SYS REMAINING, 3.02.24 (except for fuel pumps)

SMOKE/TOXIC FUMES REMOVAL

· *Use the smoke removal procedure if there is dense smoke, toxic fumes (smell), or if smoke generation cannot be stopped.*
If a scent similar to orange peels pervades the cockpit, suspect a toxic leak of rain repellent fluid. If the scent is similar to pine needles, suspect a non-toxic leak ◁.

· *If there is smoke in the cabin, it may be necessary to make a PA announcement to minimize apprehension.*

– OXY MASK/GOGGLE . . . . ON/100 %/EMERG
Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
Turn the emergency knob to remove condensation or smoke from the mask.

– SEAT BELTS/NO SMOKING . . . . ON

● **If fuel vapors :**

– CAB FANS . . . . ON
The recirculating air ventilates the air mixer bay and other fuselage area, preventing fuel vapors from accumulating and the risk of explosion. Passenger health is not affected.

– PACK 1+2 . . . . OFF

R ● **If no fuel vapor :**

R – CAB FANS . . . . OFF

R *To prevent smoke from entering the cockpit and cabin.*

R – PACK FLOW . . . . HI

R *To provide maximum airflow from the packs.*

R *Do not shut down the air conditioning packs, and do not reduce ventilation in an*

R *attempt to smother the fire.*

R *Do not deploy oxygen masks, if fire is suspected in the cabin.*

– LDG ELEV . . . . 10000 FT/MEA

– DESCENT (FL 100 or MEA or minimum obstacle clearance altitude) . . . . INITIATE
Since the most effective means of smoke removal is use of the ram air, descent is initiated to FL100, or the MEA, or the minimum obstacle clearance altitude, while the cabin altitude is increased to 10000 feet or MEA.
The increase in cabin altitude also reduces, at least temporarily, the smoke concentration.
Cabin depressurization starts when descent is initiated.
Passenger oxygen, as required by regulation.

– ATC . . . . NOTIFY

⇩

SMOKE/TOXIC FUMES REMOVAL (CONT'D)

R ● **At FL100, or MEA :**

R – PACKS 1 + 2 . . . . OFF
R – MODE SEL . . . . MAN
R – MAN V/S CTL . . . . FULL UP
– RAM AIR . . . . ON

At FL100, or MEA, or minimum obstacle clearance altitude, it is possible to open the
R *RAM AIR valve when △P is 1 psi or below. Opening the RAM AIR allows flying with*
R *both packs OFF.*

● **If cockpit window opening is required :**

Unless smoke pervades the cockpit, do not open the cockpit window to evacuate the smoke.

MAX SPD . . . . 200 KT
– HEADSETS . . . . ON
– COCKPIT WINDOW . . . . OPEN

CAUTION
Due to the increased noise level, pay particular attention to visual warnings.

SMOKE FWD (AFT) CARGO SMOKE

LAND ASAP

– AGENT . . . . DISCH

If the SMOKE warning is displayed on ground, with the cargo doors open, do not initiate AGENT DISCH. Request the ground crew to investigate and eliminate the smoke source.

Note : Expect the SMOKE warning to remain after agent discharge, even if the smoke source is extinguished. Gases from the smoke source are not evacuated, and smoke detectors are also sensitive to the extinguishing agent.
order the ground crew not to open the door of the affected cargo compartment, unless the passengers have disembarked and fire services are present.

CARGO SMOKE FWD (AFT) BTL SQUIB FAULT

Crew awareness.

SMOKE FWD (AFT) CRG DET FAULT

Crew awareness.

SMOKE LAV + CRG DET FAULT

Crew awareness.

SMOKE LAVATORY SMOKE

Crew awareness.

Maintain contact with the cabin crew to follow up on the status of the fire, and consider emergency descent and SMOKE/TOXIC FUMES REMOVAL.

SMOKE LAVATORY DET FAULT

Toilet smoke detection is lost.

Crew awareness.

STATUS

INOP SYS

LAV DET

F/CTL FLAPS FAULT/LOCKED

- **If flaps locked :**
  - WING TIP BRK ON or ALIGNMENT FAULT

– MAX SPEED . . . . See page 3

Limit speed to the VFE corresponding to the next flap position.

– FLAPS LEVER (if flaps not locked) . . . . RECYCLE

- **If unsuccessful :**

  See FCOM 3.02.10 for LANDING WITH SLATS OR FLAPS JAMMED.
  The autopilot may be used down to 500 feet AGL. As it is not tuned for the abnormal configurations, its behaviour can be less than optimum and must be monitored.

STATUS

APPR PROC	INOP SYS
– FOR LDG (if flaps ≤ 3) . . . USE FLAP 3 *Do not select CONF FULL so as not to degrade handling qualities.* – FLAPS (if flaps>3) .. KEEP CONF FULL – GPWS FLAP MODE (if flaps < 3) . OFF – GPWS LDG FLAP 3 (if flaps ≥ 3) . . ON APPR SPD . . . . See page 3 LDG DIST PROC (see page 3) . . . . APPLY *Landing distance increases due to increase in approach speed.* ENG 1 APPR IDLE ONLY (only in case of FLAPS FAULT) ENG 2 APPR IDLE ONLY (only in case of FLAPS FAULT) INCREASED FUEL CONSUMP (see page 3) CAT 1 ONLY (a)	FLAPS AP 1+2 (a) A/THR (a) Moreover, both FDs are lost (a)

(a) If both flap channels fault.

F/CTL SLATS FAULT/LOCKED

– WING TIP BRK ON (if slats locked)
– MAX SPEED . . . . See page 3
Speed is limited to the VFE corresponding to the next slat position.
– FLAPS LEVER (if slats not locked) . . . . RECYCLE

● **If unsuccessful** :
See FCOM 3.02.10 for LANDING WITH SLATS OR FLAPS JAMMED.
The autopilot may be used down to 500 feet AGL. As it is not tuned for the abnormal configurations, its behavior could be less than optimum and must be monitored.
Note : If there is a SLATS FAULT after both slat channels fail, alternate law becomes active (see associated procedure).

● **If slats not at zero** :
– FUEL MODE SEL . . . . MAN
To allow CTR TK feeding.
– CTR TK PUMPS . . . . AS RQRD
Set CTR TK PUMPS to OFF when CTR TK is empty or during approach.

STATUS

R APPR PROC
– FOR LDG . . . . USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– CTR TK PUMPS . . . . OFF
– GPWS LDG FLAP 3 . . . . ON
APPR SPD . . . . See page 3
LDG DIST PROC (see page 3) . . . . APPLY
Landing distance increases due to an increase in approach speed.
CTR TK FEED : MAN ONLY
● **If both slat channels fail** :
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
INCREASED FUEL CONSUMP (see page 3)
CAT 1 ONLY (a)

INOP SYS
F/CTL PROT (a)
SLATS
AP 1 + 2 (a)
A/THR (a)
Moreover, both FDs are lost (a).

(a) If both slat channels fail.

FLAPS/SLATS FAULT/LOCKED

<table>
<tr><th colspan="6">MAX SPEED</th></tr>
<tr><th>Flaps (1)
Slats (1)</th><th>F = 0</th><th>0 < F ≤ 1</th><th>1 < F ≤ 2</th><th>2 < F ≤ 3</th><th>F > 3</th></tr>
<tr><td>S = 0</td><td>NO LIMITATION</td><td rowspan="2">215 kt</td><td rowspan="3">200 kt</td><td rowspan="3">185 kt</td><td rowspan="2">Not allowed
(177 kt)</td></tr>
<tr><td>0 < S ≤ 1</td><td>230 kt</td></tr>
<tr><td>1 < S ≤ 3</td><td colspan="2">200 kt</td><td rowspan="2">177 kt</td></tr>
<tr><td>S > 3</td><td colspan="4"></td></tr>
</table>

R

<table>
<tr><th colspan="6">APPR SPD and LDG DIST</th></tr>
<tr><th>Flaps (1)
Slats (1)</th><th>F = 0</th><th>0 < F < 1</th><th>1 ≤ F < 2</th><th>2 ≤ F < 3</th><th>F ≥ 3</th></tr>
<tr><td>S = 0</td><td>VREF + 60 (Appr)
VREF + 50
(Touch Down)
DIST × 1.8</td><td rowspan="2">VREF + 45
DIST × 1.8</td><td rowspan="2">VREF + 30
DIST × 1.4</td><td rowspan="2">VREF + 25
DIST × 1.35</td><td rowspan="2">(FLAPS > 3
not
allowed)
VREF + 25
DIST × 1.35</td></tr>
<tr><td>0 < S < 1</td><td></td></tr>
<tr><td>1 ≤ S < 3</td><td colspan="2" rowspan="2">VREF + 25
DIST × 1.3</td><td rowspan="2">VREF + 15
DIST × 1.2</td><td rowspan="2">VREF + 10
DIST × 1.15</td><td>VREF + 10
DIST × 1.15</td></tr>
<tr><td>S = 3</td><td>VREF + 5
DIST × 1.1</td></tr>
</table>

R (1) Slats/Flaps position displayed on the upper ECAM display.

CAUTION

For flight with SLATS or FLAPS extended, fuel consumption is increased.
Refer to the fuel flow indication.
As a guideline, determine the fuel consumption in clean configuration, at the same altitude without airspeed limitation (e.g. from ALTERNATE FLIGHT PLANNING tables), and multiply this result by 1.6 (SLATS EXTENDED), or 1.8 (FLAPS EXTENDED), or 2 (SLATS and FLAPS EXTENDED) to obtain the fuel consumption required to reach the destination in the current configuration.

SLATS and FLAPS FAULT in Conf 0

– FLAPS LEVER .... RECYCLE

● **If both slat channels fail :**

F/CTL ALTN LAW

(PROT LOST)
MAX SPEED .... 320 KT

STATUS

APPR PROC
– FOR LDG .... USE FLAP 1
With FLAPS lever set at 1, AP/FD GO AROUND mode is available.
– CTR TK PUMPS .... OFF
– GPWS FLAP MODE .... OFF
APPR SPD .... VREF + 60 KT
Approach with A/THR in selected mode is recommended.

● **If both slat channels fail :**
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW

● **AT 300 FT AGL :**
TARGET SPD .... VREF + 50
Reduce speed between 500 and 300 feet to reach VREF + 50 knots at runway threshold and disconnect A/THR, as the target speed may be below VLS.
LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2 or, to the FCOM 3.02.80.*
ENG 1 APPR IDLE ONLY (b)
ENG 2 APPR IDLE ONLY (b)
INCREASED FUEL CONSUMP
CAT 1 ONLY (a)

INOP SYS
F/CTL PROT (c)
SLATS
FLAPS
AP 1 + 2 (a)
A/THR (a)
Moreover, both FDs are lost (a)

(a) If both slat or flap channels fail.
(b) only in case of FLAPS FAULT.
(c) If both slat channels fail.

F/CTL SLAT SYS 1(2) FAULT

Crew awareness

STATUS

SLATS SLOW

F/CTL FLAP SYS 1(2) FAULT

● **If FLAP sys 1 fault**
- GPWS FLAP MODE . . . . OFF

STATUS

ENG 1(2) APPR IDLE ONLY
FLAPS SLOW

F/CTL SLAT (FLAP) TIP BRK FAULT

Failure of one slat or flap wingtip brake.
Crew awareness

F/CTL L (R) SIDESTICK FAULT

Crew awareness

F/CTL FLAP ATTACH SENSOR

Failure of flap attachment failure detection sensor.
Crew awareness

R
CONFIG SLATS (FLAPS) NOT IN T.O CONFIG

R Crew awareness.

F/CTL ELAC 1 (2) FAULT

■ One computer failed :

CAUTION
Do not reset ELAC, if uncommanded maneuvers occurred during the flight.

– ELAC (affected) . . . . OFF THEN ON

Note : 1. In some sidestick transducer failure cases, ELAC 1(2) FAULT is triggered without the proc., and FAULT lt on associated pb does not come on.
2. ELAC FAULT may be triggered during engine start, due to the electrical transient. To recover the affected ELAC on the ground, if the reset was unsuccessful, switch OFF the G, Y and B HYD PUMPS (PARKING BRK ON), wait 1minute, then reset the ELAC pushbutton. After 8 seconds (end of power up test indicated by the disappearance of the ELAC FAULT warning), switch the G, Y and B HYD PUMPS to ON/AUTO.
R *3. If the ELAC 1 computer is reset on ground, the pitch trim returns to the*
R *ground setting position (0°).*

● **IF UNSUCCESSFUL :**

– ELAC (affected) . . . . OFF

Functions are performed by the other ELAC. LAF is degraded (A320 with LAF only).

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ELAC 1(2)
CAT 3 DUAL

■ Both computers failed :

– ELAC 1 . . . . OFF THEN ON

R *Note : If the ELAC 1 computer is reset on ground, the pitch trim returns to the ground*
R *setting position (0°).*

– ELAC 2 . . . . OFF THEN ON

● **If both ELAC FAULT remain :**

– ELAC 1 . . . . OFF
– ELAC 2 . . . . OFF

F/CTL ALTN LAW

(PROT LOST)

Pitch and roll normal laws are lost : Refer to F/CTL ALTN LAW procedure. THS motor 1 and both ailerons are lost. LAF is degraded and uses spoilers only (A320 only).

MAX SPEED . . . . 320 KT

F/CTL SLAT SYS 1(2) FAULT

Crew awareness

STATUS

SLATS SLOW

F/CTL FLAP SYS 1(2) FAULT

- **If FLAP sys 1 fault**
  – GPWS FLAP MODE . . . . OFF

STATUS

ENG 1(2) APPR IDLE ONLY
FLAPS SLOW

F/CTL SLAT (FLAP) TIP BRK FAULT

Failure of one slat or flap wingtip brake.
Crew awareness

F/CTL L (R) SIDESTICK FAULT

Crew awareness

F/CTL FLAP ATTACH SENSOR

Failure of flap attachment failure detection sensor.
Crew awareness

R ## CONFIG SLATS (FLAPS) NOT IN T.O CONFIG

R Crew awareness.

F/CTL ELAC 1 (2) FAULT

■ **One computer failed :**

CAUTION
Do not reset ELAC, if uncommanded maneuvers occurred during the flight.

– ELAC (affected) . . . . OFF THEN ON

Note : 1. In some cases of sidestick transducer failure, ELAC 1(2) FAULT is triggered without the procedure, and the FAULT light on the associated pushbutton does not come on.

R *2. If the ELAC 1 computer is reset on ground, the pitch trim returns to the*
R *ground setting position (0°).*

● **IF UNSUCCESSFUL :**

– ELAC (affected) . . . . OFF

Functions are performed by the other ELAC. LAF is degraded (A320 with LAF only).

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ELAC 1(2)
CAT 3 DUAL

■ **Both computers failed :**

– ELAC 1 . . . . OFF THEN ON

R *Note : If the ELAC 1 computer is reset on ground, the pitch trim returns to the ground*
R *setting position (0°).*

– ELAC 2 . . . . OFF THEN ON

– ELAC 2 . . . . OFF THEN ON

● **If both ELAC FAULT remain :**

– ELAC 1 . . . . OFF

– ELAC 2 . . . . OFF

F/CTL ALTN LAW

(PROT LOST)

Pitch and roll normal laws are lost : Refer to the F/CTL ALTN LAW procedure.
THS motor 1 and both ailerons are lost.
LAF is degraded and uses spoilers only (A320 only).

MAX SPEED . . . . 320 KT

F/CTL ELAC 1 (2) FAULT (CONT'D)

STATUS

MAX SPEED . . . . 320 KT

APPR PROC

– FOR LDG . . . . USE FLAP 3

Do not select CONF FULL, so as not to degrade handling qualities.

– GPWS LDG FLAP 3 . . . . ON

Will be displayed when flaps in CONF 3

APPR SPD . . . . VREF + 10 KT

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DOWN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to DIRECT LAW procedure).

CAT 1 ONLY

INOP SYS

F/CTL PROT
L + R AIL
ELAC 1 + 2
AP 1 + 2

F/CTL ELAC 1(2) PITCH FAULT

Crew awareness

Pitch function is achieved by the other ELAC.

STATUS

CAT 3 SINGLE ONLY

INOP SYS

ELAC PITCH (if ELAC 1 and 2 PITCH FAULT)
CAT 3 DUAL

F/CTL SEC 1 (2) (3) FAULT

– SEC (affected) . . . . OFF THEN ON

● **IF UNSUCCESSFUL :**

– SEC (affected) . . . . OFF

Associated spoilers are lost. If SEC 1 or 2 fails, LAF is degraded (A320 with LAF only). If all spoilers are inoperative (3 SECs failed), roll direct law and pitch alternate law become active.

– SPD BRK (if SEC 1 affected) . . . . DO NOT USE

VLS would not be corrected, if speedbrakes 2 extend (no speedbrake position sent to FACs).

F/CTL ALTN LAW (b)

(PROT LOST) (b)

STATUS

– SPD BRK . . . . DO NOT USE

(If SEC 1 is affected).

– FOR LDG . . . . USE FLAP 3 (b)

APPR SPD . . . . VREF + 10 (b)

LDG DIST PROC . . . . APPLY

(Not displayed, if only SEC 2 is affected).

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST(b)

WHEN L/G DN : DIRECT LAW(b)

R *When the three SECs are lost, the LGCIU information can*
R *no longer be sent to the ELAC. This prevents activation of*
R *DIRECT law upon landing gear extension. So, the aircraft*
R *will revert to DIRECT law, when slats are extended.*

INOP SYS

F/CTL PROT(b)
SPLR (associated)
SEC (affected)
REVERSER 1(2)(a)

(a) If at least 2 SECs fail, the autobrake is lost.
If SEC 1 + 2 fail, reverser 1 is not available for landing.
If SEC 1 + 3 fail, reverser 2 is not available for landing.

(b) If SEC 1 + 2 + 3 fail.

CONFIG SPD BRK NOT RETRACTED

Crew awareness.

F/CTL ELAC 1 (2) FAULT (CONT'D)

STATUS

MAX SPEED .... 320 KT
APPR PROC
– FOR LDG .... USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– GPWS LDG FLAP 3 .... ON
Will be displayed when flaps in CONF 3
APPR SPD .... VREF + 10 KT
LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
ALTN LAW : PROT LOST
WHEN L/G DOWN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to DIRECT LAW procedure).
CAT 1 ONLY

INOP SYS
F/CTL PROT
L + R AIL
ELAC 1 + 2
AP 1 + 2

F/CTL ELAC 1(2) PITCH FAULT

Crew awareness
Pitch function is achieved by the other ELAC.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ELAC PITCH (if ELAC 1 and 2 PITCH FAULT)
CAT 3 DUAL

F/CTL SEC 1 (2) (3) FAULT

– SEC (affected) .... OFF THEN ON

● **IF UNSUCCESSFUL** :

– SEC (affected) .... OFF

Associated spoilers are lost. If SEC 1 or 2 fails, LAF is degraded (A320 with LAF only). If all spoilers are inoperative (3 SECs failed), roll direct law and pitch alternate law become active.

– SPD BRK (if SEC 1 affected) .... DO NOT USE

VLS would not be corrected, if speedbrakes 2 extend (no speedbrake position sent to FACs).

F/CTL ALTN LAW (c)

(PROT LOST) (c)

STATUS

– SPD BRK .... DO NOT USE

(If SEC 1 is affected).

– FOR LDG .... USE FLAP 3 (c)

APPR SPD .... VREF + 10 (c)

LDG DIST PROC .... APPLY

(Not displayed, if only SEC 2 is affected).

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST(c)

WHEN L/G DN : DIRECT LAW(c)

R *When the three SECs are lost, the LGCIU information can*
R *no longer be sent to the ELAC. This prevents activation of*
R *DIRECT law upon landing gear extension. So, the aircraft*
R *will revert to DIRECT law, when slats are extended.*

INOP SYS

F/CTL PROT(c)
SPLR (associated)
SEC (affected)
REVERSER 1(2)(b)
AUTO BRK (a)

(a) If at least 2 SECs fail.
(b) If SEC 1 + 2 fail, reverser 1 is not available for landing.
If SEC 1 + 3 fail, reverser 2 is not available for landing.
(c) If SEC 1 + 2 + 3 fail.

CONFIG SPD BRK NOT RETRACTED

Crew awareness.

F/CTL DIRECT LAW

PFD displays « USE MAN PITCH TRIM » in amber. See the FCOM 3.04.27 for flight characteristics.

(PROT LOST)

Note : In case of GPWS (EGPWS ◁) alerts, since protections are lost, respect stall warning when applying the GPWS (EGPWS ◁) procedure.

MAX SPEED 320/.77

Speed is limited, due to the loss of high-speed protection. Do not exceed M .77, so as not to degrade handling qualities.

– MAN PITCH TRIM (except if HYD Y + G SYS LO PR) . . . USE

Automatic trim is inoperative in direct law.

MANEUVER WITH CARE

Use small control inputs at high speed, since in direct law the controls are powerful. Use of manual thrust is recommended. Avoid large thrust changes.

USE SPD BRK WITH CARE

At high Mach numbers, use speedbrakes with care to avoid too strong nose up changes.

STATUS

MAX SPEED 320/.77
MANEUVER WITH CARE
USE SPD BRK WITH CARE
APPR PROC
– FOR LDG . . . . USE FLAPS 3
– GPWS LDG FLAP 3 . . . . ON
MAN PITCH TRIM . . . . USE
APPR SPD . . . . VREF + 10
LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
DIRECT LAW

INOP SYS
F/CTL PROT

CONFIG L (R) SIDESTICK FAULT

BY TAKE OVER

The warning is triggered, when on the ground, if either stick is inoperative (takeover pushbutton pressed more than 30 seconds).

– L (R) TAKEOVER . . . . DEPRESS

The affected stick becomes operative.

CONFIG PITCH TRIM NOT IN T.O RANGE

Crew awareness.

F/CTL ALTN LAW

See the FCOM 3.04.27 for flight characteristics.
With the autopilot engaged, the FMGC (AP mode) controls the aircraft.

(PROT LOST)

All protections, except maneuver protections, are lost.
Depending on the failure, static stability may be introduced.

Note : In case of GPWS (EGPWS ⊲) alerts, since protections are lost, respect stall warnings when applying the GPWS (EGPWS ⊲) procedure.

MAX SPEED . . . . 320 KT

(320/.77, if dual hydraulic system low pressure).
Speed is limited to 320/.82 or 320/.77 for dual hydraulic failure, due to the loss of high-speed protection.

– SPD BRK (if L or R elevator fault) . . . . DO NOT USE

STATUS

MAX SPEED . . . . 320 KT

(320/.77, if dual hydraulic system low pressure).

– SPD BRK (if L or R elevator fault) . . . DO NOT USE

APPR PROC

– FOR LDG . . . . USE FLAP 3

– GPWS LDG FLAP 3 . . . . ON

APPR SPD . . . . VREF + 10

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to FCOM 3.02.80.*

● **If no AP engaged :**

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll.
See the DIRECT LAW procedure.

● **If AP engaged :**

WHEN L/G DN AND AP OFF : DIRECT LAW

If the autopilot is disengaged :

- *Before landing gear extension, flight control alternate law is active.*
- *After landing gear extension, flight control direct law is active.*

See the DIRECT LAW procedure.

ALTN LAW : PROT LOST

INOP SYS

F/CTL PROT

CONFIG RUD TRIM NOT IN T.O RANGE

Crew awareness.

F/CTL FCDC FAULT

■ **FCDC 1(2) FAULT :**

Crew awareness

STATUS

INOP SYS
FCDC 1(2)

■ **FCDC 1 + 2 FAULT :**

– MONITOR F/CTL OVHD PNL

F/CTL data on the ECAM is lost.
Control laws remain normal.
Note : When both FCDCs fail :
- *F/CTL warnings are not available on the ECAM.*
- *Stall warning may be triggered as in alternate or direct law (it may occur at speeds greater than Vα max).*
- *Bank and pitch limits are no longer displayed on the PFD.*
- *Vα prot, Vα max are lost on the PFD.*
- *Vsw, displayed on the PFD, corresponds to the stall warning of the alternate and direct law.*

STATUS

F/CTL INDICATIONS LOST

INOP SYS
FCDC 1 + 2

F/CTL AIL SERVO FAULT

Crew awareness
LAF is degraded (A320 only).

F/CTL L (R) AIL FAULT

Crew awareness
LAF is degraded and uses spoilers only (A320 only).

STATUS

R *Note : With one or both aileron fault(s), fuel consumption*
R *increases by approximately 6 %.*

INOP SYS
L (R) AIL

F/CTL L + R ELEV FAULT

MAX SPEED 320/.77

Due to loss of high speed protections.

– MAN PITCH TRIM .... USE

Only manual trim is available for pitch control.

– SPD BRK .... DO NOT USE

Do not use speedbrakes, because it is difficult to control the induced pitch moment with manual pitch trim only.

STATUS

MAX SPEED 320/.77
SPD BRK .... DO NOT USE
APPR PROC
– FOR LDG .... USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– GPWS LDG FLAP 3 .... ON
Will be displayed when flaps in CONF 3.
– MAN PITCH TRIM .... USE
APPR SPD .... VREF + 10
LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
PITCH MECH BACK UP
ROLL DIRECT LAW
CAT 1 ONLY

INOP SYS
L + R ELEV
ELAC PITCH
LAF (A320 with LAF only)
AP 1 + 2

F/CTL ELEV SERVO FAULT

Crew awareness

The remaining servojack controls the elevator.

CAUTION
Do not use speedbrakes above 350 KT/M 0.82 (VMO/MMO).

STATUS

CAT 3 SINGLE ONLY

INOP SYS
CAT 3 DUAL

F/CTL L (R) ELEV FAULT

F/CTL ALTN LAW (PROT LOST)

Note : If the L(R) elevator fails, the ELACs loose pitch control through the elevator. Therefore, the SECs control pitch in alternate law. This is not the case, if the right elevator is lost, due to the failure of B+Y hydraulic circuits. Pitch normal law remains active in ELAC.

MAX SPEED . . . . 320 KT

Speed is limited, due to the loss of high-speed protection.

– SPD BRK . . . . DO NOT USE

STATUS

MAX SPEED . . . . 320 KT
SPD BRK . . . . DO NOT USE
APPR PROC
– FOR LDG . . . . USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– GPWS LDG FLAP 3 . . . . ON
Will be displayed, when flaps in CONF 3.
APPR SPD . . . . VREF + 10 KT
LDG DIST PROC . . . . APPLY
R *Refer to the QRH part 2, or to the FCOM 3.02.80.*
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll. Refer to the DIRECT LAW procedure.
CAT 1 ONLY

INOP SYS
F/CTL PROT
L (R) ELEV
ELAC PITCH
AP 1 + 2

F/CTL SPLR FAULT

Loss of one or more spoilers.

Note : If heavy vibrations are felt, CONF 3 may be used for landing in order to reduce the buffeting.

– SPD BRK (if spoilers 3 + 4 affected) . . . . DO NOT USE

Do not use speedbrakes, since using only surfaces N° 2 is not efficient and would activate the SPD BRK DISAGREE caution.

STATUS

● **If spoilers 3 + 4 affected :**

– SPD BRK . . . . DO NOT USE

LDG DIST PROC . . . . APPLY

See GND SPLR FAULT below.

INOP SYS

SPLR (affected)
SPD BRK (if spoilers 2 + 3 + 4 affected)

F/CTL GND SPLR / 1 + 2 / 3 + 4 / FAULT

Crew awareness.

- **GND SPLR FAULT :**

  Loss of ground spoiler function in SEC 1 + 3, or 1 + 2, or 2 + 3, or 1 + 2 + 3.

- **GND SPLR 1 + 2 (3 + 4) FAULT :**

  Loss of ground spoiler function in SEC 3 (or 1).

STATUS

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

INOP SYS

GND SPLR (affected)

F/CTL SPD BRK DISAGREE

■ **Surfaces 3 + 4 affected**

Surfaces' position not in agreement with the handle position.

– SPD BRK LEVER . . . . RETRACT

– SPD BRK . . . . DO NOT USE

STATUS

– SPD BRK . . . . DO NOT USE

INOP SYS

SPD BRK 3 + 4

■ **Surfaces 2 + 3 + 4 affected :**

After automatic retraction (due to activation of alpha protection or slats/flaps in configuration FULL), surface position is not in agreement with the handle position.

– SPD BRK LEVER . . . . RETRACT

F/CTL SPD BRK FAULT or SPD BRK 2 (3 + 4) FAULT

Loss of speedbrake surfaces, due to failure of the speedbrake lever transducer(s). In addition, associated ground spoilers are only available through reverse selection.

– SPD BRK (if SPD BRK 3 + 4 affected) . . . . DO NOT USE

Do not use speedbrakes, since it is not efficient to use only Surface n° 2, and would activate the SPD BRK DISAGREE caution.

STATUS

R – SPD BRK . . . . DO NOT USE
(if SPD BRK 3 + 4 affected)
LDG DIST PROC . . . . APPLY
R *If reversers are not used, refer to the QRH Part 2, or to the*
R *FCOM 3.02.80.*

INOP SYS
SPD BRK
(affected)

F/CTL SIDESTICK PRIORITY

A failure is detected in the sidestick priority logic circuit.

– CHECK PRIORITY LOGIC

Check the integrity of flight control priority, as follows (not displayed on ECAM) :

– ELAC 1 . . . . OFF THEN ON

R *Note : When the ELAC 1 computer is reset on ground, the pitch trim returns to the*
R *ground setting position (0°).*

– ELAC 2 . . . . OFF THEN ON

● **If the warning disappears :**

– CAPT TAKE OVER pb . . . . PRESS (at least 3 seconds)

Check that the :
– Aural "priority left" message is activated.
– F/O red arrow light is on.

– CAPT TAKE OVER pb . . . . RELEASE

– F/O TAKE OVER pb . . . . PRESS (at least 3 seconds)

Check that the :
– Aural "priority right" message is activated
– CAPT red arrow light is on.

– F/O TAKE OVER pb . . . . RELEASE

– Check that the warning does not reappear.

Note : There is no need to move the sidestick for the check.

● **If the warning does not disappear, or if the warning reappears after the above check :**

Maintenance action is due.

F/CTL STABILIZER JAM

When the ELACs detect a stabilizer jam, the pitch control law reverts to alternate law.

– MAN PITCH TRIM .... CHECK

The force needed on the PITCH TRIM wheel may be higher than during pre-takeoff manual setting.

● **IF MAN TRIM AVAIL :**

– TRIM FOR NEUTRAL ELEV

If manual pitch trim is available, trim to maintain the elevator at the zero position (indications on ECAM F/CTL page).

F/CTL ALTN LAW

(PROT LOST)
MAX SPEED .... 320 KT

STATUS

R MAX SPEED .... 320 KT

APPR PROC :

– FOR LDG .... USE FLAP 3

Do not select configuration FULL, so as not to degrade the handling qualities.

– GPWS LDG FLAP 3 .... ON

Will be displayed when flaps in CONF 3

● **IF MAN TRIM NOT AVAIL :**

● **WHEN CONF 3 AND VAPP :**

– L/G .... DN

Landing gear extension is delayed, in order to delay the switching to direct law.

APPR SPD : .... VREF + 10 KT

LDG DIST PROC .... APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll. Refer to DIRECT LAW procedure.

CAT 1 ONLY

INOP SYS

F/CTL PROT
STABILIZER
ELAC PITCH
AP 1 + 2

STABILIZER JAM

The ELACs may not detect a stabilizer jam when the pitch trim wheel is jammed.
The flight control normal law remains active in this case and there is no ECAM warning.
Apply the following procedure.

– AP . . . . OFF
– MAN PITCH TRIM . . . . CHECK
  The pitch trim wheel may not be fully jammed, the force needed may be higher than pre-takeoff manual setting.

● **IF MAN TRIM AVAIL** :
  – TRIM FOR NEUTRAL ELEV
    If manual pitch trim is available, trim to maintain the elevator at the zero position (indications on ECAM F/CTL page).

<u>APPR PROC</u>

● **IF MAN TRIM NOT AVAIL** :
  – FOR LDG . . . . USE FLAP 3
    Do not select configuration full so as not to degrade the handling qualities.
  – GPWS LDG FLAP 3 . . . . ON

CAT 1 ONLY

F/CTL RUDDER JAM

Rudder jamming may be detected by undue (and adverse) pedal movement during rolling maneuvers.
This is because the yaw damper orders can no longer be sent to the rudder, but are fed back to the pedals.
Use ECAM F/CTL page for a visual check of the rudder position.

FOR APPROACH

- AVOID LANDING WITH CROSSWIND from the side where the rudder is deflected.
- MAX CROSSWIND 15 KT
- FOR LDG . . . . USE NORMAL CONF
- SPEED AND TRAJECTORY . . . . STABILIZE ASAP

ON GROUND

- DIFFERENTIAL BRAKING . . . . USE ASAP
  Do not use asymmetric reverse thrust.
  Use nosewheel steering handle below 70 knots.

R

ACTIVE CONTROL LAW

ACTIVE LAW ►	PITCH		ROLL	YAW
SYS FAILED ▼	LAW	PROTEC		
ELAC 1 or 2 or SEC 1 or 2	NORM	NORM	NORM	NORM
ELAC 1 and 2 or both ailerons	ALTN	REDUCED	DIRECT	ALTN
2 SEC	NORM	NORM	NORM	NORM
3 SEC	ALTN	REDUCED	DIRECT	ALTN
2 FAC	ALTN	REDUCED	DIRECT	MECH
Yaw damper	ALTN	REDUCED	DIRECT	MECH
2 SFCC (slat channel)	ALTN	NO	DIRECT	ALTN
2 ADR or 2 IR (2nd self detected)	ALTN	REDUCED	DIRECT	ALTN
2 ADR (2nd not self detec.)	ALTN	NO ----- REDUCED (1)	DIRECT	ALTN
2 IR (2nd not self detec.)	DIRECT ----- ALTN (2)	NO ----- REDUCED (2)	DIRECT	MECH ----- ALTN
3 ADR	ALTN	NO	DIRECT	MECH
3 IR	DIRECT	NO	DIRECT	MECH
2 RADIO ALT	NORM ----- DIRECT (4)	NORM ----- NO (4)	NORM ----- DIRECT (4)	NORM ----- MECH (4)
SPOILER 4 or 5 or (4 and 5)	NORM	NORM	NORM	NORM
All SPOILERS	ALTN	REDUCED	DIRECT	ALTN
1 AIL SERVO or 1 AILERON	NORM	NORM	NORM	NORM
1 ELEV SERVO	NORM	NORM	NORM	NORM
1 ELEVATOR	ALTN	NO	DIRECT	ALTN
THS (jammed) (5)	NORM	NORM	NORM	NORM
	ALTN	REDUCED	DIRECT	ALTN
HYD G or Y or B	NORM	NORM	NORM	NORM
HYD G + Y	ALTN	REDUCED	DIRECT	MECH
HYD G + B	ALTN	REDUCED	DIRECT	ALTN
HYD Y + B	NORM	NORM	NORM	NORM
on BATTERIES	ALTN	REDUCED	DIRECT	MECH
on EMER GEN	ALTN	REDUCED	DIRECT	MECH ----- ALTN (3)

(1) in case of AOA disagree.
(2) after the faulty IR is selected off.
(3) after FAC 1 is reset.
(4) when landing gear down (or CONF 2 if both LGCIUs faulty).
(5) depending where the failure is, control law may revert to alternate law.

F/CTL RUDDER JAM

Rudder jams may be detected by undue (and adverse) pedal movement during rolling maneuvers.
This is because yaw damper orders can no longer be sent to the rudder, but are fed back to the pedals.
Use the ECAM F/CTL page for a visual check of the rudder position.

FOR APPROACH

- AVOID LANDING WITH CROSSWIND from the side where the rudder is deflected.
- MAX CROSSWIND 15 KT
- FOR LDG . . . . USE NORMAL CONF
- SPEED AND TRAJECTORY . . . . STABILIZE ASAP

ON GROUND

- DIFFERENTIAL BRAKING . . . . USE ASAP
  Do not use asymmetric reverse thrust.
  Use the nosewheel steering handle below 70 knots.

R

F/CTL FLAP LVR NOT ZERO

Crew awareness.
Slats or flaps were unintentionally selected in cruise.

F/CTL SPD BRK STILL OUT

Crew awareness.
Speedbrakes are out, with at least one engine not at idle.

R

ACTIVE CONTROL LAW

ACTIVE LAW ▶	PITCH		ROLL	YAW
SYS FAILED ▼	LAW	PROTEC		
ELAC 1 or 2 or SEC 1 or 2	NORM	NORM	NORM	NORM
ELAC 1 and 2 or both ailerons	ALTN	REDUCED	DIRECT	ALTN
2 SEC	NORM	NORM	NORM	NORM
3 SEC	ALTN	REDUCED	DIRECT	ALTN
2 FAC	ALTN	REDUCED	DIRECT	MECH
Yaw damper	ALTN	REDUCED	DIRECT	MECH
2 SFCC (slat channel)	ALTN	NO	DIRECT	ALTN
2 ADR or 2 IR (2nd self detected)	ALTN	REDUCED	DIRECT	ALTN
2 ADR (2nd not self detec.)	ALTN	NO – – – – – REDUCED (1)	DIRECT	ALTN
2 IR (2nd not self detec.)	DIRECT – – – – – ALTN (2)	NO – – – – – REDUCED (2)	DIRECT	MECH – – – – – ALTN
3 ADR	ALTN	NO	DIRECT	MECH
3 IR	DIRECT	NO	DIRECT	MECH
2 RADIO ALT	NORM – – – – – DIRECT (4)	NORM – – – – – NO (4)	NORM – – – – – DIRECT (4)	NORM – – – – – MECH (4)
SPOILER 4 or 5 or (4 and 5)	NORM	NORM	NORM	NORM
All SPOILERS	ALTN	REDUCED	DIRECT	ALTN
1 AIL SERVO or 1 AILERON	NORM	NORM	NORM	NORM
1 ELEV SERVO	NORM	NORM	NORM	NORM
1 ELEVATOR	ALTN	NO	DIRECT	ALTN
THS (jammed) (5)	NORM	NORM	NORM	NORM
	ALTN	REDUCED	DIRECT	ALTN
HYD G or Y or B	NORM	NORM	NORM	NORM
HYD G + Y	ALTN	REDUCED	DIRECT	MECH
HYD G + B	ALTN	REDUCED	DIRECT	ALTN
HYD Y + B	NORM	NORM	NORM	NORM
on BATTERIES	ALTN	REDUCED	DIRECT	MECH
on EMER GEN	ALTN	REDUCED	DIRECT	MECH – – – – – ALTN (3)

(1) in case of AOA disagree.
(2) after the faulty IR is selected off.
(3) after FAC 1 is reset.
(4) when landing gear down (or CONF 2 if both LGCIUs faulty).
(5) depending where the failure is, control law may revert to alternate law.

ELEVATORS AND STABILIZER CONTROL AFTER FAILURE

	LEFT ELEVATOR		THS	RIGHT ELEVATOR	
	BLUE	GREEN	GREEN AND YELLOW	YELLOW	BLUE
NORM OPERATION		ELAC2	ELAC2	ELAC2	
SINGLE FAILURE					
ELAC2	ELAC1		ELAC1		ELAC1
ELAC1		ELAC2	ELAC2	ELAC2	
SEC2		ELAC2	ELAC2	ELAC2	
SEC1		ELAC2	ELAC2	ELAC2	
G	ELAC1		ELAC1		ELAC1
Y	ELAC1		ELAC1		ELAC1
B		ELAC2	ELAC2	ELAC2	
DOUBLE FAILURE					
ELAC2 + ELAC1		SEC2	SEC2	SEC2	
+ SEC2	ELAC1		ELAC1		ELAC1
+ SEC1	ELAC1		ELAC1		ELAC1
+ G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B		SEC2	SEC2	SEC2	
ELAC1 + SEC2		ELAC2	ELAC2	ELAC2	
+ SEC1		ELAC2	ELAC2	ELAC2	
+ G	SEC1		SEC2	SEC2	
+ Y		SEC2	SEC2		SEC1
+ B		ELAC2	ELAC2	ELAC2	
SEC2 + SEC1		ELAC2	ELAC2	ELAC2	
+ G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B		ELAC2	ELAC2	ELAC2	
SEC1 + G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B		ELAC2	ELAC2	ELAC2	
G + Y	ELAC1		inop		ELAC1
B + G	Damped		ELAC2	ELAC2	
B + Y		ELAC2	ELAC2	Damped	

R

	LEFT ELEVATOR		THS	RIGHT ELEVATOR	
	BLUE	GREEN	GREEN AND YELLOW	YELLOW	BLUE
TRIPLE FAILURE					
ELAC2					
ELAC1 + SEC2	SEC1		SEC1		SEC1
+ SEC1		SEC2	SEC2	SEC2	
+ G	SEC1		SEC2	SEC2	
+ Y		SEC2	SEC2		SEC1
+ B		SEC2	SEC2	SEC2	
SEC2 + SEC1	ELAC1		ELAC1		ELAC1
+ G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B	Centered		Mechanical	Centered	
SEC1 + G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B		SEC2	SEC2	SEC2	
G + Y	ELAC1		inop		ELAC1
B + G	Damped		SEC2	SEC2	
B + Y		SEC2	SEC2	Damped	
ELAC1					
SEC2 + SEC1		ELAC2	ELAC2	ELAC2	
+ G	SEC1		SEC1		SEC1
+ Y	SEC1		SEC1		SEC1
+ B		ELAC2	ELAC2	ELAC2	
SEC1 + G	Damped		SEC2	SEC2	
+ Y		SEC2	SEC2	Damped	
+ B		ELAC2	ELAC2	ELAC2	
G + Y	SEC1		inop		SEC1
B + G	Damped		ELAC2	ELAC2	
B + Y		ELAC2	ELAC2	Damped	
SEC2					
SEC1 + G	ELAC1		ELAC1		ELAC1
+ Y	ELAC1		ELAC1		ELAC1
+ B		ELAC2	ELAC2	ELAC2	
G + Y	ELAC1		inop		ELAC1
B + G	Damped		ELAC2	ELAC2	
B + Y		ELAC2	ELAC2	Damped	
SEC1					
G + Y	ELAC1		inop		ELAC1
B + G	Damped		ELAC2	ELAC2	
B + Y		ELAC2	ELAC2	Damped	

FUEL L (R) TK PUMP 1 + 2 LO PR

■ Center tank not empty :

– FUEL MODE SEL (if CTR TK not feeding) . . . . MAN
Setting FUEL MODE SEL to MAN will allow center tank pumps to run.
– TK PUMP 1 (affected) . . . . OFF
– TK PUMP 2 (affected) . . . . OFF

● **WHEN TK (affected) FUEL RQRD :**
Apply GRVTY FUEL FEEDING procedure.
– TK (affected) FEED . . . . GRVTY ONLY
– PROC : GRVTY FUEL FEEDING

STATUS

R – TK (affected) GRVTY FEED ONLY

INOP SYS
TK PUMPS (affected)

■ Center tank empty :

– FUEL X FEED (if above FL150) . . . . ON
– ENG MODE SEL . . . . IGN
The selection of continuous relight protects against flame-out, caused by possible fuel supply surging.
– TK PUMP 1 (affected) . . . . OFF
– TK PUMP 2 (affected) . . . . OFF

● **If FUEL X FEED off :**
As long as fuel X feed is closed, associated engine is fed by gravity only.
– PROC : GRVTY FUEL FEEDING
Apply GRVTY FUEL FEEDING procedure.
AVOID NEGATIVE G FACTOR
Avoiding negative g factors will prevent fuel surging and, therefore, reduce the risk of engine malfunction.

● **WHEN TK (affected) FUEL RQRD :**
– TK (affected) FEED . . . . GRVTY ONLY
Apply GRVTY FUEL FEEDING procedure.
Fuel from the affected tank may be used immediately, if there is no ceiling limitation for gravity fuel feeding.

STATUS

TK (affected) GRVTY FEED ONLY

INOP SYS
TK PUMPS (affected)

FUEL L (R) TK PUMP 1 + 2 LO PR (CONT'D)

R ● **When reaching FL 150 :**
R *FUEL L(R) TK PUMP 1 + 2 LO PR caution is automatically recalled.*

– ENG MODE SEL . . . . IGN

● **WHEN TK (affected) FUEL RQRD :**

– TK (affected) FEED . . . . GRVTY ONLY
– FUEL X FEED . . . . OFF
– PROC : GRVTY FUEL FEEDING
AVOID NEGATIVE G FACTOR

STATUS

	INOP SYS
– PROC : GRVTY FUEL FEEDING AVOID NEGATIVE G FACTOR TK (affected) GRVTY FEED ONLY	TK PUMPS (affected)

FUEL L (R) TK PUMP 1(2) LO PR

– TK PUMP (affected) . . . . OFF

STATUS

	INOP SYS
	TK PUMP (affected)

FUEL L (R) WING TK LO LVL

CAUTION
Do not apply this procedure if a fuel leak is suspected. Refer to FUEL LEAK procedure.

- **If center tank not empty :**
  - – FUEL MODE SEL . . . . MAN
- **IF FUEL UNBALANCE**
  - – FUEL X FEED . . . . ON
  - – TK PUMP 1 (on side with LO LVL) . . . . OFF
  - – TK PUMP 2 (on side with LO LVL) . . . . OFF

  Note : TK PUMP 1+2 (on side with LO LVL) LO PR warning will be triggered.

STATUS

R CTR TK FEED : MAN ONLY (if center tank not empty)	INOP SYS TK PUMPS

FUEL L + R WING TK LO LVL

LAND ASAP

- – FUEL MODE SEL (if center tank not empty) . . . . MAN
- – ALL TK PUMPS . . . . ON

  All pumps in center tank and in wing tanks will run.
- – FUEL X FEED . . . . OFF

FUEL L (R) XFR VALVE CLOSED

Note : When fuel quantity in affected wing reaches low level, corresponding WING TK LO LVL warning is triggered.

OUTER TK UNUSABLE (affected side)

STATUS

OUTER TK UNUSABLE (affected side)

FUEL L (R) XFR VALVE OPEN

Crew awareness

STATUS

INOP SYS

L (R) CELL VALVE

FUEL X FEED VALVE FAULT

Crew awareness

If valve failed open, maintain fuel balance with selective use of pumps.

If valve failed closed and if unable to maintain an acceptable balance, land as soon as possible.

STATUS

INOP SYS

FUEL X FEED

FUEL L (R) OUTER TK LO TEMP

R ■ **on the ground before takeoff :**

– DELAY T.O

Do not takeoff until temperatures are within limits.

■ **in flight**

Crew awareness

Consider descending to a lower altitude and/or increasing Mach to increase TAT.

FUEL L (R) INNER TK LO TEMP

R ■ **on the ground before takeoff :**

– DELAY T.O

Do not takeoff until temperatures are within limits.

■ **in flight**

Crew awareness

Consider descending to a lower altitude and/or increasing Mach to increase TAT.

FUEL L (R) OUTER (INNER) TK HI TEMP

– GALLEY . . . . OFF
Reducing electrical loads reduce heat emitted by IDG.

■ **on the ground** :
- LIMITED TAXI TIME
- ● **if temp reaches 60° C in outer cell or 54° C in inner cell** :
  - DELAY T.O.
  - ENG MASTER (affected side) . . . . OFF

■ **in flight** :
- ENG F. FLOW (affected side) . . . . INCREASE
  Disconnect autothrust. Adjust the thrust lever to increase fuel flow through the IDG oil heat exchanger and decrease the temperature of the fuel returning to the outer cell.
- ● **IF TEMP ABV 65 DEG C in outer cell or 57 DEG C in inner cell**
  - APU . . . . AS RQRD
    APU if available may be started and APU GEN used to allow IDG disconnection.
  - ● **if opposite GEN avail** :
    - IDG (affected side) . . . . OFF

FUEL FQI CH 1(2) FAULT

Crew awareness

FUEL ENG 1(2) LP VALVE OPEN

Crew awareness

FUEL APU LP VALVE FAULT

Crew awareness

FUEL CTR TK PUMP 1(2) LO PR

– FUEL X FEED . . . . ON
– CTR TK PUMP (affected) . . . . OFF
FUEL X FEED may be switched OFF when the center tank is empty to avoid possible fuel imbalance (if performance of pumps of one wing differs from that of other wing).

STATUS

INOP SYS
CTR TK PUMP 1(2)

FUEL CTR TK PUMPS LO PR

R *Selecting FUEL MOD SEL to MAN position will prevent repetitive triggering of the warning.*
– CTR TK PUMP 1 . . . . OFF
– CTR TK PUMP 2 . . . . OFF
– CTR TK UNUSABLE
Gravity feeding from the center tank is not possible (no by-pass valve fitted on the center tank pumps).

STATUS

CTR TK FUEL UNUSABLE

INOP SYS
CTR TK PUMPS

FUEL AUTO FEED FAULT

– FUEL MODE SEL . . . . MAN
The center tank pumps will run and feed the engines.

■ **Fuel in one wing tank < 5000 kg (11000 lb) and in center tank > 250 kg (550 lb) :**
– CTR TK PUMP 1 . . . . ON
– CTR TK PUMP 2 . . . . ON
When the center tank is empty, CTR TK PUMP LO PR warning will come on.

■ **CTR TK PUMPS running after slat extension or LO LVL in center tank**
– CTR TK PUMP 1 . . . . OFF
– CTR TK PUMP 2 . . . . OFF

STATUS

CTR TK FEED : MAN ONLY

FUEL LEAK

A fuel leak may either be detected by :

R *· The sum of FOB and F.USED significantly less than FOB at departure, or decreasing, or*
· Passenger observation (fuel spray from engine or wing tip), or
· Total fuel quantity decreasing at an abnormal rate, or
· A fuel imbalance, or
· A tank emptying too fast (leak from engine, or a hole in a tank), or
· A tank overflowing (due to a pipe rupture in a tank), or
R *· An excessive fuel flow (leak from engine), or*
R *· A fuel smell in the cabin.*

If visibility permits, a visual check from the cabin may enable identification of the leak source.

WHEN A LEAK IS CONFIRMED

LAND ASAP

■ **LEAK FROM ENGINE :**

- THR LEVER (of affected engine) . . . . IDLE
- ENG MASTER (of affected engine) . . . . OFF
- R FUEL XFEED . . . . USE AS RQRD

  The crossfeed valve can now be selected open for re-balancing, or to allow use of the fuel from both wings. Do not restart the engine.

■ **LEAK NOT FROM ENGINE or LEAK NOT LOCATED :**

- FUEL X FEED . . . . MAINTAIN CLOSED

  The crossfeed valve must remain closed to prevent the leak from affecting both sides.
- DESCEND TO GRVTY FUEL FEEDING CEILING (FL100 IF JET B)

  See the gravity fuel feeding procedure.
- ENG MODE SEL . . . . IGN
- ALL TK PUMPS (when gravity ceiling is reached) . . . . OFF

  In almost all cases, switching the pumps off will prevent any further loss of fuel. All pumps must be switched off, even if the leak is from one wing only, as there are some failures on one side that will result in fuel loss from the other side.
- AVOID NEGATIVE G FACTOR

FUEL LEAK (CONT'D)

CAUTION
Do not open the FUEL X-FEED, even if requested by another ECAM procedure.
Do not apply the FUEL IMBALANCE procedure : Even with a fuel imbalance of one wing full/one wing empty, no special procedure is required for approach and landing.

● **If one engine flames out when there is still fuel in the feeding tank :**

R – ALL TK PUMPS . . . . ON
R – LEAK FROM ENGINE proc . . . . APPLY

Note : *The flameout is due to air suction from a leak from the engine.*

FOR LANDING

CAUTION
– Notify the ATC, and do not use reverse.

FUEL IMBALANCE

– FOB . . . . CHECK

Compare the FOB + FU, with the FOB at departure.
If the difference is significant, or if the FOB + FU decreases, suspect a fuel leak.

CAUTION
A fuel imbalance may indicate a fuel leak.
Do not apply this procedure, if a fuel leak is suspected.
Refer to the FUEL LEAK procedure.

– FUEL X FEED . . . . ON

● **On the lighter side and in the center tank :**

– FUEL PUMPS . . . . OFF

● **When fuel is balanced :**

– FUEL PUMPS (WING + CTR) . . . . ON
– FUEL X FEED . . . . OFF

Note : *There is no requirement to correct an imbalance, until the ECAM fuel advisory is displayed.*

FUEL CTR TK PUMPS OFF

The center tank pumps pushbuttons are OFF, with slats retracted.

– CTR TK PUMP 1 . . . . ON
– CTR TK PUMP 2 . . . . ON

GRVTY FUEL FEEDING

– ENG MODE SEL . . . . IGN

AVOID NEGATIVE G FACTOR

● **DETERMINE GRAVITY FEED CEILING** :

Depending on when the fuel pumps have failed, the flight altitude must be limited to the following values :

Flight conditions at time of gravity feeding	Gravity feed ceiling
Flight time above FL300 greater than 30 minutes (Fuel deaerated)	Current FL*
Flight time above FL300 lower than 30 minutes (Fuel non-deaerated)	FL 300*
Aircraft flight level never exceeded FL300 (Fuel non-deaerated)	FL150*, or 7000 ft above takeoff airport, whichever is higher

* For JET B, gravity feed ceiling is FL100 in all cases.

DESCEND TO GRVTY FEED CEILING (if applicable).

● **WHEN REACHING GRVTY FEED CEILING** :

– FUEL X FEED . . . . OFF

R ● **IF NO FUEL LEAK AND FOR AIRCRAFT HANDLING** :

R If no fuel leak and for flight with only one engine running, this engine being fed by gravity, apply the following :

– FUEL X FEED . . . . ON
– BANK ANGLE . . . . 1° WING DOWN ON LIVE ENGINE SIDE

The fuel from the wing tank on the engine running side is used.

– RUDDER TRIM . . . . USE

Use rudder trim to maintain constant course and neutral stick.

● **WHEN FUEL UNBALANCE REACHES 1000 kg (2200 lbs)** :

– BANK ANGLE . 2° or 3° WING DOWN ON LIVE ENG SIDE

Fuel from the opposite wing tank is used, until fuel imbalance is reduced to 0.

HYD B RSVR LO AIR PR/OVHT/LO LVL

■ **RSVR OVHT or LO LVL :**

– BLUE ELEC PUMP .... OFF

■ **RSVR LO AIR PR :**

● **IF PRESS FLUCTUATES :**

– BLUE ELEC PUMP .... OFF

B SYS LO PR

Affected systems
* F/CTL

STATUS

■ **Sys lost by RSVR LO AIR PR :**

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

APPR PROC HYD LO PR

– BLUE ELEC PUMP .... AUTO

● **If sys not recovered :**

LDG DIST PROC .... APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS SLOW

CAT 3 SINGLE ONLY

■ **Sys lost by RSVR OVHT :**

APPR PROC HYD LO PR

● **IF BLUE OVHT OUT**

– BLUE ELEC PUMP .... AUTO

● **If sys not recovered :**

LDG DIST PROC .... APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS SLOW

CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
B ELEC PUMP

■ **Sys lost by RSVR LO LVL :**

LDG DIST PROC .... APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS SLOW

CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
EMER GEN
B ELEC PUMP

HYD G RSVR LO AIR PR/OVHT/LO LVL

■ **RSVR OVHT or LO LVL :**

– PTU . . . . OFF
– GREEN ENG 1 PUMP . . . . OFF

■ **RSVR LO AIR PR :**

● **IF PRESS FLUCTUATES :**

– PTU . . . . OFF
– GREEN ENG 1 PUMP . . . . OFF

R G ENG 1 PUMP LO PR

R G SYS LO PR

Affected systems
R *WHEEL
R *F/CTL

HYD G RSVR LO AIR PR/OVHT/LO LVL (CONT'D)

STATUS

■ **sys lost by RSVR LO AIR PR :**

APPR PROC HYD LO PR

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

– GREEN ENG 1 PUMP . . . . ON
– PTU . . . . AUTO

● **IF HYD NOT RECOVERED :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

■ **sys lost by RSVR OVHT :**

APPR PROC HYD LO PR

● **IF GREEN OVHT OUT**

– GREEN ENG 1 PUMP . . . . ON
– PTU . . . . AUTO

● **IF HYD NOT RECOVERED :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

■ **sys lost by RSVR LO LVL :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS

GREEN HYD
SPLR 1 + 5
CAT 3 DUAL
N.W. STEER
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
YAW DAMPER 1

HYD Y RSVR LO AIR PR/OVHT/LO LVL

● **RSVR OVHT or LO LVL**
- PTU . . . . OFF
- YELLOW ENG 2 PUMP . . . . OFF
- YELLOW ELEC PUMP . . . . OFF

● **RSVR LO AIR PR**

● **IF PRESS FLUCTUATES :**
- PTU . . . . OFF
- YELLOW ENG 2 PUMP . . . . OFF
- YELLOW ELEC PUMP . . . . OFF

R Y ENG 2 PUMP LO PR

R Y SYS LO PR

Affected systems
*F/CTL

HYD G RSVR LO AIR PR/OVHT/LO LVL (CONT'D)

STATUS

■ **sys lost by RSVR LO AIR PR :**

APPR PROC HYD LO PR

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

– GREEN ENG 1 PUMP . . . . ON
– PTU . . . . AUTO

● **IF HYD NOT RECOVERED :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

■ **sys lost by RSVR OVHT :**

APPR PROC HYD LO PR

● **IF GREEN OVHT OUT**

– GREEN ENG 1 PUMP . . . . ON
– PTU . . . . AUTO

● **IF HYD NOT RECOVERED :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

■ **sys lost by RSVR LO LVL :**

– L/G . . . . GRVTY EXTN
Refer to 3.02.32

LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS

GREEN HYD
SPLR 1 + 5
CAT 3 DUAL
N.W. STEER
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
YAW DAMPER 1

HYD Y RSVR LO AIR PR/OVHT/LO LVL

● **RSVR OVHT**
- PTU .... OFF
- YELLOW ENG 2 PUMP .... OFF
- YELLOW ELEC PUMP .... OFF

● **RSVR LO AIR PR**

● **IF PRESS FLUCTUATES :**
- PTU .... OFF
- YELLOW ENG 2 PUMP .... OFF
- YELLOW ELEC PUMP .... OFF

● **RSVR LO LVL**
- PTU .... OFF
- YELLOW ENG 2 PUMP .... OFF
- R YELLOW ELEC 2 PUMP .... OFF

R Y ENG 2 PUMP LO PR.

R Y SYS LO PR

Affected systems
*F/CTL

HYD Y RSVR LO AIR PR/OVHT/LO LVL (CONT'D)

STATUS

■ **sys lost by RSVR LO AIR PR :**

The probability of cavitation increases with altitude. Therefore it may be possible to restore the system after descending to a lower altitude.

APPR PROC HYD LO PR
- YELLOW ENG 2 PUMP .... ON
- PTU .... AUTO

● **if sys not recovered :**

LDG DIST PROC .... APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
FLAPS SLOW
CAT 3 SINGLE

■ **sys lost by RSVR OVHT :**

APPR PROC HYD LO PR

● **IF YELLOW OVHT OUT**
- YELLOW ENG 2 PUMP .... ON
- PTU .... AUTO

● **if not recovered :**

LDG DIST PROC .... APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
FLAPS SLOW
CAT 3 SINGLE

■ **sys lost by RSVR LO LVL :**

LDG DIST PROC .... APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
FLAPS SLOW
CAT 3 SINGLE

Note : Following a yellow hydraulic system failure, the parking brake may be inoperative due to a yellow accumulator low pressure.

INOP SYS

YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
ALTN BRK
REVERSER 2
CARGO DOOR (if LO LVL)
YAW DAMPER 2

HYD G + B SYS LO PR

Note : If green system has been lost because of fluid low level or overheat, "HYD PTU FAULT" should appear demanding that the flight crew switches the PTU OFF.

LAND ASAP

● **if blue sys lost by ELEC PUMP LO PR**

– RAT . . . . MAN ON
MIN RAT SPD . . . . 140 KT

– Affected PUMPS . . . . OFF
– MANEUVER WITH CARE

F/CTL ALTN LAW

(PROT LOST)
The flight control normal laws and associated protections are lost. Only load factor limitation is furnished (alternate law without protection).
MAX SPEED 320/.77
Speed is limited due to loss of high speed protection.
– SPD BRK . . . . DO NOT USE

■ **if blue sys recovered :**

See procedure for single failure

■ **if blue sys not recovered :**

(Refer to 3.02.10) LANDING WITH SLATS OR FLAPS JAMMED.

Affected systems
R * WHEEL
R * F/CTL

HYD G + B SYS LO PR (CONT'D)

STATUS

MIN RAT SPD (if RAT out) . . . . 140 KT
(if B PUMP LO PR)
MAX SPEED 320/.77
MANEUVER WITH CARE
R – SPD BRK . . . . DO NOT USE
APPR PROC DUAL HYD LO PR (line not displayed for a double LO LVL) :

- **if sys lost by RSVR LO AIR PR** :
  - related PUMPS . . . . ON
  - PTU (if green affected) . . . . . AUTO
- **if sys lost by RSVR OVHT** :
  - **IF BLUE OVHT OUT** :
    - BLUE ELEC PUMP . . . . . . AUTO
  - **IF GREEN OVHT OUT** :
    - GREEN ENG 1 PUMP . . . . . . ON
    - PTU . . . . AUTO

HYD G + B SYS LO PR (CONT'D)

STATUS

- **IF HYD NOT RECOVERED (line not displayed for a double LO LVL) :**
  - A/THR .... OFF
    Select the target speed on the FCU. Due to the loss of slats and some flight control surfaces, the A/THR may not satisfactorily maintain speed.
  - FOR LDG .... USE FLAP 3
  - GPWS LDG FLAP 3 .... ON
  - L/G .... GRVTY EXTN
    Refer to 3.02.32.

APPR SPD .... VREF + 25 KT
Approach speed must be increased, due to the loss of ailerons and slats.
LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll. (See the DIRECT LAW procedure 3.02.27)
FLAPS SLOW
CAT 1 ONLY

INOP SYS
G + B HYD
F/CTL PROT
L ELEV
L + R AIL
SPLR 1+3+5
ELAC 1
SLATS
AP 1 + 2
N.W. STEER
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
EMER GEN
(if B RSVR LO LVL)
B ELEC PUMP
YAW DAMPER 1

HYD G + B SYS LO PR (CONT'D)

STATUS

MIN RAT SPD (if RAT out) . . . . 140 KT
(if B PUMP LO PR)
MAX SPEED 320/.77
MANEUVER WITH CARE
R – SPD BRK . . . . DO NOT USE
APPR PROC DUAL HYD LO PR (line not displayed for a double LO LVL) :

- **if sys lost by RSVR LO AIR PR** :
  – related PUMPS . . . . ON
  – PTU (if green affected) . . . . . AUTO
- **if sys lost by RSVR OVHT** :
  - **IF BLUE OVHT OUT** :
    – BLUE ELEC PUMP . . . . . . AUTO
  - **IF GREEN OVHT OUT** :
    – GREEN ENG 1 PUMP . . . . . . ON
    – PTU . . . . AUTO

HYD G + B SYS LO PR (CONT'D)

STATUS

- **IF HYD NOT RECOVERED (line not displayed for a double LO LVL) :**
  - A/THR . . . . OFF
    Select the target speed on the FCU. Due to the loss of slats and some flight control surfaces, the A/THR may not satisfactorily maintain speed.
  - FOR LDG . . . . USE FLAP 3
  - GPWS LDG FLAP 3 . . . . ON
  - L/G . . . . GRVTY EXTN
    Refer to 3.02.32.

APPR SPD . . . . VREF + 25 KT
Approach speed must be increased, due to the loss of ailerons and slats.

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll. (See the DIRECT LAW procedure 3.02.27)

FLAPS SLOW

CAT 1 ONLY

INOP SYS

G + B HYD
F/CTL PROT
L ELEV
L + R AIL
SPLR 1+3+5
SLATS
AP 1 + 2
N.W. STEER
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
EMER GEN
(if B RSVR LO LVL)
B ELEC PUMP
YAW DAMPER 1

HYD G + Y SYS LO PR

LAND ASAP

– Affected PUMPS .... OFF

● **if yellow sys lost by ENG 2 PUMP LO PR**

R – YELLOW ELEC PUMP .... ON

MANEUVER WITH CARE

F/CTL ALTN LAW
(PROT LOST)

Flight control normal laws and associated protections are lost. Only load factor limitation, high and low speed stability are provided (alternate law with reduced protection).

MAX SPEED 320/.77

Speed is limited due to loss of high speed protection.

■ **if yellow sys recovered :**

Refer to procedure for single failure

■ **if yellow sys not recovered**

R *Refer to 3.02.10 LANDING WITH SLATS OR FLAPS JAMMED.*

Affected systems
* F/CTL
* WHEEL

HYD G + Y SYS LO PR (CONT'D)

STATUS

MAX SPEED 320/.77
MAX BRK PR .... 1000 PSI
MANEUVER WITH CARE
R APPR PROC DUAL HYD LO PR (line not
R displayed for a double LO LVL)

- **if sys lost by RSVR LO AIR PR :**
  - related PUMP .... ON
R - PTU (if no RSVR OVHT and no RSVR
R LO LVL) .... AUTO
- **if sys lost by RSVR OVHT :**
  - **IF GREEN OVHT OUT :**
    - GREEN ENG 1 PUMP .... ON
R - PTU (if no Y RSVR OVHT and no
R RSVR LO LVL) .... AUTO
  - **IF YELLOW OVHT OUT :**
    - YELLOW ENG 2 PUMP ...... ON
R - PTU (if no G RSVR OVHT and no
R RSVR LO LVL) .... AUTO

R ● **IF HYD NOT RECOVERED (line not**
R **displayed for a double LO LVL) :**
- FOR LDG .... USE FLAP 3
- GPWS FLAP MODE .... OFF

HYD G + Y SYS LO PR (CONT'D)

STATUS

● **WHEN CONF 3 AND VAPP :**

– L/G .... GRVTY EXTN

(Refer to 3.02.32). Being stabilized at VAPP before selecting the gear down enables the aircraft to be trimmed for approach.

APPR SPD .... VREF + 25 KT

Approach speed must be increased, due to the loss of flaps.

LDG DIST PROC .... APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch as well as in roll (see DIRECT LAW procedure 3.02.27). A slight transient pitch up may occur, depending on the frozen THS position.

BRK Y ACCU PR ONLY

7 full brake applications are available.

SLATS SLOW

CAT 1 ONLY

Note : Following a yellow hydraulic system failure, the parking brake may be inoperative due to yellow accumulator low pressure.

INOP SYS

G + Y HYD
F/CTL PROT
STABILIZER
REVERSER 1 + 2
SPLR 1+2+4+5
FLAPS
YAW DAMPER
AP 1 + 2
ANTI SKID
N.W. STEER
L/G RETRACT
CARGO DOOR
(if Y RSVR LO LVL)

HYD B + Y SYS LO PR

Note : If the yellow system has been lost by low level or overheat, "HYD PTU FAULT" should appear to demand the PTU switch at OFF.

LAND ASAP

- **if yellow sys lost by ENG 2 PUMP LO PR :**
  - YELLOW ELEC PUMP .... ON
- **if blue sys lost by ELEC PUMP LO PR :**
  - RAT .... MAN ON

  MIN RAT SPD .... 140 KT

– Affected PUMPS .... OFF

MAX SPEED 320/.77

Note : Flight controls remain in normal law

– MANEUVER WITH CARE

■ **if blue or yellow sys recovered**

See procedure for single failure

■ **if neither system recovered**

Affected systems
* F/CTL

HYD B + Y SYS LO PR (CONT'D)

STATUS

MIN RAT SPD . . . . 140 KT
(If B PUMP LO PR)
MAX SPEED 320/.77
MANEUVER WITH CARE
APPR PROC : DUAL HYD LO PR (line not displayed for dual LO LVL)

- **If sys lost by RSVR LO AIR PR** :
  - Related PUMP . . . . ON
  - PTU (if yellow affected) . . . . AUTO
- **If sys lost by RSVR OVHT** :
  - **IF BLUE OVHT OUT**
    - BLUE ELEC PUMP . . . . . . AUTO
  - **IF YELLOW OVHT OUT**
    - YELLOW ENG 2 PUMP . . . . . ON
    - PTU . . . . AUTO
- **IF HYD NOT RECOVERED (line not displayed for dual LO LVL)** :
  - L/G . . . . GRVTY EXTN

    Landing gear is extended by gravity to preserve green system integrity (Refer to 3.02.32).

LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
SLATS/FLAPS SLOW
CAT 1 ONLY
Note : *Following a yellow hydraulic system failure, the parking brake may be inoperative due to yellow accumulator low pressure.*

INOP SYS
B + Y HYD
R ELEV
SPLR 2+3+4
SPD BRK
AP 1 + 2
ALTN BRK
CARGO DOOR
(if Y RSVR LO LVL)
REVERSER 2
B ELEC PUMP
EMER GEN
(if B RSVR LO LVL)
YAW DAMPER 2

HYD Y ELEC PUMP LO PR or OVHT

If the ELEC PUMP overheats, or if the Y ELEC PUMP fails, while the Y ENG PUMP and the PTU are inoperative :

– YELLOW ELEC PUMP .... OFF

Y SYS LO PR

Affected systems
*F/CTL

STATUS

APPR PROC HYD LO PR
- **IF YELLOW OVHT OUT**
  - – YELLOW ENG 2 PUMP .... ON
  - – PTU .... AUTO

  The above two lines are only displayed, in case of an electrical pump overheat.

LDG DIST PROC .... APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS
YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
ALTN BRK
REVERSER 2
Y ELEC PUMP
YAW DAMPER 2

HYD G (Y) ENG 1(2) PUMP LO PR

– ENG PUMP (affected) . . . . OFF

■ **PTU operative**

STATUS

INOP SYS
G (Y) ENG 1(2)
PUMP

■ **PTU inoperative**

G (Y) SYS LO PR

Note : If yellow system is affected, the yellow elec pump may be used

Affected systems
* WHEEL
(if G SYS affected)
* F/CTL

STATUS

● **G sys lost**
– L/G . . . . GRVTY EXTN
LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
SLATS/FLAPS SLOW
CAT 3 SINGLE

INOP SYS
GREEN HYD
SPLR 1 + 5
CAT 3 DUAL
N.W. STEER
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
PTU
G ENG 1 PUMP
YAW DAMPER 1

● **Y sys lost :**
LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
FLAPS SLOW
CAT 3 SINGLE
Note : Following a yellow hydraulic system failure, the parking brake may be inoperative due to a yellow accumulator low pressure.

INOP SYS
YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
ALTN BRK
REVERSER 2
PTU
Y ENG 2 PUMP
YAW DAMPER 2

HYD PTU FAULT

Note : This warning is triggered, if the second engine is started within 40 seconds, following the end of the cargo doors operation. In this case, reset the warning by switching the yellow elec pump ON, then OFF.

● **If green or yellow reservoir low level and system low press:**
– PTU . . . . OFF

STATUS

INOP SYS
PTU

HYD RAT FAULT

Crew awareness.

STATUS

INOP SYS
RAT

HYD B ELEC PUMP LO PR or OVHT

– BLUE ELEC PUMP . . . . OFF

B SYS LO PR

Affected systems
*F/CTL

STATUS

APPR PROC HYD LO PR
● **IF BLUE OVHT OUT**
– BLUE ELEC PUMP . . . . AUTO
LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
SLATS SLOW
CAT 3 SINGLE ONLY

INOP SYS
BLUE HYD
SPLR 3
CAT 3 DUAL
B ELEC PUMP

ANTI ICE L (R) WINDSHIELD (WINDOW)

R Crew awareness.

STATUS

INOP SYS
L (R) WSHLD
(WNDW) HEAT

ANTI ICE L + R WINDSHIELD

R Crew awareness.

STATUS

INOP SYS
WSHLD HEAT

ANTI ICE CAPT PITOT or L (R) STAT

Failure of probe heating.

– AIR DATA SWTG . . . . CAPT

ADR 3 supplies data to PFD 1 and ND 1.

When ADR 3 is selected on captain side, deicing of pitot associated with ADR 1 is lost.

Note : AIR DATA SWTG should not be selected to CAPT 3 if ADR 3 is not available.

STATUS

INOP SYS

CAPT PITOT/
L STAT/
R STAT

ANTI ICE F/O PITOT or L (R) STAT

Failure of probe heating.

– AIR DATA SWTG . . . . F/O

ADR 3 supplies data to PFD 2 and ND 2.

Note : AIR DATA SWTG should not be selected to F/O 3 if ADR 3 is not available.

STATUS

INOP SYS

F/O PITOT/
L STAT/
R STAT

ANTI ICE CAPT (F/O) AOA or TAT

Crew awareness

STATUS

INOS SYS
R CAPT (F/O)
AOA/TAT

ANTI ICE STBY PITOT or L (R) STAT or AOA

Crew awareness

If standby instruments are used, monitor air data information.

STATUS

INOP SYS
STBY PITOT/
L(R) STAT/
AOA

R

DOUBLE PROBE HEAT FAILURE

In case of double failure of pitot or alpha probe heaters in icing conditions, the choice made by the computers among the 3 ADR values is erroneous.

- **If icing conditions cannot be avoided :**
  - One of affected ADRs . . . . OFF

    There will be a disagreement between the two remaining ADRs : see F/CTL ADR DISAGREE (3.02.34).

ANTI ICE CAPT (F/O) (STBY) PROBES

■ **CAPT PROBES fault :**

– AIR DATA SWTG . . . . CAPT

Note : AIR DATA SWTG should not be selected to CAPT 3 if ADR 3 is not available.

STATUS

INOP SYS
CAPT PROBES

■ **F/O PROBES fault :**

– AIR DATA SWTG . . . . F/O

Note : AIR DATA SWTG should not be selected to F/O 3 if ADR 3 is not available.

STATUS

INOP SYS
F/O PROBES

■ **STBY PROBES fault :**

Crew awareness

STATUS

INOP SYS
STBY PROBES

ANTI ICE ENG 1 (2) VALVE CLSD

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

INOP SYS
ENG 1 (2) A. ICE

ANTI ICE ENG 1 (2) VALVE OPEN

THRUST LIM PENALTY

STATUS

THRUST LIM PENALTY

WING ANTI ICE L (R) VALVE OPEN

■ **Failure detected on ground :**

- WING ANTI ICE .... OFF
- ENG BLEED (affected side) .... OFF
- X BLEED (if not closed) .... SHUT
- APU BLEED (if left wing affected and if APU running) .. OFF

WAI AVAIL IN FLT

STATUS

WAI AVAIL IN FLT

INOP SYS
ENG 1 (2) BLEED
PACK 1 (2)

● **After takeoff when above 1500 feet (automatic recall) :**

WAI AVAIL IN FLT

- ENG BLEED .... ON
- WING ANTI ICE .... AS RQRD

Wing anti ice is available if needed and anyway is continually on, on failed side.

- THRUST LIM PENALTY

STATUS

R THRUST LIM PENALTY

● **After landing (automatic recall) :**

- WING ANTI ICE .... OFF
- ENG BLEED (affected side) .... OFF
- X BLEED (if not closed) .... SHUT
- APU BLEED (if left wing affected) .... OFF

STATUS

INOP SYS
ENG 1 (2) BLEED
PACK 1 (2)

WING ANTI ICE L (R) VALVE OPEN (CONT'D)

■ **Failure detected in flight :**

WAI AVAIL IN FLT
- WING ANTI ICE . . . . AS RQRD

  Wing anti-ice is available if needed and anyway is continually on on failed side.
- THRUST LIM PENALTY

STATUS

THRUST LIM PENALTY
WAI AVAIL IN FLT

● **After landing (automatic recall) :**
- ENG BLEED (affected side) . . . . OFF
- X BLEED (if not closed) . . . . SHUT
- APU BLEED (if left wing affected) . . . . OFF
- WING ANTI ICE . . . . OFF

STATUS

INOP SYS
ENG 1(2) BLEED
PACK 1 (2)

WING ANTI ICE OPEN ON GND

Following ground test the valves are still open after 35 seconds.

– WING ANTI ICE . . . . OFF

STATUS

WAI AVAIL IN FLT

WING ANTI ICE SYS FAULT

- **If one wing valve remains closed when the wing anti-ice is turned on :**

  – WING ANTI ICE . . . . OFF

  AVOID ICING CONDITIONS

STATUS

R AVOID ICING CONDITIONS
R *Note : If ice accretion, the approach speed must not be*
R *lower than VLS + 5 knots and the landing*
R *distance must be multiplied by 1.1.*

INOP SYS
WING ANTI ICE

- **If the wing anti-ice is turned on after one engine shutdown or after the loss of one bleed :**

  – X BLEED . . . . OPEN

R *Note : The affected pack has to be selected OFF due to precooler performance.*

WING ANTI ICE L (R) HI PR

THRUST LIM PENALTY

STATUS

THRUST LIM PENALTY

INOP SYS
WAI REGUL

RECORDER DFDR FAULT

Crew awareness.

STATUS

INOP SYS
DFDR

RECORDER FDIU FAULT

Crew awareness.

STATUS

INOP SYS
FDIU

FWS OEB/FWC DISCREPANCY

– OEB DATABASE .... XCHECK
This action is normally performed by maintenance.

FWS SDAC 1(2) FAULT

Crew awareness

STATUS

INOP SYS
SDAC 1(2)

FWS SDAC 1 + 2 FAULT

– MONITOR OVERHEAD PANEL
Amber cautions are lost. Aircraft status on the ECAM STATUS page is lost.
Only red warnings, engine and fuel parameters, and slat/flap positions are available on the upper ECAM DU.

R – ECAM ENG FUEL F/CTL WHEEL (L/G pos ind) SYS PAGES
R AVAIL.

STATUS

Note : Although this failure does not affect engine idle, the "ENG 1 APPR IDLE ONLY" and "ENG 2 APPR IDLE ONLY" messages are displayed. Disregard them.

INOP SYS
SDAC 1 + 2

EIS DMC 1(2)(3) FAULT

■ **DMC 1**
– EIS DMC SWITCH .... CAPT
DMC 3 replaces DMC 1.

■ **DMC 2**
– EIS DMC SWITCH .... F/O
DMC 3 replaces DMC 2.

■ **DMC 3**
Crew awareness.

STATUS

INOP SYS
DMC 1(2)(3)

FWS FWC 1(2) FAULT

Crew awareness.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
R CAT 3 DUAL
R FWC 1(2)

FWS FWC 1 + 2 FAULT

– MONITOR SYS
R – MONITOR OVERHEAD PANEL

NOT AVAIL
R ECAM WARN
ALTI ALERT
STATUS
A/CALL OUT
MEMO

ECAM cautions and warnings, aural warnings, master caution and warning lights are lost. ECAM system pages are still available. Therefore cockpit panels must be monitored for local warnings and ECAM system pages must be regularly called for system checks.

DISPLAY UNIT FAILURE

■ **AFFECTED DU IS BLANK or DISPLAY IS DISTORTED :**

– DU (affected) . . . . AS RQRD
The DU can be switched off.

– ECAM/ND XFR (if ECAM DUs affected) . . . . USE
Transfer SD to F/O or CAPT ND.

– PFD/ND XFR (if EFIS DUs affected) . . . . USE

■ **DIAGONAL LINE ON THE AFFECTED DU :**

R *This failure may be due to a DMC FAULT or a communication interruption between the*
R *DMC and DU.*

– EIS DMC SWITCHING . . . . AS RQRD

● **If unsuccessful :**

– DU (affected) . . . . OFF THEN ON

R *Note : ND display may disappear, in case too many waypoints and associated*
R *information are displayed. Reduce the range, or deselect WPT or CSTR, and*
R *the display will automatically recover after about 30 seconds.*

■ **INVERSION OF EWD AND SD :**

R – ECAM UPPER DISPLAY . . . . OFF THEN ON
The same action on the EIS DMC SWITCHING selector produces the same effect.

ECAM SINGLE DISPLAY

Only the EWD is available. No SD on the other DUs.

■ **To call a SYS page :**

– PRESS AND MAINTAIN SYS page key on the ECP.

■ **OVERFLOW ON THE STATUS page :**

– PRESS AND MAINTAIN STS KEY ON ECP
First page of STATUS is displayed.

– RELEASE IT, THEN PRESS AGAIN WITHIN 2 SECONDS
Second page of STATUS is displayed.

– CONTINUE UNTIL THE OVERFLOW ARROW DISAPPEARS.
When the STS key is released for more than 2 seconds, EWD is displayed again.

L/G SHOCK ABSORBER FAULT

■ **Shock absorber not extended after liftoff :**

MAX SPEED 280/.67
– L/G . . . . KEEP DOWN

STATUS

MAX SPEED 280/.67	INOP SYS
– L/G . . . . KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

Flight with landing gear extended has a significant effect on fuel consumption and climb gradient (see "SPECIAL OPERATIONS" - FLIGHT WITH GEAR DOWN).

R *Note : If WHEEL N.W. STEER FAULT is also displayed, then the nose wheels may be at*
R *maximum deflection. (turned 90 degrees from center). During landing, delay nose*
R *wheel touchdown for as long as possible.*

■ **Shock absorber extended on the ground :**

Crew awareness.

L/G GEAR NOT UPLOCKED

This warning appears if the landing gear sequence is not completed after 30 seconds.

■ **L/G doors closed :**

AVOID EXCESS G FACTOR

Because the gear rests on the doors, avoid excessive load factors in order not to damage door structure.

L/G GEAR NOT UPLOCKED (CONT'D)

■ **L/G doors not closed :**

MAX SPEED 220/.54
– L/G . . . . RECYCLE

● **IF UNSUCCESSFUL :**

– L/G . . . . DOWN
MAX SPEED 280/.67

STATUS

MAX SPEED 280/.67	INOP SYS
INCREASED FUEL CONSUMP	L/G RETRACT

Note : – Flight with landing gear extended has a significant effect on fuel consumption and climb gradient (see "SPECIAL OPERATIONS" - FLIGHT WITH GEAR DOWN - FCOM 2.04.25). Multiply fuel consumption by approximately 2.8. Disregard FM fuel predictions.
– Other predictions should also be disregarded (altitude, speed and time), except time predictions at waypoints when in cruise.
– Do not use managed speed (except in approach) and CLB and DES autopilot modes.

L/G GEAR NOT DOWNLOCKED

This warning appears, if the landing gear sequence is not completed after 30 seconds.

– L/G lever . . . . RECYCLE

● **IF UNSUCCESSFUL :**

– L/G . . . . GRVTY EXTN
Rotate the handle clockwise about 3 turns until reaching the mechanical stop. See the procedure on the next page.

STATUS

– L/G . . . . GRVTY EXTN	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL
If gravity extension is unsuccessful, see "LDG WITH ABNORMAL L/G" procedure.	N.W. STEER

Note : As nose gear doors remain open, hydraulic power for nosewheel steering is lost.

L/G GRAVITY EXTENSION

– GRAVITY GEAR EXTN handcrank . . . . PULL AND TURN

Rotate the handle clockwise 3 turns until reaching the mechanical stop, even if resistance is felt.

– L/G lever . . . . DOWN

The landing gear lever should be confirmed in the DOWN position for the following reasons :

· To turn off the UNLK lights on the landing gear indication panel.
· To prevent the L/G CTL message from appearing on the WHEEL page.
· To minimize the risk of landing gear retraction on the ground, due to an unknown system fault, when the freefall system is reset.

– GEAR DOWN indications (if available) . . . . CHECK

Note : 1. Depending on aircraft speed, the display may show the landing gear doors in the amber transit position.

2. In the event of gravity extension, caused by the failure of both LGCIUs, landing gear position indications on the ECAM are lost. LDG GEAR lights on the LDG GEAR control panel remain available, if LGCIU 1 is electrically-supplied.

R *3. The LGCIU 2 FAULT or BRAKES BSCU CH 1(2) FAULT warning may be spuriously triggered after a gravity extension.*

4. If the three green downlock arrows are not on, it is possible that the handcrank is not at the mechanical stop. Check that the handcrank is firmly against the mechanical stop.

CAUTION

Nosewheel steering is lost.

■ **If successful :**

Do not reset the freefall system. This will avoid such undesirable effects as further loss of fluid, in the event of a leak, or possible landing gear unlocking, in the event of a gear selector valve jamming in the UP position.

Note : The freefall system may be reset in flights used for training. If the green hydraulic system is available, resetting the freefall system allows the landing gear doors to be closed and the nosewheel steering to operate.
The flight crew should not reset the freefall system on ground after the flight.

■ **If unsuccessful :**

– LDG WITH ABNORMAL L/G procedure . . . . APPLY

L/G DOORS NOT CLOSED

- **If aircraft speed is below 220 knots and the L/G lever is UP:**
  – L/G . . . . RECYCLE
- **IF UNSUCCESSFUL :**
  MAX SPEED 250/.60

STATUS

MAX SPEED 250/.60	INOP SYS
INCREASED FUEL CONSUMP	L/G DOOR

L/G GEAR UPLOCK FAULT

– L/G . . . . KEEP DOWN

The landing gear must be left down to avoid structural damage, because the uplock device will stay in the locked position.

MAX SPEED 280/.67

STATUS

MAX SPEED 280/.67	INOP SYS
– L/G . . . . KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

Flight with the landing gear extended has a significant effect on fuel consumption and
R *climb gradient (see "SPECIAL OPERATIONS" - FLIGHT WITH GEAR DOWN). Multiply fuel*
R *consumption by approximately 2.8.*

L/G SYS DISAGREE

Disagreement between the landing gear positions are detected by LGCIU 1 and LGCIU 2. Provided there is no other L/G ECAM warning, the landing gear position is in agreement with the landing gear lever position.

Crew awareness.

L/G GRAVITY EXTENSION

– GRAVITY GEAR EXTN handcrank . . . . PULL AND TURN

Rotate the handle clockwise 3 turns until reaching the mechanical stop, even if resistance is felt.

– L/G lever . . . . DOWN

The landing gear lever should be confirmed in the DOWN position for the following reasons :

· To turn off the UNLK lights on the landing gear indication panel.
· To prevent the L/G CTL message from appearing on the WHEEL page.
· To minimize the risk of landing gear retraction on the ground, due to an unknown system fault, when the freefall system is reset.

– GEAR DOWN indications (if available) . . . . CHECK

Note : 1. Depending on aircraft speed, the display may show the landing gear doors in the amber transit position.
2. In the event of gravity extension, caused by the failure of both LGCIUs, landing gear position indications on the ECAM are lost. LDG GEAR lights on the LDG GEAR control panel remain available, if LGCIU 1 is electrically-supplied.
3. The LGCIU 2 FAULT or BRAKES SYS 1(2) FAULT warning may be spuriously triggered after a gravity extension.
4. If the three green downlock arrows are not on, it is possible that the handcrank is not at the mechanical stop. Check that the handcrank is firmly against the mechanical stop.

CAUTION
Nosewheel steering is lost.

■ **If successful :**

Do not reset the freefall system. This will avoid such undesirable effects as further loss of fluid, in the event of a leak, or possible landing gear unlocking, in the event of a gear selector valve jamming in the UP position.

Note : The freefall system may be reset in flights used for training. If the green hydraulic system is available, resetting the freefall system allows the landing gear doors to be closed and the nosewheel steering to operate.
The flight crew should not reset the freefall system on ground after the flight.

■ **If unsuccessful :**

– LDG WITH ABNORMAL L/G procedure . . . . APPLY

L/G DOORS NOT CLOSED

- **If aircraft speed is below 220 knots and the L/G lever is UP:**
  – L/G .... RECYCLE
- **IF UNSUCCESSFUL :**
  MAX SPEED 250/.60

STATUS

MAX SPEED 250/.60	INOP SYS
INCREASED FUEL CONSUMP	L/G DOOR

L/G GEAR UPLOCK FAULT

– L/G .... KEEP DOWN

The landing gear must be left down to avoid structural damage, because the uplock device will stay in the locked position.

MAX SPEED 280/.67

STATUS

MAX SPEED 280/.67	INOP SYS
– L/G .... KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

Flight with the landing gear extended has a significant effect on fuel consumption and
R *climb gradient (see "SPECIAL OPERATIONS" - FLIGHT WITH GEAR DOWN). Multiply fuel*
R *consumption by approximately 2.8.*

L/G SYS DISAGREE

Disagreement between the landing gear positions are detected by LGCIU 1 and LGCIU 2. Provided there is no other L/G ECAM warning, the landing gear position is in agreement with the landing gear lever position.

Crew awareness.

L/G LGCIU 1(2) FAULT

■ one LGCIU faulty :

– GPWS (if LGCIU 1 affected) . . . . OFF

If LGCIU 1 is lost, GPWS receives "L/G in up position" information even if the landing gear is down.
Setting the GPWS SYS pushbutton to OFF will prevent untimely warnings during the approach.

STATUS

ENG 1(2) APPR IDLE ONLY

When idle is selected on the ground with slats extended, only approach idle is available.

INOP SYS
LGCIU 1(2)
REV 1(2)
GPWS (if LGCIU 1 fault)

■ both LGCIUs faulty :

Normal landing gear control and position indications are lost. LDG GEAR lights on LDG GEAR control panel remain available if LGCIU 1 is electrically supplied.

– L/G . . . . GRVTY EXTN

See the L/G GRAVITY EXTENSION procedure.

– GPWS . . . . OFF

As LGCIU 1 is lost, GPWS receives "L/G in up position" information even if the landing gear is down.
Setting the GPWS SYS pushbutton to OFF will prevent untimely warnings during approach.

STATUS

– L/G . . . . GRVTY EXTN
L/G CONTROL NOT AVAIL
ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
CAT 1 ONLY

INOP SYS
REVERSER 1 + 2
AP 1 + 2 (except in LAND mode)
A/THR
N.W STEER
LGCIU 1 and 2
GPWS

Note : 1. The partial spoiler extension (◁) at landing when only one main landing gear is compressed is not available. The spoilers extend normally on ground when wheel speed greater than 72 knots.
2. Depending on the LGCIU failure, only a part of the above systems may be lost.

L/G GEAR NOT DOWN

Select landing gear down.

LDG WITH ABNORMAL L/G

The procedure is intended for use when the nose or main landing gear fail to extend and/or lock down following the application of the L/G GRVTY EXTN procedure.
It is preferable to use any available landing gear, rather than carry out a belly landing.
Under these circumstances, a hard surface runway landing is recommended.
Full advantage should be taken of any foam, spread on the runway.

PREPARATION

- CABIN CREW .... NOTIFY
  Notify the cabin crew of the nature of the emergency encountered and state intentions. Specify the amount of available preparation time.
- ATC .... NOTIFY
  Notify ATC of the nature of the emergency and state intentions.
  Consider fuel reduction to a safe minimum. This reduces VREF and, consequently, the load factor at impact and the energy to be dissipated.
- GALLEY .... OFF

● **If NOSE L/G abnormal**
  - CG location (if possible) .... AFT
    · *10 passengers from front to rear about + 4 %*
    · *10 passengers from mid to rear about + 2.5 %*

● **If one MAIN L/G abnormal**
  - FUEL IMBALANCE .... CONSIDER
    Open the fuel X-FEED valve and switch off the pumps on the side with landing gear normally extended.

- OXYGEN CREW SUPPLY .... OFF
- SEAT BELTS/NO SMOKING .... ON
- CABIN and COCKPIT .... PREPARE
  · *Loose equipment secured.*
  · *Survival equipment prepared.*
  · *Belts and shoulder harnesses locked.*

APPROACH

- GPWS SYS .... OFF
- L/G lever .... CHECK DOWN
R - GRVTY GEAR EXTN handcrank .. TURN BACK TO NORMAL
R *Rotating three turns back to normal may, in certain cases, pressurize the landing gear down actuators, thereby reducing the probability of gear collapse after touchdown.*

LDG WITH ABNORMAL L/G (CONT'D)

- AUTOBRAKE .... DO NOT ARM

  Manual braking will enable better pitch and roll control. Moreover, with at least one main landing gear in the abnormal position the autobrake cannot be activated (ground spoilers not armed).
- EMER EXIT LT .... ON
- CABIN REPORT .... OBTAIN

● **If one or both MAIN L/G abnormal**

- A/SKID & N/S STRG .... OFF

  With one main landing gear not extended, the reference speed used by the anti-skid to detect a wheel blockage is not correctly initialized. Consequently, the anti-skid must be switched off to prevent permanent brake release.
- MAX BRAKE PR 1000PSI

  Modulate the brake pressure to 1000 psi because the anti-skid is off.
- GROUND SPOILERS .... DO NOT ARM

  To keep as much roll authority as possible for maintaining the wings level.
  Ground spoiler extension would prevent spoilers from acting as roll surfaces.

BEFORE LANDING

- RAM AIR .... ON

  To ensure full depressurization of the aircraft before impact.
- BRACE FOR IMPACT .... ORDER

FLARE, TOUCH DOWN AND ROLL OUT

Engines should be shut down sufficiently early to ensure fuel is shut off before the nacelles impact, but sufficiently late to ensure adequate hydraulic supplies for the flight controls.

Engine pumps continue to supply adequate hydraulic pressure for 30 seconds after engine shutdown.

- REVERSE .... DO NOT USE

  Do not use reverse to prevent ground spoiler extension, and because the engine will touch the ground during roll-out.

● **if NOSE L/G abnormal**

- NOSE .... MAINTAIN UP

  After touchdown, keep the nose off the runway by the use of the elevator. Then, lower the nose on to the runway before elevator control is lost.
- BRAKES (compatible with elevator efficiency) . . . APPLY
- ENG MASTERS .... OFF

  Shutdown the engines before nose impact.

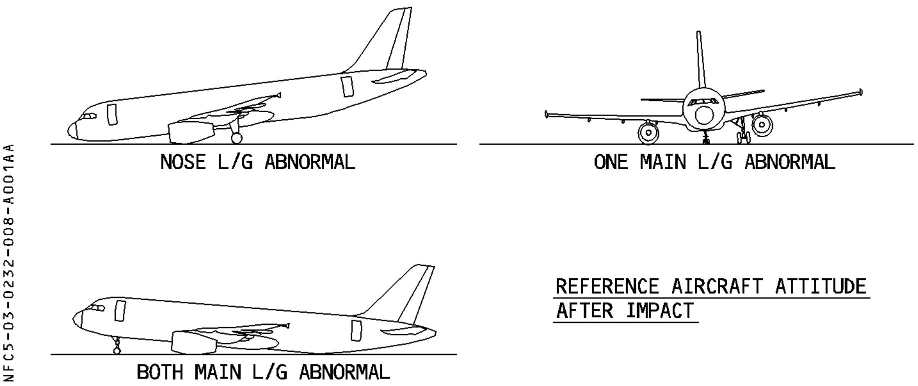
LDG WITH ABNORMAL L/G (CONT'D)

- **If one MAIN L/G abnormal**
  - ENG MASTERS . . . . OFF
    At touchdown, shut down both engines.
  - FAILURE SIDE WING . . . . MAINTAIN UP
    Use roll control, as necessary, to maintain the unsupported wing up as long as possible.
  - DIRECTIONAL CONTROL . . . . MAINTAIN
    Use rudder and brakes (maximum 1000 psi) to maintain the runway axis as long as possible.
- **If both MAIN L/G abnormal**
  - ENG MASTERS . . . . OFF
    Shut down the engines in the flare, before touchdown.
  - PITCH ATTITUDE (at touchdown) . . NOT LESS THAN 6°

WHEN A/C STOPPED

- ENG (all) and APU FIRE pushbutton . . . . PUSH
  Pressing the ENG FIRE pushbutton shuts off the related hydraulic pressure within a short time.
- ALL ENG and APU AGENT . . . . DISCH

R – EVACUATION . . . . INITIATE
  · *Announce : "PASSENGER EVACUATION" over the Passenger Address system, and press the EVAC COMMAND pushbutton.*
  · *All emergency and passenger doors may be used to evacuate the aircraft.*



CONFIG PARK BRAKE ON

Check that the parking brake handle is in the OFF position. If warning stays on, check that the brake pressure is at zero on the BRAKES PRESSURE indicator.

WHEEL N.W. STEER FAULT

STATUS

CAT 3 SINGLE ONLY

Note : 1. Use differential braking to steer the aircraft during taxi.
2. If the L/G SHOCK ABSORBER FAULT is also displayed, then the nose wheels may be at maximum deflection. (turned 90 degrees from center). During landing, delay nosewheel touchdown as long as possible.
R *3. As specified in the QRH 5.04, automatic rollout is*
R *not permitted.*

INOP SYS
CAT 3 DUAL
N.W. STEER

BRAKES A/SKID NWS FAULT or ANTI SKID/NWS OFF

Either both BSCU channels are failed, or the A/SKID & N/W STRG switch is OFF.

MAX BRK PR . . . . 1000 PSI

Monitor brake pressure on the BRAKES PRESS indicator. Limit brake pressure to approximately 1000 psi and, at low ground speed, adjust brake pressure as required.
Avoid landing on an icy runway.

STATUS

MAX BRK PR . . . . 1000 PSI
LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
CAT 3 SINGLE ONLY

Note : 1. Autobrake is lost.
2. As specified in the QRH 5.04, automatic rollout is not permitted.

INOP SYS
CAT 3 DUAL
ANTI SKID
N.W. STEER
BSCU CH 1
BSCU CH 2

BRAKES BSCU CH 1(2) FAULT

Crew awareness.

STATUS

INOP SYS
BSCU CH 1(2)

BRAKES HOT

– BRK FAN (if installed) .... ON

Note : If the caution is displayed during taxi in, brake fan selection should be delayed for a minimum of about 5 minutes, or done just before stopping at the gate (whichever occurs first), to allow thermal equalization and stabilization, and thus avoid oxidation of brake surface hot spots.

■ **On ground :**

– DELAY T.O. FOR COOL

· *Delay takeoff, until the brake temperature is below 300° C with the brake fans OFF, and 150°C with the brake fans ON (◁).*

· *Refer to 3.04.32 for brake temperature limitations requiring maintenance actions.*

· *If the BRAKES HOT message is still on when the aircraft is parked, the flight crew should not set the PARKING BRK ON.*

■ **In flight :**

● **IF PERF PERMITS :**

– L/G .... DN FOR COOL

MAX SPEED 250/.60

· *If performance permits, the landing gear should be extended or, if already extended, it should remain so, to improve brake cooling.*

· *Reduce speed to 220 knots, for landing gear retraction, when the brake temperature is within limits.*

STATUS

MAX SPEED 280/.67

As long as the landing gear is extended, limit the speed to 280kt/M.67.

For landing gear retraction when the brake temperature is within limits, reduce the speed to 220 knots.

BRAKES AUTO BRK FAULT

Crew awareness

BRAKE RELEASED

The AUTOBRAKE FAULT warning may be due to a failure of the autobrake mode itself, or to a brake released condition. The crew should, therefore, be prepared to counter a possible slight lateral drift at landing, by using the rudder.

STATUS

LDG DIST PROC .... APPLY | INOP SYS

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.* | AUTO BRK

CONFIG PARK BRAKE ON

Check that the parking brake handle is in the OFF position. If warning stays on, check that the brake pressure is at zero on the BRAKES PRESSURE indicator.

R ## WHEEL N/W STRG FAULT

CAT 3 SINGLE ONLY

R *Note : 1. Use differential braking to steer the aircraft during*
R *taxi.*
R *2. If the L/G SHOCK ABSORBER FAULT is also displayed, then the nose wheels may be at maximum deflection. (turned 90 degrees from center). During landing, delay nose wheel touchdown as long as possible.*
R *3. As specified in the QRH 5.04, automatic rollout is*
R *not permitted.*

STATUS

INOP SYS

CAT 3 DUAL
N/W STRG

BRAKES A/SKID NWS FAULT or ANTI SKID/NWS OFF

Either both BSCU channels are failed, or the A/SKID & NOSEWHEEL switch is OFF.

MAX BRK PR . . . . 1000 PSI

Monitor brake pressure on the BRAKES PRESS indicator. Limit brake pressure to approximately 1000 psi and, at low ground speed, adjust brake pressure as required.

Avoid landing on an icy runway.

STATUS

MAX BRK PR . . . . 1000 PSI

LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

R CAT 3 SINGLE ONLY

Note : 1. Autobrake is lost.
2. As specified in the QRH 5.04, automatic rollout is not permitted.

INOP SYS

CAT 3 DUAL
ANTI SKID
N/W STRG
BRK SYS 1
BRK SYS 2

BRAKES SYS 1(2) FAULT

Crew awareness.

STATUS

INOP SYS

BRK SYS 1(2)

BRAKES HOT

■ **On ground :**

– BRK FAN (if installed) . . . . ON

Note : If the caution is displayed during taxi in, brake fan selection should be delayed for a minimum of about 5 minutes, or done just before stopping at the gate (whichever occurs first), to allow thermal equalization and stabilization, and thus avoid oxidation of brake surface hot spots.

– DELAY T.O. FOR COOL

· *Delay takeoff, until the brake temperature is below 300° C with the brake fans OFF, and 150°C with the brake fans ON (◁).*

· *Refer to 3.04.32 for brake temperature limitations requiring maintenance actions.*

· *If the BRAKES HOT message is still on when the aircraft is parked, the flight crew should not set the PARKING BRK ON.*

■ **In flight :**

● **IF PERF PERMITS :**

– L/G . . . . DN FOR COOL

– BRK FAN (if installed) . . . . ON

MAX SPEED 250/.60

· *If performance permits, the landing gear should be extended or, if already extended, it should remain so, to improve brake cooling.*

· *Reduce speed to 220 knots, for landing gear retraction, when the brake temperature is within limits.*

STATUS

MAX SPEED 280/.67

As long as the landing gear is extended, limit the speed to 280kt/M.67.

For landing gear retraction when the brake temperature is within limits, reduce the speed to 220 knots.

BRAKES AUTO BRK FAULT

Crew awareness

BRAKE RELEASED

The AUTOBRAKE FAULT warning may be due to a failure of the autobrake mode itself, or to a brake released condition. The crew should, therefore, be prepared to counter a possible slight lateral drift at landing, by using the rudder.

STATUS

LDG DIST PROC . . . . APPLY | INOP SYS

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.* | AUTO BRK

LOSS OF BRAKING

● **IF AUTOBRAKE IS SELECTED :**

– BRAKE PEDALS . . . . PRESS

This will override the autobrake.

● **IF NO BRAKING AVAILABLE :**

– REV . . . . MAX

– BRAKE PEDALS . . . . RELEASE

Brake pedals should be released when the A/SKID & N/W STRG selector is switched OFF, since the pedal force or displacement produces more braking action in alternate mode than in normal mode.

– A/SKID & N/W STRG . . . . OFF

Braking system reverts to alternate mode.

– BRAKE PEDALS . . . . PRESS

Apply brake with care, since initial pedal force or displacement produces more braking action in alternate mode than in normal mode.

– MAX BRK PR . . . . 1000 PSI

Monitor brake pressure or BRAKES PRESS indicator. Limit brake pressure to approximately 1000 psi and, at low ground speed, adjust brake pressure as required.

● **If STILL NO BRAKING :**

– PARKING BRAKE . . . . USE

Use short successive parking brake applications to stop the aircraft. Brake onset asymmetry may be felt at each parking brake application. If possible, delay the use of the parking brake until low speed, to reduce the risk of tire burst and lateral control difficulties.

WHEEL HYD SEL FAULT

R *Failure of normal brake selector valve, or the steering selector valve, in the open position.*
R *– If the normal brake selector valve is failed open, full green hydraulic pressure is present*
R *at normal servovalves' entry.*
R *Nosewheel steering remains available.*
R *– On ground, do not tow the aircraft with the green hydraulic system pressurized :*
R *Nosewheel steering remains pressurized, and so towing may either break the towbar*
R *shear pin, or the nose gear (if towbarless towing).*
R *– Selecting A/SKID & N/W STRG OFF, or resetting the BSCU, will cause the nosewheel to*
R *go to maximum deflection.*

– A/SKID & N/W STRG . . . . KEEP ON

As long as antiskid is operative, brake pressure is regulated by normal servovalves.

RESIDUAL BRAKING PROC

■ **IN FLIGHT :**

For simplication purposes, the following procedure must be applied in all residual braking cases (of the normal or alternate system), even if some actions are not really necessary in the case of actual residual pressure on the normal braking system.

– BRAKE PEDALS . . . . APPLY SEVERAL TIMES

Press the brakes pedals several times. This could zero a residual pressure on the alternate system.

● **IF RESIDUAL PRESSURE REMAINS :**

– A/SKID & N/W STRG selector . . . . KEEP ON

■ **IF AUTOBRAKE IS AVAILABLE :**

– FOR LANDING . . . . AUTO/BRK MED

Using MED mode gives immediate priority to normal braking upon landing gear touchdown, which cancels alternate pressure.

■ **IF AUTOBRAKE IS NOT AVAILABLE :**

– JUST AFTER TOUCHDOWN . . . . APPLY BRAKING

Pressing the brake pedals gives immediate priority to normal braking, which cancels residual alternate pressure.

– Beware of possible braking asymmetry after touchdown, which can be controlled by using the pedals.

Note : In case of taxi with deflated or damaged tires, refer to the TAXI WITH DEFLATED TIRES procedure (FCOM 3.01.32, page 2).

NAV HDG DISCREPANCY

– HDG . . . . X CHECK
Compare the 3 IR headings on ADIRS CDU or crosscheck with standby compass.
– ATT HDG SWTG . . . . AS RQRD
Select IR 3 (if available) to faulty side.

NAV ATT DISCREPANCY

– ATT . . . . X CHECK
Crosscheck with standby horizon.
– ATT HDG SWTG . . . . AS RQRD
Select IR 3 (if available) to faulty side.

NAV ALTI DISCREPANCY

Crew awareness.

OVERSPEED

VMO/MMO 350/.82
(235/.60 in case of dispatch with landing gear down).
VLE 280/.67
VFE . . . . see below

CONF	VFE
FULL	177
3	185
2	200
1 + F	215
1	230

NAV ADR FAULT

Note : In case of simultaneous failure of ADR and IR (same ADIRU), apply ADR FAULT procedure before IR FAULT procedure.

■ ADR 1 FAULT :

– AIR DATA SWTG . . . . CAPT

R *Select ADR 3 (if available) to captain side.*

The GPWS TERR amber FAULT light comes on as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

– ADR 1 . . . . OFF

Depending on ADR failure, ADR should be switched off.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ADR 1
CAT 3 DUAL
GPWS

■ ADR 2 FAULT :

– AIR DATA SWTG . . . . F/O

Select ADR 3 (if available) to first officer side.

– ADR 2 . . . . OFF

– BARO REF . . . . CHECK

If ADR 2 fails, both baro reference channels are driven by the same FCU channel. Consequently the baro reference displays must be checked.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ADR 2
CAT 3 DUAL

■ ADR 3 FAULT :

– AIR DATA SWTG (if ADR 3 in use) . . . . NORM

– ADR 3 . . . . OFF

STATUS

CAT 3 SINGLE ONLY

INOP SYS
ADR 3
CAT 3 DUAL

NAV ADR FAULT (CONT'D)

■ Two ADR FAULT :

R *Flight control normal laws are lost. Pitch alternate law preserves the neutral static*
R *stability. All protections, except maneuver protections, are lost.*

● ADR 1 + 2 FAULT :

– AIR DATA SWTG . . . . CAPT

Set ADR 3 (if available) to the captain's side.

– ADR (affected) . . . . OFF

The GPWS TERR amber FAULT light comes on, as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

F/CTL ALTN LAW (PROT LOST)

MAX SPEED . . . . 320 KT

Speed is limited, due to the loss of high-speed protections.

● ADR 1 + 3 (or 2 + 3) FAULT :

Air data information is lost on one PFD.

Note : In case of an ADR 1 + 3 FAULT, the landing gear safety valve is controlled closed:
- *Landing gear retraction is inoperative.*
- *Landing gear extension must be performed by gravity.*

– AIR DATA SWTG . . . . NORM

– ATC (if ADR 1 failed) . . . . SYS 2

– ATC (if ADR 2 failed) . . . . SYS 1

– ADR (affected) . . . . OFF

R *In case of an ADR 1 + 3 FAULT, the GPWS TERR amber FAULT light comes on, as*
R *the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR*
R *pushbutton should be switched OFF.*

F/CTL ALTN LAW

(PROT LOST)

MAX SPEED . . . . 320 KT

Speed is limited, due to the loss of high-speed protections.

⇩

NAV ADR FAULT (CONT'D)

STATUS

MAX SPEED . . . . 320 KT

APPR PROC

Note : In case of an ADR 1 + 3 FAULT, the landing gear safety valve is closed. Landing gear extension must be performed by gravity. (Refer to 3.02.32).

– FOR LDG . . . . USE FLAP 3

Do not select CONF FULL so as not to degrade handling qualities.

– GPWS LDG FLAP 3 . . . . ON

Will be displayed when CONF 3 is selected.

APPR SPD . . . . VREF + 10 KT

LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

– WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll (see DIRECT LAW procedure 3.02.27).

CAT 1 ONLY

● **ADR 1 + 3 (or 2 + 3) FAULT** :

BOTH PFD ON THE SAME FAC

In case of ADR 1 + 3 FAULT, the GPWS TERR amber FAULT light comes on as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

INOP SYS

F/CTL PROT
ADR 1 + 2 or (2 + 3) or (1 + 3)
AP 1 + 2
A/THR
RUD TRV LIM 1(2)(a)
GPWS (if ADR1 fault)

(a) RUD TRV LIM 1, in case of ADR 1 + 3 FAULT
RUD TRV LIM 2, in case of ADR 2 + 3 FAULT

ADR 1 + 2 + 3 FAULT

This procedure is not displayed on the ECAM. Only dual ADR warnings are displayed, in case of a triple ADR failure.

– ADR (all) . . . . OFF

– STBY INST (ALT + ASI) . . . . USE

Note : Disregard ECAM actions for AIR DATA SWTG and ATC, since these have no effect in case of a total loss of ADRs.

ADR 1 + 2 + 3 FAULT (CONT'D)

F/CTL ALTN LAW

(PROT LOST)
Note : The STALL WARNING is lost.
MAX SPEED 320/.82
See the following table for the IAS/M relationship for .82

FL	390	370	350	330	310	290	280 and below
MAX SPD	252	265	278	290	305	315	320

– WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll (see the DIRECT LAW procedure 3.02.27).
Note : Use manual control of cabin pressurization :
– MODE SEL . . . . . . MAN
– MAN V/S CTL . . . . . . AS RQRD
These lines are not displayed on the ECAM. (For details, refer to 3.02.21).

STATUS

MAX SPEED 320/.82
R RUD WITH CARE ABV 160 KT
R *The rudder travel limit value is frozen at the value it had at the*
R *moment when the failure occurred. Therefore, rudder inputs*
R *must be limited at speeds above 160 knots, so as not to*
R *damage structure. At slats' extension, full rudder travel*
R *authority is recovered.*
APPR PROC :
R *Note : As the landing gear safety valve is closed, landing gear extension must be performed by gravity (Refer to 3.02.32).*
WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll.
– FOR LDG . . . . USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– GPWS LDG FLAP 3 . . . . ON
Displayed, when CONF 3 is selected.
APPR SPD . . . . VREF + 10 KT
CAT 1 ONLY

ADR 1 + 2 + 3 FAULT (CONT'D)

STATUS

- **DURING FINAL APPR**
  - V/S CTL .... FULL UP
  - LDG DIST PROC .... APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

Note : In case of a go-around, respect the maximum speed of 215 knots in CONF 1+F, due to loss of flap auto retraction to CONF 1.

> CAUTION
> Check that △P is zero before opening the doors.

INOP SYS

See below

INOP SYS displayed on ECAM

F/CTL PROT	ADR 1+2+3	A/THR
WINDSHEAR DET	AP 1 + 2	RUD TRV LIM 1+2
GPWS		CAB PR 1 + 2

Other inoperative systems

ATC ALTI MODE	TCAS ◁
	L/G RETRACT

RAT automatic extension.

NAV IR FAULT

Note : In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT procedure prior to the IR FAULT procedure.

■ IR 1 FAULT :

– ATT HDG SWTG . . . . CAPT

The GPWS TERR amber FAULT light comes on, as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched off.

STATUS

	INOP SYS
IR MAY BE AVAIL IN ATT *Refer to the IR ALIGNMENT IN ATT MODE procedure.* CAT 3 SINGLE ONLY	IR 1 CAT 3 DUAL TCAS (*)

R *Note : (*) In case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS*
R *manufacturer).*

■ IR 2 FAULT :

– ATT HDG SWTG . . . . F/O

STATUS

	INOP SYS
IR MAY BE AVAIL IN ATT *Refer to the IR ALIGNMENT IN ATT MODE procedure.* CAT 3 SINGLE ONLY	IR 2 CAT 3 DUAL

■ IR 3 FAULT :

– ATT HDG SWTG (if IR 3 in use) . . . . NORM

This line is not displayed on the ECAM.

STATUS

	INOP SYS
IR MAY BE AVAIL IN ATT *Refer to the IR ALIGNMENT IN ATT MODE procedure.* CAT 3 SINGLE ONLY	IR 3 CAT 3 DUAL

NAV IR FAULT (CONT'D)

■ **Two IR FAULT :**

● **If IR 1 + 2 FAULT :**

– ATT HDG SWTG .... CAPT

Set IR 3 (if available) to Captain.
Attitude information on F/O PFD is lost.
The GPWS TERR amber FAULT light comes on as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

● **If IR 1 + 3 (or 2 + 3) FAULT :**

– ATT HDG SWTG .... NORM

Attitude information is lost on one side (captain or first officer).
R *The GPWS TERR amber FAULT light comes on as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.*

F/CTL ALTN LAW

(PROT LOST)

Flight control normal laws are lost. Pitch alternate law with static stability becomes active.
All protections, except maneuver protections, are lost.

MAX SPEED .... 320 KT

Speed is limited because of a loss of high-speed protection.

NAV IR FAULT (CONT'D)

STATUS

MAX SPEED . . . . 320 KT
APPR PROC
– FOR LDG . . . . USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
– GPWS LDG FLAP 3 . . . . ON
Will be displayed, when CONF 3 is selected.
APPR SPD : VREF + 10 KT
LDG DIST PROC . . . . APPLY
R *Refer to the QRH part 2, or to the FCOM 3.02.80.*
ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law, in pitch, as well as in roll (see the DIRECT LAW procedure 3.02.27).
IR (affected) MAY BE AVAIL IN ATT
Refer to the IR ALIGNMENT IN ATT MODE procedure.
CAT 1 ONLY

INOP SYS
F/CTL PROT
IR 1 (2)(3)
IR 1 + 2 or 1 + 3 or 2 + 3
AP 1 + 2
A/THR
YAW DAMPER 1(2)(a)
TCAS (*)

(a) Yaw damper 1, in case of an IR 1 + 3 fault
Yaw damper 2, in case of an IR 2 + 3 fault

Note : *(*) In case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS manufacturer).*

IR ALIGNMENT IN ATT MODE

If IR alignment is lost, the navigation mode is inoperative (red ATT flag on PFD and red HDG flag on ND).
Aircraft attitude and heading may be recovered by applying the following procedure.
R *Aircraft must stay level with constant speed during 30 seconds.*

- MODE SELECTOR .... ATT
  ALIGN light on during 30 seconds.
  ATT MODE displayed on CDU.
- LEVEL A/C ATTITUDE .... HOLD
- CONSTANT A/C SPEED .... MAINTAIN
- DISPLAY SYS switch .... AFFECTED SYS
- DISPLAY DATA switch .... HDG

Depending on the CDU keyboard installed, an "H" may be written on the "5" key :

■ **If "H" is written on the "5" key :**

- H KEY .... PRESS
  Degree marker, 0 decimal point, ENT and CLR lights come on.
- A/C HEADING .... ENTER

■ **If "H" is not written on the "5" key :**

- A/C HEADING .... ENTER
  Enter aircraft magnetic heading on CDU keyboard. Then press ENT key to enter data.
  Example : to enter heading 320°, dial 3, 2, 0, 0 then press ENT.
  Heading will be displayed on the associated ND.
  "HDG–ATT MODE" will be displayed on CDU.
  Due to IR drift, magnetic heading has to be periodically crosschecked with standby compass and updated if required.

NAV PRED W/S DET FAULT

The predictive windshear function is lost.
Crew awareness

STATUS

INOP SYS
PRED W/S DET

F/CTL IR DISAGREE

Disagreement between two IRs, the third one having failed or been rejected by the ELACs. Pitch direct, roll direct, and yaw mechanical laws become active. All protections (pitch and roll) are lost.

– ATT . . . . X CHECK

Use the standby horizon to determine the faulty IR.

● **IF DISAGREE CONFIRMED :**

– FAULTY IR . . . . OFF

This will also switch off the associated ADR.

– ELAC 2 . . . . OFF THEN ON

– ELAC 1 . . . . OFF THEN ON

Note : When the ELAC 1 computer is reset on ground, the pitch trim returns to the ground setting position (0°).

After corrective action (faulty IR switched off and ELACs reset), pitch alternate law with reduced protections is recovered.

F/CTL ALTN LAW

(PROT LOST)

– MAX SPEED . . . . 320 KT

STATUS

– MAX SPEED . . . . 320 KT

APPR PROC

– FOR LDG . . . . USE FLAP 3

Do not select CONF FULL, so as not to degrade handling qualities.

– GPWS LDG FLAP 3 . . . . . . ON

Will be displayed, when CONF 3 is selected.

APPR SPD . . . . VREF + 10

LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll (see the DIRECT LAW procedure 3.02.27).

INOP SYS

F/CTL PROT

NAV RA 1(2) FAULT

Crew awareness.

STATUS

■ **One RA FAULT :**

CAT 2 ONLY

INOP SYS
RA 1(2)
CAT 3
GPWS (if RA 1 fault)

■ **Both RA FAULT :**

WHEN L/G DN : DIRECT LAW

At landing gear extension, flight controls revert to direct law in pitch, as well as in roll (see DIRECT LAW procedure 3.02.27).

CAT 1 ONLY

R *ILS APPR mode cannot be engaged ; LOC mode is*
R *available via the FCU LOC pushbutton.*

INOP SYS
RA 1 + 2
A/CALLOUT
AP 1 + 2 (when landing gear is down)
GPWS

NAV TCAS FAULT ◁

Crew awareness.

STATUS

INOP SYS
TCAS

NAV GPS 1(2) FAULT

Crew awareness.

STATUS

INOP SYS
GPS 1(2)

NAV FM/GPS POS DISAGREE

This message is triggered, when either one of the FM positions differ from either of the GPS positions by more than 0.5 minutes of latitude or longitude.

– A/C POS . . . . CHECK

The following procedure is not displayed on the ECAM :

- **If the message occurs at takeoff initiation, or in ILS/LOC approach (LOC green)** :
  - DISREGARD it.
- **If the message occurs in climb, cruise, or descent** :
  - CHECK navigation accuracy, using raw data :
  - ■ **If the check is positive :**
    - NAV mode and ND ARC/ROSE NAV may be used.
  - ■ **If the check is negative :**
    - HDG/TRK mode and raw data must be used.
    - Consider switching off the terrain functions of the EGPWS.
  - When possible, compare the FM position versus the GPIRS position, on the POSITION MONITOR page :
  - ■ **If one FM position agrees with the GPIRS position on the POSITION MONITOR page :**
    - Use the associated FD/AP.
  - ■ **If not :**
    - Deselect GPS and revert to basic information.
- **If the message occurs during a non precision approach** :
  - ■ **Overlay approach :**
    - SELECT HDG or TRK, and use raw data.
  - ■ **GPS or RNAV approach :**
    - GO AROUND or fly visual, if visual conditions are met.

NAV ILS 1(2) FAULT

Crew awareness.

STATUS

CAT 1 ONLY

INOP SYS
ILS 1(2)
CAT 2

NAV GPWS FAULT

– GPWS . . . . OFF

STATUS

INOP SYS
GPWS

NAV GPS 1(2) FAULT

Crew awareness.

STATUS

INOP SYS
GPS 1(2)

NAV FM/GPS POS DISAGREE

The FMS and GPS positions differ by more than :
– A longitude threshold that depends on the latitude :
· 0.5 minutes for latitudes below 55°
· 0.9 minutes for latitudes at, or above 55°, and below 70°
– A latitude threshold of 0.5 minutes, regardless of the latitude.

– A/C POS . . . . CHECK

The following procedure is not displayed on the ECAM :

- **If the message occurs at takeoff initiation, or in ILS/LOC approach (LOC green) :**
  - DISREGARD it.
- **If the message occurs in climb, cruise, or descent :**
  - CHECK navigation accuracy, using raw data :
  - ■ **If the check is positive :**
    - NAV mode and ND ARC/ROSE NAV may be used.
  - ■ **If the check is negative :**
    - HDG/TRK mode and raw data must be used.
    - Consider switching off the terrain functions of the EGPWS.
  - When possible, compare the FM position with the GPIRS position, on the POSITION MONITOR page :
  - ■ **If one FM position agrees with the GPIRS position on the POSITION MONITOR page :**
    - Use the associated FD/AP.
  - ■ **If not :**
    - Deselect GPS and revert to basic information.
- **If the message occurs during a non precision approach :**
  - ■ **Overlay approach :**
    - SELECT HDG or TRK, and use raw data.
  - ■ **GPS or RNAV approach :**
    - GO AROUND or fly visual, if visual conditions are met.

NAV ILS 1(2) FAULT

Crew awareness.

STATUS

CAT 1 ONLY

INOP SYS
ILS 1(2)
CAT 2

NAV GPWS FAULT

– GPWS . . . . OFF

STATUS

INOP SYS
GPWS

R

EGPWS ALERTS

CAUTION
During night or IMC conditions, apply the procedure immediately. Do not delay reaction for diagnosis.
During daylight VMC conditions, with terrain and obstacles clearly in sight, the alert may be considered cautionary. Take positive corrective action until the alert ceases, or a safe trajectory is ensured.

■ **"PULL UP" - "TERRAIN TERRAIN PULL UP" - "TERRAIN AHEAD PULL UP"**

Simultaneously :
- AP .... OFF
- PITCH .... PULL UP

  Pull up to full backstick and maintain.
- THRUST LEVERS .... TOGA
- SPEEDBRAKE lever .... CHECK RETRACTED
- BANK .... WINGS LEVEL or adjust

  For "TERRAIN AHEAD PULL UP" only, in addition to climbing, and if the crew concludes that turning is the safest way of action, a turning maneuver can be initiated.

● **When the flight path is safe and GPWS warning ceases :**
Decrease pitch attitude and accelerate.

● **When speed is above VLS and vertical speed is positive :**
Clean up aircraft, as required.

■ **"TERRAIN TERRAIN" "TOO LOW TERRAIN" :**

Adjust the flight path, or initiate a go-around.

■ **"TERRAIN AHEAD" :**

Adjust the flight path. Stop descent. Climb and/or turn, as necessary, based on analysis of all available instruments and information.

■ **"SINK RATE" "DON'T SINK" :**

Adjust pitch attitude and thrust to silence the alert.

■ **"TOO LOW GEAR" - "TOO LOW FLAPS" :**

Correct the configuration, or perform a go-around.

■ **"GLIDE SLOPE" :**

Establish the airplane on the glideslope, or switch OFF the G/S mode pushbutton, if flight below the glideslope is intentional (non precision approach).

NAV GPWS TERR DET FAULT

The enhanced TCF and TAD modes of the EGPWS are inoperative.

– GPWS TERR . . . . OFF

The basic GPWS mode 1 to mode 5 are still operative if the SYS pushbutton switch lights FAULT or OFF are not illuminated.

TCAS WARNINGS

■ **Traffic advisory : "TRAFFIC" messages**

Do not maneuver based on a TA alone.
Attempt to see the reported traffic.

■ **Preventive resolution advisory : "MONITOR VERTICAL SPEED" message.**

Maintain or adjust the vertical speed, as required, to avoid the red
R area of the vertical speed scale.
Notify ATC.
When "CLEAR OF CONFLICT" is announced :
Resume normal navigation in accordance with ATC clearance.

■ **Corrective resolution advisory : All "CLIMB" and "DESCEND", or "MAINTAIN VERTICAL SPEED MAINTAIN", or "ADJUST VERTICAL SPEED ADJUST" type messages.**

Respond promptly and smoothly to a RA.

– AP (if engaged) .... OFF

The TCAS orders may require an incremental load factor, which is greater than that achieved by the autopilot.

– BOTH FDs .... OFF

Adjust the vertical speed, as required, to that indicated on the green area of the vertical speed scale.

Note : Avoid excessive maneuvers, while keeping the vertical speed outside the red area of the VSI and within the green area. If necessary, use the full speed range between Vαmax and Vmax.

R Respect stall, GPWS, or windshear warnings.
Notify ATC.
When "CLEAR OF CONFLICT" is announced :
– Resume normal navigation, in accordance with ATC clearance.
AP/FD can be re-engaged, as required.

● **GO AROUND procedure must be performed when a RA "CLIMB" or "INCREASE CLIMB" is triggered on final approach.**

Note : Resolution Advisories (RA) are inhibited below 900 feet.

F/CTL ADR DISAGREE

If one ADR is faulty, or has been rejected by the ELAC, and if there is a speed or alpha disagreement between the 2 remaining ADRs, alternate law becomes active, and protections are lost.

– AIR SPD . . . . X CHECK

■ **IF SPD DISAGREE :**

Refer to the ADR CHECK PROC paper procedure to determine the faulty ADR.

– FAULTY ADR . . . . OFF

■ **IF NO SPD DISAGREE :**

– AOA DISCREPANCY

F/CTL ALTN LAW

(PROT LOST)

– MAX SPEED . . . . 320 KT

STATUS

– MAX SPEED . . . . 320 KT

APPR PROC

– FOR LDG . . . . USE FLAP 3

Do not select CONF FULL, so as not to degrade handling qualities.

– GPWS LDG FLAP 3 . . . . ON

Displayed, when CONF 3 is selected.

APPR SPD . . . . VREF + 10

LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll (see DIRECT LAW procedure 3.02.27).

● **IF NO SPD DISAGREE :**

RISK OF UNDUE STALL WARN

INOP SYS

F/CTL PROT

ADR CHECK PROC

Use this procedure :

– Following an ADR DISAGREE, if there is a speed disagree (16 knots minimum) between the remaining ADRs.
– In case of an erroneous speed/altitude, which can either be suspected by :
  · Speed discrepancies (between ADR 1, 2, 3, and standby instruments).
  · Fluctuating or unexpected increase/decrease/permanent indicated speed, or pressure altitude.
  · Abnormal correlation of the basic flight parameters (speed, pitch attitude, thrust, climb rate).
  · Abnormal AP/FD/ATHR behavior.
  · STALL warning, or OVERSPEED warnings, that contradicts with at least one of the indicated speeds.
    * Rely on the stall warning that could be triggered in alternate or direct law. It is not affected by unreliable speeds, because it is based on angle of attack.
    * Depending on the failure, the OVERSPEED warning may be false or justified. Buffet, associated with the OVERSPEED VFE warning, is a symptom of a real overspeed condition.
  · Inconsistency between radio altitude and pressure altitude.
  · Reduction in aerodynamic noise with increasing speed, or increase in aerodynamic noise with decreasing speed.
  · Impossibility of extending the landing gear by the normal landing gear control.

To determine the correct ADR, refer to the :

– UNRELIABLE SPEED INDICATION procedure to fly the target pitch and thrust setting (Refer to the FCOM 3.02.34), or
– SEVERE TURBULENCE procedure, if in cruise, to set a thrust and deduce the correct speed indication (Refer to the FCOM 3.04.91).
– FAULTY ADR . . . . OFF

UNRELIABLE SPEED INDICATION

Unreliable speed indication may be due to radome damage, or due to air probe failure or obstruction.
The indicated altitude may also be affected, if static probes are affected.
Unreliable speed cannot be detected by the ADIRU. The flight control and flight guidance computers normally reject erroneous speed/altitude source(s), provided a significant difference is detected.
However, they will not be able to reject two erroneous speeds or altitudes that synchronously and similarly drift away. In this remote case, the aircraft systems will consider the remaining correct source as being faulty and will reject it. Consequently, the flight control and flight guidance computers will use the remaining two wrong ADRs for their computation.
Therefore, in all cases of unreliable speed situation, the pilots must identify the faulty ADR(s) and then switch it (them) OFF. During this failure identification time, since the flight control laws may be affected, it is recommended to maneuver the aircraft with care until the ADR(s) is (are) switched OFF.
Unreliable speed indications may be suspected, either by :

- Speed discrepancies (between ADR 1, 2, 3, and standby instruments).
- Fluctuating or unexpected increase/decrease/permanent indicated speed, or pressure altitude.
- Abnormal correlation of the basic flight parameters (speed, pitch attitude, thrust, climb rate).
- Abnormal AP/FD/ATHR behavior.
- STALL warning, or OVERSPEED warnings, that contradicts with at least one of the indicated speeds.
  - Rely on the stall warning that could be triggered in alternate or direct law. It is not affected by unreliable speeds, because it is based on angle of attack.
  - Depending on the failure, the OVERSPEED warning may be false or justified. Buffet, associated with the OVERSPEED VFE warning, is a symptom of a real overspeed condition.
- Inconsistency between radio altitude and pressure altitude.
- Reduction in aerodynamic noise with increasing speed, or increase in aerodynamic noise with decreasing speed.
- Impossibility of extending the landing gear by the normal landing gear control.

UNRELIABLE SPEED INDICATION (CONT'D)

How to apply the procedure :

- If the wrong speed or altitude information does not affect the safe conduct of the flight, first apply the ADR CHECK procedure to identify the faulty ADR(s) and switch it (them) OFF. If necessary, enter the unreliable speed procedure, or severe turbulence table (if in cruise), to set the pitch and thrust corresponding to the current flight phase. Check the resulting speed indicated on the table with all the indicated speeds/altitudes (from ADR 1, 2, 3 and standby instruments) to positively identify the faulty ADR(s).
- If the safe conduct of the flight is affected (all the speed indications are unreliable, or the wrong speed indication cannot not be positively identified) :
  - Immediately apply the memory items : AP/FD/ATHR OFF, and fly the memory pitch – thrust settings.
  - Then, once stabilized, refer to the QRH in order to determine the pitch and thrust settings required by the current flight phase.
  - Determine the faulty ADR(s) once the aircraft is stabilized, by comparing all of the indicated speeds/altitudes (from ADR 1, 2, 3 and standby instruments) with the expected speed, as per the table ; use ground speed and GPS speed/altitude variations for reasonableness considerations.
  - In the extreme case where the faulty ADR(s) cannot be identified and all speed indications remain unreliable, apply the proper pitch-thrust settings for each flight phase until landing and refer to ground speed and GPS speed/altitude variations for assistance.

UNRELIABLE SPEED INDICATION (CONT'D)

CAUTION
If the failure is due to radome destruction, the drag will increase, and N1 must, therefore, be increased by 5 %. Fuel flow will increase by about 27 %.

IMMEDIATE ACTIONS

- AP/FD . . . . OFF
- A/THR . . . . OFF
- FLAPS . . . . MAINTAIN CURRENT CONFIG
- SPEEDBRAKES . . . . CHECK RETRACTED

  Note : If failure is detected while in CONF FULL and go-around is initiated, select CONF 3.
- L/G . . . . UP WHEN AIRBORNE

IMMEDIATE PITCH ATTITUDE AND THRUST GUIDANCE

■ **With slats extended :**
- THRUST LEVER . . . . MCT
- PITCH ATTITUDE . . . . 12.5°

■ **In clean configuration :**
- THRUST LEVER . . . . CLB
- PITCH ATTITUDE below FL 100 . . . . 10°
- PITCH ATTITUDE above FL 100 . . . . 5°

Respect the stall warning, if in alternate law.
Ground speed variations can provide valuable short-term information at low altitude.
The FPV is unreliable, if altitude information is affected. In other cases, it is a valuable aid in establishing a safe flight path.

WHEN FLIGHT PATH IS STABILIZED

- PROBE WINDOW HEAT . . . . ON
- ATTITUDE/THRUST . . . . ADJUST

  Adjust attitude and thrust according to the table below.

UNRELIABLE SPEED INDICATION (CONT'D)

FLIGHT PHASE		WEIGHT (1000 kg)	FLT LEVEL	PITCH ATT	N1
TAKEOFF					TO or FLX
ACCELERATION	F	below 48 48 to 60 60 to 72 above 72		20° 17° 14° 13°	CL
and CONF CHANGE	S	below 48 48 to 60 60 to 72 above 72		16° 12° 10° 9°	CL
CLIMB	250 kt	below 45 above 45	0 to 50	15° 11°	CL
	250 kt	below 45 above 45	50 to 100	13° 10°	CL
Climb profile : · 250 kt below FL 200 · 275 kt from FL 200 to FL 320 · M 0.76 above FL 320	250 kt	below 45 above 45	100 to 150	10° 9°	CL
	250 kt	below 45 above 45	150 to 200	9° 7.5°	CL
	275 kt		200 to 250 250 to 320	5° 4°	CL
	.76		above 320	3.5°	CL
CRUISE	250 kt	below 55 from 55 to 75 above 75	0 to 200	1.5° 3° 4.5°	*
	275 kt	below 55 from 55 to 75 above 75	200 to 320	1° 2° 3°	*
	. 76	below 55 from 55 to 75 above 75	above 320	1.5° 2.5° 3°	*

* In cruise, initially set the pitch attitude and adjust N1 to maintain approximate level flight with the pitch attitude held constant. When time permits, set an accurate N1 from FCOM 3.04.91 "SEVERE TURBULENCE", and adjust attitude to maintain level flight.

UNRELIABLE SPEED INDICATION (CONT'D)

FLIGHT PHASE		WEIGHT (1000 kg)	FLT LEVEL	PITCH ATT	N1
DESCENT	.76	below 45 from 45 to 55 above 55	above 350	– 3° – 1.5° – 0.5°	IDLE
Descent profile : M 0.76 above FL 320 · 275 kt from FL 320 to FL 200 · 250 kt below FL 200	.76	below 45 from 45 to 55 above 55	350 to 320	– 4° – 3° – 2°	IDLE
	275 kt	below 45 from 45 to 55 above 55	320 to 200	– 3.5° – 2.5° – 1.5°	IDLE
	250 kt	below 45 from 45 to 55 above 55	below 200	– 3° – 1.5° – 0.5°	IDLE
APPROACH (STABILIZED) IN CLEAN TO SELECT FLAPS 1 (equivalent to green dot)		below 48 48 to 60 60 to 72 above 72	LEVEL OFF	5°	49 % 54 % 59 % 62 %
IN CONF 1 TO SELECT FLAPS 2 (equivalent to S speed)		below 48 48 to 60 60 to 72 above 72	LEVEL OFF	7.5°	49 % 55 % 60 % 63 %
IN CONF 2 TO SELECT FLAPS 3 (equivalent to VLS + 10)		below 48 48 to 60 60 to 72 above 72	LEVEL OFF	7.5°	51 % 57 % 61 % 65 %
IN CONF 3 TO SELECT FLAPS FULL (equivalent to VLS + 10)		below 48 48 to 60 60 to 72 above 72	LEVEL OFF	6°	57 % 62 % 68 % 71 %
IN CONF FULL (equivalent to VLS + 10)		below 48 48 to 60 60 to 72 above 72	LEVEL OFF	4.5°	59 % 66 % 71 % 75 %

Note : 1. *The N1 given for approach is that required for level flight in the given configuration, before the configuration change is initiated.*
2. *To decelerate between stabilized points, N1 should be reduced toward idle and the attitude adjusted to maintain level flight.*
3. *When the attitude required for level flight equals that given for the next stable point, set the N1 appropriate to that point.*

UNRELIABLE SPEED INDICATION (CONT'D)

FLIGHT PHASE	WEIGHT (1000 kg)	FLT LEVEL	PITCH ATT	N1
FINAL APPROACH				
IN CONF FULL (equivalent to VLS + 10)	below 48 48 to 60 60 to 72 above 72	DESCENT AT − 3° GRADIENT	2°	47 % 52 % 56 % 58 %
IN CONF 3 (equivalent to VLS + 10)	below 48 48 to 60 60 to 72 above 72	DESCENT AT − 3° GRADIENT	3.5°	42 % 47 % 51 % 53 %

AIR BLEED 1(2) OFF

One engine bleed is switched off with no fault.

Crew awareness.

AIR ENG BLEED NOT CLSD

Engine bleed valve fails to close :
– during engine start or when APU BLEED is selected on.
– at engine shutdown or when APU BLEED is selected OFF with engine not running.

– ENG BLEED . . . . OFF

Note : The warning may be triggered
– after engine shutdown, or
– after APU BLEED is selected OFF with engine not running
due to residual pressure between the HP or IP valves and the engine bleed valve. Select the ENG BLEED pushbutton OFF then on. If the warning disappears, no maintenance action is due.

STATUS

ONE PACK ONLY IF WAI ON

INOP SYS
ENG 1(2) BLEED

AIR ENG 1(2) BLEED ABNORM PR

● **If wing anti-ice is on and both packs are on :**

– PACK (affected) . . . . OFF

One pack must be closed when the pilot is using wing anti-ice because of precooler performance.

– X BLEED . . . . OPEN

STATUS

ONE PACK ONLY IF WAI ON

INOP SYS
ENG 1(2) BLEED
PACK 1(2) (if closed)

AIR ENG 1(2) BLEED FAULT

– ENG BLEED affected (if not automatically closed) . . . . OFF

· *With the ENG BLEED pushbutton switch on, the FAULT light remains on.*

· *With the ENG BLEED pushbutton switch OFF, the FAULT light goes out when the failure*
R *(overheat or overpressure) disappears.*

● **If wing anti-ice is on and both packs are on :**

– PACK affected . . . . OFF

One pack must be closed when the pilot is using wing anti-ice because of precooler perfomance.

– X BLEED . . . . OPEN

STATUS

ONE PACK ONLY IF WAI ON	INOP SYS ENG 1(2) BLEED PACK 1(2) (if closed)

AIR DUAL BLEED FAULT

R *Do not apply this procedure, if ENG BLEED 1 was lost due to a :*
. LEAK on side 1
. ENG 1 FIRE
. Start air valve 1 failed open.

MAX FL 200

Rapidly descend to FL200, to recover the APU bleed supply.

– APU . . . . START

Start the APU during the descent.

● **AT OR BELOW FL200** :

● **If ENG 2 BLEED loss due to** :
LEAK on side 2, or
ENG 2 FIRE, or
Start Air Valve 2 failed open.

– X BLEED . . . . SHUT

– PACK2 (if above FL150) . . . . OFF

Only if PACK 1 is available.

– WING A.ICE . . . . OFF

APU BLEED must not be used for wing anti-ice.

– APU BLEED . . . . ON

AVOID ICING CONDITIONS

AIR L (R) WING or ENG 1(2) BLEED LEAK

Note : Spurious ENG 1(2) BLEED LEAK or L(R) WING LEAK warnings may be triggered after electrical transients. Reset in these cases the affected ENG BLEED pushbutton for an ENG BLEED LEAK, or both ENG BLEED pushbuttons for a WING LEAK.

- ENG BLEED affected (if not automatically closed) . . . . OFF
  - *With the ENG BLEED pushbutton on, the FAULT light remains on*
  - *With the ENG BLEED pushbutton off, the FAULT light goes out when the overheat disappears.*

● **If left wing or bleed leak** :
  - APU BLEED (if not closed) . . . . OFF
- X BLEED (if not closed) . . . . SHUT
- WING ANTI-ICE . . . . OFF
- AVOID ICING CONDITIONS

STATUS

R AVOID ICING CONDITIONS

INOP SYS
WING A.ICE
ENG 1(2) BLEED
PACK 1(2)

AIR X BLEED FAULT

– X BLEED . . . . MAN CTL

Select OPEN, when the APU BLEED pushbutton is ON, or for engine start, or when WING
R *ANTI-ICE is ON and one bleed is inoperative.*
Select SHUT in other cases.

● **If manual opening inoperative, and only one bleed available:**

– WING ANTI ICE . . . . OFF

AVOID ICING CONDITIONS

● **If manual opening inoperative :**

AVOID ICING CONDITIONS

R X BLEED MAN CTL

STATUS

INOP SYS
X BLEED
WING A. ICE

AIR APU BLEED LEAK

Note : This warning may spuriously appear after electrical transients. In that case, an APU bleed reset may be attempted by switching the APU BLEED pushbutton OFF, then on.

– APU BLEED (if not closed) . . . . OFF

- *With the APU BLEED pushbutton ON, the FAULT light remains on.*
- *With the APU BLEED pushbutton off, the FAULT light goes off, when the overheat disappears.*

STATUS

INOP SYS
APU BLEED

AIR APU BLEED FAULT

The valve position disagrees with the commanded position, when the APU is running.

Crew awareness.

Note : Switching the APU BLEED pushbutton once may allow APU bleed recovery.

STATUS

INOP SYS
APU BLEED
(if valve closed)

AIR ENG HP VALVE FAULT

Crew awareness.

STATUS

AIR PRESS LOW AT IDLE

AIR L (R) WNG LEAK DET FAULT

Crew awareness.

STATUS

INOP SYS
L(R) LEAK DET

BLEED MONITORING FAULT

Crew awareness.

STATUS

INOP SYS
BMC 1 + 2

AIR ENG 1(2) BLEED LO TEMP

In flight, engine bleed temperature is too low for correct wing de-icing.

– A/THR .... OFF
– THR LEVER (affected engine) .... ADVANCE

R *The thrust lever of the affected engine must be advanced, with the autothrust OFF.*
R *Low bleed temperature may be due to low outside air temperature. Therefore, increasing*
R *engine thrust may increase bleed temperature and clear the ECAM caution.*

● **IF UNSUCCESSFUL and opposite bleed available** :

– X BLEED .... OPEN
– ENG BLEED (affected) .... OFF
– associated PACK (if opposite pack ON) .... OFF

One pack must be closed, when the pilot is using wing anti-ice, due to precooler performance.

STATUS

ONE PACK ONLY IF WAI ON

INOP SYS
ENG 1(2) BLEED
PACK 1(2)
(if selected OFF)

● **IF UNSUCCESSFUL and opposite bleed not available** :

– WING A. ICE .... OFF

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

AIR ENG 1 + 2 BLEED LO TEMP

– A/THR .... OFF
– THR LEVERS .... ADVANCE

R *The thrust lever of the affected engine must be advanced, with the autothrust OFF.*
R *Low bleed temperature may be due to low outside air temperature. Therefore, increasing*
R *engine thrust may increase bleed temperature and clear the ECAM caution.*

● **IF UNSUCCESSFUL** :

– WING A. ICE .... OFF

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

APU AUTO (EMER) SHUT DOWN

APU EMER SHUT DOWN is triggered if :
- *an APU fire is detected on ground, or*
- *the ground crew shuts down the APU manually by pushing the APU SHUT OFF pushbutton on the nose gear interphone panel, or*
- *the flight crew presses the APU FIRE pushbutton in the cockpit.*

– MASTER SW . . . . OFF

STATUS

INOP SYS
APU

DOORS (L/R/FWD/AFT) AVIONICS

■ **On the ground**

Crew awareness.

■ **In flight**

No crew action required as long as cabin pressure is normal.

● **IF ABN CAB V/S :**

– MAX FL 100/MEA

Limit maximum flight level to FL100 or MEA or minimum obstacle clearance altitude.

Avionics doors are of plug type. Therefore full depressurization is not recommended.

STATUS

MAX FL 100/MEA

DOORS CABIN/EMER EXIT/CARGO

Crew may confirm a cabin door warning by checking the visual indicator on the door.

■ **On the ground**

Crew awareness.

Crew may confirm a cargo door warning by removing the detachable inspection panel on the base of cargo door.

■ **In flight**

No crew action required as long as cabin pressure is normal.

● **IF ABN CAB V/S :**

– MAX FL 100/MEA

Limit maximum flight level to FL100 or MEA or minimum obstacle clearance altitude.

If door warning is accompanied by abnormal increase of cabin altitude, flight crew must reduce cabin $\triangle$P and altitude by descending.

STATUS

MAX FL 100/MEA

ENG 1(2) FUEL FILTER CLOG

Crew awareness.
Maintenance action is due.

ENG 1(2) REVERSER FAULT

● **If reverser position fault with reverser pressurized :**
ENG 1(2) AT IDLE
Thrust of the affected engine is locked at idle.
– THR LEVER 1(2) . . . . IDLE
Set thrust lever of affected engine at idle.

STATUS
INOP SYS
REVERSER 1(2)

ENG 1(2) REV PRESSURIZED

Reverse thrust system is pressurized with reverser doors stowed and locked.
– THR LEVER 1(2) . . . . IDLE
If flight conditions permit, reduce the thrust of the affected engine to IDLE as a precautionary measure.

ENG 1(2) REV SWITCH FAULT

Crew awareness.

ENG 1(2) EIU FAULT

The data bus between the EIU and ECU fails. Therefore :
· affected engine start is lost
· autothrust control is lost
· thrust reverser on the affected engine is lost
· when idle is selected, only approach idle is available
· bleed corrections on N1 limit are lost (See BLEED STATUS FAULT procedure).
Crew awareness.

ENG 1(2) APPR IDLE ONLY
Minimum idle is lost.

STATUS
INOP SYS
A/THR
REVERSER 1(2)
ENG 1(2) START

ENG VIB SYS FAULT

Crew awareness.

ENG 1(2) OIL LO PR

● **IF OIL PR < 13 PSI :**

Check oil pressure indication on ECAM ENG page.

– THR LEVER (of affected engine) .... IDLE
– ENG MASTER (of affected engines) .... OFF

ENG 1(2) **SHUT DOWN**

Carry out after ENG SHUT DOWN procedure.

Note : If oil pressure is low (< 13 psi) is indicated only on ECAM ENG page (red indication) without the ENG OIL LO PR warning, it can be assumed, that the oil pressure transducer is faulty. Flight crew may continue engine operation while monitoring other engine parameters.

ENG 1(2) OIL HI TEMP

Oil temperature between 140° C and 155° C for more than 15 minutes or oil temperature above 155° C.

– THR LEVER (of affected engine) .... IDLE
– ENG MASTER (of affected engine) .... OFF

ENG 1(2) **SHUT DOWN**

Apply after ENG SHUT DOWN procedure.

ENG 1(2) OIL FILTER CLOG

Crew awareness.
Maintenance action is due.

ENG 1(2) N1/N2/EGT OVERLIMIT

■ **Max pointer indication :**

EGT between 891° and 935° C or
N1 between 102.1 % and 103.8 % or
N2 between 105.1 % and 105.8 %.

– THR LEVER (of affected engine) . . . . BELOW LIMIT

Normal operation may be resumed and maintained until next landing. Report in maintenance log.

■ **Max pointer indication :**

EGT above 935° C or
N1 above 103.8 % or
N2 above 105.8 %.

– THR LEVER (of affected engine) . . . . IDLE
– ENG MASTER (of affected engine) . . . . OFF

If conditions do not permit engine shut-down land ASAP using the minimum thrust required to sustain safe flight.

ENG 1(2) SHUT DOWN

Apply after ENG SHUT DOWN procedure.

ENG 1(2) REVERSE UNLOCKED

One or more reverser doors are not stowed. Auto-restow function is activated.

■ **On ground :**

ENG 1(2) AT IDLE

Only displayed, if the FADEC automatically sets the engine at idle (i.e. when 4 reverser doors are not stowed, or 1, 2, or 3 reverser doors are not stowed with the reverser pressurized).

– THR LEVER (affected engine) . . . . IDLE
– ENG MASTER (affected engine) . . . . OFF

■ **In flight :**

● **If the FADEC automatically sets the engine at idle :**

ENG 1(2) AT IDLE
– THR LEVER (affected engine) . . . . IDLE

● **IF BUFFET :**

The warning alone, without buffet or vibration, may be a false warning.

MAX SPEED . . . . 240 KT
– ENG MASTER (affected engine) . . . . OFF

● **If the FADEC does not automatically set the engine at idle:**

● **IF BUFFET :**

– THR LEVER (affected engine) . . . . IDLE
MAX SPEED . . . . 240 KT
– ENG MASTER (affected engine) . . . . OFF

● **If reverser is actually deployed :**

– RUD TRIM . . . . FULL R (L)
R – CONTROL HDG WITH ROLL

ENG 1(2) $\boxed{\textbf{SHUT DOWN}}$

Apply the after ENG SHUT DOWN procedure.

ENG 1(2) STALL

This warning is triggered for an N2 between 50 % and IDLE.

A stall may be indicated by varying degrees of abnormal engine noises, accompanied by flame from the engine exhaust (and possibly from the engine inlet in severe case), fluctuating performance parameters, sluggish or no thrust lever response, high EGT and/or a rapid EGT rise when thrust lever is advanced. Engine stalls must be reported for maintenance action.

– ENG MASTER (affected engine) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply after ENG SHUT DOWN procedure.
Engine restart at crew discretion.

If the N2 is above IDLE, this warning is not displayed on the ECAM. Consequently, if the crew detects a stall, it must apply the following procedure :

■ **On the ground :**

– ENG MASTER (affected engine) . . . . OFF

■ **In flight :**

– THR LEVER (affected engine) . . . . IDLE
– ENG PARAMETERS (affected engine) . . . . CHECK

● **Abnormal :**

– ENG MASTER (affected engine) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply after ENG SHUT DOWN procedure.
Engine restart at crew discretion.

● **Normal :**

– ENG A. ICE (affected engine) . . . . ON
– WING A. ICE . . . . ON
Operation of engine and wing anti ice will increase the stall margin, but EGT will increase accordingly.
– THR LEVER (affected engine) . . . . . . SLOWLY ADVANCE

● **If stall recurs :**

– THR LEVER (affected engine) . . . . REDUCE
Reduce thrust and operate below the stall threshold.

● **If stall does not recur :**

Continue engine operation.

ENG 1(2) START VALVE FAULT

■ **START VALVE NOT CLOSED :**

Remove all bleed sources supplying the faulty start valve.

- APU BLEED (if ENG 1 affected) .... OFF
- X BLEED .... SHUT

● **In flight :**

- ENG BLEED (affected side) .... OFF

● **On the ground :**

- MAN START (if man start performed) .... OFF
- ENG MASTER (affected side) .... OFF

R *On the ground, consider application of "START VALVE MANUAL OPERATION"*
R *procedure.*

■ **START VALVE NOT OPEN :**

● **If opposite engine running :**

- X BLEED .... ON

● **If APU AVAIL below FL 200 :**

- APU BLEED .... ON

● **If UNSUCCESSFUL :**

- MAN START (if man start performed) .... OFF
- ENG MASTER (affected) (if auto start performed) . . OFF

MAN START procedure is useless since in both cases, the start valve is controlled by FADEC.

On the ground, consider application of "START VALVE MANUAL OPERATION" procedure.

ENG 1(2) HP FUEL VALVE

■ **Associated engine below idle :**

HP FUEL VALVE NOT OPEN.

Failure of HP fuel valve.

● **On the ground :**

- MAN START (if man start performed) .... OFF
- ENG MASTER (affected) .... OFF

■ **Associated engine at or above idle :**

Failure of HP fuel valve position switch.

HP FUEL POS SWT FAULT.

ENG 1(2) START FAULT

■ ENG 1(2) IGNITION FAULT

(No light up within the 18 seconds following ignition start).

- **In flight :**
  - ENG MASTER (affected) . . . . OFF

    Wait 30 seconds before attempting a new start (to drain the engine).
- **On the ground (auto start) :**

  R *In case of no light up, the FADEC can perform one additional start attempt. After each unsuccessful start attempt, a dry crank phase is automatically performed.*

  R *The following message will be displayed on the ECAM :*

  R – NEW START IN PROGRESS
  - **When the final dry cranking process is finished :**
    - ENG MASTER (affected) . . . . OFF

      Following starter cooldown, the pilot must decide whether to attempt auto or manual start, or to report the nostart condition for appropriate maintenance action.
- **On the ground (manual start) :**

  R – MAN START (affected) . . . . OFF

  R – ENG MASTER (affected) . . . . OFF

  – MODE SEL . . . . CRANK

  R – MAN START (affected) . . . . ON

  Note : The last two lines are not displayed on the ECAM.
  Dry crank the engine for 30 seconds. The start valve automatically reopens when N2 is below 20 %.
  The pilot must decide whether to attempt a new start, or to report the no start condition for appropriate maintenance action.

ENG 1(2) START FAULT (CONT'D)

■ ENG 1(2) STALL, ENG 1(2) EGT OVERLIMIT :

● **In flight** :
- ENG MASTER (affected) . . . . OFF

Wait 30 seconds before attempting a new start (to drain the engine).

● **On the ground (auto start)** :

If it detects a stall or a potential EGT overheat, the FADEC will reduce the fuel schedule in stages, if necessary, to achieve a normal condition. The following message will be displayed on the ECAM.

R – NEW START IN PROGRESS

If a normal condition cannot be achieved, the fuel valve is closed and the following ECAM message is displayed :

- ENG MASTER (affected) . . . . OFF

· The fuel metering valve and starter air valve are automatically closed. Both igniters are turned off.
· Setting ENG MASTER to OFF confirms automatic start abort.
· In case of ENG STALL, consider making a XBLEED start, if pressure is low.

● **On the ground (manual start)** :

R – MAN START (affected) . . . . OFF
R – ENG MASTER (affected) . . . . OFF
– MODE SEL . . . . CRANK
R – MAN START (affected) . . . . ON

Note : The last two lines are not displayed on the ECAM.
Dry crank the engine for 30 seconds. The start valve automatically reopens when N2 is below 20 %.
The pilot must decide whether to attempt a new start, or to report the no start condition for appropriate maintenance action.

■ STARTER TIME EXCEEDED :

- MAN START (if manual start is performed) . . . . OFF
- ENG MASTER (affected) . . . . OFF

■ LO START AIR PRESS :

- BLEED AIR SUPPLY . . . . CHECK

■ THR LEVER NOT AT IDLE :

- THR LEVER . . . . IDLE

ENG 1(2) LOW N1 (on ground)

No N1 rotation during start.

● **IF CONFIRMED** :
- ENG MASTER (affected) . . . . OFF

ENG 1(2) N1 or N2 or EGT or FF DISCREPANCY

There is discrepancy between the value displayed on the ECAM and the real value. The upper ECAM upper displays a CHECK message below the affected indication.

Crew awareness.

Normal indication may be recovered by switching from DMC 1 to DMC 3.

If unsuccessful, and if both thrust levers are at the same position, crosscheck with the opposite parameter.

ENG FLEX TEMP NOT SET

At takeoff, the pilot sets the thrust levers at MCT/FLEX without having entered the flex TO temperature. The FADEC selects MCT thrust.

– THR LEVERS . . . . TO/GA

ENG 1(2) FADEC ALTERNATOR

Loss of electrical auto supply of either FADEC channel.

Crew awareness.

ENG RELIGHT (in flight)

MAX ALTITUDE . . . . See below
- ENG MASTER (affected) . . . . OFF
- THR LEVER (affected) . . . . Check IDLE
- MAN START pushbutton . . . . OFF

  Note : Autostart is recommended in flight. Unlike the procedure for auto start on ground, the crew must take appropriate action in case of an abnormal start.
- ENG MODE SEL . . . . IGN
- X BLEED . . . . OPEN

  If outside the windmilling start envelope, the FADEC will open the starter valve.
- WING A. ICE (for starter assist) . . . . OFF
- ENG MASTER (affected) . . . . ON

R *Engine light-up must be achieved within 30 seconds after the fuel flow increases. Monitor N2. If uncertain about successful relight, move the thrust lever forward and check engine response.*

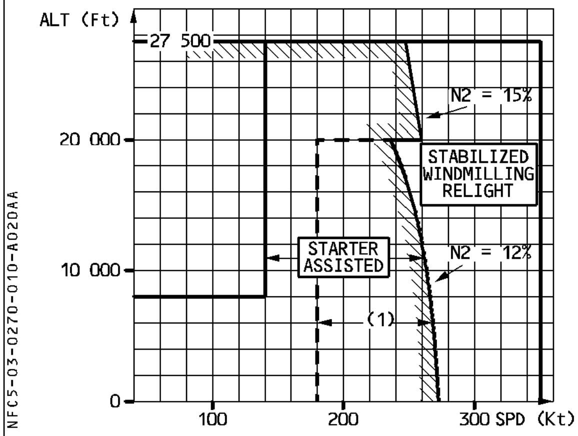
■ **When idle is reached :**
- ENG MODE SEL . . . . NORM
- TCAS MODE SEL ◁ . . . . check TA/RA

  Check that the selector is at TA/RA since, if the ENG SHUT DOWN procedure has been applied, the TCAS mode selector may have been set to the TA position.
- Affected SYS . . . . RESTORE

  Restore affected systems, and set the X BLEED selector to AUTO.

■ **If no relight :**
- ENG MASTER (affected) . . . . OFF

  Wait 30 seconds before attempting a new start (to drain the engine).



(1) A windmilling relight can be attempted in this zone while N2 is decreasing, provided that N2 has not dropped below 12%

ENG 1(2) FAIL

An engine flame-out may be recognized by a rapid decrease in EGT, N2, FF, followed by a decrease in N1.
Engine damage may be accompanied by :
- *Loud noise,*
- *Significant increase in aircraft vibrations and/or buffeting,*
- *Repeated or uncontrollable engine stalls,*
- *Associated abnormal indications such as hydraulic fluid loss, or no N2 indication.*

R LAND ASAP

■ Before takeoff or after landing

- THR LEVER (affected engine) . . . . IDLE
- ENG MASTER (affected engine) . . . . OFF

  On ground, after 5 minutes, the FADEC is no longer supplied. So, the THR LEVER . . . IDLE line reappears, even if the thrust lever is at idle.

● **IF DAMAGE**

- ENG FIRE P/B (affected engine) . . . . PUSH

  The FADEC is no longer supplied. So, the THR LEVER . . . IDLE line reappears, even if the thrust lever is at idle.
- AGENT 1 . . . . DISCH

● **IF NO DAMAGE**

If conditions permit, do not restart the engine. A new engine start would erase FADEC troubleshooting data.

- ENG (affected) RELIGHT . . . . INITIATE

  If no damage, a new start sequence may be initiated.

ENG 1(2) $\boxed{\text{SHUT DOWN}}$

Apply ENG SHUT DOWN procedure, if damage or if engine relight is unsuccessful.

ENG 1(2) FAIL (CONT'D)

■ **In flight**

– ENG MODE SEL . . . . IGN

Selection of continuous ignition confirms the immediate relight attempt made by the FADEC.

– THR LEVER (affected engine) . . . . IDLE

Note : *In case of GPWS (EGPWS ◁) alerts, reduce speed with care below VLS with flaps extended (at light weights VMC may be reached before αMax) when applying the GPWS (EGPWS ◁) procedure.*

● **IF NO ENG RELIGHT**

– ENG MASTER (affected engine) . . . . OFF

● **IF DAMAGE**

– ENG FIRE P/B (affected engine) . . . . PUSH

FADEC is no longer supplied. As a consequence the line THR LEVER . . . IDLE reappears, even if the thrust lever is at idle.

– AGENT 1 (after 10 seconds in flight) . . . . DISCH

ENG 1(2) **SHUT DOWN**

Apply ENG SHUT DOWN procedure if damage or if engine relight unsuccessfull.
If high vibration occurs and continues after engine shutdown, reduce airspeed and descent to a safe altitude.
Attempt to determine and use a pratical airspeed and altitude for minimum vibrations.

● **IF NO DAMAGE**

– ENG (affected) RELIGHT . . . . INITIATE

Apply ENG RELIGHT (in flight) procedure.

ENG 1(2) REV ISOL FAULT

Crew awareness.

The thrust reverser shut off valve is detected failed open.

ENG 1(2) FAIL

An engine flame-out may be recognized by a rapid decrease in EGT, N2, FF, followed by a decrease in N1.
Engine damage may be accompanied by :
– Loud noise,
– Significant increase in aircraft vibrations and/or buffeting,
– Repeated or uncontrollable engine stalls,
– Associated abnormal indications such as hydraulic fluid loss, or no N2 indication.

R LAND ASAP

■ Before takeoff or after landing

– THR LEVER (affected engine) . . . . IDLE
– ENG MASTER (affected engine) . . . . OFF
On ground, after 5 minutes, the FADEC is no longer supplied. So, the THR LEVER . . . IDLE line reappears, even if the thrust lever is at idle.

● IF DAMAGE

– ENG FIRE P/B (affected engine) . . . . PUSH
The FADEC is no longer supplied. So, the THR LEVER . . . IDLE line reappears, even if the thrust lever is at idle.
– AGENT 1 . . . . DISCH

● IF NO DAMAGE

If conditions permit, do not restart the engine. A new engine start would erase FADEC troubleshooting data.
– ENG (affected) RELIGHT . . . . INITIATE
If no damage, a new start sequence may be initiated.

ENG 1(2) **SHUT DOWN**

Apply ENG SHUT DOWN procedure, if damage or if engine relight is unsuccessful.

ENG 1(2) FAIL (CONT'D)

■ **In flight :**

– ENG MODE SEL . . . . IGN

Selection of continuous ignition confirms the immediate relight attempt made by the FADEC.

– THR LEVER (affected engine) . . . . IDLE

Note : In case of GPWS (EGPWS ◁) alerts, reduce speed with care below VLS with flaps extended (at light weights VMC may be reached before αMax) when applying the GPWS (EGPWS ◁) procedure.

● **IF NO ENG RELIGHT AFTER 30 S**

– ENG MASTER (affected engine) . . . . OFF

● **IF DAMAGE**

– ENG FIRE P/B (affected engine) . . . . PUSH

FADEC is no longer supplied. As a consequence the line THR LEVER . . . IDLE reappears, even if the thrust lever is at idle.

– AGENT 1 (after 10 seconds in flight) . . . . DISCH

ENG 1(2) SHUT DOWN

Apply ENG SHUT DOWN procedure if damage or if engine relight unsuccessfull.
If high vibration occurs and continues after engine shutdown, reduce airspeed and descent to a safe altitude.
Attempt to determine and use a pratical airspeed and altitude for minimum vibrations.

● **IF NO DAMAGE**

– ENG (affected) RELIGHT . . . . INITIATE

Apply ENG RELIGHT (in flight) procedure.

ENG 1(2) REV ISOL FAULT

Crew awareness.

The thrust reverser shut off valve is detected failed open.

After ENG 1(2) SHUT DOWN

LAND ASAP

- **If Wing Anti-ice ON :**
  - **If Elec Emer Config :**
    - PACK 1 . . . . OFF
      In Emer Elec, only Pack 1 can be controlled off.
  - **If not Elec Emer Config :**
    - PACK (affected side) . . . . OFF
      One pack must be closed when wing anti-ice is in use, due to precooler performance.
  - R X BLEED (if ENG FIRE pb not pushed) . . . . OPEN
    X BLEED must be opened to have symmetrical wing anti-icing.
- ENG MODE SEL . . . . IGN
  Continuous ignition is selected, in order to protect the remaining engine.
- FUEL X FEED . . . . ON
  Fuel X Feed valve is opened to avoid fuel imbalance.
  Note : Select "TA" on the TCAS control panel (if installed).
- **If REV unlocked and if BUFFET :**
  MAX SPEED . . . . 240 KT
- **If ENG FIRE pushbutton pushed :**
  - XBLEED . . . . SHUT
  - WING ANTI ICE . . . . OFF

  AVOID ICING CONDITIONS

Affected systems
* HYD
* ELEC
* AIR BLEED

Note : In some conditions, with full asymmetric power, the aircraft may be control-limited before reaching the protection system limit. Therefore, in extreme conditions, where low speed may be advantageous (GPWS, WINDSHEAR, etc), reduce speed with care below VLS and respect the minimum control speed.

STATUS

- **If ENG 1(2) FIRE pushbutton pushed :**
  AVOID ICING CONDITIONS

After ENG 1(2) SHUT DOWN (CONT'D)

STATUS

- **If REV unlocked :**

  APPR PROC

  - **4 doors not stowed (CFM) or reverser deployed (IAE) :**
    - **IF BUFFET :**
      - FOR LDG . . . . USE FLAP 1
      - APPR SPD . . . . . . VREF + 55 KT
      - RUD TRIM . . . . 5 DEG R(L)

        When committed to land, set 5° rudder trim towards live engine.
      - A/THR . . . . OFF
      - GPWS FLAP MODE . . . . OFF
    - **WHEN LDG ASSURED :**
      - L/G . . . . DOWN
    - **AT 800 FT AGL :**
      - TARGET SPD . . . VREF + 40 KT

      LDG DIST PROC . . . . APPLY

R *See QRH part 2, or FCOM 3.02.80.*
  - **1, 2, or 3 doors not stowed (CFM), or reverse detected unlocked (IAE) :**
    - **IF BUFFET :**
      - FOR LDG . . . . USE FLAP 3
      - GPWS LDG FLAP 3 . . . . ON

      APPR SPD . . . . VREF + 10 kt
      - LDG DIST PROC . . . . APPLY

R *See QRH part 2, or FCOM 3.02.80.*

R R
- **If WING A/ICE off and ENG 1(2) FIRE pushbutton not pushed :**
  - **IF PERF PERMITS**
    - X BLEED . . . . OPEN

R R R *If no obstacle constraint exists, the XBLEED should be selected OPEN, and the single engine gross ceiling (Refer to 3.06.20 p. 1) must be decreased by 1200 feet.*

After ENG 1(2) SHUT DOWN

LAND ASAP

- **If Wing Anti-ice is ON :**
  - **If Elec Emer Config :**
    - PACK 1 . . . . OFF
      In Emer ELEC, only Pack 1 can be controlled off.
  - **If not Elec Emer Config :**
    - PACK (affected side) . . . . OFF
      One pack must be closed, when wing anti-ice is in use, due to precooler performance.
  - X BLEED (if ENG FIRE pb not pushed) . . . . OPEN
    X BLEED must be opened to have symmetrical wing anti-icing.
- ENG MODE SEL . . . . IGN
  Continuous ignition is selected, in order to protect the remaining engine.
- FUEL X FEED . . . . ON
  R *The FUEL X FEED valve is opened, to avoid fuel imbalance.*
- TCAS MODE SEL (if installed) . . . . TA
- **If REV unlocked, and if BUFFET :**
  MAX SPEED . . . . 240 KT
- **If ENG FIRE pushbutton pushed :**
  - XBLEED . . . . SHUT
  - WING ANTI ICE . . . . OFF
  AVOID ICING CONDITIONS

Affected systems
* HYD
* ELEC
* AIR BLEED

Note : In some conditions, with full asymmetric power, the aircraft may be control-limited before reaching the protection system limit. Therefore, in extreme conditions, where low speed may be advantageous (GPWS, WINDSHEAR, etc), reduce speed with care below VLS and respect the minimum control speed.

STATUS

- **If ENG 1(2) FIRE pushbutton pushed :**
  AVOID ICING CONDITIONS

After ENG 1(2) SHUT DOWN (CONT'D)

STATUS

- **If REV unlocked :**
  APPR PROC
  - **4 doors not stowed (CFM) or reverser deployed (IAE) :**
    - **IF BUFFET :**
      - FOR LDG . . . . USE FLAP 1
      - APPR SPD . . . . . . VREF + 55 KT
      - RUD TRIM . . . . 5 DEG R(L)
        When committed to land, set 5° rudder trim towards live engine.
      - A/THR . . . . OFF
      - GPWS FLAP MODE . . . . OFF
    - **WHEN LDG ASSURED :**
      - L/G . . . . DOWN
    - **AT 800 FT AGL :**
      - TARGET SPD . . . VREF + 40 KT

      LDG DIST PROC . . . . APPLY

R *See QRH part 2, or FCOM 3.02.80.*
  - **1, 2, or 3 doors not stowed (CFM), or reverse detected unlocked (IAE) :**
    - **IF BUFFET :**
      - FOR LDG . . . . USE FLAP 3
      - GPWS LDG FLAP 3 . . . . ON

      APPR SPD . . . . VREF + 10 kt
      - LDG DIST PROC . . . . APPLY

R *See QRH part 2, or FCOM 3.02.80.*

R **If WING A/ICE off and ENG 1(2) FIRE**
R **pushbutton not pushed :**
  - **IF PERF PERMITS**
    - X BLEED . . . . OPEN

R *If no obstacle constraint exists, the XBLEED should*
R *be selected OPEN, and the single engine gross*
R *ceiling (Refer to 3.06.20 p. 1) must be decreased by*
1200 feet.

After ENG 1(2) SHUT DOWN (CONT'D)

STATUS

ONE PACK ONLY IF WAI ON

Note :
- *If available, the APU may be started and the APU GEN used.*
- *If the ENG 1 FIRE pushbutton is pushed, APU bleed must not be used.*
  If ENG 2 FIRE pushbutton is pushed, APU bleed may be used, provided the X BLEED selector is set at SHUT.
- *After landing, the Fuel Used value of the engine, shutdown in flight, becomes incorrect.*

INOP SYS
ENG 1(2) BLEED
PACK 1(2)
MAIN GALLEY
GEN 1(2)
G ENG 1 PUMP or
Y ENG 2 PUMP
WING A. ICE
(if affected ENG
FIRE pushbutton
pushed)
AFT CRG HEAT

ENG 1(2) ONE TLA FAULT

Crew awareness.

ENG 1(2) IGN FAULT

■ **IGN A or B FAULT :**

Crew awareness.

STATUS

INOP SYS
ENG 1(2) IGN A
(B)

■ **IGN A + B FAULT :**

– AVOID ADVERSE CONDITIONS

STATUS

INOP SYS
ENG 1(2) IGN

ENG 1(2) THR LEVER DISAGREE

Both Thrust Lever Angle (TLA) sensors not in agreement on one engine.
If the failure occurs during takeoff (with thrust lever in TOGA or FLX/MCT gate), FADEC maintains TO., FLX TO., or DRT TO ◁ thrust until thrust reduction, after which the maximum
R *available thrust is MCT. In flight, if the failure occurs while the thrust lever is between idle*
R *and MCT, the FADEC selects the larger TLA limited at MCT. On ground, the FADEC selects*
R *idle thrust.*

■ **On ground (if TLA not at TOGA or FLX/MCT) :**

– ENG (affected) IDLE POWER ONLY.
FADEC automatically selects idle power.
– THR LEVER (affected) . . . . IDLE

■ **In flight :**

– AVAIL MAX POWER : MCT
R *If TLA at, or below, MCT with slats retracted (or when MN > 0.47, if the onside EIU*
R *is failed).*
– ENG (affected) AT IDLE (when slats are extended).
– THR LEVER (affected) (when slats are extended) . . . . . IDLE
– A/THR (if engaged) . . . . KEEP ON
– A/THR (if not engaged and if slats are not extended) . . ON
With A/THR engaged, thrust is automatically managed between idle and higher TLA position.

STATUS

● **If TLA at, or below, MCT**
● **WHEN SLATS OUT**
(Displayed, if slats not extended), or
● **WHEN MN < 0.47**
(Displayed, if the onside EIU is failed)
ENG (affected) AT IDLE
For any case of thrust lever disagree (TO, FLEX, or between Idle and MCT), the FADEC will command idle thrust for the approach when slats are extended (or when the Mach number is less than 0.47, if associated EIU is failed). It is independent of the autothrust condition. The affected engine's thrust remains definitively at idle, even for go-around.
REV AVAIL ON GND
ENG (affected) AVAIL MAX PWR : MCT
ON GND ENG (affected) MAX PWR : IDLE.

INOP SYS
ENG 1(2) THR

ENG 1(2) THR LEVER FAULT

R *No validated thrust lever angle for one engine thrust lever.*

■ **On the ground :**

ENG (affected) IDLE POWER ONLY.

Idle power is automatically selected by FADEC.
If associated thrust reverser is already deployed, FADEC commands restow.

– THR LEVER (affected) . . . . IDLE

■ **In flight :**

If selected thrust lever position at the time of fault detection is :
TO or FLEX : FADEC freezes TO or flex TO thrust until slat retraction. At slat retraction it will select MCT thrust.
Between IDLE and MCT : in manual thrust setting mode, engine rating increases and freezes at MCT or IDLE with slats extended (or MN < 0.47 if the FADEC no longer receives the slats position due to EIU failure). It is possible to activate autothrust. If selected, autothrust mode will manage thrust between idle and MCT.

– ENG (affected) AT IDLE

R *For any case of thrust lever fault (TO, FLEX or between IDLE and MCT) the FADEC will*
R *command idle thrust for the approach when slats are extended (or when MN < 0.47*
R *if associated EIU is failed). It is independant of the autothrust condition. Thrust of*
R *affected engine remains definitively at idle even for go around.*

– THR LEVER (affected) . . . . IDLE

When slats are extended or MN < 0.47, if on side EIU is failed.

● **A/THR engaged :**

– A/THR . . . . KEEP ON

● **A/THR not engaged :**

ENG (affected) HI PWR IN MAN THR.

Inhibited when the FADEC commands the affected engine at IDLE.

● **BEFORE SLATS IN :**

– A/THR . . . . ON

HI POWER ONLY (if thrust lever angle failed in TO or flex position).

STATUS

● **WHEN SLATS OUT**

(Displayed if slats not extended) or,

● **WHEN MN < 0.47**

(Displayed if the onside EIU is failed).

ENG 1(2) AT IDLE

INOP SYS

REVERSER 1(2)
ENG 1(2) THR

ENG 1(2) COMPRESSOR VANE

Failure of VBV or VSV. Depending on the type of failure, one of the two following messages is displayed :

– AVOID RAPID THR CHANGES or

If the A/THR is engaged, adjust the thrust lever (of the affected engine) to align the thrust lever command with actual N1 and disconnect A/THR.

ENG (affected) SLOW RESPONSE

STATUS

AVOID RAPID THR CHANGES, or
ENG (affected) SLOW RESPONSE

ENG COMPRESSOR VANE

Engine 1 and 2 VBV or VSV motor fault detected on the standby ECU channel.

Crew awareness.

ENG 1(2) FUEL CTL FAULT

Failure of Fuel Metering Valve. Depending on the type of failure, one of the following two messages is displayed :

– AVOID RAPID THR CHANGES, or

ENG (affected) SLOW RESPONSE

STATUS

AVOID RAPID THR CHANGES or
ENG (affected) SLOW RESPONSE

ENG 1(2) OVSPD PROT FAULT

Crew awareness.

Note : If the warning appears during engine start, shut down the engine. Restart the engine. If the warning still appears, maintenance action is due.

ENG 1(2) CTL VALVE FAULT

Failure of Burner staging valve or HP Turbine clearance system or RACC system.

MAX N2 .... 96 %

Retard associated thrust lever to limit N2 to 96 %.

STATUS

MAX ENG (affected) N2 .... 96 %

ENG 1(2) SENSOR FAULT

PS3, T25, T3, N1, N2 data not available on both ECU channels.

■ **on the ground :**

Crew awareness.

■ **in flight :**

AVOID RAPID THR CHANGES.

STATUS

AVOID RAPID THR CHANGES.

ENG 1(2) PROBES FAULT

P0, PT2, T12 data not available on both ECU channels.

Crew awareness.

ENG 1(2) FUEL RETURN VALVE

■ **VALVE NOT OPEN**

The valve is failed closed.

Crew awareness.

■ **VALVE NOT CLOSED**

The valve is failed open.

Crew awareness.

ENG DUAL FAILURE

LAND ASAP

– ENG MODE SEL . . . . IGN

An immediate relight attempt is made.

– THR LEVERS . . . . IDLE

OPTIMUM RELIGHT SPD . . . . 280 KT

The optimum airspeed to allow an effective windmilling start attempt is 280 kt.

In case of speed indications failure (volcanic ash) the pitch attitude for optimum relight speed
R *is – 2.5°. (For weights above 50 000 kg/110 000 lb add 1° for each 10 000 kg/22 000 lb.)*
R *At 280 kt, the aircraft can fly up to about :*
R *· 2.2 NM per 1000 ft at 50 000 kg/110 000 lb*
R *· 2.5 NM per 1000 ft at 60 000 kg/132 000 lb*
R *· 2.7 NM per 1000 ft at 70 000 kg/154 000 lb*

– EMER ELEC PWR (if EMER GEN not in line) . . . . MAN ON

Pressing EMER ELEC PWR MAN ON pushbutton allows extension of RAT and emer gen coupling.

– VHF1/HF1 (◁) /ATC1 . . . . USE

· In Elec emer configuration only VHF1, HF1 (◁) and ATC1 are supplied.

· Notify traffic control of the nature of the emergency and state intention.
If there is no contact with air traffic control, switch to code A7700 or transmit a distress message on one of the following frequencies, VHF frequency 121.5 MHz, HF 2182 KHz or 8364 KHz.

– FAC1 . . . . OFF THEN ON

Aircraft is out of trim due to right aileron up float.

Resetting FAC 1 permits to recover rudder trim even if no indication is available.

● **IF NO RELIGHT AFTER 30 S :**

– ENG MASTERS . . . . OFF 30 S/ON

Engine masters must be left OFF for 30 seconds to allow ventilation of combustion chamber.

ENG DUAL FAILURE (CONT'D)

● **WHEN APU AVAIL FL < 200 :**

If the APU is available, APU may be started when below FL 250, and APU BLEED may be used for engine start below FL 200.
R *APU start is unavailable for 45 seconds after the loss of both engine generators.*
R *This 45–second delay prevents any interference with emergency generator coupling.*

– APU BLEED . . . . ON
– ENG MASTERS . . . . OFF 30 S/ON
Start one engine at a time.

OPTIMUM SPEED . . . . G DOT
Green dot is displayed on the Captain's PFD. It represents the best lift-to-drag ratio.

● **EARLY IN APPR**

(If ditching is foreseen, apply the DITCHING procedure, instead of the following) :

– CAB SECURE . . . . ORDER
– USE RUDDER WITH CARE.
As hydraulic power is available from RAT only, avoid large or rapid rudder deflection.
– FOR LDG . . . . USE FLAP 3
As only blue hydraulic power is available, only the slats will extend and operating times are noticeably increased.

● **AT 5000 FEET AGL :**

– L/G . . . . GRVTY EXTN
See the L/G GRVTY EXTN procedure (3.02.32).

TARGET SPEED . . . . 150 KT

● **AT TOUCHDOWN :**

– ENG MASTERS . . . . OFF
LP and HP valves close.
– APU MASTER SW . . . . OFF
APU LP valve closes.
– EVAC . . . . INITIATE
– BAT 1 + 2 (if time permits before leaving aircraft) . . . . OFF
Batteries are left ON, until the flight crew leaves the aircraft, to ensure cabin communications.

Note : Keep batteries on for at least 10 seconds after switching the ENG MASTERS to OFF, to allow complete closure of fuel LP valves.

ENG 1(2) BLEED STATUS FAULT

Status of bleed valves, pack valves, wing and engine anti ice valves, X bleed valve is not received by the FADEC active channel.

■ **on ground :**

– HI GND IDLE

FADEC increases minimum idle as if valves were opened.

● **If ENG ANTI ICE on :**

– ENG MODE SEL . . . . IGN

When eng anti ice is on, there is no automatic selection of continuous relight since FADEC does not know position of engine anti ice valves position.

● **BEFORE T.O. :**

– PACK (associated side) . . . . OFF

Associated pack must be closed to reduce risk of excessive EGT.

	STATUS
ENG 1(2) HI GND IDLE	I

■ **In flight**

● **If ENG ANTI ICE on**

– ENG MODE SEL . . . . IGN

	STATUS
ENG 1(2) HI GND IDLE	I

ENG 1(2) FADEC A(B) FAULT

Loss of one FADEC channel.

Crew awareness.

R *Note : Some cases of spurious FADEC fault have been experienced at engine start on*
R *ground.*
R *The warning can be considered as spurious, if it disappears after application of the*
R *following procedure :*
R *– Set the master lever to OFF, and wait until N2 speed goes below 5 %.*
R *– Pull and reset the C/B's of the affected ECU electrical supply (A04 or A05 on*
R *49 VU or R41 or Q40 on 120 VU).*
R *– Wait for the ECU power-up sequence, and restart the engine.*

ENG 1(2) FADEC FAULT

– CONFIRM ENG STATUS.

ON SYS PAGES :

Since engine indications are lost, other system pages such as HYD ELEC or BLEED must be used to confirm engine status.

● **IF ENG FAIL CONFIRMED** :

– ENG MASTER (affected) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply the after ENG SHUT DOWN procedure.

ENG 1(2) FADEC HI TEMP

■ **On the ground :**

– ENG MASTER (associated engine) . . . . OFF
– ENG MODE SEL . . . . NORM
– FADEC GND PWR . . . . Check OFF

■ **In flight :**

● **If the ECU temp is above the overheat threshold** :

FADEC OVHT

Reducing engine power should decrease temperature in the ECU area.
If overheating is severe enough, ECU failure could result in a significant loss of engine functions.

ENG TYPE DISAGREE

This caution is triggered when a rating discrepancy is detected between two engines.

Crew awareness

ENG THRUST LOCKED

The thrust is frozen on one or more engine after a failure or an involuntary autothrust disconnections.
This caution is automatically repeated every 5 seconds until thrust levers are moved.

– THR LEVERS . . . . MOVE

ENG TAILPIPE FIRE

Internal engine fire may be encountered during engine start or engine shutdown.
It may be seen by the ground crew, or the EGT may fail to decrease after the MASTER switch is turned OFF.

CAUTION
External fire agents can cause severe corrosive damage and should, therefore, only be considered after having applied the following procedure :

– MAN START (if manual start performed) . . . . OFF
– ENG MASTER (affected) . . . . OFF

Note : Do not press the engine fire pushbutton, since this would cut off the FADEC power supply, which would prevent motoring sequence.

– AIR BLEED PRESS . . . . ESTABLISH

· Select the APU, or opposite BLEED, to motor the engine.
· If APU BLEED is not available, and the opposite engine is shut down, connect external pneumatic power (if readily available).

R – BEACON . . . . ON
– ENG MODE SEL . . . . CRANK
– MAN START . . . . ON

The start valve automatically reopens, when N2 is below 20 %.

● **When burning has stopped :**
– MAN START . . . . OFF
– ENG MODE SEL . . . . NORM
– Maintenance action is due.

HIGH ENGINE VIBRATION

The VIB advisory on ECAM (N1 ≥ 6 units, N2 ≥ 4.3 units) is mainly a guideline to induce the crew to monitor engine parameters more closely.

VIB detection alone does not require engine shut down.

Note : 1. High engine vibrations may be accompanied by cockpit and cabin smoke and/or the smell of burning. This may be due only to compressor blade tip contact with associated abradable seals.

2. High N1 vibrations are generally accompanied by perceivable airframe vibrations. High N2 vibrations can occur without perceivable airframe vibrations.

■ **If no icing conditions :**

– ENG PARAMETERS . . . . CHECK

Check engine parameters and especially EGT ; crosscheck with other engine. Report in maintenance log.

● **If rapid increase above the advisory :**

– THRUST LEVER (affected engine) . . . . RETARD

Flight conditions permitting reduce N1 to maintain vibration level below advisory threshold.

Note : If the VIB indication does not decrease following thrust reduction, this may indicate other problems on the engine. Apply adequate procedure.

■ **If icing conditions :**

An increase of engine vibration in icing conditions with or without engine anti-ice may be due to fan blades and/or spinner icing.

– ATHR . . . . OFF

– ENGINE ANTI ICE . . . . CHECK

If ENG ANTI ICE is off, switch it ON at idle fan speed, one engine after the other with approximately 30 seconds interval.

– THRUST LEVER (one engine at a time) . INCREASE THRUST

Increase thrust to a setting compatible with the flight phase. VIB level will come back to normal after ice shed despite a slight increase during acceleration.
Resume normal operation.

Note : If possible, shut the engine down after landing for taxiing, when vibrations above the advisory level have been experienced during the flight.

ON GROUND EMER/EVACUATION

Carefully analyze the situation before deciding to evacuate passengers. However, do not waste valuable time.

- AIRCRAFT/PARKING BRK . . . . STOP/ON
- ATC (VHF) . . . . NOTIFY
  Notify ATC of the nature of the emergency, and state intentions.
  Only VHF 1 is available on batteries.
- R ΔP . . . . CHECK ZERO
  R *If ΔP is not at zero, select manual mode and V/S CTL-FULL UP in order to fully open the*
  R *outflow valve.*
- ENG MASTER 1 and 2 . . . . OFF
  Associated LP and HP valves close.
- CABIN CREW (PA) . . . . NOTIFY
  Notify the cabin crew of the nature of the emergency, and state intentions.
- FIRE pushbuttons (ENG and APU) . . . . PUSH
- R AGENTS (ENG and APU) . . . . AS RQRD
- EVACUATION . . . . INITIATE
  Using the passenger address system, announce an appropriate command such as "PASSENGER EVACUATION-EVACUATE THROUGH LH or RH DOORS", and press the EVAC COMMAND pushbutton, if installed.

DITCHING

PREPARATION

- CABIN CREW . . . . NOTIFY
  Notify the cabin crew of the nature of the emergency and state intentions.
  Specify the available time.
- ATC/TRANSPONDER . . . . NOTIFY/AS RQRD
  Notify ATC of the nature of emergency encountered and state intentions.
  If not in contact with ATC, select transponder code A7700 or transmit a distress message on : (VHF) 121.5 MHZ or (HF) 2182 KHZ or 8364 KHZ.
- GPWS-SYS . . . . OFF
R *Pressing OFF the SYS pushbutton switch avoids nuisance warning.*
- SEAT BELTS/NO SMOKING . . . . ON
- CABIN and COCKPIT . . . . PREPARE
  · *loose equipment secured*
  · *survival equipment prepared*
  · *belts and shoulder harnesses locked*
- LDG ELEV . . . . SELECT 00
- V. BUGS . . . . SET
- BARO . . . . SET
  Omit normal approach and landing check list.

APPROACH

- L/G LEVER . . . . UP
- ● **If engines running :**
  - SLATS and FLAPS . . . . MAX AVAIL
- ● **if engines not running :**
  - FOR LDG . . . . USE FLAP 3
  - USE RUDDER WITH CARE
  - MIN RAT SPEED . . . . 140 KT
- ENG MODE SEL . . . . NORM
- CABIN REPORT . . . . OBTAIN

DITCHING (CONT'D)

BEFORE DITCHING

– CAB PRESS MODE SEL . . . . CHECK AUTO
The outflow valve would remain open, if the MODE SEL were not at AUTO.

R – BLEED (ENGs and APU) . . . . OFF

– DITCHING pushbutton . . . . ON

R *The outflow valve, emergency ram air inlet, avionics ventilation inlet and extract*
R *valves, and pack flow control valves close.*

– BRACE FOR IMPACT . . . . ORDER
The ditching direction mainly depends on the wind direction, and on the state of the sea. These factors may be considered as follows :

1. Wind direction :
This may be determined by observing of the waves, which move and break downwind. Spray from the wave tops is also a reliable indicator.

2. Wind speed :
The following guidelines can be used to evaluate wind speed :
A few white crests . . . . 8-17 knots
Many white crests . . . . 17-26 knots
Streaks of foam along the water . . . . 23-35 knots
Spray from the waves . . . . 35-43 knots

3. Sea state :
This is best determined from a height of 500 to 1000 feet.
At a lower altitude, the swell direction may be less obvious than the wave direction, even though the waves are much smaller.

4. When there is no swell, align into the wind. In the presence of swell, and provided that drift does not exceed 10 degrees, ditch parallel to the swell and as nearly into wind as possible. If drift exceeds 10 degrees, ditch into the wind. The presence of drift on touchdown is not dangerous, but every effort should be made to minimize roll.
Touch down with approximately 11 degrees of pitch, and minimum aircraft vertical speed.

DITCHING (CONT'D)

JUST BEFORE DITCHING

– ENG MASTERS . . . . OFF

AFTER DITCHING

– ATC (VHF 1) . . . . NOTIFY
With engine and APU shut down, only VHF 1 is supplied.
– FIRE pushbutton (ENG's and APU) . . . . PUSH
– AGENTS (ENG's and APU) . . . . DISCH
– EVACUATION . . . . INITIATE
After impact the lowest point of the passenger exits (aft door) remains above the waterline for more than 7 minutes.

DITCHING (CONT'D)

BEFORE DITCHING

- CAB PRESS MODE SEL .... CHECK AUTO

  The outflow valve would remain open, if the MODE SEL were not at AUTO.

R - BLEED (ENGs and APU) .... OFF
- DITCHING pushbutton .... ON

R *The outflow valve, emergency ram air inlet, avionics ventilation inlet and extract*
R *valves, and pack flow control valves close.*

- BRACE FOR IMPACT .... ORDER

  The ditching direction mainly depends on the wind direction, and on the state of the sea. These factors may be considered as follows :

  1. Wind direction :
  This may be determined by observing of the waves, which move and break downwind. Spray from the wave tops is also a reliable indicator.

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  This is best determined from a height of 500 to 1000 feet.
  At a lower altitude, the swell direction may be less obvious than the wave direction, even though the waves are much smaller.

  4. When there is no swell, align into the wind. In the presence of swell, and provided that drift does not exceed 10 degrees, ditch parallel to the swell and as nearly into wind as possible. If drift exceeds 10 degrees, ditch into the wind. The presence of drift on touchdown is not dangerous, but every effort should be made to minimize roll.
  Touch down with approximately 11 degrees of pitch, and minimum aircraft vertical speed.

DITCHING (CONT'D)

JUST BEFORE DITCHING

– ENG MASTERS . . . . OFF

AFTER DITCHING

– ATC (VHF 1) . . . . NOTIFY
With engine and APU shutdown, only VHF 1 is supplied.
– FIRE pushbutton (ENG's and APU) . . . . PUSH
– AGENTS (ENG's and APU) . . . . DISCH
– EVACUATION . . . . INITIATE
– ELT . . . . CHECK EMITTING
If not, switch on the transmitter.
After impact, the lowest point of the passenger exits (aft door) remains above the waterline for more than 7 minutes.

FORCED LANDING

PREPARATION

- CABIN CREW .... NOTIFY
  Notify the cabin crew of the nature of the emergency and state intentions.
  Specify the available time.
- ATC/TRANSPONDER .... NOTIFY/AS RQRD
  Notify ATC of the emergency encountered and state intentions.
  If not in contact with the ATC, select transponder code A7700, or transmit a distress message on (VHF) 121.5 MHZ, or (HF) 2182 khz, or 8364 khz.
- OXYGEN CREW SUPPLY (if not required) .... OFF
- GPWS-SYS .... OFF
  To avoid nuisance warnings.
- SEAT BELTS/NO SMOKING .... ON
- GALLEY/COMMERCIAL ◁ .... OFF
- CABIN and COCKPIT .... PREPARE
  · Loose equipment secured and survival equipment prepared.
  · Belts and shoulder harnesses locked.
- LDG ELEV .... SET
  If not known, select an approximate value.
- V BUGS .... SET
- BARO .... SET
  Omit normal approach and landing checklist.

APPROACH

- RAM AIR .... ON
  Switch ON the RAM AIR to ensure complete cabin depressurization on ground.

■ **If engines running :**

R
  - L/G lever .... DOWN
  - SLATS and FLAPS .... MAX AVAIL

■ **If engines not running :**

  - FOR LDG .... USE FLAP 3
R
  - L/G GRVTY EXTN .... DOWN
R
    See the L/G GRVTY EXTN procedure (3.02.32).
  - USE RUDDER WITH CARE
  - MIN RAT SPEED .... 140 KT
- GND SPLR .... ARM
- ENG MODE SEL .... NORM
- CABIN REPORT .... OBTAINED

⇩

FORCED LANDING (CONT'D)

BEFORE LANDING

– BRACE FOR IMPACT . . . . ORDER

JUST BEFORE TOUCHDOWN

– ENG MASTERS . . . . OFF

AFTER TOUCHDOWN

● **When aircraft has stopped :**

– PARKING BRK . . . . ON
– ATC (VHF 1) . . . . USE
With both engines and APU shut down, only VHF 1 is supplied.
– FIRE pushbutton (ENG's and APU) . . . . PUSH
– AGENTS (ENG's and APU) . . . . DISCH
R – EVACUATION . . . . INITIATE

FORCED LANDING

PREPARATION

- CABIN CREW . . . . NOTIFY
  Notify the cabin crew of the nature of the emergency and state intentions.
  Specify the available time.
- ATC/TRANSPONDER . . . . NOTIFY/AS RQRD
  Notify ATC of the emergency encountered and state intentions.
  If not in contact with the ATC, select transponder code A7700, or transmit a distress message on (VHF) 121.5 MHZ, or (HF) 2182 khz, or 8364 khz.
- OXYGEN CREW SUPPLY (if not required) . . . . OFF
- GPWS-SYS . . . . OFF
  To avoid nuisance warnings.
- SEAT BELTS/NO SMOKING . . . . ON
- GALLEY/COMMERCIAL ◁ . . . . OFF
- CABIN and COCKPIT . . . . PREPARE
  · Loose equipment secured and survival equipment prepared.
  · Belts and shoulder harnesses locked.
- LDG ELEV . . . . SET
  If not known, select an approximate value.
- V BUGS . . . . SET
- BARO . . . . SET
  Omit normal approach and landing checklist.

APPROACH

- RAM AIR . . . . ON
  Switch ON the RAM AIR to ensure complete cabin depressurization on ground.

■ **If engines running :**

R - L/G lever . . . . DOWN
  - SLATS and FLAPS . . . . MAX AVAIL

■ **If engines not running :**

  - FOR LDG . . . . USE FLAP 3
R - L/G GRVTY EXTN . . . . DOWN
R *See the L/G GRVTY EXTN procedure (3.02.32).*
  - USE RUDDER WITH CARE
  - MIN RAT SPEED . . . . 140 KT
- GND SPLR . . . . ARM
- ENG MODE SEL . . . . NORM
- CABIN REPORT . . . . OBTAINED

⇩

FORCED LANDING (CONT'D)

BEFORE LANDING

– BRACE FOR IMPACT . . . . ORDER

JUST BEFORE TOUCHDOWN

– ENG MASTERS . . . . OFF

AFTER TOUCHDOWN

● **When the aircraft has stopped** :

– PARKING BRK . . . . ON
– ATC (VHF 1) . . . . USE
With both engines and APU shutdown, only VHF 1 is supplied.
– FIRE pushbutton (ENG's and APU) . . . . PUSH
– AGENTS (ENG's and APU) . . . . DISCH
– EVACUATION . . . . INITIATE
– ELT . . . . CHECK EMITTING
If not, switch on the transmitter.

EMER DESCENT

R **IMMEDIATE ACTIONS**

– CREW OXY MASKS . . . . ON

Descend with the autopilot engaged :
. Turn the ALT selector knob and pull.
. Turn the HDG selector knob and pull.
. Adjust the target SPD/MACH.
Use of the autopilot is also permitted in EXPEDITE mode (⩤).

– THR LEVERS (if A/THR not engaged) . . . . IDLE

– SPD BRK . . . . FULL

Extension of the speedbrakes will significantly increase Vls.
To avoid autopilot disconnection and automatic retraction of the speedbrakes, due to possible activation of the angle of attack protection, allow the speed to increase before starting to use the speedbrakes.

R **WHEN DESCENT ESTABLISHED**

– EMER DESCENT FL 100 or minimum allowable altitude.

– SPEED . . . . MAX/APPROPRIATE

CAUTION

Descend at the maximum appropriate speed. If structural damage is suspected, use the flight controls with care and reduce speed as appropriate.

Landing gear may be extended below 25000 feet. Speed must be reduced to VLO/VLE.

– SIGNS . . . . ON

– ENG MODE SEL . . . . IGN

– ATC . . . . NOTIFY

Notify ATC of the nature of the emergency, and state intentions.
If not in contact with ATC, select transponder code A 7700, or transmit a distress message on (VHF) 121.5 MHZ, or (HF) 2182 KHZ, or 8364 KHZ.
· To save oxygen, set the oxygen diluter selector to the N position.
· With the oxygen diluter selector left at 100 %, oxygen quantity may be insufficient to cover the entire emergency descent profile.
· Ensure crew communication is established with oxygen masks. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.

● **IF CAB ALT > 14 000 feet :**

– PAX OXY MASKS . . . . MAN ON

Confirm passenger oxygen masks released.
Note : Notify the cabin crew, when a safe flight level has been reached and oxygen mask use can be terminated.

OVERWEIGHT LANDING

– LDG CONF . . . . DETERMINE

When an overweight landing has to be performed after an operational turnback, refer to the corresponding RTOW chart, or to FCOM to find approach and landing configuration
R *given as a function of the approach climb limiting weight.*

Note : For weights greater than 70000 kg (or 154 000 lb) S speed is greater than VFE CONF 2 (200 knots). Consequently the crew must select on FCU a speed below
R *200 knots before setting FLAPS 2. When in FLAPS 2, the crew can use managed*
R *speed again.*

– LDG DIST . . . . CHECK

– PACK 1 and 2 . . . . OFF or supplied by APU

Selecting packs off (or supplied from APU) will increase the maximum thrust available from the engines in the event of a go-around.

● **In final stages of approach**

– TARGET SPEED . . . . VLS

Reduce speed to reach VLS at runway threshold.

Touch down as smooth as possible (Maximum V/S at touchdown 360 ft/min)

● **At main landing gear touchdown**

– REVERSE THRUST . . . . USE MAX AVAILABLE

● **After nose wheel touchdown**

– BRAKES . . . . APPLY AS NECESSARY

Maximum braking may be used after nose wheel touchdown, but if landing distance permits, delay or reduce braking to take full benefit of the available runway length.

● **Landing complete**

– BRAKE FANS (⧏) . . . . ON

Be prepared for tyre deflation if temperatures exceed 800° C.

CREW INCAPACITATION

If a cockpit crew member becomes incapacitated, the remaining crew member must call a cabin attendant as soon as practicable. The best way to request assistance from the cabin crew, is by means of the passenger address system :
"ATTENTION, PURSER TO COCKPIT PLEASE". The purser or any other cabin attendant must proceed to the cockpit immediately.
The cabin attendant must then :

- tighten and manually lock the shoulder harness of the incapacitated crew member ;
- push the seat completely aft ;
- recline the seat back.

It takes 2 people to remove the dead weight of an unconscious body from a seat without endangering any controls and switches.
If it is not possible to remove the body, one cabin attendant must remain in the cockpit to take care of and observe the incapacited crew member.
In coordination with the purser :

- request assistance from any medically qualified passenger.
- check if a type qualified company pilot is on board to replace the incapacitated crew member.

BOMB ON BOARD

IF POSSIBLE, LAND AND EVACUATE THE AIRCRAFT IMMEDIATELY.

R If it is not possible to land and evacuate the aircraft within 30 minutes, apply the following procedures :

COCKPIT PROCEDURES

Background

To avoid the activation of an altitude-sensitive bomb, the cabin altitude should not exceed the value at which the bomb has been discovered.

To reduce the effects of the explosion, the aircraft should fly as long as possible with approximately 1 PSI differential pressure, to help the blast go outwards. 1 PSI differential pressure corresponds to a 2500 feet difference between the aircraft and the cabin altitude.

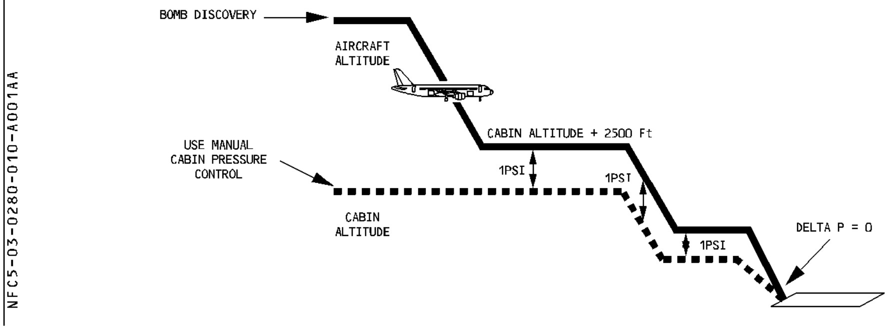
These conditions are achieved by using the manual pressure control.

Procedure

The following procedure assumes that it is initiated during climb or cruise :

- First, maintain the cabin altitude.
- While maintaining the cabin altitude, descend the aircraft to the cabin altitude + 2500 feet and maintain delta P at 1 PSI.
- During further steps of descent, maintain delta P at 1 PSI.
- For landing, reduce the differential pressure to zero, until the final approach.

If flight conditions are different, the crew should adapt the procedure, bearing in mind the above-mentioned principles (background paragraph).



BOMB ON BOARD (CONT'D)

- AIRCRAFT (if climbing) . . . . LEVEL OFF
- CABIN PRESS MODE SEL . . . . MAN

  The purpose is to immediately prevent the cabin altitude from increasing, in order to avoid the activation of an altitude-sensitive bomb.
- CAB ALT . . . . MAINTAIN

  Use MAN V/S CTL to maintain the cabin altitude at the value it had when the bomb was discovered.
- CABIN CREW . . . . NOTIFY
- ATC/COMPANY OPERATIONS . . . . NOTIFY

  To obtain expert advice from explosive specialists.
- FUEL RESERVES . . . . DETERMINE

  Keep in mind that when flying at cabin altitude + 2500ft, fuel consumption in CONF 1, with landing gear down, will be about 2.1 times that consumed in clean configuration.
- NEXT SUITABLE AIRPORT . . . . DETERMINE
- FCU SPEED SELECTION KNOB . . . . PULL AND TURN

  Select the most appropriate speed, taking into account the time to destination, the fuel consumption and the fact that low speed could reduce the consequences of possible structural damage, if the bomb explodes.
- DESCENT TO CAB ALT + 2500 FT or MEA or minimum obstacle clearance altitude . . . . INITIATE

  Descending to 2500ft above the cabin altitude gives a cabin differential pressure of approximately 1 PSI, which helps to ensure that the blast goes outwards, if the bomb explodes.
- AVOID SHARP MANEUVERS

  which might result in the bomb moving.
- CAB ALT . . . . MAINTAIN

  Use MAN V/S CTL to maintain the cabin altitude. Initially brief UP input should be required; but, be careful not to increase the cabin altitude.

● **When at CAB ALT + 2500 FT :**

  - 1 PSI DELTA P . . . . MAINTAIN

    Use MAN V/S CTL to adjust delta P to 1 PSI. Brief DN input should be initially required to set 0 ft/min cabin vertical speed.
  - GALLEY/COMMERCIAL (◁) . . . . OFF
  - FLAPS (fuel permitting) . . . . AT LEAST CONF 1

    For landing, use normal configuration.

BOMB ON BOARD (CONT'D)

– LANDING GEAR (fuel permitting, except for flight over water) .... DOWN

The detonation could damage the landing systems. Therefore, if fuel permits, configure the aircraft for landing as soon as possible. Reducing the speed will minimize stress on the aircraft structure.

● **For any other steps of descent :**

– 1 PSI DELTA P .... MAINTAIN

Use MAN V/S CTL to DN to adjust delta P to 1 PSI.

● **During approach :**

– CABIN PRESS MODE SEL .... AUTO

The purpose is to allow the CPC to automatically control the cabin altitude to 0 during final approach.

● **When the aircraft is on ground and stopped in a remote area (if possible) :**

R – EVACUATION .... INITIATE

Avoid exits and exiting on the same side as the bomb or near the bomb.

CABIN PROCEDURES

CAUTION
The least risk bomb location for the aircraft's structure and systems is the CENTER OF THE RH AFT CABIN DOOR.

– EOD PERSONNEL ON BOARD .... CHECK

Announce "Is there any EOD personnel on board ?". By using these initials, only those familiar with EOD (Explosive Ordnance Disposal) will be made aware of the problem.

– BOMB .... DO NOT OPEN, DO NOT CUT WIRES, SECURE AGAINST SLIPPING, AVOID SHOCKS

Secure in the attitude found, and do not lift before having checked for an anti-lift ignition device.

– PASSENGERS .... LEAD AWAY FROM BOMB

Move passengers at least 4 seat rows away from the bomb location. If the other seats are full, these passengers should sit on the floor in protected areas.
Passengers near the bomb should protect their heads with pillows, blankets, etc, and sit in the brace position.
All passengers must remain seated with seatbelts on and, if possible, head below the top of the head rest. Seat backs and tray tables should be in their full upright position.

BOMB ON BOARD (CONT'D)

– BOMB . . . . CHECK NO ANTI-LIFT DEVICE

To check for an anti-lift switch or lever, slide a string or stiff card, (such as the emergency information card) under the bomb, without disturbing the bomb.

If the string or card cannot be slipped under the bomb, it may indicate that an anti-lift
R *switch or lever is present and that the bomb cannot be moved.*

If a card is used and can be slid under the bomb, leave it under the bomb and move together with the bomb. If it is indicated that an anti-lift device is present, it may be possible to move the bomb together with the surface on which the bomb is located, such as a shelf or seat cushion.

R *If it is not possible to move the bomb, then it should be surrounded with a single thin*
R *sheet of plastic (e.g. trash bag), then with wetted materials, and other blast attenuation materials, such as seat cushions and soft carry-on baggage. Move personnel as far away from the bomb location as possible.*

● **If the bomb can be moved :**

PLACE THE BOMB AS CLOSE TO THE CENTER OF THE RH AFT CABIN DOOR AS POSSIBLE.

– PASSENGERS . . . . MOVE/ADVISE

Move passengers at least 4 seat rows away from the least risk bomb location (RH aft cabin door). If the other seats are full, these passengers should sit on the floor in protected areas towards the front of the aircraft.

Passengers near the bomb should protect their heads with pillows, blankets, etc, and sit in the brace position.

All passengers must remain seated with seatbelts on and, if possible, head below the
R *top of the head rest. Seat backs and tray tables should be in their full upright position.*

R – RH AFT CABIN DOOR SLIDE . . . . DISARM

– LEAST RISK BOMB LOCATION (LRBL) . . . . PREPARE

Build up a platform of solid baggage against the door up to about 25cm (10 in) below the middle of the door.

On top of this, build up at least 25cm (10 in) of wetted material such as blankets and pillows.

R *Place a single thin sheet of plastic (e.g. trash bag) on top of the wetted materials. This*
R *prevents any possible short circuit.*

BOMB ON BOARD (CONT'D)

– BOMB . . . . MOVE TO LRBL

Carefully carry in the attitude found, and place on top of the wetted materials in the same attitude and as close to the door structure as possible.

– LEAST RISK BOMB LOCATION . . . . COMPLETE

R *Place an additional single thin sheet of plastic over the bomb.*

Build up at least 25cm (10in) of wetted material around the sides and on top of the bomb.

DO NOT PLACE ANYTHING BETWEEN THE BOMB AND THE DOOR, AND MINIMIZE AIRSPACE AROUND THE BOMB.

The idea is to build up a protective surrounding of the bomb, so that the explosive force is only directed towards the only unprotected area into the door structure.

Fill the area around the bomb with seat cushions and other soft materials such as
R *hand luggage (saturated with water or any other nonflammable liquid) up to the cabin*
R *ceiling, compressing as much as possible. Secure the LRBL stock in place using belt,*
R *ties, or other appropriate materials. The more material stacked around the bomb, the less the damage will be.*

USE ONLY SOFT MATERIAL. AVOID USING MATERIALS CONTAINING ANY INFLAMMABLE LIQUID AND ANY METAL OBJECTS WHICH COULD BECOME DANGEROUS PROJECTILES.

– EVACUATION/DISEMBARKATION . . . . EXECUTE

Evacuate through normal and emergency exits on the opposite side of the bomb location.

Do not use the door just opposite the bomb.

Use all available airport facilities to disembark without delay.

VOLCANIC ASH ENCOUNTER

Accomplish the following while making a 180 degrees turn:

- ATC .... NOTIFY
- A/THR .... OFF

  This prevents the autothrust from generating thrust variations.
- THRUST (conditions permitting) .... DECREASE

  So as to reduce ash ingestion.

R *If altitude permits, reduce thrust to idle. This maximizes engine surge margin and lowers*
R *engine turbine temperature.*
- CREW OXYGEN MASKS .... ON/100 %
- CABIN CREW .... NOTIFY
- PASSENGER OXYGEN .... AS RQRD

  Depending on contamination.
- ENG ANTI ICE .... ON
- WING ANTI ICE .... ON
- PACK FLOW .... HI
- APU .... START

  If possible, start the APU and have it ready for an assisted engine relight in the event of an engine flame-out. Refer to APU limitations (refer to 3.01.49).
- ENGINE PARAMETERS .... MONITOR

  Monitor particularly EGT. If EGT exceeds limits, it may become necessary to consider a precautionary engine shutdown and engine restart in flight.
- AIRSPEED INDICATIONS .... MONITOR

  If airspeed is unreliable or lost, use the UNRELIABLE SPEED INDICATION procedure.

  Note : · *If both engines flame out and speed indications are lost, use the DUAL ENGINE FAILURE procedure to get the required pitch attitude for the optimum relight speed.*

  · *In case of engine failure, switch off the wing anti ice before engine restart.*

R

COCKPIT WINDSHIELD/WINDOW CRACKED

In case of a one ply failure, whichever the one may be, the windshield is still able to sustain the maximum differential pressure. Nevertheless, because the pilot is unable to accurately determine how many plies have failed, the differential pressure must be reduced to 5 PSI by applying the following procedure :

MAX FL 230

The maximum flight level is restricted to FL230 to obtain △P 5 PSI, without resulting in an excessive cabin altitude and corresponding EXCESS CAB ALT warning.
The following procedure, allows maintaining △P 5 PSI in manual cabin pressure mode.

– CAB PRESS MODE SEL . . . . MAN
– MAN V/S CTL . . . . AS RQRD

Set the cabin altitude, according to the table below :

△P = 5 PSI	FL	100	150	200	230
	CABIN ALTITUDE	0	3000	6000	8000

● **When starting the final descent**
– CAB PRESS MODE SEL . . . . AUTO

R

COCKPIT WINDSHIELD/WINDOW ARCING

– Affected WINDOW/WINSHIELD ANTI ICE C/B . . . . PULL

In case of electrical arcing, pull the circuit breaker of the affected window/windshield heating system :

. ANTI ICE L WHSLD (AF10) *. ANTI ICE/WINDOWS L C/B (X14)*
. ANTI ICE R WHSLD (AF03) *. ANTI ICE/WINDOWS R C/B (W14)*

ECAM ADVISORY CONDITIONS

SYSTEM	CONDITIONS	RECOMMENDED ACTION
CAB PRESS	CAB VERTICAL SPEED V/S > 1800 ft/min	CPC changeover may be attempted : MODE SEL . . . . MAN Wait 10 seconds then : MODE SEL . . . . .AUTO
	CAB ALTITUDE altitude ≥ 8800 ft	MODE SEL . . . . MAN Manual pressure control
	CAB DIFF PRESS $\Delta P \geq 1.5$ psi in phase 7	LDG ELEV . . . . MAN ADJUST If unsuccessful : MODE SEL . . . . MAN Manual pressure control
ELEC	IDG OIL TEMP T ≥ 147°C	Reduce IDG load if possible (GALLEY or GEN OFF). If required, restore when temperature has dropped. Restrict use of generator to short time, if temperature rises again excessively.
FUEL	Difference between wing fuel quantities greater than 1500 kg (3307 lb)	FUEL MANAGEMENT. . . . . CHECK If a fuel leak is suspected, refer to FUEL LEAK procedure. For limitations, see 3.01.28.
	Fuel temp greater than 45°C in inner cell or 55° in outer cell	GALLEY . . . . OFF
	Fuel temp lower than – 40°C in inner or outer cell	Consider descending to a lower altitude and/or increasing Mach to increase TAT.
APU	FLAP OPEN Flap not fully closed when APU master switch is at off.	
	EGT > EGT MAX – 33°C (inhibited during APU start)	
	OIL QTY (message LOW OIL LEVEL pulsing)	If there is no oil leak, then the remaining oil quantity allows normal APU operation for about 10 hours.

R ECAM ADVISORY CONDITIONS

SYSTEM	CONDITIONS	RECOMMENDED ACTION
ENG	OIL PRESS P < 16 PSI	· If oil pressure is between 16 and 13 psi (advisory), continue normal operation. · If oil pressure is below 13 psi (red indication) without the ENG OIL LO PR ECAM warning, continue normal engine operation (it can be assumed that the oil pressure transducer is faulty). In both cases, monitor other engine parameters especially oil temperature and oil quantity.
	OIL PRESS P > 90 PSI	Monitor other engine parameters closely for symptoms of engine malfunction. If high oil pressure is not accompanied by other abnormal indications operate engine normally for remainder of flight. Record high oil pressure and corresponding N2 readings for maintenance action.
	OIL TEMP T > 140°C	A rise in oil temperature during normal steady-state operation indicates a system malfunction and should be closely monitored for other symptoms of engine malfunction. *Note : If OIL TEMP rise follows thrust reduction, increasing thrust may reduce oil temperature.* In addition, a rise in oil temperature could be related to the IDG oil cooling system. To reduce oil temperature rise before limits are reached, the following are recommended : 1. Low Speed - Increase engine speed to increase fuel flow and thereby cool IDG oil. 2. High Speed - Reduce generator load or turn off generator. If oil temperature continues to rise, mechanically disconnect IDG.
	OIL QTY < 3 qt	If oil quantity low at high power setting, expect level increase after power reduction
	NAC TEMP ≥ 240°C	Monitor engine parameters and cross check with other engine
	VIBRATION N1 ≥ 6 units N2 ≥ 4,3 units	Refer to HIGH ENGINE VIBRATION procedure. *Note : The advisory threshold may be decreased by a MCDU procedure at the level of vibration reached during the last flight.* *If this function has been activated, the N1 and N2 VIB indication will respectively pulse below 6 and 4.3.*

R

LDG CONF - APPR SPD - LDG DIST CORRECTIONS FOR FAILURES		FLAPS LEVER POSITION FOR LDG	APPR SPD : INCREMENT TO VREF (△ VREF)	MULTIPLY LDG DIST CONF FULL BY
ELEC	EMER ELEC CONFIG	3	10	2.0
	DC EMER CONFIG	NORM (1)	–	1.7
	DC BUS 1 + 2	NORM (1)	–	1.75
	DC BUS 2	NORM (1)	–	1.15
	DC ESS BUS	NORM (1)	–	Negl.
	AC BUS 1	NORM (1)	–	1.1
FTL CTL	ALTN LAW/DIRECT LAW ELAC 1 + 2/L(R) ELEV FAULT STAB JAM/L + R ELEV FAULT	3	10	1.2 *
	ONE SPLR FAULT (except n°3 or 5)	NORM (1)	–	1.1
	TWO SPLR FAULT	NORM (1)	–	1.1
	Three or more SPLR FAULT	NORM (1)	–	1.35
	SEC 1 or 3 FAULT	NORM (1)	–	1.1
	SEC 2 FAULT	NORM (1)	–	Negl.
	SEC 1 + 2 or 2 + 3 FAULT	NORM (1)	–	1.2
	SEC 1 + 3 FAULT	NORM (1)	–	1.4
	SEC 1 + 2 + 3 FAULT	3	10	1.6
FLAPS/ SLATS	FLAPS and SLATS at zero	1	60 (APPR) 50 (THRESHOLD)	1.8 *
	0 < FLAPS < 1 : Slats < 1	3	45	1.8 *
	0 < FLAPS < 1 : Slats ≥ 1	3	25	1.3 *
	1 ≤ FLAPS < 2 : Slats < 1	3	30	1.4 *
	1 ≤ FLAPS < 2 : Slats ≥ 1	3	15	1.2 *
	2 ≤ FLAPS < 3 : Slats < 1	3	25	1.35 *
	2 ≤ FLAPS < 3 : Slats ≥ 1	3	10	1.15 *
	FLAPS = 3 : Slats < 1	3	25	1.35 *
	FLAPS = 3 : 1 ≤ Slats ≤ 3	3	10	1.15 *
	FLAPS = 3 : Slats > 3	3	5	1.1 *
	FLAPS > 3 : Slats < 1	NOT ALLOWED		
	FLAPS > 3 : 1 ≤ Slats ≤ 3	FULL	10	1.15 *
	FLAPS > 3 : Slats > 3	FULL	5	1.1 *

(1) If CONF 3 is used when "NORM" is indicated in the table, multiply the resulting landing distance by an additional factor of 1.1.

R

LDG CONF - APPR SPD - LDG DIST CORRECTIONS FOR FAILURES		FLAPS LEVER POSITION FOR LDG	APPR SPD : INCREMENT TO VREF (△ VREF)	MULTIPLY LDG DIST CONF FULL BY
HYD	GREEN or YELLOW	NORM (1)	–	1.1
	BLUE	NORM (1)	–	Negl.
	GREEN + BLUE	3	25	1.6
	GREEN + YELLOW	3	25	2.6
	YELLOW + BLUE	NORM (1)	–	1.5
BRK	ANTI SKID	NORM (1)	–	1.5
	AUTO BRK FAULT	NORM (1)	–	1.1
NAV	IR 1 + 2 + 3 FAULT	3	10	2.35
	DUAL IR FAULT DUAL ADR FAULT ADR 1 + 2 + 3 FAULT	3	10	1.2 *
ENG	REV UNLOCK with buffet	1 **	55 (APPR) 40 (THRESHOLD)	1.75 *
	REV UNLOCK with buffet	3 **	10	1.2 *

(1) If CONF 3 is used when "NORM" is indicated in the table, multiply the resulting landing distance by an additional factor of 1.1.

* See below for multiple failures.

R ** The applicable landing configuration (CONF 1 or CONF 3) is
R displayed on the ECAM STATUS page.

USE OF THE TABLE

– △ VREF accounts for corrections due to failure, and to the required landing configuration. The LDG DIST factor must be applied to the actual landing distance of CONF FULL.

– For a single failure :
- *Determine the required LDG CONF to be selected ;*
- *Determine the △ VREF ;*
- *VAPP = VREF + △ VREF + WIND CORRECTION ;*
- *Determine the LDG DIST factor.*

– For multiple failures :
- *Use the lowest LDG CONF ;*
- *Use the highest △ VREF to compute VAPP ;*
- *Multiply the landing distance factors together, except when all failures are indicated by an asterisk (*). In this case, the highest factor has to be taken.*
- *Examples : Dual failure*

FLAPS FAULT (F < 3, S ≥ 1)	LDG CONF 3	△ VREF = 10 KT	LDG DIST × 1.15*
BRK ANTI SKID	NORM CONF	△ VREF = 0	LDG DIST × 1.5
TOTAL	LDG CONF 3	△ VREF = 10 KT	LDG DIST × 1.725

ALTN LAW	LDG CONF 3	△ VREF = 10 KT	LDG DIST × 1.2*
FLAPS FAULT (F < 1, S ≥ 1)	LDG CONF 3	△ VREF = 25 KT	LDG DIST × 1.3*
TOTAL	LDG CONF 3	△ VREF = 25 KT	LDG DIST × 1.3

WINDSHEAR

A red flag "WINDSHEAR" is displayed on each PFD associated with an aural synthetic voice "WINDSHEAR" repeated three times.

If windshear is detected either by the system or by pilot observation, apply the following recovery technique:

■ **At takeoff**

● **If before V1**

The takeoff should be rejected only if significant airspeed variations occur below indicated V1 and the pilot decides that there is sufficient runway remaining to stop the airplane.

● **If after V1**

– THR LEVERS . . . . TOGA
– REACHING VR . . . . ROTATE
– SRS ORDERS . . . . FOLLOW

■ **Airborne, initial climb or landing**

– THR LEVERS AT TOGA . . . . SET OR CONFIRM
– AP (if engaged) . . . . KEEP
– SRS ORDERS . . . . FOLLOW

This includes the use of full back stick, if demanded.

Note : 1. If engaged, the autopilot disengages when α is greater than α prot.
2. If the FD is not available, use an initial pitch attitude up to 17.5°. If necessary to minimize the loss of height, increase this pitch attitude.

– DO NOT CHANGE CONFIGURATION (SLATS/FLAPS, GEAR) UNTIL OUT OF SHEAR.
– CLOSELY MONITOR FLIGHT PATH AND SPEED.
– RECOVER SMOOTHLY TO NORMAL CLIMB OUT OF SHEAR.

WINDSHEAR AHEAD

The "W/S AHEAD" message is displayed on each PFD. The color of the message depends on the severity and location of the windshear.

W/S AHEAD red

■ Takeoff

Associated with an aural synthetic voice "WINDSHEAR AHEAD, WINDSHEAR AHEAD".

- **Before takeoff**
  - Delay takeoff, or select the most favorable runway.
- **During the takeoff run**
  - Reject takeoff.

    Note : Predictive windshear alerts are inhibited above 100 knots until 50 feet.
- **When airborne**
  - THR LEVERS . . . . TOGA

    As usual, the slat/flap configuration can be changed, provided the windshear is not entered.
  - SRS ORDERS . . . . FOLLOW

    Note : If engaged, the autopilot disengages when α is greater than α prot.

■ Landing

Associated with an aural synthetic voice "GO AROUND, WINDSHEAR AHEAD".

Note : If a positive verification is made that no hazard exists, the warning may be considered cautionary.

- THR LEVERS . . . . TOGA
- ANNOUNCE . . . . "GO AROUND-FLAPS"
- FLAPS . . . . RETRACT ONE STEP
- L/G UP . . . . SELECT

This includes the use of full backstick, if demanded.

Note : 1. If engaged, the autopilot disengages when α is greater than α prot.
2. If the FD is not available, use a pitch initial attitude up to 17.5°. If necessary to minimize the loss of height, increase this pitch attitude.

W/S AHEAD amber

Apply precautionary measures, as indicated in the SUPPLEMENTARY TECHNIQUES 3.04.91.

GENERAL

A successful outcome for an emergency situation depends, first of all, upon each crew member's perfect knowledge and execution of the duties assigned to him.
The captain should check frequently that all crew members know exactly their assigned positions and their specific duties, as well as the duties of the other crew members, in case of an abnormal or an emergency condition.
Since it is not possible to cover all the situations that may occur, the captain will be responsible for adapting the following instructions to obtain the best coordination of the emergency operation. Should it be physically impossible for the captain to carry out his duties, another crew member will substitute for him according to the chain of command.
The procedures in this manual are AIRBUS INDUSTRIE procedures and should be considered to be a reference.

R **COCKPIT-ASSIGNED DUTIES FOR EVACUATION**

- If it is NOT POSSIBLE to reach the passenger cabin :
  The cockpit crew should evacuate the aircraft via the cockpit clearview windows, by using the escape ropes.
  On ground, each crewmember must help passengers, and direct them away from the aircraft.
- If it is POSSIBLE to reach the passenger cabin :

R

CAPT	– Is the last person to leave the cockpit : Proceeds to the cabin, and helps with passenger evacuation, as necessary. – Is the last person to leave the aircraft : Checks that all persons have evacuated the aircraft. – Evacuates the aircraft, via the rear door, or any other available exit, if he/she cannot reach the rear door. – On ground, he/she takes command of operations until rescue units arrive.
F/O	– Proceeds to the cabin, and takes the emergency equipment. – Evacuates the aircraft, using any available exit. – Helps passengers on ground, and directs them away from the aircraft.

CABIN CREW-ASSIGNED AREAS FOR EVACUATION

R

CABIN CREW DESIGNATION	ASSIGNED JUMPSEAT AND DOOR	ASSIGNED JUMPSEAT	ASSIGNED AREA
1 PURSER	DOOR 1 LH	FWD OUTBOARD	FWD/MID
1 CABIN CREW	DOOR 1 LH	FWD INBOARD	FWD/MID
1 CABIN CREW	DOOR 2 RH	AFT CENTER	MID/AFT
1 CABIN CREW	DOOR 2 LH	REARWARD	MID/AFT

R R <u>Note</u> : *These procedures are established for the minimum required number of 4 cabin crews.*

COMMUNICATIONS

R

1. EMERGENCY CALL			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– Press "EMER" CALL pushbutton on the CALLS panel, or – Passenger Address (PA) System : "PURSER TO COCKPIT PLEASE!"	Purser must immediately go to the cockpit.
CABIN	COCKPIT	– Interphone : "PRIO CAPT"	Any cabin crewmember can make such a call. The cockpit crew must reply.

R

2. EMERGENCY ALERT			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "ATTENTION CREW! AT STATIONS !"	The cockpit crew makes a short and precise announcement to warn that an emergency evacuation may soon be required. Cabin crews must proceed to their emergency stations, and fasten their seatbelts.

R

3. NOTIFICATION TO PASSENGERS			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– "NO SMOKING/SEATBELT" signs ON. – PA System	For psychological reasons, the cockpit crew should be the first to inform of an intended emergency landing.
PURSER	CABIN	– CABIN LIGHTS 100 % – PA System	Purser informs passengers that they have to pay special attention to these warnings : – "FINISH PREPARATION" – "BRACE FOR IMPACT" – "PASSENGERS EVACUATE"

R

4. FINISH PREPARATION			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– Passenger Address (PA) System : "FINISH PREPARATION"	The cockpit crew gives this order a short time before an emergency landing.

R

5. BRACE FOR IMPACT			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "BRACE FOR IMPACT !"	The cockpit crew gives this order no later than 1 minute before impact.

R

6. INITIATE EVACUATION (RESTRICTED EXITS)			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "PASSENGERS EVACUATE" – Activate EVAC signals ◁	The cockpit crew orders an immediate evacuation, and the cabin crew directs passengers to all available exists.
CABIN	COCKPIT AND CABIN	– EVAC SIGNAL SYSTEM ◁ on FWD ATTND panel (FAP) – PA System or megaphone	Used by the cabin crew, if there is no signal or order from the cockpit, and if it is unmistakably clear that the aircraft must be evacuated.
CABIN	CABIN	– Verbal	The cabin crew stands up and shouts : – "SEATBELTS OFF!" – "LEAVE EVERYTHING!" – "GET OUT!" – "COME THIS WAY!"

R

7. EVACUATION NOT REQUIRED			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "CABIN CREW and PASSENGERS REMAIN SEATED !"	When the Captain decides that an evacuation is not required, the cockpit crew makes an immediate announcement to this effect.

ON GROUND EVACUATION

COCKPIT CREW PROCEDURES

- **The cockpit crew notifies the cabin crew of the nature of the emergency, and states intentions.**
- **The cockpit crew uses the Passenger Address system to make an appropriate announcement, such as : "PASSENGERS EVACUATE", and presses the EVAC COMMAND pushbutton.**

CABIN CREW PROCEDURES

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows :

- **STAND UP AND SHOUT . . . . "UNFASTEN SEATBELTS"**
- **OUTSIDE CONDITIONS . . . . CHECK**

● **If outside conditions are safe :**

- **DOOR IN ARMED POSITION . . . . OPEN FIRMLY**
- **SHOUT . . . . "COME THIS WAY"**

● **If the door does not open automatically :**

- **DOOR . . . . PUSH AND OPEN MANUALLY**

R - **SLIDE (or SLIDERAFT) DEPLOYMENT . . . . CHECK FULL DEPLOYMENT**
R It takes approximately four seconds for the slide (or slideraft) to deploy.

R ● **If the slide (or slideraft) does not automatically inflate :**

- **RED, MANUAL INFLATION HANDLE . . . . PULL**
R The red, manual inflation handle is located on the right-hand side of the slide (or slideraft) girt extension.

R - **ORDER . . . . "PASSENGERS EVACUATE"**
- **PASSENGER EVACUATION . . . . EXPEDITE**

R ● **If the slide (or slideraft) becomes unserviceable :**

- **PASSENGER EVACUATION . . . . STOP**
- **PASSENGERS TO ANOTHER USABLE EXIT . . . . REDIRECT**

- **TOTAL ZONE EVACUATION . . . . CHECK**
- **CABIN CREW . . . . EVACUATE**
- **PASSENGERS AWAY FROM THE AIRCRAFT . . . . DIRECT**

● **If outside conditions are unsafe :**

- **EXIT DOOR . . . . BLOCK**
- R **PASSENGERS TO NEAREST USABLE EXIT . . . . REDIRECT**

COCKPIT EVACUATION THROUGH WINDOW

OPENING THE SLIDING WINDOW

- **HANDLE . . . . PUSH DOWN AND PULL BACK**
  Pulling the handle backwards, opens the sliding window.

COCKPIT EVACUATION WITH ESCAPE ROPE

- **ESCAPE ROPE STOWAGE . . . . OPEN**
  The escape rope stowage is located above the sliding window, on either side of the overhead panel.
- **ESCAPE ROPE . . . . UNROLL**
  Unroll the escape rope until the red flag appears, and throw it through the window.
- **SEAT . . . . STEP ON**
- **ESCAPE ROPE . . . . GRASP**
  Grasp the escape rope firmly with both hands, and slide down along the rope.

R **EVACUATION ON WATER**

CABIN CREW RESPONSIBLE FOR TYPE "I" DOORS

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows :

– **CHILDREN LIFEVESTS . . . . DISTRIBUTE**

– **STAND UP AND SHOUT . . "UNFASTEN SEATBELTS – PUT ON YOUR LIFEVEST"**
Inflate the lifevest, only once outside the aircraft.

R – **ORDER . . . . "REMOVE SHOES"**

● **If the Type I door is usable :**

– **DOOR IN ARMED POSITION . . . . OPEN**

– **SLIDE . . . . DEPLOY**

– **RED, MANUAL INFLATION HANDLE . . . . PULL**
Do not wait for automatic inflation of the slide.

■ **If the water level is close to the door sill :**
The slide inflates on the water.

– **SLIDE . . . . LEAVE ATTACHED TO CABIN FLOOR**

R – **PASSENGER LIFEVESTS . . . . INFLATE WHEN EVACUATING AIRCRAFT**

R – **PASSENGERS . . . . EVACUATE**
R Evacuate passengers into the water. The slide is used as a flotation device.

– **TOTAL ZONE EVACUATION . . . . CHECK**

– **LAST CREWMEMBER . . . . EVACUATE**

– **SLIDE . . . . SEPARATE FROM DOOR SILL**
The last crewmember must separate the slide from the door sill.

– **MOORING LINE . . . . CUT**

■ **If the water level is too far away from the door sill :**

– **SLIDE . . . . DISCONNECT FROM DOOR SILL**
The slide remains tied to the aircraft by a 6–meter (20 feet) mooring line.

– **MOORING LINE . . . . HOLD**
To keep the slide close to the exit, hold the mooring line.

R – **PASSENGER LIFEVESTS . . . . INFLATE WHEN EVACUATING AIRCRAFT**

– **PASSENGERS . . . . EVACUATE**
R Evacuate passengers into the water. The slide is used as a flotation device.

– **TOTAL ZONE EVACUATION . . . . CHECK**

– **LAST CREWMEMBER . . . . EVACUATE**

– **MOORING LINE . . . . CUT**

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FOREWORD

R The procedures contained in this Chapter are recommended by Airbus, and are consistent with the other Chapters of this manual.
The Authorities do not certificate Standard Operating Procedures. The manufacturer presents them herein as the best way to proceed, from a technical and operational standpoint. They are continually updated and the revisions take into account Operator input, as well as manufacturer experience.
In addition, Operators may amend them, as needed. However, the manufacturer recommends that Operators using the FCOM as onboard operational manual submit suggested changes to expedite publication, and maintain consistency of the manual.
The Operator should note that they may rewrite this Chapter, at their own responsibility ; this could, however, make it difficult to update the manual and keep it consistent with the other Chapters.

PRELIMINARY

The following sections contain expanded information on normal procedures.
Standard Operating Procedures consist of inspections, preparations, and normal procedures. All items of a given procedure are listed in a sequence that follows a standardized scan of the cockpit panels, unless that sequence goes against the action priority logic, to ensure that all actions are performed in the most efficient way.
Standard Operating Procedures are divided into flight phases, and are performed by memory.
These procedures assume that all systems are operating normally, and that all automatic functions are used normally.
Some normal procedures, that are non-routine will be found in the SUPPLEMENTARY TECHNIQUES Chapter (3.04), and in the SPECIAL OPERATIONS Chapter (2.04).

NORMAL CHECKLIST

After completing a given procedure, the flight crew uses the related normal checklist to ascertain that they have checked the safety points.
The crewmember that reads the checklist should announce completion of the checklist (Example : "LANDING CHECKLIST COMPLETED").
R The normal checklist, developed by Airbus, takes advantage of the ECAM system and only includes the items that may directly impact safety and efficiency if done incorrectly.
All normal checklists are requested by the PF, and read by the PNF. They are of the challenge/response type. The responding crewmember only responds to the challenge after having checked the configuration. If the configuration does not agree with the checklist response, he must take corrective action before answering.

If corrective action is not possible, the pilot modifies the response to reflect the actual situation (specific answer). Whenever necessary, the other crewmember crosschecks the validity of the response. The challenger waits for the response, before proceeding any further.
For the checklist items identified “AS RQRD”, the response states the actual condition or configuration of the system (for example “ANTI ICE”.............”ON”).

Note : Normal checklists are not “TO DO” lists. The flight crew should have performed the actions, or checks, prior to going through the checklist.
Obviously, the flight crew must take corrective action on any item that is not in the proper condition, when it reads the list.

COMMUNICATION

R · Cross-cockpit communications :
Cross-cockpit communication is VITAL for any two-pilot crew. Whenever a crewmember makes any adjustments or changes to any information or equipment on the flight deck, he must advise the other crewmember and obtain an acknowledgement. This includes such items as : FMGS alterations, changes in speed or Mach, the tuning of navigation aids, flight plan modifications, and the selection of such systems as anti-ice and pack low flow.
The flight crew must use headsets from engine startup to top of climb, and from top of descent until the aircraft is parked.

R · Sterile cockpit rule :
R Below 10 000 feet, any non-essential conversation within the cockpit and between the
R cabin and cockpit crews should be avoided. Adherence to this policy facilitates effective
R crew communication, as well as communication of emergency or safety-related
R information by cabin crew.

USE OF THE FLIGHT MANAGEMENT AND GUIDANCE SYSTEM

The FMGC has 3 functions :
- The two FG (Flight Guidance) functions :
  - Autopilot (AP) and Flight Director (FD)
  - Autothrust (A/THR)
- The FM (Flight Management) function.

AUTOPILOT AND FLIGHT DIRECTOR

The design objective of the AP and FD is to provide assistance to the crew throughout the flight :
- By freeing up the Pilot Flying from routine handling tasks, and thus providing time and resources to assess the overall operational situation.
- By providing the Pilot Flying with adequate attitude or flight path orders, with the flight director symbol on the Primary Flight Display, so as to facilitate accurate handling of the aircraft.

The AP/FD guides the aircraft along the intended flight path, or at the intended speed, according to the guidance modes engaged by the pilot on the Flight Control Unit (FCU). (Example : NAV-HDG-V/S...).
The FCU is the short-term interface between the pilot and the FMGC, used to select guidance targets and arm/engage guidance modes.
There are 2 types of modes and associated targets :
- Managed modes and targets : The aircraft is guided along the FMS lateral and vertical flight plan and speed profile. These modes and targets are armed or engaged by pressing the FCU knobs.
- Selected modes and targets : The aircraft is guided by selected targets according to the modes selected on the FCU. These modes and targets are armed or engaged by the pilot by turning and pulling the FCU knobs.

The PF's task is to set the desired modes and targets to fly the aircraft where he wants to go.
- If the autopilot is used, the PF may select the modes on the FCU.
- R If the autopilot is not used, the PF asks the PNF to select the intended modes and targets on the FCU.

The armed and engaged modes are indicated on the Flight Mode Annunciator (FMA) on top of the PFD ; the targets (SPD, ALT, HDG...) are indicated on the associated scales on the PFD.
- The crew must check the FCU-selected targets on the PFD.
- The crew must monitor the engaged/armed modes on the FMA.

If the autopilot and/or flight director do not guide the aircraft where the crew is expecting:
- The PF should disengage the autopilot using the instinctive disconnect pushbutton on the sidestick, or both pilots should delete the flight director symbols from the PFDs with the flight director pushbuttons located on the EFIS control panel, and fly the aircraft manually.
- The PF should not disengage the autopilot by sidestick override, except if instinctive reaction.

The autopilot may be used from after takeoff down to a late stage of the approach (including autoland when permitted).
The autopilot may be used in most failure cases, when available :
- In case of engine failure, without any restriction including autoland on CATII/CATIII ILS.
- In case of abnormal configuration, down to 500 feet AGL in all modes.

When the autopilot is engaged, there is no backdriven feedback system to the sidestick, since this is no longer necessary with fly-by-wire controls.
When the PF handflies the aircraft using the flight director, he must obey the flight director orders ; in other words, the crossbars must be centered, or the flight path vector must be on the flight path director symbol so as to fly according to the selected modes and targets.
- If the PF does not wish to fly the flight director orders,both pilots must delete the flight director symbols from the PFDs.
- When flying a visual approach, the flight directors should be deselected.

AUTOTHRUST (A/THR)

The A/THR's design objective is to provide assistance to the crew for thrust management throughout the flight.
The A/THR may be engaged in one of the following modes, which automatically depend on the AP/FD vertical modes :
- THRUST mode : The A/THR maintains a fixed thrust level (e.g. THR CLB or THR IDLE), when the AP/FD guides the aircraft in climb or descent at a constant speed (e.g. CLB or DES modes)
- SPEED/MACH mode : The A/THR varies the thrust, so as to maintain a target speed, when the AP/FD guides the aircraft on a given trajectory (e.g. V/S, ALT, G/S modes).

When the A/THR is active, the thrust levers are set to detents (e.g. MCT, CLB) ; they remain in this fixed position, while the A/THR varies or sets the thrust according to the active mode.
When the A/THR is active, the thrust lever position defines the maximum thrust available for the A/THR.
The crew must monitor the A/THR to ensure correct operation :
- On the PFD, by checking the active mode on the FMA, the current speed versus the target speed and, most importantly, the speed trend vector on the speed scale.
- On the ECAM, by checking the thrust command symbols on the engine thrust indication (N1 or EPR).

In case the PF is not satisfied with the A/THR's operation, he must disengage it using one of the instinctive disconnect pushbuttons located on the thrust levers.
He can then command the thrust manually, which is totally conventional.
R The A/THR may be used from thrust reduction, after takeoff, down to flare, at landing.
The A/THR may be used in most failure cases, when available, in case of :
- One engine failure, without any restrictions ;
- Abnormal configuration, with selected target speed for the approach.

FLIGHT MANAGEMENT SYSTEM (FMS)

The FMS is designed to provide assistance to the crew for :
- Navigation
- Flight planning
- Aircraft performance (optimum speeds/altitudes)
- Predictions

The FMS is an important long-term planning and management tool, linked to the AP/FD.
When the AP/FD is engaged in Managed modes, the aircraft is guided along the FMS flight plan, using the FMS target speeds.
The Multipurpose Control and Display Unit (MCDU) is used to insert and retrieve data to/from the FMS.
The FMS MCDU is a major interface between the pilots and the FMS. However, the various FMS entries required at successive flight phases should not distract the crew from the general flight conduct and duties.

The prime concern for the flight crew should be :
— is the aircraft flying as expected NOW ?
— what is the aircraft expected to fly NEXT ?
If any doubt is raised about the aircraft current trajectory, or proposed target speed..., the PF must immediately select the appropriate modes and targets on the FCU (which automatically disengages the managed modes).
Subsequently and if time permits, the PNF will analyze and correct whatever might have gone wrong on the MCDU.

GENERAL RULES FOR GOOD USE OF THE FMGS

— Monitor the AP/FD/ATHR modes and engagement status on the FMA
— Any FMA modification must be announced.
— Monitor the result of any target selection performed on the FCU, on the related scales of the PFD (e.g. SPD target, on SPD scale)
— Monitor the AP/FD/ATHR resulting guidance, on the basic flight instrument scales of the PFD (HDG, SPD, ALT, attitude...)
— If the PF is not satisfied with the guidance he must :
  · REVERT TO BASICS
  · FLY THE AIRCRAFT where he wants to go.

The FMGS description and procedures are provided in the FCOM VOL 4 called FMGS PILOT'S GUIDE.

TAKING OVER THE FLIGHT CONTROLS

Because of the nature of "fly by wire" and "side stick" systems, the PNF should not make control inputs to correct the PF's handling of the aircraft.
If a take-over becomes necessary during flight, the PNF must call clearly "I have control", and press the sidestick priority pushbutton, keeping it pressed until the transfer of control is clearly established.

TECHNICAL CONDITION OF THE AIRCRAFT

— The crew will verify the technical state of the aircraft (deferred defect list), with regard to airworthiness, acceptability of malfunctions (MEL), and influence on the flight plan.

WEATHER BRIEFING

— The crew will get a weather briefing.
— The briefing should include :
  · Actual and expected weather conditions, including runway conditions for takeoff and climb-out.
  · Significant weather enroute, including winds and temperatures.
  · Terminal forecasts for destination and alternate airports.
  · Actual weather for destination and alternates, for short range flights and recent past weather, if available.
  · Survey of the meteorological conditions at airports along the planned route.

Weather can affect the choice of routing (for example, influence which route is quickest) and the choice of flight level. The flight crew must also consider the possibility of runways being contaminated at the departure and destination airfields. The flight crew must also verify ISA deviations and enroute icing conditions, and must consider the possibility of holding due to weather at the destination.

NOTAMS

— The flight crew must examine NOTAMs for changes to routings, unserviceable navaids, availability of runways and approach aids etc, all of which may affect the final fuel requirement.
— In order to prevent the risks of projection of debris towards the trimmable horizontal stabilizer and the elevators, it is not recommended to takeoff from runways in bad condition (loose surface, under repair, covered with debris...).

FLIGHT PLAN AND OPERATIONAL REQUIREMENTS

— The crew will check the company flight plan for routing, altitudes, and flight time.
— The Captain will check the ATC flight plan and ensure that it :
R · Is filled in and filed, in accordance with the prescribed procedures,
  · It agrees with the fuel flight plan routing.
— The crew will check the estimated load figures, and will calculate the maximum allowable takeoff and landing weights.

OPTIMUM FLIGHT LEVEL

The flight crew should choose a flight level that is as close to the optimum as possible. To obtain the optimum flight level, use the chart in the QRH or in the FCOM (Refer to FCOM
R 2.05.20).
As a general rule, an altitude that is 4000 feet below the optimum produces a significant penalty (approximately 5 % of fuel). Flight 8000 feet below the optimum altitude produces a penalty of more than 10 % against trip fuel. (The usual contingency allowance is 5 %).

FUEL REQUIREMENTS

COMPUTERIZED FLIGHT PLAN CHECK

In most cases the flight crew uses a computer-derived flight plan to obtain the correct fuel requirements. Although these computerized requirements are normally accurate, the flight crew must check them for gross errors.
The easiest way to do this is to use the "Quick Determination of F-PLN" tables in FCOM
R 2.05.40. Although the aircraft will fly at ECON MACH that is based on the cost index, the 0.78 Mach table is accurate enough to permit the crew to check for gross error.
Ensure that both the captain and the first officer have verified that the fuel calculations and required fuel on board are correct and that the figure complies with the applicable regulations.

FUEL TRANSPORTATION

The flight crew must check the policy covering the "tankering" of fuel on sectors where there is a favourable fuel price differential or operational requirement.
Remember that carrying unnecessary extra fuel increases the fuel consumption for that sector and therefore reduces the economy of the operation (lower flex temperature, more tire and brake wear, more time in climb phase, lower optimum flight level etc).

SAFETY EXTERIOR INSPECTION

Items marked by (*) are the only steps to be completed during a transit stop.
This inspection ensures that the aircraft and its surroundings are safe for operations.
On arriving at the aircraft, check for obstructions in the vicinity, engineering activity, refueling, etc.

*– **WHEEL CHOCKS . . . . CHECK IN PLACE**

*– **LANDING GEAR DOORS . . . . CHECK POSITION**

WARNING
Do not pressurize the green hydraulic system without clearance from ground personnel, if any gear door is open. Remember that the green hydraulic system is pressurized if the yellow system is pressurized and the PTU is on auto.

*– **APU AREA . . . . CHECK**
Observe that the APU inlet and outlet are clear.

PRELIMINARY COCKPIT PREPARATION

Items marked by asterisks (*) are the only steps to be completed during a transit stop.
The following procedure, performed by the PNF ensures that all required checks are performed before the application of electrical power to avoid inadvertent operation of systems and danger to the aircraft and personnel.
Included is APU starting and the establishment of electrical and pneumatic power.

ENG

– **MASTER 1 and 2 . . . . OFF**

– **MODE selector . . . . NORM**

L/G

– **L/G lever . . . . Check DOWN position**

WIPERS

– **WIPERS . . . . OFF**

ELEC

■ **If the aircraft has not been electrically supplied for 6 hours or more, perform the following check :**

– **BAT 1 and 2 . . . . CHECK OFF**

– **BAT 1 and 2 VOLTAGE . . . . CHECK ABOVE 25.5 V**
Battery voltage above 25.5 V ensures a charge above 50 %.

● **If battery voltage is below 25.5 V :**
a charging cycle of about 20 minutes is required.

– **BAT 1 and 2 . . . . AUTO**

– **EXT PWR . . . . ON**
Check on ECAM ELEC page, battery contactor closed and batteries charging.

● **after 20 minutes :**

– **BAT 1 + 2 . . . . OFF**

– **BAT 1 and 2 VOLTAGE . . . . CHECK ABOVE 25.5 V**

- **If battery voltage is above 25.5 V :**

  – **BAT 1 and 2 . . . . AUTO**
  If the APU is started on batteries only, it should be started within 30 minutes after the selection of batteries to AUTO (35 minutes after battery selection to AUTO, the battery charge is less than 25 % of maximum capacity).

■ **If the aircraft has been electrically supplied during the last 6 hours :**

– **BAT 1 and 2 . . . . AUTO**

– **EXT PWR (when AVAIL light is on) . . . . ON**
AVAIL light goes out.

HYD

WARNING

R Do not pressurize hydraulic systems without clearance from ground crew.

APU FIRE

– **APU FIRE pushbutton . . . . IN and GUARDED**

– **AGENT light . . . . OUT**
If the APU is already running, ensure that the following check has already been completed. If not, perform it.

– **APU FIRE TEST pushbutton . . . . PRESS**
Check :
· APU FIRE warning on ECAM + CRC + MASTER WARN light (if AC Power available).
· APU FIRE pushbutton lighted red.
· SQUIB and DISCH lights on

APU START

■ If the EXT PWR ON light is on :

– **APU MASTER switch . . . . ON**
The ON light comes on.
The APU page appears on the ECAM.

– **APU START . . . . ON**

R *Note : Wait at least 5 seconds before selecting APU START.*

The FLAP OPEN indication appears on the ECAM APU page.
On the ECAM APU page, N and EGT rise.
When N = 95 % :
. On the ECAM APU page, the AVAIL indication appears.
. On the APU panel : The START ON light goes off.
The AVAIL light comes on.
10 seconds later :
. The ECAM DOOR page replaces the ECAM APU page.

– **EXT PWR . . . . AS RQRD**

■ If the EXT PWR ON light is off :

– **APU MASTER switch . . . . ON**
The ON light comes on.

– **APU START . . . . ON**

R *Note : Wait at least 5 seconds before selecting APU START.*

At 95% RPM :
· The START ON light goes off.
· The AVAIL light comes on.
· The APU GEN comes on line.
· The ECAM APU page appears after 10 seconds.
If required, adjust brightness on the ECAM control panel.
10 seconds later :
· The ECAM DOOR page replaces the ECAM APU page.

COCKPIT LIGHTS

*– **COCKPIT LIGHTS . . . . AS RQRD**
· Set OVHD INTEG LT, STBY COMPASS, DOME, ANN LT switches as required.
· Set FLOOD LT, and INTEG LT as required.
DOME light should be on because it is the only lighting source in the EMER ELEC configuration. The DIM position is recommended for takeoff.

* PARKING BRAKE

*– **PARKING BRAKE . . . . ON**

*– **ACCU PRESS & BRAKES PRESS indicators . . . . CHECK**
– Check for normal indications.
– The ACCU PRESS indication must be in the green band. If required use the electric pump on yellow hydraulic system to recharge the brake accumulator.

WARNING
Yellow and green hydraulic systems are pressurized from yellow electric pump. Get ground crew clearance before using the electric pump.

ALTERNATE BRAKING SYSTEM

Note : *The purpose of this check is to verify, before the first flight of the day, the efficiency of the alternate braking system (absence of "spongy pedals").*

– **Y ELEC PUMP . . . . CHECK OFF**

– **CHOCKS . . . . CHECK IN PLACE**

– **PARKING BRAKE . . . . OFF**

– **BRAKE PEDALS . . . . PRESS**
Apply maximum pressure on both pedals.

– **BRAKE PRESSURE (on BRAKE press indicator) . . . . CHECK**
Pressure must build up without delay symmetrically on left and right sides for the same application simultaneously applied on left and right pedals. With full pedal deflection, the
R pressure must be between 2000 and 2700 psi.

– **BRAKE PEDALS . . . . RELEASE**

– **PARKING BRAKE . . . . ON**
The parking brake must be on during the exterior inspection to allow the flight crew to check brake wear indicators.

F/CTL

– **FLAPS . . . . CHECK POSITION**
Check the upper ECAM display to confirm that the FLAPS position agrees with the handle position.

R *– **SPEEDBRAKE lever . . . . CHECK RETRACTED and DISARMED**

WARNING
If flight control surface positions do not agree with the control handle positions, check with the maintenance crew before applying hydraulic power.

PROBE/WINDOW HEAT

– **PROBE/WINDOW HEAT . . . . CHECK AUTO**

AIR COND

– **APU BLEED . . . . ON**
R Do not use APU BLEED, if ground personnel confirms that ground air unit is connected.
R Pilots should also check the ECAM BLEED page to determine whether an HP ground air
R unit is connected (pressure in the bleed system).

– **ALL WHITE LIGHTS . . . . OFF**

– **X BLEED . . . . AUTO**

– **Zone temperature selectors . . . . AS RQRD**
Full range temperature 24 ± 6° C (75 ± 11° F).

CARGO HEAT ◁

– **SELECTORS . . . . AS RQRD**
Set temperature selectors, as required.

ELEC

– **Scan and check that there are no amber lights, except GEN FAULT lights.**

VENT

– **Check all lights off.**

LEFT INTENTIONALLY BLANK

* ECAM

*– **RECALL . . . . PRESS**
- Press the RECALL pushbutton for at least 3 seconds to recall all warnings that have been cleared or cancelled.
- If applicable, check warnings compatible with MEL, then CLEAR or CANCEL them. If any action is required, call maintenance personnel as soon as possible.

*– **DOOR . . . . PRESS**
If oxygen pressure is below 1500 psi (boxed in amber) check “MIN FLT CREW OXY CHART” to ascertain if it is sufficient for the scheduled flight (Refer to 3.01.35).

*– **HYD . . . . PRESS**
Check that the quantity indexes are in the normal filling range.

*– **ENG . . . . PRESS**
R Check that the oil quantity is at or above 9.5 qts + estimated consumption (maximum
R average estimated consumption ~ 0.5 qt/h).

EMERGENCY EQUIPMENT

– **Check the following equipment :**
· Life jackets stowed
· Axe stowed
· Smoke hoods ◁ or portable oxygen equipment and full face masks ◁ stowed and serviceable
· Portable fire extinguisher lockwired and pressure in the green area
· Smoke goggles stowed (smoke hoods if installed)
· Oxygen masks stowed
· Flashlights stowed
· Escape ropes stowed

RAIN REPELLENT

– **Pressure and quantity indicators** . . . . **CHECK**

CAUTION
Never use rain repellent to wash the windshield and never use it on a dry windshield.

REAR and OVERHEAD CIRCUIT BREAKERS panels

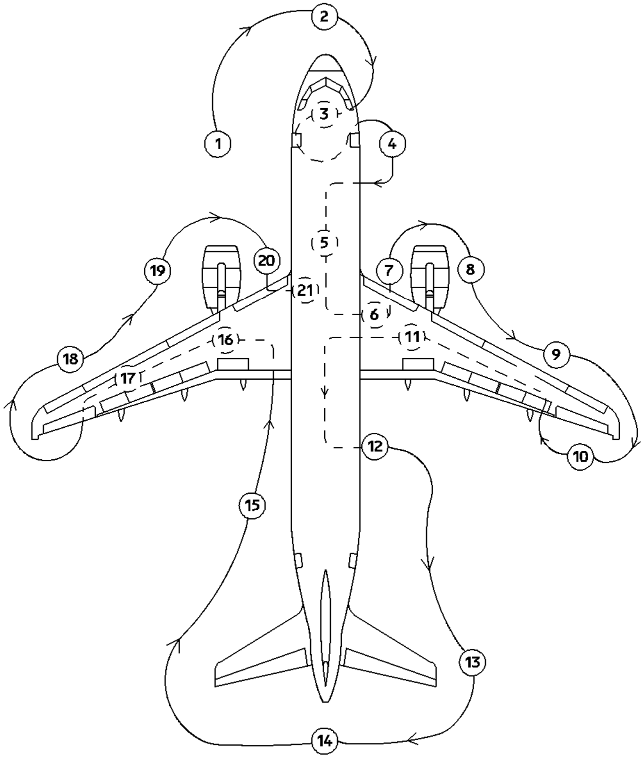
– **REAR and OVERHEAD CIRCUIT BREAKERS panels** . . . . **CHECK**
Check that all circuit breakers are set. Reset as necessary.

GENERAL

The exterior inspection ensures that the overall condition of the aircraft and its visible components and equipment are safe for the flight.
Complete inspection is normally performed by maintenance personnel or in the absence of maintenance personnel by a flight crew member before each originating flight.
Items marked by asteriks (*) must be performed again by a flight crew member before each flight.
The parking brake must be on during the exterior inspection to allow the flight crew to check brake wear indicators.
· Check structure for impact damage
R · Check that there is no evident fuel, oil or hydraulic leaks.

WARNING
If a landing gear door is open, contact the maintenance crew before applying hydraulic power.

EXTERIOR WALK-AROUND



NFC5-03-0305-001-A001AA

1 LH FWD FUSELAGE

*– AOA probes . . . . CONDITION
– F/O and CAPT static ports . . . . CLEAR
– Avionics equipment vent air inlet valve . . . . CONDITION
– Oxygen bay . . . . CLOSED
– Oxygen overboard discharge indicator . . . . GREEN
*– Toilet servicing door (if installed) . . . . CLOSED

2 NOSE SECTION

*– Pitot probes . . . . CONDITION
– STBY static ports . . . . CLEAR
*– TAT probes . . . . CONDITION
*– Radome and latches . . . . CONDITION/LATCHED
– Forward avionics compartment door . . . . CLOSED
– Ground electrical power door (if not required.) . . . . CLOSED

3 NOSE L/G

*– Nose wheel chocks . . . . IN PLACE
*– Wheels and tires . . . . CONDITION
– Nose gear structure . . . . CONDITION
– Taxi, TO, turn-off lights . . . . CONDITION
– Hydraulic lines and electrical wires . . . . CONDITION
– Wheel well . . . . CHECK
– Safety pin . . . . REMOVED

4 RH FWD FUSELAGE

– RH + AFT avionic compartment doors . . . . CLOSED
– Avionic equipment vent air outlet valve . . . . CONDITION
– F/O-CAPT static ports . . . . CLEAR
*– AOA probe . . . . CONDITION
– Forward cargo door and selector panel . . . . CHECK

5 LOWER CENTER FUSELAGE

– Potable water drain panel (if installed) . . . . CLOSED
– Antennas . . . . CONDITION
– Drain mast . . . . CONDITION
– RAM air inlet flap . . . . CONDITION
– LP and HP ground connection doors . . . . CLOSED
– Anticollision light . . . . CHECK
– CTR TK magnetic fuel level . . . . FLUSH
– Pack air intakes and outlets . . . . CLEAR

6 RH CENTER WING

– Yellow hydraulic bay door . . . . CLOSED
– Fuel panel . . . . CLOSED
– Inner tank magnetic fuel . . . . FLUSH
– Fuel water drain valve inner tank . . . . NO LEAK
– Landing light . . . . CONDITION
*– Slat 1 . . . . CONDITION

7 ENG 2 LH SIDE

– Oil fill access door . . . . CLOSED
– Master magnetic chip detector access door (IAE only) . . . . CLOSED
*– Fan cowl doors . . . . CLOSED/LATCHED
*– Drain mast . . . . CONDITION/NO LEAK
*– Engine inlet and fan blades . . . . CHECK

8 ENG 2 RH SIDE

– Vent inlet (CFM only) . . . . CLEAR
– Pressure-relief/Start valve handle access door . . . . CLOSED
– Turbine exhaust (CFM only) . . . . CLEAR
– Pylon/access panel . . . . CONDITION/CLOSED

9 RH WING LEADING EDGE

*– Slats 2, 3, 4, 5 . . . . CONDITION
– Inner and outer cells magnetic fuel level . . . . FLUSH
– Fuel water drain valves (outer cell, surge tank) . . . . NO LEAK
– Refuel coupling . . . . CLOSED
– Surge tank air inlet . . . . CLEAR
*– Fuel ventilation overpressure disc . . . . INTACT
– Navigation light . . . . CONDITION
*– Wing tip . . . . CONDITION

(10) RH WING TRAILING EDGE

– Static dischargers . . . . CHECK
*– Control surfaces . . . . CONDITION
*– Flaps and fairings . . . . CONDITION

(11) RH L/G AND FUSELAGE

*– Chocks . . . . REMOVED
*– Wheels and tires . . . . CONDITION
– Brakes and brake wear ind. . . . . CONDITION
– Torque link damper ◁ . . . . CONDITION
– Hydraulic lines . . . . CHECK
– Landing gear structure . . . . CHECK
– Downlock springs . . . . CHECK
– Safety pin . . . . REMOVED
– Ground hydraulic connection yellow . . . . CLOSED
– Water drain mast ◁ . . . . CONDITION
– Shroud fuel drain . . . . CONDITION/NO LEAK

(12) RH AFT FUSELAGE

– Cargo door and selector panel . . . . CHECK
– Bulk door ◁ . . . . CHECK
*– Toilet service access door . . . . CLOSED
– Outflow valve . . . . CONDITION
– Drain mast . . . . CONDITION
– Flight recorder access door . . . . CLOSED

(13) TAIL

*– Stabilizer, elevator, fin, and rudder . . . . CONDITION
– Static dischargers . . . . CHECK
*– Lower fuselage structure (tail impact on runway) . . . . CONDITION

(14) APU

– Access doors . . . . CLOSED
– Air intake . . . . CONDITION
– Drain . . . . CONDITION/NO LEAK
– Oil cooler air outlet . . . . CLEAR
– Exhaust . . . . CLEAR
– Navigation light . . . . CONDITION
– Fire extinguisher overpressure indication (red disc) . . . . IN PLACE

(15) LH AFT FUSELAGE

*– Stabilizer, elevator, fin, and rudder . . . . CONDITION
*– Potable water service door . . . . CLOSED
– Ground hydraulic connection blue and green doors . . . . CLOSED
– Hydraulic reservoir filling door . . . . CLOSED

(16) LH LANDING GEAR

*– Chocks . . . . REMOVED
*– Wheels and tires . . . . CONDITION
– Brakes and brake wear indicator . . . . CONDITION
– Torque link damper ◁ . . . . CONDITION
– Hydraulic lines . . . . CHECK
– Landing gear structure . . . . CHECK
– Downlock springs . . . . CHECK
– Safety pin . . . . REMOVED

(17) LH WING TRAILING EDGE

*– Flaps and fairing . . . . CONDITION
*– Control surfaces . . . . CONDITION
– Static dischargers . . . . CHECK

(18) LH WING LEADING EDGE

*– Wing tip . . . . CONDITION
– Navigation light . . . . CONDITION
– Surge tank air inlet . . . . CLEAR
R *– Fuel ventilation overpressure disc . . . . INTACT
– Fuel water drain valve . . . . NO LEAK
– Inner and outer cell magnetic fuel level . . . . FLUSH
*– Slats 2, 3, 4, 5 . . . . CONDITION

(19) ENG 1 LH SIDE

– Oil fill access door . . . . CLOSED
– Master magnetic chip detector access door (IAE only) . . . . CLOSED
*– Fan cowl doors . . . . CLOSED/LATCHED
*– Drain mast . . . . CONDITION/NO LEAK
*– Engine inlet and fan blades . . . . CHECK

(20) ENG 1 RH SIDE

- Vent inlet (CFM only) . . . . CLEAR
- Pressure relief/Start valve handle access door . . . . CLOSED
- Turbine exhaust (CFM only) . . . . CLEAR
- Pylon/access panel . . . . CONDITION/CLOSED

(21) LH CENTER WING

*– Slat 1 . . . . CONDITION
- Wing leading edge ventilation intake ◁ . . . . CLEAR
- Fuel water drain valves . . . . NO LEAK
R – Inner tank magnetic fuel . . . . FLUSH
- Landing lights . . . . CONDITION
- Hydraulic reservoir pressurization door . . . . CLOSED
- RAT doors . . . . CLOSED

INTRODUCTION

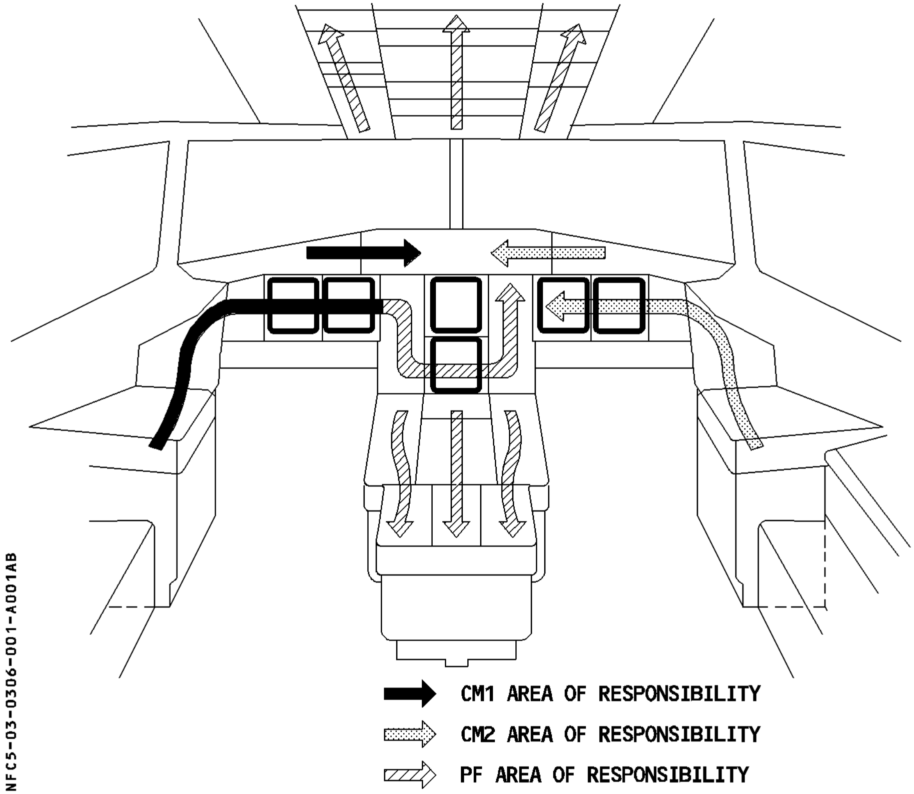
Items marked by (*) are the only steps to be completed during a transit stop.
The PF and PNF should perform the cockpit preparation according to the panel scan sequence, defined below, and the task sharing defined in the Quick Reference Handbook (QRH).

DOCUMENTATION AND MAINTENANCE

On entering the aircraft, obtain the technical (maintenance) log and verify that the certificate of maintenance and daily inspection (or similar) are up to date and signed. Check the deferred or carried-forward defects. If refueling has already been completed, check the uplift.

PANEL SCAN SEQUENCE

R



*– **GEAR PINS and COVERS** . . . . **CHECK**
Check that three are on board and stowed.

OVERHEAD PANEL

IT IS A GENERAL RULE TO TURN OFF ALL WHITE LIGHTS FOR ALL THE SYSTEMS DURING THE SCAN SEQUENCE. THEREFORE, THESE ACTIONS ARE NOT LISTED HERE.

RCDR

*– **RCDR GND CTL** . . . . **ON**

– **CVR TEST** . . . . **PRESS AND RELEASE**
Check low frequency signal through the loudspeakers.

Note : The parking brake must be ON to perform the CVR test.

R **EVAC**

– **CAPT and PURS/CAPT switch** . . . . **AS RQRD**
The usual position is CAPT.

* ADIRS

*– **Mode rotary selectors (3) . . . . NAV**

- The ADIRS outputs are used by many systems of the aircraft so it is essential to set the selectors to NAV as early as possible to provide data to the related systems.
- For the first flight of the day, set mode selectors at NAV. Alignment lasts approximately 10 minutes depending on the latitude.
  Check that ALIGN lights of the three ADIRS are on.
  R Enter the present position just after switching the three mode selectors to NAV to avoid excessive ADIRS drift.
- For normal transit stops it is not normally necessary to realign the IRSs. However, the flight crew should monitor their performance by checking the residual ground speed on the CDU with the aircraft stationary. If one IRS has a residual ground speed greater than 5 knots complete a fast alignment on all 3 IRSs :
  . Set all 3 ADIRS CDU selectors to OFF.
  . Set all 3 ADIRS CDU selectors back to NAV within 5 seconds.
  . Press ALIGN IRS and check coordinates received by ADIRS.

Note : *For flights with long segments on which there is no updating of FMGC position with radio navigation perform a complete alignment. For other flights, a fast alignment is sufficient.*

EXT LT

– **EXTERIOR LIGHTS . . . . AS RQRD**
Set STROBE switch to AUTO, BEACON switch to OFF and remaining switches as required.

* SIGNS

*– **SEAT BELTS . . . . ON/AUTO**

*– **NO SMOKING . . . . AUTO**

*– **EMER EXIT LT . . . . ARM**

Note : *Leaving the NO SMOKING selector ON prevents the emergency batteries from charging.*
If the CIDS has been programmed (option) for a non-smoking flight, NO SMOKING signs are permanently illuminated with the NO SMOKING switch at AUTO (with permanent charge of emergency batteries).

CABIN PRESS

– **LDG ELEV . . . . AUTO**

*** AIR COND**

*– **PACK FLOW . . . . AS RQRD**
Select :
LO : If the number of passengers is below 115.
HI : For abnormally hot and humid conditions.
NORM : For all other normal operating cases.
If the APU is supplying, pack controllers select HI flow automatically, independent of the selector position.

ELEC

– **ECAM ELEC PAGE . . . . CALL**

– **BAT 1 + 2 . . . . OFF then ON**
R 10 seconds after selecting ON, check on the ECAM ELEC page that both battery charge currents are below 60 A and decreasing.

*** FUEL**

Apply the following procedure, if your airline is affected by FUEL CTR TK PUMP LO PR warnings in flight when the center tank is empty :

● **If the center tank is empty for the flight :**

– **FUEL MODE SEL . . . . MAN**

– **CTR TK PUMP 1 and 2 . . . . OFF**

ENG 1 – ENG 2 FIRE

– **ENG 1 and 2 FIRE pushbuttons . . . . CHECK IN and GUARDED**

– **AGENT 1 and AGENT 2 lights . . . . CHECK OUT**

– **ENG 1 (2) TEST pushbutton . . . . PRESS**
Check :
· ENG 1 (2) FIRE warning on ECAM + CRC + MASTER WARN light.
· ENG FIRE pushbutton lighted red.
· SQUIB and DISCH lights on.
· FIRE light (on ENG panel) on.

AUDIO SWITCHING panel

— **AUDIO SWITCHING panel . . . . NORM**

THIRD OCCUPANT AUDIO CONTROL PANEL

— **PA reception knob . . . . Select reception**
· This allows cabin attendant announcements to be recorded on the CVR.
· For proper recording, set volume at or above medium range.

MAINTENANCE PANEL

— **Check all lights out. If not out, select associated pushbutton switch to off.**

RMP

— **RMP . . . . ON**

— **Green NAV light . . . . CHECK OFF**

— **SEL light . . . . CHECK OFF**

— **COM FREQUENCIES . . . . TUNE**
Use VHF 1 for ATC (only VHF1 is available in emergency electrical configuration), VHF2 for ATIS and company frequencies. VHF3 is normally devoted to ACARS.

* AIRFIELD DATA

Obtain data needed for initializing the system and preparing the cockpit. This should include, RUNWAY IN USE, ALTIMETER SETTING, and WEATHER DATA.

* ATC CLEARANCE

Obtain ATC clearance or use the probable clearance.

* ACARS ◁

R Initialize ACARS at that point or after FMGS INITIALIZATION, as per company policy.

*FMGS INITIALIZATION

At electrical power-up, the FMGSs and FCU run through various internal tests. Allow enough time (3 minutes) for tests' completion, and do not start to press pushbuttons until the tests are over. If the "PLEASE WAIT" message appears, do not press any MCDU key until the message clears.

*– **ENGINE & AIRCRAFT TYPE . . . . CHECK**

*– **FM database validity . . . . CHECK**
- Press the DATA key, and display the STATUS page (if not displayed).
- Check DATA BASE validity and stored WPT/NAVAIDS/RWY/ROUTES, if any. If applicable, review the stored data for deletion decision.

*– **NAVAID DESELECTION . . . . AS RQRD**
If NOTAMs warn of any unreliable DME or VOR/DME, display DATA, then POSITION MONITOR. Access the SEL NAVAID page, and deselect the related navaid.

*– **FLIGHT PLAN INITIALIZATION . . . . COMPLETE**
- Press the INIT key.
- Insert CO RTE or city pair, and check FROM/TO.
- Check/modify ALTN/CO RTE.
- Enter flight number.

Note : For ATC needs, the crew should enter exactly the entire flight number, as shown on the ICAO flight plan, without inserting any space, on the MCDU INIT page.

- Enter (and/or check) cost index.
- Enter intended initial CRZ FL, or check if it was already supplied by the database. Modify it, if necessary, taking into account ATC constraints or expected gross weight.
- Check and modify CRZ FL TEMP and tropopause level to agree with forecast.
- Check latitude/longitude.

*– **ALIGN IRS prompt . . . . PRESS**
- Enter the present position, just after switching the three mode selectors to NAV.
- Do not move the aircraft, as long as alignment is not completed.
- The IRSs are usually aligned to the departure airport reference point coordinates. It is recommended to use these coordinates, as stored in the navigation database, for transit flights, or for any flight with GPS. When published, use of the gate coordinates (insert/slew in the INIT A page) should be reserved for aircraft without GPS, and when flying long segments without radio updates.
- When IRS alignment is completed, the RESET IRS TO NAV message on the MCDU
R may indicate that the INIT page coordinates have been modified and are different
R from the IRS coordinates.

*– **F-PLN A page . . . . COMPLETE AND CHECK**
If CO RTE has been inserted, the F-PLN should automatically include the preferential or probable takeoff runway approach and landing runway, associated SIDs, STARs, transition and en route waypoints. However some data bases will only include departure and arrival airport idents and en route waypoints.
The crew must check, modify, or insert (as applicable) the F-PLN in the following order, according to the data given by ATIS, ATC, or MET :
· Lateral revision at departure airport. Select RWY, then SID, then TRANS using scroll keys.
· Lateral revision at WPT for ROUTE modification if needed. (Refer to 4.04.10).
R · Vertical revision. Check or enter climb speed limit, constraints according to ATC
R clearance. Enter step altitude as appropriate.

*– **WINDS . . . . AS APPROPRIATE**
Choose between using TRIP WIND or forecast wind for CLB or CRZ phases.
(Refer to 4.04.20).

*– **F-PLN . . . . CHECK**
· Check the F-PLN using F-PLN page and ND PLAN mode versus the computer (paper) flight plan or navigation chart.
· Check DIST TO DEST along the F-PLN. Compare it with the total distance computed for the flight with the computer (paper) flight plan.

*– **SECONDARY FLIGHT PLAN . . . . AS APPROPRIATE**
This is routinely a copy of the active flight plan. However, consideration may be given to the following :
a) Copy the active F-PLN, but modify it at a suitable WPT for an immediate return to the departure airfield in the event of, for example, engine failure.
b) If weather is below landing minimums at the departure airfield, the secondary flight plan should be that required for a diversion immediately after takeoff.
c) If there is a chance of a change in runway or SID during taxi, prepare for it by copying the active flight plan and making the necessary modifications.

*– **RADIO NAV . . . . CHECK**
· Check the VOR, ILS and ADF tuned by the FMGC.
· Modify them if required, and check that the correct identifier is displayed on the ND and PFD (ILS). If unsatisfactory, go through the audio check.

* FMGS DATA INSERTION

GROSS WEIGHT INSERTION (INIT B page) :

*– **ZFCG/ZFW . . . . INSERT**

*– **BLOCK FUEL . . . . INSERT**

> CAUTION
> The characteristic speeds displayed on the MCDU (green dot, F, S, VLS) are computed from the ZFW and ZFCG entered by the crew on the MCDU. Therefore, this data must be carefully checked (Captain's responsibility).

The flight crew should insert the weights after completing all other insertions. This is to avoid cycles of prediction computations at each change in flight plan, constraints, etc.

· If ZFCG and ZFW are unavailable, it is acceptable to enter the expected values in order to obtain predictions. Similarly, the flight crew may enter the expected fuel on board, if refueling has not been completed at that time.

· If ZFCG, ZFW, and BLOCK FUEL are inserted, the FM will provide all predictions, as well as the EXTRA fuel, if any.

TAKEOFF DATA INSERTION (PERF TAKEOFF page) :

*– **V1, VR, V2 . . . . INSERT**

*– **FLX TO TEMP . . . . INSERT**

*– **THR RED/ACC altitude . . . . SET or CHECK**
For noise abatement procedure "A", the crew must set the acceleration altitude at, or above, 3000 feet.

*– **ENG OUT ACC altitude . . . . SET or CHECK**

*– **FLAPS/THS reminder . . . . INSERT**

*– **TO SHIFT . . . . AS RQRD**
Enter the takeoff SHIFT distance, if takeoff is to be from an intersection. This is
R essential for position updating at takeoff and, consequently, for navigation accuracy.

CLIMB, CRUISE, DESCENT, SPEED PRESELECTION

*– **PRESET SPEEDS . . . . AS RQRD**

If the flight is cleared for a close-in turn or close-in altitude constraint, the flight crew may preselect green dot speed on the PERF CLB page. Once the CLB phase is active, the preselected speed will be displayed in the FCU speed window and on the PFD (blue symbol). Once the turn is completed or the altitude cleared, the pilot will resume the managed speed profile by pressing the SPD selector on the FCU.

Similarly the pilot may select a CRZ MACH number on the PERF CRZ page (constant CRZ Mach segment, for example). When the CRZ phase is active, the preselected CRZ MACH number will be displayed in the FCU speed window and on the PFD. When ECON MACH number may be resumed, the crew presses the FCU SPD selector.

In either of the above cases, the pilot may cancel the CLB or CRZ preselected SPD/MACH prior to activating the related phase, by selecting ECON on the PERF CLB or CRZ pages.

SPD LIM is defaulted to 250 knots below 10000 feet in the managed speed profile. This may be either cleared or modified on the VERT REV page at the origin (or a climb waypoint).

GLARESHIELD

– **Glareshield integral light and flood light . . . . AS RQRD**

*– **BARO REF . . . . SET**
· Set QNH on EFIS control panel and on standby altimeter
· Check barometer settings and altitude indications on PFD and standby altimeter. (Tolerance limits are given in 3.04.34).

*– **FD . . . . CHECK ON**

*– **ILS . . . . AS RQRD**

R *Note : Do not engage the autothrust on ground as it may generate the AUTO FLT*
R *A/THR OFF warning at engine start.*

*** EFIS CONTROL PANEL**

*– **ND mode and range . . . . AS RQRD**
MODE : Display the ARC mode on the ND if the takeoff direction is approximately the departure direction, or the ROSE NAV mode if the direction change is to be more than 70° after takeoff (to allow the ND to display the area behind the aircraft).
RANGE : Set the minimum range to display the first waypoint after departure, or as required for weather radar.

*– **VOR/ADF selector . . . . AS RQRD**
Display VOR and ADF needles as needed.

*** FCU**

*– **SPD MACH window . . . . DASHED**

*– **HDG V/S-TRK FPA . . . . HDG V/S**

*– **ALT window . . . . INITIAL EXPECTED CLEARANCE ALT**

CLIMB, CRUISE, DESCENT, SPEED PRESELECTION

*– **PRESET SPEEDS . . . . AS RQRD**

If the flight is cleared for a close-in turn or close-in altitude constraint, the flight crew may preselect green dot speed on the PERF CLB page. Once the CLB phase is active, the preselected speed will be displayed in the FCU speed window and on the PFD (blue symbol). Once the turn is completed or the altitude cleared, the pilot will resume the managed speed profile by pressing the SPD selector on the FCU.
Similarly the pilot may select a CRZ MACH number on the PERF CRZ page (constant CRZ Mach segment, for example). When the CRZ phase is active, the preselected CRZ MACH number will be displayed in the FCU speed window and on the PFD. When ECON MACH number may be resumed, the crew presses the FCU SPD selector.
In either of the above cases, the pilot may cancel the CLB or CRZ preselected SPD/MACH prior to activating the related phase, by selecting ECON on the PERF CLB or CRZ pages.
SPD LIM is defaulted to 250 knots below 10000 feet in the managed speed profile. This may be either cleared or modified on the VERT REV page at the origin (or a climb waypoint).

GLARESHIELD

– **Glareshield integral light and flood light . . . . AS RQRD**

*– **BARO REF . . . . SET**
· Set QNH on the EFIS control panel and on the standby altimeter
· Check barometer settings and altitude indications on the PFD and standby altimeter. (Tolerance limits are given in 3.04.34).

*– **FD . . . . CHECK ON**

*– **LS . . . . AS RQRD**

Note : Do not engage the autothrust on ground, as it may generate the AUTO FLT A/THR OFF warning at engine start.

* EFIS CONTROL PANEL

*– **ND mode and range . . . . AS RQRD**
MODE : Display the ARC mode on the ND, if the takeoff direction is approximately the departure direction ; or, the ROSE NAV mode, if the direction change is to be more than 70° after takeoff (to allow the ND to display the area behind the aircraft).
RANGE : Set the minimum range to display the first waypoint after departure, or as required for weather radar.

*– **VOR/ADF selector . . . . AS RQRD**
Display VOR and ADF needles, as needed.

* FCU

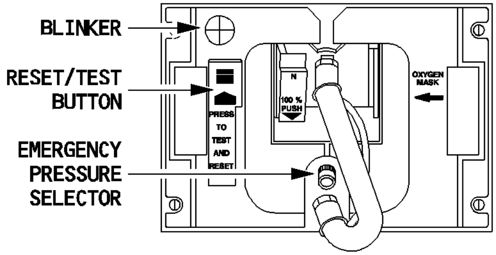
*– **SPD MACH window . . . . DASHED**

*– **HDG V/S-TRK FPA . . . . HDG V/S**

*– **ALT window . . . . INITIAL EXPECTED CLEARANCE ALT**

LATERAL CONSOLES

OXYGEN MASK TEST



NFC5-03-0306-011-A001AA

On the OXYGEN panel :

– **CREW SUPPLY . . . . CHECK ON**

On the glareshield :

– **LOUDSPEAKERS . . . . ON**

On the audio control panel :

– **INT reception knob . . . . PRESS OUT-ADJUST**

– **INT/RAD switch . . . . INT**

On the mask stowage box :

· Press and hold the reset/test button in the direction of the arrow.
  – Check that the blinker turns yellow for a short time, and then goes black.
· Hold the reset/test button down, and press the emergency pressure selector.
  – Check that the blinker turns yellow and remains yellow, as long as the emergency pressure selector is pressed.
  – Listen for oxygen flow through the loudspeakers. Warn any engineer, whose headset may be connected to the nose intercom, that a loud noise may be heard when performing this check.
· Check that the reset/test button returns to the up position and the N 100 % selector is in the 100 % position.
R · Press the emergency pressure selector again, and check that the blinker does not turn
R yellow. This ensures that the mask is not supplied.

On the ECAM DOOR/OXY page :

– **REGUL LO PR message . . . . CHECK OFF**
· The crew must perform this check after having checked all masks. It ensures that the LP valve is open, (due to residual pressure between the LP valve and the oxygen masks, an LP valve failed in the closed position may not be detected during the oxygen mask test).

CM 1/2 INSTRUMENT PANELS

– **PFD and ND brightness knob . . . . AS RQRD**
Check the ND outer ring to maximum range (radar display)

– **LOUDSPEAKER . . . . SET**
One o'clock position.

R *– **PFD . . . . CHECK**
– Check PFD/ND not transferred.
– Check for correct display when ATT and HDG are available.
– Check IAS, FMA, initial target ALT, altimeter readings, VSI, altimeter settings, heading and attitude display.

R *– **ND . . . . CHECK**
– Check for correct display.
– Crosscheck compass indication on the ND and DDRMI.
– Check ground speed less than 5 knots, heading, initial waypoint, VOR ADF indications.

CTR INSTRUMENT PANEL

R *– **STBY ASI . . . . CHECK**

R *– **STBY ALTI (and STBY ALTI in meter ◁) . . . . CHECK**

R *– **STBY HORIZON . . . . CHECK**
Check no flag – Erect if necessary.

R **<u>* CLOCK</u>**

– **Check time adjust if necessary ; elapsed time at zero, chrono at zero.**

<u>NOSEWHEEL STEERING</u>

R *– **A/SKID & N/W STRG . . . . ON**

PEDESTAL

ACP

– **INT knob . . . . PRESS OUT / VOLUME CHECK**
Make sure that INT volume is turned up to permit contact with the ground crew.

– **VHF . . . . CHECK**
Check transmission and reception.

– **HF (if required for flight) . . . . CHECK**
· Check transmission and reception.
· Do not transmit on HF during refueling.

* WEATHER RADAR

*– **Power supply switch . . . . CHECK OFF**

*– **WINDSHEAR switch (⊲) . . . . CHECK OFF**

*– **GAIN . . . . AUTO**

*– **MODE . . . . AS RQRD**

SWITCHING panel

– **SWITCHING panel . . . . CHECK**
Check all selectors at NORM.

* ECAM control panel

*– **STS . . . . PRESS**
Check that INOP SYS display is compatible with MEL.
If a message is displayed in MAINTENANCE STATUS, see PARKING procedure (Refer to 3.03.25).

*– **PRESS . . . . PRESS**
Check that the CAB PRESS page displays LDG ELEV AUTO to confirm correct position of the LDG ELEV selector.

Note : The landing field elevation of the destination airport may not be correctly displayed on the ECAM CAB PRESS page. It is automatically corrected after first engine start.

***THRUST LEVERS**

*– **THRUST LEVERS . . . . CHECK IDLE**

*** ENG**

*– **ENG MASTER switch . . . . CHECK OFF**

*– **ENG MODE selector . . . . CHECK NORM**

R *** PARKING BRK**

R *– **PARKING BRAKE . . . . ON THEN OFF**
· Check pressure on BRAKE PRESS indicator.
R · If chocks are in place, release the parking brake to increase brake cooling.

GRAVITY GEAR EXTN

– **GRAVITY GEAR EXTN . . . . CHECK STOWED**

ATC

– **ATC . . . . SET FOR OPERATION**

– **ALT RPTG . . . . ON**

– **SYS 1 . . . . SELECT**
Only system 1 is available in the emergency electrical configuration.

* FMGS DATA CONFIRMATION

*– **AIRFIELD DATA** . . . . **CONFIRM**

*– **ATC CLEARANCE** . . . . **OBTAIN**

*– **IRS ALIGN** . . . . **CHECK**
Confirm coordinates.

*– **GROSS WEIGHT INSERTION** . . . . **CHECK**
The PNF checks FMGS data.

*– **TO DATA** . . . . **CALCULATE/CHECK**
The PNF calculates and check takeoff data.

*– **F-PLN A and B pages** . . . . **CHECK**
· Select the EFIS CSTR pushbutton switch on.
· The PNF ensures that the inserted F-PLN agrees with planned routes. (Refer to 4.05.10)
· If company policy requires it, use the scroll key to check the whole F-PLN thoroughly. Tracks and distances between waypoints are displayed on the second line from the top of the MCDU. Compare them with the navigation charts, if necessary.
Check correct stringing, using ND in PLAN mode.
SID and EOSID tracks and distances must be checked from the appropriate navigation charts.

* ATC

*– **ATC CODE** . . . . **SET**

* FUEL

*– **FUEL QTY** . . . . **CHECK**
· Check that ECAM fuel on board corresponds to the F-PLN.
R · Check that fuel imbalance is within limits.

*TAKEOFF BRIEFING

*– **TAKEOFF BRIEFING . . . . PERFORM**

The purpose of the takeoff briefing is for the PF to inform the PNF of the planned course of action for both normal and abnormal situations during takeoff.

Whenever practical, it is recommended that as much of the takeoff briefing as possible be completed at the gate.

Prior to the first flight of a trip series the PF should conduct a complete departure briefing. It should include, but not necessarily be limited to, a review of the following areas:

· Adverse weather and runway conditions.
· Crew coordination in the event of a rejected takeoff.
· A discussion of any unusual, non-standard, or abnormal conditions which might affect the safety of the flight.
· SID with 1 engine out, making extensive use of FMGS.
· For airlines having different models of the A319/A320/A321 family, mention if the aircraft is an A319 or A320 or A321. Awareness of the aircraft model may prevent tailstrike.

The PF will brief for all subsequent flights, however, the briefing may be substantially reduced when continuing with the same crew.

However, any change or items peculiar to the specific departure should be thoroughly covered.

R ## *PC DEDICATED TO MAINTENANCE ◁

R Check that the Personal Computer (PC) dedicated to maintenance use and located in front
R of lower stowage at RH rear corner is stowed.
R Check that the light of its manual switch is off. If not, switch it off.
R Check that its associated printer located in front of RH rear panel of the cockpit is stowed.

BEFORE PUSHBACK or START

- **LOADSHEET . . . . CHECK**
  The Captain should thoroughly check the load and trim sheet, particularly for gross errors. Make sure that the loadsheet data is correct : Correct flight, correct aircraft, dry operating index, configuration, fuel on board, etc.
  Compare ZFW/ZFCG with the previously-entered data, and adjust if necessary.

- **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
  Once the loadsheet is checked :
  - The PNF checks or recomputes the takeoff speeds and flexible temperature, using the RTOW charts.
  - The PF independently calculates the takeoff speeds and flexible temperature, as a crosscheck.
    Take particular care in determining the takeoff configuration. (Refer to 2.02.20).
R Confirm any takeoff weight limitation.
  - The PF checks (or revises) the takeoff data in the INIT B and PERF pages of the MCDU.

- **SEATS, SEAT BELTS, HARNESSES, RUDDER PEDALS, ARMRESTS . . . . ADJUST**
  The seat is correctly adjusted when the pilot's eyes are in line with the red and white balls.

- **MCDU . . . . IN TAKEOFF CONFIGURATION**
  It is recommended that the crew displays F-PLN on the PNF side and PERF TAKEOFF on the PF side.

- **EXT PWR . . . . CHECK OFF**
  Request that external power be removed.

- **BEFORE START CHECKLIST down to the line . . . . COMPLETE**

– **PUSHBACK/START UP CLEARANCE . . . . OBTAIN**
Obtain ATC pushback/startup clearance.
Obtain ground crew clearance.

– **NW STRG DISC . . . . CHECK AS RQRD**
In case of pushback (conventional or towbarless), the nosewheel steering selector bypass pin must be in the tow position. The ECAM's NW STRG DISC, or N WHEEL STEERG DISC memos indicate this to the flight crew.

CAUTION
> If NW STRG DISC is not displayed on the ECAM, but the ground crew confirms that the steering selector bypass pin is in the towing position, then the pushback must not be performed. This is to avoid possible nose landing gear damage upon green hydraulic pressurization.
> To dispatch the aircraft in such a case, refer to the MMEL.

In case of a powerpush by the main landing gear, the nosewheel steering selector should remain in the normal position to steer the aircraft (Refer to 3.04.80).

– **WINDOWS and DOORS . . . . CHECK CLOSED**
- Check that the cockpit windows are closed and locked.
- Check, on the ECAM lower display, that all the aircraft doors are closed.
- When required by local airworthines authorities, check that the cockpit door is closed and locked (no cockpit door open/fault indication).
  If entry is requested, identify the person requesting entry before unlocking the door. With the cockpit door selector on NORM, the cockpit door is closed and locked. If entry is requested from the cabin, and if no further action is performed by the pilot, the cabin crew will be able to unlock the door by using the emergency access procedure. Except for crew entry/exit, the cockpit door should remain closed until engine shutdown.

– **BEACON . . . . ON**

– **THR LEVERS . . . . IDLE**

CAUTION
> Engines will start, regardless of the thrust lever position ; thrust will rapidly increase to the corresponding thrust lever position, causing a hazardous situation, if thrust levers are not at IDLE.

R – **PARKING BRAKE ACCU PRESS . . . . CHECK**
R The ACCU PRESS indication must be in the green band.

– **PARKING BRAKE . . . . AS RQRD**
– If no pushback is required, check that the PARKING BRK handle is ON, and check the BRAKES PRESS indication.

CAUTION
If, during engine start with parking brake on, the aircraft starts to move due to a parking brake failure, immediately release the PARKING BRK handle to restore braking by pedals.

– If pushback is required, set the PARKING BRK to OFF.

CAUTION
Do not use brakes during pushback, unless required due to an emergency.

After pushback is completed, set the PARKING BRAKE to ON and inform the ground crew to allow towbar to be disconnected.

– **BEFORE START CHECKLIST below the line . . . . COMPLETE**

AUTOMATIC ENGINE START

Use the automatic engine start procedure in most circumstances. However, if the start aborts due to insufficient starter inlet air pressure (e.g. on high airfields or in case of low pressure from an external pneumatic power group), it is recommended to proceed with the manual start procedure, rather than use the automatic one.
If, during the engine start the ground crew reports a fuel leak from engine drain mast, run the engine at idle for 5 minutes. If the leak disappears during the 5 minutes, the aircraft can be dispatched without maintenance action. If the leak is still present after 5 minutes,
R maintenance action may be required before next flight.

– **ENG MODE selector . . . . IGN/START**
The lower ECAM display shows the ENG page.

– **ANNOUNCE . . . . "STARTING ENGINE 2"**
Engine 2 is usually started first. It powers the yellow hydraulic system, which pressurizes the parking brake.

– **MASTER switch 2 . . . . ON**
Do not turn the MASTER switch ON before all amber crosses and messages have disappeared on the engine parameters (upper ECAM display).

ON ECAM UPPER DISPLAY	ON ECAM LOWER DISPLAY
N2 increases	Corresponding start valve in line. Bleed pressure indication green. Oil pressure increases.
At 16 % N2	Indication of the active igniter (A or B).
At 22 % N2 – FF increases 15 seconds (maximum) after fuel is on – EGT increases – N1 increases	
At 50 % N2	Start valve cross line. Igniter indication off.

– Parameter callouts are not mandatory.
– In case the electrical power supply is interrupted during the start sequence (indicated by the loss of ECAM DUs), abort the start by switching OFF the MASTER switch. Then, perform a 30-second dry crank.

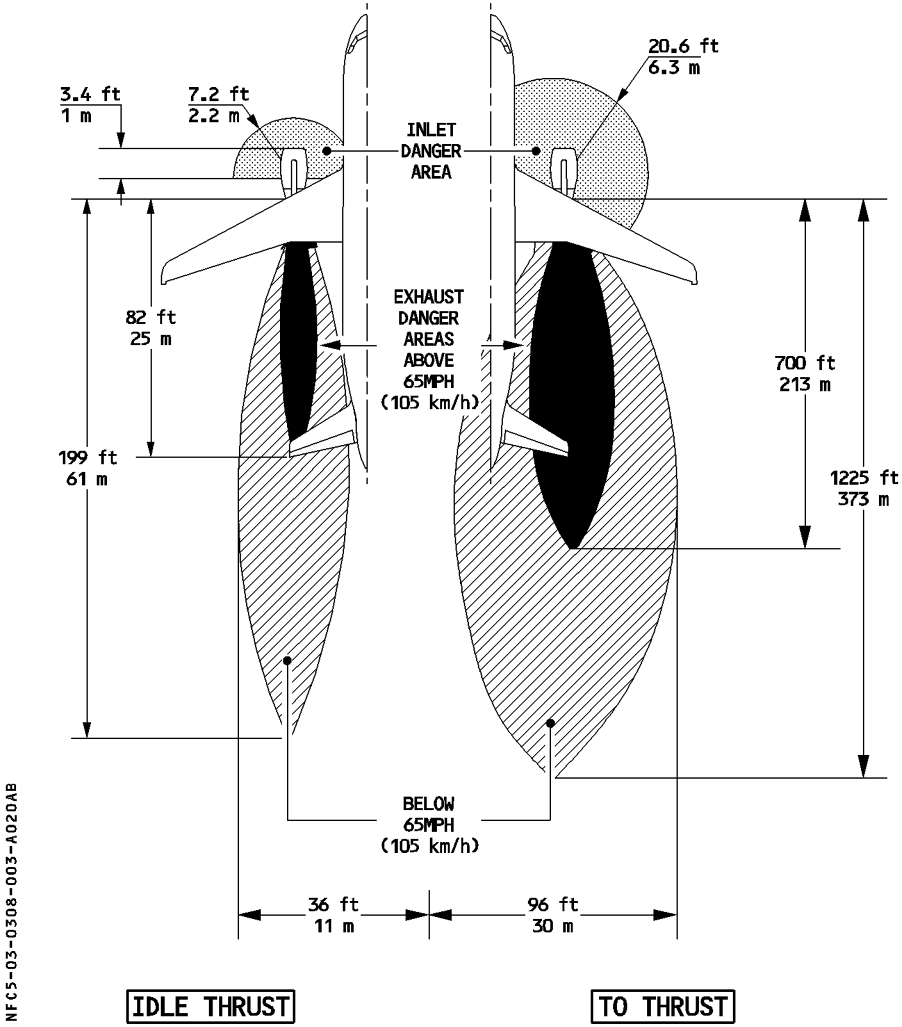
– **MAIN AND SECONDARY ENG. IDLE PARAMETERS . . . . CHECK NORMAL**
At ISA sea level : N1 about 19.5 %
N2 about 58.5 %
EGT about 390° C
FF about 275 kg/h (600 lb/h)
Grey background on N2 indication disappears.

– **ANNOUNCE . . . . "STARTING ENGINE 1"**

– **MASTER switch 1 . . . . ON**
Same procedure as for engine 2.
Both pack valves reopen with 30 second delay after the second engine N2 is above 50 %.

Note : *A PTU FAULT is triggered, if the second engine is started within 40 seconds following the end of the cargo doors operation.*

GROUND RUN UP – DANGER AREAS



AFTER START

– **ENG MODE selector . . . . NORM**
- Turning the ENG MODE selector to NORM indicates the end of the start sequence. AFTER START actions may be performed.
- On ECAM lower display the WHEEL page replaces the ENG page.
- Leaving the ENG MODE selector at the START/IGN position would prevent continuous relight selection on the ground (would be supplied at lift off). In addition, the ENG page would remain displayed. The selector must be cycled to recover normal control of ignition and to display WHEEL page.
- After start, to avoid thermal shock, the pilot should operate the engine at idle or near idle for at least 2 minutes before advancing the thrust lever to high power. Taxi time
R at idle may be included in the warm-up period.

– **APU BLEED . . . . OFF**
- Turn APU BLEED off just after engine start to avoid ingesting engine exhaust gases.
- APU BLEED valve closes, ENG BLEED valves open.

– **GROUND SPOILERS . . . . ARM**

– **RUD TRIM . . . . ZERO**
If RUD TRIM position indication is not at zero, press the RESET pushbutton.

– **FLAPS lever . . . . SET**
- Set flaps for takeoff.
- Check their position on the ECAM upper display.
- If taxiing in slush, keep the flaps retracted until reaching the holding point before takeoff.

– **PITCH TRIM . . . . SET**
Set takeoff CG on pitch trim wheel.

– **ECAM STATUS . . . . CHECK**
- Check that there is no status reminder (STS) on the ECAM upper display.
- If the status reminder is displayed, press the STS pushbutton.

– **ENG ANTI ICE . . . . AS RQRD**
- If icing conditions last longer than 30 minutes, or if significant engine vibration occurs,
R the engine should be accelerated to approximately 70 % N1 for 30 seconds before
R operating at higher thrust. (See also parking brake limitation 3.01.32). If airport surface
R conditions and congestion do not permit to accelerate the engine to 70 % N1, then
R power setting and dwell time should be as high as practical. This run up should also
R be performed just prior takeoff with particular attention to engine parameters to ensure
R normal engine operation.
- If switched on, IGNITION memo appears on ECAM as continuous ignition is automatically selected.

<u>Note</u> : *Icing conditions may be expected when the OAT (on the ground and for take-off), or when TAT (in flight) is 10° C or below with visible moisture in the air or standing water, slush, ice or snow is present on the taxiways or runways.*

– **WING ANTI ICE . . . . AS RQRD**
When wing ANTI ICE is switched on on the ground, the anti ice valves open for about 30 seconds (test sequence) then close as long as the aircraft is on ground.

– **APU MASTER switch (if APU not required) . . . . OFF**
- AVAIL light goes out after APU cooling period.

– **ECAM DOOR page . . . . SELECT**
- Check that all slides are armed
- Deselect the DOOR page after verifying the slides.

– **ANNOUNCE . . . . "CLEAR TO DISCONNECT"**
Request : Chocks removed
Nose wheel steering bypass pin removed (NW STRG DISC memo not displayed)
Interphone disconnect
Hand signal on the left/right side.

– **AFTER START CHECK LIST . . . . COMPLETE**

TAXI

– **TAXI clearance . . . . OBTAIN**

R – **NOSE light . . . . TAXI**
Turn on the nosewheel light to TAXI day and night.
R RWY TURN OFF lights may be switched ON, as required.

– **PARKING BRAKE . . . . OFF**
Check that brake pressure is zero (triple indicator). Slight residual pressure may be indicated for a short period of time.

– **ELAPSED TIME . . . . AS RQRD**
If ACARS is not installed, start ELAPSED TIME to record block time.

– **THRUST LEVERS . . . . AS RQRD**
· Little, if any, power above idle thrust will be needed to get the aircraft moving (40 % N1 maximum). Thrust should normally be used symmetrically. Once the aircraft starts to move, little thrust is required.
· Use of the engine anti-ice increases ground idle thrust, so the pilot must use care on slippery surfaces.
· The engines are close to the ground. Avoid positioning them over unconsolidated, or unprepared ground (beyond the edge of the taxiways, for example).
Avoid high thrust settings at low ground speeds, which increase the risk of ingestion (FOD), and the risk of projection of debris towards the trimmable horizontal stabilizer and towards the elevators.

– **BRAKES . . . . CHECK**
– Once the aircraft starts moving :
· Check the brake efficiency of the normal braking system : The aircraft must slow down when pressing the brake pedals.

CAUTION
If the aircraft has been parked in wet conditions for a long period, the efficiency of the first brake application at low speed will be reduced.

· Also check that green pressure has taken over yellow pressure : The yellow pressure on the brake pressure triple indicator must be at 0 when pressing the brake pedals. Although green hydraulic power supplies the braking system, a brief brake pressure indication appears on BRAKE PRESS indicator, if the pedals are quickly pressed.
– Thereafter, the normal maximum taxi speed should be 30 knots in a straight line, 10 knots for a sharp turn. As the ground speed is difficult to assess, monitor ground speed on the ND. Do not "ride" the brakes. As 30 knots is exceeded with idle thrust, apply the brakes smoothly and decelerate to 10 knots. Release the brakes, and allow the aircraft to accelerate again.
– If a "spongy" pedal is felt during taxi, this indicates a degraded performance of the alternate braking system.
– If an arc is displayed on the ECAM WHEEL page, above the brake temperature, set the brake fans on (if installed).

– **FLIGHT CONTROLS . . . . CHECK**
R 1. At a convenient stage, prior to or during taxi, and before arming the autobrake, the PF silently applies full longitudinal and lateral sidestick deflection.
R On the F/CTL page, the PNF checks full travel of all elevators and all ailerons, and the correct deflection and retraction of all spoilers.
R The PNF calls out "full up", "full down", "neutral", "full left", "full right", "neutral", as each full travel/neutral position is reached.
R The PF silently checks that the PNF calls are in accordance with the sidestick order.

R *Note : In order to reach full travel, full sidestick must be held for a sufficient period of time.*

R 2. The PF presses the PEDAL DISC pushbutton on the nosewheel tiller, and silently applies full left rudder, full right rudder, and neutral. The PNF calls out "full left", "full right", "neutral", as each full travel/neutral position is reached.
R 3. The PNF applies full longitudinal and lateral sidestick deflection, and silently checks full travel and the correct sense of all elevators and all ailerons, and the correct deflection and retraction of all spoilers, on the ECAM F/CTL page.

R *Note : The F/CTL page is automatically displayed for 20 seconds.*

LEFT INTENTIONALLY BLANK

– **AUTO BRK . . . . MAX**
· ON light comes on.
· Autobrake may be armed, with the parking brake on.
· The selection of MAX mode prior to takeoff improves safety, in the event of an aborted takeoff.
If the takeoff must be aborted, the autobrake system applies maximum braking as soon as the thrust levers are set to idle, if ground speed is above 72 knots.

– **ATC clearance . . . . CONFIRM**

TAKEOFF DATA/CONDITIONS

If takeoff data has changed, or in case of a runway change, prepare updated takeoff data, as appropriate :

– **F-PLN (Runway) . . . . REVISE**

– **FLAPS LEVER . . . . AS APPROPRIATE**
Select takeoff position.

– **V1, VR, V2 . . . . REINSERT**

– **FLX TO temperature . . . . REINSERT**

FMGS

– **F-PLN (SID,TRANS) . . . . REVISE or CHECK**
Carefully confirm that the ATC clearance agrees with the FMGS, if NAV mode is to be used.

– **INITIAL CLIMB SPEED AND SPEED LIMIT . . . . MODIFY or CHECK**
Use VERT REV at departure, or at a CLB waypoint.

– **CLEARED ALTITUDE ON FCU . . . . SET**

– **HDG ON FCU . . . . IF REQUIRED, PRESET**
R · If a heading is required by the ATC after takeoff, in case of a radar vector departure, preset the heading on the FCU. NAV mode will be disarmed.
· RWY TRK mode will keep the aircraft on the runway track.

– **FD . . . . CHECK SELECTED ON**

– **FMA . . . . CHECK**

– **FLIGHT INSTRUMENTS . . . . CHECK**

– **RADAR (if required) . . . . ON**
If radar is required for the flight, use the following test procedure :
Adjust the tilt downward until ground returns appear and then slowly adjust it in 1 to 2 degree steps up to 15° UP for weather returns. Select tilt at 4° UP for takeoff.

R – **PREDICTIVE WINDSHEAR SYSTEM ◁ . . . . AUTO**

– **ATC code . . . . CONFIRM/SET**

– **TAKEOFF BRIEFING . . . . CONFIRM**
This briefing should normally be only a brief confirmation of the thorough takeoff briefing made at the gate. Any changes in the clearance are to be addressed at this time.
Make extensive use as is possible of the displays. For example
"Takeoff from RWY 07 (Perf page), weight 68 000 kg (lower ECAM), configuration 2, 10 000 kg of fuel, FLEX 50° , 93 % N1 (upper ECAM), LMG 2D departure (FPLN page), V1 140, V2 145 (PFD), initial clearance 12000 feet blue (FMA)".

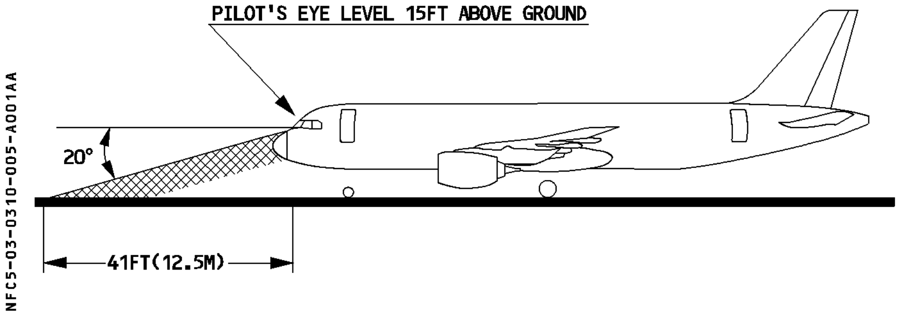
– **CABIN REPORT . . . . RECEIVE**
Obtain cabin report from the purser, as a minimum : "CABIN SECURED FOR TAKEOFF"

– **TO CONFIG pushbutton . . . . PRESS**
Check that ECAM upper display shows "TO CONFIG NORMAL".

– **TO MEMO . . . . CHECK NO BLUE LINE**

– **BEFORE TAKEOFF CHECKLIST down to the line . . . . COMPLETE**

VISUAL GROUND GEOMETRY



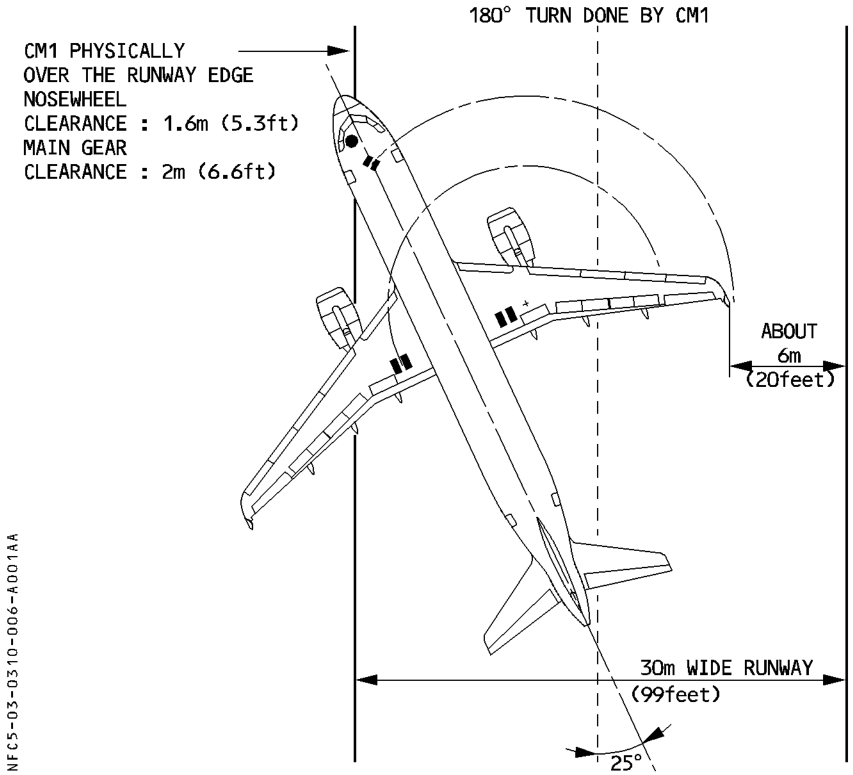
180° TURN ON RUNWAY

A standard runway is 45 meters wide. However, this aircraft only needs a pavement of 30 meters (99 feet) wide for a 180° turn.
The following procedure is recommended for making such a turn in the most efficient way.

- **FOR THE CM1**
  - Taxi on the right-hand side of the runway and turn left, maintaining 25° divergence from the runway axis. Maximum ground speed is 10 knots.
  - When the CM1 is physically over the runway edge, he turns the nosewheel full right and sets 50 % to 55 % N1 for CFM engines, or 1.05 EPR for IAE engines.
- **FOR THE CM2**

  The procedure is symmetrical. (Taxi on the left-hand side of the runway).

R



Note : To avoid skidding the nosewheel on a wet runway, perform the turn at very low speed, using asymmetric thrust and differential braking as necessary.

BEFORE TAKEOFF

- **If the brake fans are running ◁ :**

  – **BRAKE TEMP . . . . CHECK**
  · If brake temperature is above 150° C, delay takeoff.
  · If brake temperature is below 150° C, select brake fans off.

– **TAKEOFF OR LINE UP CLEARANCE . . . . OBTAIN**

– **APPROACH PATH CLEAR OF TRAFFIC . . . . CHECK**

– **CABIN CREW . . . . ADVISE**

– **ENG MODE selector . . . . AS RQRD**
Select IGN, if :
· The runway has standing water.
· Heavy rain is falling.
· Heavy rain or severe turbulence is expected after takeoff.

<u>Note</u> : *Continuous ignition is automatically selected, if the ENG ANTI ICE pushbutton is ON.*

– **TCAS (◁) Mode selector . . . . TA or TA/RA**
The FAA recommends selecting TA mode :
– In case of known nearby traffic, which is in visual contact.
– At particular airports and during particular procedures, identified by an Operator as having a significant potential for unwanted or inappropriate resolution advisories (closely-spaced parallel runways, converging runways...)

– **PACK 1 and 2 . . . . AS RQRD**
R Consider selecting packs OFF, or APU bleed ON.
R This will improve performance when using TOGA thrust.
R In case of a FLEX takeoff, selecting packs OFF or APU bleed ON will reduce takeoff EGT,
R and thus reduce maintenance costs.
The use of flex thrust may reduce maintenance costs. The effect is particularly
R significant with the first degrees of FLEX.
Use of APU bleed is not authorized, if wing anti-ice is to be used.

– **EXTERIOR LIGHTS . . . . SET**
Set the RWY TURN OFF, LAND, and NOSE switches to ON/TO, in order to minimize bird strike hazard during takeoff.
R Set the STROBE lights to ON, before entering the runway.

– **SLIDING TABLE ⊲ . . . . STOW**

– **ATC . . . . When cleared for takeoff : ON (or XPDR or XPNDR ⊲)**
This is not applicable to ATC panels equipped with :
· An AUTO position, if AUTO is selected.
· A common selector for ATC transponder and TCAS.

– **BEFORE TAKEOFF CHECKLIST below the line . . . . COMPLETE**
Read the checklist below the line, when line up or takeoff clearance is received.

TAKEOFF

– **ANNOUNCE . . . . « TAKEOFF »**

– **BRAKES . . . . RELEASE**

Rolling takeoff is recommended when possible.

● **If the crosswind is at or below 20 knots and there is no tailwind :**

– **THRUST LEVERS . . . . FLX or TOGA**

· To counter the nose-up effect of setting engine takeoff thrust, apply half forward stick until the airspeed reaches 80 knots. Release the stick gradually to reach neutral at 100 knots.
· For crosswind takeoffs, routine use of into-wind aileron is not recommended. In strong crosswind conditions, small amounts of lateral control may be used to maintain wings level, but the pilot should avoid using excessive amounts. This causes excessive spoiler deployment, which increases the aircraft tendency to turn into wind.
· PF progressively adjusts engine thrust in two steps :
– from idle to about 50 % N1 (1.05 EPR).
– from both engines at similar N1 to takeoff thrust.
  · Once the thrust is set, the captain keeps his hand on the thrust levers until the aircraft reaches V1.

● **In case of tailwind or if crosswind is greater than 20 knots :**

– **THRUST LEVERS . . . . FLX or TOGA**

· PF applies full forward stick.
· For crosswind takeoffs, routine use of into-wind aileron is not recommended. In strong crosswind conditions, small amounts of lateral control may be used to maintain wings level, but the pilot should avoid using excessive amounts. This causes excessive spoiler deployment, which increases the aircraft tendency to turn into wind.
· PF sets 50 % N1 (1.05 EPR) on both engines then rapidly increases thrust to about
R 70 % N1 (1.15 EPR) then progressively to reach takeoff thrust at 40 knots ground speed, while maintaining stick full forward up to 80 knots. Release stick gradually to reach neutral at 100 knots.
· Once the thrust is set, the captain keeps his hand on the thrust levers until the aircraft reaches V1.

Note : ENG page replaces WHEEL page on the ECAM lower display.

– **DIRECTIONAL CONTROL . . . . USE RUDDER**
At 130 knots (wheel speed) the connection between nosewheel steering and the rudder pedals is removed, hence in strong crosswinds more rudder input will be required at this point to prevent the aircraft from turning into the wind.

– **CHRONO . . . . START**

– **PFD/ND . . . . SCAN**
· Check the flight mode annunciator on the PFD :
MAN TOGA (MAN FLX xx), SRS, RWY (or blank), both FDs on.
· Check the FMGS position update (aircraft on runway centerline).

R ● **Reaching 80 knots :**

R – **TAKEOFF N1 . . . . CHECK**
R Check that the actual N1 of individual engines has reached the N1 rating limit before
R the aircraft reaches 80 knots. Check EGT.

Note : If there is a discrepancy of more than 1 % of N1 between the engines, it should be entered in the logbook after flight.

– **ANNOUNCE . . . . « POWER SET »**

– **PFD and ENG indications . . . . SCAN**
· Scan airspeed, N1, and EGT throughout the takeoff.
· Disregard the EGT index pulsing amber when using TOGA or FLX thrust.

– **ANNOUNCE . . . . « ONE HUNDRED KNOTS »**
· The PF crosschecks the speed indicated on the PFD and announces “checked”.
· Below 100 knots the captain may decide to abort the takeoff according to the circumstances.
· Above 100 knots, rejecting the takeoff is a more serious matter.

– **ANNOUNCE . . . . « V1 »**

– **ANNOUNCE . . . . « ROTATE »**

– **ROTATION . . . . PERFORM**
R · At VR, initiate the rotation to achieve a continuous rotation with a rate of about 3°/sec,
R towards a pitch attitude of 15° (12.5° if one engine is failed).
R · Minimize lateral inputs on ground and during the rotation, to avoid spoiler extension.
R · After lift-off, follow the SRS pitch command bar.

CAUTION
If a tailstrike occurs, avoid flying at an altitude requiring a pressurized cabin, and return to the originating airport for damage assessment.

– **ANNOUNCE . . . . "POSITIVE CLIMB"**

– **ORDER . . . . "GEAR UP"**

– **LDG GEAR . . . . SELECT UP**

– **GRND SPLRS . . . . DISARM**

– **EXTERIOR LIGHTS . . . . SET**
Set NOSE & RWY TURN OFF light switches to OFF.
LAND lights may be left ON, depending on the airline policy or regulatory recommendation.

– **AP . . . . AS RQRD**
Above 100 feet AGL, AP 1 or 2 may be engaged.

– **ANNOUNCE . . . . "FMA"**

– **ANNOUNCE . . . . "GEAR UP"**

● **At thrust reduction altitude (LVR CLB flashing on FMA)**

– **THRUST LEVERS . . . . CL**
Move the thrust levers promptly to the CL detent, when the flashing LVR CLB prompt appears on the FMA. A/THR is now active.
In manual flight, the pilot must anticipate the change in pitch attitude in order to prevent the speed from decaying when thrust is reduced.

– **PACK 1 and 2 (if applicable) . . . . ON**
· Select PACK 1 ON after CLB thrust reduction.
· Select PACK 2 ON after flap retraction.

Note : 1. Selecting pack ON before reducing takeoff thrust would result in an EGT increase.
2. Selecting both packs ON simultaneously may affect passenger comfort.
3. If packs are not switched on after the takeoff phase, an ECAM caution will be triggered.
4. PACK 2 may be selected earlier.

● **At acceleration altitude :**

– **ANNOUNCE FMA . . . . "THR CLB/OP CLB" or "THR CLB/CLB"**
Check the target speed change from V2 + 10 to the first CLB speed (either preselected or managed).

Note : 1. For most normal operations, thrust reduction and acceleration altitudes will be the same. So, the FMA will change from FLX/SRS/NAV to THR CLB/CLB/NAV.
2. If FCU-selected altitude is equal to or close to the acceleration altitude, then the FMA will switch from SRS to ALT.*

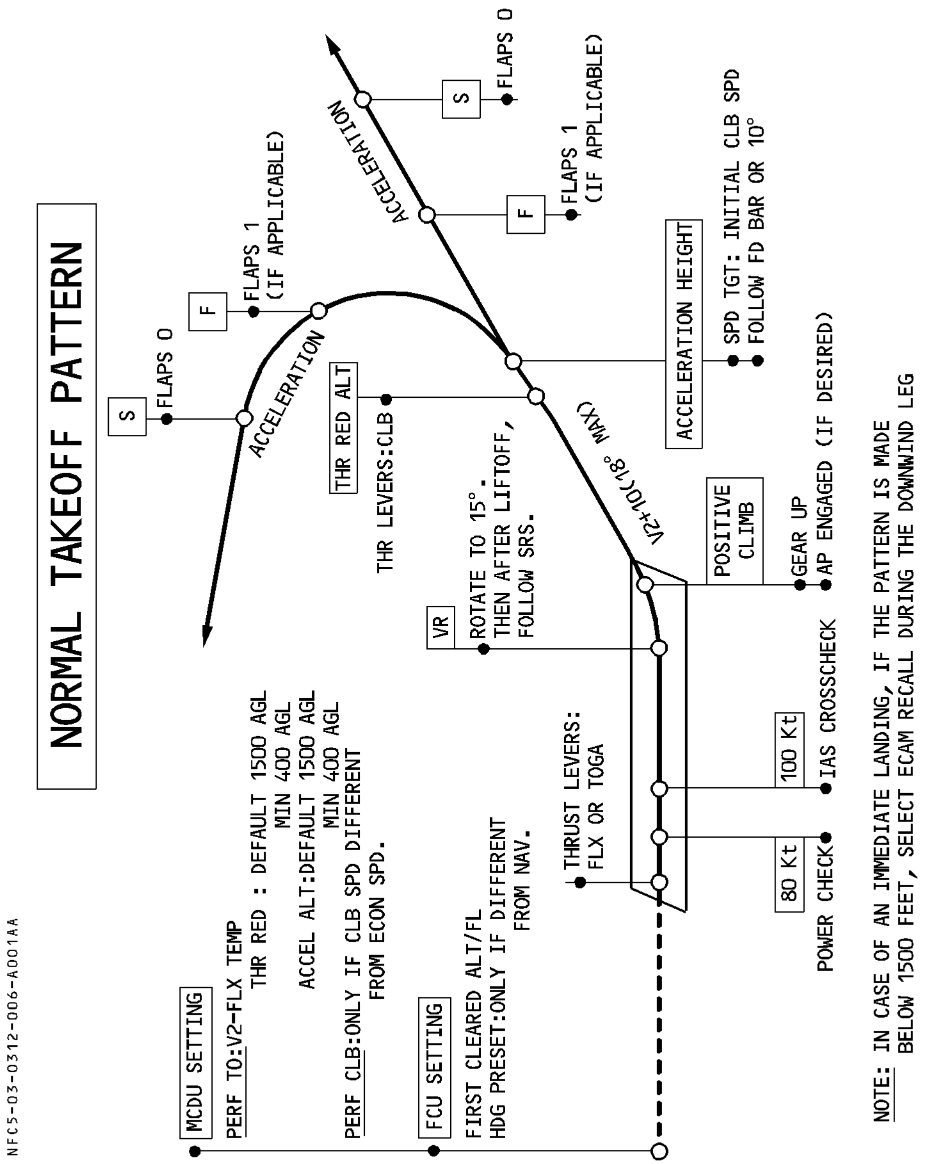
- **Above acceleration altitude (or once in climb phase) :**
  The following procedure ensures that the aircraft is effectively accelerating toward climb speed.
  - **At F speed**
    - **ORDER . . . . "FLAPS 1"**
    - **FLAPS 1 . . . . SELECT**
R - **CONFIRM/ANNOUNCE . . . . "FLAPS 1"**

    Note : For takeoff in CONF 1 + F, "F" speed is not displayed.
  - **At S speed**
    - **ORDER . . . . "FLAPS ZERO"**
    - **FLAPS ZERO . . . . SELECT**
R - **CONFIRM/ANNOUNCE . . . . "FLAPS ZERO"**

    Note : CRUISE page replaces ECAM ENG page.

- **DERATED CLB OPS ◁ . . . . REFER TO 3.04**

R


NORMAL TAKEOFF PATTERN
MCDU SETTING
PERF TO:V2-FLX TEMP
THR RED : DEFAULT 1500 AGL
MIN 400 AGL
ACCEL ALT:DEFAULT 1500 AGL
MIN 400 AGL
PERF CLB:ONLY IF CLB SPD DIFFERENT
FROM ECON SPD.
FCU SETTING
FIRST CLEARED ALT/FL
HDG PRESET:ONLY IF DIFFERENT
FROM NAV.
THRUST LEVERS:
FLX OR TOGA
80 Kt
POWER CHECK
100 Kt
IAS CROSSCHECK
VR
ROTATE TO 15°.
THEN AFTER LIFTOFF,
FOLLOW SRS.
POSITIVE
CLIMB
GEAR UP
AP ENGAGED (IF DESIRED)
V2+10(18° MAX)
THR RED ALT
THR LEVERS:CLB
ACCELERATION HEIGHT
SPD TGT: INITIAL CLB SPD
FOLLOW FD BAR OR 10°
ACCELERATION
F
FLAPS 1
(IF APPLICABLE)
S
FLAPS 0
NOTE: IN CASE OF AN IMMEDIATE LANDING, IF THE PATTERN IS MADE
BELOW 1500 FEET, SELECT ECAM RECALL DURING THE DOWNWIND LEG
NFC5-03-0312-006-A001AA

AFTER TAKEOFF

– **APU BLEED . . . . AS RQRD**
If the APU has been used to supply air conditioning during takeoff, set the APU BLEED to OFF. For use of the APU BLEED, refer to the APU LIMITATION Chapter (3.01.49).

– **APU MASTER switch . . . . AS RQRD**

– **ENG MODE selector . . . . AS RQRD**
Select IGN, if severe turbulence or heavy rain is encountered.

– **TCAS (◁) Mode selector . . . . TA/RA**
Select TA/RA, if the takeoff has been performed with TA only.

– **ANTI ICE PROTECTION . . . . AS RQRD**
R ENG ANTI ICE should be ON, when icing conditions are expected with a TAT at, or
R below, 10°C.

Note : *With ENG ANTI ICE ON, the FADEC automatically selects continuous ignition. The IGNITION memo appears on ECAM.*

– **AFTER TAKEOFF/CLIMB CHECKLIST down to the line . . . . COMPLETE**

CLIMB

– **Normal vertical mode is CLB or OP CLB with managed speed active.**

R – **PF MCDU . . . . PERF CLB**

· PF MCDU should be showing the PERF CLB page (allowing PF to monitor when the aircraft will reach the FCU selected altitude) but he may select other pages such as F-PLN page as may be tactically necessary.
With the AP engaged, the PF will make any required flight plan revisions.

· The MCDU PROG page displays OPT FL and MAX REC FL. It is worth noting that this OPT FL is a function of the cost index.

· The displayed MAX REC FL gives the aircraft at least a 0.3 g buffet margin. The pilot may enter a cruise flight level above this level into the MCDU and the FMGS will accept it, provided that it does not exceed the level at which the margin is reduced to 0.2 g.

– **PNF MCDU . . . . F-PLN**

PNF MCDU should be showing the F-PLN page (allowing him to enter any ATC long-term revisions to the lateral or vertical flight plan).

– **CLIMB SPEED MODIFICATIONS :**

● **If ATC, turbulence or operational considerations lead to a speed change :**

Select the new speed with FCU SPD selection knob and pull. Speed target is now "selected". To return to managed speed mode, push FCU SPD selection knob. The speed target is now "managed".

Note : *The best speed (and rate of climb) for long-term situations lies between green dot speed and ECON speed. At high altitude, acceleration from green dot to ECON speed can take a long time.*

– **EXPEDITE CLIMB ⊲**

● **If ATC requires a rapid climb through a particular level :**

Push the EXP pushbutton on the FCU. The target speed is now green dot speed.
FMA : THR CLB/EXP CLB/NAV

Note : *Use EXP (⊲) only for short-term tactical situations. For the best overall economy fly at ECON IAS.*
To return to ECON CLB speed :
Push ALT selector knob.
Check FMA : THR CLB/CLB/NAV

– **BARO REF** . . . . **SET**
· At transition altitude (baro setting flashing on PFD) set STD on the EFIS control panel and STBY ALT.
· Cross-check baro settings and altitude readings.

– **CRZ FL** . . . . **SET AS RQRD**
· If ATC clears the aircraft to its intended CRZ FL or above, there is no need to modify the CRZ FL entered in the INIT A page during cockpit preparation. The FCU will automatically take into account a higher CRZ FL selected with the FCU ALT knob.
· If ATC limits CRZ FL to a lower level than the one entered in the INIT A page (or present on the PROG page) the flight crew must insert this lower CRZ FL in the PROG page. Otherwise there is no transition into CRZ phase : the managed speed targets and Mach are not modified, and SOFT ALT mode is not available. In that case FMA will display: MACH/ALT/NAV instead of MACH/ALT CRZ/NAV.

– **AFTER TAKEOFF/CLIMB CHECKLIST below the line** . . . . **COMPLETE**

– **ENG ANTI ICE** . . . . **AS RQRD**
ENG ANTI ICE should be ON when the aircraft encounters icing conditions, unless the SAT is below – 40° C.

– **RADAR TILT** . . . . **ADJUST**
The tilt angle depends on aircraft altitude and on the selected range on the ND. The radar must have a slightly negative tilt in order to avoid overscanning and to show some ground return at the top edge of the ND.

● **At 10 000 ft :**

R – **LAND light** . . . . **OFF**

R – **SEAT BELTS** . . . . **AS RQRD**

R – **EFIS option** . . . . **ARPT**

R – **ECAM MEMO** . . . . **REVIEW**

– **RAD NAV page** . . . . **CHECK**
Clear manually tuned VORs from MCDU RAD NAV page.

– **SEC F-PLN page** . . . . **AS RQRD**
Recopy the active flight plan in the secondary if an immediate return flight plan has been constructed previously.

– **OPT/MAX ALT** . . . . **CHECK**

CRUISE

– **ECAM MEMO . . . . REVIEW**

– **ECAM SYS PAGES . . . . REVIEW**

Periodically review system display pages and, in particular :

ENG : Oil pressure and temperature
BLEED : BLEED parameters
ELEC : Parameters, GEN loads
HYD : A slight decrease in quantity is normal.
Fluid contraction during cold soak can be expected.
Green system is lower than on ground, following landing gear retraction.
FUEL : Fuel distribution.
COND : Duct temperature, compared with zone temperature.
Avoid large differences for passenger comfort.
FLT CTL : Note any unusual control surface position.

– **FLIGHT PROGRESS . . . . CHECK**

Monitor flight progress in the conventional way.
When overflying a waypoint :
· Check track and distance to the next waypoint.
R When overflying the waypoint, or every 30 minutes :
· Check FUEL : Check FOB (ECAM), and fuel prediction (FMGC), and compare with the computer flight plan or the in-cruise quick-check table (Refer to 3.05.20).
Check that the sum of the fuel on board and the fuel used is consistent with the fuel on board at departure. If the sum is unusually greater than the fuel on board at departure, suspect a frozen fuel quantity indication. Maintenance action is due before
R the next flight. If the sum is unusually smaller than the fuel on board at departure, or
R if it decreases, suspect a fuel leak.

CAUTION
This check must also be performed each time a FUEL IMBALANCE procedure is necessary. Perform the check before applying the FUEL IMBALANCE procedure. If a fuel leak is confirmed, apply the FUEL LEAK procedure.

– **STEP FLIGHT LEVEL . . . . AS APPROPRIATE**

(Refer to 3.05.15).

– **NAVIGATION ACCURACY . . . . CHECK**

On aircraft equipped with GPS primary, no navigation accuracy check is required, as long as GPS PRIMARY is available.

Otherwise, navigation accuracy must be monitored, at all times but especially when any of the following occurs :

· IRS only navigation
· The PROG page displays LOW accuracy.
· “NAV ACCUR DOWNGRAD” appears on the MCDU.

Methods for checking accuracy :

· Manually tune VOR (VOR/DME or ADF) to a station that is within range on the RAD NAV page, and select associated needles on the ND.
  Check that the needle (raw data) overlies the corresponding blue navaid symbol (FM computed) and that the DME distance is equal to the distance showing between the aircraft symbol and the navaid symbol on the ND.
· Or insert a VOR/DME ident in BRG/DIST TO field on the PROG page and compare the computed BRG (DIST) with the raw data on the ND. This method allows the FM error to be quantified.

If the check is positive (error ≤ 3NM) : FM position is reliable.

– Use ND (ARC or NAV) and managed lateral guidance.

If the check is negative (error > 3NM) : FM position is not reliable.

– Use raw data for navigation and monitor it.
– If there is a significant mismatch between the display and the real position : disengage MANAGED NAV mode and use raw data navigation (possibly switching to ROSE VOR, so as not to be misled by FM data).

– **RADAR TILT . . . . ADJUST**

Below 20000 feet	:	Start with tilt near zero, then adjust. If using different ranges on the two NDs, set the tilt down for the shorter ND range (in order to monitor and detect weather activity) and near zero for the longer ND range (in order to monitor course changes).
Above 20000 feet	:	A slight downward tilt is recommended.

– **CABIN TEMP . . . . MONITOR**

Pay regular attention to the ECAM CRUISE page, in order to monitor passenger cabin temperatures and adjust them, as necessary.

● **If the oxygen mask has been used :**

– **OXYGEN MASK . . . . CHECK**

Check that the oxygen mask has been properly stowed, as indicated in the FCOM 1.35.20.

DESCENT PREPARATION

Descent preparation and approach briefing can take approximately 10 minutes, so they should begin approximately 80 NM before top of descent.

- **LDG ELEV** . . . . **CHECK**
  Check on ECAM CRUISE page that LDG ELEV AUTO is displayed.

- **WEATHER AND LANDING INFORMATION** . . . . **OBTAIN**
  Check weather reports at ALTERNATE and DESTINATION airports. Airfield data should include runway in use for arrival.

FMGS

- **ARRIVAL page** . . . . **COMPLETE/CHECK**
  Insert TRANS, APPR, STAR, and APPR VIA if applicable. (Access by lateral revision at destination.)

- **F-PLN A page** . . . . **CHECK**
  Check speeds and altitude constraints.
  Add new speed or altitude constraints if required.

- **DES WIND** . . . . **CHECK**
  Enter winds for descent starting at cruise flight level.

- **PERF CRUISE page** . . . . **CHECK**
  Modify the cabin descent rate if different pressure rate is required.

- **PERF DES page** . . . . **CHECK**
  Prior to descent, access PERF DES page and check ECON MACH/SPD. If a speed other than ECON is required, insert that MACH or SPD into the ECON field. This new MACH or SPD is now the one for the descent path and TOD computation, and it will be used for the managed speed descent profile (instead of ECON).
  A speed limit of 250 knots below 10000 feet is the defaulted speed, in the managed speed descent profile. The flight crew may delete or modify it if necessary on the VERT REV at DEST page.

– **PERF APPR page . . . . COMPLETE/CHECK**
– Enter the QNH, temperature, and wind at destination.

Note : *The entered wind should be the average wind given by the ATC or ATIS. Do not enter gust values. For example, if the wind is 150/20-25, insert the lower speed 150/20 (ground speed mini-function will cope with the gust).*

– Insert the MDA (MDH if QFE used) or DH whichever applies.

R Note : *To avoid undershooting the MDA (MDH) during go-around, due to the aircraft*
R *inertia during pull-up, the flight crew should add an additional number of feet*
R *(defined by the operator) to the published MDA (MDH).*

CAUTION
If QNH altimeter setting is used with an aircraft with QFE option, refer to 3.04.34.

Note : *Changing the RWY or type of arrival (VOR, ILS) automatically erases the previous MDA/MDH or DH.*

– Check or modify the landing configuration. Always select the landing configuration on the PERF APP page :
· The pilot may choose FLAP 3, rather than FLAP FULL for landing, depending on the available runway length and go-around performance, or if windshear/severe turbulence is considered possible on the approach.
· The ECAM may require landing in configuration 3, in case of a system failure :
∗ First read the VLS CONF FULL value on the PERF APP page to determine the VAPP (or use QRH 2.31).
∗ Then, select CONF 3 on the PERF APP page.
As a general rule, managed speed can be used if the landing configuration and the configuration selected on the PERF APP page are the same. (If they are not the same, the managed speed will not drop down to the approach speed).
– Check VAPP according to the FLAPS FULL or FLAPS 3 selection on the MCDU.
The pilot can modify VAPP. The new value will be taken into account for the ground speed mini-function.

Note : *If some abnormality requires a speed increment for the approach, the increment must be added to VLS CONF FULL.*

– **GO-AROUND page . . . . CHECK/MODIFY**
Check the THR RED ALT and ACC ALT, and modify if necessary.

– **RAD NAV page . . . . CHECK**
Set navaids, as required, and check idents on the NDs (VOR-ADF) and PFDs (ILS). If a VOR/DME exists close to the airfield, select it and enter its ident in the BRG/DIST field of the PROG page, for NAV ACCY monitoring during descent.

– **SEC F-PLN page . . . . AS RQRD**
Before the top of descent, the SEC F-PLN should either be set to an alternate runway for destination, or to the landing runway in case of circling. In all cases, routing to the alternate should be available. If there is a last-minute runway change, then the flight crew only needs to activate the secondary F-PLN, without forgetting to set the new MDA or DH and navaids.

– **GPWS LDG FLAP 3 . . . . AS RQRD**
If the pilot plans on landing in FLAPS 3 configuration, the GPWS LDG FLAP 3 switch should be set to ON.

– **APPROACH BRIEFING . . . . PERFORM**
The flight crew should use FMGS pages as a descent and approach briefing guide.
· PERF page : Safe altitude is .. .. Transition altitude is .. ..
· RAD NAV page : ILS, VOR, ADF and associated crossing altitudes.
· F-PLN page : To check STAR, APPR, missed approach.
· FMA : MDA/DH (MDH/DH if QFE used).
R · Go-around (Standard call/task sharing, Diversion decision).
R · Terminal area topography to ensure a proper terrain awareness.
· Weather at destination.
· Fuel page : Fuel needed for diversion ; holding fuel possibility.
· Landing configuration (including ground spoilers, reverser application, and autobrake selection).
· Runway conditions, lighting, and dimensions.
· For airlines having different models of the A319/A320/A321 family, mention whether the aircraft is an A319, A320, or A321. Awareness of the aircraft model may prevent tailstrike.

– **DESCENT CLEARANCE . . . . OBTAIN**
When clearance is obtained, set the ATC-cleared altitude (FL) on the FCU (also considering what is the safe altitude).
If the lowest safe altitude is higher than the ATC-cleared altitude, check with the ATC that this constraint applies.
If it is confirmed, set the FCU altitude to the safe altitude, until it is safe to go to the ATC-cleared altitude.

– **ANTI ICE PROTECTION . . . . AS RQRD**
· During descent, ENG ANTI ICE must be ON when icing conditions are encountered. (Refer to 3.04.30 p. 1).
· With engine ANTI ICE ON, the FADEC automatically controls continuous ignition and selects a higher idle thrust which gives better protection against flame-out. The IGNITION memo appears on the ECAM.
· ANTI ICE ON reduces the descent path angle (when the engines are at idle). The pilot can compensate for this by increasing the descent speed, or by extending up to half speedbrakes.

DESCENT INITIATION

– **DESCENT . . . . INITIATE**
The normal method of initiating the descent is to select DES mode at the FMGS calculated top of descent (TOD).

■ **If ATC requires an early descent :**
Use DES mode which will guide the aircraft down at a lower vertical speed in order to converge on the required descent path. (The pilot may use a V/S of – 1000 ft/mn).

■ **If ATC delays the descent :**
Beyond TOD, a DECELERATE message comes up on the PFD and MCDU. This suggests to the crew that it starts reducing speed towards green dot speed (with ATC permission). When cleared to descend, select DES mode with managed speed active.

DESCENT MONITORING

– **PF MCDU . . . . PROG/PERF DES**
PF MCDU should be set to PROG or PERF DES page :
· PROG page in order to get VDEV or RQD DIST TO LAND/DIRECT DIST TO DEST information.
· PERF DES in order to get predictions down to any inserted altitude in DES/OP DES
R modes and EXP mode (◁).

– **PNF MCDU . . . . F-PLN**
With the AP engaged, the PF usually makes any required F-PLN revisions.

Note : The NDs show a level-off symbol ↳ along the flight path. Its position is based on the current active AP/FD and A/THR modes.

- **DESCENT . . . . MONITOR**
  (Refer to FCOM 4 05.60)
  - When flying in NAV mode, use DES mode.
    The aircraft descends along the descent flight path : the PFD and PROG page display VDEV, and so it can be monitored. All constraints of the flight plan are taken into account for the guidance.
  - When the aircraft is flying in HDG or TRK mode, and thus out of the lateral F-PLN, DES mode is not available.
    However the PFD still displays VDEV, and this is useful whenever cross track error is small (up to 5 NM).
    The flight crew can use the level ↘ symbols on the ND to monitor the descent.
    MCDU predictions assume a return to the lateral F-PLN and descent flight path.
    Note that whenever the lateral mode is changed from NAV to HDG/TRK the vertical mode reverts to V/S at the value pertaining at the time of the mode change.
  - From time to time during stabilized descent, the flight crew may select FPA to check that the remaining distance to destination is approximately the altitude change required divided by the FPA in degrees.

    $\boxed{\text{FPA } (^\circ) = \Delta \text{ FL/DIST (NM)}}$

DESCENT ADJUSTMENT

To increase the rate of descent :
- Increase descent speed (by use of selected speed) if comfort and ATC permit. It is economically better (Time/Fuel) than the following procedures.
- Maintain high speed as long as possible. (SPD LIM may be suspended, subject to ATC clearance).
- If the aircraft is high and at high speed, it is more efficient to keep the high speed to ALT* and decelerate, rather than to mix descent and deceleration.
- If the aircraft goes below the desired profile, use SPEED and the V/S mode to adjust the rate of descent.

Note : EXPEDITE DESCENT.
If a high rate of descent is required, push the EXPED pushbutton ◁ on the FCU. The target speed for the descent now becomes Mach 0.8 or 340 knots, whichever is lower. The FMA will display THR IDLE/EXP DES/NAV.
To return to DES mode, push the FCU ALT knob.
To return to SPEED/V/S modes, pull the FCU V/S knob.
In all cases, monitor the FMA to ensure that the mode engages properly.

– **SPEEDBRAKES . . . . AS RQRD**
In OPEN DES : Use speedbrakes to increase the rate of descent. The pilot may use up to half speedbrakes to maintain the required rate of descent, when engine anti-ice is used.
In DES mode : If the aircraft is on, or below, the flight path and the ATC requires a higher rate of descent, do not use speedbrakes because the rate of descent is dictated by the planned flight path. Thus, the A/THR may increase thrust to compensate for the increase in drag. In this case, use OPEN DES with speedbrakes.

Note : 1. If speedbrakes are used above 315 knots/M.75 with the AP engaged, their rate of retraction is low (total time for retraction from full extension is approximately 25 seconds). The ECAM memo page displays SPD BRAKES in amber until retraction is complete.
2. In order to avoid overshooting the altitude, due to speedbrake retraction in ALT mode, retract the speedbrakes at least 2000 feet before the selected altitude.*

– **RADAR TILT . . . . ADJUST**
Every 10000 feet of the planned descent, and down to about 15000 feet, adjust the tilt upwards to eliminate ground clutter on the upper part of the ND.
Every 5000 feet below 15000 feet, adjust the tilt angle one degree upwards, in order to keep the ND relatively free of ground clutter.

– **BARO REF . . . . SET**
R · Set QNH on the EFIS control panel and on the standby altimeter, when approaching the transition level and when cleared for an altitude.
· Crosscheck baro settings and altitude readings.

Note : When operating in low OAT, altitude corrections, as defined in 3.05.05 page 6, should be considered.

● **If EGPWS is available :**

– **TERR ON ND . . . . ON**
If use of radar is required, consider selecting the radar display on the PF side, and TERR ON ND on the PNF side only.

– **ECAM STATUS . . . . CHECK**

· Check that there is no status reminder on the upper ECAM display.
· If there is a status reminder, check the aircraft STATUS.
· Check the ECAM status page before completing the approach checks. Take particular note of any degradation in landing capability, or any other aspect affecting the approach and landing.

● **At 10 000 feet :**

– **LAND LIGHTS . . . . ON**

R LAND lights may be switched ON, according to the airline policy/regulatory
R recommendations.

– **SEAT BELTS . . . . AS RQRD**

– **EFIS option . . . . CSTR**

– **ILS pushbutton . . . . AS RQRD**

Select ILS, if an ILS or LOC approach is intended.
The PFD displays the LOC and glide scales and deviation symbol, if there is a valid ILS signal.

– **RAD NAVAIDS . . . . SELECTED/IDENTIFIED**

Ensure that appropriate radio navaids are tuned and identified.
For NDB approaches, manually select the reference navaid.

– **NAV ACCURACY . . . . CHECK**

On aircraft equipped with GPS primary, no navigation accuracy check is required, as long as GPS PRIMARY function is available.
Otherwise, crosscheck NAV ACCURACY using the PROG page (BRG/DIST computed data), and the ND (VOR/DME raw data).
The navigation accuracy check determines which autopilot mode the flight crew should use for the approach, and the type of displays to be shown on the ND.

GENERAL

For more information about precision approaches and how to use the FMGS see FMGS pilot's guide (Refer to 4.05.70). The approach procedures described here assume that the flight crew uses managed speed guidance which is recommended.

INITIAL APPROACH

– **ENG MODE selector . . . . AS RQRD**
Select IGN if the runway is covered with standing water, or if heavy rain or severe turbulence is expected during approach or go-around.

R – **SEAT BELTS . . . . ON/AUTO**

– **APPROACH PHASE . . . . CHECK/ACTIVATE**
· If the aircraft overflies the DECEL pseudo waypoint in NAV mode, the APPR phase activates automatically.
· If the aircraft is in HDG/TRK mode, approximately 15 NM from touchdown activate and
R confirm APPROACH phase on the MCDU.

– **POSITIONING . . . . MONITOR**
· In NAV mode, use VDEV information on the PFD and PROG page.
· In HDG or TRK mode, use the energy circle on ND representing the required distance to land.

– **MANAGED SPEED . . . . CHECK**
If ATC requires a particular speed, then use selected speed. When the ATC speed constraint ("maintain 170 knots to the outer marker", for example) no longer applies, return to managed speed.

– **SPEEDBRAKES . . . . AS RQRD**
If the pilot uses speedbrakes to increase the rate of deceleration, or to increase the rate of descent, he should realize that VLS with speedbrakes fully extended, in the clean configuration, may be higher than green dot speed and possibly than VFE FLAP 1. The A/THR in speed mode, or the pitch demand in OPEN DES, will limit the speed to VLS. In this situation, the pilot should begin to retract speedbrakes upon reaching VLS + 5 knots and should select FLAP 1, as soon as speed is below VFE NEXT. He may then extend the speedbrakes, if necessary. The landing gear may always be extended out of sequence to aid deceleration.

– **NAV ACCURACY . . . . MONITOR**
When GPS PRIMARY is available, no NAV ACCURACY monitoring is required.
When GPS PRIMARY is lost, check the PROG page to verify that the required navigation accuracy is appropriate to the flight phase. Monitor NAV accuracy, and be prepared to change approach strategy. If NAV ACCURACY DOWNGRAD occurs, use raw data to check navigation accuracy.
Navigation accuracy determines which autopilot modes the flight crew should use, the type of displays to be shown on the ND, as well as the use of EGPWS.

R

<table>
<tr><th rowspan="2">NAVIGATION ACCURACY</th><th colspan="2">ND</th><th rowspan="2">AP/FD mode</th><th rowspan="2">TERR pushbutton</th></tr>
<tr><th>PF</th><th>PNF</th></tr>
<tr><td>GPS PRIMARY</td><td colspan="2" rowspan="3">ARC or ROSE NAV with navaid raw data</td><td rowspan="3">NAV</td><td rowspan="3">ON</td></tr>
<tr><td>NAV ACCUR HIGH</td></tr>
<tr><td>NAV ACCUR LOW and NAV ACCURACY check ≤ 1 NM</td></tr>
<tr><td>GPS PRIMARY LOST and NAV ACCUR LOW and NAV ACCURACY check > 1 NM</td><td rowspan="2">ROSE ILS</td><td rowspan="2">ARC or ROSE NAV or ROSE ILS with navaid raw data</td><td rowspan="2">HDG or TRK</td><td rowspan="2">OFF</td></tr>
<tr><td>GPS PRIMARY LOST and Aircraft flying within unreliable radio navaid area</td></tr>
</table>

– **RADAR TILT . . . . ADJUST**
Increase tilt, as required (+ 3° to + 4°).

– **APPROACH CHECKLIST . . . . COMPLETE**

INTERMEDIATE/FINAL APPROACH (ILS approach entered in the F-PLN)

The objective is to be stabilized on the final descent path at VAPP, thrust above idle, in the landing configuration, at 1000 feet, after continuous deceleration on the glideslope.
R To be stabilized, all of the following conditions must be achieved prior to, or upon, reaching
R this stabilization height :
R – The aircraft is on the correct lateral flight plan,
R – The aircraft is in the desired landing configuration,
R – The thrust is stabilized above idle, to maintain the target speed on the desired glide path,
R – No excessive flight parameter deviation.

The advantages are :
· Lower fuel consumption.
· Lower noise levels.
· Time saved.
· Flexibility and ability to vary speed to suit ATC.

If the aircraft is not stabilized on the approach path in landing configuration, at 1000 feet in instrument conditions, or at 500 feet in visual conditions, or as restricted by airline
R policy/regulations, a go-around must be initiated.

– **APPR pushbutton on FCU . . . . PRESS**
  · Press the APPR pushbutton, only when ATC cleares the aircraft for the approach. This arms the LOC and G/S modes.
  · LOC and/or G/S capture modes will engage no sooner than 3 seconds after being armed.

– **Both APs . . . . ENGAGE**
  When APPR mode is selected, both autopilots should be engaged.

AT GREEN DOT SPEED

– **ORDER . . . . "FLAPS 1"**

– **FLAPS 1 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . “FLAPS 1”**
· FLAPS 1 should be selected more than 3 NM before the FAF (Final Approach Fix).

Note : *The ECAM automatically displays the STATUS page, if it is applicable, and if the flight crew has not already selected a system page manually.*

· Check deceleration toward “S” speed.
· The aircraft must reach, or be established on, the glideslope with FLAPS 1 and S speed at, or above, 2000 feet AGL.
· If the aircraft speed is significantly higher than S on the glideslope, or if the aircraft does not decelerate on the glideslope, extend the landing gear to slow it down.
The use of speedbrakes is not recommended, because it causes an unwanted increase in VLS.

– **TCAS (◁) . . . . TA or TA/RA**
The FAA recommends selecting TA only mode :
· In case of known nearby traffic, which is in visual contact.
· At particular airports, and during particular procedures, identified by an operator as having a significant potential for unwanted or inappropriate resolution advisories (closely-spaced parallel runways, converging runway, low terrain along the final approach...).

– **FMA . . . . CHECK**

– **LOC CAPTURE . . . . MONITOR**

– **ANNOUNCE . . . . “LOC*”**

– **G/S CAPTURE . . . . MONITOR**

● **If above the glideslope :**

– **V/S mode . . . . SELECT**

– **FCU ALTITUDE . . . . SET ABOVE A/C ALTITUDE**

Note : *1. When reaching VFE, the AP maintains VFE and reduces the V/S without MODE REVERSION.*
2. If the aircraft intercepts the ILS above the radio altimeter validity range (no radio altitude indication available on the PFD), CAT 1 is displayed on the FMA. Check that the FMA displays the correct capability for the intended approach, when the aircraft is below 5000 feet.

– **ANNOUNCE** . . . . **"G/S*"**

– **GO-AROUND ALT** . . . . **SET**
Set the go around altitude on the FCU.

AT 2000 FT AGL (minimum)

– **ORDER** . . . . **"FLAPS 2"**

– **FLAPS 2** . . . . **SELECT**

R – **CONFIRM/ANNOUNCE** . . . . **"FLAPS 2"**
· Check deceleration toward F speed.
· If the aircraft intercepts the ILS glideslope below 2000 feet AGL, select FLAPS 2 at one dot below the glideslope.
· If the aircraft speed is significantly higher than S on the glide slope, or the aircraft does not decelerate on the glide slope, extend the landing gear in order to slow down the aircraft. The use of speedbrakes is not recommended.
· When the speedbrakes are deployed, extending the flaps beyond FLAPS 1 may induce a slight roll movement, and in calm conditions a small lateral control asymmetry may remain until disturbed by a control input or by an atmospheric disturbance.

WHEN FLAPS ARE AT 2

– **ORDER . . . . "GEAR DOWN"**

– **L/G DOWN . . . . SELECT**

– **GROUND SPOILERS . . . . ARM**

– **AUTO BRK . . . . AS RQRD**

Use of autobrake is recommended.
Use of MAX mode is not recommended at landing.
On short or contaminated runways, use MED mode.
On long and dry runways, LO mode is recommended.

Note : If, on very long runways, the pilot anticipates that braking will not be needed, use of the autobrake is unnecessary.

Firmly press the appropriate pushbutton, according to the runway length and condition, and check that the related ON light comes on.

– **CONFIRM/ANNOUNCE . . . . "GEAR DOWN"**

WHEN LANDING GEAR IS DOWN

– **ORDER** . . . . **"FLAPS 3"**

– **FLAPS 3** . . . . **SELECT**
Select FLAPS 3 below VFE.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS 3"**

– **ECAM WHEEL page** . . . . **CHECK**
· ECAM WHEEL page appears below 800 feet, or at landing gear extension.
· Check for three landing gear green indications.

R ● **If residual pressure is indicated on the triple indicator :**

R – **RESIDUAL BRAKING PROC** . . . . **APPLY**

– **ORDER** . . . . **"FLAPS FULL"**

– **FLAPS FULL** . . . . **SELECT**
· Select FLAPS FULL below VFE. (VFE – 15 knots is recommended to minimize flaps wear).
· Retract the speedbrakes before selecting FLAPS FULL to avoid an unexpected pitch down, when the speedbrakes retract automatically.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS FULL"**
Check deceleration towards VAPP.

– **A/THR . . . . CHECK IN SPEED MODE OR OFF**

– **WING ANTI ICE . . . . OFF**
Switch the WING ANTI ICE ON, only in severe icing conditions.

– **EXTERIOR LIGHTS . . . . SET**
Set NOSE switch to TAXI.
RWY TURN OFF switch to ON, and
LAND switch to ON.

– **SLIDING TABLE ⊲ . . . . STOW**

– **LDG MEMO . . . . CHECK NO BLUE LINE**

– **CABIN REPORT . . . . OBTAIN**

– **CABIN CREW . . . . ADVISE**

– **LANDING CHECKLIST . . . . COMPLETE**

– **FLIGHT PARAMETERS . . . . CHECK**
PF announces any FMA modification.
The PNF calls out, if :
– Speed goes lower than the speed target – 5 knots, or greater than the speed target + 10 knots.
– Pitch attitude goes lower than – 2.5°, or greater than 10° nose up.
– Bank angle becomes greater than 7°.
– Descent rate becomes greater than 1000 feet/min.
– Excessive LOC or GLIDE deviation occurs.

AT DH + 100 FT (or MDA/MDH + 100 FT) :

– **MONITOR (or ANNOUNCE) . . . . "ONE HUNDRED ABOVE"**

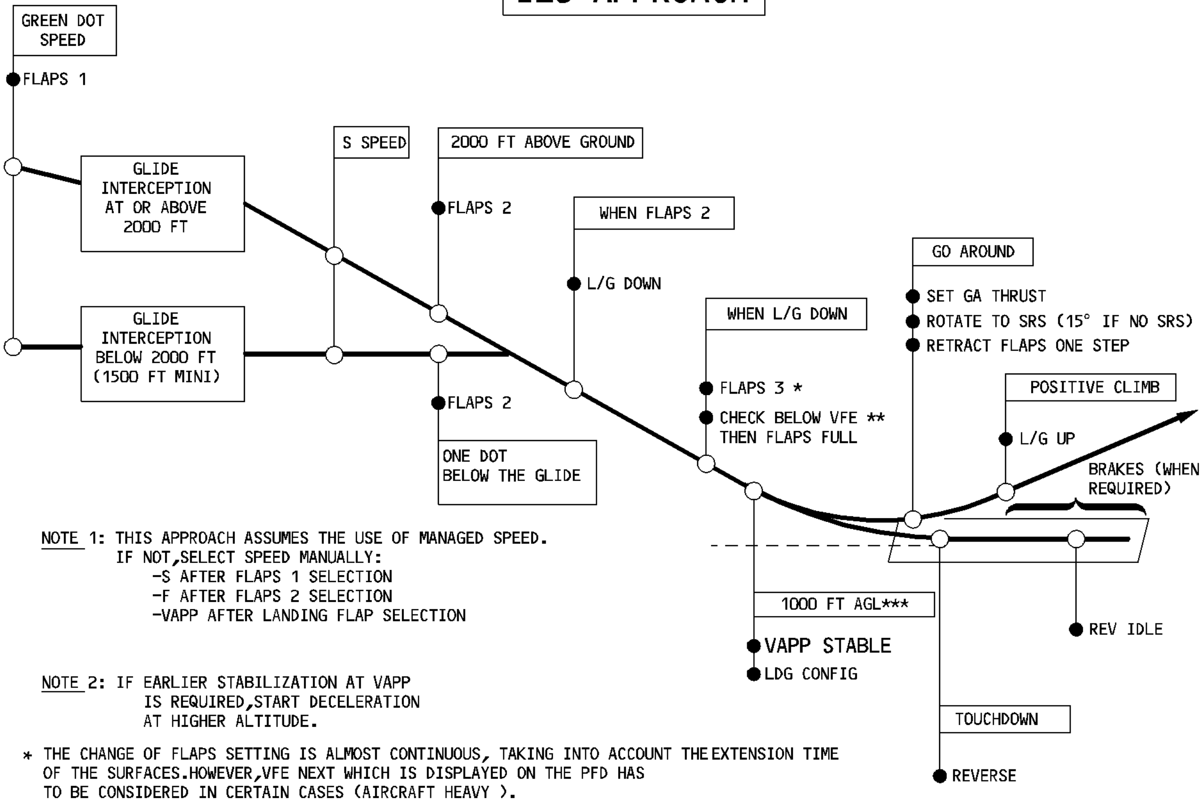
AT DH (or MDA/MDH)

– **MONITOR (or ANNOUNCE) . . . . "MINIMUM"**

– **ANNOUNCE . . . . "LANDING" or "GO AROUND/FLAPS"**
Do not duck under the glideslope. Maintain a stabilized flight path down to the flare.
At 50 feet, one dot below the glideslope is 14 feet below the glideslope.

NFC5-03-0318-009-A001AA

ILS APPROACH



NOTE 1: THIS APPROACH ASSUMES THE USE OF MANAGED SPEED.
IF NOT,SELECT SPEED MANUALLY:
-S AFTER FLAPS 1 SELECTION
-F AFTER FLAPS 2 SELECTION
-VAPP AFTER LANDING FLAP SELECTION

NOTE 2: IF EARLIER STABILIZATION AT VAPP IS REQUIRED,START DECELERATION AT HIGHER ALTITUDE.

* THE CHANGE OF FLAPS SETTING IS ALMOST CONTINUOUS, TAKING INTO ACCOUNT THE EXTENSION TIME OF THE SURFACES.HOWEVER,VFE NEXT WHICH IS DISPLAYED ON THE PFD HAS TO BE CONSIDERED IN CERTAIN CASES (AIRCRAFT HEAVY).

** TO MINIMIZE FLAPS WEAR,EXTEND FLAPS AT VFE-15 Kt WHEN POSSIBLE.

*** 1000Ft AGL MINIMUM IMC,
500Ft AGL MINIMUM VMC OR AS RESTRICTED BY AIRLINE POLICY/REGULATIONS.

INTRODUCTION

APPROACH GUIDANCE FOR NON PRECISION APPROACHES OTHER THAN LOC AND RNAV NON PRECISION APPROACHES

Three different approach strategies are available to perform non-precision approaches :
1. Lateral and vertical guidance, selected by the crew : TRK-FPA (or HDG-V/S) modes.
2. Lateral guidance, managed by the FM, and vertical guidance selected by the crew : NAV-FPA (or NAV-V/S) modes.
3. Lateral and vertical guidance, managed by the FM : FINAL APP mode.
   In all cases, the recommended flying reference is FPV, which should be selected during the initial approach.

— Approach procedures including a PI-CF leg (PROC-T indicated on the MCDU F-PLN) are not eligible for the use of NAV and FINAL APP modes.
— Lateral managed guidance (NAV) can be used, provided the approach is stored in the navigation database and the final approach is laterally and vertically monitored, using the adequate raw data (reference navaid, altimeter).
— Lateral and vertical managed guidance (FINAL APP) in IMC conditions can be used, provided the following conditions are met :
  · The approach stored in the navigation database has been validated, and is approved by the operator for use of FINAL APP mode.
R This validation includes evaluation of the OAT effect on obstacle clearance : It is
R necessary to define a minimum OAT, below which selected vertical guidance must be
R used.
  · The final approach (FAF to runway or MAP), as extracted from the navigation database and inserted in the primary F-PLN including altitude constraints, is not revised by the crew.
  · Before starting the approach, the crew must check the lateral and the vertical FM F-PLN against the published approach chart, using the MCDU and ND.
  · The approach trajectory is laterally and vertically intercepted, before the FAF, or equivalent waypoint in the FM F-PLN, so that the aircraft is correctly established on the final approach course before starting the descent.
  · The final approach is laterally and vertically monitored, using the appropriate raw data (navaids, distance to the runway or MAP, altitude, FPV).

R *Note : For additional information on recommended flight crew procedures, and on*
R *navigation database vertical flight path validation, refer to the dedicated FCOM*
R *Bulletin N° 53 and the FMGS Pilot's Guide (4.05.70).*

If the FM/GPS POS DISAGREE ECAM caution is triggered during the approach, use selected guidance to continue the approach with radio navaid raw data.
If GPS PRIMARY is lost, NAV and FINAL APP mode can be used to continue the approach, provided the radio navaid raw date indicates the correct navigation.

APPROACH GUIDANCE FOR RNAV APPROACH

Two different approach strategies are available to perform RNAV approaches :

1. Lateral guidance, managed by the FM, and vertical guidance selected by the crew : NAV-FPA (or NAV-V/S) modes.
   This strategy applies, when LNAV ONLY (Lateral Navigation only) RNAV approach is intended.
2. Lateral and vertical guidance, managed by the FM : FINAL APP mode.
   This strategy applies, when LNAV/VNAV (Lateral and Vertical Navigation) RNAV approach is intended.
   In all cases, the recommended flying reference is FPV, which should be selected during the initial approach.
   RNAV approach can be performed, provided :

- The approach procedure does not include a PI-CF leg (PROC T indicated on the MCDU F-PLN).
- The approach stored in the navigation database has been validated, and is approved by the operator.
R This validation includes evaluation of the OAT effect on obstacle clearance : It is
R necessary to define a minimum OAT, below which selected vertical guidance must be
R used.
- The final approach (FAF to runway or MAP), as extracted from the navigation database and inserted in the primary F-PLN including altitude constraints, is not revised by the crew.
- Before starting the approach, the crew must check the lateral and the vertical FM F-PLN against the published approach chart, using the MCDU and ND.
- Before starting the approach, two navigation systems must be operative : 2 FMGS and 2 sensors (2 GPS, 2 DME, 2 VOR as appropriate).
- The approach trajectory is laterally and vertically intercepted, before the FAF, or equivalent waypoint in the FM F-PLN, so that the aircraft is correctly established on the final approach course before starting the descent.
- The final approach is laterally and vertically monitored, using the appropriate raw data (distance to the runway, altitude, FPV).

R <u>Note</u> : *For additional information on recommended flight crew procedures, and on*
R *navigation database vertical flight path validation, refer to the dedicated FCOM*
R *Bulletin N° 53 and the FMGS Pilot's Guide (4.05.70).*

R **For RNAV approach with GPS PRIMARY**

R An instrument approach procedure, not requiring GPS PRIMARY, must be available at
R destination or destination alternate (and at required takeoff alternate, and en route
R alternate). Check RAIM availability, using the PREDICTIVE GPS MCDU page. Before starting
R the approach, check that GPS PRIMARY is available on both MCDUs.
R If the GPS PRIMARY LOST indication appears on the ND during the approach, discontinue
R the approach, unless :
R – For RNAV approach not requiring GPS, HIGH accuracy is displayed on the MCDU with
R the appropriate RNP value.
R – If GPS PRIMARY is lost on only one, FMGC, the approach can be continued, using the
R AP/FD associated to the other FMGC.
R If the FM/GPS POS DISAGREE ECAM caution is triggered during the approach, discontinue
R the approach.

R **For RNAV approach without GPS PRIMARY**

R Before starting the approach, check the FM position accuracy with radio navaid raw data.
R Check, in addition, that HIGH accuracy is displayed on the MCDU with the specified RNP
R value.
R If HIGH accuracy is lost on one FMGC, the approach can be continued with the AP/FD
R associated to the other FMGC.
R If HIGH accuracy is lost on both FMGCs, discontinue the approach.

APPROACH GUIDANCE FOR LOC NON PRECISION APPROACHES

The Standard Operating Procedure of this section can be used for flying LOC approaches, provided the following approach guidance items are observed.
The FM NAV mode can be used down to LOC interception.
For LOC intermediate and final approach, use the LOC AP/FD mode for lateral navigation, associated with the FPA (or V/S) for vertical navigation.
Vertical navigation must be monitored using raw data (altimeter, distance to the runway given by radio-navaid).
The VDEV indication on the PFD must be disregarded, since it may be incorrect if the MAP is located before the runway threshold.

APPROACH SPEED TECHNIQUE

In all cases, the crew should use managed speed.
The standard speed technique is to make a stabilized approach using AP/FD and A/THR :
The aircraft intercepts the final descent path in landing configuration, and at VAPP. For this purpose, the flight crew should insert VAPP as a speed constraint at the FAF.
If the operator adopts a decelerated approach technique and the crew uses managed guidance, the aircraft should intercept the final descent path at S speed in CONF 1.
R The objective is to be stabilized on the final descent path thrust above idle, in the landing
R configuration at 1000 feet.
R To be stabilized, all of the following conditions must be achieved prior to, or upon, reaching
R this stabilization height :
R – The aircraft is on the correct lateral flight plan,
R – The aircraft is in the desired landing configuration,
R – The thrust is stabilized above idle, to maintain the target speed on the desired descent
R path,
R – No excessive flight parameter deviation.
R If the aircraft is not stabilized on the approach and in landing configuration, at 1000 feet in
R instrument conditions, or at 500 feet in visual conditions, or as restricted by airline
R policy/regulations, a go-around must be initiated.

INITIAL APPROACH

- **ENG START selector . . . . AS RQRD**
  Select IGN if the runway is covered with standing water, or heavy rain, or if severe turbulence is expected in the approach or go-around area.

- **SEATBELTS . . . . ON/AUTO**

- **APPROACH PHASE . . . . ACTIVATE**
  · In NAV mode, the APPR phase automatically activates at the DECEL pseudo waypoint.
  · In HDG or TRK mode, manually activate the APPR phase on the PERF APPR page, when the distance to land is approximately 15 NM.

- **POSITIONING . . . . MONITOR**
  · In NAV mode, use VDEV information on the PFD and PROG page.
  · In HDG or TRK mode, use the energy circle displayed on ND representing the required distance to land.

- **MANAGED SPEED . . . . CHECK**
  If the ATC requires a particular speed, use selected speed. When the ATC speed constraint no longer applies, return to managed speed.

- **SPEEDBRAKES . . . . AS RQRD**

– **NAVIGATION ACCURACY . . . . MONITOR**
- When GPS PRIMARY is available, no accuracy check is required.
- When GPS PRIMARY is lost, check the PROG page to ensure that the required navigation accuracy is appropriate to the phase of flight. Perform a navigation accuracy check (as described in 3.03.15).

If the approach is stored in the navigation database, determine the strategy to be used for the final approach, according to the table below :

R

<table>
<tr><th rowspan="2">NAVIGATION ACCURACY</th><th rowspan="2">Approach guidance</th><th colspan="2">ND</th><th rowspan="2">AP/FD mode</th><th rowspan="2">TERR pushbutton</th></tr>
<tr><th>PF</th><th>PNF</th></tr>
<tr><td>GPS PRIMARY</td><td rowspan="3">Managed***</td><td colspan="2" rowspan="3">ARC or ROSE NAV *
With navaid raw data</td><td rowspan="3">NAV-FPA or APP-NAV/ FINAL ***</td><td rowspan="3">ON</td></tr>
<tr><td>NAV ACCUR HIGH</td></tr>
<tr><td>NAV ACCUR LOW and NAV ACCURACY check ≤ 1NM</td></tr>
<tr><td>GPS PRIMARY LOST and NAV ACCUR LOW and NAV ACCURACY check > 1 NM</td><td rowspan="2">Selected</td><td rowspan="2">ROSE VOR **</td><td rowspan="2">ARC or ROSE NAV or ROSE VOR **
With navaid raw data</td><td rowspan="2">TRK-FPA</td><td rowspan="2">OFF</td></tr>
<tr><td>GPS PRIMARY LOST and aircraft flying within unreliable radio navaid area</td></tr>
</table>

(*) For VOR approaches, one pilot may select ROSE VOR.
(**) For LOC approaches, select ROSE ILS.
(***) Managed vertical guidance can be used, provided the approach coding in the navigation database has been validated.

R *Note :* *1. During approach in overlay to a conventional radio navaid procedure, monitor raw*
R *data. If raw data indicates unsatisfactory managed guidance, revert to selected*
R *guidance.*
2. The pilot can continue to fly a managed approach, after receiving a NAV ACCUR DOWNGRADED message, if raw data indicates that the guidance is satisfactory.

– **RADAR TILT . . . . ADJUST**
Increase tilt, as required (+ 3° to + 4°).

– **APPROACH CHECKLIST . . . . PERFORM**

INTERMEDIATE/FINAL APPROACH

R ● **For RNAV approach :**

R – **GPS 1+2 on GPS MONITOR page . . . . CHECK BOTH IN NAV**

R – **GPS PRIMARY on PROG page . . . . CHECK AVAILABLE**

R ● **If GPS PRIMARY is not available**

R – **RNP for approach . . . . CHECK/ENTER**

R – **HIGH accuracy . . . . CHECK**

R *Note : RNAV approach without GPS is subject to a specific operational approval.*

● **For approach in managed vertical guidance :**

– **APPR pushbutton on FCU . . . . PRESS**
Once cleared for the approach, press the pushbutton when flying towards the FAF. Check that APPR NAV is engaged, FINAL is armed, and the VDEV scale is on the PFD.

Note : For instructions for switching from a non ILS to an ILS approach, see the FMGS pilot's guide. (Refer to 4.05.70)

AT GREEN DOT SPEED

– **ORDER . . . . "FLAPS 1"**

– **FLAPS 1 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 1"**

– **TCAS Mode Selector . . . . TA OR TA/RA**
· See ILS approach (Refer to 3.03.18)

– **ND DISPLAY . . . . SELECT RANGE/MODE**

AT S SPEED

– **ORDER . . . . "FLAPS 2"**

– **FLAPS 2 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 2"**

WHEN FLAPS ARE AT 2

– **ORDER . . . . "GEAR DOWN"**

– **L/G DOWN . . . . SELECT**

– **GROUND SPOILERS . . . . ARM**

– **AUTO BRK . . . . AS RQRD**
Use of the autobrake is recommended.
The use of MAX mode is not recommended at landing.
On short or contaminated runways, use MED mode.
On long and dry runways, LO mode is recommended.

Note : If, on very long runways, the pilot anticipates that braking will not be needed, autobrake use is unnecessary.

Firmly press the appropriate pushbutton, according to runway length and condition, and check that the related ON light comes on.

– **CONFIRM/ANNOUNCE . . . . "GEAR DOWN"**

WHEN LANDING GEAR DOWN :

– **ORDER . . . . "FLAPS 3"**

– **FLAPS 3 . . . . SELECT**
· Select FLAPS 3 below VFE.

– **CONFIRM/ANNOUNCE . . . . "FLAPS 3"**

– **ECAM WHEEL page . . . . CHECK**
· The ECAM WHEEL page appears below 800 feet, or at landing gear extension.
· Check the three landing gear green indications.

R ● **If residual pressure is indicated on the triple indicator :**

R – **RESIDUAL BRAKING PROC . . . . APPLY**

– **ORDER** . . . . **"FLAPS FULL"**

– **FLAPS FULL** . . . . **SELECT**
· Select FLAPS FULL below VFE. VFE – 15 knots is recommended to minimize flaps wear.
· Retract the speedbrakes before selecting FLAPS FULL to avoid an unexpected pitch down when the speedbrakes automatically retract.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS FULL"**
· Check deceleration towards VAPP.
R · Check correct TO waypoint on the ND.

MANAGED VERTICAL GUIDANCE	**SELECTED VERTICAL OR SELECTED LATERAL AND VERTICAL GUIDANCE**
. After the FAF : **– FINAL APP . . . . CHECK** Check FINAL APP green on the FMA. **– GO AROUND ALTITUDE . . . . SET** Set, when below the go-around altitude.	**. At FAF :** **– FPA for final approach . . . . SET** **. After the FAF :** **– GO AROUND ALTITUDE . . . . SET** Set, when below the go-around altitude.
– POSITION/FLIGHT PATH . . . . MONITOR **· For approach in overlay to a conventional radio navaid procedure :** Use radio navaid raw data and altitude to monitor the lateral and vertical navigation. If the navigation is unsatisfactory, revert to selected guidance. In particular, monitor the vertical guidance, using altitude indication versus radio navaid position, and be prepared to revert to NAV-FPA, if the vertical guidance is unsatisfactory. **· For RNAV approach :** Monitor VDEV and FPV (on the PFD) and XTK error (on the ND). Use altitude indication versus distance to the runway to monitor the vertical navigation. If the vertical guidance is unsatisfactory, revert to NAV/FPA or consider the go-around. If the lateral guidance is unsatisfactory, perform a go-around.	**– POSITION/FLIGHT PATH . . MONITOR/ADJUST** **· For approach in overlay to a conventional radio navaid procedure :** Use radio navaid raw data to monitor the lateral navigation. Using altitude indication versus radio navaid position, adjust the FPA, as necessary, to follow the published descent profile, taking into account the minimum altitudes. Do not use the FMGC VDEV on the PFD. If the lateral navigation is unsatisfactory, revert to TRK/FPA. **· For RNAV approach :** Monitor XTK error on ND. Using altitude indication versus distance to the runway, adjust the FPA as necessary to follow the published descent profile, taking into account the minimum altitudes. If the lateral guidance is unsatisfactory, perform a go-around.

– **A/THR . . . . CHECK IN SPEED MODE OR OFF**

– **WING ANTI ICE . . . . OFF**
Switch WING ANTI ICE ON only in severe icing conditions.

– **EXTERIOR LIGHTS . . . . SET**
Set NOSE switch to TAXI, RWY TURN OFF switch to ON, and LAND switch to ON.

– **SLIDING TABLE . . . . STOW**

– **LDG MEMO . . . . CHECK NO BLUE LINE**

– **CABIN REPORT . . . . OBTAIN**

– **CABIN CREW . . . . ADVISE**

– **LANDING CHECKLIST . . . . COMPLETE**

– **FLIGHT PARAMETERS . . . . CHECK**
PF announces any FMA modification.
PNF calls out :
R – "SPEED", when the speed goes below V target – 5, or goes above the speed target
R + 10.
R – "SINK RATE", when V/S is greater than – 1000 feet/minute.
R – "BANK", when the bank angle goes above 7 degrees.
R – "PITCH", when the pitch attitude goes below – 2.5 degrees, or goes above + 7.5
R degrees.
R – "COURSE", when greater than 1/2 dot (VOR) or 5 degrees (ADF).
R – "_ FT HIGH (LOW)" at altitude checkpoints.

R ● **AT ENTERED MDA/MDH + 100 FT :**

– **MONITOR or ANNOUNCE . . . . "ONE HUNDRED ABOVE"**

R ● **At ENTERED MDA or MDH**

– **MONITOR or ANNOUNCE . . . . "MINIMUM"**

● **If ground references are visible :**

– **ANNOUNCE . . . . "LANDING"**

– **AP . . . . OFF**
Continue, as with a visual approach (Refer to 3.03.20).

● **If ground references are not visible :**

– **ANNOUNCE . . . . "GO AROUND/FLAPS"**
Begin a go-around.

Note : 1. *In managed guidance (FINAL APP mode engaged), when the aircraft reaches MDA (MDH) – 50 or 400 feet (if no MDA/MDH entered), the autopilot automatically disengages.*
2. *In selected guidance, if ground references are not visible when the aircraft reaches MDA, the pilot should make an immediate go-around. However, if the distance to the runway is not properly assessed, a step descent approach may be considered and a level-off at MDA may be performed while searching for visual references. If the pilot has no visual reference at MAP, at the latest, he must begin a go-around.*

CIRCLING APPROACH

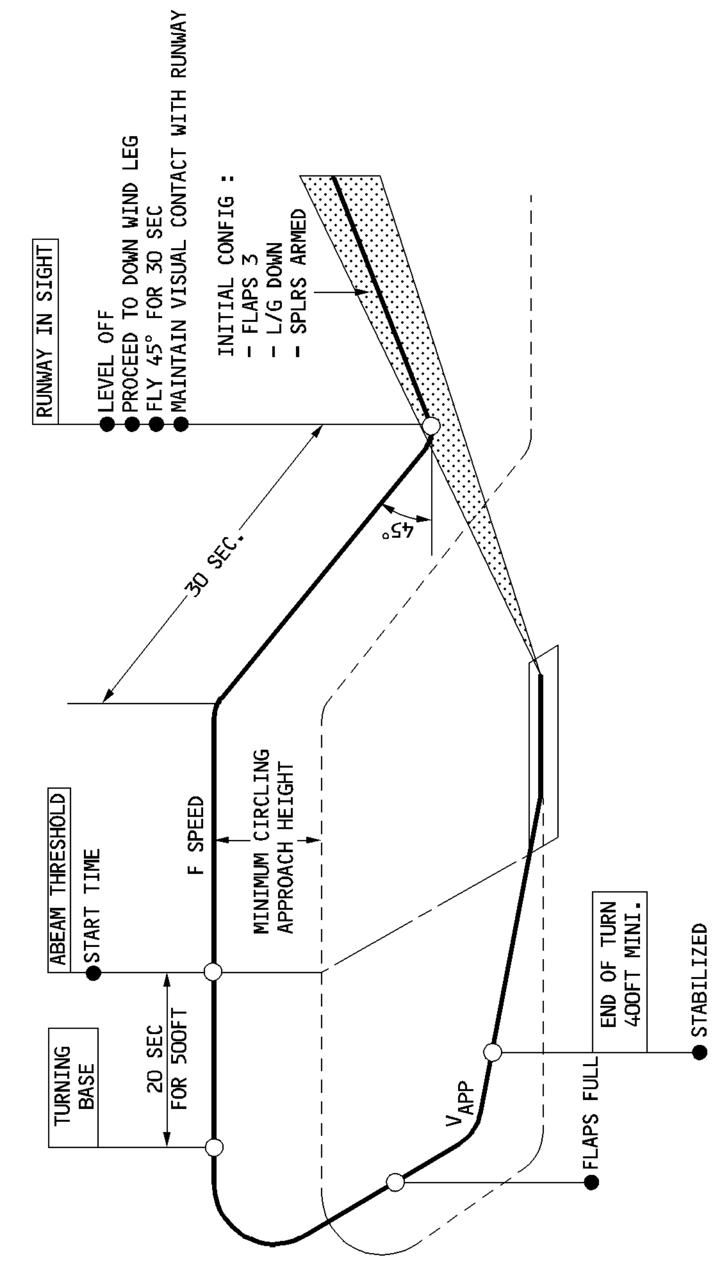
For a circling approach, the flight crew should prepare the flight plan as follows :
Primary flight plan : Introduce the instrument approach
Secondary flight plan : – Copy the ACTIVE F-PLN
– Revise the Landing runway
The aircraft should circle in CONF 3 at F speed.
Upon reaching MDA :
– Push the V/S/FPA knob to level off.
– Search for visual reference.

- **If the flight crew finds no visual reference :**
  - **AT MAP : Initiate go-around**
- **If the flight crew finds sufficient visual references :**
  - **Select TRK for downwind**
  - **Early on downwind : Activate SEC F-PLN**

CAUTION
The PNF should activate the SEC F-PLN.
The PF should maintain visual contact during all the circling.

  - **Disengage autopilot before reaching the base leg.**

LOW VISIBILITY CIRCLING APPROACH



NFC5-03-0319-013-A001AA

OBJECTIVE

Perform the approach on a nominal 3 degree glideslope using visual references. Approach to be stabilized by 500 feet AGL on the correct approach path, in the landing configuration, at VAPP.

Method :

- The autopilot is not used.
- Both FDs are off.
- FPV use is recommended.
- A/THR use is recommended with managed speed.

R Bear in mind the possible risk of optical illusions due to hindered night vision.

VISUAL CIRCUIT

INITIAL/INTERMEDIATE APPROACH

The flight plan selected on the MCDU should include the selection of the landing runway. The downwind leg may also be part of the flight plan. This may be a useful indication of the aircraft position in the circuit on the ND.

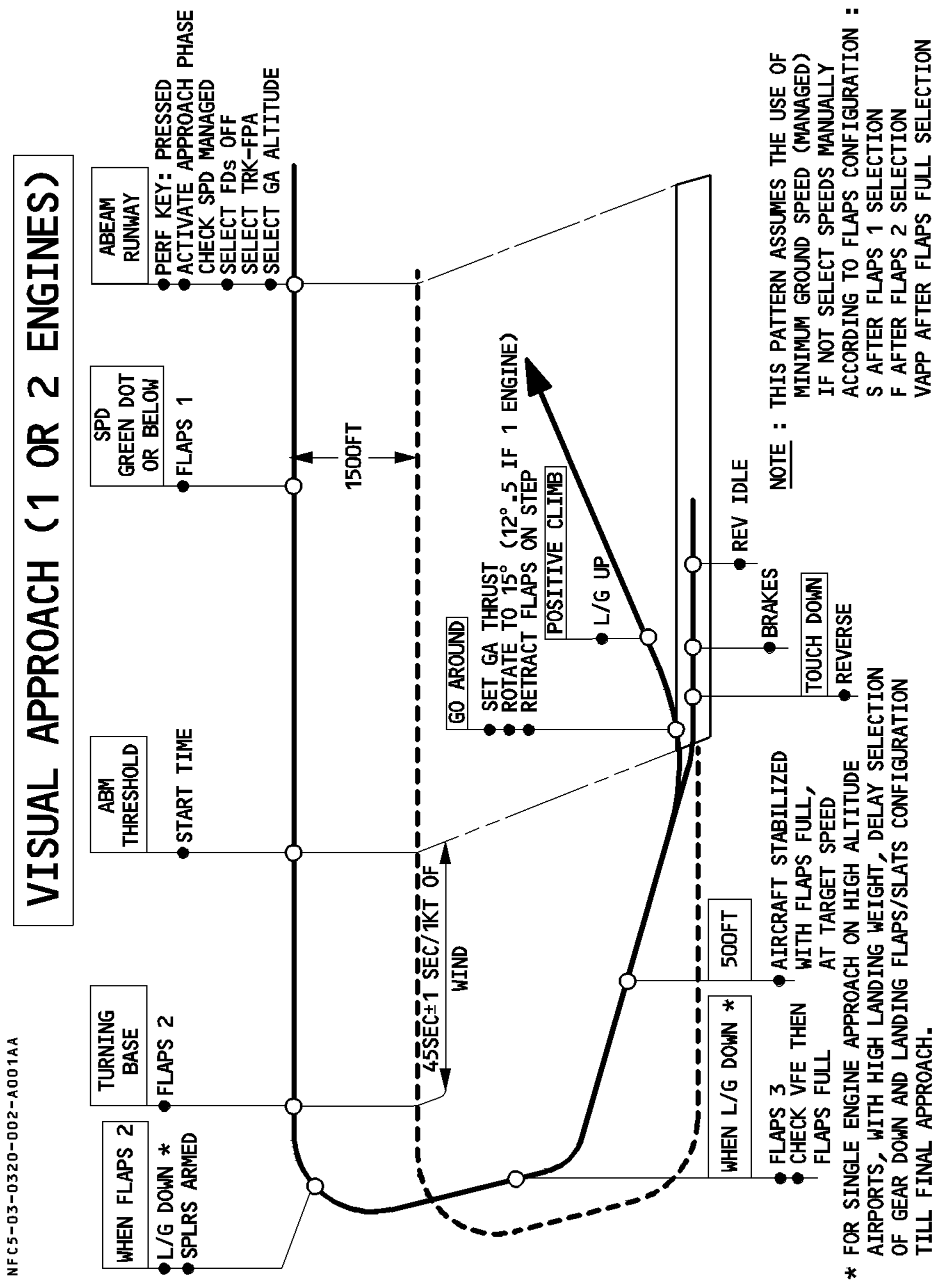
However, visual references must be used.

Therefore, at the beginning of the downwind leg :

- **Manually ACTIVATE APPR.**
- **Select FDs to OFF.**
- **Select TRK-FPA to have FPV displayed.**
- **Check A/THR active.**
  Extend the downwind leg to 45 seconds (± wind correction).
  Turn into base leg with a maximum of 30° of bank. Descent with approximate FPA, in FLAPS 2, at F speed.

FINAL APPROACH

- The speed trend arrow and FPV help the flight crew make timely and correct thrust settings (if in manual thrust), and approach path corrections. Avoid descending through the correct approach path with idle thrust. (Late recognition of this situation without a prompt thrust increase may lead to considerable speed decay and altitude loss).
- Have the aircraft stabilized by 500 feet AGL, on the correct approach path at VAPP (or ground speed mini) with the appropriate thrust applied. If not stabilized, a go-around should be considered.
- Avoid any tendency to “duck under” in the late stages of the approach.
- Avoid destabilizing the approach in the last 100 feet, in order to have the best chance of performing a good touchdown at the desired position.

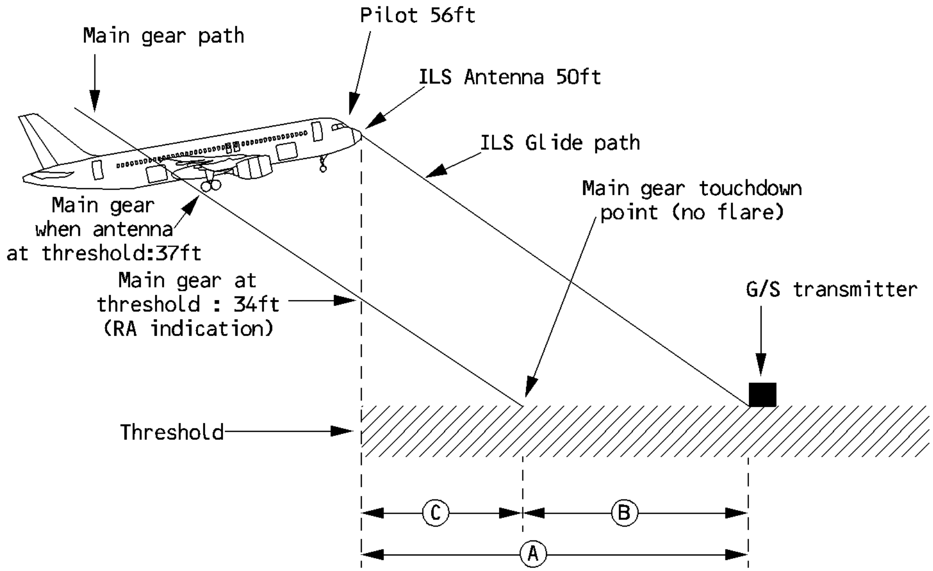

VISUAL APPROACH (1 OR 2 ENGINES)
ABEAM RUNWAY
PERF KEY: PRESSED
ACTIVATE APPROACH PHASE
CHECK SPD MANAGED
SELECT FDs OFF
SELECT TRK-FPA
SELECT GA ALTITUDE
SPD GREEN DOT OR BELOW
FLAPS 1
1500FT
ABM THRESHOLD
START TIME
TURNING BASE
FLAPS 2
WHEN FLAPS 2
L/G DOWN *
SPLRS ARMED
45SEC±1 SEC/1KT OF WIND
GO AROUND
SET GA THRUST
ROTATE TO 15° (12°.5 IF 1 ENGINE)
RETRACT FLAPS ON STEP
POSITIVE CLIMB
L/G UP
REV IDLE
BRAKES
TOUCH DOWN
REVERSE
500FT
AIRCRAFT STABILIZED WITH FLAPS FULL, AT TARGET SPEED
WHEN L/G DOWN *
FLAPS 3
CHECK VFE THEN FLAPS FULL
NOTE : THIS PATTERN ASSUMES THE USE OF MINIMUM GROUND SPEED (MANAGED)
IF NOT SELECT SPEEDS MANUALLY ACCORDING TO FLAPS CONFIGURATION :
S AFTER FLAPS 1 SELECTION
F AFTER FLAPS 2 SELECTION
VAPP AFTER FLAPS FULL SELECTION
* FOR SINGLE ENGINE APPROACH ON HIGH ALTITUDE AIRPORTS, WITH HIGH LANDING WEIGHT, DELAY SELECTION OF GEAR DOWN AND LANDING FLAPS/SLATS CONFIGURATION TILL FINAL APPROACH.
NFC5-03-0320-002-A001AA

PRECISION APPROACH

R (Refer to FCOM 4.05.70).

ILS FINAL APPROACH AND LANDING GEOMETRY

R

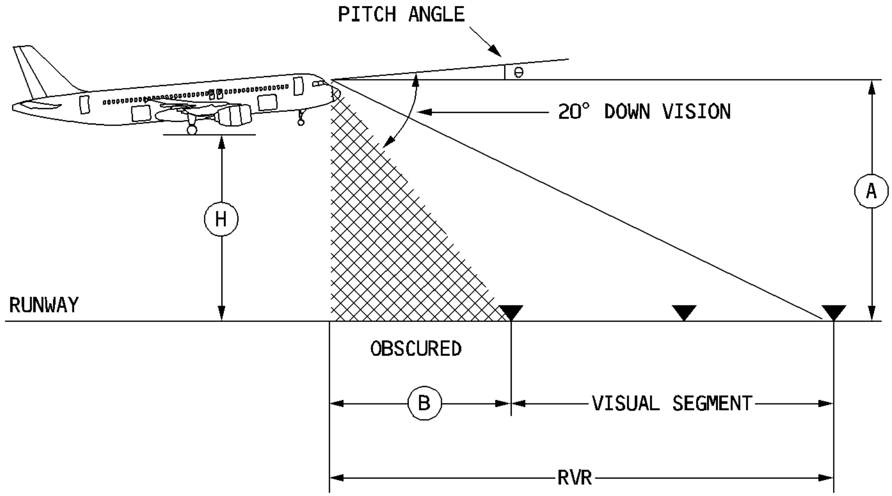


NFC5-03-0322-001-A040AA

CONDITIONS :	GLIDE PATH (°)	A	B	TOUCHDOWN POINT C
- FLAPS FULL - ILS ANTENNA AT 50 ft AT THRESHOLD	2°5	348 m 1145 ft	112 m 366 ft	236 m 779 ft
- NO FLARE - PITCH ANGLE : 4°	3°	291 m 954 ft	93 m 306 ft	198 m 648 ft

MINIMUM VISUAL GROUND SEGMENTS (Flare phase)

R



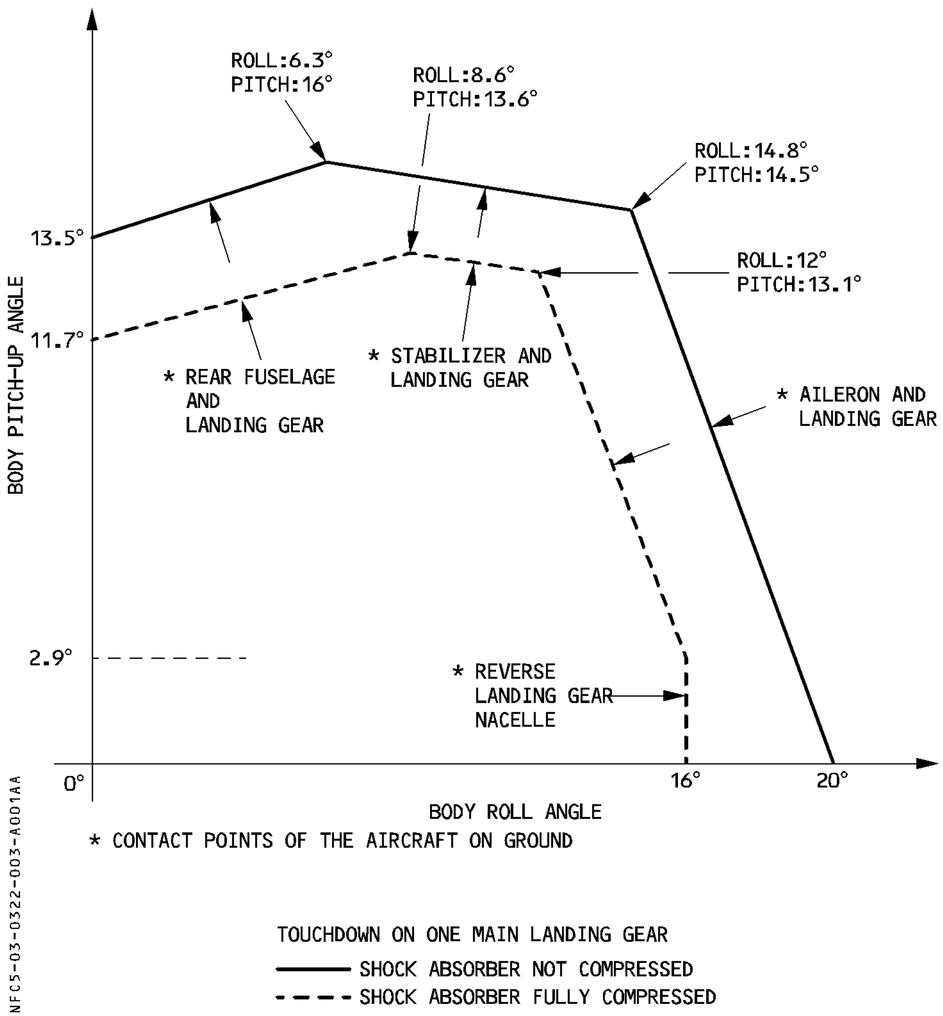
	CAT III		CAT II
H	15 ft (θ = 5.4°)	50 ft (θ = 4.7°)	100 ft (θ = 4.7°)
VISUAL SEGMENT	60 m (197 ft)		120 m (394 ft)
A	36 ft	71 ft	121 ft
OBSCURED B	43 m (140 ft)	79 m (259 ft)	134 m (442 ft)
MINIMUM RVR	103 m (337 ft)	139 m (456 ft)	254 m (836 ft)

NFC5-03-0322-002-A040AA

R *Note : This drawing shows that, for a CAT III landing (60 meters minimum visual segment),*
R *the minimum RVR is 103 meters at 15 feet.*

GROUND CLEARANCE DIAGRAM

R



LANDING

The cockpit cut-off angle is 20 degrees.

R ● **At approximately 30 feet :**

– **FLARE . . . . PERFORM**

– **ATTITUDE . . . . MONITOR**
The PNF should monitor the attitude, and call out :
R – "PITCH, PITCH", if the pitch angle reaches 10 degrees.
– "BANK, BANK", if the bank angle reaches 7 degrees.

– **THRUST levers . . . . IDLE**
In manual landing conditions, the "RETARD" callout is generated at 20 feet RA, as a reminder. Start a gentle progressive flare, and allow the aircraft to touch down without prolonged float.

Crosswind landings

· The preferred technique is to use the rudder to align the aircraft with the runway heading, during the flare, while using lateral control to maintain the aircraft on the runway centerline. Routine use of into wind aileron is not recommended, because sidestick deflection commands the roll rate until touchdown.
In strong crosswind conditions, small amounts of lateral control may be used to maintain the wings level. This lateral stick input must be reduced to zero at first main landing gear touchdown.

Ground clearance

· Avoid flaring high.
· A tailstrike occurs, if the pitch attitude exceeds 13.5 degrees (11 degrees with the landing gear compressed).
A wingtip or engine scrape occurs, if the roll angle exceeds 20 degrees (16 degrees with the landing gear compressed).
· Be aware of the pitch-up tendency, with ground spoiler extension.

- **At touchdown :**

  – **REV . . . . MAX**
  · Select MAX REV immediately after the main landing gear touches down.
  If the airport regulations restrict the use of reversers, select and maintain reverse idle until taxi speed is reached.
  A slight pitch-up, easily controlled by the crew, may appear when the thrust reversers are deployed before the nose landing gear touches down.
  Lower the nosewheel without undue delay, if MED is selected.
  · In case of engine failure, the use of the remaining reverser is recommended.
  · Braking may be commenced before nosewheel is down, if required for performance reasons ; but when comfort is the priority, it should be delayed until the nosewheel has touched down.
  During roll out, sidestick inputs (either lateral or longitudinal) should be avoided.
  If directional control problems are encountered, reduce thrust to reverse idle until directional control is satisfactory.
  · After reverse thrust is initiated, a full stop landing must be made.

– **GROUND SPOILERS . . . . CHECK**
Check that the ECAM WHEEL page shows the ground spoilers fully deployed after
R touchdown. Announce “Ground spoilers” then “reverse green”.

– **DIRECTIONAL CONTROL . . . . ENSURE**
· Use rudder pedals for directional control.
· Do not use the nosewheel steering control handle before reaching taxi speed.

– **BRAKES . . . . AS RQRD**
· Monitor the autobrake, if it is on. When required, brake with the pedals.
· Although the green hydraulic system supplies the braking system, if pedals are pressed quickly a brief brake pressure indication appears on the BRAKE PRESS indicator.

- **At 70 knots :**

  – **THRUST levers . . . . REV IDLE**
  70 knots is the minimum recommended speed with full reverse thrust.

  CAUTION
  Avoid using high levels of reverse thrust at low airspeed, because gases re-entering the compressor can cause engine stalls that may result in excessive EGT.

- **At taxi speed :**

  – **THRUST levers . . . . FWD IDLE**
  · Deselect the REV position upon reaching taxi speed and before leaving the runway. On snow-covered grounds, reversers should be stowed when the aircraft speed reaches 25 knots. When deselecting REV, be careful not to apply forward thrust by moving the thrust levers beyond the FWD IDLE position.

  > CAUTION
  > On taxiways, the use of reversers, even when restricted to idle thrust, may have the following effects :
  > – The engines may ingest fine sand and debris that may be detrimental to both the engines and the airframe systems.
  > – On snow covered areas, snow will recirculate into the air inlet, which may result in engine flame-out or roll back.Except in an emergency, do not use reverse thrust to control aircraft speed while taxiing.

- **Before 20 knots :**

  – **AUTO BRK . . . . DISENGAGE**
  Disengage the autobrake to avoid some brake jerks at low speed.

GO AROUND

Apply the following three actions simultaneously :

– **THRUST LEVERS . . . . TOGA**

– **ANNOUNCE . . . . "GO AROUND – FLAPS"**

– **ROTATION . . . . PERFORM**
· Rotate the aircraft to get a positive rate of climb, and establish the required pitch attitude, as directed by the SRS pitch command bar.
· Check and announce the FMA : MAN TOGA, SRS, GA TRK.

– **FLAPS . . . . RETRACT ONE STEP**
Announce "FLAPS..." when indicated.

– **ANNOUNCE . . . . "POSITIVE CLIMB"**

– **ORDER . . . . "GEAR UP"**

– **L/G UP . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "GEAR UP–FLAPS"**

Note : Consider retarding to CL detent, if TOGA thrust is not required.

– **NAV or HDG mode . . . . SELECT**
Reselect NAV or HDG, as required (minimum height 100 feet).

Note : Go-around may be flown with both autopilots engaged. Whenever any other mode engages, AP 2 disengages.

● **At go-around thrust reduction altitude (LVR CLB flashing on FMA) :**

R – **THRUST LEVERS . . . . CL**

- **At go-around acceleration altitude :**

  – **Monitor target speed increases to green dot.**

R - **If target speed does not increase to green dot :**

R   – **FCU ALT . . . . CHECK and PULL**

  – **Retract flaps on schedule.**

  Note : Consider the next step :
  – Engage NAV mode, to follow the published missed approach procedure, or
  – Prepare for a second approach by selecting the ACTIVATE APP PHASE, and CONFIRM on the PERF page.

LEFT INTENTIONALLY BLANK

LEFT INTENTIONALLY BLANK

AFTER LANDING

– **LAND LIGHTS . . . . RETRACT**
Retract landing lights, unless they are needed.
Set the STROBE lights to AUTO, when leaving the runway.

– **GROUND SPOILERS . . . . DISARM**

– **FLAPS . . . . RETRACT**
· Set the FLAP lever to position 0.
· If the approach was made in icing conditions, or if the runway was contaminated with slush or snow, do not retract the flaps and slats until after engine shutdown and after the ground crew has confirmed that flaps and slats are clear of obstructing ice.
· On ground, hot weather conditions may cause overheating to be detected around the bleed ducts in the wings, resulting in “AIR L(R) WING LEAK” warnings. Such warnings may be avoided during transit by keeping the slats in Configuration 1 when the OAT is above 30°C.

– **ENG MODE selector . . . . NORM**

– **ATC . . . . STBY/OFF**
This is not applicable to transponder panels equipped with an AUTO position, if AUTO is selected.

– **TCAS Mode selector ◁ . . . . STBY**
This is only applicable to transponder panels equipped with an AUTO position, if AUTO is selected.

– **ANTI ICE . . . . AS RQRD**
If engine anti-ice is used, take care to control taxi speed, especially on wet or slippery surfaces. (N1 ground idle is increased).

– **APU . . . . START**
APU START may be delayed until just prior to engine shutdown.

– **RADAR . . . . OFF/STBY**

– **PREDICTIVE WINDSHEAR SYSTEM ◁ . . . . OFF**
Switching the radar and predictive windshear system OFF after landing avoids risk of radiating persons at the gate area.

– **BRAKE TEMPERATURE . . . . CHECK**
- Check brake temperature on the ECAM WHEEL page for discrepancies and high temperature.
- If brake fans are installed (◁) :
R Brake fans selection should be delayed for a minimum of about 5 minutes, or done just
R before stopping at the gate (whichever occurs first), to allow thermal equalization and stabilization and thus avoid oxidation of brake surface hot spots.
  However, when turnaround times are short, or brake temperatures are likely to exceed 500°C, use the brake fans, disregarding possible oxidation phenomenon.
- Refer to 3.04.32 for the brake temperature limitations requiring maintenance actions.

– **AFTER LANDING CHECKLIST . . . . COMPLETE**
Ensure that the after-landing checks are completed, once the aircraft has cleared the runway.

PARKING

Prior to performing this check, consideration should be given to "GROUND OPERATIONS IN HEAVY RAIN" (Refer to 3.04.30).

– **PARKING BRAKE ACCU PRESS . . . . CHECK**
The ACCU PRESS indication must be in the green band. In case of low accumulator pressure, chocks are required before engine 1 shutdown.

– **PARKING BRK . . . . ON**
· Above 500°C, parking brake application should be avoided, unless operationally necessary.

R – **ANTI-ICE . . . . OFF**

– **APU BLEED . . . . ON**
Select APU bleed ON just before engine shutdown to prevent engine exhaust fumes from entering the air conditioning.

– **ENG MASTER switch 1 and 2 . . . . OFF**

CAUTION

If JP4 fuel is used at ambient temperatures higher than 10°C, dry motor the engines for 2 minutes after engine shutdown. This dry motor period should start approximately 90 seconds after the master lever is selected off.

· Following high thrust operation, such as maximum reverse thrust during landing, operate the engine at idle for 3 minutes prior to shutdown to thermally stabilize the engine's hot section. Operating time at idle, as during taxiing, is included in this 3-minute period. If operational requirements dictate, the engine may be shut down after a one-minute cooling period.
· If APU is not available, set EXT PWR at ON before setting ENG MASTERS OFF.
· Check that engine parameters decrease.

Note : *If the engine fails to shut down, switch the affected master lever ON then OFF. If the engine still fails to shut down, press the affected ENG FIRE pushbutton (Engine will shut down after about 1 minute, during which it uses the fuel between the LP valve and the nozzles).*

· The DOOR page is displayed on the lower ECAM display.

– **GROUND CONTACT . . . . ESTABLISH**
· Establish ground communication.
· Check chocks in place.

– **SLIDE DISARMED . . . . CHECK**
Check slides disarmed on the ECAM DOOR page. Warn the cabin crew, if any slide is not disarmed.

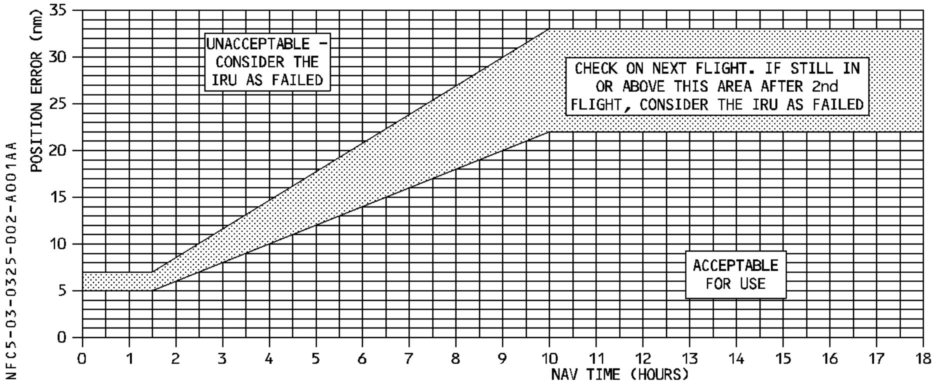
– **EXTERIOR LIGHTS . . . . AS RQRD**
Switch off the BEACON switch, when all engines have obviously spooled down.

– **SEAT BELTS . . . . OFF**

– **ELAPSED TIME (⧏) . . . . STOP**

– **FUEL PUMPS . . . . OFF**

– **IRS PERFORMANCE . . . . CHECK**
· Drift check
– Call up the POSITION MONITOR page. Check that the drift does not exceed the following:



· Residual ground speed check :
- CAPT and F/O NDs display the IRS 1 and 2 residual ground speeds respectively. The IRS 3 residual ground speed can be read on the CAPT ND by switching the ATT HDG selector to CAPT ON 3.
  · If ground speed ≥ 15 knots : Report (The IR part of the ADIRU must be considered as failed, if the excessive deviation occurs after two consecutive flights).
  · If ground speed ≥ 21 knots : Report (The IR part of the ADIRU must be considered as failed).

  Note : *On aircraft equipped with LITTON IRS, the ground speed check must be performed within the 2 minutes following aircraft stop. (Ground speed reset to 0 after 2 minutes).*

- **FUEL QUANTITY . . . . CHECK**
  Check that the sum of the fuel on board and the fuel used is consistent with the fuel on board at departure. If an unusual discrepancy is found, maintenance action is due.

- **STATUS (ECAM Control panel) . . . . PRESS**
  - Check the STATUS page.
    If maintenance status messages are displayed :
    · At transit : Disregard, unless AIR BLEED maintenance status.
    · At main base, or at an airport where repairs can easily be made (at the end of the last flight of the day) : Report for maintenance analysis.

- **BRAKE FAN (⊲) . . . . OFF**
  Switch off, when not required.

- **PARKING BRAKE . . . . AS RQRD**
  · The parking brake should be released after chocks are in place, if the "BRAKES HOT" ECAM caution is displayed.
  Releasing the parking brake prevents the critical structures from being exposed to high temperature levels for an extended time. However, if operational conditions dictate (e.g. slippery tarmac), the parking brake may remain applied.
  · When parking with a flat tire on the nose gear, keep the parking brake on, to avoid aircraft yawing at parking brake release.

- **DUs . . . . DIM**
  Dim EFIS, ECAM and MCDU display units.

- **PARKING CHECKLIST . . . . COMPLETE**

- **REPORT SEVERE ICING CONDITIONS**
  Report severe icing conditions in the log book, requiring inspection of the fan accoustic panels of the engines during the walkaround.

SECURING THE AIRCRAFT

Prior to performing this check, COLD WEATHER should be taken into account (Refer to 3.04.91).

- **PARKING BRAKE** . . . . **CHECK ON**
  To reduce hydraulic leak rate in the brake accumulator, keep the parking brake on.

- **OXYGEN CREW SUPPLY** . . . . **OFF**

- **ADIRS (1 + 2 + 3)** . . . . **OFF**
  ADIRS should not be switched off during transits at latitudes above 70°N, to avoid their requiring excessive alignment time.
  After having switched off the ADIRS, wait at least 10 seconds before switching off the electrical supply to ensure that the ADIRS memorize the latest data.

- **EXTERIOR LIGHTS** . . . . **OFF**

- **MAINT BUS switch** . . . . **AS RQRD**
  Should electrical power be required for the crew or servicing personnel, consider setting the overhead MAINT BUS switch (in the forward cabin) to the ON position, prior to setting aircraft power to off.

- **APU BLEED** . . . . **OFF**

- **APU MASTER switch** . . . . **OFF**
  Switch off the APU after the passengers have disembarked.

- **EMER EXIT LT** . . . . **OFF**

- **NO SMOKING** . . . . **OFF**
  Switching off the NO SMOKING signs enables the emergency batteries to be charged, provided external power is supplying the aircraft network.

- **EXT PWR** . . . . **AS RQRD**

- **BAT 1 and 2** . . . . **OFF**
  Wait until the APU flap is fully closed (about 2 minutes after the APU AVAIL light goes
  R out), before switching off the batteries. Switching the batteries off before the APU flap
  R is closed may cause smoke in the cabin during the next flight.
  If the batteries are off while the APU is running, APU fire extinguishing is not available.

- **SECURING THE AIRCRAFT CHECKLIST** . . . . **COMPLETE**

COMMUNICATIONS AND STANDARD TERMS

Standard phraseology is essential to ensure effective crew communication. The phraseology should be concise and exact. The following Chapter lists the calls that should be used as standard. They supplement the callouts identified in the SOP.
These standard Airbus callouts are also designed to promote situational awareness, and to ensure crew understanding of systems and their use in line operation.

R ## CHECKLIST CALLOUTS

– "CHECK" : A command for the other pilot to check an item.
– "CHECKED" : A response that an item has been checked.
– "CROSSCHECKED" : A call verifying information from both pilots stations.

R If a checklist needs to be interrupted, announce : "HOLD CHECKLIST AT ___" and "RESUME
R CHECKLIST AT ___" for the continuation.
Upon completion of a checklist announce : "__CHECKLIST COMPLETE".

ACTIONS COMMANDED BY PF

The following commands do not necessarily initiate a guidance mode change, eg : selected to managed/managed to selected. The intent is to ensure clear, consistent, standard communication between crewmembers.
All actions performed on the FCU must be verified on the PFD/ND.

SET

The "SET" command means using an FCU knob to set a value, but not to change a mode. SET is accomplished by only rotating the appropriate selection knob. Example :
– "SET GO AROUND ALTITUDE__"
– "SET QNH __"
– "SET FL __"
– "SET HDG __"

MANAGE/PULL

The "MANAGE" command means pushing an FCU knob to engage, or arm, a managed mode or target.
The "PULL" command means pulling an FCU knob to engage, or arm, a selected mode or target. Example :

– "HDG 090 PULL"	(Heading knob is turned and pulled).
– MANAGE NAV	(Heading knob is pushed).
– "FL 190 PULL"	(Altitude knob is turned and pulled).
– "FL 190 MANAGE"	(Altitude knob is turned and pushed).
– SPEED 250 KTS PULL	(Speed knob is turned and pulled).
– MANAGE SPEED	(Speed knob is pushed).

Note : 1. If the value was previously set, there is no requirement to repeat the figure. Simply call e.g. HDG PULL : SPEED PULL : FL PULL
2. It is sometimes preferable to first pull the FCU knob before setting the value (e.g. a long turn).

The VS/FPA selector knob has no managed function. The standard calls for the use of this knob are as follows :
V/S Plus (or Minus) 700 PULL or –
FPA Minus 3° PULL (V/S (FPA) knob is turned and pulled)
PUSH TO LEVEL OFF (V/S (FPA) knob is pushed)

ARM

The "ARM __" command means arming a system by pushing the specified FCU button.
e.g. : "ARM APPROACH"
e.g. : "ARM LOC."

ON/OFF

The simple ON or OFF command is used for the autopilot, flight directors, autothrust and the bird (flight path vector).
e.g. : BIRD ON (The HDG-V/S/TRK-FPA pushbutton is pushed.)

Note : All actions on the FCU and MCDU must be verified on the PFD and ND, as follows :
– First, ensure that the correct FCU knob is used, then verify indications on the PFD/ND.
– Mode changes should be confirmed by calling the color when appropriate (e.g. BLUE, MAGENTA).

FMA

Unless listed otherwise (eg CAT II & III task sharing), all FMA changes will be normally called by the PF.

ALTITUDE

The PNF calls when passing 1000 feet before the cleared altitude or FL, and is acknowledged by the PF calling : "CHECKED".
R e.g. : 1000 below 4000
R e.g. : 1000 above 290

FLAP OR GEAR CONFIGURATION

FLAPS CALLS

FLAPS CONFIGURATION	CALL
1	One
1 + F	One
0	Zero

The reply will be given when selecting the new flap position.
e.g. :

	CALL	REMARK
PF	"FLAPS FULL"	PF commands Flaps Full
PNF	"SPEED CHECKED" "FLAPS FULL"	PNF replies when selecting the Flap position, and checks the blue number on the ECAM flap indicator to confirm the correct selection has been made.

GEAR CALL

	CALL	REMARK
PF	"GEAR UP (DOWN)"	PF commands Gear Up (Down)
PNF	"GEAR UP (DOWN)"	PNF replies when selecting the Gear position, and checks the lights on the landing gear indicator panel to confirm gear operation.

FLIGHT PARAMETERS

PNF will make call-outs for the following conditions during final approach. Attitude callouts also to be made through to landing.
- "SPEED" when speed becomes less than Vapp – 5 or more than speed target + 10.
- "SINK RATE" when V/S is greater than – 1000 ft/min.
- "BANK" when bank angle becomes greater than 7°.
- "PITCH" when pitch attitude becomes lower than – 2.5° or higher than + 10°.
- 'LOC" or "GLIDE" when either localizer or glide slope deviation is one dot.
- "COURSE" when greater than 1/2 dot (VOR) or 5 degrees (ADF).
- "__ FT HIGH (LOW)" at altitude checks points.

PF/PNF DUTIES TRANSFER

Transfer of control is initiated by a command and followed by an acknowledgement.

– "I HAVE CONTROL" is either the command that the other pilot is to pass control and assume PNF duties ; or the acknowledgement by the other pilot that he has assumed PF duties.
– "YOU HAVE CONTROL" is either the command that the other pilot is to take control and assume PF duties ; or the acknowledgement by the other pilot that he has assumed PNF duties.

ABNORMAL AND EMERGENCY CALL OUTS

ECAM Procedures

1. "ECAM ACTION" is commanded by PF when required.
2. "CLEAR __ (title of the system)" is asked by the PNF for confirmation by the PF, that all actions have been taken/reviewed on the present ECAM WARNING/CAUTION or SYSTEM PAGE.
   e.g. : CLEAR HYDRAULIC
3. "CLEAR __ (title of the system)" is the command by the PF that the action and review is confirmed.
4. "ECAM ACTIONS COMPLETE" is the announcement by the PNF that all APPLICABLE ACTIONS have been completed.
5. Should the PF require an action from the PNF during ECAM procedures, the order "STOP ECAM" will be used. When ready to resume the ECAM the order "CONTINUE ECAM" will be used.

SUMMARY FOR EACH PHASE

TO REMOVE GROUND SUPPLY		
EVENT	**PF or PNF**	**GND Mech**
Initial ground contact	GROUND (from) COCKPIT	COCKPIT (from) GROUND
External __ disconnection	REMOVE EXTERNAL __	EXTERNAL__ REMOVED

BEFORE ENGINE START/PUSH BACK		
EVENT	**PF**	**PNF**
Before start up clearance received	BEFORE START C/L TO THE LINE	BEFORE START C/L TO THE LINE COMPLETE
After start up clearance received	BELOW THE LINE	BEFORE START C/L COMPLETE

PUSH BACK/ENGINE START

EVENT	PF	GND Mech.
When ready for push back and push back clearance received from ATC	GROUND (from) COCKPIT, CLEARED FOR PUSH	COCKPIT (from) GROUND, RELEASE BRAKES
Start of push	BRAKES RELEASED CLEAR TO PUSH	
When ready to start engines	CLEAR TO START ? STARTING ENG(S)__	CLEAR TO START
When push back completed	BRAKES SET	SET BRAKES
When ready to disconnect (after engine started and parameters are stabilized)	CLEAR TO DISCONNECT (hand signals on left/right)	DISCONNECTING (hand signals on left/right)

AFTER ENGINE START

EVENT	PF	PNF
All engines started and stabilized and GND is disconnected	AFTER START C/L	AFTER START C/L COMPLETE

TAXI

EVENT	PF	PNF
When taxi clearance obtained	CLEAR LEFT (RIGHT) SIDE	CLEAR RIGHT (LEFT) SIDE
Brake transfer check	BRAKE CHECK	PRESSURE ZERO
Flight control check in following sequence (can be done before start of taxi)	FLIGHT CONTROL CHECK	
1. Elevators	FULL UP, FULL DOWN, NEUTRAL	CHECKED
2. Ailerons	FULL LEFT, FULL RIGHT, NEUTRAL	CHECKED
3. Rudder *	FULL LEFT, FULL RIGHT, NEUTRAL	CHECKED
During taxi	BEFORE TAKE-OFF CHECK LIST TO THE LINE	BEFORE TAKE-OFF C/L TO THE LINE COMPLETE
Lining up on the runway	BELOW THE LINE	BEFORE TAKE-OFF C/L COMPLETE

*Note : * The PNF should follow pedal movement with his/her feet*

R

TAKE-OFF		
EVENT	**PF**	**PNF**
Setting thrust levers to initial stabilisation value	TAKE-OFF	
When thrust levers set to FLEX/TOGA	ANNOUNCE FMA	CHECKED
Before passing 80 kts	CHECKED	POWER SET
At 100 kts	CHECKED	ONE HUNDRED KNOTS
At V1		V1
At VR		ROTATE
When climbing clear of the ground (positive increase of V/S, BARO and RAD ALT)	GEAR UP	POSITIVE CLIMB GEAR UP
If AP is engaged by PNF If AP is engaged by PF	AP 1(2) ON AP 1(2)	CHECKED
When F Speed and accelerating	FLAPS ONE	SPEED CHECKED FLAPS ONE
When S Speed and accelerating	FLAPS ZERO	SPEED CHECKED FLAPS ZERO
After T/O check (not normally requested before flap retraction completed)	AFTER TAKE-OFF C/L	AFTER TAKE-OFF C/L COMPLETED TO THE LINE

ALTIMETER SETTING CHANGES TO/FROM QNH/QFE-STD		
EVENT	**PF**	**PNF**
Barometric setting change and subsequent altimeter cross-check	PULL STANDARD (PUSH QNH/QFE) CHECKED	STANDARD (QNH/QFE) CROSS-CHECKED PASSING FL__(__FT) NOW

R

APPROACH AND LANDING		
EVENT	**PF**	**PNF**
When cleared below transition level, or when appropriate	APPROACH C/L	APPROACH C/L COMPLETE
Activation of approach Phase (approx 15nm from touchdown ; automatic, if in managed nav)	ACTIVATE APPROACH PHASE	APPROACH PHASE ACTIVATED
Beginning of radio altimeter indication (could be auto callout of 2500 ft)	CROSS CHECKED	RAD ALT ALIVE (see Note 4 below)
At green dot speed or < VFE	FLAPS ONE	SPEED CHECKED FLAPS ONE
"GS*", "FINAL APP", or "FAF"	SET GA ALTITUDE__FT	GA ALTITUDE__SET,
2000 ft AGL min (ILS) ; or S speed (non-precision)	FLAPS TWO	SPEED CHECKED FLAPS TWO
When at flaps at two	GEAR DOWN	GEAR DOWN
When gear is down	FLAPS THREE	SPEED CHECKED FLAPS THREE
When flaps at three (unless landing with Flap 3)	FLAPS FULL	SPEED CHECKED FLAPS FULL
FAF	CHECKED	PASSING__(Fix Name),__FT,
When landing flaps set, and landing memo is displayed on ECAM	LANDING C/L	LANDING C/L COMPLETE
1000 ft above TDZE (may be auto callout)	CHECKED	ONE THOUSAND
FMA "LAND GREEN" (ILS approach)	LAND GREEN	CHECKED
100 ft above MDA/DH	CHECKED	ONE HUNDRED ABOVE (if no Auto Callout)
MDA/DH visual reference	LANDING	MINIMUM
MDA/DH no visual reference	GO AROUND-FLAPS	MINIMUM
PNF monitors pin-programmed auto callout, or announces if inoperative		ONE HUNDRED FIFTY
After touchdown		GROUND SPOILERS, REVERSE GREEN, (See the note 5 below)
If autobrake armed		DECEL (See note 6 below)
At 70 knots	CHECK	SEVENTY KNOTS

Note 4 : Crew awareness, crew should now keep RA in scan to landing.
Note 5 : If reverse deployment is not as expected, call NO REVERSE ENGINE__ or NO REVERSE, as appropriate.
Note 6 : If autobrake is armed, and no positive deceleration is observed, call NO DECEL.

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GENERAL

This chapter shows the symbology and definition of speeds.
Source of computation is also given when applicable.

CHARACTERISTIC SPEEDS

The characteristic speeds displayed on the PFD are computed by the FAC (Flight Augmentation Computer) according to aerodynamic data.
VLS (of normal landing configuration : CONF 3 or FULL), F, S and Green Dot speeds are also displayed on the MCDU TAKEOFF and/or APPR pages.
These values are computed by the FMGC, based on the aircraft gross weight (which is computed according to the entered ZFW and the FOB) or predicted grossweight (for approach or go around).

VS : Stalling speed.
Not displayed.
For a conventional aircraft, the reference stall speed, VSmin, is based on a load factor that is less than 1g. This gives a stall speed that is lower than the stall speed at 1g. All operating speeds are expressed as functions of this speed (for example, VREF = 1.3 VSmin).
Because aircraft of the A320 family have a low-speed protection feature (alpha limit) that the flight crew cannot override, the airworthiness authorities have reconsidered the definition of stall speed for these aircraft.
All the operating speeds must be referenced to a speed that can be demonstrated by flight test. This speed is designated VS1g.
Airworthiness authorities have agreed that a factor of 0.94 represents the relationship between VS1g for aircraft of the A320 family and VSmin for conventional aircraft types. As a result the authorities allow aircraft of the A320 family to use the following factors :
V2 = 1.2 × 0.94 VS1g = 1.13 VS1g
VREF = 1.3 × 0.94 VS1g = 1.23 VS1g
These speeds are identical to those that the conventional 94 % rule would have defined for these aircraft. The A319, A320 and A321 have exactly the same maneuver margin that a conventional aircraft would have at its reference speeds.
The FCOM uses VS for VS1g.

VLS	:	Lowest Selectable speed. Represented by the top of an amber strip along the airspeed scale on the PFD. Computed by the FAC based on aerodynamic data, corresponds to 1.13 VS during takeoff or following a touch and go. Becomes 1.23 VS after retraction of one step of flaps. R Becomes 1.28 VS when in clean configuration. _Note_ : *If in CONF 0 VLS were 1.23 VS (instead of 1.28 VS), the alpha protection strip would hit the VLS strip on the PFD.* Above 20000 feet, VLS is corrected for Mach effect to maintain a 0.2g buffet margin.
F	:	Minimum speed at which the flaps may be retracted at takeoff. In approach, used as a target speed when the aircraft is in CONF 2 or CONF 3. Represented by “F” on the PFD speed scale. Equal to about 1.18 VS to 1.22 VS of CONF 1 + F.
S	:	Minimum speed at which the slats may be retracted at takeoff. In approach, used as a target speed when the aircraft is in CONF 1. Represented by “S” on the PFD airspeed scale. Equal to about 1.22 VS to 1.25 VS of clean configuration.
0	:	Green dot speed. Engine out operating speed in clean configuration. (Best lift to drag ratio speed). Corresponds also to the final takeoff speed. Represented by a green dot on the PFD scale. Below 20000 feet equal to 2 × weight (tonnes) + 85 Above 20000 feet add 1 knot per 1000 feet

PROTECTION SPEEDS

Vα PROT, Vα MAX and VSW are computed by the FAC, based on aerodynamic data. They are only used for display on the PFD, and not for flight control protection (the activation of the protections is computed by the ELAC).

Vα PROT	: Angle of attack protection speed. Corresponds to the angle of attack at which the angle of attack protection becomes active. Represented by the top of a black and amber strip along the PFD speed scale, in normal law.
Vα MAX	: Maximum angle of attack speed. Corresponds to the maximum angle of attack that may be reached in pitch normal law. Represented by the top of a red strip along the PFD speed scale, in normal law.
VSW	: Stall warning speed. Represented by a red and black strip along the speed scale when the flight control normal law is inoperative.
VMAX	: Represented by the bottom of a red and black strip along the speed scale. Determined by the FAC according to the aircraft configuration. Is equal to VMO (or speed corresponding to MMO), VLE or VFE.

LIMIT SPEEDS

VMCG	: Minimum speed, on the ground during takeoff, at which the aircraft can be controlled by only using the primary flight controls, after a sudden failure of the critical engine, the other engine remaining at takeoff power.
VMCA	: Minimum control speed in flight at which the aircraft can be controlled with a maximum bank of 5°, if one engine fails, the other engine remaining at takeoff power (takeoff flap setting, gear retracted).
R VMCL	: Minimum control speed in flight, at which the aircraft can be R controlled with a maximum bank of 5°, if one engine fails, the other R engine remaining at takeoff power (approach flap setting).
VFE	: Maximum speed for each flap configuration.
VLE	: Maximum speed with landing gear extended.
VLO	: Maximum speed for landing gear operation.
VMO	: Maximum speed.
VFE NEXT	: Maximum speed for the next (further extended) flap lever position.

OTHER SPEEDS

V1	:	The highest speed, during takeoff, at which the flight crew has a choice between continuing the takeoff or stopping the aircraft. Represented by “1” on the airspeed scale (or the V1 value when it is off the airspeed scale). Inserted manually through the MCDU by the crew at the latest. Displayed on the MCDU TAKEOFF page.
VR	:	The speed at which the pilot rotates in order to reach V2 at an altitude of 35 feet at the latest after an engine failure. Inserted manually through the MCDU by the crew. Displayed on the MCDU TAKEOFF page.
V2	:	Takeoff safety speed that the aircraft attains at the latest at an altitude of 35 feet with one engine failed and maintains during the second segment of the takeoff. Represented by the SPEED SELECT symbol on the speed scale. Minimum value equal to 1.13 VS for the corresponding configuration. Inserted manually through the MCDU by the crew. Displayed on the MCDU TAKEOFF page.
VREF	:	Reference speed used for normal final approach. Equal to 1.23 × VS of configuration FULL. Displayed on the MCDU APPR page if landing is planned in CONF FULL (VLS CONF FULL).
VAPP	:	Final approach speed. Displayed on MCDU APPR page. Calculated by the FMGCs. Represents : VAPP = VLS + wind correction. The wind correction is limited to a minimum of 5 knots and a maximum of 15 knots. The flight crew may modify VAPP through the MCDU. – During autoland or when A/THR is on or in case of ice accretion or gusty crosswind greater than 20 knots, VAPP must not be lower than VLS + 5 knots.
VAPP TARGET	:	Represented by a magenta triangle. Calculated by the FMGCs Gives efficient speed guidance in approach during various windy conditions. Represents : VAPP TARGET = GS mini + actual headwind (measured by ADIRS) GS mini = VAPP – TOWER WIND (headwind component along runway axis calculated by FMGC from tower wind entered on MCDU).

AIR CONDITIONING

R An external HP source may be used for air conditioning, provided the air supply is
R confirmed to be free from oil contamination.

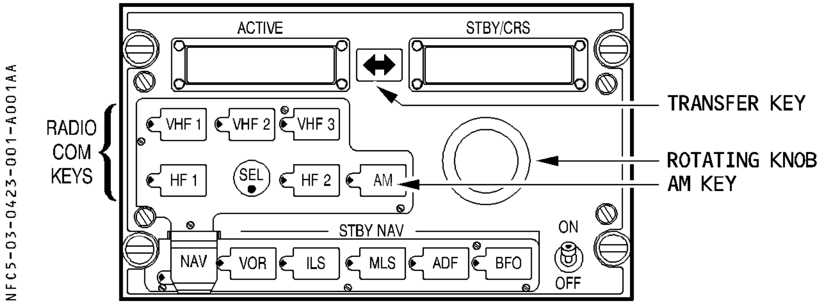
LEFT INTENTIONALLY BLANK

VHF, HF UTILIZATION

R *Note : 1. Reception of some frequencies could be noisy, on one or more VHFs. In such*
R *cases, try selecting an unaffected one.*
2. If two frequencies are closer than 2 MHz (between VHF1 and 2, or between VHF3 and 2), or closer than 6 MHz (between VHF1 and 3), some interference may occur.

TUNING

The pilot should normally use his onside RMP to tune any one of the VHF or HF radios. If the SEL lights come on, when tuning the radio, the pilot should turn them off by selecting the appropriate radio system dedicated to his RMP.



– **ON/OFF switch . . . . CHECK ON**

– **VHF or HF key . . . . PRESS**
The green light comes on.
ACTIVE and STBY/CRS windows display active and preset frequencies, respectively.

Note : When an RMP tunes a transceiver that is normally associated with another RMP, the SEL lights on both RMPs come on.

To change frequency :

– **Rotating knob** . . . . **TURN**
  Make the STBY/CRS window display the new frequency.
  Outer knob is for units, inner knob for decimals.

– **Transfer key** . . . . **PRESS**
  This interchanges the ACTIVE and STBY frequencies.
  The receiver is now tuned to the new ACTIVE frequency.

– **AM key (if necessary)** . . . . **PRESS**
  Green light comes on.

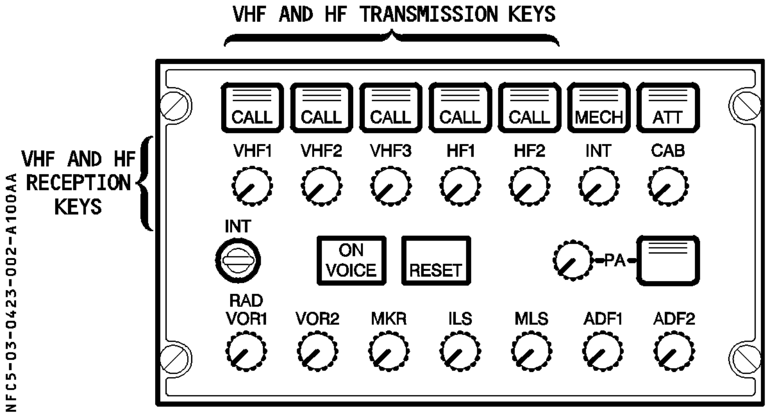
– **SEL lt** . . . . **CHECK OFF**
If SEL light is on, select the appropriate radio systems dedicated to the on side RMP.

Failure cases

When an RMP fails :
– The affected RMP no longer controls the selected receiver.
– The frequency displays disappear and the green VHF or HF lights go out.

– **Affected RMP** . . . . **SWITCH OFF**
One RMP can control all receivers.
· if RMP 1 fails tune VHF 1 through RMP 3
· if RMP 2 fails tune VHF 2 through RMP 3
· if RMP 3 fails tune, HF 1 (if installed) through RMP 1, HF 2 (if installed) through RMP 2
· if two RMP's fail, tune all receivers through the remaining RMP.

TRANSMISSION AND RECEPTION



– **VHF or HF transmission key** . . . . **PRESS**
Green bars on the selected system key light up.
Microphones and PTT command are connected to the selected system.

– **VHF or HF reception key** . . . . **PRESS**
The integrated white light comes on.
The receiver brings in the selected system.
To adjust the volume, turn the key.

Note : Do not use VHF 3 for communications with ATC if ACARS is installed unless VHF 1 and VHF 2 are inoperative.

– **SEL light . . . . CHECK OFF**
If the SEL light is on, select the appropriate radio systems dedicated to the onside RMP.

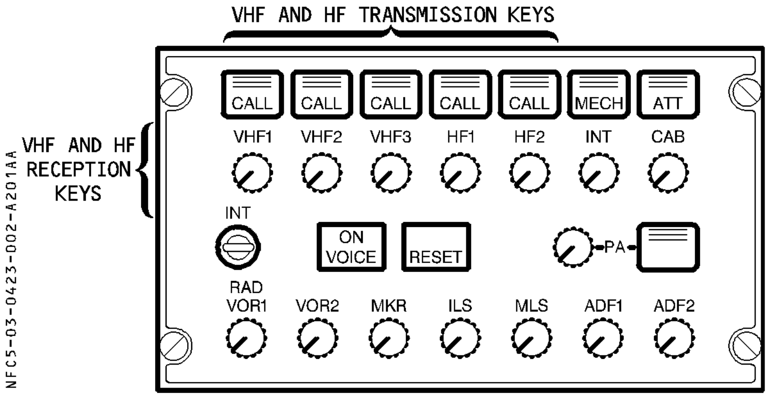
Failure cases :

When an RMP fails :
– The affected RMP no longer controls the selected receiver.
– The frequency displays disappear and the green VHF or HF lights go out.

– **Affected RMP . . . . SWITCH OFF**
One RMP can control all receivers. If RMP1 fails tune VHF1 through RMP3. If RMP2 fails, tune VHF2 through RMP3. If RMP3 fails, tune HF1 (if installed) through RMP1, HF2 (if installed) through RMP2. If two RMPs fail, tune all receivers through the remaining RMP.

TRANSMISSION AND RECEPTION

Note : *If the VHF3 VOICE DIRECTORY page is customized with user frequencies :*
– Use it as a pure directory.
– Do not press the key adjacent to the desired frequency for direct turning.
– VHF3 in VOICE mode should either be tuned using the MANUAL FREQ field, or using the RMP.



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– **VHF or HF reception key . . . . PRESS**
The integrated white light comes on. The receiver brings in the selected system. To adjust the volume, turn the key.

Note : *Do not use VHF 3 for communications with ATC, if ACARS is installed, unless VHF 1 and 2 are inoperative.*

CAPT-ATT CALL

PROCEDURE FOR CALLING ATT STATION WHEN PREVIOUS CALL HAS NOT BEEN RESET

If, after a call from cockpit to the attendant's station, the attendant does not press the RESET key on the attendant's panel, the pilot must use the following procedure to call the station :

– **CAB transmission key (on audio control panel) . . . . PRESS**
Green lines light up.

– **INT/RAD (on ACP) . . . . MAINTAIN IN RAD POSITION for 2 seconds.**
Wait 60 seconds for automatic cancellation of previous CAPT-ATT calls, then :

– **CAB transmission key . . . . PRESS**

Note : This procedure will no longer be necessary after the introduction of CIDS Mark II standard, which includes a function to reset the system automatically after 60 seconds if no one has pressed the RESET key.

R **TRIPPED C/B RE-ENGAGEMENT**

In flight, do not re-engage a circuit breaker that has tripped by itself, unless the Captain (using his/her emergency authority) judges it necessary for the safe continuation of the flight. This procedure should be adopted only as a last resort, and only one re-engagement should be attempted.

R On ground, do not re-engage any tank fuel pump circuit breaker. For all other circuit breakers, if the flight crew coordinates the action with maintenance, they may re-engage a tripped C/B, provided the cause of the tripped C/B is identified.

COMPUTER RESET

The normal purpose of a circuit breaker (C/B) is to protect wiring against short circuits, and to isolate equipment for maintenance.

Another circuit breaker function involves digital computers : The reset function. When a digital computer behaves abnormally due to an electrical transient, for example, the abnormal behavior can be stopped by briefly interrupting the power supply to its processor. The flight crew can reset most of this aircraft's computers with a normal cockpit control (selector or pushbutton). However, for some systems, the only way to cut off electrical power is to pull the associated circuit breaker.

PROCEDURE

To perform a computer reset :

- Set the related normal cockpit control to OFF, or pull the corresponding reset button or circuit breaker.
- Wait 3 seconds if normal cockpit control is used, or 5 seconds if a circuit breaker is used (unless a different time is indicated).
- Set the related normal cockpit control to ON, or push the corresponding reset button or circuit breaker.
- Wait 3 seconds for the end of the reset.

WARNING

Do not reset more than one computer at the same time, unless instructed to do so.

R **COMPUTER RESET TABLE**

R The computers that are most prone to reset are listed in the table of the next pages with
R the associated reset procedure, or FCOM reference when applicable.
R Specific reset procedures, included in OEB or Temporary revisions, are normally not
R referenced in this table and, when issued, superseed this table.

R *Note : Repetitive resets have to be reported to maintenance.*

R – On ground, almost all computers can be reset, and are not limited to the ones indicated
R in the table.
R Following computers are not allowed to be reset in all circumstances :
R · ECU (Engine Control Unit on CFM engines) or EEC (Electronic Engine Control on IAE
R engines) and EIU (Engine Interface Unit) while the engine is running.
R · BSCU (Brake Steering Control Unit) if the aircraft is not stopped. (Refer to 3.04.32).
R – In flight, as a general rule, the crew must restrict computer resets to those listed in the
R table, or to those in applicable TRs or OEBs. Before taking any action on other computer
R the flight crew must consider and fully understand the consequences.

CAUTION
R Do not pull the following circuit breakers :
R – SFCC (could lead to SLATS/FLAPS locked)
R – ECU or EEC, EIU.

R *Note : In the table's "reset" column, the "if applicable" note signifies that, depending on*
R *the computer standard, the reset procedure may no longer be necessary. If this is*
R *the case, the reset procedure is removed from the applicable FCOM section.*

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
21	VENT AVNCS SYS FAULT	AEVC	On ground only : – Pull C/B Y 17 on 122VU. – Wait 1 second before pushing the C/B.
22	AUTO FLT YAM DAMPER 1(2) FAULT	FAC 1(2)	Refer to the FCOM 3.02.22, if applicable.
	WINDSHEAR DET FAULT or REAC W/S DET FAULT (◁)	FAC 1 + 2	
	AUTO FLT FCU 1(2) FAULT	FCU	On ground, or in flight : – PULL the C/B B05 on 49VU for FCU1, or M21 on 121VU for FCU2. – Push it after 5 seconds. – CHECK the displayed targets and the barometer reference, and correct them if necessary.
	AUTO FLT FCU 1+2 FAULT	FCU	On ground, or in flight : – RESET FCU1 and FCU2 successively : – Pull the C/B B05 on 49VU for FCU1. – Push it after 5 seconds. – Pull the C/B M21 on 121VU for FCU2. – Push it after 5 seconds. – CHECK the displayed targets and the barometer reference, and correct them if necessary. FCU targets are synchronized on current aircraft values and displayed as selected targets. – RE-ENTER the barometer altimeter setting value, if necessary.
	One MCDU locked or blank Both MCDU locked or blank FMGC malfunction	MCDU FMGC FMGC	Refer to the FCOM 4.06.20.

R

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
23	COM CIDS 1+2 FAULT	CIDS	On ground, or in flight : – Pull the C/Bs in the following order : G02 on 49VU, M05 on 121VU. – Wait 10 seconds, then : – Push the C/Bs in the following order : M05, G02.
	Uncommanded EVAC horn actuation	CIDS	On ground, or in flight : Press the EVAC HORN SHUT OFF pushbutton. · IF UNSUCCESSFUL : – Pull the C/Bs in the following order : G02 on 49VU, M05 on 121VU. – Wait 10 seconds, then : – Push the C/Bs in the following order : M05, G02.
	Frozen RMP	RMP	Refer to the FCOM 3.04.23.
	FAP freezing	FAP or Tape reproducer/PRAM	On ground or in flight : – Pull CB M14 of the FAP in the 121VU. – Wait 10 seconds before pushing the C/B. · IF UNSUCCESSFUL : – Pull the tape reproducer/PRAM C/B F07 on 2000 VU (cabin). – Wait 10 seconds before pushing the C/B.

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
26	SMOKE LAV + CRG DET FAULT	SDCU	On ground only : – Pull C/B C06 on 49VU, and C/B T18 on 122VU. – Wait 10 seconds before pushing both C/Bs.
27	F/CTL ELAC 1(2) FAULT F/CTL ALTN LAW F/CTL ELAC 1(2) PITCH FAULT	ELAC	– Refer to the FCOM 3.02.27, if applicable.
	ELAC or SEC malfunction	ELAC or SEC	WARNING : Do not reset more than one computer at a time. · It is possible to reset flight control computers in flight, even if not requested by the ECAM, provided only one reset is performed at a time: For the ELAC only, in case of uncommanded maneuvers during the flight, it is not recommended to reset the ELAC. Note : *When an ELAC reset is performed on ground the crew must check the pitch trim position.*

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
30	ANTI ICE L(R)/WINDSHIELD (WINDOW)	WHC	Refer to the FCOM 3.02.30, if applicable.
31	FWS FWC 1(2) FAULT	FWC	On ground or in flight : Pull, then push, the C/B of the affected FWC : – FWC 1 . . . . F01 ON 49VU – FWC 2 . . . . Q7 ON 121VU
32	Braking malfunction	BSCU	Refer to 3.04.32 or OEB 50, if applicable.
32	L/G LGCIU 1(2) FAULT	LGCIU 1(2)	On ground only : LGCIU 1 : Pull C/B Q34 on 121 VU then C09 on 49VU. Then push C/B C09 and C/B Q34. LGCIU 2 : Pull then push C/B Q35 on 121 VU.
34	NAV TCAS FAULT	TCAS	On ground only : – Pull C/B K10 on 121VU. – Wait 5 seconds then push the C/B.
38	Failure messages on the CIDS FAP in the cabin	Vacuum System Controller	On ground or in flight – Pull C/B 35 MG on 2001 VU, aft cabin, – Wait 30 seconds, then push the C/B.
70	ENG IGN A+B FAULT	FADEC and EIU	Refer to the FCOM 3.02.70, if applicable.
70	ENG 1(2) FADEC A(B) FAULT	FADEC	Refer to the FCOM 3.02.70, if applicable.

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
26	SMOKE LAV + CRG DET FAULT	SDCU	On ground only : – Pull C/B C06 on 49VU, and C/B T18 on 122VU. – Wait 10 seconds before pushing both C/Bs.
27	F/CTL ELAC 1(2) FAULT F/CTL ALTN LAW F/CTL ELAC 1(2) PITCH FAULT	ELAC	– Refer to the FCOM 3.02.27, if applicable.
	ELAC or SEC malfunction	ELAC or SEC	WARNING : Do not reset more than one computer at a time. · It is possible to reset flight control computers in flight, even if not requested by the ECAM, provided only one reset is performed at a time: For the ELAC only, in case of uncommanded maneuvers during the flight, it is not recommended to reset the ELAC. Note : *When an ELAC reset is performed on ground the crew must check the pitch trim position.*

R

ATA	System malfunction or ECAM warning/caution	Affected system	Reset
30	ANTI ICE L(R)/WINDSHIELD (WINDOW)	WHC	Refer to the FCOM 3.02.30, if applicable.
31	FWS FWC 1(2) FAULT	FWC	On ground or in flight : Pull, then push, the C/B of the affected FWC : – FWC 1 . . . . F01 ON 49VU – FWC 2 . . . . Q7 ON 121VU
32	Braking malfunction	BSCU	Refer to 3.04.32 or OEB 50, if applicable.
	L/G LGCIU 1(2) FAULT	LGCIU 1(2)	On ground only : LGCIU 1 : Pull C/B Q34 on 121 VU then C09 on 49VU. Then push C/B C09 and C/B Q34. LGCIU 2 : pull then push C/B Q35 on 121 VU.
34	NAV TCAS FAULT	TCAS	On ground only : – Pull C/B K10 on 121VU. – Wait 5 seconds then push the C/B.
38	Failure messages on the CIDS FAP in the cabin	Vacuum System Controller	On ground or in flight : – Pull C/B 35 MG on 2001 VU, aft cabin, – Wait 30 seconds, then push the C/B.
46	ATSU malfunction	ATSU	An ATSU reset should be attempted in case of : – Permanent display of "INVALID DATA" on the DCDU. – No key selection effect on the DCDU or MCDU ATC pages. On ground or in flight : – Pull the C/Bs in the following order : 3TX1, 5TX1 on 121 VU. – Wait 5 seconds, then : – Push the C/Bs in the following order : 5TXI, 3TX1.
70	ENG IGN A+B FAULT	FADEC and EIU	Refer to the FCOM 3.02.70, if applicable.
	ENG 1(2) FADEC A(B) FAULT	FADEC	Refer to the FCOM 3.02.70, if applicable.

COCKPIT DOOR OPERATION

This procedure should be applied, if local Airworthiness Authorities require that the cockpit door remain closed throughout the entire flight.

BEFORE PUSHBACK OR ENGINE START

– **COCKPIT DOOR . . . . CLOSE**
With the cockpit door selector at NORM, the cockpit door is closed and locked.

AFTER ENGINE START

● **If ROUTINE ACCESS is requested from the cabin :**
The buzzer sounds in the cockpit for 1 to 9 seconds (3 seconds by default).
Prior to unlocking the door, the flight crew should identify the person requesting entry.

● **If entry is NOT authorized by the flight crew :**

– **DOOR LOCK switch . . . . LOCK**
Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.

● **If entry is authorized by the flight crew :**

– **DOOR LOCK switch . . . . UNLOCK**
The flight crew should pull the switch and maintain it in the UNLOCK position, until the cabin crew pushes the door open.

Note : *If the flight crew does not take any action after a routine cabin request, the cabin crew will be able to open the door by using the emergency access procedure.*

- **If EMERGENCY ACCESS is initiated from the cabin :**
  The buzzer will sound continuously in the cockpit, and the OPEN light flashes on the center pedestal's cockpit door panel.

  Note : *If the flight crew does not take any action, the door will unlock after a preselected time between 15 and 120 seconds.*

  – **DOOR LOCK switch . . . . LOCK**
  Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.
  When the situation in the cockpit permits, the flight crew should identify the person requesting entry, prior to unlocking the door.

  - **If entry is authorized by the flight crew :**

    – **DOOR LOCK switch . . . . UNLOCK**
    The flight crew should pull the switch and maintain it in the UNLOCK position, until the cabin crew pushes the door open.

OPENING THE COCKPIT DOOR FROM THE CABIN

– **CABIN CREW ROUTINE ACCESS . . . . REQUEST ON KEYPAD**

– **CABIN CREW . . . . PRESS #, or N+#**
"N" represents an Operator-defined figure between 0 and 7 seven digits.

– **CABIN CREW . . . . STAND IN COCKPIT DOOR AXIS**
The cabin crew should stand in the axis of the cockpit door.
A buzzer sounds in the cockpit.

● **If entry is NOT authorized by the flight crew :**
- The flight crew locks the door via the DOOR LOCK switch.
- The keypad's red light comes on steady, and indicates that the door is locked. Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.

● **If entry is authorized by the flight crew :**
- The flight crew unlocks the door via the DOOR LOCK switch.
- The keypad's green light comes on steady, and indicates that the door is unlocked.

– **CABIN CREW . . . . PUSH DOOR TO OPEN**

● **If there is no reaction from the flight crew :**

– **CABIN CREW SECOND ACCESS . . . . REQUEST ON KEYPAD**
Repeat the above procedure.

● **If there is no reaction from the flight crew, after a second request :**

– **CABIN CREW . . . . CALL THE COCKPIT**
To establish contact with the flight crew and request access to the cockpit.

● **If there is no reaction from the flight crew, after a cabin crew interphone call :**

– **CABIN CREW . . APPLY THE FOLLOWING EMERGENCY ACCESS PROCEDURE**

– **EMERGENCY ENTRY CODE . . . . ENTER and PRESS #**
The emergency entry code is an Operator-defined figure between 2 and 7 seven digits. A buzzer will sound continuously in the cockpit and the keypad's green light flashes. After a preselected time between 15 and 120 seconds, the keypad's green light comes on steady, and the cabin crew can then push the door open.

– **CABIN CREW . . . . PUSH DOOR TO OPEN**
The cockpit door unlocks for 5 seconds.
The buzzer stops and indicates that the door is unlocked.

GENERAL

The fly-by-wire system has been designed and certificated to make the new generation of aircraft more cost effective and safer and smoother to fly or ride in than a conventional aircraft.

NORMAL OPERATIONS

The pilot uses the sidestick to fly the aircraft in pitch and roll (and indirectly, through turn coordination, in yaw).
The computers interpret the pilot's inputs and move the control surfaces as necessary.
However, regardless of the pilot's inputs the computers will prevent :
R — excessive load factor
— loss of control leading to excursions outside the safe flight envelope.

AIRCRAFT ON THE GROUND

At ground speeds below 70 knots, the sidesticks have full authority over the controls in pitch and roll to permit control checks.
At ground speeds above 70 knots, the authority in pitch is reduced from 30° up to 20° up.
In this ground mode, movements of the control surfaces in pitch and roll correspond directly to the stick inputs.
With the aircraft in the normal configuration and engines running on the ground :
— when the wheel brakes are released, the aircraft usually rolls with no added thrust.
— nose wheel steering is "fly.by.wire", with no mechanical connection between the nose wheel and the steering tiller. The control forces are light : the flight crew should be careful to move the tiller gently to avoid unnecessarily high-rate turns.
The aircraft can make very tight turns, but the flight crew should resist any tendency to overcontrol. When making tight turns at low ground speed, the crew should hold the selected tiller position, even if the turn radius is shorter than intended, so as to maintain a smooth turn.

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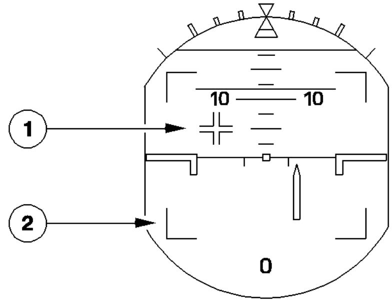

The PFD includes a symbol (1) that is the sum of sidestick positions given to the computers. It permits the PNF to check that the PF is making an appropriate control input
R during takeoff roll.
Small limit marks (2) indicate the limits of stick travel (± 16° in pitch, ± 20° in roll).
They are only displayed with the aircraft on ground. The flight crew must not use this display for control checks, because it does not necessarily indicate the control position in failure cases. The flight crew must use the ECAM flight controls page for making that check.

IN FLIGHT

TAKEOFF MODE

R

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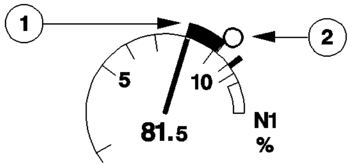

Thrust management is very easy. The pilot selects a FLX thrust by stopping the thrust levers in the FLX/MCT detent, and by checking that the resulting N1 (or EPR) (1) is compatible with N1 (or EPR) target (2). For maximum takeoff thrust, the pilot moves the thrust levers fully forward and performs the same thrust check (N1 or EPR).
To counter the nose-up effect of setting engine takeoff thrust, the pilot should apply half forward stick, until the airspeed reaches 80 knots. Then, he should release the stick
R gradually to reach neutral at 100 knots (Refer to SOP 3.03.12 for additional information).

Rotation is conventional. It takes about 1/3 to 1/2 back stick. The pilot continues the rotation to a typical all-engine attitude of about 15°. As the attitude changes and stabilizes, the control laws change to those for the flight mode in pitch, allowing the sidestick to return to the neutral position to maintain 1g at the chosen attitude. Pitch trim can begin to work at 50 feet.

R For crosswind takeoffs, routine use of into wind aileron is not recommended. In strong
R crosswind conditions, some lateral control may be used, but care should be taken to avoid
R using large deflections, resulting in excessive spoiler deployment which increases the
R tendency to turn into wind, reduces lift and increases drag. Spoiler deflection starts to
R become significant with more than one third sidestick deflection. As the aircraft lifts off,
R any lateral control applied will result in a roll rate demand.

FLIGHT MODE

Normally the sidestick is in the neutral position, with the aircraft stable in pitch and roll at the chosen altitude in straight or turning flight within certain limits. As a result, even in turbulence, the aircraft is flown best with little or no stick input.

Hands off, the system maintains 1g in pitch, corrected for pitch and roll attitude, and zero roll rate, within certain limits (+ 30°, – 15° in pitch and ± 33° roll). Hands off, within these limits the aircraft resists disturbance from the atmosphere and rides well even in heavy turbulence.

The system compensates almost 100% for changes of trim due to changes in speed and configuration. Changes of trim due to changes in thrust can be too large for the system to compensate, and the aircraft may respond to them in pitch in the conventional sense and then hold the new attitude at which it has stabilized after the trim change.

The pitch trim wheel moves as the control law compensates for these changes.

The control laws also make turning easier. They protect against overbanking, and at the chosen bank attitude (less than 33° of bank) the system maintains zero roll rate, stick free.

Steep turns can be made at up to 67° of bank. This is the steepest bank at which it is possible to maintain level flight at 2.5g.

Beyond 33° of bank, the pitch trim stops working and a lateral stability term is introduced. This term becomes progressively stronger as bank angle increases, so that it equals a full sidestick demand at 67° of bank, hence forming the limiting system.

The lack of pitch trim makes it necessary for the pilot to hold the nose up in a steep turn. If he releases the stick, the nose drops and the aircraft eases its roll angle to less than 33° of bank and stabilizes at the pitch and bank angles it achieves at less than 33° of bank.

During a normal entry into a turn, the pilot must make an intentional initial change to the pitch attitude in order to maintain level flight. Once he has done this, he can release the stick. The system then maintains a level turn.

In climb, cruise, descent, and approach all these basic rules remain in effect.

LANDING MODE

The system's landing mode gives the aircraft a stabilized flight path and makes a conventional flare and touchdown. It carries out the initial approach as this manual described earlier. At 50 feet, the system memorizes the attitude, usually 3° or 4° nose up. From 30 feet down, this value washes out over eight seconds to – 2°. The result is that the pilot has to exert a progressive pull to increase pitch gently in the flare. He should pull the thrust levers back at or above 20 feet, and the landing should occur without a long flare. Touchdown quality is better and more repeatable at fairly flat attitudes. An audible "RETARD" callout reminds the pilot if he has not pulled back the thrust levers when the aircraft has reached 20 feet.

R Crosswind landings are conventional. The preferred technique is to use the rudder to align
R the aircraft with the runway heading, during the flare, while using lateral control to maintain
R the aircraft on the runway centerline (Refer to SOP 3.03.22). The lateral control mode does not change until the wheels are on the ground, so there is no discontinuity in the control laws. The aircraft tends to roll gently in the conventional sense as drift decreases, and the pilot may have to use some normal cross control to maintain roll attitude.

Even during an approach in considerable turbulence, the control system resists the disturbances quite well without pilot inputs. In fact, the pilot should try to limit his control inputs to those necessary to correct the flight path trajectory and leave the task of countering air disturbances to the flight control system.

Derotation is conventional. The pilot releases the back pressure he was holding for the flare and the nose wheel comes down nicely.

Pitch trim then resets to zero.

ABNORMAL OPERATIONS

ENGINE FAILURE AT TAKEOFF

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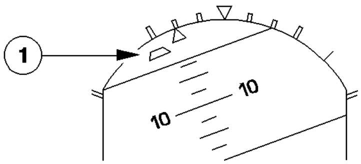


On the ground the aircraft is conventional. The pilot uses rudder to maintain direction. He should rotate to about 12.5° of pitch and adjust as required. The sideslip indication (1) changes to the engine-out mode (blue). When it is centered, the aircraft is close to the zero aileron position (best drag condition). It is therefore important to zero the slip indication accurately.

Trim the rudder conventionally.

When time permits, the pilot should check the ECAM's FLT CTL page, and refine the rudder trim to give neutral lateral control, and also trim the rudder toward the spoilers that are up or toward the aileron that is farthest up to bring the lateral controls back to neutral.

ENGINE-OUT LANDING

The engine-out landing is basically a conventional landing. The pilot should trim to maintain the slip indication centered. It is yellow, as long as N1 is less than 80%. Between 100 and 50 feet, the pilot he can reset rudder trim to make the landing run easier, and to recover full rudder travel in both directions.

R BOUNCE AT LANDING

R In case of a light bounce, maintain the current pitch attitude and complete the landing,
R while maintaining the thrust at idle. In case of a strong bounce, initiate a go-around, initially
R maintaining the pitch attitude. Retract the flaps one step, and then the landing gear, once
R the aircraft is properly established on the go-around segment. In all cases, do not attempt
R to soften the (potential) second touchdown by increasing the pitch attitude.

TRAINING TOUCH-AND-GO

With the nosewheel on ground, pitch trim automatically resets to zero. The pilot should select CONF 2 and add thrust. He must always move the thrust levers to TOGA to bring up the speed reference system (SRS), and then reduce to a lower thrust (not less than CL), if he chooses. Takeoff may be a little out of trim, which may affect the rotation slightly, but once the aircraft is off the ground, the control law holds the "out of trim", then retrims at 50 feet.

ABNORMAL CONTROL LAWS - GENERAL

ALTERNATE LAW

Pitch alternate and roll direct is the first level of degraded control law, resulting from some double failures.
The autopilot may be available, depending on the cause and type of failure(s).

DIRECT LAW

The sidestick is directly coupled to the controls via the computers, but without any of the stabilization feedbacks. In effect, this law turns the aircraft into a conventional aircraft, but is compensated for configuration and CG. The pilot must use manual pitch trim, as is signaled on the PFD. The autopilot is not available.

R **MECHANICAL BACKUP**

The pilot can use the pitch trim and rudder to control the aircraft for short periods of total loss of fly-by-wire.

ABNORMAL CONTROL LAWS - IN DETAIL

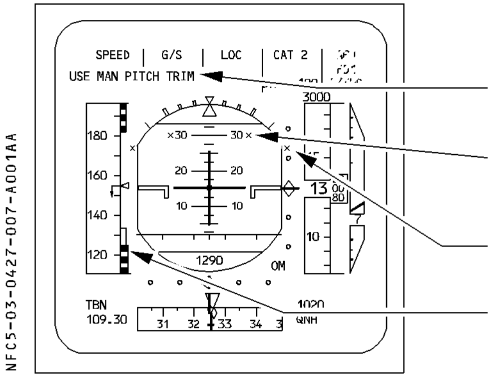
ALTERNATE LAW

Pitch

Alternate law in pitch is almost the same (for the pilot) as the normal control laws.
However, alternate law does not maintain any of the protections, except for the load factor limitation. As a result, the pilot must fly the aircraft more attentively to avoid inadvertently exceeding the normal limits.
Alternate law reduces VMO to 320 knots to restore a normal aircraft speed margin in case of upset. This is not necessary in the Mach range, because the margin there is, in any case, conventional.
An aural "STALL, STALL, STALL" warning sounds at low speeds. Upon hearing it, the pilot must return to the normal operating speed by taking conventional actions with the controls:
THRUST LEVERS . . . . .TOGA
At the same time :
PITCH ATTITUDE . . . . .REDUCE
BANK ANGLE . . . . .ROLL WINGS LEVEL
SPEEDBRAKES . . . . .CHECK RETRACTED

· If a danger of ground contact exists, reduce pitch attitude no more than necessary to allow the airspeed to increase. After initial recovery, maintain speed close to VSW, until it is safe to accelerate.
· If below 20000 feet, and if in clean, select FLAP 1.
· Out of stall, when no threat of ground contact :
  LANDING GEAR . . . . .UP
  – Recover to normal speeds, and select flaps are required.
  – In case of one engine inoperative, use power and rudder with care.

The aural stall warning may also sound at high altitude, where it warns that the aircraft is approaching the angle of attack for the onset of buffet. To recover, the pilot must relax the back pressure on the sidestick and reduce the bank angle, if necessary. When the stall warning stops, the pilot can increase the back pressure again, if necessary, to return to the planned trajectory.



At low speed the change in the speed scale is very noticeable. VLS remains, but Vα PROT and Vα MAX disappear, replaced by a single black and red strip the top of which is stall warning speed. Unlike VLS which is stable, VSW is g sensitive so as to give additional margin in turns.
As mentioned above, ALTERNATE reverts to DIRECT law for landing when the flight crew lowers the landing gear.

Roll

Roll control is direct. The rate of roll is generally higher than with normal law and at first the aircraft appears to be very sensitive.
Bank stability and protections are no longer active and the flight crew should take care to stay within normal limits.

DIRECT LAW

Normally direct law in pitch is transitory, due to undetected failures of, for example, a second IRS. Once the flight crew has isolated the failed system, it can reset the ELACs to acquire alternate law in pitch.
When the system goes into direct law, “USE MAN PITCH TRIM” appears on the PFDs. This message flashes for 5 seconds, then becomes steady.
The pilot should use small control inputs when the aircraft is in direct law at high speed, because the controls are powerful. Good trimming in pitch is required.
The pilot should avoid using large thrust changes or sudden speedbrake movements, particularly if the center of gravity is aft. If the speedbrakes are out and the aircraft has been retrimmed, the pilot should retract the speedbrakes gently, giving time to retrim so as to avoid a large nose-down trim change.
The flight crew must fly the aircraft carefully at all times. Control is precise, but there are no protections.
The aural stall warning for alternate law also serves direct law, and the technique for recovery is the same.
Any tendency to roll stick free can be corrected by conventional use of rudder. Residual rudder forces can be trimmed out by using rudder trim in the direction of the applied force.

After trimming, the sideslip index will be slightly displaced from center. With some failure conditions the asymmetric rolling tendency may be increased. It will always be possible to trim the aircraft to fly straight, hands off. There may then be an asymmetry in roll response, but the roll rate achieved is always adequate.
Landing in direct law is like landing a conventional aircraft. Trim changes to compensate for configuration changes are small, as is the trim change with speed change. Trim change with a large thrust change is quite large, so the pilot should make smooth thrust changes.
The flare height for landing is the same (20 feet), and the pilot uses conventional techniques. (The controls remain light and powerful).
Pilots have landed this aircraft in direct law in moderate to heavy turbulence with gusting winds without undue difficulty.
Direct law works with or without the yaw damper. The aircraft is always convergent in dutch roll, so if an oscillation begins it will stop itself if not excited. To stop dutch roll the pilot should use lateral inputs, not rudder.

THE PROTECTION SYSTEMS

GENERAL

The aircraft has a comprehensive flight envelope protection system.
This system increases safety if the pilot has to make an extreme maneuver or the aircraft enters a very violent meteorological situation.
In either of these situations, the pilot can make full sidestick inputs in normal laws at any speed. The rudder is not protected in this way, but is not normally used during symmetrical flight.
The pilot will never see any aspect of this envelope protection take effect as long as he flies the aircraft normally.

Note : The normal flight envelope is not different from that of a conventional aircraft, and is defined as VLS to VMO. Pilots should not deliberately fly at a speed that is lower than VLS except for properly authorized training or testing.

PITCH ATTITUDE PROTECTION

The system limits the aircraft to 67° of bank, which corresponds approximately to the bank angle needed for a level 2.5g turn.
The system limits pitch attitude to + 30° and – 15°. The + 30° limit decreases to 25° at low speed. If the aircraft attitude approaches these limits, the pitch and roll rates start to decrease 5° before the limit so that it will stop at the limit without overshooting.

LOAD FACTOR LIMITATION

The aircraft is structurally designed to the same limits as any other large aircraft. The 2.5g limit (2g with flaps extended) allows the aircraft to make an abrupt maneuver without structural risk if such a maneuver becomes necessary.
When this occurs (after a ground proximity warning, for example), the pilot should quickly apply full control and hold it until the flight path is safe. Response time is a vital factor in avoidance : the system allows maneuvers that the pilot would not normally be able to perform safely at any altitude, low or high.

EXCEEDING VMO/MMO

During descent the aircraft may slightly exceed VMO/MMO with the autopilot engaged. This may happen when adverse conditions are encountered.
Using the following procedure prevents such an exceedance during descent :

1. The current speed is close to VMO (maximum operating speed) :
   - Monitor the speed trend symbol on the PFD :
     - · If the speed trend reaches or slightly exceeds the VMO limit :
       - Use the FCU immediately to select a lower speed target.
     - · If the speed trend significantly exceeds the VMO red band, without high speed protection activation :
       - Select a lower target speed on the FCU and, if the aircraft continues to accelerate, consider disconnecting the AP.
       - Before re-engaging the autopilot, smoothly establish a shallower pitch attitude.
2. If the aircraft accelerates above VMO with the AP engaged :
   The AP will disengage upon reaching the high speed protection. The high speed protection will apply a nose-up order up to 1.75 g, in addition to pilot input during VMO recovery. Consequently :
   - Make a smooth pitch correction in order to recover proper speed.

In all events :
- Check AP engagement status and re-engage it when appropriate. It may have tripped if VMO/MMO was significantly exceeded. The associated aural warning may have been superseded by the overspeed aural warning.

HIGH SPEED PROTECTION

The aircraft automatically recovers following a high speed upset. Depending on the flight conditions (high acceleration, low pitch attitude) the High Speed Protection is activated at/or above VMO/MMO.
When it is activated, the pitch trim is frozen, spiral static stability is introduced to 0° bank angle (instead of 33° in normal law), and the bank angle limit is reduced from 67° to 45°.
As the speed increases above VMO/MMO, the side-stick nose-down authority is progressively reduced, and a permanent nose-up order is applied to aid recovery to normal flight conditions.

The High Speed Protection is deactivated when the aircraft speed decreases below VMO/MMO, where the usual normal control laws are recovered.
The flight crew should never deliberately fly the aircraft beyond VMO/MMO, unless absolutely necessary for operational reasons, such as avoiding another aircraft.
The pilot should, as soon as possible, reduce resistance to the High Speed Protection and allow the aircraft to return to a speed below VMO/MMO, by smoothly relaxing the forward stick force to attain a comfortable nose-up pitch rate. It is not usually necessary to apply a pull force to recover. If a quicker recovery is required for operational reasons, the pilot should pull back smoothly and progressively, monitoring the g indication on the ECAM".

HIGH ANGLE OF ATTACK PROTECTION

The aircraft resists attempts by either a pilot or the atmosphere to stall it. If a pilot attempts a stall, he feels the aircraft trying to pitch down as speed approaches the amber and black strip. The pilot can resist this tendency until speed reaches the red band (alpha maximum), and then further nose-up control is not available. Between these two points, αfloor automatically sets go around thrust. The pilot can hold full back stick, if it is needed (see windshear), and the aircraft stabilizes at an angle of attack close to but short of the 1g stall.
WHEN FLYING AT αmax, THE PILOT CAN MAKE GENTLE TURNS, IF NECESSARY.
As the aircraft enters protection at the amber and black strip. (αprot), the system inhibits further nose-up trim beyond the point already reached. Nose-down trim remains available if the pilot pushes the stick forward.
The pilot should not deliberately fly the aircraft in αprot except for brief periods when maximum maneuvering is required. If the pilot enters αprot inadvertently, he should get out of it as quickly as possible by easing forward on the sidestick to reduce the angle of attack while simultaneously adding power (if αfloor has not already been activated or has been cancelled). The system will regain the normal load factor law if the stick is pushed forward of neutral, but it will re-enter αprot if the stick is released with the angle of attack still greater than the value set for αprot. Thus to exit αprot properly, the pilot should reduce angle attack to a value less than the value set for αprot.
The PFD shows this clearly, because the indicated speed is above the black and amber strip.
The pilot should now increase speed above VLS (clear of the amber strip) as soon as other considerations (ground clearance, for example) allow him to do so.
αfloor will usually be triggered just after αprot is entered, and go around thrust will automatically be applied. Thus, if the sidestick is held aft, either inadvertently or deliberately, the aircraft will start to climb at a relatively constant low airspeed. To recover to a normal flight condition, αprot should be exited by easing forward on the sidestick, as described above, and the αfloor should be cancelled by using the disconnect pushbutton on either thrust lever as soon as a safe speed is regained.

The aircraft can also enter αprot at a high level, where it protects the aircaft from the buffet boundary. The PFD shows that αprot is active, in the same way it does at low speed or low level : The amber and black strip increases to the actual aircraft speed. At low speed or low level, if the stick is merely released to neutral, the aircraft maintains the alpha for αprot. (However, this value of alpha is not the same as the value used at low speed : Alpha for αprot is reduced as a function of Mach, so that a typical cruise value is about 3.5° for
R the A18 and A321, or 4.5° for the A319 and A320.) Thus, the aircraft may climb, stick free, when leaving a turn after entering αprot. If the pilot has flown into αprot, he should leave it as soon as other considerations allow, by easing forward on the stick to reduce alpha below the value of αprot, while simultaneously increasing thrust or speed as appropriate.

WINDSHEAR

Most of the recommended techniques for flight in windshear also apply to the A320 aircraft family. But for these aircraft, the techniques are somewhat simpler.
The aircraft can only survive windshear, if it has enough energy to carry it through the loss-of-performance field. It can sustain this energy level in the following three ways :
- Carry extra speed. The aircraft does this automatically in some cases.
- Add maximum thrust. The aircraft does this automatically.
- Trade height energy for speed. Any aircraft can do this.

Proper pilot technique helps in this survival process. The pilot must follow orders from the Speed Reference System (SRS) or, if the FD is not available or is switched OFF for a visual approach, maintain 17.5° of pitch, even if he has to use full backstick in order to do so. At this stage, maintain full backstick until the shear is passed. The aircraft will automatically hold close to the maximum angle-of-attack. The speed should stay close to the beginning of the red strip. But, in turbulence, it could be temporarily below it without significant effect. As speed begins to recover, the pilot can reduce backstick, while still following SRS orders until well clear of the shear.

ABNORMAL CONFIGURATIONS

In some flight control failure cases, such as loss of control of both elevators, or loss of flaps or slats, the landing configuration is Configuration 3.
With the horizontal stabilizer jammed, control is much easier than it is on a conventional aircraft, because the integrator holds the elevator required to maintain the 1g flight path. The control laws remain normal to touchdown.

AIRCRAFT TRIMMING

When the aircraft is :
- In normal cruise range (around M.77),
- In straight flight,
- With the autopilot engaged,
- With symmetrical engine thrust, and
- With fuel in the wing tanks distributed symmetrically,

the rudder trim should stay between 1° right and 2.3° left.

Note : *This indication corresponds to a true rudder deflection within ± 1.5°, taking into account the permanent offset of rudder trim indication, when the aircraft is in cruise conditions. (average 0.5° right, 0.8° left).*
An indicated, rudder trim above 1° right or 2.3° left is acceptable, if maintenance personnel establishes that the corresponding real rudder position is within 1.5° left, and 1.5° right.

FQI IN DEGRADED MODE

If, on upper ECAM display the FOB indication is displayed with two dashes across the two least significant digits, the FQI is in degraded mode.
In this case, the ECAM FUEL page must be called on ECAM lower display to determine which tank is affected.
The loss of accuracy resulting from the loss of FQI normal mode is as follows :

wing outer cell affected	: + 20 kg (+ 45 lb), – 200 kg (– 440 lb)
wing inner cell affected	: ± 110 kg (240 lb).
center tank affected	: ± 130 kg (290 lb).
all tanks affected	: + 390 kg (+ 860 lb), – 750 kg (– 1660 lb).

ICING CONDITIONS

Icing conditions may be expected when the OAT (on ground and for takeoff), or when the TAT (in flight) is at or below 10°C, and there is visible moisture in the air (such as clouds, fog with low visibility of one mile or less, rain, snow, sleet, ice crystals) or standing water, slush, ice or snow is present on the taxiways or runways.

WARNING
Pilots must turn on the engine anti-ice system, when temperature and visible moisture meet these criteria, and should not wait until they see ice building up.

OPERATIONS IN ICING CONDITIONS

Flight in icing conditions

- **Engine anti-ice**
  ENGINE ANTI ICE must be ON during all ground and flight operations, when icing conditions exist, or are anticipated, except during climb and cruise when the SAT is below – 40° C.
  ENGINE ANTI ICE must be ON before and during a descent in icing conditions, even if the SAT is below – 40° C.
- **Wing anti-ice**
  WING ANTI ICE may either be used to prevent ice formation, or to remove ice accumulation from the wing leading edges.
  WING ANTI ICE should be selected ON, whenever there is an indication that airframe icing exists. This can be evidenced by ice accumulation on the visual ice indicator (located between the two cockpit windshields), or on the windshield wipers.

CAUTION
1. Extended flight, in icing conditions with the slats extended, should be avoided.
2. In case of suspected significant ice accumulation on non de-iced parts of the airframe, the approach speed must not be lower than :
   – In configuration full, VLS + 5 knots and the landing distance must be multiplied by 1.1.
   – In configuration 3, VLS + 10 knots and the landing distance must be multiplied by 1.15.

RAIN REPELLENT ◁

If the rain repellent is operative, the flight crew should only use the rain repellent in moderate to heavy rain.

GROUND OPERATIONS IN HEAVY RAIN

When the aircraft is parked on the ground during heavy rain, it can take rainwater into the avionics ventilation system via the open skin air inlet valve.
To prevent this, the following procedure must be applied :

- **After landing :**

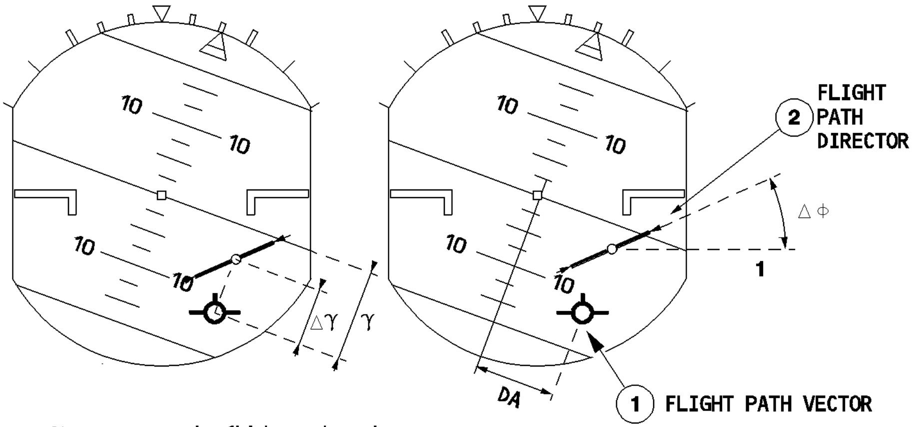
  – **EXTRACT . . . . OVRD**
  This closes the avionics ventilation system, preventing rainwater from entering.

  – **PACKS 1 and 2 . . . . CHECK ON**
  This adds air from the air conditioning system to ventilation air. If bleed air is not available, the arrangement can function for a limited time, as follows :
  · OAT ≤ 39°C : no limit
  · 39°C ≤ OAT ≤ 45°C : 3 hours
  · OAT ≥ 45°C : 30 minutes

- **After takeoff :**

  – **EXTRACT . . . . AUTO**

USE OF FLIGHT PATH VECTOR



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γ represents the flight path angle
DA represents the drift angle
△γ represents the difference between the ordered flight path angle and the actual one
△Φ represents the difference between the ordered roll angle and the actual one

The flight path vector (FPV) indicates performance and does not direct or command. Because there is always a slight lag between an attitude change and the change in flight path that results from it, when the pilot uses the FPV he should make an attitude change first, then use the FPV to check the resulting flight path.
Vertically the FPV indicates the aircraft's flight path angle.
The FPV is particularly useful when the aircraft is doing visual circuits. For example, when the aircraft is flying downwind the pilot simply adjusts the aircraft attitude to put the FPV symbol on the horizon. This establishes the aircraft in level flight. On the final approach, the pilot puts the FPV three degrees below the horizon to establish the aircraft at a normal angle of descent. If this results in the aircraft going below the chosen approach path (undershooting the touchdown point), the pilot can reduce the angle of descent by raising the FPV. As soon as the aircraft regains the correct descent path, he should bring the FPV back to –3°.
Laterally, the FPV indicates the aircraft's track and its drift angle. It has the same displacement as the drift diamond on the heading scale and thus appears directly above it. It shows on the PFD the drift the aircraft is experiencing.
The pilot must take care when making a go-around with the FPV selected. There is inevitably some lag between the pilot's raising the nose to commence the go-around and the aircraft's responding by changing its trajectory. For the same reason the pilot does not use the FPV on takeoff: the primary parameter for rotation, either on takeoff or on go-around, is attitude.

The TRK-FPA Flight Director is particularly useful for guiding the aircraft during non-precision approaches, although it can also be used at other times. When using this mode of the FD, the pilot places the FPV symbol in the center of the flight path director (FPD) symbol. This is similar to using the FD in HDG-VS, when the pilot puts the center of the fixed aircraft symbol at the center of the crossed bars of the FD. If the FCU is set on the correct track and flight path angle, and if the FPV and the FPD are aligned, they will guide the aircraft along a trajectory that is stabilized with respect to the ground, whereas when the pilot is using HDG-VS the trajectory is stabilized with respect to the air. However, if the aircraft is disturbed from this ideal trajectory, merely following the FPD will result in its following a trajectory that is parallel to the intended trajectory. Thus, when the aircraft is disturbed from the original trajectory, the pilot must adjust either its track or its flight path angle or both in order to obtain guidance back to the original trajectory. Likewise, when the pilot uses the FPA to create a synthetic glide path, it will be positioned correctly only if it commences at the right point in space.

BSCU RESET

In case of braking/steering difficulty, the crew may perform a BSCU reset to recover correct functioning of the system. In particular, this applies in the case of any of the following ECAM warnings :

– WHEEL N.W. STEER FAULT
– BRAKES AUTO BRAKE FAULT (except in flight)
– BRAKES BSCU CH1 (2) FAULT or SYS 1(2) FAULT

R · On ground, aircraft stopped and parking brake applied, by switching OFF then ON the A/SKID & N/W STRG selector.

R After any BSCU reset on ground, check the braking efficiency of the normal braking R system once the aircraft starts moving again (the aircraft must slow down when R pressing the brake pedals).

Note : If a BRAKES BSCU CH 1(2) FAULT or SYS 1(2) FAULT cannot be cleared by resetting via the A/SKID & N/W STRG selector, a further reset may be attempted with the BSCU circuit breakers to clear the fault.

· In flight, with landing gear retracted, by switching OFF then ON the A/SKID & N/W STRG selector.

In the case of an AUTO BRAKE FAULT, a reset should not be performed in flight so as to avoid clearing a real tachometer failure (no tachometer test in flight).

If required, the autobrake has to be rearmed.

R *Note : Checking the normal braking after a BSCU reset in flight is not necessary (and R not possible), since the BSCU would detect any loss of normal braking at R touchdown, and the ECAM would inform the crew of the switch to alternate R braking without anti-skid.*

BRAKING IN ALTERNATE MODE

Apply brakes with care, since initial pedal force or displacement produces more braking action in alternate mode than in normal mode. If anti-skid is lost, modulate brake pressure at or below 1000 psi. If the nosewheel steering is lost, steer the aircraft with differential braking.

BRAKE TEMPERATURE LIMITATIONS REQUIRING MAINTENANCE ACTIONS

Maintenance action is due in the following cases :
- The temperature difference between the 2 brakes on the same gear is greater than 150°C, and the temperature of either one of the brakes is higher than or equal to 600°C, or,
- The temperature difference between the 2 brakes on the same gear is greater than 150°C, and the temperature of one brake is lower than or equal to 60°C, or,
- The difference between the LH and RH brakes' average temperature is higher than or equal to 200°C , or,
- A fuse plug has melted, or,
- One brake's temperature exceeds 900°C.

OPERATION WITH NOSEWHEEL STEERING OFFSET

GENERAL

During taxi, the crew may notice an aircraft veering tendency. It can be due to some external conditions (crosswind, slope....), or it can be due to the nosewheel steering
R system itself. The latter case is identifiable due to flight crews' repetitive reports of
R permanent aircraft veering tendency. Such reports enable maintenance to determine when
R corrective action or troubleshooting is required.

A veering aircraft may still be operated before corrective action is taken, provided nosewheel steering deviation is within the values specified in the following table.

NWS OFFSET OPERATIONAL LIMITATION

NWS Offset	Offset ≤ 0.5°	0.5° < Offset ≤ 1.5°	Offset > 1.5°
Rudder trim to taxi straight	Trim ≤ 2.5°	2.5° < Trim ≤ 7.5°	Trim > 7.5°
Dispatch	YES	YES	NO
Procedures	No operational limitation	Apply the following procedure : Autoland : – MAX X WIND 10KT	Immediate maintenance action is due

CAUTION

The tolerance required by maintenance guidelines (± 0.5° NWS offset, corresponding to
R the ± 2.5° rudder trim necessary to taxi straight) remains valid. Operating the aircraft
R outside the maintenance tolerance is possible by using the applicable procedure.
R However, in such cases, the flight crew must accurately and systematically make
R logbook entries (indicating the rudder trim input value to taxi straight) to ensure that
R maintenance can take corrective action within the applicable timeframe.

When using rudder trim to taxi straight for NWS offset identification, takeoff must only be performed after a rudder trim reset.

TIRE PRESSURE

These charts present the various nominal tire pressures, depending on maximum taxi weight, tire type, and landing gear configuration (shock absorbers extended, or compressed).

	PRESSURE				PRESSURE			
	Unloaded		Loaded		Unloaded		Loaded	
	bar	psi	bar	psi	bar	psi	bar	psi

	DIMENSIONS							
MAXIMUM TAKEOFF WEIGHT	30 × 8.8 R 15 30 × 8.8 - 15				46 × 17 R 20 46 × 16 - 20			
	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi
67000 KG / 147708 LB 68000 KG / 149913 LB 70000 KG / 154322 LB	11.0	160	11.4	165	12.3	178	12.8	186
73500 KG / 162038 LB 75500 KG / 166447 LB	11.8	171	12.3	178	13.3	193	13.8	200
77000 KG / 169754 LB	11.8	171	12.3	178	13.8	200	14.4	209

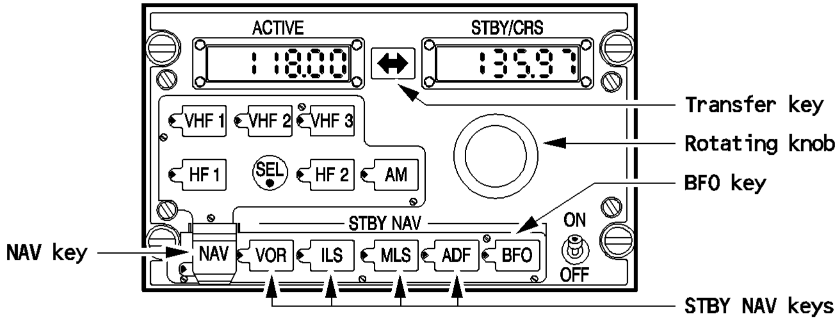
	DIMENSIONS							
MAXIMUM TAKEOFF WEIGHT	49 × 17 - 20				49 × 19 - 20			
	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi
67000 KG / 147708 LB 68000 KG / 149913 LB 70000 KG / 154322 LB	10.2	148	10.6	154	9.2	133	9.6	139
73500 KG / 162038 LB 75500 KG / 166447 LB	11.0	160	11.4	165	9.9	144	10.3	149
77000 KG / 169754 LB	11.5	167	12.0	174	10.3	149	10.7	155

	DIMENSIONS							
MAXIMUM TAKEOFF WEIGHT	1270 × 455 R 22				915 × 300 R 16 36 × 11 - 16			
	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi	Unloaded bar	Unloaded psi	Loaded bar	Loaded psi
67000 KG / 147708 LB 68000 KG / 149913 LB 70000 KG / 154322 LB	10.5	152	10.9	158	-	-	-	-
73500 KG / 162038 LB	11.3	164	11.8	171	11.7	170	12.2	177
75500 KG / 166447 LB	11.3	164	11.8	171	-	-	-	-
77000 KG / 169754 LB	11.8	171	12.3	178	-	-	-	-

PROCEDURES FOR TUNING STANDBY NAVIGATION RADIOS

CAUTION

Pilots should use these procedures only when both FMGCs or both MCDUs are
R inoperative. When at least one FMGC is operative, the use of NAV key on RMP while
R the LOC update is active, may freeze the FM position during approach and must be
R avoided.
In this case they must press both RMP NAV keys (lighting the green lights).



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FOR BOTH RMPs

– **ON/OFF Switch** . . . . **CHECK ON**

– **NAV key (guarded)** . . . . **PRESS**
Green light comes on.
A lighted STBY NAV key shows which system had been selected earlier in the radio-nav standby mode, and the windows show which frequencies had been used.

ON THE RMP ASSOCIATED WITH THE RECEIVER TO BE TUNED

Select a STBY NAV system :

● **ADF tuning :**

– **ADF key** . . . . **PRESS**
The green light comes on.
The windows show the previously selected frequencies.

– **Rotating knob** . . . . **TURN**
Watch the STBY/CRS window to set a frequency.
The outer knob changes units, inner knob decimals.

– **Transfer key . . . . PRESS**
This interchanges the ACTIVE and STBY frequencies. The ADF receiver is now tuned to the new ACTIVE frequency.

– **BFO key (if necessary) . . . . PRESS**
Green light comes on.

● **VOR (or ILS) tuning :**

– **VOR (or ILS) key . . . . PRESS**
Green light comes on.
Both windows display previously selected frequencies.

– **Rotating knob . . . . TURN**
Set the frequency in the STBY/CRS window.

– **Transfer key . . . . PRESS**
The ACTIVE window displays the selected frequency.
The STBY/CRS window displays the frequency that had been displayed in the ACTIVE window.

– **Rotating knob . . . . TURN**
Set the course in the STBY/CRS window.
The receiver is now tuned to the frequency of the new station, and the course is selected.
To select another station, press the transfer key (making both windows display the previously selected frequency) before retuning the VOR (or ILS).

Note : *When the radio-nav standby mode is active (NAV key ON) and VHF or HF tuning is required, select the VHF key or the HF key on the RMP (normal radio communications use). The NAV key, which has no effect on the selection of a radio communication frequency, must remain in the ON position in order to*
R *prevent radio navigation aid tuning from changing NAV receiver frequencies.*

AUTOMATIC IDENTIFICATION OF ADF/VOR/ILS

Although the navigation display automatically identifies the tuned ADF, VOR, or ILS station (auto ident decoded), the flight crew must, in the following cases, confirm the correct tuning of the desired station via the audio system :

— A station has either been autotuned or tuned manually by a crew member's entering the associated ident on the MCDU RAD NAV page, and the decoded ident appearing on the ND is the wrong one.
— A crew member has tuned the station manually on an RMP or by entering the frequency on the MCDU RAD NAV page.

WEATHER RADAR

INTRODUCTION

Airborne weather radar gives the flight crew an efficient tool for detecting bad weather during flight. The digital weather radar with its multicolor navigation display allows the crew to follow the best route to avoid weather problems.
To this end, some operational advice, based upon a general knowledge of the radar capabilities, is given in this chapter.

GENERAL

The radar is nothing more than a precipitation detector. How much weather it detects depends upon the raindrops, their size, composition and number.
The radar does not detect :
· clouds, fog or wind (too small droplets or no precipitation at all)
· clear air turbulence (no precipitation)
· windshear (no precipitation except in microburst)
· lightning.
The radar does detect :
· rainfall
· wet hail and wet turbulence
· ice crystals, dry hail and dry snow (above 30 000 feet) will only give small reflections.

OPERATIONAL FUNCTIONS

TILT, RANGE AND GAIN

The three things that the flight crew must understand in order to take full advantage of the weather radar are :
— antenna tilt, which causes the center of the radar beam to scan above or below the attitude reference plane
— range control which, in coordination with tilt governs the range of the navigation display
— gain control, which adjusts the sensitivity of the receiver (and should normally be set
R to AUTO). The sensitivity of the receiver may vary from one type of radar system to
R another.

COLOR CODE

A color code distinguishes areas according to their precipitation intensity :
- Black, for the lowest intensity (nothing appears on the ND)
- Green, amber, and red for progressively higher intensities.
- Magenta, for saturated areas, in the weather and turbulence mode (WX + T)

GROUND MAPPING AND GCS

Some radars have two additional modes :
- Ground mapping mode permits the radar to produce more returns from less reflective targets on the ground. The associated color codes are : Black for standing water (no returns), green for the ground, amber or red for cities and mountains (strong returns).
- Ground Clutter Suppression (GCS) erases up to 85 % of ground clutter return. The flight crew should only use this mode at shallow tilt angles (0 to 5°) and for short intervals, since it may incorrectly identify stationary weather targets. Steep tilt angles can make it difficult to distinguish between ground and weather targets.

OPERATIONAL USE

CAUTION

R Before selecting WX, WX/T or MAP mode on the control unit, make certain that :
R – No one is within a distance less than 5 meters from the antenna in movement, within
R an arc of plus or minus 135° on either side of the aircraft centerline.
R – The aircraft is not directed towards any large metallic obstacle, such as a hangar,
R which is within 5 meters in an arc of plus or minus 90° on either side of the aircraft
R centerline.

TILT AND RANGE

- Refer to the FCOM 3.03.

DETECTION AND INTERPRETATION

General

1. The flight crew should monitor the weather at long range, as well as at shorter ranges, in order to be able to efficiently plan course changes, and to avoid weather-defined blind alleys and box canyons.
2. Ground returns usually appear smaller, sharper, more packed, better-defined, and more angular than weather targets, whereas the latter usually appear larger, have less definite shapes, and tend to remain relatively unchanged.
3. The line-of-sight distance to the horizon is :
   $D(NM) = 1,23 \sqrt{(\text{aircraft altitude (feet)})}$.

Red and magenta areas : thunderstorms, tornadoes, hail

The steeper the gradient of rainfall rate, the stronger the turbulence (magenta color) and the possibility of hail.

- To use the radar effectively for avoiding thunderstorms, the flight crew should select the following ranges on the NDs (if possible) :
  - 160 NM on the Pilot Non-Flying (PNF) ND
  - 80 NM on the Pilot Flying (PF) ND
- To avoid a large storm, the flight crew must make decisions while still 40 NM from it. Therefore the flight crew should :
  - Avoid magenta (WX+T mode) and red areas and fringes by at least 20 NM above the FL230 and by 5 to 10 NM below FL230.
  - Avoid single magenta areas of turbulence (not associated with heavy precipitation) by at least 5 NM.
- Flight crew should readjust the tilt frequently in order to monitor storm development and to get the best cell echo.
- Failure to tilt the antenna down periodically may cause a target to disappear.
- The following formula calculates the vertical distance between the top of the cell and the aircraft flight level :

  $\boxed{\triangle h \text{ (feet)} \sim d(NM) \times \text{Tilt (degrees)} \times 100.}$

  Example :
  Cell at 40 NM disappearing at less than 3 degrees downtilt
  $\triangle h \sim 40 \times 3 \times 100 = 12\ 000$ feet.
- The pilot should not attempt to penetrate a cell or clear its top by less than 5000 vertical feet, because otherwise the aircraft may encounter severe turbulence.

R If the top of cell is at or above 25000 feet, overflying should be avoided due to the
R possibility of encountering turbulence stronger than expected.

In the same way, the pilot should avoid flying under a thunderstorm because of possible windshear, microbursts, severe turbulence, or hail.

Turbulence mode :

- The turbulence detection mode is most effective when the ND is set on 40 NM and the antenna is tilted to avoid ground return.
- When examining areas of heavy rainfall in WX+T mode, the flight crew should adjust antenna tilt frequently, because turbulence areas vary with the altitude.
- Closely spaced (or thin lines between) color gradations are usually associated with severe turbulence.

FLIGHT INSTRUMENT TOLERANCES

The values given below apply to aircraft in symmetrical flight (no sideslip), in clean configuration, and in straight and level flight.

ALTITUDE TOLERANCES

R – PFD 1 or 2 at ground check : ± 25 feet (8 m)
R – standby altimeter at ground check : ± 300 feet (91 m)

Note : On ground, as the standby altimeter's vibrator is off, the standby altimeter's tolerance value is high. In flight, the vibrator is on and the value is lower.

MAXIMUM DIFFERENCES BETWEEN ALTITUDE INDICATIONS

R

FL/SPEED	ALTITUDE (ft) COMPARISON BETWEEN		
	ADR 1 and ADR 2 (on PFD)	ADR 3 and ADR 1 or ADR 3 and ADR 2 (on PFD)	STBY ALTI and any ADR 1 or 2 or 3
GND CHECK	20 (6 m)	20 (6 m)	*
FL50/250 kt	50 (15 m)	80 (24 m)	130 (40 m)
FL100/250 kt	55 (17 m)	80 (24 m)	185 (56 m)
FL200/300 kt	90 (27 m)	145 (44 m)	295 (90 m)
FL300/.78	130 (40 m)	355 (108 m)	390 (119 m)
FL390/.78	130 (40 m)	365 (111 m)	445 (136 m)

* On ground, the check is meaningless because the standby altimeter's vibrator is off.

AIRSPEED/MACH TOLERANCES

Maximum differences between Speed/Mach indications :

FL/SPEED	SPEED (kt) MACH COMPARISON BETWEEN					
	ADR 1 and ADR 2 (on PFD)		ADR 3 and ADR 1 or ADR 3 and ADR 2		STBY ASI and any ADR 1 or 2 or 3	
	SPEED	MACH	SPEED	MACH	SPEED	MACH
GND CHECK	6	0.008	6	0.008	6	–
FL50/250 kt	4	0.005	5	0.011	7	–
FL100/250 kt	4	0.005	4	0.011	8	–
FL200/300 kt	3	0.007	4	0.008	9	–
FL300/0.78	3	0.010	7	0.017	9	–
FL390/0.78	3	0.010	6	0.019	8	–

Red and magenta areas : thunderstorms, tornadoes, hail

The steeper the gradient of rainfall rate, the stronger the turbulence (magenta color) and the possibility of hail.

· To use the radar effectively for avoiding thunderstorms, the flight crew should select the following ranges on the NDs (if possible) :
  – 160 NM on the Pilot Non-Flying (PNF) ND
  – 80 NM on the Pilot Flying (PF) ND

· To avoid a large storm, the flight crew must make decisions while still 40 NM from it. Therefore the flight crew should :
  – Avoid magenta (WX+T mode) and red areas and fringes by at least 20 NM above the FL230 and by 5 to 10 NM below FL230.
  – Avoid single magenta areas of turbulence (not associated with heavy precipitation) by at least 5 NM.

· Flight crew should readjust the tilt frequently in order to monitor storm development and to get the best cell echo.

· Failure to tilt the antenna down periodically may cause a target to disappear.

· The following formula calculates the vertical distance between the top of the cell and the aircraft flight level :

$$\boxed{\triangle h \text{ (feet)} \sim d(\text{NM}) \times \text{Tilt (degrees)} \times 100.}$$

Example :
Cell at 40 NM disappearing at less than 3 degrees downtilt
$\triangle h \sim 40 \times 3 \times 100 = 12\ 000$ feet.

· The pilot should not attempt to penetrate a cell or clear its top by less than 5000 vertical feet, because otherwise the aircraft may encounter severe turbulence.
R If the top of cell is at or above 25000 feet, overflying should be avoided due to the
R possibility of encountering turbulence stronger than expected.
In the same way, the pilot should avoid flying under a thunderstorm because of possible windshear, microbursts, severe turbulence, or hail.

Turbulence mode :

· The turbulence detection mode is most effective when the ND is set on 40 NM and the antenna is tilted to avoid ground return.

· When examining areas of heavy rainfall in WX+T mode, the flight crew should adjust antenna tilt frequently, because turbulence areas vary with the altitude.

· Closely spaced (or thin lines between) color gradations are usually associated with severe turbulence.

FLIGHT INSTRUMENT TOLERANCES

The values below apply to aircraft in symmetrical flight (no sideslip), in clean configuration, and in straight and level flight.

ALTITUDE TOLERANCES

– PFD 1 or 2 at ground check : ± 25 feet (8 m)
– Standby altimeter at ground check : ± 300 feet (91 m)

Note : On ground, as the standby altimeter's vibrator is off, the standby altimeter's tolerance value is high. In flight, the vibrator is on and the value is lower.

MAXIMUM DIFFERENCES BETWEEN ALTITUDE INDICATIONS

FL/SPEED	ALTITUDE (ft) COMPARISON BETWEEN		
	ADR 1 and ADR 2 (on PFD)	ADR 3 and ADR 1 or ADR 3 and ADR 2 (on PFD)	STBY ALTI and any ADR 1 or 2 or 3
GND CHECK	20 (6 m)	20 (6 m)	*
FL50/250 kt	50 (15 m)	65 (20 m)	130 (40 m)
FL100/250 kt	55 (17 m)	80 (24 m)	185 (56 m)
FL200/300 kt	90 (27 m)	135 (41 m)	295 (90 m)
FL300/.78	130 (40 m)	195 (59 m)	390 (119 m)
FL390/.78	130 (40 m)	195 (59 m)	445 (136 m)

* On ground, the check is meaningless because the standby altimeter's vibrator is off.

AIRSPEED/MACH TOLERANCES

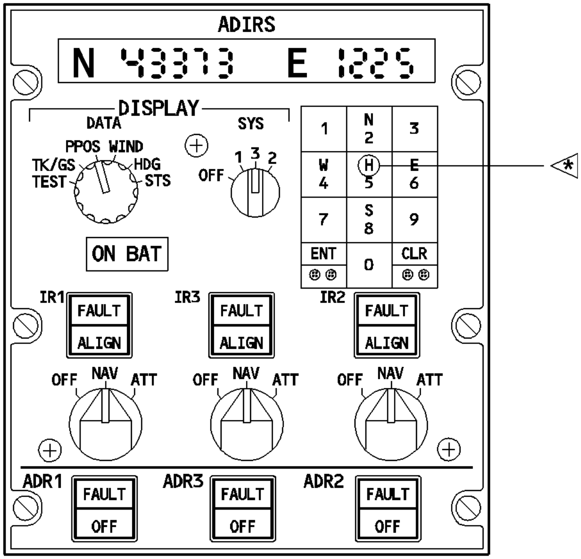
Maximum differences between Speed/Mach indications :

FL/SPEED	SPEED (kt) MACH COMPARISON BETWEEN					
	ADR 1 and ADR 2 (on PFD)		ADR 3 and ADR 1 or ADR 3 and ADR 2		STBY ASI and any ADR 1 or 2 or 3	
	SPEED	MACH	SPEED	MACH	SPEED	MACH
GND CHECK	6	0.008	6	0.008	6	–
FL50/250 kt	4	0.005	4	0.007	7	–
FL100/250 kt	4	0.005	5	0.008	8	–
FL200/300 kt	3	0.007	5	0.011	9	–
FL300/0.78	3	0.010	5	0.014	9	–
FL390/0.78	3	0.010	4	0.014	8	–

HEADING TOLERANCES

Maximum differences between magnetic heading indications on the NDs : 4 degrees.

ADIRS ALIGNMENT



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ALIGNMENT (on the ground)

When an IR is off, the flight crew must align it before it can enter the navigation mode and
R supply data to various aircraft systems. The aircraft must be stationary during alignment.
R Any aircraft motion while in ALIGN mode will restart the alignment. Also avoid alignment
R during engine start or while engines are running. This will prevent the alignment from
R restarting due to power interrupts or aircraft movement.
Alignment takes approximately 10 minutes.
The system first uses gravity to determine level attitude, then determines true heading, based on the earth's rotation. The flight crew must manually enter the latitude and
R longitude of the present position just after switching the three mode rotary selectors to NAV. This becomes the navigation starting point from which the IRs determine subsequent aircraft position during flight.

R – **All 3 mode selectors . . . . OFF for more than 10 seconds.**

R – **All 3 mode selectors . . . . back to NAV**
ON BAT light comes on for 5 seconds. Then the ALIGN light for each IRU comes on and
R stays on.

– **DISPLAY DATA switch . . . . PPOS**

– **Present position PPOS . . . . ENTER**

R Enter the present position, immediately after switching the three mode rotary selectors to NAV. The flight crew uses the MCDU or ADIRS CDU keyboard to enter local latitude and longitude. One entry serves all IRs during the alignment phase.

Note : Refer to Volume 4, for instructions on using the MCDU.
R *For transit flights, or for any flight with GPS, the best PPOS to be used when*
R *performing an alignment are, by priority :*
R *1. The airport coordinates stored in the FMS database.*
R *2. The gate coordinates.*
R *3. The airport coordinates shown on the Jeppesen chart.*
R *For aircraft without GPS, and when flying long segments without radio updates,*
R *the best PPOS to be used when performing an alignment are, by priority :*
R *1. The gate coordinates.*
R *2. The airport coordinates stored in the FMS database.*
R *3. The airport coordinates shown on the Jeppesen chart.*

● **If the ALIGN light flashes :**

– **Status message . . . . CHECK**
· If the screen displays a message, the flight crew must take appropriate action (See the STATUS MESSAGES paragraph, 3.04.34 page 10).
· If there is no message, the flight crew should enter (identical) present position again. The ALIGN light then remains steady.

● **If the ALIGN light flashes at the end of the ten minute alignment phase :**

– **DISPLAY DATA switch . . . . PPOS**
The flight crew should check the entered present position, and enter the correct present position again.
Then :
· If the ALIGN light goes off, the IR portion of the ADIRU has entered NAV mode.
· If the ALIGN light stays on and the IR FAULT light flashes, the IR can only be used in ATT mode.
· If the ALIGN light stays on, but the IR FAULT does not flash, switch off the affected IR and perform a normal alignment again.

FAST REALIGNMENT (on the ground)

During transit or enroute stops with brief ground times, the flight crew may perform a realignment and zero the ground speed error, by selecting OFF from NAV then reselecting NAV within 5 seconds.

– **All 3 ADIRS CDU selectors . . . . OFF**

– **All 3 ADIRS CDU selectors . . . . back to NAV within 5 seconds**
The ALIGN light stays off, as long as selector is at OFF (5 seconds maximum), then comes on during the 30-second realignment period.
If the DATA DISPLAY switch is in the STS position, the CDU displays REALN DESN 5 SEC (realign decision 5 seconds).

– **DATA DISPLAY switch . . . . PPOS**

– **Present position . . . . ENTER**
Enter the local latitude and longitude, using the MCDU or ADIRS CDU keyboard.

Note : *Refer to Volume 4, for instructions on using the MCDU.*
R *For transit flights, or for any flight with GPS, the best PPOS to be used when*
R *performing an alignment are, by priority :*
R *1. The airport coordinates stored in the FMS database.*
R *2. The gate coordinates.*
R *3. The airport coordinates shown on the Jeppesen chart.*
R *For aircraft without GPS, and when flying long segments without radio updates,*
R *the best PPOS to be used when performing an alignment are, by priority :*
R *1. The gate coordinates.*
R *2. The airport coordinates stored in the FMS database.*
R *3. The airport coordinates shown on the Jeppesen chart.*

If present position has not been entered, or if the entered values disagree (within given limits) with the calculated values, the ALIGN light flashes.
The flight crew must check the present position it has entered, and enter present position again. If the ALIGN light still flashes, the flight crew must switch off the affected IR and perform a normal alignment.
After the 30-second realignment, the system automatically goes to NAV mode.

SHUTDOWN

– **Mode selectors . . . . OFF**
Pull and turn the 3 mode selectors to OFF.
The message screen displays REALN DESN 5 SEC (realign decision) for 5 seconds, then a 5 seconds countdown to off (OFF TIME 5 SEC displayed). Flight crew must not pull circuit breakers until after the final countdown is completed.

STATUS MESSAGES

Status messages appear when the DISPLAY DATA switch is set to STS. If there is more than one condition calling for a message, the display scrolls to the next message every 2 seconds.

R

MESSAGE	DESCRIPTION
STS IR FAULT	Hard failure. Select ATT (if corresponding message is displayed) or refer to MMEL or remove ADIRU for maintenance.
STS-DELAY MAINT	Failure not affecting IR functioning. Service ADIRU when convenient.
STS-ENTER PPOS	Enter present position or check entered position is correct. Note : The confirmation of an erroneous longitude at the present position entry will create a wrong position of the aircraft symbol on the NDs.
STS-SELECT ATT	Hard IRU failure, select ATT mode.
STS-EXCESS MOTION	Excess motion detected during alignment. ADIRU will automatically restart alignment. Ensure aircraft is not moving.
STS-SWITCH ADR	ADR invalid.
STS-CHECK CK/BK	Check circuit breakers *
STS-CDU FAULT	Remove CDU for maintenance.
STS-ENT MAG HDG	Enter magnetic heading.

* If a corresponding FAULT light comes on, check BAT 1 load.

TCAS

For System Description, refer to 1. 34.
For Operational Procedures, refer to 3.02

CONFLICT RESOLUTION PRINCIPLES

– **Traffic Advisory (TA)**
If an intruder represents a potential collision threat, a visual and aural Traffic Advisory will be given. This advisory helps the crew to visually situate the intruder. It also prepares the crew for a possible Resolution Advisory. However, not every RA is preceded by a TA.

– **Resolution Advisory (RA)**
If the intruder is considered to be a real collision threat, an aural and visual Resolution Advisory is given.
TCAS determines the optimum vertical maneuver that ensures effective separation, with a minimum change in vertical speed.
Depending on each situation, TCAS generates a :
· Preventive Advisory (i.e. the actual vertical speed may be maintained). It displays the vertical speed range to be avoided.
· Corrective Advisory i.e. the actual vertical speed is within the range to be avoided and a recommended vertical speed (fly to) range is displayed.
· Modified Corrective Advisory, which changes already displayed RA (i.e if the intruder changes their vertical speed).

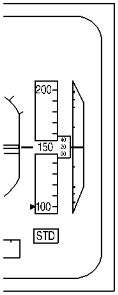
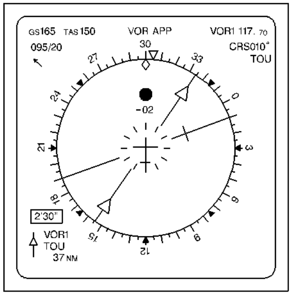
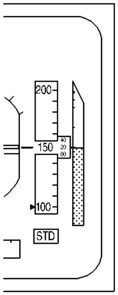
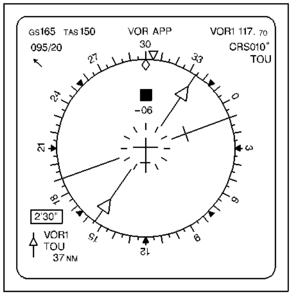
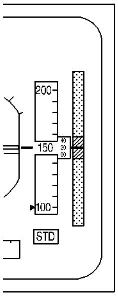
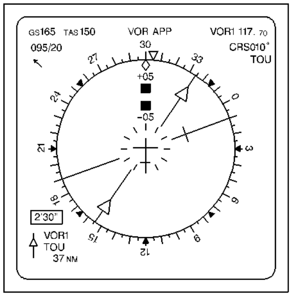
R OPERATIONAL RECOMMENDATIONS

● **Avoidance generalities :**
R Always follow the RAs orders, even if they lead to cross the altitude of the intruders,
R as they ensure the best global separation.

CAUTION
R If a pilot does not follow a RA, he should be aware that the intruder may be TCAS
R equipped and may be maneuvering toward his aircraft in response to a
R coordinated RA. This could compromize safe seperation.

Pilots should comply with the vertical speed limitations during the last 2000 feet of climb or descent. In particular, pilots should limit vertical speeds to 1500 feet/min during the last 2000 feet of a climb or descent, especially when they are aware of traffic that is converging in altitude and intending to level off 1000 feet above or below the pilot's assigned altitude.

- **Select TA only mode in the following cases :**
  - Engine failure
  - Dispatch with landing gear down (if applicable)
  - In case of known nearby traffic which is in visual contact.
  - At particular airports and during particular procedures identified by an operator as having a significant potential for unwanted a inappropriate RAs (closely spaced parallel runways, converging runways, low terrain along the final approach...)

SCENARIO	AURAL WARNING and TYPICAL DISPLAY PFD	ND	CREW RESPONSE
TRAFFIC ADVISORY - one intruder is ahead at 12:00 o'clock beyond 6 NM, 200 ft below your altitude	"TRAFFIC, TRAFFIC" 		- Do not maneuver on the traffic advisory symbol. - Attempt to visually acquire the intruder. - Be prepared to maneuver if the TA changes to an RA
RESOLUTION ADVISORY (PREVENTIVE) - One intruder is ahead at 12:00 o'clock, 600 ft below your altitude	"MONITOR VERTICAL SPEED" 		- Do not descend
RESOLUTION ADVISORY (CORRECTIVE) - Two intruders are ahead at 12:00 o'clock . one, at 500 ft above your altitude . the other, at 500 ft below your altitude	MAINTAIN VERTICAL SPEED MAINTAIN 		- Remain in level flight - Do not climb or descend

V/S scale color legend: (hatched) : green (dotted) : red

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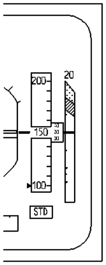
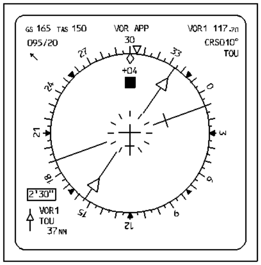
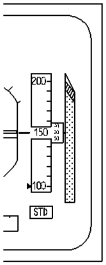
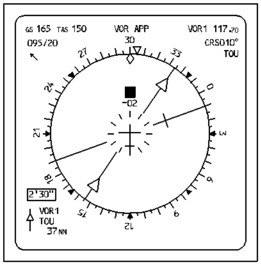
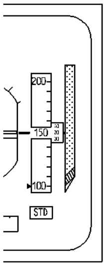
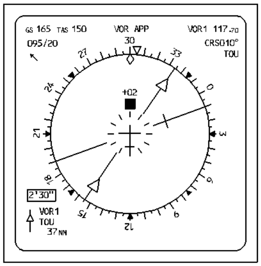
SCENARIO	AURAL WARNING and TYPICAL DISPLAY PFD	AURAL WARNING and TYPICAL DISPLAY ND	CREW RESPONSE
RESOLUTION ADVISORY (CORRECTIVE) - The intruder is ahead at 12:00 o'clock, 400 ft above your altitude - You are already climbing at 2000 ft/mn	"ADJUST VERTICAL SPEED ADJUST" 		- Reduce climb at present rate
- The intruder is ahead at 12:00 o'clock, 200 ft below your altitude	"CLIMB, CLIMB" 		- Promptly (within 5 seconds) smoothly establish a climb rate of 1 500 ft/mn
- The intruder is ahead at 12:00 o'clock, 200 ft above your altitude	"DESCEND, DESCEND" 		- Promptly (within 5 seconds) and smoothly establish a descent rate of 1 500 ft/mn

V/S scale color legend: ▨ : green ░ : red

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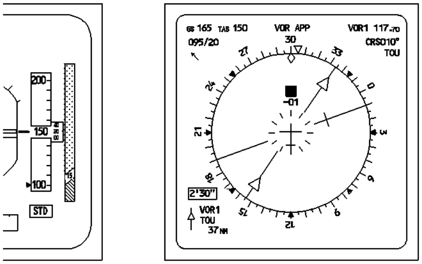
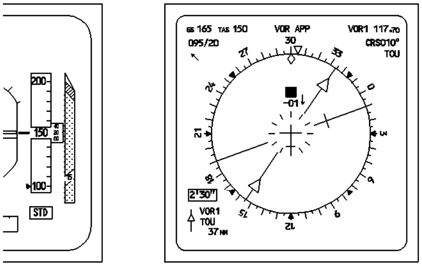
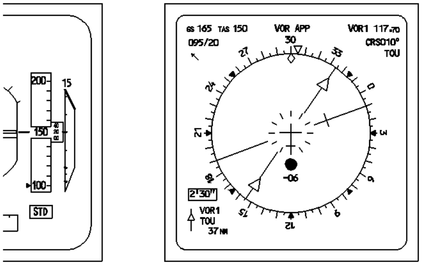
SCENARIO	AURAL WARNING and TYPICAL DISPLAY (PFD / ND)	CREW RESPONSE
RESOLUTION ADVISORY (ADDITIONAL CORRECTIVE) - The intruder ahead has stopped its climb - It is now 100 ft below your altitude	"INCREASE DESCEND INCREASE DESCEND" 	- Immediately (within 2.5 seconds) and smoothly increase your descent rate to 2 500 ft/mn
- The intruder has changed from level flight to a rapid descent after TCAS issued a DESCEND RA - TCAS is now changing that to a CLIMB RA	"CLIMB, CLIMB, NOW CLIMB, CLIMB, NOW" 	- Initiate a change from a descent to a climb maneuver, within 2.5 seconds.
RA CLEARED - The intruder has passed behind and is now 600 ft below your altitude - It is no longer a threat	"CLEAR OF CONFLICT" 	- Return promptly to the previous ATC clearance.

V/S scale color legend: ▨ : green ░ : red

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APPROACH ON PAPI

R Eye to wheel height on approach is 25 feet and minimum recommended wheel clearance over the threshold is 20 feet. Do not follow Precision Approach Path Indicator (PAPI) guidance below 200 feet when PAPI Minimum Eye Height over Threshold (MEHT) is less
R than 45 feet.

R QNH USE FOR TO/APPR/LDG ON QFE/QNH PIN PROGRAMMED AIRCRAFT

The QNH option is the basic reference on the aircraft.
For airlines using QFE reference, the switching from "QNH only" to QNH/QFE can be done by activating a specific pin program on the three following computers : FMGC, GPWC, FCU.
For various reasons, some airlines may use QNH reference for approach and landing on QNH/QFE pin programmed aircraft. The crew should be aware of the following consequences and should use the following procedures.

CONSEQUENCES

When the pin program is the QNH/QFE option, the 2R field of the MCDU PERF APPR page is named "MDH" independently of the baro setting reference selected by the crew.
On some airports in mountainous areas, GPWS warnings may be delayed by a maximum of five seconds.

PROCEDURES

No specific procedures are necessary for takeoff, climb, cruise, descent and go around phases.

Procedure for precision approaches (CAT 2 and CAT 3) :
· Insert the DH into the DH field of the PERF APPR page as usual.

Procedure for ILS approach (CAT 1) :
· Insert the DA into the MDH field of the PERF APPR page.

Procedure for non precision approach :
· Insert the MDA value into the MDH field of the PERF APPR page.

Note : *If the MDA is greater than 5000 feet, the value is not accepted and the message OUT OF RANGE is displayed on the MCDU. In such a case, the MDH field remains blank and the PNF should announce the call outs.*

· Do not use APPR NAV FINAL
Use selected mode TRK/FPA until visual references are met.
· The change of color from green to amber in the PFD altitude scale will occur at the correct altitude.

QFE USE FOR TO/APPR/LDG ON AIRCRAFT WITH QNH ONLY PIN PROGRAMMING

The crew should not use QFE on aircraft with a “QNH only” pin programming (incorrect profile computation of the managed vertical modes CLB, DES and FINAL APPR, possible false GPWS warnings in mountainous areas).

LEFT INTENTIONALLY BLANK

LEFT INTENTIONALLY BLANK

LEFT INTENTIONALLY BLANK

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS)

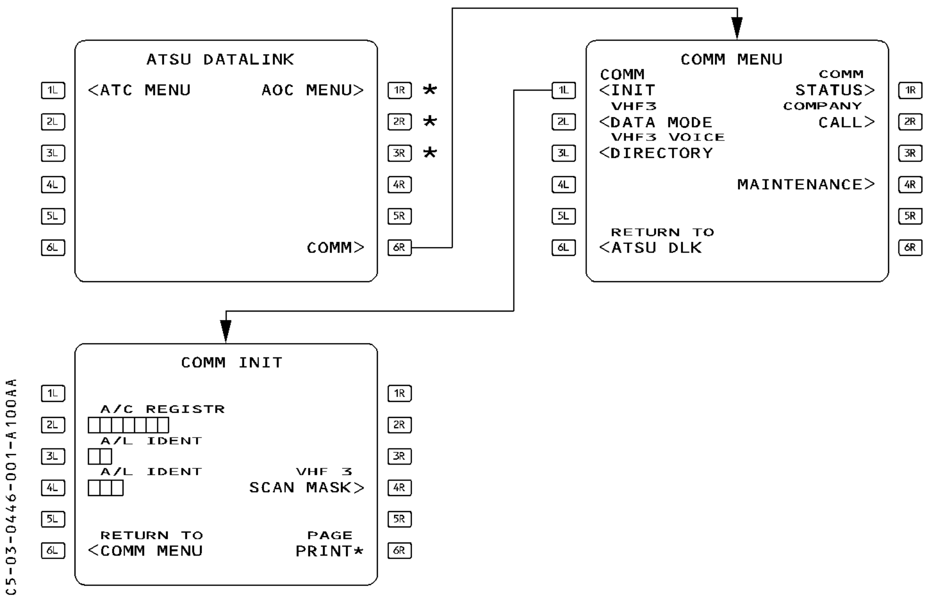
The Flight Management System (FMS) provides aircraft position inputs to the EGPWS for enhanced function processing purpose.
The TERR pushbutton located on the overhead panel enables the activation or de-activation of the enhanced functions of the EGPWS.
During all flight phases, when the check of the navigation accuracy performed by the pilots (as described in volumes 3.03 and 4.05) is positive, the enhanced functions should be switched ON.
During climb, descent, approach, and go around phases, when GPS PRIMARY is not available (or not installed) and the FMS navigation accuracy check prevents the crew from using the NAV mode in a phase of flight, the TERR pushbutton must be switched OFF. When the TERR pushbutton is switched OFF, the ECAM message "NAV GPWS TERR DET FAULT" is displayed only the basic GPWS modes 1 to 5 remain operative.
R If the TERR ON ND is not selected, and a terrain alert is generated, the terrain is
R automatically displayed on the ND.
R The brightness of the terrain indication on the ND is controlled via the weather radar
R brightness control knob. If the weather radar brightness was set to low (due to bad
R weather) and a terrain alert occurs, then the terrain display brightness will also be low.
R Thus when a terrain alert occurs, the ND weather/terrain image brightness may need to be
R adjusted.

ATSU INITIALIZATION

ATSU is automatically initialized provided a list of Service Providers has been scanned and provided the 2 following parameters have been received and validated by the ATSU :
– Aircraft Registration Number (ARN)
– Airline Identity code (A/L ID).
If one of these 3 above conditions is not fulfilled then the ATSU is not available :
– the ECAM displays ACARS STBY
  and
– the MCDU scratchpad displays a message to request a crew action.
A manual entry of the missing parameter reinitializes the ATSU and clears the ECAM and MCDU message.

If ARN is not valid
The MCDU scratchpad displays "ENTER A/C REGISTER" message.
After having cleared the scratchpad the crew writes the ARN on the scratchpad. Pressing the 2L key on the COMM INIT page enters the ARN in the 2L field.

If A/L ID is not valid
The MCDU scratchpad displays "ENTER A/L IDENT" message.
After having cleared the scratchpad the crew writes the two-character A/L ID code on the scratchpad. Pressing the 3L key enters the A/L ID code on the 3L field. The crew should repeat the same operation for the three character A/L ID code using the 4L key instead of 3L key.



* THESE FIELDS ARE CUSTOMIZED ACCORDING TO THE AOC PROGRAMMING

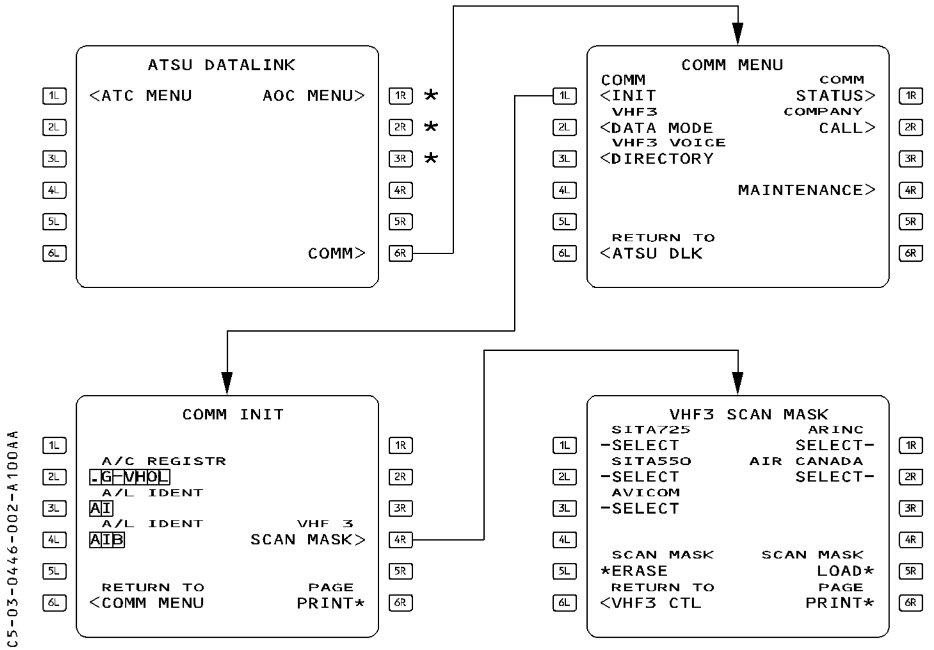
If no VHF Service Providers has been selected :

The MCDU scratchpad displays "ENTER VHF3 SCAN MASK" message.

On the VHF3 SCAN MASK page the crew selects a service providers list in the airline priority order and activates the VHF SCAN MASK function.

Example : selection of the service providers SITA 725 and ARINC.

1. Press 5L key : the star adjacent to ERASE indication goes out of view then comes into view
2. Press 1L key to select SITA 725 : SELECT indication goes out and the priority number
R of selection # 1 comes into view
3. Press 1R key to select ARINC : SELECT indication goes out and the priority number of
R selection # 2 comes into view
4. Press 5R key to activate the VHF SCAN MASK function : the star adjacent to the SCAN MASK LOAD indication goes out of view then comes into view.



* THESE FIELDS ARE CUSTOMIZED ACCORDING TO THE AOC PROGRAMMING

R *Note : Modification of the SCAN MASK setting may result in the loss of air-ground VHF*
R *datalink communication. Therefore, the SCAN MASK setting should not be modified*
R *by the crew, unless they have been instructed to do so.*

THRUST CONTROL

GENERAL

The flight crew uses console-mounted levers to control engine thrust. Each lever sends electrical signals to the FADEC of the engine it controls. The FADEC responds to the thrust lever position or an autothrust command by setting the engine thrust.
The thrust lever quadrant is the equivalent of a thrust rating panel. For each lever it has five detents. Moving the thrust lever to the forward stop of the quadrant always gives maximum takeoff or go-around thrust, as appropriate, and signals the AP/FD to go to takeoff or go-around, as appropriate. The FMA (Flight Mode Annunciator) in the left window of each PFD displays the status of the thrust system to the pilot.
The engine instrument display gives a read-out of the engine thrust mode (CL, MCT, etc.) and the appropriate engine limit. It displays the actual limit set, thrust lever position, FADEC command, and maximum engine rating limit continually.

MANUAL THRUST CONTROL

With A/THR disconnected, thrust control between full reverse (on the ground only) and maximum takeoff or go-around thrust is entirely conventional.
TLA (Thrust Lever Angle) determines the thrust demanded.
The rating limit selected by the pilot and the actual engine limit appear on the engine instrument display.
With the thrust lever short of the CL position on the quadrant, the engine instrument display shows CL continually. If one or both thrust levers are above CL, it shows MCT/FLEX. If one or both thrust levers are beyond the MCT detent, it shows TOGA. With the thrust levers positioned in a detent, the detent setting controls the engines to that limiting parameter.

AUTOTHRUST

When active A/THR controls either speed, thrust or retard as appropriate. The engine limit corresponds to the thrust lever position. If the thrust lever is below the CL detent then the TLA determines the engine power limit.
With the thrust lever above the CL detent, autothrust reverts to arm (A/THR blue on FMA) except if alpha-floor is active. CLB (or LVR CLB) flashes on the FMA.
If the thrust levers are not aligned, an asymmetric message (ASYM or LVR ASYM) appears on the FMA. If so, each engine is limited to its appropriate TLA.
This allows the use of autothrust to continue if one engine has to have its maximum RPM limited for some operational reasons such as excessive vibration.

Autothrust disconnection

Autothrust disconnection occurs when :
- The A/THR fails, or
- The FCU's A/THR pushbutton is pressed, or
- The thrust lever(s)' instinctive disconnect button is pressed, or
- Both thrust levers are set to IDLE.

R — When the radio altitude is below 100 ft and :
R · Both thrust levers above CL detent or
R · One thrust lever above MCT detent.

1. Disconnection, due to a failure or to the use of the FCU A/THR pushbutton.
   If the thrust levers are in the CL detent (both engines operating), or one thrust lever in the MCT (one engine operative), the thrust is locked at its actual value. The FMA displays "THR LK". A single chime sounds, and an amber ECAM caution appears, as long as thrust is locked. (For more details, refer to FCOM 1.22.30).
   Movement of the thrust lever(s) unlocks the thrust, and the engine then responds to TLA at the normal rate.
2. Disconnection, due to the use of instinctive disconnect button.
   When a pilot presses the instinctive disconnect button, the engines immediately develop thrust corresponding to the position of their thrust levers, whatever that might be.

Instinctive Disconnection procedure

To avoid any confusion for those pilots flying the A318/A319/A320/A321 with different modifications (with, and without, energy management), Airbus recommends that pilots use one procedure for disconnecting with the instinctive disconnect button.
- Set the thrust levers to the current thrust setting by adjusting the levers until the N1 (or EPR) TLA white circle is adjacent to the actual N1 (or EPR).
- Use the instinctive button to disconnect the A/THR.
- Check that "AUTO FLT A/THR" OFF is displayed on the, and that there is no annunciator in the first column of the FMA.
- Set the thrust manually.

Use of autothrust in approach

The pilot should use autothrust for approaches. On final approach, it usually gives more accurate speed control, although in turbulent conditions the actual airspeed may vary from the target speed, by as much as five knots. Although the changeover between auto and manual thrust is easy to make with a little practice, the pilot should, when using autothrust for the final approach, keep it engaged until he retards the thrust levers to idle for touchdown. If the pilot is going to make the landing using manual thrust, he should disconnect the A/THR by the time he has reached 1000 feet on the final approach.
If he makes a shallow flare, with A/THR engaged, it will increase thrust to maintain the approach speed until he pulls the thrust levers back to idle. Therefore he should avoid making a shallow flare, or should retard the thrust levers as soon as it is no longer necessary to carry thrust, and if necessary before he receives the "retard" reminder.

When using autothrust, the pilot can always change thrust by moving the thrust levers above the CL detent. The thrust then increases to what corresponds to the thrust lever position. However, autothrust stays armed, and immediately takes effect when the thrust levers are returned to the CL detent. Therefore, the pilot should normally put the thrust levers back to CL, as soon as the aircraft has made the change for which he increased thrust. This feature gives the pilot a means of advancing phase on the autothrust in very difficult environmental conditions. But, it should only be needed in exceptional circumstances.

R *Note* : *When below 100 feet, moving thrust levers above the CL detent, will result in*
R *A/THR disconnection.*

Although use of the autothrust is recommended for the entire approach, this does not absolve the pilot from his responsibility to monitor its performance, and to disconnect it if it fails to maintain speed at the selected value. Such monitoring should include checking on whether or not the managed speed, calculated by the FMGC, is reasonable.
R For more information concerning aircraft handling during final approach, refer to the FCOM
R Bulletin 54.

Engine failure

The pilot can continue to use autothrust after an engine failure, but some pilots feel that directional control is more difficult, when autothrust changes the thrust instead of the pilot making the thrust changes manually. The choice between using, or not using, autothrust after engine failure is a personal one. As far as speed control is concerned, autothrust is usually more accurate than a pilot.

MANUAL ENGINE START

Pilots normally use automatic starting to start an engine.
However, manual starting is recommended in the following cases :

- **After aborting a start, because of :**
  - Engine stall
  - Engine EGT overlimit
  - Low start air pressure

- **When expecting a start abort, because of :**
  - Degraded bleed performance, due to hot conditions, or at a high-altitude airfields.
  - An engine with a reduced EGT margin, in hot conditions, or at a high-altitude airfields.
  - Marginal performance of the external pneumatic power group.

MANUAL ENGINE START PROCEDURE

– **THR LEVERS . . . . IDLE**

> CAUTION
> The engine will start regardless of the position of the thrust lever and will accelerate rapidly to generate the thrust demanded by the TLA, causing an hazardous situation if the thrust levers are not at idle.

– **ENG MODE selector . . . . NORM THEN IGN**
Lower ECAM displays the engine page.

– **ENG MAN START . . . . ON**
· Do not set MAN START pushbutton to ON before all amber crosses have disappeared on engine parameters (upper ECAM display).
· On ECAM lower display check that the START VALVE is in line
· On ECAM displays check that OIL PRESS increases, N2 increases.

● **When N2 reaches maximum motoring speed (minimum 20 %) :**
Maximum motoring speed is defined as that at which N2 acceleration is less than 1% in approximately 5 seconds.

R ● **If N2 does not get up to 20% check that the pack valve autoclosure**
R **functions. If the autoclosure functions, shed APU loads as follows.**

R – **GALLEY . . . . OFF**
R If needed, shed also :

R – **BLUE ELEC PUMP (ground only) . . . . OFF**

R – **FUEL X FEED . . . . ON**

R – **FUEL PUMPS except R TK PUMP 2 . . . . OFF**

R – **BLOWER . . . . OVRD**

R – **CAB FANS . . . . OFF**

– **MASTER switch . . . . ON**
The CM 2 starts the timing for monitoring the light up delay.

– **ECAM displays . . . . CHECK**
Check : Indication of igniters A and B.
Fuel flow increase.
EGT and N1 increase 15 seconds (maximum) after fuel is on.
In case of electrical power supply is interrupted during the start sequence (indicated by loss of ECAM CRTs) abort the start by switching OFF the MASTER
R switch. Then perform a 30 second dry crank.

● **When N2 reaches 50 %**

– **ECAM displays . . . . CHECK**
Check : START VALVE cross line.
Igniter indication off.

– **MAIN AND SECONDARY ENG. IDLE PARAMETERS . . . . . . CHECK NORMAL**
Grey background on N2 indication disappears.

Note : CFM Eng. 56-5-B1/B2 engines accelerate slowly from 50 % N2 to idle. Start abort is not required as long as N2 is increasing.

– **MAN START . . . . OFF**

– **ENG MODE SELECTOR . . . . NORM**

ENGINE START WITH EXTERNAL PNEUMATIC POWER

- **Before connecting external pneumatic power :**

  – **PACKS 1 and 2 . . . . OFF**
  (To prevent pack contamination).

- **Before start :**

  – **APU BLEED . . . . OFF**

  – **ENG BLEED (both engines) . . . . OFF**

  – **X BLEED . . . . OPEN**

- **Cleared to start :**

R – **Start Engine 2 first.**

R *Note : As necessary, Engine 1 can also be started by using the external pneumatic*
R *power. If Engine 1 is started first, check the brake accu pressure prior to*
R *engine start.*

  – **Use the normal engine start procedure.**
  The minimum recommended starter air supply pressure is 30 psi, when the start valve is open.
  Two external pneumatic power units may be used in parallel, if the pressure/flow relation is expected to be marginal.

- **After Engine 2 is started :**

  – **Request removal of the external pneumatic power unit(s).**

  – **PACKS 1 and 2 . . . . ON**

  – **ENG 2 BLEED . . . . ON**

  – **CROSSBLEED ENGINE START PROCEDURE . . . . APPLY**

CROSSBLEED ENGINE START

CAUTION
The use of engine bleed supply and external pneumatic power supply simultaneously is prohibited.

- **Before start :**

  – **APU BLEED . . . . OFF**
  The BLEED valve of the running engine reopens and the cross bleed valve closes.

  – **ENG BLEED (running engine) . . . . check ON**

  – **ENG BLEED (receiving engine) . . . . OFF**
  The bleed valve of engine to be started is closed to eliminate reverse flow leakage.

  – **X BLEED . . . . OPEN**

- **Cleared to start :**

  – **Confirm area is clear of obstacles.**
  Ensure increased power jet wake does not constitute any hazard to people or installation behind the aircraft.
  Adjust thrust of supplying engine to obtain 30 psi at start air valve before start initiation and at least 25 psi during start.
R Do not exceed 80 % N2 to limit jet wake.
  Apply the normal engine start procedure.

- **After start :**

  – **THRUST LEVER (supplying engine) . . . . IDLE**

  – **X BLEED . . . . AUTO**

  – **ENG BLEED (receiving engine) . . . . ON**

  – **PACKS . . . . Check ON**

START VALVE MANUAL OPERATION

Advise ground crew to prepare for manual start valve operation.

– **AUDIO CONTROL PANEL . . . . CAB**

● **When ground crew member is ready, order "START 1 or 2"**

– **ENG MODE SEL . . . . IGN**

– **ENG MASTER . . . . ON**

– **START VALVE . . . . "ORDER OPEN AND KEEP OPEN"**
If not maintained in OPEN position by the ground crew member, the start valve closes.

● **When N2 at 50 %**

– **START VALVE . . . . "ORDER CLOSE"**
Continue with normal procedure.

LEFT INTENTIONALLY BLANK

LEFT INTENTIONALLY BLANK

PUSHBACK WITH POWER PUSH UNIT VIA THE MAIN LANDING GEAR

GENERAL

At several airports, the pushback is performed using a Power Push Unit (PPU), which pushes the aircraft via the main landing gear, while the flight crew provides steering via the green hydraulic system. Steering guidance will be given by ground personnel via interphone communication.
This section provides the flight crew with Airbus operational recommendations in performing such a pushback, and replaces the “BEFORE PUSHBACK or START” standard operating procedure.

PREPARATION

– **LOADSHEET . . . . CHECK**
The Captain should thoroughly check the load and trim sheet, particularly for gross errors, and ensure that the loadsheet data is correct : Correct flight, correct aircraft, dry operating index, configuration, fuel onboard, etc.
Compare ZFW/ZFCG with the previously-entered data and adjust, if necessary.

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loadsheet is checked :
  – The PNF checks or recomputes the takeoff speeds and flexible temperature, using the RTOW charts.
  – The PF independently calculates the takeoff speeds and flexible temperature, as a crosscheck.
    Particular care should be taken to determine the takeoff configuration (refer to 2.02.20).
    Confirm any takeoff weight limitation.
R – The PF checks (or revises) the takeoff data on the MCDU’s INIT B and PERF pages.

– **SEATS, SEAT BELTS, HARNESSES, RUDDER PEDALS, ARMRESTS . . . . ADJUST**
The seat is correctly adjusted when the pilot’s eyes are in line with the red and white balls.

– **MCDU . . . . IN TAKEOFF CONFIGURATION**
It is recommended that the crew display F-PLN on the PNF side, and PERF TAKEOFF on the PF Side.

– **EXT PWR . . . . CHECK OFF**
Request that external power be removed.

– **BEFORE START CHECKLIST down to the line . . . . COMPLETE**

– **TOWING LEVER . . . . NORMAL POSITION**
To be confirmed by ground personnel, and no NW STRG DISC indication on the ECAM.

– **PUSHBACK/START UP CLEARANCE . . . . OBTAIN**
Obtain ATC pushback/start up clearance.
Obtain clearance from ground personnel. Due to the face-to-face position of the flight crew and ground personnel, it is necessary that the flight crew ensure they have clearly and correctly understood the ground personnel's directional phraseology.

– **WINDOWS and DOORS . . . . CHECK CLOSED**
  – Check that the cockpit windows are closed and locked (red circle on handle fully visible). Check, on the ECAM's lower display, that all doors are closed.
  – When required by local Airworthines Authorities, check that the cockpit door is closed and locked (no cockpit door open/fault indication). If entry is requested, identify the person requesting entry before unlocking the door. With the cockpit door selector on NORM, the cockpit door is closed and locked. If entry is requested from the cabin, and if no further action is performed by the pilot, the cabin crew will be able to unlock the door by using the emergency access procedure. Except for crew entry/exit, the cockpit door should remain closed until engine shutdown.

– **BEACON . . . . ON**

– **THR LEVERS . . . . IDLE**

CAUTION

Engine will start, regardless of the thrust lever position; thrust will rapidly increase to the corresponding thrust lever position, causing a hazardous situation, if thrust levers are not in idle.

– **ENG 2 . . . . START**
Engine 2 is usually started first, to pressurize the yellow hydraulic system to maintain parking brake pressure. Engine 1 must be started after the pushback is completed, to ensure that the Power Push Unit is able to push the aircraft.

CAUTION

If, during engine start with the parking brake ON, the aircraft starts to move due to a parking brake failure, immediately release the PARKING BRK handle to restore braking by pedals.

– **PTU . . . . CHECK AUTO**
The green hydraulic system must be pressurized, via the PTU, to ensure that nosewheel steering is available.

PUSHBACK

– **PARKING BRK . . . . OFF**
Advise the ground personnel that the parking brake is OFF and that pushback can be started.

CAUTION
Do not use brakes during pushback unless required, due to an emergency.

R In case of an emergency, advise the ground personnel that the PPU should be removed
R and moved out of the evacuation area.

– **NW STRG . . . . AS RQRD**
Steer the aircraft following guidance from the ground personnel.

– **PARKING BRK . . . . ON**
After pushback is completed, set the PARKING BRK to ON and inform the ground personnel that the power-push unit can be removed.

– **ENG 1 . . . . START**

GENERAL

When the aircraft is not in such unusual operational environments as an uphill slope, slippery taxiways, or high gross weight, it may be advisable to taxi on one engine. The pilot must exercise caution when taxiing on one engine to avoid generating excessive jet blast.

DEPARTURE

The pilot should use the following procedures for taxiing out if company policy and regulations permit.

– **BRAKE ACCU PRESS . . . . CHECK**
  If necessary, use the Y ELEC PUMP to pressurize the brake accumulator.

– **ENGINE 1 . . . . START**
  Use the engine 1 for taxiing because it pressurizes the green hydraulic system (nose wheel steering + normal braking), without using the PTU.

– **X BLEED . . . . OPEN**
  This supplies both packs from engine 1.

– **Apply normal “AFTER START” procedures except :**
  · Keep the APU running to avoid additional electrical transients and to allow the galley to operate.
  · Do not run the wing anti-icing, engine anti-icing, and ECAM STATUS checks.
  · Switch off APU BLEED in order to prevent the air conditioning system from ingesting engine exhaust gases.

• **Before releasing the parking brake :**

  – **Y ELEC PUMP . . . . ON**
    This pressurizes the yellow hydraulic system.

– **Use normal “TAXI” procedures.**

• **Before ENG 2 start :**

  – **Y ELEC PUMP . . . . OFF**
    Correct operation of the PTU will be checked during engine 2 start.

  – **APU BLEED . . . . ON**

- **No less than 2 minutes before takeoff :**

  – **ENGINE 2 . . . . START**

  Note : Do not press the brake pedals during engine start, if the aircraft is moving.

  – **APU . . . . AS RQRD**

  – **X BLEED . . . . AUTO**

  Proceed with the "AFTER START" checklist (wing anti-ice, engine anti-ice, and ECAM STATUS).

ARRIVAL

The flight crew may use the following procedure for taxiing in :

– **APU . . . . START**
Start the APU before shutting down the engine, in order to avoid one electrical transient.

R • **No less than 3 minutes after high thrust operations, and when taxiing straight :**

  – **Y ELEC PUMP . . . . ON**
  This avoids running the PTU.

  – **ENG 2 . . . . SHUT DOWN**

  Note : Do not press the brake pedals during engine shutdown, if the aircraft is moving.

- **At parking :**

  – **Y ELEC PUMP . . . . OFF**

  – **ENG 1 . . . . SHUT DOWN**

SEVERE TURBULENCE

GENERAL

Whenever possible, avoid areas with known or forecasted severe turbulence. If turbulence is unavoidable, aim to keep the speed in the region of the target speed given in this section, so as to provide the best protection against the effect of gust on the structural limits, whilst maintaining an adequate margin above VLS.
Consider requesting a lower flight level to increase margin to buffet onset.
Sufficient buffet margin exists at optimum altitude.

SIGNS

Before entering an area of known turbulence, the flight crew and the cabin crew must secure all loose equipment and turn on the "SEAT BELTS" and "NO SMOKING" signs.

AUTOPILOT/AUTOTHRUST

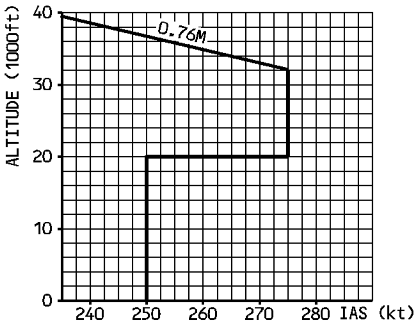
– **Keep the autopilot ON.**

– **When thrust changes become excessive : Disconnect Autothrust.**

– **For approach : Use A/THR for managed speed.**

THRUST AND AIRSPEED

Set the thrust to give the recommended speed (see table on next page). This thrust setting attempts to obtain, in stabilized conditions, the speed for turbulence penetration given in the graph below.
Only change thrust in case of an extreme variation in airspeed, and do not chase your Mach or airspeed.
A transient increase is preferable to a loss of speed, that decreases buffet margins and is difficult to recover.



NFC5-03-0491-001-A100AA

THRUST SETTING (N1) FOR RECOMMENDED SPEED

FL	SPD or Mach	WEIGHT (1000 kg)								
		44	48	52	56	60	64	68	72	76
		N1 %								
390	.76	84.2	85.1	86.3	87.6	–	–	–	–	–
370	.76	83.1	83.9	84.8	85.8	87.0	88.3	–	–	–
350	.76	82.7	83.4	84.1	84.9	85.7	86.7	87.8	89.1	–
330	.76	82.6	83.2	83.8	84.5	85.2	86.0	86.8	87.7	88.8
310	275	81.9	82.4	83.0	83.7	84.4	85.1	85.9	86.7	87.6
290	275	80.5	81.0	81.6	82.3	82.9	83.7	84.5	85.4	86.3
270	275	79.2	79.8	80.4	81.0	81.6	82.3	83.1	83.9	84.9
250	275	77.9	78.5	79.1	79.7	80.4	81.1	81.8	82.6	83.4
200	275	74.4	74.9	75.5	76.1	76.8	77.5	78.2	78.9	79.8
150	250	67.8	68.5	69.1	69.9	70.7	71.7	72.6	73.5	74.4
100	250	63.7	64.4	65.0	65.7	66.5	67.4	68.3	69.3	70.2
50	250	59.8	60.4	61.1	61.8	62.6	63.5	64.5	65.4	66.3

ALTITUDE

If the crew flies manually the aircraft :
- Expect large variations in altitude, but do not chase altitude.
- Maintain attitude and allow altitude to vary.

SPEEDBRAKES

Whenever speedbrakes are applied, keep a hand on the speedbrake handle, except while performing some other specific cockpit function (changing power, resetting altimeter, etc.).

LANDING

Configuration FULL or 3 can be used. However configuration 3 provides more energy and less drag.

OPERATIONS IN WINDSHEAR OR DOWNBURST CONDITIONS

PRECAUTIONS FOR SUSPECTED WINDSHEAR

- **Before TAKEOFF**

  - **Delay takeoff until conditions improve.**
  - **Evaluate takeoff conditions :**
    · Using observations and experience.
    · Checking weather conditions.
  - **Select the most favorable runway (considering location of the likely windshear).**
  - **Use the weather radar or the predictive windshear system (◁) before commencing takeoff to ensure that the flight path clears any potential problem areas.**
  - **Select TOGA thrust.**
  - **Monitor closely airspeed and airspeed trend during the takeoff run for early signs of windshear.**

- **During APPROACH**

  - **Delay landing or divert to another airport until conditions are more favorable.**
  - **Evaluate condition for a safe landing by :**
    · Using observations and experience.
    · Checking weather conditions.
  - **Use the weather radar.**
  - **Select the most favorable runway, considering also which has the most appropriate approach aid.**
  - **Select FLAPS 3.**
  - **Use managed speed in the approach phase.**
  - **Check both FDs engaged in ILS, FPA or V/S.**

– **Engage the autopilot, for a more accurate approach and earlier recognition of deviation from the beam, when ILS is available.**

Note : – *When it is using the GS mini-function, associated with managed speed, the system will carry extra speed in strong wind conditions.*
– *If downburst is expected, increase Vapp displayed on the MCDU up to a maximum of VLS + 15 knots.*

RECOVERY TECHNIQUE AT TAKEOFF

- **Before V1 :**

The takeoff should only be rejected if unacceptable airspeed variations occur below the indicated V1, and the pilot decides that there is sufficient runway remaining to stop the aircraft.

- **After V1 :**

– **Set thrust levers to TOGA**

– **Rotate normally.**

– **Follow SRS orders.**

- **During initial climb :**

– **Set or maintain TOGA.**

– **If the autopilot is engaged, use it ; but, be aware that automatic disengagement may occur, if $\alpha > \alpha$ prot.**

– **Follow SRS orders (including use of full backstick, if demanded).**

Note : If SRS is not available, use pitch attitude up to 17.5°, with full backstick, if necessary.

– **Do not change configuration (gear, flaps), until out of shear.**

– **Closely monitor the flight path and speed.**

– **Recover smoothly to a normal climb, when out of shear.**

RECOVERY TECHNIQUE AT LANDING

- **Set thrust levers to TOGA.**
- **If the autopilot is engaged, use it ; but, be aware that automatic disengagement may occur, if $\alpha > \alpha$ prot.**
- **Follow SRS orders.**

  Note : If the FD is not available, or if it is switched off for a visual approach, use pitch attitude up to 17.5° with full backstick, if necessary.

- **Do not change configuration.**
- **Closely monitor the flight path and speed.**
- **Recover smoothly to a normal climb, when out of shear.**

COLD WEATHER

For flight operations in icing conditions, see the Ice and Rain Protection Chapter (3.04.30).
For ground operations on contaminated runways, see the FCOM Volume 2 (2.04.10).
The preparation and ground operation of the aircraft, after it has been sitting idle in very low temperatures, may present particular problems. In such cases, the flight crew should use the following procedures, which complement the normal operating procedures.
Ice accumulates on the aircraft when the air temperature approaches, or falls below, freezing (0°C) and there is precipitation or condensation. Ice may also build up when the aircraft is exposed to any form of moisture, after the surfaces have been cold-soaked during previous cruise flight at high altitudes, after the aircraft has been refueled with cold fuel, or after it has been exposed to low overnight air temperatures.

EXTERIOR INSPECTION

- **PRELIMINARY COCKPIT PREPARATION (normal procedures) . . . . COMPLETED**
  APU is started and air conditioning is on.
- **PROBE/WINDOW HEAT . . . . ON**

– **SURFACES . . . . CHECKED FREE OF FROST, ICE AND SNOW**
All surfaces of the aircraft (critical surfaces : leading edges and upper surfaces of wings, vertical and horizontal stabilizers, all control surfaces, slats and flaps) must be clear of snow, frost and ice for takeoff.
Thin hoarfrost is acceptable on the upper surface of the fuselage.

Note : *Thin hoarfrost is typically a white crystalline deposit which usually develops uniformly on exposed surfaces on cold and cloudless nights ; it is so thin that a person can distinguish surface features (lines or markings) beneath it.*

On the underside of the wing tank area, a maximum layer of 3 mm (1/8 inch) of frost will not penalize takeoff performance.

– **FOLLOWING EQUIPMENT . . . . CHECKED FREE OF FROST, ICE AND SNOW**
  – Landing gear assemblies (lever locks) and tires, landing gear doors.
  – Engine inlets, inlet lips, fans (check for rotation), spinners, fan exhaust ducts, reverser assemblies.
  – Drains, bleeds, probes (pitots, static ports, TAT sensors, angle of attack sensors).
  – Fuel tank ventilation.
  – Radome.
  – Verify that the commercial water supplies are not frozen and have been refilled (these should have been emptied prior to the cold soak).

R ● **After first engine start**

R – **PROBE/WINDOW HEAT . . . . AUTO**
R Heating will continue to operate but under automatic control.

PROCEDURE FOR GROUND DE-ICING AND ANTI-ICING

In all circumstances, it is the Captain's responsibility to decide whether or not to de-ice/anti-ice the aircraft, or to order a repeated treatment.

CAUTION

R — Check that no external air is supplied to the aircraft, via the low or high pressure
R ground connectors.

— If repeated anti-icing is necessary, ground crew must de-ice the surfaces with a hot fluid mixture before applying a new layer of anti-icing fluid.

Ensure that the ground crew is using de-icing/anti-icing fluids, in accordance with applicable company requirements and Aircraft Maintenance Manual instructions.
The flight crew must establish good communication with the ground personnel, responsible for de-icing or anti-icing, before the procedure begins.
R The aircraft may be de-iced or anti-iced with its engines and APU stopped, or with the APU
R running, and/or with the engines running. However, the flight crew should not start the engines or APU while the fluid is being sprayed on the aircraft.

CAUTION

— Avoid indiscriminate use of de-icing fluid and its ingestion by the engine or APU.
— Do not move flaps or slats, flight control surfaces, or trim surfaces, if they are not free of ice.
— Always have the aircraft treated symmetrically: The left and right sides must receive the same and complete treatment.

BEFORE FLUID SPRAYING :

— **CAB PRESS MODE SEL . . . . CHECK AUTO**

— **ENG BLEED 1 + 2 . . . . OFF**

— **APU BLEED . . . . OFF**

— **DITCHING pushbutton . . . . ON**
R Outflow valve, pack valves, and avionic ventilation inlet and extract valves close.

This prevents de-icing fluid from entering the aircraft. Avionic ventilation is in closed circuit with both fans running. In view of the low OAT, there is no time limit for this configuration.

Note : *If the "VENT AVNCS SYS FAULT" warning appears, reset the AEVC circuit breaker at the end of the aircraft de-icing procedure.*
AIR COND/AVNCS VENT/CTL D06 on 49VU.
AIR COND/AVNCS/VENT/MONG Y17 on 122 VU.

– **THRUST LEVERS . . . . CHECK IDLE**

– **"AIRCRAFT PREPARED FOR SPRAYING" . . . . INFORM GROUND CREW**

UPON COMPLETION OF THE SPRAYING OPERATION :

– **DITCHING pushbutton . . . . OFF**

R – **OUTFLOW VALVE . . . . CHECK OPEN**
R On the ECAM PRESS page, confirm that the outflow valve indication reaches the open
R green position to avoid any unexpected aircraft pressurization.

– **ENG BLEED 1 + 2 . . . . ON**

• **At least 60 seconds after APU start, or on completion of spraying operation :**

– **APU BLEED . . . . ON**

– **PITOTS and STATICS (ground crew) . . . . CHECK**

– **GROUND EQUIPMENT . . . . REMOVE**

– **DE-ICING/ANTI-ICING REPORT . . . . RECEIVED**
The information from ground personnel, who performed the de-icing and post-application check, must include (ANTI-ICING CODE) :
· Type of fluid used.
· The mix ratio of fluid to water (for example 75/25).
· When the holdover time began.

– **NORMAL PROCEDURE . . . . RESUME**
Apply appropriate normal procedures. Pay special attention to the flight control check. In freezing precipitation, perform the appropriate checks to evaluate aircraft icing. Base the decision on whether to takeoff, or to re-protect the aircraft, on the amount of ice that has built up on the critical surfaces since the last de-icing, as revealed by a personal inspection from the inside and outside of the aircraft. Make this inspection before the holdover time expires, or just before takeoff.

Note : If the fuselage has been sprayed, there is a risk of de-icing fluid ingestion by the APU air intake, resulting in specific odors, or SMOKE warnings. Thus, consider APU BLEED OFF during takeoff.

R **SECURING THE AIRCRAFT FOR COLD SOAK**

R ● **After switching off all bleeds, and before switching off AC power :**

R – **DITCHING pushbutton . . . . ON**
R This closes the outflow valve, the pack valves, and the avionic ventilation inlet and
R extract valves.

R – **PARKING BRAKE . . . . OFF**
R Check chocks in place, and release the parking brake to prevent brakes from freezing.

R ● **After switching off the batteries :**

R – **DITCHING pushbutton . . . . OFF**

R – **PROTECTIVE COVERS . . . . INSTALL**
R Install protective covers and plugs to protect the aircraft and engines from snow and
R ice.

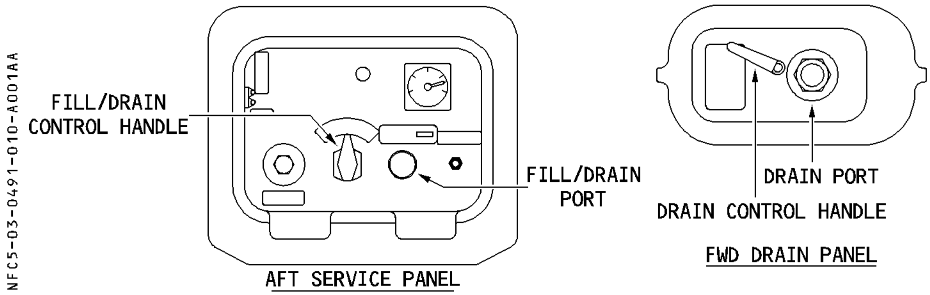
WATER SYSTEM DRAINING

Drain the water system, if the OAT requires it, as shown below :

Configuration			Exposure time	Water tank drain
Air Conditioning	Cabin temperature	Outside Air Temperature		
ON	Above 10° C (50° F)	Between 0° C and – 15° C (32° and 5° F)	None	Not required
		Below – 15° C (5° F)	1 h 15 min	Required
OFF		Between 0° C and – 7° C (32° and 19.4° F)	1 h 30 min	
		Between – 7° C and – 15° C (19.4° and 5° F)	0 h 30 min	
		Below – 15° C (5° F)	Any	

FOR DRAINING WATER PROCEDURE

This procedure uses electrical power.



– **ACCESS PLATFORM(S) . . . . PUT IN POSITION**

– **SHUTOFF VALVE IN GALLEYS/TOILETS . . . . CHECK OPEN**

– **FWD/AFT ACCESS PANEL DOORS . . . . OPEN**

– **DRAIN PORT CAPS . . . . REMOVE**
Remove drain port caps on forward drain and aft service panels.

– **DRAIN HOSES . . . . CONNECT**
Connect drain hoses to :
· the drain port on the forward drain panel.
· the full/drain port on the aft service panel.

■ **On the forward drain panel**

– **DRAIN CONTROL HANDLE . . . . TURN LEFT**
Turn the control handle to drain.

■ **On the aft service panel**

– **FILL/DRAIN CONTROL HANDLE . . . . TURN TO “DRAIN” AND PULL**
Turn the handle to the “DRAIN” position and pull it out to its mechanical stop to drain.
The indicator light comes on.

■ **When the water system is drained**
In freezing conditions, the drain valves must stay open to prevent damage to the system. Do not put on the caps and leave the access door open.

– **DRAIN HOSES . . . . DISCONNECT**

– **PANELS . . . . CLEAN AND DRY**

R – **ACCESS PLATFORM(S) . . . . REMOVE**

R **OPERATIONS IN VOLCANIC ASH**

R The following procedures are recommended for operators who fly routes that could take
R their aircraft through the material emerging from active volcanoes.
R Because volcanic ash is composed of very abrasive particles it can do serious damage to
R aircraft parts and impair the operation of aircraft systems significantly.
R Operators should avoid airports with volcanic ash deposits if possible. If operations at such
R airports are unavoidable, operators should heed the following recommendations.

R **GROUND OPERATIONS ON AIRPORTS COVERED WITH ASH OR DUST**

R **Preparation of the cockpit**

R – **APU . . . . DO NOT USE**
R Use the APU only to start the engines, and then only if ground power is not available.
R Request ground supply for air conditioning and for electricity.

R – **WINDSHIELD WIPERS . . . . DO NOT USE**
R Do not use windshield wipers to remove ash, or for anything else.

R **Exterior inspection**

R – **SURFACES AND EQUIPMENT . . . . CHECK FREE OF ASH DEPOSITS**
R Ground maintenance should remove ash that has settled on exposed lubricated surfaces
R and could penetrate seals or enter the engine gas path, air conditioning system, air data
R probes, and other orifices on the aircraft.

R – **ENGINE INLETS . . . . CHECK FREE OF ASH DEPOSITS**
R Inspect the inlets and order them cleaned of any volcanic ash. Have the area within 25
R feet of the engine inlet cleaned of volcanic ash (as much as practical).

R **Engine start**

R Use external pneumatic supply for starting the engines, if it is available. (Refer 3.04.70).

R – **ENGINE . . . . CRANK**
R Before starting the engines, ventilate them by dry cranking at maximum motoring speed
R for two minutes. This will blow out any ash that may have entered the booster area.

R **Taxi**

R After releasing the brakes :

R – **THRUST LEVERS .. ADVANCE SMOOTHLY THEN MOVE TO IDLE WHEN ROLLING**
R Advance the levers smoothly to the minimum required for breakaway.
R Avoid making sharp or high-speed turns.

R – **ENG 1, ENG 2 BLEED . . . . OFF**
R Keep bleed valves closed for taxiing.

R **Takeoff**

R – **Allow ash and dust (if present) to settle on runway before starting the takeoff roll.**

R – **Use the rolling takeoff technique if possible.**

R – **Adjust progressively engine power as for normal takeoff procedures.**

R **Landing**

R – **REVERSERS . . . . USE AS LIGHTLY AS FEASIBLE**
R If it appears that maximum reverse thrust will be needed, apply reverse thrust when the
R main landing gear touches down. Limit the use of reverse thrust as much as possible,
R because reverse flow may throw up ash and impair visibility.

R *Note : The abrasive effect of volcanic ash on windshields and landing lights may reduce*
R *the pilot's visibility for approach and landing significantly. Consider diverting to*
R *an airfield where it is possible to use AUTOLAND.*

R – **BRAKE PERFORMANCE . . . . CONSIDER PENALTY**
R A layer of ash on the runway may degrade braking efficiency. Treat landing performance
R as if it is similar to that on a wet runway (dry ash) or on slush (wet ash).

Securing the aircraft

If the aircraft is to be parked at an airport contaminated with volcanic ash, install engine inlet covers and other protective covers and plugs.
In addition,

- **After switching off all bleeds and before switching off AC power :**

  – **DITCHING pushbutton . . . . ON**
  This closes the outflow valve, pack valves and avionic ventilation inlet and extract valves.

- **After switching off the batteries :**

  – **DITCHING pushbutton . . . . OFF**

<u>FLIGHT OPERATIONS</u>

Avoid flight into areas of known volcanic activity.
If a volcanic eruption is reported while the aircraft is in flight, reroute the flight to remain well clear of the affected area (volcanic dust may spread over several hundred miles). If possible, stay on the upwind side of the volcano (at least 20 NM upwind of it if it is erupting).
In hours of darkness or in meteorological conditions that obscure volcanic dust, one or several of the following phenomena indicate that the aircraft may be flying into ash cloud:
· smoke or dust in the cockpit,
· acrid odor similar to that of electrical smoke,
· at night, the appearance of St. Elmo’s fire and static discharges around the windshield,
· bright white or orange glow appearing in the engine inlets,
· sharp, distinct beams from the landing lights,
· multiple engine malfunctions, such as rising EGT, decreasing power, stall, or flame out.

- **If the aircraft enters a volcanic ash cloud :**

  – **ESCAPE MANEUVER (terrain permitting) . . . . INITIATE**
  Because the lateral dimensions of ash cloud are not known, the pilot should if possible turn 180°.

  – **ATC . . . . NOTIFY**

  – **A/THR . . . . OFF**
  This will prevent thrust variations.

  – **THRUST (terrain permitting) . . . . DECREASE**
  This helps to maintain the engine stall margin by reducing the amount of ash ingestion and limiting the EGT. It also holds the accumulation of molten volcanic ash on turbine vanes to a minimum. Do not climb, since this increases EGT.

R – **CREW OXYGEN** . . . . **ON/100 %**

R – **CABIN CREW** . . . . **NOTIFY**

R – **PASSENGER OXYGEN** . . . . **AS RQRD**
R Depending on contamination.

R – **ENG ANTI ICE** . . . . **ON**

R – **WING ANTI ICE** . . . . **ON**

R – **PACK FLOW** . . . . **HI**
R Maximum airbleed gives the engines additional stall margin.

R *Note : If the aircraft has a cargo ventilation system, switch off the CARGO ISOL*
R *valves to prevent a cargo smoke warning from being triggered.*

R – **APU (if available)** . . . . **START**
R This prepares the aircraft for a starter-assisted engine relight.

R – **ENGINE PARAMETERS** . . . . **MONITOR**
R Monitor the EGT carefully to see that it does not go over its limit.

R *Note : To prevent the engines from exceeding EGT limits it may become necessary*
R *to use a precautionary engine shut-down.*
R *· Restart when clear of the volcanic ash cloud.*
R *· Upon restart, the engine may accelerate very slowly. Do not misinterpret*
R *this as a failure to start.*
R *· Consider that the compressor and turbine blades have been eroded and*
R *avoid sudden changes in thrust. Fuel flow and EGT may increase.*

R – **AIRSPEED INDICATIONS** . . . . **MONITOR**
R Volcanic ash may clog the pitot probes. If the airspeed indication is lost or becomes
R unreliable, see the abnormal procedure “UNRELIABLE SPEED INDICATION” (Refer to
R 3.02.80).

R *Note : Electrostatic conditions may cause communication problems.*

R **Reporting**

R · Whenever operating in areas affected by volcanic activity, flight crews should be aware
R of volcanic reporting procedures and be familiar with the use of the ICAO Special Air
R Report of Volcanic Activity (Model VAR).
R · If the aircraft encounters a volcanic ash cloud, the flight crew should report the location,
R altitude, and direction of drift for the ash cloud to ATC, flight conditions and crew duties
R permitting.

INTRODUCTION

The Less Paper Cockpit (LPC) concept consists of a complete set of software tools, designed to :
- Improve access to pilot's operational information, and simplify some of their tasks.
- Reduce the quantity of paper documents in the cockpit, and replace them with electronic ones, enabling quicker and easier updates, while improving information retrieval.

The applicable areas include Performance and Weight and Balance computations, in addition to technical operational documentation (FCOM, MEL, Operations Policy Manual..).
This section addresses the procedures corresponding to the modules which are already available.
The various modules are linked via F.O.V.E. (Flight Operations Versatile Environment), which is designed to provide an interface between the various modules by enabling :
- Inter-module communication
- Software compatibility management
- Software version management
- Integrity control between data and the software versions
- Update management
- Context management

Each airline may choose to install one or several modules, each of which is able to work independently.

GENERAL

LPC PROGRAM AND REFERENCE VERSION NUMBER UPDATING

R Each pilot should check that the version of F.O.V.E, installed on their PC, corresponds to the latest updated version provided by their airline's Flight Operations.

POWER SUPPLY

Check that each available PC is electrically-supplied.

PC STOWAGE DURING TAKEOFF AND LANDING

PCs should be stowed during takeoff and landing.

LPC TAKEOFF MODULE

The takeoff module is designed to provide aircraft takeoff performance, based on actual daily environmental conditions, just prior to flight. It allows straightforward computations, and provides the best takeoff performance for the given conditions.

TAKEOFF PERFORMANCE TASKSHARING

The tasksharing policy for data computation, and introduction in the MCDU is consistent with the currently applicable policy, as per the SOP :
One pilot performs the computation, then introduces the resulting data in the MCDU.
The other pilot checks the :
– Computation by using the PC to verify that the entered data is correct.
– Data entered in the MCDU.
Data entry and computation are generally done by the PF, and checked by the PNF. These tasks can be swapped, as per company policy, or as circumstances dictate. For instance, during taxi, data entry and computation should be done by the PNF, since the PF is busy taxiing the aircraft.
The PF will then have to perform the check, by stopping the aircraft or, if a stop is not possible, by transferring command to the other pilot.

COCKPIT PREPARATION

TAKEOFF DATA COMPUTATION

R The PF checks that the version of F.O.V.E, available on the PC, is the applicable one. (The applicable version is indicated on the computerized F-PLN, or other document, as per airline policy).
The PF enters the data, then shows the screen to the PNF for data confirmation.

R ● **If the Weight and Balance module is to be used :**

- **Use the pilot's PC to compute the ZFCG and ZFW :**
  The computed values will be automatically fed to the takeoff performance module.

– **Use the pilot's PC to compute takeoff data :**
Any NOTAM affecting airport data should be considered at this stage, and taken into account in the "Modify runway" frame of the pilot interface. When the computation has been performed, a summary of the results is available in the "REMINDER", which is equivalent to the MCDU PERF page. Only the values to be addressed are indicated.

FMGS DATA INSERTION (no change compared to current SOP)

The PF enters the data computed on the PC into the MCDU.

GROSS WEIGHT INSERTION (INIT B page)

– **ZFCG/ZFW** . . . . **INSERT**

– **BLOCK FUEL** . . . . **INSERT**

TAKEOFF DATA INSERTION (PERF TO page)

– **V1, VR, V2** . . . . **INSERT**

– **FLEX TO TEMP/DERATE** . . . . **INSERT**

FMGS DATA CONFIRMATION

– **GROSS WEIGHT INSERTION** . . . . **CHECK**
The PNF checks FMGS data.
· If the Aircraft Loading module is used :
– Check on pilot PC that entered data are correct.
– Check that computed data have been correctly introduced in the MCDU.

– **TO DATA** . . . . **CALCULATE/CHECK**
The PNF checks on pilot PC that entered data are correct.
He checks that computed data have been correctly introduced in the MCDU.

BEFORE PUSHBACK or START

R – **LOADING . . . . CHECK**

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loading is checked :
– Check or re-enter the data entered on the takeoff module performance.
– Check or revise the takeoff data on the MCDU's INIT B and PERF pages.
Data to be crosschecked by the other pilot.

BEFORE TAKEOFF

– **PILOT PC . . . . STOWED**

ILS (or NON PRECISION) APPROACH

● **When the landing gear is down :**

– **PILOT PC . . . . STOWED**

R **LPC WEIGHT AND BALANCE MODULE**

R The Weight and Balance (W & B) module provides a computerized loadsheet and trim
R sheet. This facilitates computation of the ZFW/ZFCG and TOW/TOCG, and enables
R last-minute changes to the passenger/cargo/fuel distribution.
R The following procedure applies to operators only using the W&B module. Operators using
R both the W&B module and the Takeoff module should refer to the LPC TAKEOFF MODULE
R section.

R **WEIGHT & BALANCE TASKSHARING**

R The tasksharing policy for data computation and introduction in the MCDU is consistent
R with the currently applicable policy, as per the SOP :
R One pilot performs the computation, then introduces the resulting data in the MCDU.
R The other pilot checks the :
R – Computation by using the PC to verify that the entered data is correct.
R – Data entered in the MCDU.
R Data entry and computation are generally done by the PF, and checked by the PNF. These
R tasks can be swapped, as per company policy, or as circumstances dictate.

COCKPIT PREPARATION

TAKEOFF DATA COMPUTATION

The PF checks that the version of F.O.V.E., available on the PC, is the applicable one. (The applicable version is indicated on the computerized F-PLN, or other document, as per airline policy).
The PF enters the data, then shows the screen to the PNF for data confirmation.

– **Use the pilot's PC to compute the ZFCG and ZFW.**

– **Use RTOW to compute takeoff data.**

FMGS DATA INSERTION (no change compared to current SOP).

The PF enters the data, computed on the PC, into the MCDU.

GROSS WEIGHT INSERTION (INIT B page)

– **ZFCG/ZFW . . . . INSERT**

– **BLOCK FUEL . . . . INSERT**

TAKEOFF DATA INSERTION (PERF TO page)

– **V1, VR, V2 . . . . INSERT**

– **FLEX TO TEMP/DERATE . . . . INSERT**

FMGS DATA CONFIRMATION

– **GROSS WEIGHT INSERTION . . . . CHECK**
The PNF checks FMGS data.
– Check on the pilot's PC, that the entered data is correct.
– Check that the computed data has been correctly introduced in the MCDU.

– **TO DATA . . . . CALCULATE/CHECK**
The PNF calculates and checks the takeoff data.

BEFORE PUSHBACK or START

– **LOADING . . . . CHECK**

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loading is checked :
– Check or recompute the takeoff speeds and the flexible temperature, using the RTOW charts.
– Check or revise the takeoff data on the MCDU's INIT B and PERF pages.
Data to be crosschecked by the other pilot.

BEFORE TAKEOFF

– **PILOT PC . . . . STOWED**

ILS (or NON PRECISION) APPROACH

● **When the landing gear is down :**

– **PILOT PC . . . . STOWED**

LPC MEL MODULE

TBD

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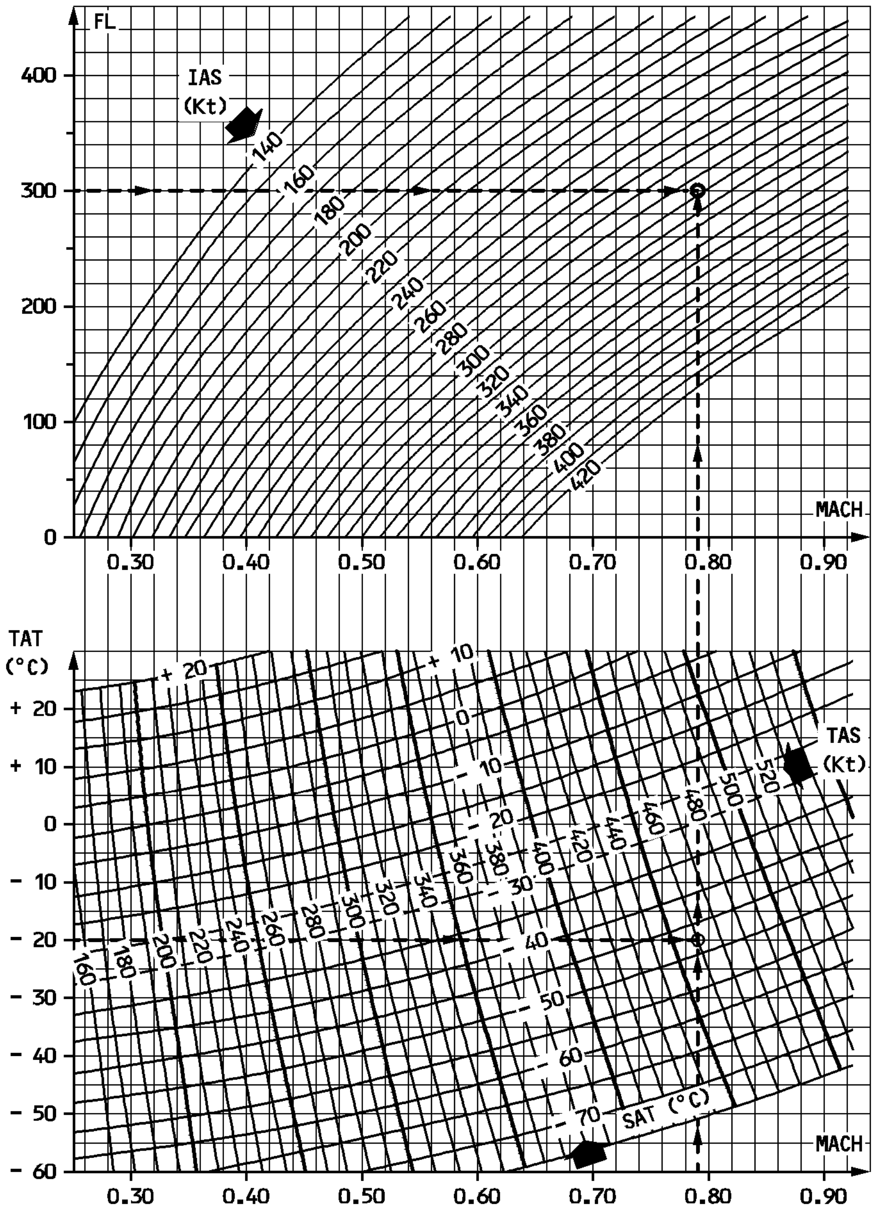
CONVERSIONS – IAS . MACH – TAS . MACH – SAT . TAT



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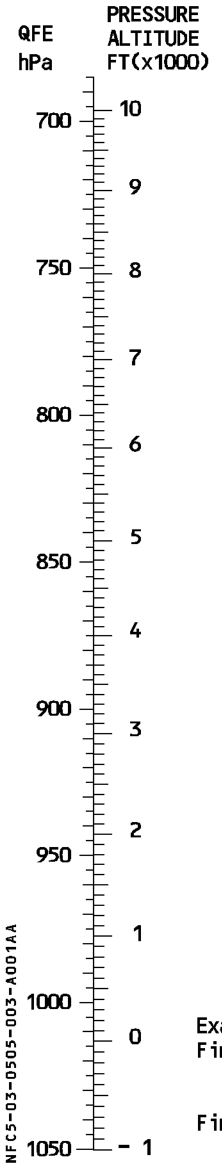
INTERNATIONAL STANDARD ATMOSPHERE (ISA)

R

ALTITUDE (Feet)	TEMP. (°C)	PRESSURE			PRESSURE RATIO $\delta = P / Po$	DENSITY $\sigma = \rho / \rho o$	SPEED OF SOUND (a) (kt)	ALTITUDE (meters)
		hPa	P.S.I.	in. Hg.				
40,000	– 56.5	188	2.72	5.54	0.1851	0.2462	573	12.192
39,000	– 56.5	197	2.85	5.81	0.1942	0.2583	573	11.887
38,000	– 56.5	206	2.99	6.10	0.2038	0.2710	573	11.582
37,000	– 56.5	217	3.14	6.40	0.2138	0.2844	573	11.278
36,000	– 56.3	227	3.30	6.71	0.2243	0.2981	573	10.973
35,000	– 54.3	238	3.46	7.04	0.2353	0.3099	576	10.668
34,000	– 52.4	250	3.63	7.38	0.2467	0.3220	579	10.363
33,000	– 50.4	262	3.80	7.74	0.2586	0.3345	581	10.058
32,000	– 48.4	274	3.98	8.11	0.2709	0.3473	584	9.754
31,000	– 46.4	287	4.17	8.49	0.2837	0.3605	586	9.449
30,000	– 44.4	301	4.36	8.89	0.2970	0.3741	589	9.144
29,000	– 42.5	315	4.57	9.30	0.3107	0.3881	591	8.839
28,000	– 40.5	329	4.78	9.73	0.3250	0.4025	594	8.534
27,000	– 38.5	344	4.99	10.17	0.3398	0.4173	597	8.230
26,000	– 36.5	360	5.22	10.63	0.3552	0.4325	599	7.925
25,000	– 34.5	376	5.45	11.10	0.3711	0.4481	602	7.620
24,000	– 32.5	393	5.70	11.60	0.3876	0.4642	604	7.315
23,000	– 30.6	410	5.95	12.11	0.4046	0.4806	607	7.010
22,000	– 28.6	428	6.21	12.64	0.4223	0.4976	609	6.706
21,000	– 26.6	446	6.47	13.18	0.4406	0.5150	611	6.401
20,000	– 24.6	466	6.75	13.75	0.4595	0.5328	614	6.096
19,000	– 22.6	485	7.04	14.34	0.4791	0.5511	616	5.791
18,000	– 20.7	506	7.34	14.94	0.4994	0.5699	619	5.406
17,000	– 18.7	527	7.65	15.57	0.5203	0.5892	621	5.182
16,000	– 16.7	549	7.97	16.22	0.5420	0.6090	624	4.877
15,000	– 14.7	572	8.29	16.89	0.5643	0.6292	626	4.572
14,000	– 12.7	595	8.63	17.58	0.5875	0.6500	628	4.267
13,000	– 10.8	619	8.99	18.29	0.6113	0.6713	631	3.962
12,000	– 8.8	644	9.35	19.03	0.6360	0.6932	633	3.658
11,000	– 6.8	670	9.72	19.79	0.6614	0.7156	636	3.353
10,000	– 4.8	697	10.10	20.58	0.6877	0.7385	638	3.048
9,000	– 2.8	724	10.51	21.39	0.7148	0.7620	640	2.743
8,000	– 0.8	753	10.92	22.22	0.7428	0.7860	643	2.438
7,000	+ 1.1	782	11.34	23.09	0.7716	0.8106	645	2.134
6,000	+ 3.1	812	11.78	23.98	0.8014	0.8359	647	1.829
5,000	+ 5.1	843	12.23	24.90	0.8320	0.8617	650	1.524
4,000	+ 7.1	875	12.69	25.84	0.8637	0.8881	652	1.219
3,000	+ 9.1	908	13.17	26.82	0.8962	0.9151	654	914
2,000	+ 11.0	942	13.67	27.82	0.9298	0.9428	656	610
1,000	+ 13.0	977	14.17	28.86	0.9644	0.9711	659	305
0	+ 15.0	1013	14.70	29.92	1.0000	1.0000	661	0
– 1.000	+ 17.0	1050	15.23	31.02	1.0366	1.0295	664	– 305

CONVERSIONS - QNH - QFE - PRESSURE ALTITUDE



QNH (hPa)	CORRECTION (ft)	QNH (in Hg)
949 – 951	+ 1900	28.01 – 28.10
952 – 955	+ 1800	28.11 – 28.20
956 – 958	+ 1700	28.21 – 28.30
959 – 961	+ 1600	28.31 – 28.40
962 – 964	+ 1500	28.41 – 28.45
965 – 968	+ 1400	28.46 – 28.56
969 – 971	+ 1300	28.57 – 28.66
972 – 974	+ 1200	28.68 – 28.77
975 – 978	+ 1100	28.78 – 28.86
979 – 981	+ 1000	28.87 – 28.95
982 – 984	+ 900	28.96 – 29.05
985 – 988	+ 800	29.06 – 29.15
989 – 991	+ 700	29.16 – 29.25
992 – 994	+ 600	29.26 – 29.35
995 – 997	+ 500	29.36 – 29.45
998 – 1001	+ 400	29.46 – 29.54
1002 – 1004	+ 300	29.55 – 29.64
1005 – 1007	+ 200	29.65 – 29.74
1008 – 1011	+ 100	29.75 – 29.84
1012 – 1014	0	29.85 – 29.94
1015 – 1018	– 100	29.95 – 30.04
1019 – 1021	– 200	30.05 – 30.14
1022 – 1025	– 300	30.15 – 30.24
1026 – 1028	– 400	30.25 – 30.34
1029 – 1031	– 500	30.35 – 30.44
1032 – 1035	– 600	30.45 – 30.54
1036 – 1038	– 700	30.55 – 30.65
1039 – 1042	– 800	30.66 – 30.75
1043 – 1045	– 900	30.76 – 30.85
1046 – 1050	–1000	30.86 – 30.95

Examples : 1) Elevation: 2500 ft QNH = 1020 hPa
Find : correction: -200 ft
Pressure altitude = 2300 ft QFE = 933 hPa
2) Elevation: 1500 ft QFE = 980 hPa
Find : Pressure altitude: 920 ft
Correction = - 580 ft QNH = 1032 hPa

CONVERSIONS QFE hPa – in. Hg – ft

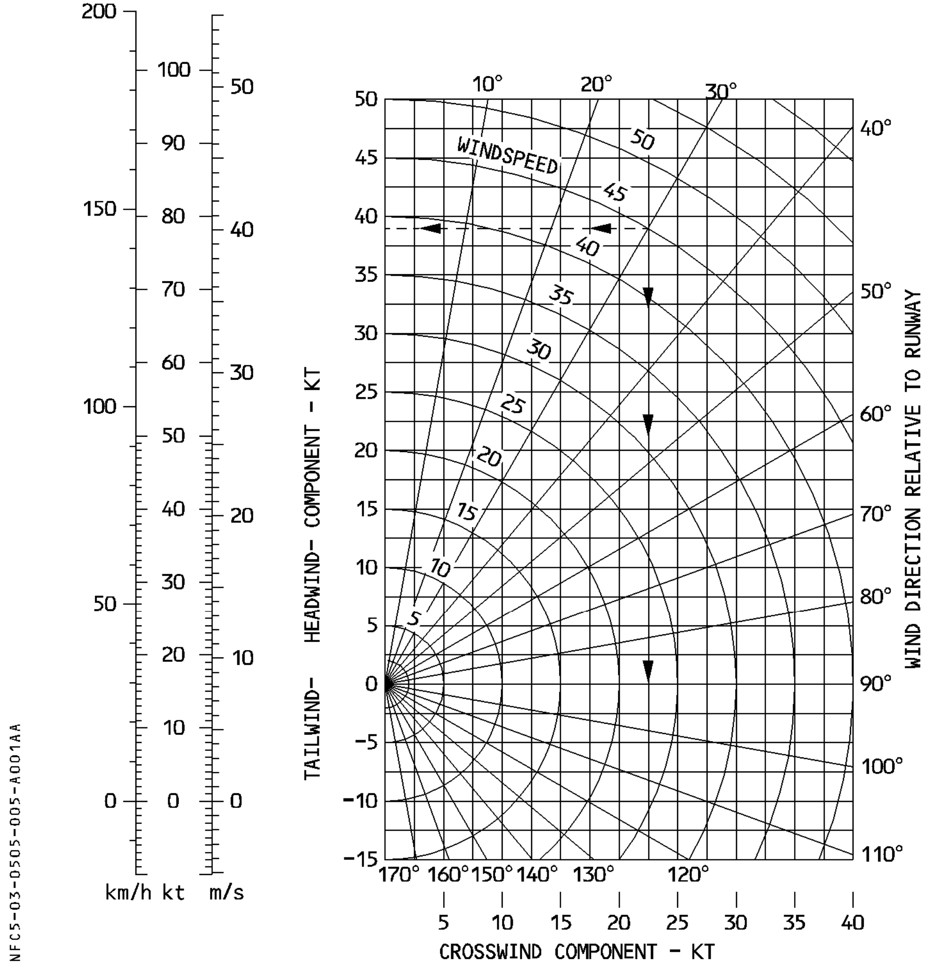
QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft
1050	31.01	– 989	960	28.35	1486	870	25.69	4157
1048	30.95	– 936	958	28.29	1543	868	25.63	4219
1046	30.89	– 883	956	28.23	1601	866	25.57	4281
1044	30.83	– 830	954	28.17	1658	864	25.51	4343
1042	30.77	– 776	952	28.11	1715	862	25.45	4405
1040	30.71	– 723	950	28.05	1773	860	25.40	4468
1038	30.65	– 669	948	27.99	1831	858	25.34	4531
1036	30.59	– 615	946	27.94	1889	856	25.28	4593
1034	30.53	– 562	944	27.88	1947	854	25.22	4656
1032	30.47	– 508	942	27.82	2005	852	25.16	4718
1030	30.42	– 454	940	27.76	2062	850	25.10	4781
1028	30.36	– 400	938	27.70	2120	848	25.04	4844
1026	30.30	– 346	936	27.64	2178	846	24.98	4907
1024	30.24	– 292	934	27.58	2236	844	24.92	4970
1022	30.18	– 238	932	27.52	2294	842	24.86	5033
1020	30.12	– 184	930	27.46	2353	840	24.81	5097
1018	30.06	– 129	928	27.40	2412	838	24.75	5161
1016	30.00	– 74	926	27.34	2471	836	24.69	5225
1014	29.94	– 20	924	27.29	2530	834	24.63	5289
1012	29.88	34	922	27.23	2589	832	24.57	5353
1010	29.83	89	920	27.17	2647	830	24.51	5417
1008	29.77	144	918	27.11	2707	828	24.45	5481
1006	29.71	199	916	27.05	2767	826	24.39	5545
1004	29.65	254	914	26.99	2826	824	24.33	5610
1002	29.59	309	912	26.93	2885	822	24.27	5675
1000	29.53	364	910	26.87	2944	820	24.21	5740
998	29.47	419	908	26.81	3004	818	24.16	5805
996	29.41	475	906	26.75	3064	816	24.10	5870
994	29.35	530	904	26.70	3124	814	24.04	5935
992	29.29	586	902	26.64	3183	812	23.98	6000
990	29.23	641	900	26.58	3243	810	23.92	6065
988	29.18	697	898	26.52	3303	808	23.86	6131
986	29.12	753	896	26.46	3363	806	23.80	6197
984	29.06	809	894	26.40	3424	804	23.74	6263
982	29.00	865	892	26.34	3484	802	23.68	6329
980	28.94	921	890	26.28	3545	800	23.62	6394
978	28.88	977	888	26.22	3606	798	23.56	6461
976	28.82	1033	886	26.16	3667	796	23.51	6528
974	28.76	1089	884	26.10	3728	794	23.45	6595
972	28.70	1145	882	26.05	3789	792	23.39	6661
970	28.64	1202	880	25.99	3850	790	23.33	6727
968	28.59	1259	878	25.93	3911	788	23.27	6794
966	28.53	1316	876	25.87	3973	786	23.21	6861
964	28.47	1373	874	25.81	4034	784	23.15	6928
962	28.41	1430	872	25.75	4096	782	23.09	6995

WIND COMPONENTS (FOR TAKEOFF AND LANDING)

R

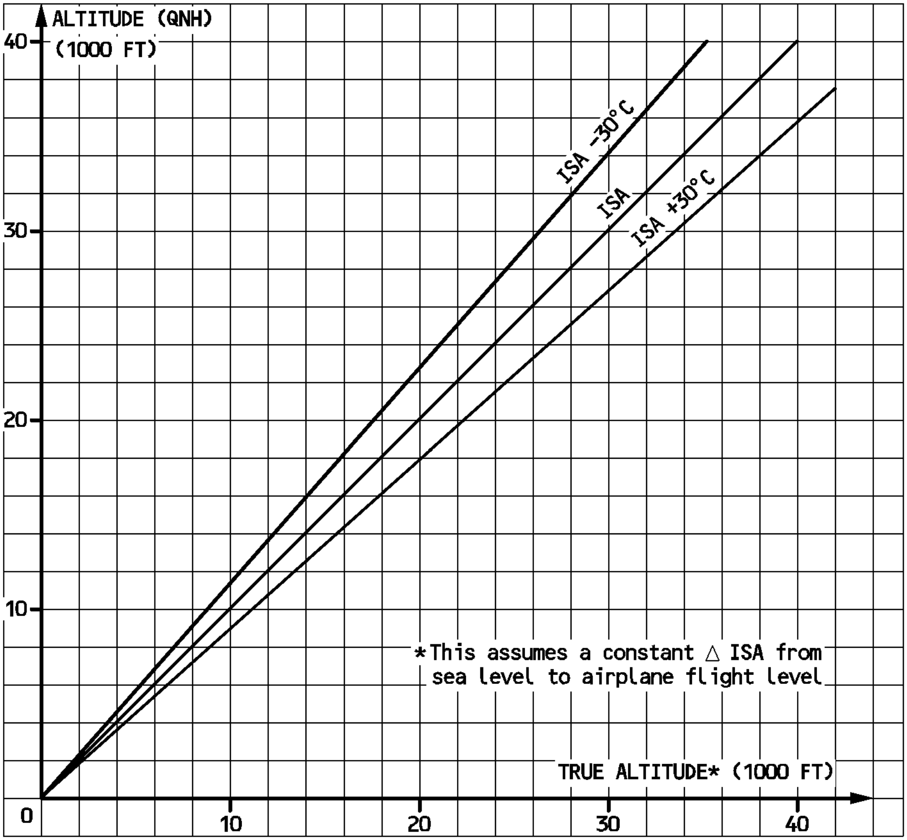
MULTIPLY	BY	TO GET
kt	1.852	km/h
kt	0.5144	m/s
m/s	3.6	km/h
m/s	1.9438	kt
km/h	0.5396	kt
km/h	0.2778	m/s

GIVEN	FIND
WIND DIRECTION RELATIVE TO RUNWAY HEADING=30 DEG WIND SPEED=45 KT	CROSS WIND COMPONENT=22.5 KT HEAD WIND COMPONENT=39.0 KT



ALTITUDE TEMPERATURE CORRECTION

FOR HIGH ALTITUDE USE



NFC5-03-0505-006-A001AA

FOR LOW ALTITUDE USE

QNH ALTITUDE MINUS TERRAIN ELEVATION (FT) →		△Z CORRECTION (FT)					
		500	1000	1500	2000	2500	3000
△ISA	− 10 °C	− 17	− 34	− 51	− 68	− 85	− 102
	− 20 °C	− 35	− 70	− 105	− 140	− 175	− 210
	− 30 °C	− 52	− 104	− 156	− 208	− 260	− 312
	− 40 °C	− 70	− 140	− 210	− 280	− 350	− 420

TRUE ALTITUDE = QNH ALTITUDE + △Z
Note: A constant △ISA from ground to airplane level has been assumed.

THRUST RATINGS

The thrust rating charts have been established for :

- **Maximum takeoff**
  It is the maximum thrust certified for takeoff and is normally limited to five minutes. This time is extended to ten minutes for engine out contingency, as authorized by the approved AFM.

- **Maximum go around**
  It is the maximum permissible thrust during go-around.

- **Flexible takeoff**
  It is a reduced takeoff thrust as compared to the maximum permissible. The related N1 is calculated as a function of the flexible temperature entered in the FMGS MCDU. The flexible temperature is a function of the aircraft weight and environmental conditions. It guarantees that the regular performance requirements are met.

- **Maximum continuous**
  It is the maximum thrust certified for continuous use. This rating should be used, at the pilot's discretion, only when required to ensure safe flight (engine failure).

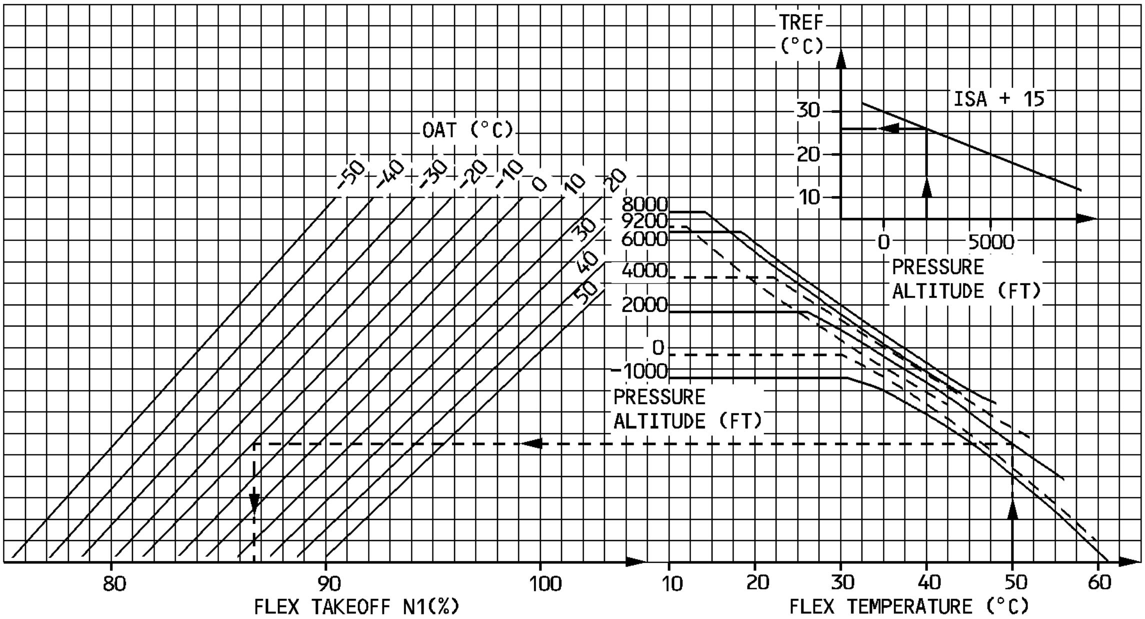
- **Maximum climb**
  It is the maximum thrust approved for normal climb.

- **Maximum cruise**
  It is the maximum thrust approved for normal cruise.
  There is no thrust lever position corresponding to this thrust rating.
  It is not displayed to the pilot, and the N1 limit which is displayed in cruise is the maximum climb N1.
  The FMGS uses the maximum cruise N1 to compute the aircraft maximum speed.
  In manual thrust setting, in cruise, the pilot should limit N1 to the maximum cruise N1 that is equal to the displayed maximum climb N1 minus 2.4 %.

FLEXIBLE TAKEOFF N1

EXAMPLE : PRESS ALT : 2000 FT OAT=−10°C. FLX T=50°C.
− FLX TEMP 50°C < FLAT RATING TEMP(ISA+15=26°C)

PRESS ALT:2000 FT
OAT:−10°C
→ N1 FLEX = 86.8%



CFM56-5A3	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA+15	OAT ⩾ ISA+15
FLEX TAKEOFF N1 MACH = .000	AIR CONDITIONING ON	− .7	− .7
	ENGINE ANTI ICE ON	0.0	− 1.3
	ENGINE AND WING ANTI ICE ON	0.0	− 1.9

NFC5-03-0506-002-A025AB

TAKEOFF

CFM56–5A3 TAKEOFF N1 NO AIR BLEED MACH=.000	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 15	OAT ≥ ISA + 15
	AIR CONDITIONING ON	–.7	–.7
	ENGINE ANTI ICE ON	0.0	–1.3
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.9

OAT (°C)	PRESSURE ALTITUDE (FT) –1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	9200.
–54.0	82.4	83.2	84.1	85.0	85.5	86.4	87.4	88.3	88.8	89.1	88.5	88.4
–50.0	83.1	83.9	84.8	85.7	86.2	87.2	88.1	89.0	89.5	89.8	89.3	89.2
–46.0	83.8	84.6	85.6	86.4	86.9	87.9	88.9	89.8	90.3	90.6	90.0	89.9
–42.0	84.5	85.3	86.3	87.2	87.7	88.6	89.6	90.5	91.0	91.3	90.8	90.7
–38.0	85.1	86.0	87.0	87.9	88.4	89.4	90.3	91.2	91.8	92.1	91.5	91.4
–34.0	85.8	86.7	87.6	88.6	89.1	90.1	91.0	92.0	92.5	92.8	92.3	92.1
–30.0	86.5	87.4	88.3	89.3	89.8	90.8	91.8	92.7	93.2	93.5	93.0	92.9
–26.0	87.2	88.1	89.0	89.9	90.5	91.5	92.5	93.4	93.9	94.3	93.7	93.6
–22.0	87.8	88.7	89.7	90.6	91.2	92.2	93.2	94.1	94.7	95.0	94.4	94.3
–18.0	88.5	89.4	90.4	91.3	91.8	92.9	93.9	94.8	95.4	95.7	95.1	95.0
–14.0	89.1	90.0	91.0	92.0	92.5	93.5	94.5	95.5	96.1	96.4	95.8	95.7
–10.0	89.8	90.7	91.7	92.6	93.2	94.2	95.2	96.2	96.8	97.1	96.5	96.4
–6.0	90.4	91.3	92.3	93.3	93.8	94.9	95.9	96.9	97.4	97.8	97.2	97.1
–2.0	91.0	92.0	93.0	93.9	94.5	95.5	96.6	97.6	98.1	98.5	97.9	97.7
2.0	91.7	92.6	93.6	94.6	95.1	96.2	97.2	98.2	98.8	99.1	98.5	98.4
6.0	92.3	93.2	94.3	95.2	95.8	96.9	97.9	98.9	99.5	99.8	99.2	99.1
10.0	92.9	93.9	94.9	95.9	96.4	97.5	98.6	99.6	100.1	100.5	99.9	99.8
14.0	93.5	94.5	95.5	96.5	97.1	98.2	99.2	100.2	100.8	101.1	*100.0*	*99.7*
18.0	94.1	95.1	96.1	97.1	97.7	98.8	99.9	100.9	*100.9*	*100.6*	*99.4*	*99.1*
22.0	94.7	95.7	96.8	97.8	98.3	99.4	*100.0*	*100.4*	*100.3*	*100.0*	*98.8*	*98.5*
26.0	95.3	96.3	97.4	98.4	*98.5*	*99.1*	*99.5*	*99.8*	*99.8*	*99.4*	*98.3*	*98.1*
30.0	95.9	*96.9*	*97.5*	*98.1*	*98.2*	*98.7*	*99.0*	*99.3*	*99.3*	*98.9*	*97.9*	*97.7*
34.0	*96.1*	*96.6*	*97.2*	*97.8*	*97.9*	*98.3*	*98.6*	*98.8*	*98.8*	*98.4*	*97.5*	*97.3*
38.0	*95.8*	*96.3*	*96.9*	*97.3*	*97.4*	*97.8*	*98.1*	*98.3*	*98.3*	*97.9*		
42.0	*95.5*	*95.8*	*96.3*	*96.8*	*96.9*	*97.3*	*97.6*	*97.8*				
46.0	*94.7*	*95.1*	*95.6*	*96.2*	*96.4*	*96.8*						
50.0	*93.9*	*94.3*	*94.9*	*95.6*								
54.0	*93.1*	*93.5*										

OAT < ISA + 15

OAT ≥ ISA + 15

LEFT INTENTIONALLY BLANK

GO AROUND

R

CFM56-5A3	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 15	OAT ≥ ISA + 15
GO AROUND N1 AIR CONDITIONING ON MACH=.225	AIR CONDITIONING OFF	.6	.6
	ENGINE ANTI ICE ON	0.0	–1.2
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.8

TAT (°C) \ PRESSURE ALTITUDE (FT)	–1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	9200.
–54.0	82.5	83.3	83.8	84.2	84.6	85.5	86.4	87.3	87.8	88.0	87.5	87.4
–50.0	83.2	84.1	84.5	84.9	85.3	86.2	87.1	88.0	88.5	88.8	88.2	88.1
–46.0	83.9	84.8	85.2	85.6	86.0	86.9	87.9	88.7	89.3	89.5	89.0	88.9
–42.0	84.6	85.5	85.9	86.3	86.7	87.7	88.6	89.5	90.0	90.3	89.7	89.6
–38.0	85.3	86.1	86.6	87.0	87.4	88.4	89.3	90.2	90.7	91.0	90.4	90.3
–34.0	86.0	86.8	87.3	87.7	88.1	89.1	90.0	90.9	91.4	91.7	91.1	91.0
–30.0	86.6	87.5	88.0	88.4	88.8	89.8	90.7	91.6	92.2	92.4	91.9	91.7
–26.0	87.3	88.2	88.6	89.1	89.5	90.5	91.4	92.3	92.9	93.2	92.6	92.4
–22.0	88.0	88.9	89.3	89.7	90.2	91.1	92.1	93.0	93.6	93.9	93.3	93.1
–18.0	88.6	89.5	90.0	90.4	90.8	91.8	92.8	93.7	94.3	94.6	94.0	93.8
–14.0	89.3	90.2	90.6	91.1	91.5	92.5	93.5	94.4	95.0	95.3	94.7	94.5
–10.0	89.9	90.8	91.3	91.7	92.1	93.2	94.2	95.1	95.6	95.9	95.3	95.2
–6.0	90.6	91.5	91.9	92.4	92.8	93.8	94.8	95.8	96.3	96.6	96.0	95.9
–2.0	91.2	92.1	92.6	93.0	93.5	94.5	95.5	96.5	97.0	97.3	96.7	96.6
2.0	91.8	92.7	93.2	93.7	94.1	95.1	96.2	97.1	97.7	98.0	97.4	97.2
6.0	92.4	93.4	93.8	94.3	94.7	95.8	96.8	97.8	98.3	98.6	98.0	97.9
10.0	93.1	94.0	94.5	94.9	95.4	96.4	97.5	98.4	99.0	99.3	98.7	98.5
14.0	93.7	94.6	95.1	95.6	96.0	97.1	98.1	99.1	99.6	100.0	99.3	99.2
18.0	94.3	95.2	95.7	96.2	96.6	97.7	98.7	99.7	100.3	*100.3*	*99.1*	*98.8*
22.0	94.9	95.9	96.3	96.8	97.3	98.3	99.4	*100.1*	*100.1*	*99.7*	*98.5*	*98.2*
26.0	95.5	96.5	97.0	97.4	97.9	*98.7*	*99.2*	*99.6*	*99.5*	*99.1*	*97.9*	*97.7*
30.0	96.1	97.1	97.6	*97.8*	*97.8*	*98.3*	*98.7*	*99.0*	*98.9*	*98.5*	*97.5*	*97.3*
34.0	96.7	*97.5*	*97.5*	*97.5*	*97.5*	*97.9*	*98.3*	*98.5*	*98.5*	*98.1*	*97.0*	*96.8*
38.0	*96.6*	*97.2*	*97.2*	*97.2*	*97.2*	*97.5*	*97.8*	*98.0*	*98.0*	*97.5*	*96.6*	*96.4*
42.0	*96.3*	*96.9*	*96.8*	*96.7*	*96.7*	*97.0*	*97.3*	*97.5*	*97.4*	*97.0*		
46.0	*95.9*	*96.2*	*96.2*	*96.1*	*96.2*	*96.5*	*96.9*	*97.0*				
50.0	*95.1*	*95.5*	*95.5*	*95.6*	*95.7*	*96.0*						
54.0	*94.4*	*94.7*	*94.8*	*95.0*								
58.0	*93.6*	*93.9*										
62.0												

OAT < ISA + 15

OAT ≥ ISA + 15

LEFT INTENTIONALLY BLANK

MAXIMUM CONTINUOUS

CFM56–5A1/A3 MAXIMUM CONTINUOUS N1 AIR CONDITIONING ON * IAS=230 KT	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI ICE ON	0.0	–.9
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–2.1

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
–54.0	79.5	81.9	83.4	84.7	86.0	85.8	86.9	87.7	88.5	89.2	88.6
–50.0	80.2	82.6	84.1	85.4	86.7	86.5	87.6	88.5	89.3	90.0	89.3
–46.0	80.9	83.3	84.8	86.1	87.5	87.3	88.3	89.2	90.0	90.7	90.1
–42.0	81.5	83.9	85.5	86.8	88.2	88.0	89.1	90.0	90.8	91.5	90.8
–38.0	82.2	84.6	86.2	87.5	88.9	88.7	89.8	90.7	91.5	92.2	91.5
–34.0	82.8	85.3	86.9	88.2	89.6	89.4	90.5	91.4	92.3	92.9	92.3
–30.0	83.5	86.0	87.6	88.9	90.3	90.1	91.2	92.1	93.0	93.7	93.0
–26.0	84.1	86.6	88.2	89.6	91.0	90.8	91.9	92.9	93.7	94.4	93.7
–22.0	84.8	87.3	88.9	90.3	91.7	91.5	92.6	93.6	94.4	*94.9*	94.4
–18.0	85.4	87.9	89.6	91.0	92.4	92.2	93.3	94.3	95.1	*94.8*	*94.5*
–14.0	86.0	88.6	90.2	91.6	93.1	92.8	94.0	94.9	*95.1*	*94.7*	*94.3*
–10.0	86.6	89.2	90.9	92.3	93.7	93.5	94.7	*95.1*	*94.9*	*94.5*	*94.2*
–6.0	87.3	89.9	91.5	92.9	94.4	94.2	*95.3*	*94.9*	*94.7*	*94.3*	*93.9*
–2.0	87.9	90.5	92.2	93.6	95.1	94.8	*95.2*	*94.8*	*94.6*	*94.1*	*93.6*
2.0	88.5	91.1	92.8	94.2	95.7	*95.0*	*95.0*	*94.7*	*94.5*	*94.1*	*93.6*
6.0	89.1	91.7	93.4	94.9	96.4	*94.7*	*94.6*	*94.4*	*94.4*	*94.1*	*93.6*
10.0	89.7	92.3	94.1	95.5	*96.2*	*94.4*	*94.3*	*94.1*	*94.0*	*93.8*	*93.5*
14.0	90.3	93.0	94.7	*96.0*	*95.9*	*94.0*	*93.9*	*93.7*	*93.6*		
18.0	90.9	93.6	95.3	*95.6*	*95.6*	*93.7*	*93.6*	*93.4*			
22.0	91.4	94.2	*95.4*	*95.3*	*95.3*	*93.3*	*93.3*				
26.0	92.0	94.8	*95.1*	*95.0*	*95.0*	*93.0*					
30.0	92.6	*94.6*	*94.7*	*94.6*	*94.6*	*92.5*					
34.0	*93.2*	*94.1*	*94.3*	*94.2*	*94.2*						
38.0	*92.7*	*93.7*	*93.9*	*93.9*							
42.0	*92.1*	*93.2*	*93.4*	*93.4*							
46.0	*91.5*	*92.7*	*93.0*								
50.0	*90.9*	*92.2*	*92.5*								
54.0	*90.3*	*91.6*									

OAT < ISA + 10
OAT ≥ ISA + 10

* One engine inoperative – 1 pack operative on remaining engine.

MAXIMUM CLIMB

CFM56–5A1/A3	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
MAXIMUM CLIMB N1 AIR CONDITIONING ON 250/300/.78	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI ICE ON	0.0	–.6
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.1

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
–54.0	77.5	80.0	81.5	82.1	83.4	84.4	85.2	86.0	87.0	88.4	88.5
–50.0	78.1	80.7	82.2	82.8	84.1	85.2	86.0	86.7	87.8	89.2	89.2
–46.0	78.8	81.4	82.9	83.5	84.8	85.9	86.7	87.4	88.5	89.9	90.7
–42.0	79.4	82.1	83.6	84.2	85.5	86.6	87.4	88.1	89.1	90.7	90.7
–38.0	80.1	82.7	84.2	84.9	86.2	87.3	88.1	88.9	89.9	91.4	91.5
–34.0	80.7	83.4	84.9	85.6	86.9	88.0	88.8	89.6	90.7	92.1	92.2
–30.0	81.4	84.0	85.6	86.2	87.6	88.7	89.5	90.3	91.4	92.9	92.9
–26.0	82.0	84.7	86.2	86.9	88.2	89.4	90.2	91.0	92.1	93.6	93.6
–22.0	82.6	85.3	86.9	87.5	88.9	90.0	90.9	91.6	91.8	94.3	94.3
–18.0	83.2	86.0	87.5	88.2	89.6	90.7	91.5	92.3	93.5	95.0	*94.8*
–14.0	83.8	86.6	88.2	88.8	90.2	91.4	92.2	93.0	94.1	*95.2*	*94.7*
–10.0	84.4	87.2	88.8	89.5	90.9	92.0	92.9	93.7	94.8	*95.0*	*94.5*
–6.0	85.0	87.8	89.4	90.1	91.5	92.7	93.5	94.3	*95.2*	*94.9*	*94.4*
–2.0	85.6	88.4	90.1	90.8	92.2	93.3	94.2	95.0	*95.0*	*94.7*	*94.1*
2.0	86.2	89.1	90.7	91.4	92.8	94.0	94.9	*94.9*	*94.8*	*94.4*	*93.8*
6.0	86.8	89.7	91.3	92.0	93.4	94.6	*95.1*	*94.8*	*94.7*	*94.3*	*93.9*
10.0	87.4	90.3	91.9	92.6	94.1	*94.9*	*95.1*	*94.9*	*94.7*	*94.3*	*93.8*
14.0	88.0	90.9	92.5	93.2	94.7	*94.7*	*94.8*	*94.9*	*94.7*	*94.3*	*93.6*
18.0	88.6	91.5	93.1	93.8	*94.4*	*94.4*	*94.5*	*94.6*	*94.5*		
22.0	89.1	92.0	*93.6*	*94.0*	*94.1*	*94.0*	*94.1*	*94.3*	*94.1*		
26.0	89.7	92.6	*93.2*	*93.6*	*93.8*	*93.7*	*93.8*	*93.9*	*93.7*		
30.0	90.2	*92.8*	*92.8*	*93.3*	*93.4*	*93.4*	*93.5*	*93.6*			
34.0	90.8	*92.3*	*92.3*	*92.9*	*93.0*	*93.0*	*93.1*				
38.0	*90.6*	*91.8*	*91.9*	*92.4*	*92.6*	*92.6*					
42.0	*89.9*	*91.3*	*91.5*	*92.0*	*92.2*						
46.0	*89.3*	*90.7*	*90.9*	*91.6*	*91.7*						
50.0	*88.6*	*90.1*	*90.4*	*91.1*							
54.0	*88.0*	*89.5*									

OAT < ISA + 10

OAT ≥ ISA + 10

MAXIMUM CRUISE

CFM56-5A1/A3 MAXIMUM CRUISE N1 AIR CONDITIONING ON 250/300/.78	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10 (C)	OAT ≥ ISA + 10 (C)
	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI ICE ON	0.0	–.6
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.1

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
–54.0	75.1	77.6	79.1	79.7	81.0	82.0	82.8	83.6	84.6	86.0	86.1
–50.0	75.7	78.3	79.8	80.4	81.7	82.8	83.6	84.3	85.4	86.8	86.8
–46.0	76.4	79.0	80.5	81.1	82.4	83.5	84.3	85.0	86.1	87.5	87.6
–42.0	77.0	79.7	81.2	81.8	83.1	84.2	85.0	85.7	86.8	88.3	88.3
–38.0	77.7	80.3	81.8	82.5	83.8	84.9	85.7	86.5	87.5	89.0	89.1
–34.0	78.3	81.0	82.5	83.2	84.5	85.6	86.4	87.2	88.3	89.7	89.8
–30.0	79.0	81.6	83.2	83.8	85.2	86.3	87.1	87.9	89.0	90.5	90.5
–26.0	79.6	82.3	83.8	84.5	85.8	87.0	87.8	88.6	89.7	91.2	91.2
–22.0	80.2	82.9	84.5	85.1	86.5	87.6	88.5	89.2	90.4	91.9	91.9
–18.0	80.8	83.6	85.1	85.8	87.2	88.3	89.1	89.9	91.1	92.6	*92.4*
–14.0	81.4	84.2	85.8	86.4	87.8	89.0	89.8	90.6	91.7	*92.8*	*92.3*
–10.0	82.0	84.8	86.4	87.1	88.5	89.6	90.5	91.3	92.4	*92.6*	*92.1*
–6.0	82.6	85.4	87.0	87.7	89.1	90.3	91.1	91.9	*92.8*	*92.5*	*92.0*
–2.0	83.2	86.0	87.7	88.4	89.8	90.9	91.8	92.6	*92.6*	*92.3*	*91.7*
2.0	83.8	86.7	88.3	89.0	90.4	91.6	92.5	*92.5*	*92.4*	*92.0*	*91.4*
6.0	84.4	87.3	88.9	89.6	91.0	92.2	*92.7*	*92.4*	*92.3*	*91.9*	*91.5*
10.0	85.0	87.9	89.5	90.2	91.7	*92.5*	*92.7*	*92.5*	*92.3*	*91.9*	*91.4*
14.0	85.6	88.5	90.1	90.8	92.3	*92.3*	*92.4*	*92.5*	*92.3*	*91.9*	*91.2*
18.0	86.2	89.1	90.7	91.4	*92.0*	*92.0*	*92.1*	*92.2*	*92.1*		
22.0	86.7	89.6	*91.2*	*91.6*	*91.7*	*91.6*	*91.7*	*91.9*	*91.7*		
26.0	87.3	90.2	*90.8*	*91.2*	*91.4*	*91.3*	*91.4*	*91.5*	*91.3*		
30.0	87.8	*90.4*	*90.4*	*90.9*	*91.0*	*91.0*	*91.1*	*91.2*			
34.0	88.4	*89.9*	*89.9*	*90.5*	*90.6*	*90.6*	*90.7*				
38.0	*88.2*	*89.4*	*89.5*	*90.0*	*90.2*	*90.2*					
42.0	*87.5*	*88.9*	*89.1*	*89.6*	*89.8*						
46.0	*86.9*	*88.3*	*88.5*	*89.2*	*89.3*						
50.0	*86.2*	*87.7*	*88.0*	*88.7*							
54.0	*85.6*	*87.1*									

OAT < ISA + 10
OAT ≥ ISA + 10

LEFT INTENTIONALLY BLANK

GENERAL

R Climb tables are established at MAX CLIMB THRUST with air conditioning in normal mode
R and anti ice OFF.
R The climb speed profile is :
R – 250 kt from 1500 ft up to FL100
R – acceleration from 250 kt to 300 kt
R – climb at 300 kt then M.78 up to selected altitude.
R All charts are established with a center of gravity corresponding to 33%.

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	52		**54**		**56**		**58**		**60**		**62**		**64**	
390	19	1391	21	1474	22	1564	24	1665	26	1781				
	125	390	134	391	144	392	155	394	168	396				
370	17	1287	18	1357	19	1431	20	1510	21	1596	23	1688	24	1791
	108	382	114	383	121	384	129	385	137	386	146	387	157	389
350	15	1202	16	1264	17	1330	18	1399	19	1471	20	1548	21	1630
	95	374	100	375	105	376	111	376	118	377	125	378	132	379
330	14	1129	14	1186	15	1245	16	1307	17	1371	18	1439	19	1511
	84	366	89	367	93	368	98	368	104	369	109	370	115	371
310	13	1060	13	1112	14	1166	15	1222	15	1281	16	1342	17	1406
	75	358	79	358	83	359	87	360	92	360	96	361	101	361
290	11	989	12	1037	13	1086	13	1137	14	1191	14	1246	15	1304
	66	348	70	348	73	349	77	349	80	350	84	350	89	351
270	10	904	11	947	11	992	12	1038	12	1085	13	1135	13	1186
	57	334	59	335	62	335	65	336	68	336	72	337	75	337
250	9	828	9	867	10	907	10	948	11	990	11	1035	12	1081
	49	322	51	322	53	323	56	323	58	323	61	324	64	324
240	9	792	9	828	9	866	10	906	10	946	11	988	11	1031
	45	315	47	316	49	316	52	317	54	317	56	317	59	318
220	8	723	8	756	8	790	9	826	9	862	9	900	10	938
	38	303	40	303	42	304	44	304	46	304	48	305	50	305
200	7	659	7	689	7	719	8	751	8	784	8	818	9	852
	33	290	34	291	36	291	38	292	39	292	41	292	43	292
180	6	597	6	624	7	652	7	681	7	710	7	741	8	772
	28	278	29	278	31	278	32	279	33	279	35	279	36	279
160	5	539	6	563	6	588	6	614	6	640	7	667	7	695
	24	264	25	265	26	265	27	266	28	266	29	266	31	266
140	5	483	5	505	5	527	5	550	6	573	6	598	6	623
	20	251	21	251	22	251	23	252	24	252	25	252	26	252
120	4	429	4	448	5	468	5	488	5	509	5	531	5	553
	16	235	17	236	18	236	19	237	19	237	20	237	21	237
100	3	341	3	356	4	372	4	388	4	405	4	422	4	440
	11	207	12	208	12	208	13	209	13	209	14	209	15	210
50	2	221	2	231	2	241	2	251	2	262	3	273	3	284
	6	169	6	170	6	170	7	170	7	171	7	171	8	171
15	1	138	1	144	1	150	2	156	2	163	2	170	2	177
	3	120	3	120	3	120	3	120	3	121	3	121	3	121

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.8 %	ΔFUEL = + 0.8 %	ΔFUEL = + 2 %	ΔFUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 0 FCOM-N0–03–05–10–002–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) **66**	**68**	**70**	**72**	**74**	**76**	**78**
390							
370	26 1905 169 391						
350	22 1718 140 381	23 1812 149 382	25 1915 159 384	26 2031 170 386	28 2161 184 388		
330	20 1586 121 372	21 1666 128 373	22 1750 135 374	23 1840 143 375	24 1937 152 377	26 2043 161 379	27 2162 173 381
310	18 1473 106 362	18 1543 112 363	19 1616 118 364	20 1694 124 365	21 1776 130 367	22 1863 138 368	24 1958 145 369
290	16 1364 93 352	17 1426 97 352	17 1491 102 353	18 1559 107 354	19 1630 112 355	20 1706 118 356	21 1786 124 358
270	14 1239 79 338	15 1294 82 339	15 1350 86 339	16 1409 90 340	17 1471 94 341	17 1535 99 342	18 1603 103 343
250	12 1128 67 325	13 1176 70 325	13 1226 73 326	14 1278 76 327	15 1332 79 328	15 1388 83 328	16 1446 87 329
240	12 1076 62 318	12 1121 64 319	13 1168 67 320	13 1217 70 320	14 1267 73 321	14 1320 76 322	15 1375 80 323
220	10 978 52 306	11 1019 55 306	11 1061 57 307	12 1104 59 307	12 1149 62 308	13 1195 65 309	13 1243 67 310
200	9 888 45 293	10 924 46 293	10 962 48 294	10 1000 50 295	11 1040 52 295	11 1081 55 296	11 1123 57 297
180	8 804 38 280	8 836 39 280	9 870 41 281	9 904 43 282	9 939 44 282	10 976 46 283	10 1013 48 284
160	7 724 32 267	7 753 33 267	8 783 35 268	8 813 36 268	8 845 37 269	9 877 39 270	9 911 40 271
140	6 648 27 253	7 674 28 253	7 700 29 254	7 727 30 255	7 755 31 255	8 784 32 256	8 814 34 257
120	6 575 22 238	6 598 23 238	6 621 24 239	6 645 25 240	6 670 26 240	7 695 27 241	7 722 28 242
100	4 457 15 210	5 476 16 211	5 494 16 212	5 513 17 212	5 533 18 213	5 553 18 214	5 573 19 215
50	3 295 8 172	3 307 8 172	3 318 9 173	3 330 9 174	3 342 9 175	3 355 10 176	3 367 10 177
15	2 184 4 122	2 191 4 122	2 198 4 123	2 205 4 124	2 212 4 125	2 219 4 126	2 227 4 127

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.8 %	△FUEL = + 0.8 %	△FUEL = + 2 %	△FUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 0 FCOM-N0–03–05–10–003–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA+10	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	52		**54**		**56**		**58**		**60**		**62**		**64**	
390	20	1472	21	1560	23	1656	24	1764	26	1887				
	132	399	141	400	151	402	163	404	178	406				
370	17	1359	18	1434	19	1513	21	1597	22	1688	23	1786	25	1896
	113	391	120	392	127	393	135	394	144	395	154	397	165	398
350	16	1269	16	1334	17	1403	18	1477	19	1554	20	1635	21	1723
	99	383	105	384	111	385	117	386	124	387	131	388	139	389
330	14	1190	15	1250	16	1312	16	1377	17	1446	18	1518	19	1594
	88	375	93	376	98	377	103	377	109	378	115	379	121	380
310	13	1115	14	1170	14	1227	15	1287	16	1349	16	1413	17	1481
	79	366	83	367	87	368	91	368	96	369	101	370	106	370
290	12	1039	12	1089	13	1142	13	1196	14	1252	15	1310	16	1372
	69	356	73	357	77	357	80	358	84	358	89	359	93	359
270	10	949	11	994	11	1041	12	1089	12	1139	13	1191	14	1246
	59	343	62	343	65	344	68	344	72	345	75	345	79	346
250	9	868	10	908	10	950	11	994	11	1038	12	1085	12	1133
	51	330	53	330	56	331	58	331	61	331	64	332	67	332
240	9	829	9	868	10	908	10	949	10	991	11	1035	11	1081
	47	323	49	324	52	324	54	325	56	325	59	325	62	326
220	8	756	8	791	8	827	9	864	9	902	10	942	10	982
	40	311	42	311	44	312	46	312	48	312	50	312	53	313
200	7	688	7	720	8	752	8	785	8	820	9	855	9	891
	34	298	36	298	38	299	39	299	41	299	43	300	45	300
180	6	624	6	652	7	681	7	711	7	742	8	774	8	806
	29	285	31	286	32	286	33	286	35	287	36	287	38	287
160	5	562	6	588	6	614	6	641	6	668	7	697	7	726
	25	272	26	272	27	273	28	273	29	273	31	273	32	274
140	5	503	5	526	5	549	5	573	6	598	6	623	6	649
	21	258	22	258	23	259	24	259	25	259	26	259	27	260
120	4	447	4	467	5	487	5	509	5	531	5	553	5	576
	17	243	18	243	19	243	19	244	20	244	21	244	22	245
100	3	355	3	371	4	387	4	404	4	421	4	439	4	458
	12	215	12	215	13	216	13	216	14	216	15	217	15	217
50	2	229	2	239	2	250	2	261	2	272	3	283	3	295
	6	177	6	177	7	178	7	178	7	179	8	179	8	179
15	1	142	1	148	1	155	2	161	2	168	2	175	2	183
	3	128	3	128	3	129	3	129	3	130	4	130	4	130

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.8 %	ΔFUEL = + 0.8 %	ΔFUEL = + 2 %	ΔFUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 10 FCOM-N0–03–05–10–004–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=33.0%	**FROM BRAKE RELEASE** **TIME (MIN) FUEL (KG)** **DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)						
	66	**68**	**70**	**72**	**74**	**76**	**78**
390							
370	27 2019 178 400						
350	23 1816 147 390	24 1916 157 391	26 2026 167 393	27 2150 179 395	29 2289 194 398		
330	20 1674 128 381	21 1758 135 382	22 1848 142 383	23 1944 151 385	25 2047 160 386	26 2161 170 388	28 2287 182 390
310	18 1552 112 371	19 1626 117 372	20 1704 124 373	21 1786 130 374	22 1873 137 376	23 1967 145 377	24 2067 153 379
290	16 1435 97 360	17 1501 102 361	18 1569 107 362	19 1641 112 363	19 1717 118 364	20 1797 124 365	21 1883 131 366
270	14 1301 82 346	15 1359 86 347	16 1419 90 348	16 1481 94 349	17 1546 99 350	18 1615 103 351	19 1687 108 352
250	13 1183 70 333	13 1234 73 334	14 1287 76 334	14 1342 80 335	15 1398 83 336	16 1458 87 337	16 1520 91 338
240	12 1128 64 326	12 1176 67 327	13 1225 70 328	13 1277 73 328	14 1330 77 329	15 1386 80 330	15 1444 83 331
220	11 1024 55 313	11 1067 57 314	11 1111 60 315	12 1157 62 315	12 1204 65 316	13 1253 68 317	13 1304 70 318
200	9 929 47 301	10 967 49 301	10 1007 51 302	10 1047 53 302	11 1089 55 303	11 1133 57 304	12 1178 60 305
180	8 840 40 288	9 874 41 288	9 909 43 289	9 946 45 290	10 983 47 290	10 1021 48 291	10 1061 50 292
160	7 756 33 274	8 787 35 275	8 818 36 276	8 850 38 276	8 883 39 277	9 918 41 278	9 953 42 279
140	6 676 28 260	7 703 29 261	7 731 30 262	7 760 31 262	7 789 33 263	8 820 34 264	8 851 35 265
120	6 600 23 245	6 624 24 246	6 649 25 247	6 674 26 247	7 700 27 248	7 727 28 249	7 755 29 250
100	4 476 16 218	5 495 17 218	5 515 17 219	5 535 18 220	5 556 19 221	5 577 19 222	5 599 20 223
50	3 307 8 180	3 319 9 181	3 331 9 182	3 344 9 183	3 357 10 184	3 370 10 186	3 383 11 187
15	2 190 4 131	2 198 4 132	2 205 4 133	2 213 4 134	2 221 4 136	2 229 5 137	2 237 5 139

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.8 %	△FUEL = + 0.8 %	△FUEL = + 2 %	△FUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 10 FCOM-N0–03–05–10–005–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA+15	**FROM BRAKE RELEASE**	
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN)**	**FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)**	**TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	52		**54**		**56**		**58**		**60**		**62**		**64**	
390	22	1571	23	1668	25	1776	27	1898						
	147	405	158	406	170	408	184	410						
370	19	1449	20	1530	22	1618	23	1711	24	1813	26	1924	28	2048
	127	397	134	398	143	399	152	400	163	401	174	403	188	405
350	17	1352	18	1424	19	1500	20	1581	21	1667	23	1758	24	1857
	111	389	118	390	125	391	132	392	140	393	149	394	158	395
330	16	1267	16	1332	17	1401	18	1473	19	1549	20	1629	21	1714
	99	381	105	382	110	383	116	383	123	384	130	385	137	386
310	14	1186	15	1246	16	1308	17	1374	17	1442	18	1514	19	1589
	88	372	93	373	98	374	103	375	109	375	114	376	120	377
290	13	1102	14	1156	14	1213	15	1272	16	1334	16	1398	17	1466
	78	362	82	362	86	363	90	364	95	364	100	365	105	366
270	11	1001	12	1050	12	1100	13	1153	14	1207	14	1263	15	1323
	66	348	69	348	72	349	76	349	80	350	84	350	88	351
250	10	913	11	956	11	1001	12	1048	12	1096	13	1146	13	1198
	56	334	59	335	62	335	65	336	68	336	71	337	74	337
240	9	871	10	912	10	955	11	999	11	1045	12	1092	12	1141
	52	328	54	328	57	329	60	329	63	330	65	330	68	331
220	8	794	9	831	9	869	10	909	10	950	11	992	11	1036
	44	315	47	316	49	316	51	317	53	317	56	317	58	318
200	8	721	8	754	8	789	9	825	9	861	9	899	10	938
	38	303	40	303	42	303	43	304	45	304	47	304	50	305
180	7	652	7	682	7	713	8	745	8	778	8	811	9	846
	32	289	34	290	35	290	37	291	38	291	40	291	42	292
160	6	587	6	614	6	641	7	670	7	699	7	729	8	760
	27	276	28	276	30	277	31	277	32	277	34	278	35	278
140	5	524	5	548	6	573	6	598	6	624	6	651	7	679
	23	262	24	262	25	262	26	263	27	263	28	263	29	264
120	5	464	5	485	5	507	5	529	5	552	6	576	6	600
	19	246	19	246	20	247	21	247	22	248	23	248	24	248
100	4	367	4	383	4	401	4	418	4	436	4	455	5	475
	13	217	13	218	14	218	15	219	15	219	16	219	17	220
50	2	236	2	247	2	258	3	269	3	280	3	292	3	305
	7	179	7	179	7	180	8	180	8	180	8	181	9	181
15	1	146	1	152	2	159	2	166	2	173	2	180	2	188
	3	128	3	128	3	128	3	129	4	129	4	130	4	130

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.8 %	ΔFUEL = + 0.8 %	ΔFUEL = + 2 %	ΔFUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 15 FCOM-N0–03–05–10–006–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA+15	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN) FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)						
	66	**68**	**70**	**72**	**74**	**76**	**78**
390							
370							
350	25 1963 168 397	27 2078 180 398	29 2207 193 400	31 2353 208 402			
330	22 1804 145 387	24 1900 154 389	25 2003 163 390	27 2115 174 392	28 2236 185 393	30 2372 198 395	32 2525 213 398
310	20 1669 127 378	21 1752 134 379	22 1841 141 380	24 1936 149 381	25 2037 158 383	26 2146 168 384	28 2265 178 386
290	18 1536 110 366	19 1610 116 367	20 1687 122 368	21 1769 128 369	22 1855 135 371	23 1947 142 372	24 2046 151 373
270	16 1384 92 352	16 1447 97 352	17 1513 101 353	18 1583 106 354	19 1655 111 355	20 1732 117 356	21 1813 123 357
250	14 1252 78 338	14 1308 81 339	15 1366 85 339	16 1426 89 340	16 1488 93 341	17 1554 98 342	18 1623 102 343
240	13 1192 72 331	14 1245 75 332	14 1299 78 332	15 1355 82 333	15 1414 86 334	16 1475 89 335	17 1539 94 336
220	11 1081 61 318	12 1128 64 319	12 1176 66 319	13 1226 69 320	14 1277 72 321	14 1331 76 322	15 1387 79 322
200	10 979 52 305	11 1020 54 306	11 1063 56 306	11 1107 59 307	12 1153 61 308	12 1200 64 309	13 1249 67 309
180	9 882 44 292	9 919 46 293	10 957 48 293	10 997 50 294	11 1037 52 295	11 1079 54 295	11 1123 56 296
160	8 792 37 278	8 825 38 279	9 859 40 280	9 894 42 280	9 930 43 281	10 967 45 282	10 1005 47 282
140	7 707 31 264	7 736 32 265	8 766 33 265	8 797 35 266	8 829 36 267	8 862 37 267	9 896 39 268
120	6 625 25 249	6 651 26 249	7 678 27 250	7 705 28 251	7 733 30 251	7 762 31 252	8 792 32 253
100	5 494 17 220	5 515 18 221	5 535 19 222	5 557 20 223	5 579 20 224	6 602 21 225	6 625 22 226
50	3 317 9 182	3 330 9 183	3 343 10 184	3 356 10 185	3 370 10 186	3 384 11 187	4 399 11 188
15	2 195 4 131	2 203 4 132	2 211 4 133	2 219 5 134	2 228 5 135	2 236 5 137	2 245 5 138

LOW AIR CONDITIONING	HIGH AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.8 %	ΔFUEL = + 0.8 %	ΔFUEL = + 2 %	ΔFUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 15 FCOM-N0–03–05–10–007–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST	ISA+20	**FROM BRAKE RELEASE**	
NORMAL AIR CONDITIONING	CG=33.0%	**TIME (MIN)**	**FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)**	**TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	52		**54**		**56**		**58**		**60**		**62**		**64**	
390	25	1702	26	1814	28	1938								
	168	410	181	412	196	414								
370	21	1563	23	1655	24	1754	26	1862	28	1979	30	2109	32	2258
	144	402	153	403	164	404	175	406	188	407	202	409	219	411
350	19	1456	20	1537	22	1623	23	1714	24	1812	26	1918	27	2033
	127	394	134	395	142	396	151	397	161	399	171	400	183	401
330	17	1363	18	1435	19	1512	21	1593	22	1679	23	1770	24	1869
	113	386	119	387	126	388	133	389	141	390	149	391	159	392
310	16	1272	17	1338	18	1407	19	1480	20	1556	21	1637	22	1723
	100	377	105	378	111	379	117	380	124	381	131	381	138	382
290	14	1177	15	1236	16	1299	17	1364	17	1432	18	1504	19	1579
	87	366	92	367	97	368	102	368	107	369	113	370	119	370
270	13	1066	13	1119	14	1174	15	1231	15	1291	16	1353	17	1419
	74	352	78	352	81	353	86	353	90	354	95	355	99	355
250	11	969	12	1016	12	1065	13	1116	13	1169	14	1224	15	1282
	63	338	66	339	69	339	73	340	76	340	80	341	84	341
240	11	924	11	969	12	1015	12	1063	13	1113	13	1165	14	1219
	58	332	61	332	64	333	67	333	70	334	74	334	77	335
220	9	840	10	880	10	921	11	964	11	1009	12	1055	12	1103
	50	319	52	319	54	320	57	320	60	321	63	321	66	321
200	8	761	9	796	9	834	9	872	10	911	10	952	11	995
	42	306	44	306	46	306	48	307	51	307	53	308	55	308
180	7	686	8	718	8	751	8	785	9	821	9	857	10	895
	36	292	37	292	39	293	41	293	43	293	45	294	47	294
160	6	615	7	644	7	674	7	704	8	735	8	768	8	801
	30	278	31	278	33	279	34	279	36	279	37	280	39	280
140	6	548	6	574	6	600	6	627	7	655	7	683	7	713
	25	263	26	263	27	264	28	264	30	264	31	265	32	265
120	5	484	5	506	5	529	6	553	6	577	6	603	6	629
	20	247	21	247	22	248	23	248	24	248	25	249	26	249
100	4	381	4	398	4	416	4	435	5	454	5	474	5	495
	14	217	14	217	15	218	16	218	17	219	17	219	18	219
50	2	245	3	256	3	267	3	279	3	291	3	304	3	317
	7	177	7	177	8	177	8	178	8	178	9	179	9	179
15	2	150	2	157	2	164	2	172	2	179	2	187	2	195
	3	123	3	124	3	124	4	124	4	125	4	125	4	126

LOW AIR CONDITIONING	HIGH AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.8 %	△FUEL = + 0.8 %	△FUEL = + 2 %	△FUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 20 FCOM-N0–03–05–10–008–100

R

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=33.0%	**FROM BRAKE RELEASE** **TIME (MIN) FUEL (KG)** **DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)						
	66	**68**	**70**	**72**	**74**	**76**	**78**
390							
370							
350	29 2159 196 403	31 2297 211 405	34 2455 228 407				
330	26 1974 169 394	27 2087 179 395	29 2210 191 397	31 2346 205 399	33 2497 220 401	36 2670 239 403	
310	23 1814 146 383	24 1910 155 385	25 2014 164 386	27 2125 174 387	29 2246 185 389	30 2379 198 391	32 2525 212 393
290	20 1659 126 371	21 1742 132 372	22 1830 139 373	24 1924 147 374	25 2024 156 376	26 2131 165 377	28 2248 175 379
270	18 1487 104 356	18 1558 110 357	19 1632 115 358	20 1711 121 359	21 1793 127 360	22 1881 134 361	23 1976 142 362
250	15 1342 88 342	16 1403 92 343	17 1468 97 343	18 1536 101 344	18 1606 106 345	19 1681 112 346	20 1760 117 347
240	14 1275 81 335	15 1333 85 336	16 1394 89 337	17 1457 93 337	17 1523 97 338	18 1592 102 339	19 1665 107 340
220	13 1152 69 322	13 1204 72 323	14 1257 75 323	15 1312 78 324	15 1370 82 324	16 1430 86 325	17 1493 90 326
200	11 1039 58 308	12 1084 60 309	12 1131 63 309	13 1180 66 310	13 1230 69 311	14 1283 72 311	14 1338 75 312
180	10 934 49 295	10 974 51 295	11 1015 53 296	11 1058 55 296	12 1103 58 297	12 1149 60 297	13 1197 63 298
160	9 836 41 281	9 871 42 281	9 908 44 281	10 946 46 282	10 985 48 283	11 1026 50 283	11 1068 52 284
140	8 743 34 266	8 775 35 266	8 807 37 267	9 841 38 267	9 875 40 268	9 911 42 268	10 948 43 269
120	7 655 28 249	7 683 29 250	7 711 30 250	7 741 31 251	8 771 33 252	8 803 34 252	8 835 35 253
100	5 516 19 220	5 537 20 221	6 560 20 221	6 583 21 222	6 607 22 223	6 631 23 223	6 657 24 224
50	3 330 10 180	3 344 10 181	3 358 10 181	4 372 11 182	4 387 11 183	4 402 12 184	4 418 12 185
15	2 203 4 127	2 211 4 127	2 220 5 128	2 229 5 129	2 238 5 130	2 247 5 131	2 257 5 132

LOW AIR CONDITIONING	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.8 %	△FUEL = + 0.8 %	△FUEL = + 2 %	△FUEL = + 5 %

10D -08F0A320–212 CFM56–5A3 21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 20 FCOM-N0–03–05–10–009–100

GENERAL

Cruise tables are established :
- for ISA, ISA + 10, ISA + 15 and ISA + 20
- with normal air conditioning and anti ice OFF
- from FL290 to FL390 at M.78
- from FL100 to FL390 at long range speed
- with a 33 % center of gravity.

OPTIMUM MACH NUMBER

Seven tables give the optimum Mach number versus cost index, altitude and wind as calculated by the FMGC.

COST INDEX = 0 (MAXIMUM RANGE)

WEIGHT/WIND 1000kg	kt	FLIGHT LEVEL 290	310	330	350	370	390
50	100.	.582	.610	.637	.667	.697	.729
	50.	.602	.629	.656	.684	.712	.740
	0.	.627	.654	.679	.705	.729	.752
	– 50.	.648	.672	.695	.719	.742	.761
	– 100.	.675	.695	.714	.733	.752	.767
55	100.	.611	.638	.667	.697	.729	.749
	50.	.631	.657	.684	.712	.739	.756
	0.	.655	.680	.705	.729	.752	.765
	– 50.	.673	.696	.719	.742	.761	.770
	– 100.	.695	.714	.733	.752	.767	.775
60	100.	.637	.666	.695	.726	.747	.764
	50.	.656	.683	.709	.737	.755	.768
	0.	.679	.704	.727	.750	.764	.774
	– 50.	.695	.718	.740	.760	.769	.777
	– 100.	.713	.732	.750	.766	.774	.780
65	100.	.663	.691	.722	.745	.761	
	50.	.680	.706	.734	.753	.766	
	0.	.702	.724	.747	.762	.772	
	– 50.	.715	.737	.758	.768	.776	
	– 100.	.729	.747	.764	.773	.779	
70	100.	.686	.717	.742	.757		
	50.	.701	.729	.750	.763		
	0.	.720	.744	.761	.770		
	– 50.	.733	.755	.766	.774		
	– 100.	.744	.762	.772	.778		
75	100.	.709	.738	.753	.770		
	50.	.722	.747	.759	.773		
	0.	.738	.758	.767	.777		
	– 50.	.750	.764	.772	.780		
	– 100.	.757	.770	.776	.782		

COST INDEX = 10 kg/min

WEIGHT 1000kg	WIND kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	100.	.634	.661	.686	.712	.736	.758
	50.	.650	.675	.700	.723	.746	.763
	0.	.670	.693	.714	.734	.753	.769
	– 50.	.697	.717	.736	.752	.764	.774
	– 100.	.727	.740	.751	.760	.769	.777
55	100.	.659	.685	.710	.734	.756	.767
	50.	.673	.697	.721	.744	.762	.771
	0.	.690	.711	.732	.751	.767	.775
	– 50.	.713	.731	.749	.763	.774	.779
	– 100.	.737	.749	.759	.768	.777	.781
60	100.	.681	.707	.730	.753	.766	.775
	50.	.694	.718	.741	.761	.770	.777
	0.	.708	.729	.748	.765	.773	.780
	– 50.	.727	.745	.760	.772	.778	.782
	– 100.	.746	.757	.766	.775	.781	.784
65	100.	.702	.725	.749	.763	.773	
	50.	.713	.735	.757	.768	.776	
	0.	.725	.744	.762	.771	.778	
	– 50.	.740	.756	.770	.777	.781	
	– 100.	.755	.764	.773	.780	.783	
70	100.	.719	.744	.761	.770		
	50.	.730	.753	.765	.773		
	0.	.739	.760	.769	.776		
	– 50.	.751	.767	.776	.780		
	– 100.	.762	.771	.779	.782		
75	100.	.736	.757	.767	.777		
	50.	.746	.763	.771	.779		
	0.	.754	.767	.774	.781		
	– 50.	.762	.774	.779	.783		
	– 100.	.768	.777	.781	.784		

COST INDEX = 20 kg/min

WEIGHT 1000kg	WIND kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	100.	.668	.691	.713	.735	.754	.770
	50.	.688	.710	.731	.750	.763	.774
	0.	.714	.732	.746	.757	.767	.776
	– 50.	.735	.746	.756	.765	.773	.780
	– 100.	.751	.760	.769	.775	.780	.784
55	100.	.687	.709	.731	.751	.767	.775
	50.	.703	.724	.744	.761	.773	.779
	0.	.727	.743	.755	.766	.775	.780
	– 50.	.743	.753	.763	.771	.779	.782
	– 100.	.757	.765	.772	.778	.783	.786
60	100.	.704	.727	.747	.764	.773	.779
	50.	.717	.738	.756	.771	.778	.782
	0.	.738	.753	.764	.774	.779	.783
	– 50.	.750	.760	.769	.777	.782	.784
	– 100.	.762	.769	.776	.781	.784	.787
65	100.	.722	.742	.761	.771	.777	
	50.	.731	.750	.767	.776	.781	
	0.	.748	.761	.772	.778	.782	
	– 50.	.757	.766	.775	.781	.783	
	– 100.	.766	.773	.779	.783	.786	
70	100.	.737	.758	.768	.775		
	50.	.744	.763	.773	.779		
	0.	.757	.769	.777	.781		
	– 50.	.763	.772	.779	.782		
	– 100.	.770	.777	.782	.785		
75	100.	.752	.766	.773	.780		
	50.	.757	.770	.776	.782		
	0.	.766	.776	.779	.783		
	– 50.	.769	.778	.781	.784		
	– 100.	.774	.781	.784	.786		

COST INDEX = 40 kg/min

WEIGHT/WIND 1000kg	kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	100.	.730	.744	.755	.765	.773	.780
	50.	.743	.754	.763	.772	.778	.783
	0.	.756	.765	.774	.781	.784	.788
	– 50.	.772	.780	.784	.788	.792	.795
	– 100.	.786	.790	.794	.797	.798	.798
55	100.	.738	.751	.761	.770	.778	.782
	50.	.749	.759	.768	.775	.781	.784
	0.	.760	.769	.776	.781	.785	.789
	– 50.	.774	.781	.785	.788	.792	.794
	– 100.	.786	.790	.793	.796	.797	.797
60	100.	.746	.758	.767	.776	.781	.784
	50.	.754	.764	.772	.779	.783	.785
	0.	.764	.772	.778	.783	.786	.789
	– 50.	.775	.781	.785	.789	.792	.793
	– 100.	.786	.790	.793	.796	.796	.796
65	100.	.754	.764	.774	.780	.783	
	50.	.760	.769	.777	.782	.784	
	0.	.768	.775	.780	.784	.787	
	– 50.	.777	.782	.785	.789	.791	
	– 100.	.786	.790	.793	.795	.795	
70	100.	.761	.771	.778	.782		
	50.	.765	.774	.780	.783		
	0.	.771	.778	.783	.785		
	– 50.	.779	.782	.787	.789		
	– 100.	.787	.790	.793	.794		
75	100.	.768	.777	.780	.784		
	50.	.770	.779	.782	.785		
	0.	.775	.781	.784	.786		
	– 50.	.780	.784	.787	.790		
	– 100.	.787	.791	.793	.794		

COST INDEX = 60 kg/min

WEIGHT/WIND 1000Kg	kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	100.	.758	.769	.777	.783	.787	.790
	50.	.772	.781	.785	.789	.793	.795
	0.	.784	.788	.792	.797	.797	.798
	– 50.	.792	.797	.799	.799	.800	.800
	– 100.	.799	.800	.800	.800	.800	.800
55	100.	.762	.771	.778	.783	.787	.790
	50.	.773	.781	.785	.789	.792	.795
	0.	.784	.788	.792	.796	.797	.797
	– 50.	.792	.796	.798	.799	.800	.800
	– 100.	.799	.800	.800	.800	.800	.800
60	100.	.765	.773	.779	.784	.788	.790
	50.	.775	.781	.785	.789	.792	.794
	0.	.784	.788	.791	.795	.796	.796
	– 50.	.792	.796	.797	.798	.799	.799
	– 100.	.799	.799	.800	.800	.800	.800
65	100.	.769	.776	.781	.785	.788	
	50.	.776	.782	.785	.789	.791	
	0.	.784	.788	.791	.794	.795	
	– 50.	.792	.795	.797	.797	.797	
	– 100.	.798	.799	.800	.800	.800	
70	100.	.772	.778	.783	.785		
	50.	.778	.782	.786	.789		
	0.	.784	.788	.791	.794		
	– 50.	.791	.795	.796	.796		
	– 100.	.798	.798	.799	.799		
75	100.	.775	.781	.784	.786		
	50.	.779	.784	.787	.789		
	0.	.784	.788	.791	.793		
	– 50.	.791	.794	.795	.795		
	– 100.	.797	.798	.798	.797		

COST INDEX = 80 kg/min

WEIGHT 1000kg	WIND kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	**100.**	.782	.787	.791	.796	.797	.798
	50.	.789	.794	.798	.799	.800	.800
	0.	.797	.799	.800	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
55	**100.**	.782	.787	.791	.795	.796	.797
	50.	.789	.793	.797	.798	.799	.799
	0.	.797	.799	.799	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
60	**100.**	.782	.787	.790	.794	.795	.796
	50.	.789	.793	.796	.797	.798	.798
	0.	.796	.798	.799	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
65	**100.**	.783	.786	.790	.793	.794	
	50.	.789	.792	.796	.796	.796	
	0.	.796	.797	.798	.799	.799	
	– 50.	.799	.800	.800	.800	.800	
	– 100.	.800	.800	.800	.800	.800	
70	**100.**	.783	.786	.790	.793		
	50.	.788	.792	.795	.795		
	0.	.795	.797	.797	.798		
	– 50.	.799	.800	.800	.800		
	– 100.	.800	.800	.800	.800		
75	**100.**	.783	.787	.790	.792		
	50.	.788	.792	.794	.794		
	0.	.794	.796	.796	.797		
	– 50.	.798	.799	.799	.797		
	– 100.	.800	.800	.800	.797		

COST INDEX = 100 kg/min

WEIGHT 1000kg	WIND kt	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390
50	**100.**	.793	.799	.799	.800	.800	.800
	50.	.799	.800	.800	.800	.800	.800
	0.	.800	.800	.800	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
55	**100.**	.793	.798	.799	.799	.800	.800
	50.	.799	.800	.800	.800	.800	.800
	0.	.800	.800	.800	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
60	**100.**	.793	.797	.798	.799	.799	.799
	50.	.798	.799	.800	.800	.800	.800
	0.	.800	.800	.800	.800	.800	.800
	– 50.	.800	.800	.800	.800	.800	.800
	– 100.	.800	.800	.800	.800	.800	.800
65	**100.**	.792	.796	.797	.798	.798	
	50.	.798	.798	.799	.800	.800	
	0.	.800	.800	.800	.800	.800	
	– 50.	.800	.800	.800	.800	.800	
	– 100.	.800	.800	.800	.800	.800	
70	**100.**	.792	.795	.796	.797		
	50.	.797	.798	.799	.799		
	0.	.799	.800	.800	.800		
	– 50.	.800	.800	.800	.800		
	– 100.	.800	.800	.800	.800		
75	**100.**	.791	.794	.795	.795		
	50.	.796	.797	.798	.797		
	0.	.799	.800	.800	.797		
	– 50.	.800	.800	.800	.797		
	– 100.	.800	.800	.800	.797		

OPTIMUM AND MAXIMUM ALTITUDES

DEFINITIONS

· Optimum altitude : the altitude at which the airplane covers the maximum distance per kilogram (pound) of fuel (best specific range). It depends on the actual weight and the deviation from ISA.

· Maximum altitude is defined as the lower of:
  – maximum altitude at maximum cruise thrust in level flight and
  – maximum altitude at maximum climb thrust with 300 feet/minute vertical speed.

Note : Definition of the maximum altitude in the FMGC is different (Refer to FCOM 4).

CRUISE LEVEL CHARTS

These charts have been established for a center of gravity at 33 % MAC.
Maximum and optimum altitudes are given for different temperatures at long range speed and M.78.

Note : The n = 1.3 g (1.4 g) curve indicates the buffet margin.

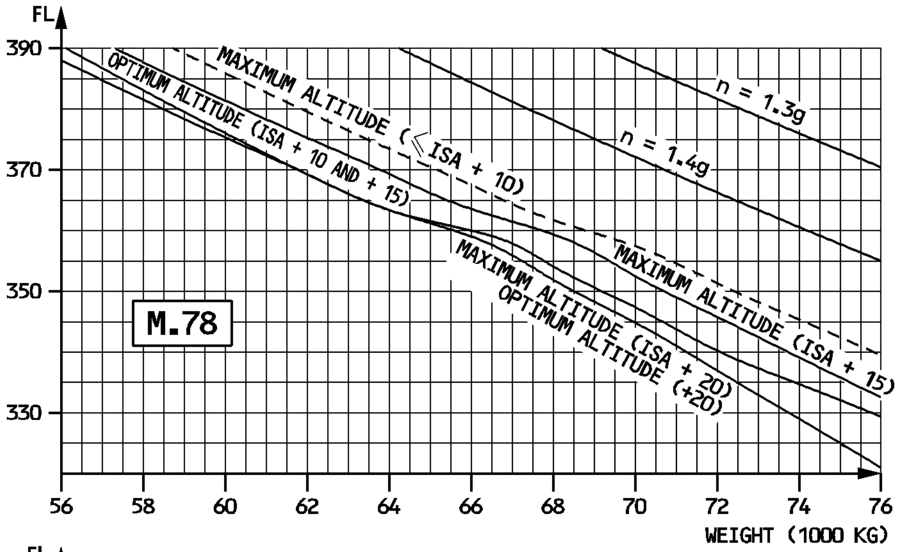
R **OPTIMUM WEIGHT FOR 4000 FEET STEP CLIMB**

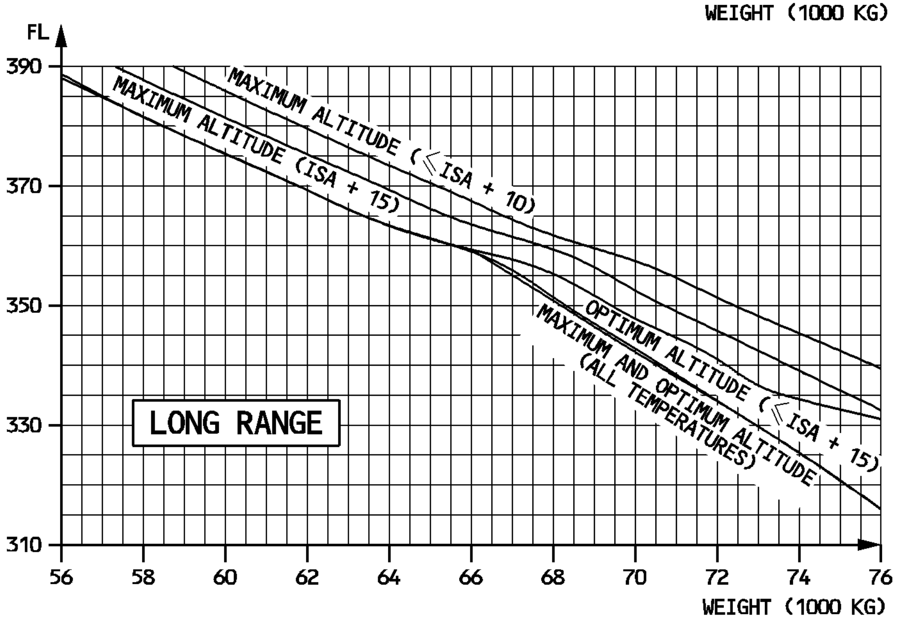
R

STEP CLIMB FROM/TO	WEIGHT (1000 kg/1000 lb)					
	≤ ISA + 10		ISA + 15		ISA + 20	
	LR	M.78	LR	M.78	LR	M.78
310/350	72/158	72/158	71/156	71/156	69/152	69/152
330/370	65/143	65/143	64/141	64/141	62/136	62/136
350/390	59/130	59/130	57/125	57/125	55/121	55/121

BLEED CORRECTIONS

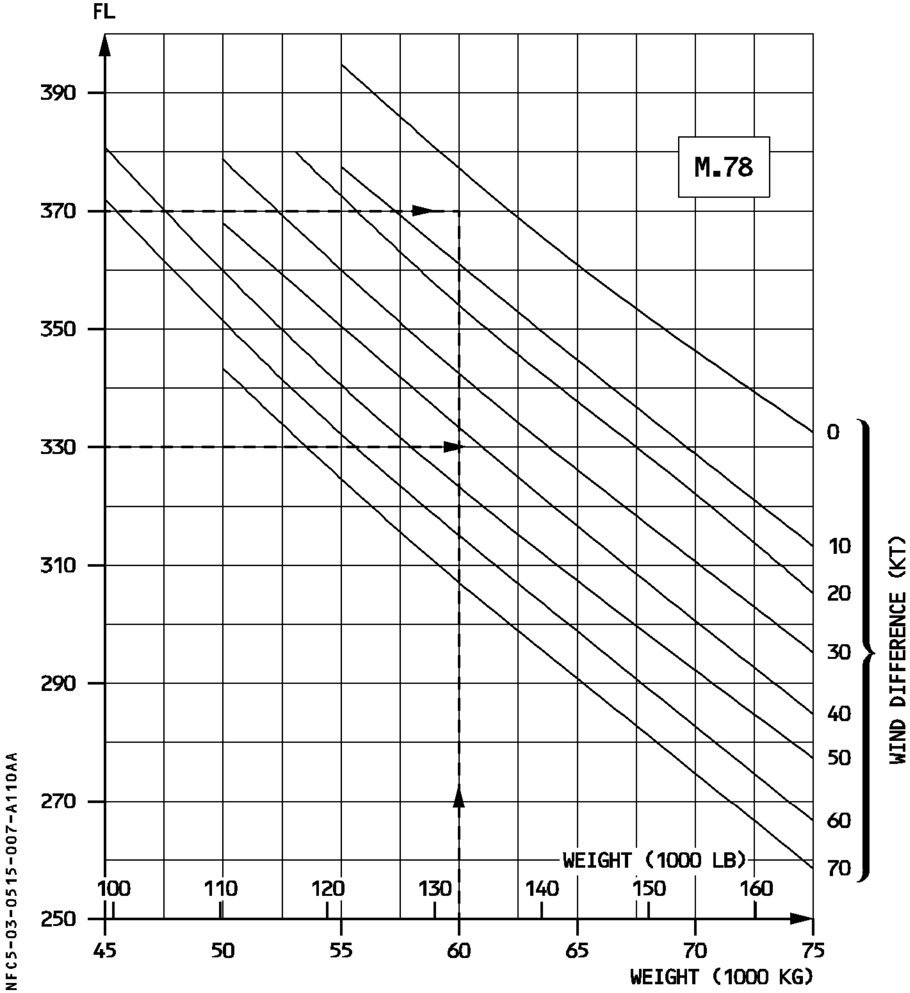
	ENGINE ANTI ICE	TOTAL ANTI ICE
ISA	Max Alt. : No corr. Opt Alt. : No corr.	Max Alt. : No corr. Opt Alt. : No corr.
ISA + 10	Max Alt. : – 500 ft Opt Alt. : No corr.	Max Alt. : – 1500 ft Opt Alt. : – 1500 ft
ISA + 15	Max Alt. : – 500 ft Opt Alt. : – 500 ft	Max. Alt. : – 1500 ft Opt Alt. – 1500 ft
ISA + 20	Max Alt. : – 1200 ft Opt Alt. : – 1200 ft	Max Alt. : – 3000 ft Opt Alt. : – 3000 ft





NFC5-03-0515-006-A105AA

WIND ALTITUDE TRADE FOR CONSTANT SPECIFIC RANGE



GIVEN : Weight : 60000 kg (132 300 lb)
Wind at FL370 : 10 kt head

FIND : Minimum wind difference to descend to FL330 : (43 – 6) = 37 kt

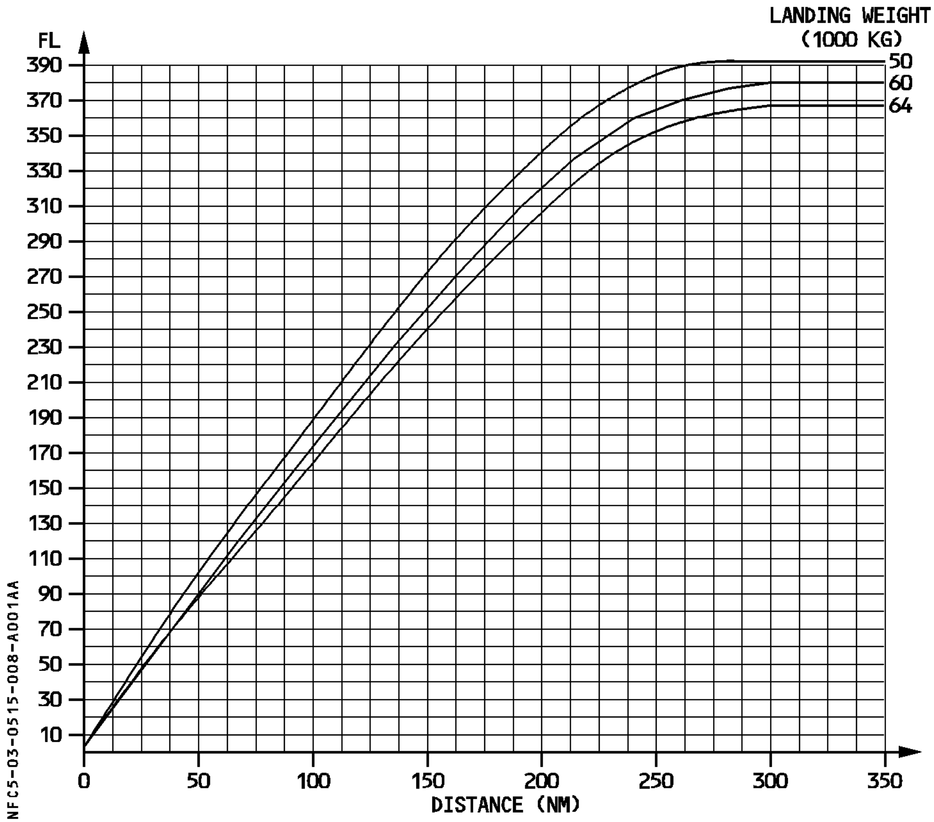
RESULTS : Descent to FL330 may be considered provided the tail wind at this altitude is more than (37 – 10) = 27 kt.

OPTIMUM ALTITUDE ON SHORT STAGE

According to the air distance (from brake release point to landing), the cruise flight level is limited by the distance required to perform climb and descent. The graph determines the optimum altitude.
It includes the following profiles:
- Takeoff
- Climb: 250kt/300kt/M.78
- Long range cruise (during at least 5 minutes)
- Descent: M.78/300kt/250kt
- Approach and landing

and it is established for:
- ISA
- CG = 33 %
- R Normal air conditioning
- Anti ice OFF

R



CRUISE - M.78

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=33.0%

N1 (%) **MACH**
KG/H/ENG **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	84.5	.780	84.4	.780	84.4	.780	84.4	.780	85.0	.780	86.1	.780
	1305	302	1212	289	1130	277	1058	264	1006	252	969	241
	176.9	462	188.8	458	200.7	454	212.4	450	222.4	447	231.0	447
52	84.7	.780	84.7	.780	84.6	.780	84.8	.780	85.4	.780	86.6	.780
	1317	302	1225	289	1144	277	1076	264	1025	252	990	241
	175.3	462	186.9	458	198.3	454	208.9	450	218.2	447	226.1	447
54	84.9	.780	84.9	.780	84.9	.780	85.1	.780	85.8	.780	87.2	.780
	1327	302	1237	289	1159	277	1094	264	1046	252	1016	241
	173.9	462	184.9	458	195.7	454	205.5	450	214.0	447	220.1	447
56	85.1	.780	85.1	.780	85.2	.780	85.5	.780	86.2	.780	87.9	.780
	1339	302	1251	289	1176	277	1113	264	1066	252	1048	241
	172.4	462	183.0	458	192.9	454	202.0	450	209.8	447	213.5	447
58	85.4	.780	85.4	.780	85.5	.780	85.8	.780	86.7	.780	88.6	.780
	1352	302	1265	289	1194	277	1133	264	1089	252	1082	241
	170.8	462	180.9	458	190.0	454	198.4	450	205.5	447	206.6	447
60	85.6	.780	85.6	.780	85.9	.780	86.2	.780	87.2	.780	89.4	.780
	1365	302	1280	289	1212	277	1153	264	1117	252	1122	241
	169.2	462	178.7	458	187.1	454	194.9	450	200.3	447	199.3	447
62	85.8	.780	85.9	.780	86.2	.780	86.6	.780	87.8	.780	90.3	.780
	1378	302	1298	289	1231	277	1174	264	1149	252	1165	241
	167.5	462	176.3	458	184.2	454	191.5	450	194.8	447	192.1	447
64	86.0	.780	86.2	.780	86.5	.780	87.0	.780	88.5	.780		
	1393	302	1316	289	1251	277	1197	264	1183	252		
	165.7	462	173.9	458	181.3	454	187.8	450	189.1	447		
66	86.3	.780	86.5	.780	86.9	.780	87.5	.780	89.2	.780		
	1409	302	1335	289	1272	277	1225	264	1222	252		
	163.8	462	171.4	458	178.4	454	183.5	450	183.0	447		
68	86.5	.780	86.8	.780	87.2	.780	88.1	.780	90.0	.780		
	1426	302	1354	289	1293	277	1257	264	1264	252		
	161.8	462	169.0	458	175.5	454	178.9	450	176.9	447		
70	86.8	.780	87.1	.780	87.6	.780	88.7	.780				
	1445	302	1374	289	1316	277	1292	264				
	159.8	462	166.5	458	172.4	454	174.0	450				
72	87.1	.780	87.4	.780	88.0	.780	89.3	.780				
	1463	302	1395	289	1342	277	1329	264				
	157.7	462	164.1	458	169.1	454	169.1	450				
74	87.4	.780	87.7	.780	88.5	.780	90.0	.780				
	1483	302	1416	289	1375	277	1371	264				
	155.7	462	161.6	458	165.0	454	164.0	450				
76	87.7	.780	88.1	.780	89.1	.780	90.8	.780				
	1503	302	1438	289	1409	277	1414	264				
	153.6	462	159.2	458	161.0	454	159.0	450				

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12100000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .780 .000 .000 0 FCOM-N0–03–05–15–009–100

CRUISE - M.78

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=33.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**	
50	86.3	.780	86.3	.780	86.2	.780	86.3	.780	86.9	.780	88.1	.780
	1345	302	1251	289	1166	277	1092	264	1038	252	999	241
	175.2	472	187.0	468	198.8	464	210.4	460	220.5	458	229.0	458
52	86.5	.780	86.5	.780	86.5	.780	86.7	.780	87.3	.780	88.5	.780
	1358	302	1263	289	1180	277	1110	264	1058	252	1021	241
	173.7	472	185.1	468	196.5	464	207.1	460	216.3	458	224.0	458
54	86.7	.780	86.7	.780	86.8	.780	87.0	.780	87.7	.780	89.1	.780
	1368	302	1277	289	1195	277	1129	264	1078	252	1050	241
	172.3	472	183.2	468	194.0	464	203.7	460	212.2	458	217.9	458
56	87.0	.780	87.0	.780	87.1	.780	87.4	.780	88.1	.780	89.8	.780
	1380	302	1290	289	1212	277	1148	264	1100	252	1084	241
	170.8	472	181.3	468	191.2	464	200.2	460	208.1	458	211.0	458
58	87.2	.780	87.2	.780	87.4	.780	87.7	.780	88.6	.780	90.6	.780
	1393	302	1305	289	1231	277	1168	264	1124	252	1120	241
	169.2	472	179.2	468	188.4	464	196.8	460	203.6	458	204.2	458
60	87.4	.780	87.5	.780	87.8	.780	88.1	.780	89.2	.780	91.4	.780
	1407	302	1321	289	1250	277	1190	264	1154	252	1161	241
	167.6	472	177.1	468	185.5	464	193.3	460	198.3	458	197.0	458
62	87.6	.780	87.8	.780	88.1	.780	88.5	.780	89.8	.780	92.3	.780
	1421	302	1339	289	1270	277	1211	264	1188	252	1205	241
	166.0	472	174.7	468	182.6	464	189.8	460	192.6	458	189.9	458
64	87.8	.780	88.1	.780	88.4	.780	88.9	.780	90.5	.780		
	1436	302	1357	289	1291	277	1236	264	1224	252		
	164.2	472	172.3	468	179.7	464	186.0	460	186.9	458		
66	88.1	.780	88.4	.780	88.7	.780	89.4	.780	91.3	.780		
	1452	302	1377	289	1312	277	1266	264	1265	252		
	162.4	472	169.8	468	176.7	464	181.6	460	180.9	458		
68	88.4	.780	88.7	.780	89.1	.780	90.0	.780	92.1	.780		
	1471	302	1397	289	1334	277	1300	264	1308	252		
	160.3	472	167.4	468	173.8	464	176.8	460	174.9	458		
70	88.6	.780	89.0	.780	89.5	.780	90.6	.780				
	1490	302	1418	289	1359	277	1336	264				
	158.3	472	164.9	468	170.6	464	172.1	460				
72	88.9	.780	89.3	.780	89.9	.780	91.3	.780				
	1510	302	1440	289	1387	277	1375	264				
	156.2	472	162.4	468	167.2	464	167.2	460				
74	89.2	.780	89.6	.780	90.4	.780	92.0	.780				
	1530	302	1462	289	1421	277	1418	264				
	154.1	472	159.9	468	163.2	464	162.2	460				
76	89.5	.780	89.9	.780	91.0	.780	92.8	.780				
	1551	302	1485	289	1456	277	1462	264				
	152.0	472	157.4	468	159.2	464	157.2	460				

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.3 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12100000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .780 .000 .000 10 FCOM-N0–03–05–15–010–100

CRUISE - M.78

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=33.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	87.2	.780	87.2	.780	87.2	.780	87.2	.780	87.9	.780	89.0	.780
	1366	302	1270	289	1184	277	1109	264	1054	252	1016	241
	174.4	476	186.1	473	197.9	469	209.5	465	219.5	463	227.7	463
52	87.4	.780	87.4	.780	87.4	.780	87.6	.780	88.3	.780	89.5	.780
	1378	302	1282	289	1198	277	1127	264	1074	252	1038	241
	172.9	476	184.2	473	195.6	469	206.1	465	215.3	463	222.7	463
54	87.6	.780	87.6	.780	87.7	.780	88.0	.780	88.7	.780	90.1	.780
	1389	302	1296	289	1214	277	1146	264	1096	252	1068	241
	171.5	476	182.3	473	193.1	469	202.7	465	211.1	463	216.6	463
56	87.8	.780	87.9	.780	88.0	.780	88.3	.780	89.1	.780	90.8	.780
	1401	302	1310	289	1231	277	1166	264	1118	252	1102	241
	170.0	476	180.4	473	190.4	469	199.2	465	206.9	463	209.8	463
58	88.1	.780	88.1	.780	88.3	.780	88.7	.780	89.5	.780	91.6	.780
	1415	302	1325	289	1250	277	1187	264	1142	252	1139	241
	168.4	476	178.4	473	187.5	469	195.7	465	202.5	463	203.1	463
60	88.3	.780	88.4	.780	88.7	.780	89.1	.780	90.1	.780		
	1428	302	1341	289	1270	277	1209	264	1173	252		
	166.8	476	176.2	473	184.6	469	192.2	465	197.2	463		
62	88.5	.780	88.7	.780	89.0	.780	89.4	.780	90.8	.780		
	1443	302	1360	289	1290	277	1231	264	1208	252		
	165.1	476	173.8	473	181.7	469	188.7	465	191.5	463		
64	88.7	.780	89.0	.780	89.3	.780	89.9	.780	91.5	.780		
	1458	302	1379	289	1311	277	1256	264	1244	252		
	163.3	476	171.3	473	178.7	469	185.0	465	185.9	463		
66	89.0	.780	89.3	.780	89.7	.780	90.4	.780	92.2	.780		
	1475	302	1399	289	1333	277	1287	264	1286	252		
	161.5	476	168.9	473	175.7	469	180.6	465	179.9	463		
68	89.3	.780	89.6	.780	90.0	.780	91.0	.780				
	1494	302	1420	289	1356	277	1322	264				
	159.5	476	166.5	473	172.9	469	175.8	465				
70	89.5	.780	89.9	.780	90.4	.780	91.6	.780				
	1513	302	1441	289	1381	277	1358	264				
	157.4	476	164.0	473	169.8	469	171.1	465				
72	89.8	.780	90.2	.780	90.9	.780	92.3	.780				
	1533	302	1463	289	1409	277	1398	264				
	155.4	476	161.5	473	166.3	469	166.2	465				
74	90.1	.780	90.5	.780	91.4	.780						
	1554	302	1485	289	1444	277						
	153.3	476	159.1	473	162.3	469						
76	90.4	.780	90.9	.780	92.0	.780						
	1575	302	1509	289	1480	277						
	151.2	476	156.6	473	158.4	469						

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12100000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .780 .000 .000 15 FCOM-N0–03–05–15–011–100

CRUISE - M.78

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=33.0%	**N1 (%) KG/H/ENG NM/1000KG**	**MACH IAS (KT) TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	88.1	.780	88.1	.780	88.1	.780	88.2	.780	88.8	.780	90.0	.780
	1387	302	1289	289	1202	277	1127	264	1071	252	1032	241
	173.5	481	185.2	477	196.9	474	208.4	470	218.3	468	226.5	468
52	88.3	.780	88.3	.780	88.3	.780	88.5	.780	89.2	.780	90.4	.780
	1399	302	1302	289	1217	277	1145	264	1092	252	1055	241
	172.0	481	183.3	477	194.6	474	205.0	470	214.2	468	221.5	468
54	88.5	.780	88.5	.780	88.6	.780	88.9	.780	89.6	.780	91.0	.780
	1411	302	1316	289	1233	277	1165	264	1113	252	1086	241
	170.6	481	181.4	477	192.1	474	201.6	470	210.0	468	215.4	468
56	88.7	.780	88.8	.780	88.9	.780	89.2	.780	90.0	.780	91.8	.780
	1423	302	1330	289	1251	277	1185	264	1136	252	1120	241
	169.1	481	179.4	477	189.3	474	198.1	470	205.8	468	208.7	468
58	89.0	.780	89.0	.780	89.2	.780	89.6	.780	90.5	.780		
	1437	302	1346	289	1270	277	1206	264	1161	252		
	167.5	481	177.4	477	186.5	474	194.7	470	201.4	468		
60	89.2	.780	89.3	.780	89.6	.780	90.0	.780	91.1	.780		
	1451	302	1362	289	1290	277	1229	264	1192	252		
	165.9	481	175.2	477	183.6	474	191.1	470	196.1	468		
62	89.4	.780	89.6	.780	89.9	.780	90.4	.780	91.7	.780		
	1465	302	1381	289	1311	277	1251	264	1227	252		
	164.2	481	172.9	477	180.7	474	187.7	470	190.5	468		
64	89.6	.780	89.9	.780	90.2	.780	90.8	.780				
	1481	302	1401	289	1332	277	1277	264				
	162.5	481	170.4	477	177.7	474	184.0	470				
66	89.9	.780	90.2	.780	90.6	.780	91.3	.780				
	1498	302	1421	289	1355	277	1308	264				
	160.6	481	168.0	477	174.8	474	179.6	470				
68	90.2	.780	90.5	.780	90.9	.780	91.9	.780				
	1517	302	1442	289	1377	277	1343	264				
	158.6	481	165.6	477	171.9	474	174.9	470				
70	90.4	.780	90.8	.780	91.3	.780						
	1537	302	1463	289	1402	277						
	156.6	481	163.1	477	168.9	474						
72	90.7	.780	91.1	.780	91.8	.780						
	1557	302	1486	289	1432	277						
	154.5	481	160.7	477	165.4	474						
74	91.0	.780	91.5	.780	92.3	.780						
	1578	302	1508	289	1467	277						
	152.5	481	158.3	477	161.4	474						
76	91.3	.780	91.8	.780								
	1600	302	1532	289								
	150.4	481	155.8	477								

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.3 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12100000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .780 .000 .000 20 FCOM-N0–03–05–15–012–100

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=33.0%	N1 (%) KG/H/ENG NM/1000KG	MACH IAS (KT) TAS (KT)

WEIGHT (1000KG)	FL100		FL150		FL200		FL230		FL250		FL270	
50	64.6	.452	68.1	.487	73.5	.571	74.8	.587	75.8	.599	77.1	.620
	1021	250	984	245	1039	261	989	253	963	248	957	246
	141.2	288	155.1	305	168.8	351	180.0	356	187.1	360	193.4	370
52	65.5	.460	68.7	.491	74.1	.576	75.5	.592	76.6	.607	78.1	.634
	1058	254	1010	247	1064	264	1017	255	997	251	1002	252
	138.7	294	152.2	308	166.2	354	176.7	359	183.2	365	188.8	378
54	66.3	.467	69.3	.494	74.7	.581	76.2	.598	77.4	.617	79.3	.651
	1092	258	1036	249	1090	266	1047	258	1034	256	1054	260
	136.5	298	149.5	310	163.6	357	173.5	363	179.4	371	184.5	389
56	67.2	.473	70.0	.499	75.3	.585	76.8	.605	78.4	.631	80.3	.667
	1125	262	1065	251	1117	268	1078	261	1081	262	1101	266
	134.3	302	146.7	313	161.0	360	170.3	367	175.5	380	180.8	398
58	68.0	.479	72.8	.545	75.9	.590	77.5	.613	79.4	.646	80.9	.677
	1157	265	1187	275	1144	271	1113	265	1132	268	1139	271
	132.2	306	143.9	342	158.5	362	167.1	372	171.8	389	177.3	404
60	68.8	.485	74.3	.566	76.5	.595	78.4	.624	80.3	.658	81.6	.687
	1189	268	1257	286	1173	273	1157	270	1176	274	1179	275
	130.2	309	141.1	355	155.9	366	163.8	379	168.5	396	174.0	410
62	69.5	.489	74.9	.573	77.2	.601	79.4	.638	81.0	.668	82.3	.700
	1219	271	1290	290	1203	276	1207	276	1215	278	1225	280
	128.1	312	139.1	359	153.4	369	160.5	387	165.5	402	170.5	418
64	70.0	.493	75.4	.577	77.8	.607	80.2	.649	81.6	.678	82.9	.707
	1247	273	1316	292	1236	279	1251	281	1254	283	1261	284
	126.2	315	137.3	361	150.8	373	157.5	394	162.6	408	167.5	422
66	70.5	.496	75.9	.581	78.4	.615	80.9	.659	82.3	.689	83.5	.714
	1273	274	1343	294	1274	283	1290	286	1299	287	1296	287
	124.3	317	135.6	364	148.3	378	154.9	400	159.6	415	164.5	426
68	71.0	.499	76.3	.585	79.2	.626	81.6	.668	82.9	.700	84.0	.720
	1300	276	1369	296	1319	288	1331	290	1345	293	1330	289
	122.5	319	133.8	366	145.8	384	152.3	406	156.7	421	161.5	430
70	73.3	.537	76.8	.589	80.0	.637	82.2	.679	83.5	.708	84.5	.724
	1422	298	1397	298	1368	293	1376	295	1383	296	1362	291
	120.5	343	132.1	369	143.2	392	149.7	412	154.0	426	158.7	432
72	74.9	.559	77.4	.593	80.7	.644	82.8	.689	84.0	.715	85.2	.734
	1506	310	1425	300	1405	297	1420	300	1421	299	1407	295
	118.6	357	130.3	371	140.9	396	147.1	418	151.4	430	155.7	438
74	75.8	.572	77.9	.597	81.2	.651	83.4	.699	84.6	.721	85.8	.744
	1563	317	1453	302	1442	300	1467	304	1457	302	1454	299
	116.8	365	128.6	374	138.7	400	144.6	424	148.9	434	152.7	444
76	76.2	.575	78.4	.602	81.9	.661	84.0	.707	85.0	.725	86.6	.760
	1587	319	1485	305	1488	305	1507	308	1489	304	1513	306
	115.6	367	126.9	377	136.6	406	142.3	429	146.6	436	149.9	454

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.3 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-N0–03–05–15–013–100

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=33.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	79.0	.656	80.6	.692	81.7	.715	82.8	.734	84.6	.769	86.3	.783
	976	250	987	254	977	252	964	247	983	249	977	242
	198.9	388	205.5	406	212.8	416	219.4	423	224.4	441	230.0	449
52	80.1	.674	81.3	.702	82.3	.720	83.7	.749	85.3	.776	86.9	.788
	1025	258	1023	258	1006	254	1011	253	1017	251	1009	244
	194.5	399	201.3	412	208.1	419	213.5	432	218.8	445	223.8	452
54	80.8	.684	82.0	.711	83.0	.727	84.6	.766	85.9	.781	87.6	.789
	1062	262	1059	262	1040	256	1061	259	1049	253	1039	244
	190.6	405	197.0	417	203.3	423	208.0	441	213.6	448	217.6	452
56	81.5	.696	82.6	.717	83.9	.740	85.3	.773	86.5	.786	88.3	.790
	1103	267	1090	264	1086	261	1097	262	1082	255	1073	244
	186.7	412	193.0	421	198.2	430	203.1	446	208.3	451	211.0	453
58	82.2	.706	83.1	.721	84.7	.759	85.8	.779	87.0	.789	89.0	.788
	1142	271	1119	265	1141	268	1130	264	1113	256	1107	244
	183.0	418	189.0	423	193.4	441	198.6	449	203.2	452	204.3	452
60	82.8	.713	83.9	.731	85.4	.768	86.3	.782	87.6	.789	89.8	.788
	1176	274	1162	270	1182	272	1160	265	1143	256	1147	244
	179.5	422	184.7	429	189.0	447	194.4	451	198.0	453	197.0	452
62	83.3	.719	84.7	.745	86.0	.775	86.9	.786	88.3	.790	90.5	.784
	1208	276	1211	275	1218	275	1193	267	1176	256	1176	242
	176.0	425	180.4	437	185.0	451	189.9	453	192.5	453	191.1	449
64	83.9	.724	85.5	.762	86.5	.780	87.4	.789	88.9	.789		
	1241	279	1267	282	1251	277	1224	268	1211	256		
	172.6	428	176.5	447	181.3	454	185.7	455	186.9	452		
66	84.6	.734	86.1	.769	87.0	.783	87.9	.789	89.7	.788		
	1285	283	1306	285	1280	278	1253	268	1250	255		
	169.0	435	172.9	451	177.8	455	181.5	455	180.9	452		
68	85.4	.746	86.7	.776	87.5	.786	88.5	.789	90.5	.788		
	1334	288	1342	288	1314	279	1287	268	1293	255		
	165.5	442	169.6	455	174.1	457	176.8	455	174.9	452		
70	86.1	.761	87.1	.780	88.0	.789	89.1	.790				
	1389	294	1373	289	1345	280	1323	268				
	162.2	451	166.6	458	170.6	459	172.0	455				
72	86.7	.769	87.5	.782	88.4	.788	89.7	.788				
	1429	297	1402	290	1372	280	1359	268				
	159.2	455	163.6	459	167.1	458	167.2	454				
74	87.2	.775	88.0	.785	88.9	.789	90.5	.788				
	1466	300	1435	291	1407	280	1401	268				
	156.3	458	160.5	461	163.1	459	162.1	454				
76	87.6	.779	88.4	.788	89.5	.790	90.9	.782				
	1499	302	1467	292	1443	280	1420	265				
	153.7	461	157.5	462	159.1	459	158.6	451				

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-N0–03–05–15–014–100

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=33.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL200		FL230		FL250		FL270	
50	65.7	.451	69.3	.486	75.0	.570	76.2	.586	77.3	.597	78.8	.621
	1042	249	1004	245	1063	261	1012	252	985	247	983	247
	140.8	293	154.6	310	168.1	357	179.2	363	186.3	367	192.5	379
52	66.7	.459	70.0	.490	75.6	.575	76.9	.591	78.0	.605	79.9	.637
	1080	254	1031	247	1089	264	1040	255	1018	250	1033	254
	138.3	299	151.7	313	165.5	360	176.0	366	182.5	372	187.9	388
54	67.5	.466	70.6	.494	76.1	.580	77.7	.597	79.0	.617	80.7	.647
	1114	258	1058	249	1116	266	1070	258	1061	256	1072	258
	136.0	303	149.0	315	162.9	363	172.8	370	178.7	379	183.9	394
56	68.4	.473	71.3	.499	76.8	.585	78.4	.604	80.0	.631	81.6	.657
	1148	261	1089	251	1143	268	1103	261	1110	262	1112	262
	133.9	307	146.2	318	160.3	366	169.5	374	174.7	388	180.2	401
58	69.2	.479	74.1	.543	77.4	.589	79.1	.613	80.9	.642	82.4	.670
	1181	265	1208	274	1170	270	1142	265	1152	267	1158	268
	131.7	311	143.3	346	157.8	369	166.3	380	171.1	394	176.4	409
60	70.0	.484	75.6	.564	78.0	.594	80.1	.626	81.6	.650	83.1	.682
	1214	268	1281	285	1199	272	1189	271	1190	270	1203	273
	129.7	315	140.6	360	155.2	372	163.0	388	167.8	400	172.9	416
62	70.7	.489	76.3	.572	78.7	.600	80.8	.635	82.5	.663	83.9	.696
	1244	270	1319	289	1231	275	1231	275	1237	276	1253	279
	127.7	318	138.5	365	152.7	376	159.8	393	164.6	407	169.3	424
64	71.2	.492	76.8	.576	79.3	.606	81.6	.644	83.1	.674	84.6	.707
	1272	272	1345	291	1265	278	1272	279	1283	281	1298	283
	125.7	320	136.7	368	150.2	380	156.8	399	161.5	414	166.0	431
66	71.8	.495	77.2	.580	79.9	.614	82.3	.653	83.8	.686	85.2	.715
	1299	274	1372	293	1302	282	1313	283	1329	286	1337	287
	123.8	322	134.9	370	147.7	385	154.0	404	158.4	421	163.0	436
68	72.3	.498	77.7	.584	80.6	.622	83.1	.664	84.6	.699	85.7	.720
	1328	276	1398	295	1344	286	1359	288	1383	292	1371	289
	122.0	324	133.2	373	145.1	390	151.3	411	155.3	430	160.1	439
70	74.6	.535	78.2	.587	81.4	.632	83.7	.675	85.2	.708	86.3	.725
	1449	296	1426	297	1388	290	1406	293	1424	296	1405	291
	120.0	348	131.5	375	142.6	396	148.6	418	152.7	435	157.3	442
72	76.2	.557	78.7	.591	82.1	.640	84.4	.687	85.7	.714	86.9	.734
	1534	309	1455	299	1432	295	1456	299	1462	299	1449	295
	118.1	362	129.7	377	140.1	401	146.0	425	150.1	439	154.3	447
74	77.1	.570	79.3	.595	82.8	.649	85.1	.699	86.3	.720	87.6	.744
	1594	316	1484	301	1476	299	1510	304	1497	301	1497	299
	116.2	371	128.0	380	137.7	407	143.4	433	147.7	442	151.4	453
76	77.5	.573	79.8	.599	83.5	.659	85.7	.707	86.7	.724	88.3	.757
	1621	318	1515	303	1522	304	1552	308	1530	303	1553	305
	115.0	373	126.3	383	135.5	413	141.1	438	145.3	445	148.6	462

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 10 FCOM-N0–03–05–15–015–100

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+10
CG=33.0%

N1 (%) **MACH**
KG/H/ENG **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	80.6	.653	82.0	.684	83.4	.711	84.7	.733	86.5	.769	88.2	.783
	995	249	1001	251	1000	250	994	247	1014	249	1007	242
	198.3	395	204.8	410	211.4	423	217.3	432	222.5	451	228.1	459
52	81.5	.664	82.9	.699	84.0	.717	85.6	.750	87.2	.776	88.8	.787
	1035	254	1048	257	1032	252	1045	253	1049	251	1040	243
	194.1	402	199.9	419	206.4	426	211.4	442	217.0	455	221.8	462
54	82.2	.677	83.7	.708	84.9	.728	86.5	.766	87.8	.781	89.5	.788
	1079	259	1086	260	1075	256	1095	259	1082	253	1074	244
	189.8	410	195.5	425	201.3	433	206.1	451	211.8	458	215.3	462
56	83.1	.691	84.3	.715	85.7	.742	87.2	.773	88.4	.785	90.2	.790
	1126	265	1121	263	1123	262	1132	262	1114	254	1110	244
	185.5	418	191.3	429	196.3	441	201.3	456	206.7	461	208.6	463
58	83.8	.703	85.0	.722	86.6	.760	87.7	.779	88.9	.788	91.0	.788
	1170	270	1156	266	1180	269	1166	264	1147	255	1145	244
	181.6	425	187.2	433	191.6	452	196.9	459	201.5	462	201.9	462
60	84.5	.712	85.7	.732	87.3	.768	88.2	.782	89.6	.789	91.9	.788
	1210	274	1199	270	1219	272	1196	265	1180	256	1187	244
	177.9	430	183.0	439	187.3	457	192.7	461	196.0	463	194.7	462
62	85.1	.718	86.5	.745	87.9	.774	88.7	.786	90.2	.789	92.5	.782
	1245	276	1249	275	1255	274	1229	266	1216	256	1213	242
	174.4	434	178.8	447	183.5	460	188.3	463	190.4	463	189.2	459
64	85.7	.724	87.4	.762	88.4	.779	89.3	.788	90.9	.788		
	1279	279	1305	282	1287	276	1262	267	1252	256		
	171.0	438	175.0	457	179.9	463	184.0	465	184.8	463		
66	86.4	.734	88.0	.769	88.8	.782	89.8	.789	91.7	.788		
	1325	283	1344	285	1318	277	1295	268	1293	255		
	167.5	444	171.5	461	176.3	465	179.5	465	178.8	462		
68	87.2	.746	88.5	.774	89.3	.785	90.4	.789	92.5	.788		
	1375	288	1379	287	1353	279	1331	268	1337	255		
	164.0	451	168.2	464	172.5	467	174.8	465	172.9	462		
70	87.9	.762	88.9	.778	89.8	.788	91.1	.790				
	1432	294	1412	288	1387	280	1368	268				
	160.8	460	165.1	466	168.9	469	170.1	465				
72	88.5	.768	89.4	.781	90.3	.788	91.7	.788				
	1471	297	1445	290	1418	280	1406	268				
	157.8	464	162.1	468	165.3	469	165.3	465				
74	89.0	.773	89.8	.784	90.9	.789	92.5	.788				
	1508	299	1479	291	1455	280	1449	267				
	155.0	467	159.0	470	161.3	469	160.3	465				
76	89.4	.777	90.3	.787	91.4	.790	92.8	.781				
	1542	301	1514	292	1491	280	1465	265				
	152.3	470	155.9	472	157.4	469	157.0	460				

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

10B -08F0A320–212 CFM56–5A3 12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 10 FCOM-N0–03–05–15–016–100

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=33.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL150**		**FL200**		**FL230**		**FL250**		**FL270**	
50	66.3	.451	69.9	.485	75.6	.570	77.0	.585	78.1	.597	79.6	.622
	1053	249	1013	244	1074	261	1023	252	997	247	997	247
	140.5	296	154.3	313	167.7	360	178.9	366	185.8	371	192.0	383
52	67.2	.459	70.6	.489	76.3	.575	77.7	.590	78.9	.606	80.6	.635
	1090	254	1041	246	1101	263	1051	255	1033	251	1042	253
	138.1	301	151.5	315	165.1	364	175.6	369	182.0	376	187.6	391
54	68.1	.466	71.2	.493	76.9	.580	78.4	.597	79.8	.617	81.5	.645
	1124	258	1069	248	1128	266	1082	257	1074	256	1082	257
	135.8	305	148.7	318	162.5	367	172.4	373	178.2	383	183.4	397
56	68.9	.472	72.0	.498	77.5	.584	79.1	.604	80.7	.628	82.3	.656
	1158	261	1100	251	1156	268	1116	261	1118	261	1124	262
	133.7	310	145.9	321	159.9	370	169.1	377	174.4	390	179.6	404
58	69.8	.478	74.7	.541	78.1	.589	79.9	.612	81.5	.639	83.1	.668
	1192	264	1219	273	1183	270	1154	264	1160	265	1170	267
	131.5	314	143.0	349	157.4	372	165.9	383	170.8	396	175.8	411
60	70.6	.484	76.2	.563	78.7	.594	80.7	.622	82.3	.648	83.9	.681
	1226	268	1294	284	1213	272	1196	269	1202	269	1217	272
	129.4	317	140.3	363	154.8	376	162.6	389	167.3	402	172.2	419
62	71.3	.488	77.0	.572	79.4	.599	81.5	.632	83.2	.661	84.7	.696
	1256	270	1334	289	1245	275	1240	274	1250	275	1270	278
	127.4	320	138.1	368	152.3	379	159.4	396	164.0	410	168.6	428
64	71.9	.491	77.4	.576	80.0	.605	82.3	.642	83.9	.673	85.4	.707
	1285	272	1360	291	1277	278	1282	278	1298	280	1316	283
	125.5	322	136.4	371	149.8	383	156.4	401	160.8	418	165.3	435
66	72.4	.495	78.0	.580	80.6	.611	83.1	.652	84.7	.686	86.1	.714
	1312	274	1388	293	1312	281	1328	283	1348	286	1355	286
	123.6	324	134.6	374	147.3	387	153.4	408	157.7	425	162.3	440
68	73.0	.498	78.4	.583	81.3	.620	83.9	.663	85.4	.699	86.6	.719
	1342	276	1414	295	1355	285	1377	288	1403	292	1389	289
	121.7	327	132.9	376	144.7	392	150.6	415	154.7	434	159.4	443
70	75.2	.533	78.9	.586	82.1	.629	84.6	.675	86.0	.707	87.1	.725
	1461	296	1441	297	1400	289	1426	293	1444	296	1425	291
	119.7	350	131.1	378	142.1	398	148.0	422	152.0	439	156.6	446
72	76.8	.556	79.4	.590	82.8	.638	85.2	.686	86.6	.714	87.8	.733
	1548	309	1469	298	1445	294	1477	298	1483	299	1469	295
	117.8	365	129.4	380	139.7	404	145.3	429	149.5	443	153.6	451
74	77.8	.569	79.9	.594	83.5	.647	85.9	.698	87.1	.719	88.5	.743
	1611	316	1498	300	1491	298	1529	304	1518	301	1518	299
	115.9	373	127.7	382	137.3	409	142.8	437	147.1	446	150.7	458
76	78.2	.573	80.5	.598	84.2	.658	86.5	.707	87.6	.723	89.1	.756
	1637	318	1530	303	1542	303	1572	308	1550	303	1573	305
	114.7	376	125.9	385	135.0	416	140.5	442	144.7	449	147.9	465

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

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LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+15
CG=33.0%

N1 (%) — MACH
KG/H/ENG — IAS (KT)
NM/1000KG — TAS (KT)

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	81.3	.649	82.8	.680	84.2	.711	85.6	.733	87.5	.769	89.1	.783
	1001	248	1010	249	1015	250	1009	247	1030	249	1023	242
	197.9	396	204.2	412	210.4	427	216.4	437	221.5	456	226.9	464
52	82.2	.663	83.7	.696	84.9	.717	86.5	.750	88.1	.775	89.8	.786
	1046	253	1059	256	1048	252	1061	253	1064	251	1057	243
	193.4	405	199.2	422	205.5	431	210.5	447	216.1	460	220.6	466
54	83.0	.676	84.5	.708	85.8	.727	87.4	.765	88.7	.781	90.5	.788
	1092	259	1103	260	1091	256	1111	259	1097	253	1092	244
	189.1	413	194.6	429	200.4	437	205.3	456	210.9	463	214.1	468
56	83.9	.690	85.2	.716	86.6	.742	88.1	.772	89.3	.785	91.2	.790
	1140	264	1139	263	1140	262	1148	262	1131	254	1129	244
	184.8	421	190.4	434	195.4	446	200.5	460	205.6	465	207.4	468
58	84.7	.703	85.9	.722	87.5	.760	88.6	.778	89.9	.788	92.0	.788
	1188	270	1173	266	1197	269	1182	264	1165	255	1165	244
	180.8	430	186.4	437	190.7	457	196.1	463	200.4	467	200.7	468
60	85.4	.712	86.6	.732	88.2	.768	89.1	.782	90.5	.789	92.3	.770
	1227	274	1218	270	1237	272	1214	265	1200	256	1168	238
	177.2	435	182.2	444	186.5	461	191.8	466	194.9	468	195.6	457
62	85.9	.717	87.4	.745	88.8	.774	89.7	.786	91.2	.789		
	1261	276	1268	275	1273	274	1249	266	1236	256		
	173.7	438	178.1	452	182.6	465	187.3	468	189.3	468		
64	86.6	.724	88.2	.761	89.3	.778	90.2	.788	91.9	.788		
	1298	278	1323	281	1307	276	1283	267	1272	255		
	170.3	442	174.2	461	178.9	468	183.0	470	183.7	468		
66	87.3	.734	88.8	.768	89.8	.782	90.8	.789	92.5	.785		
	1344	283	1362	284	1340	277	1317	268	1303	254		
	166.8	448	170.7	465	175.3	470	178.5	470	178.7	465		
68	88.0	.746	89.4	.773	90.3	.785	91.4	.789				
	1394	288	1399	286	1375	279	1353	268				
	163.3	455	167.4	469	171.6	472	173.8	470				
70	88.8	.760	89.8	.778	90.8	.788	92.0	.789				
	1450	294	1434	288	1409	280	1390	268				
	160.1	464	164.2	471	168.0	474	169.1	470				
72	89.3	.767	90.3	.781	91.3	.788	92.7	.788				
	1492	297	1468	290	1441	280	1427	267				
	157.1	469	161.2	473	164.4	474	164.5	469				
74	89.9	.773	90.8	.785	91.8	.789						
	1530	299	1503	291	1478	280						
	154.2	472	158.1	475	160.5	474						
76	90.3	.777	91.2	.787	92.4	.789						
	1566	301	1538	292	1515	280						
	151.6	475	155.0	477	156.6	474						

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

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LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) **MACH**
KG/H/ENG **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL200		FL230		FL250		FL270	
50	66.9	.451	70.5	.485	76.3	.569	77.7	.585	78.9	.598	80.3	.620
	1063	249	1023	244	1086	261	1034	252	1010	247	1006	246
	140.3	298	154.1	315	167.3	363	178.4	369	185.4	375	191.6	385
52	67.8	.459	71.2	.489	76.9	.574	78.4	.590	79.6	.606	81.2	.631
	1100	254	1051	246	1113	263	1063	254	1045	251	1049	251
	137.9	303	151.2	318	164.7	367	175.2	373	181.6	380	187.2	393
54	68.7	.465	71.9	.493	77.5	.579	79.2	.596	80.5	.615	82.2	.642
	1136	257	1079	248	1140	265	1095	257	1084	255	1091	256
	135.6	308	148.4	320	162.1	370	171.9	376	177.8	385	183.0	399
56	69.5	.471	72.6	.498	78.2	.583	79.8	.602	81.3	.626	83.1	.654
	1169	261	1111	251	1168	267	1127	260	1127	260	1137	261
	133.4	312	145.6	324	159.5	373	168.7	380	174.0	392	178.9	407
58	70.4	.477	75.3	.539	78.8	.588	80.5	.609	82.2	.636	83.9	.667
	1203	264	1229	272	1196	270	1161	263	1171	264	1185	266
	131.3	316	142.7	351	157.0	375	165.5	384	170.3	399	175.1	415
60	71.2	.483	76.8	.562	79.4	.593	81.3	.619	83.1	.647	84.7	.681
	1237	267	1305	284	1225	272	1205	268	1215	269	1235	272
	129.2	320	140.0	365	154.5	379	162.2	391	166.7	405	171.4	423
62	71.9	.488	77.6	.571	80.1	.598	82.2	.629	84.0	.659	85.6	.696
	1268	270	1347	289	1257	274	1250	272	1264	274	1289	279
	127.2	323	137.8	371	151.9	382	159.0	397	163.4	413	167.8	433
64	72.5	.491	78.1	.575	80.6	.603	83.0	.640	84.7	.672	86.3	.706
	1297	272	1374	291	1289	277	1296	277	1316	280	1334	283
	125.2	325	136.0	374	149.4	385	155.9	404	160.1	421	164.6	439
66	73.0	.494	78.6	.578	81.3	.609	83.8	.650	85.5	.685	86.9	.714
	1325	273	1400	292	1325	280	1343	282	1367	286	1373	286
	123.3	327	134.2	376	146.8	389	152.8	410	157.1	429	161.6	444
68	73.6	.498	79.1	.582	82.0	.618	84.7	.664	86.3	.699	87.4	.718
	1356	276	1427	294	1368	284	1397	288	1422	292	1407	288
	121.4	329	132.5	378	144.2	395	150.0	419	154.0	438	158.7	447
70	75.8	.532	79.5	.585	82.8	.628	85.4	.675	86.9	.707	88.0	.724
	1472	295	1454	296	1416	289	1446	293	1464	296	1443	291
	119.4	352	130.8	380	141.6	401	147.3	426	151.4	443	155.9	450
72	77.4	.555	80.0	.588	83.5	.638	86.0	.686	87.4	.714	88.6	.732
	1562	308	1482	297	1463	293	1496	298	1503	299	1488	294
	117.5	367	129.0	382	139.1	407	144.7	433	148.8	447	152.9	455
74	78.4	.568	80.6	.593	84.3	.646	86.7	.698	87.9	.719	89.3	.742
	1624	315	1514	300	1510	298	1550	304	1538	301	1539	299
	115.6	376	127.2	385	136.7	413	142.2	441	146.4	450	150.0	462
76	78.8	.571	81.2	.597	85.0	.657	87.3	.706	88.4	.722	90.0	.756
	1651	317	1548	302	1561	303	1593	307	1571	302	1598	305
	114.4	378	125.5	388	134.4	420	139.9	446	144.1	453	147.2	470

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = − 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

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LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) / MACH
KG/H/ENG / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	82.0	.646	83.6	.679	85.1	.711	86.5	.733	88.4	.769	90.1	.783
	1010	247	1021	249	1030	250	1025	247	1045	248	1039	242
	197.4	399	203.4	415	209.4	431	215.4	442	220.5	461	225.7	469
52	83.0	.660	84.5	.695	85.8	.716	87.4	.750	89.0	.775	90.7	.786
	1056	252	1073	255	1063	252	1077	253	1079	251	1074	243
	192.7	407	198.4	426	204.6	435	209.6	451	215.1	464	219.4	471
54	83.8	.674	85.4	.708	86.6	.727	88.3	.764	89.6	.781	91.5	.788
	1104	258	1119	260	1106	256	1126	259	1115	253	1110	244
	188.4	416	193.7	434	199.5	442	204.4	460	209.8	468	212.9	473
56	84.7	.690	86.1	.715	87.5	.741	88.9	.771	90.2	.785	92.1	.786
	1157	265	1154	263	1157	262	1163	261	1150	254	1139	243
	184.0	426	189.6	438	194.6	450	199.7	464	204.5	470	207.0	471
58	85.6	.704	86.7	.722	88.4	.758	89.5	.777	90.8	.787		
	1206	270	1190	266	1212	268	1200	263	1184	255		
	180.0	434	185.5	442	189.9	460	195.0	468	199.3	472		
60	86.2	.712	87.5	.732	89.1	.767	90.1	.782	91.5	.789		
	1246	274	1236	270	1253	271	1234	265	1220	256		
	176.4	439	181.3	448	185.7	465	190.7	471	193.8	473		
62	86.8	.717	88.3	.745	89.7	.773	90.6	.785	92.2	.789		
	1279	276	1286	275	1291	274	1269	266	1256	256		
	173.0	443	177.3	456	181.7	469	186.3	473	188.3	473		
64	87.4	.723	89.1	.760	90.2	.778	91.2	.788				
	1316	278	1341	281	1328	276	1303	267				
	169.6	446	173.4	465	177.9	473	182.0	474				
66	88.1	.733	89.7	.767	90.7	.782	91.7	.789				
	1361	282	1383	284	1361	277	1338	268				
	166.1	452	169.9	470	174.4	475	177.5	475				
68	88.9	.744	90.3	.773	91.2	.785	92.4	.789				
	1411	287	1420	286	1397	279	1375	268				
	162.6	459	166.6	473	170.7	477	172.9	475				
70	89.6	.760	90.7	.778	91.7	.788						
	1471	293	1456	288	1432	280						
	159.3	469	163.4	476	167.1	478						
72	90.2	.767	91.2	.781	92.2	.788						
	1514	296	1491	290	1464	280						
	156.3	473	160.4	478	163.5	479						
74	90.8	.773	91.7	.784	92.5	.783						
	1553	299	1526	291	1477	278						
	153.4	477	157.3	480	160.9	475						
76	91.2	.777	92.1	.787								
	1589	301	1562	292								
	150.8	479	154.3	482								

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.3 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

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GENERAL

The following in cruise quick check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to land.
These tables are established for :
- Cruise Mach number : M.78/LR
- Descent profile : M.78/300KT/250KT
- Approach and landing : 120 kg or 270 lb – 6 minute IMC
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

<u>Note</u> : *1. In the tables, the asterisk "*" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
R *3. For each degree celsius above ISA apply a fuel correction of*
R *0.005 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)*
R *or 0.011 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)*

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The in cruise quick check tables are based on a reference initial weight.
The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

EXAMPLE

In-cruise quick check with cruise at M.78
FL370
Actual cruise weight : 55000 kg
Remaining ground distance : 800 NM
ISA + 10
Average wind during flight : – 40 kt (head wind)

- Evaluation of air distance to be covered
  · Using the "Ground Distance/Air Distance" conversion table (see 3.05.50 P2), the corresponding air distance is : 880 NM
- Determination of the fuel consumption and time for the reference initial weight in cruise.
  · Enter table on 3.05.20 page 4 with an air distance of 880 NM and FL370 for ISA.
  Fuel consumption : 4086 kg
  Time needed : 2 h 07 min
- Correction due to real in cruise weight of 55000 kg
  △ fuel consumption : – 51 kg per 1000 kg below reference
  △ fuel : – 51 × (60 – 55) = – 255 kg
- Temperature correction :
  △ fuel consumption : + 0.005 kg per 1° above ISA and per 1 NM Air distance
  △ fuel : + 0.005 × 10 × 880 = 44 kg

Result :
R Fuel : 4086 – 255 + 44 = 3875 kg
R Time : 2 h 07 min

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
100	371 0.22	343 0.22	318 0.22	294 0.22	270 0.22	247 0.22	0	0	0
125	520 0.25	484 0.26	452 0.26	422 0.26	395 0.26	373 0.26	0	0	0
150	668 0.29	624 0.29	586 0.29	551 0.29	520 0.29	498 0.29	0	0	1
175	816 0.32	764 0.32	719 0.32	679 0.32	645 0.32	623 0.32	1	1	2
200	964 0.35	904 0.35	853 0.35	807 0.36	770 0.36	748 0.36	2	2	4
225	1112 0.38	1044 0.39	986 0.39	935 0.39	894 0.39	873 0.39	1	3	6
250	1259 0.42	1183 0.42	1120 0.42	1063 0.42	1018 0.42	997 0.42	2	4	8
275	1407 0.45	1323 0.45	1253 0.45	1191 0.46	1142 0.46	1121 0.46	3	5	9
300	1554 0.48	1462 0.48	1386 0.49	1319 0.49	1265 0.49	1245 0.49	4	6	11
325	1702 0.51	1602 0.52	1519 0.52	1446 0.52	1389 0.52	1368 0.52	4	7	13
350	1849 0.55	1741 0.55	1651 0.55	1573 0.56	1512 0.56	1491 0.56	5	8	14
375	1996 0.58	1880 0.58	1784 0.59	1701 0.59	1635 0.59	1614 0.59	6	9	16
400	2143 1.01	2019 1.02	1916 1.02	1828 1.02	1758 1.02	1737 1.02	7	10	18
425	2290 1.04	2158 1.05	2049 1.05	1954 1.06	1881 1.06	1859 1.06	7	11	19
450	2437 1.08	2297 1.08	2181 1.09	2081 1.09	2003 1.09	1982 1.09	8	12	21
475	2584 1.11	2435 1.11	2313 1.12	2208 1.12	2126 1.13	2103 1.13	9	13	23
500	2731 1.14	2574 1.15	2445 1.15	2334 1.16	2248 1.16	2225 1.16	10	14	24
525	2877 1.17	2712 1.18	2577 1.18	2460 1.19	2370 1.19	2347 1.19	10	15	26
550	3024 1.21	2851 1.21	2708 1.22	2587 1.22	2492 1.23	2468 1.23	11	16	27
575	3170 1.24	2989 1.24	2840 1.25	2713 1.26	2614 1.26	2589 1.26	12	17	29
600	3316 1.27	3127 1.28	2971 1.28	2838 1.29	2736 1.29	2709 1.29	12	18	34
625	3462 1.30	3265 1.31	3102 1.32	2964 1.32	2857 1.33	2830 1.33	13	19	35
650	3609 1.34	3403 1.34	3234 1.35	3090 1.36	2978 1.36	2950 1.36	14	20	37
675	3754 1.37	3540 1.38	3364 1.38	3215 1.39	3099 1.39	3070 1.39	15	21	39
700	3900 1.40	3678 1.41	3495 1.42	3340 1.42	3220 1.43	3190 1.43	15	22	40
725	4046 1.43	3816 1.44	3626 1.45	3466 1.46	3341 1.46	3309 1.46	16	23	42

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–003–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	**310**	**330**	**350**	**370**	**390**	**FL290 FL310**	**FL330 FL350**	**FL370 FL390**
725	4046 1.43	3816 1.44	3626 1.45	3466 1.46	3341 1.46	3309 1.46	16	23	42
750	4192 1.47	3953 1.47	3757 1.48	3591 1.49	3462 1.49	3428 1.49	17	24	43
775	4337 1.50	4090 1.51	3887 1.51	3715 1.52	3582 1.53	3547 1.53	17	25	45
800	4483 1.53	4227 1.54	4018 1.55	3840 1.56	3702 1.56	3666 1.56	18	26	46
825	4628 1.56	4365 1.57	4148 1.58	3965 1.59	3823 1.59	3784 1.59	19	27	48
850	4773 2.00	4502 2.00	4278 2.01	4089 2.02	3943 2.03	3903 2.03	19	28	49
875	4918 2.03	4638 2.04	4408 2.05	4214 2.06	4062 2.06	4021 2.06	20	29	51
900	5063 2.06	4775 2.07	4538 2.08	4338 2.09	4182 2.09	4139 2.09	21	30	52
925	5208 2.09	4912 2.10	4667 2.11	4462 2.12	4301 2.13	4256 2.13	21	31	54
950	5353 2.13	5048 2.14	4797 2.15	4586 2.16	4421 2.16	4374 2.16	22	32	55
975	5498 2.16	5185 2.17	4926 2.18	4710 2.19	4540 2.20	4491 2.20	23	33	57
1000	5643 2.19	5321 2.20	5056 2.21	4833 2.22	4659 2.23	4608 2.23	23	34	58
1025	5787 2.22	5457 2.23	5185 2.24	4957 2.26	4778 2.26	4724 2.26	24	35	60
1050	5931 2.26	5593 2.27	5314 2.28	5080 2.29	4896 2.30	4841 2.30	25	36	61
1075	6076 2.29	5729 2.30	5443 2.31	5203 2.32	5015 2.33	4957 2.33	25	37	63
1100	6220 2.32	5865 2.33	5572 2.34	5327 2.36	5133 2.36	5073 2.36	26	38	64
1125	6364 2.35	6001 2.36	5700 2.38	5450 2.39	5251 2.40	5189 2.40	27	39	65
1150	6508 2.38	6137 2.40	5829 2.41	5572 2.42	5369 2.43	5304 2.43	27	40	67
1175	6652 2.42	6272 2.43	5957 2.44	5695 2.46	5487 2.46	5420 2.46	28	41	68
1200	6796 2.45	6408 2.46	6086 2.48	5818 2.49	5605 2.50	5535 2.50	29	41	69
1225	6940 2.48	6543 2.50	6214 2.51	5940 2.52	5722 2.53	5650 2.53	29	42	71
1250	7084 2.51	6678 2.53	6342 2.54	6063 2.56	5840 2.56	5764 2.56	30	43	72
1275	7227 2.55	6813 2.56	6470 2.57	6185 2.59	5957 3.00	5879 3.00	31	44	73
1300	7371 2.58	6949 2.59	6598 3.01	6307 3.02	6074 3.03	5993 3.03	31	45	75
1325	7515 3.01	7084 3.03	6726 3.04	6429 3.06	6191 3.06	6107 3.06	32	46	76
1350	7658 3.04	7219 3.06	6853 3.07	6551 3.09	6308 3.10	6221 3.10	33	47	77

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–004–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1350	7658 3.04	7219 3.06	6853 3.07	6551 3.09	6308 3.10	6221 3.10	33	47	77
1375	7802 3.08	7354 3.09	6981 3.11	6672 3.12	6424 3.13	6335 3.13	33	48	79
1400	7945 3.11	7489 3.12	7108 3.14	6794 3.16	6541 3.16	6448 3.16	34	49	80
1425	8088 3.14	7624 3.16	7236 3.17	6915 3.19	6657 3.20	6562 3.20	34	50	81
1450	8231 3.17	7759 3.19	7363 3.21	7037 3.22	6774 3.23	6675 3.23	35	50	82
1475	8374 3.21	7893 3.22	7490 3.24	7158 3.26	6890 3.27	6788 3.27	36	51	84
1500	8517 3.24	8028 3.26	7617 3.27	7279 3.29	7006 3.30	6900 3.30	36	52	85
1525	8660 3.27	8162 3.29	7744 3.31	7400 3.32	7123 3.33	7013 3.33	37	53	86
1550	8803 3.30	8297 3.32	7871 3.34	7521 3.36	7239 3.37	7126 3.37	37	54	87
1575	8946 3.34	8431 3.35	7998 3.37	7642 3.39	7355 3.40	7238 3.40	38	55	89
1600	9088 3.37	8565 3.39	8124 3.40	7762 3.42	7471 3.43	7350 3.43	39	56	90
1625	9231 3.40	8699 3.42	8251 3.44	7883 3.46	7587 3.47	7462 3.47	39	57	91
1650	9373 3.43	8833 3.45	8377 3.47	8003 3.49	7703 3.50	7574 3.50	40	57	92
1675	9516 3.47	8967 3.48	8503 3.50	8124 3.52	7818 3.53	7686 3.53	40	58	93
1700	9658 3.50	9101 3.52	8629 3.54	8244 3.56	7934 3.57	7798 3.57	41	59	94
1725	9800 3.53	9235 3.55	8756 3.57	8364 3.59	8049 4.00	7909 4.00	42	60	95
1750	9942 3.56	9368 3.58	8881 4.00	8484 4.02	8164 4.03	8020 4.03	42	61	97
1775	10084 4.00	9502 4.02	9007 4.04	8604 4.06	8279 4.07	8131 4.07	43	62	98
1800	10226 4.03	9635 4.05	9133 4.07	8723 4.09	8394 4.10	8242 4.10	43	62	99
1825	10368 4.06	9769 4.08	9259 4.10	8843 4.12	8509 4.13	8353 4.13	44	63	100
1850	10510 4.09	9902 4.11	9384 4.13	8962 4.16	8624 4.17	8463 4.17	45	64	101
1875	10651 4.13	10035 4.15	9509 4.17	9082 4.19	8739 4.20	8573 4.20	45	65	102
1900	10793 4.16	10168 4.18	9635 4.20	9201 4.22	8853 4.23	8684 4.23	46	66	103
1925	10934 4.19	10301 4.21	9760 4.23	9320 4.26	8968 4.27	8793 4.27	46	66	104
1950	11076 4.22	10434 4.24	9885 4.27	9439 4.29	9082 4.30	8903 4.30	47	67	105
1975	11217 4.26	10567 4.28	10010 4.30	9558 4.32	9196 4.34	9013 4.34	47	68	106

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–005–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1975	11217 4.26	10567 4.28	10010 4.30	9558 4.32	9196 4.34	9013 4.34	47	68	106
2000	11358 4.29	10700 4.31	10134 4.33	9677 4.36	9310 4.37	9122 4.37	48	69	107
2025	11499 4.32	10832 4.34	10259 4.37	9795 4.39	9424 4.40	9231 4.40	48	70	108
2050	11640 4.35	10965 4.38	10384 4.40	9914 4.42	9538 4.44	9341 4.44	49	70	109
2075	11781 4.39	11097 4.41	10508 4.43	10032 4.46	9652 4.47	9449 4.47	50	71	110
2100	11922 4.42	11230 4.44	10633 4.46	10150 4.49	9765 4.50	9558 4.50	50	72	111
2125	12063 4.45	11362 4.47	10757 4.50	10269 4.52	9879 4.54	9667 4.54	51	73	112
2150	12204 4.48	11494 4.51	10881 4.53	10387 4.56	9992 4.57	9775 4.57	51	73	113
2175	12345 4.51	11626 4.54	11005 4.56	10505 4.59	10105 5.00	9883 5.00	52	74	114
2200	12486 4.55	11758 4.57	11129 5.00	10622 5.02	10218 5.04	9991 5.04	52	75	115
2225	12627 4.58	11890 5.00	11253 5.03	10740 5.06	10331 5.07	10099 5.07	53	76	116
2250	12767 5.01	12022 5.04	11377 5.06	10858 5.09	10444 5.10	10207 5.10	53	77	117
2275	12908 5.04	12154 5.07	11500 5.10	10975 5.12	10557 5.14	10315 5.14	54	77	118
2300	13048 5.08	12285 5.10	11624 5.13	11093 5.16	10669 5.17	10422 5.17	54	78	118
2325	13189 5.11	12417 5.14	11747 5.16	11210 5.19	10782 5.20	10529 5.20	55	79	119
2350	13329 5.14	12548 5.17	11870 5.19	11327 5.22	10894 5.24	10636 5.24	56	79	120
2375	13470 5.17	12679 5.20	11994 5.23	11444 5.26	11006 5.27	10743 5.27	56	80	121
2400	13610 5.21	12811 5.23	12117 5.26	11561 5.29	11119 5.30	10850 5.30	57	81	122
2425	13750 5.24	12942 5.27	12241 5.29	11678 5.32	11231 5.34	10957 5.34	57	82	123
2450	13890 5.27	13073 5.30	12364 5.33	11794 5.36	11343 5.37	11063 5.37	58	82	124
2475	14030 5.30	13204 5.33	12487 5.36	11911 5.39	11454 5.40	11169 5.40	58	83	125
2500	14170 5.34	13335 5.36	12610 5.39	12027 5.42	11566 5.44	11275 5.44	59	84	125
2525	14310 5.37	13465 5.40	12734 5.43	12144 5.46	11678 5.47	11381 5.47	59	85	126
2550	14450 5.40	13596 5.43	12857 5.46	12260 5.49	11789 5.51	11487 5.51	60	85	127
2575	14589 5.43	13727 5.46	12980 5.49	12376 5.52	11901 5.54	11593 5.54	60	86	128
2600	14729 5.47	13857 5.50	13102 5.53	12492 5.56	12012 5.57	11698 5.57	61	87	129

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–006–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
2600	14729 5.47	13857 5.50	13102 5.53	12493 5.56	12012 5.57	11698 5.57	61	87	129
2625	14869 5.50	13988 5.53	13225 5.56	12608 5.59	12123 6.01	11804 6.01	61	87	130
2650	15008 5.53	14118 5.56	13348 5.59	12724 6.02	12234 6.04	11909 6.04	62	88	131
2675	15148 5.56	14248 5.59	13470 6.02	12840 6.06	12344 6.07	12014 6.07	62	89	132
2700	15287 6.00	14379 6.03	13593 6.06	12956 6.09	12455 6.11	12119 6.11	63	89	132
2725	15426 6.03	14509 6.06	13715 6.09	13071 6.12	12565 6.14	12225 6.14	63	90	133
2750	15565 6.06	14639 6.09	13837 6.12	13187 6.16	12676 6.17	12330 6.17	64	91	134
2775	15705 6.09	14769 6.12	13960 6.16	13302 6.19	12786 6.21	12436 6.21	64	91	135
2800	15844 6.13	14899 6.16	14082 6.19	13417 6.22	12896 6.24	12541 6.24	65	92	136
2825	15983 6.16	15029 6.19	14204 6.22	13533 6.26	13006 6.27	12647 6.27	65	93	137
2850	16121 6.19	15158 6.22	14326 6.26	13648 6.29	13116 6.31	12752 6.31	65	93	137
2875	16260 6.22	15288 6.26	14447 6.29	13762 6.32	13226 6.34	12857 6.34	66	94	138
2900	16399 6.26	15418 6.29	14569 6.32	13877 6.36	13336 6.37	12962 6.37	66	95	139
2925	16538 6.29	15547 6.32	14691 6.35	13992 6.39	13445 6.41	13066 6.41	67	95	140
2950	16676 6.32	15676 6.35	14812 6.39	14107 6.42	13555 6.44	13171 6.44	67	96	140
2975	16815 6.35	15806 6.39	14934 6.42	14221 6.46	13664 6.47	13275 6.47	68	97	141
3000	16953 6.39	15935 6.42	15055 6.45	14336 6.49	13773 6.51	13380 6.51	68	97	142
3025	17092 6.42	16064 6.45	15177 6.49	14450 6.52	13882 6.54	13484 6.54	69	98	143
3050	17230 6.45	16193 6.48	15298 6.52	14564 6.56	13991 6.58	13588 6.58	69	99	144
3075	17367 6.48	16322 6.52	15419 6.55	14678 6.59	14100 7.01	13692 7.01	70	99	144
3100	17505 6.51	16451 6.55	15540 6.59	14792 7.02	14209 7.04	13796 7.04	70	100	145

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–007–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	**150**	**200**	**230**	**250**	**270**	**FL100 FL150**	**FL200 FL230**	**FL250 FL270**
100	759 0.26	626 0.24	518 0.24	463 0.23	429 0.23	396 0.23	3	0	0
125	950 0.31	803 0.28	678 0.28	615 0.27	577 0.27	540 0.26	4	1	0
150	1141 0.36	980 0.33	838 0.32	768 0.31	726 0.31	683 0.30	6	3	2
175	1332 0.41	1156 0.37	997 0.36	920 0.35	874 0.34	827 0.34	7	4	3
200	1522 0.46	1333 0.41	1157 0.40	1072 0.39	1021 0.38	970 0.37	9	6	5
225	1712 0.50	1509 0.45	1316 0.44	1223 0.43	1169 0.42	1113 0.41	10	7	6
250	1902 0.55	1685 0.50	1475 0.48	1375 0.47	1316 0.46	1256 0.45	12	8	7
275	2091 1.00	1860 0.54	1634 0.53	1526 0.51	1464 0.50	1399 0.48	13	10	9
300	2281 1.05	2035 0.58	1793 0.57	1677 0.55	1611 0.53	1541 0.52	15	11	10
325	2470 1.10	2209 1.03	1951 1.01	1828 0.59	1757 0.57	1683 0.56	16	12	12
350	2658 1.15	2383 1.07	2110 1.05	1978 1.03	1904 1.01	1825 1.00	17	14	13
375	2847 1.20	2557 1.12	2268 1.09	2129 1.07	2050 1.05	1967 1.03	19	15	14
400	3035 1.25	2730 1.16	2426 1.13	2279 1.11	2196 1.09	2109 1.07	20	16	16
425	3223 1.30	2903 1.21	2583 1.17	2429 1.15	2342 1.13	2250 1.11	22	18	17
450	3410 1.35	3076 1.25	2741 1.22	2578 1.19	2487 1.17	2392 1.14	23	19	19
475	3597 1.40	3248 1.30	2898 1.26	2727 1.24	2633 1.20	2533 1.18	25	20	20
500	3785 1.45	3420 1.35	3055 1.30	2877 1.28	2778 1.24	2674 1.22	26	22	21
525	3971 1.50	3592 1.39	3212 1.34	3026 1.32	2923 1.28	2814 1.26	28	23	23
550	4158 1.55	3763 1.44	3369 1.38	3174 1.36	3067 1.32	2955 1.29	29	24	24
575	4344 2.00	3935 1.49	3525 1.42	3323 1.40	3212 1.36	3095 1.33	31	26	26
600	4530 2.04	4105 1.54	3681 1.47	3471 1.44	3356 1.40	3235 1.37	32	27	27
625	4716 2.09	4276 1.58	3838 1.51	3619 1.48	3500 1.44	3375 1.40	34	28	29
650	4901 2.14	4446 2.03	3993 1.55	3767 1.52	3644 1.48	3515 1.44	35	30	30
675	5086 2.19	4615 2.08	4149 1.59	3914 1.56	3788 1.52	3655 1.48	37	31	31
700	5271 2.24	4785 2.13	4305 2.03	4062 2.00	3931 1.56	3794 1.52	38	32	33
725	5456 2.29	4954 2.18	4460 2.07	4209 2.04	4075 2.00	3934 1.55	40	33	34

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–008–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	150	200	230	250	270	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL150	FL200 FL230	FL250 FL270
725	5456 2.29	4954 2.18	4460 2.07	4209 2.04	4075 2.00	3934 1.55	40	33	34
750	5640 2.34	5123 2.23	4615 2.12	4356 2.08	4218 2.04	4073 1.59	41	35	36
775	5825 2.39	5291 2.28	4770 2.16	4503 2.13	4361 2.07	4212 2.03	43	36	37
800	6008 2.44	5460 2.33	4925 2.20	4649 2.17	4503 2.11	4350 2.07	44	37	38
825	6192 2.49	5627 2.38	5079 2.24	4796 2.21	4646 2.15	4489 2.10	46	38	40
850	6376 2.54	5795 2.44	5234 2.28	4942 2.25	4788 2.19	4627 2.14	47	40	41
875	6559 2.59	5962 2.49	5388 2.33	5088 2.29	4930 2.23	4765 2.18	49	41	43
900	6742 3.04	6129 2.54	5542 2.37	5233 2.33	5072 2.27	4903 2.22	50	42	44
925	6924 3.10	6296 2.59	5696 2.41	5379 2.37	5213 2.31	5041 2.26	52	43	45
950	7106 3.15	6462 3.05	5849 2.45	5524 2.41	5355 2.35	5179 2.29	53	45	47
975	7288 3.20	6628 3.10	6003 2.49	5669 2.46	5496 2.39	5316 2.33	55	46	48
1000	7470 3.25	6794 3.15	6156 2.54	5814 2.50	5637 2.43	5454 2.37	56	47	50
1025	7651 3.30	6960 3.20	6309 2.58	5959 2.54	5778 2.47	5591 2.41	58	48	51
1050	7832 3.35	7127 3.25	6462 3.02	6103 2.58	5919 2.51	5728 2.45	59	49	53
1075	8013 3.40	7293 3.30	6615 3.06	6248 3.02	6059 2.55	5864 2.48	61	51	54
1100	8194 3.45	7458 3.35	6767 3.11	6392 3.06	6200 2.59	6001 2.52	62	52	55
1125	8374 3.50	7624 3.40	6920 3.15	6535 3.11	6340 3.03	6138 2.56	64	53	57
1150	8554 3.55	7789 3.45	7072 3.19	6679 3.15	6480 3.07	6274 3.00	65	54	58
1175	8734 4.00	7954 3.50	7224 3.23	6823 3.19	6619 3.11	6410 3.04	67	55	60
1200	8914 4.06	8119 3.54	7375 3.27	6966 3.23	6759 3.15	6546 3.07	69	57	61
1225	9093 4.11	8284 3.59	7527 3.32	7109 3.27	6898 3.20	6682 3.11	70	58	62
1250	9273 4.16	8448 4.04	7678 3.36	7252 3.31	7036 3.24	6817 3.15	72	59	64
1275	9451 4.21	8612 4.09	7830 3.40	7395 3.36	7175 3.28	6952 3.19	73	60	65
1300	9630 4.26	8776 4.14	7981 3.44	7538 3.40	7313 3.32	7087 3.23	75	61	67
1325	9808 4.31	8940 4.19	8132 3.49	7681 3.44	7451 3.36	7222 3.27	76	62	68
1350	9987 4.36	9103 4.24	8282 3.53	7823 3.48	7589 3.40	7356 3.31	78	64	69

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–009–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	**150**	**200**	**230**	**250**	**270**	**FL100 FL150**	**FL200 FL230**	**FL250 FL270**
1350	9987 4.36	9103 4.24	8282 3.53	7823 3.48	7589 3.40	7356 3.31	78	64	69
1375	10165 4.42	9266 4.29	8433 3.57	7965 3.52	7726 3.44	7491 3.35	79	65	71
1400	10342 4.47	9429 4.34	8583 4.01	8107 3.56	7864 3.48	7625 3.38	81	66	72
1425	10520 4.52	9592 4.39	8733 4.06	8249 4.01	8001 3.52	7759 3.42	83	67	73
1450	10697 4.57	9754 4.44	8883 4.10	8391 4.05	8138 3.56	7893 3.46	84	68	75
1475	10874 5.02	9917 4.49	9033 4.14	8532 4.09	8275 4.01	8027 3.50	86	69	76
1500	11050 5.07	10079 4.54	9183 4.19	8674 4.13	8411 4.05	8160 3.54	87	70	78
1525	11227 5.13	10240 4.59	9332 4.23	8815 4.17	8548 4.09	8293 3.58	89	72	79
1550	11403 5.18	10402 5.04	9482 4.27	8956 4.22	8684 4.13	8427 4.02	90	73	80
1575	11579 5.23	10563 5.09	9631 4.31	9096 4.26	8820 4.17	8560 4.06	92	74	82
1600	11755 5.28	10724 5.14	9780 4.36	9237 4.30	8956 4.21	8692 4.10	94	75	83
1625	11930 5.33	10885 5.19	9928 4.40	9377 4.34	9091 4.25	8825 4.14	95	76	84
1650	12105 5.39	11046 5.24	10077 4.44	9518 4.38	9227 4.30	8957 4.18	97	77	86
1675	12280 5.44	11206 5.30	10226 4.48	9658 4.43	9362 4.34	9090 4.22	98	78	87
1700	12454 5.49	11366 5.35	10374 4.53	9797 4.47	9497 4.38	9222 4.26	100	79	88
1725	12628 5.55	11526 5.40	10522 4.57	9937 4.51	9632 4.42	9354 4.30	101	81	90
1750	12802 6.00	11686 5.45	10670 5.01	10077 4.55	9766 4.46	9486 4.34	102	82	91
1775	12976 6.05	11846 5.50	10818 5.06	10216 4.59	9901 4.51	9617 4.38	104	83	93
1800	13149 6.10	12005 5.55	10965 5.10	10355 5.04	10035 4.55	9749 4.42	105	84	94
1825	13322 6.16	12164 6.00	11113 5.14	10494 5.08	10169 4.59	9880 4.46	107	85	95
1850	13495 6.21	12323 6.05	11260 5.19	10633 5.12	10303 5.03	10011 4.50	108	86	97
1875	13667 6.26	12481 6.10	11407 5.23	10772 5.16	10437 5.07	10142 4.54	110	87	98
1900	13840 6.32	12639 6.15	11554 5.27	10910 5.21	10570 5.12	10273 4.58	111	88	99
1925	14012 6.37	12797 6.20	11701 5.31	11048 5.25	10703 5.16	10403 5.02	112	89	101
1950	14184 6.42	12955 6.25	11847 5.36	11186 5.29	10836 5.20	10534 5.06	114	90	102
1975	14356 6.48	13113 6.30	11994 5.40	11324 5.33	10969 5.25	10664 5.10	115	92	103

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.3 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–010–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	**150**	**200**	**230**	**250**	**270**	**FL100 FL150**	**FL200 FL230**	**FL250 FL270**
1975	14356 6.48	13113 6.30	11994 5.40	11324 5.33	10969 5.25	10664 5.10	115	92	103
2000	14527 6.53	13270 6.35	12140 5.44	11462 5.38	11102 5.29	10794 5.14	117	93	105
2025	14698 6.58	13428 6.40	12287 5.49	11600 5.42	11235 5.33	10924 5.18	118	94	106
2050	14869 7.04	13585 6.45	12433 5.53	11737 5.46	11367 5.37	11054 5.22	120	95	107
2075	15040 7.09	13741 6.49	12579 5.57	11874 5.50	11499 5.42	11184 5.26	121	96	109
2100	15211 7.14	13898 6.54	12725 6.02	12012 5.55	11631 5.46	11313 5.30	122	97	110
2125	15381 7.20	14054 6.59	12871 6.06	12149 5.59	11763 5.50	11443 5.34	124	98	111
2150	15551 7.25	14211 7.04	13017 6.10	12286 6.03	11895 5.55	11572 5.38	125	99	112
2175	15721 7.31	14367 7.09	13162 6.14	12423 6.07	12026 5.59	11701 5.42	127	101	114
2200	15891 7.36	14522 7.14	13308 6.19	12559 6.12	12158 6.03	11830 5.46	128	102	115
2225	16060 7.41	14678 7.19	13453 6.23	12696 6.16	12289 6.07	11958 5.51	130	103	116
2250	16229 7.47	14833 7.24	13598 6.27	12832 6.20	12420 6.12	12086 5.55	131	104	118
2275	16398 7.52	14989 7.29	13743 6.32	12968 6.24	12551 6.16	12213 5.59	132	105	119
2300	16567 7.58	15144 7.34	13887 6.36	13105 6.29	12681 6.20	12339 6.03	134	107	120
2325	16735 8.03	15298 7.39	14032 6.40	13240 6.33	12812 6.24	12466 6.07	135	108	121
2350	16904 8.08	15453 7.44	14176 6.45	13376 6.37	12942 6.29	12592 6.11	137	109	123
2375	17072 8.14	15607 7.49	14321 6.49	13512 6.41	13073 6.33	12718 6.16	138	110	124
2400	17238 8.20	15762 7.54	14465 6.53	13647 6.46	13203 6.37	12844 6.20	139	112	125
2425	17404 8.25	15916 7.59	14609 6.58	13782 6.50	13332 6.41	12970 6.24	141	113	127
2450	17569 8.31	16069 8.04	14753 7.02	13918 6.54	13462 6.46	13096 6.28	142	114	128
2475	17734 8.37	16223 8.09	14897 7.06	14053 6.58	13592 6.50	13221 6.32	144	115	129
2500	17898 8.42	16376 8.14	15040 7.11	14187 7.03	13721 6.54	13347 6.37	145	117	130
2525	18063 8.48	16529 8.19	15184 7.15	14322 7.07	13850 6.59	13472 6.41	147	118	132
2550	18227 8.54	16682 8.24	15327 7.19	14457 7.11	13979 7.03	13597 6.45	148	119	133
2575	18391 8.59	16835 8.29	15470 7.24	14591 7.16	14108 7.07	13721 6.49	150	120	134
2600	18555 9.05	16988 8.35	15613 7.28	14725 7.20	14237 7.11	13846 6.54	151	122	136

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–011–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	150	200	230	250	270	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) **FL100 FL150**	**FL200 FL230**	**FL250 FL270**
2600	18555 9.05	16988 8.35	15613 7.28	14725 7.20	14237 7.11	13846 6.54	151	122	136
2625	18718 9.11	17140 8.40	15756 7.32	14859 7.24	14365 7.16	13970 6.58	152	123	137
2650	18882 9.17	17292 8.45	15899 7.37	14993 7.28	14493 7.20	14095 7.02	154	124	138
2675	19045 9.22	17443 8.50	16042 7.41	15127 7.33	14622 7.24	14219 7.06	155	125	139
2700	19207 9.28	17594 8.55	16184 7.45	15261 7.37	14750 7.29	14343 7.11	157	127	141
2725	19370 9.34	17745 9.00	16326 7.50	15394 7.41	14878 7.33	14466 7.15	158	128	142
2750	19532 9.40	17896 9.05	16468 7.54	15528 7.46	15005 7.37	14590 7.19	160	129	143
2775	19694 9.46	18046 9.10	16610 7.58	15661 7.50	15133 7.42	14714 7.23	161	130	145
2800	19856 9.52	18196 9.15	16752 8.03	15794 7.54	15260 7.46	14837 7.28	163	131	146
2825	20018 9.57	18347 9.20	16894 8.07	15927 7.58	15388 7.50	14960 7.32	164	133	147
2850	20179 10.03	18496 9.25	17036 8.11	16060 8.03	15515 7.55	15083 7.36	166	134	148
2875	20340 10.09	18646 9.31	17177 8.16	16192 8.07	15642 7.59	15206 7.41	167	135	150
2900	20501 10.15	18796 9.36	17317 8.20	16325 8.11	15768 8.04	15328 7.45	169	136	151
2925	20662 10.21	18945 9.41	17458 8.25	16457 8.16	15895 8.08	15451 7.49	170	138	152
2950	20822 10.27	19094 9.46	17598 8.29	16589 8.20	16021 8.12	15573 7.54	172	139	153
2975	20982 10.33	19243 9.51	17738 8.33	16721 8.24	16148 8.17	15695 7.58	173	140	155
3000	21142 10.39	19392 9.56	17878 8.38	16853 8.29	16274 8.21	15817 8.02	175	141	156
3025	21302 10.45	19540 10.01	18018 8.42	16985 8.33	16400 8.25	15939 8.07	176	143	157
3050	21462 10.50	19689 10.07	18157 8.47	17117 8.37	16526 8.30	16061 8.11	178	144	158
3075	21621 10.56	19837 10.12	18297 8.51	17248 8.42	16651 8.34	16182 8.16	179	145	159
3100	21780 11.02	19985 10.17	18436 8.56	17379 8.46	16777 8.39	16304 8.20	180	146	160

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–012–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
100	364 0.23	340 0.22	317 0.22	294 0.22	271 0.22	247 0.22	0	0	0
125	503 0.26	475 0.26	450 0.26	423 0.26	397 0.26	374 0.26	0	0	0
150	643 0.30	610 0.29	582 0.29	552 0.29	523 0.29	501 0.29	1	0	1
175	782 0.33	746 0.33	714 0.32	681 0.32	650 0.32	627 0.32	2	2	3
200	921 0.37	881 0.36	846 0.36	809 0.36	775 0.36	753 0.36	4	3	4
225	1060 0.40	1015 0.40	978 0.39	937 0.39	901 0.39	879 0.39	5	5	6
250	1198 0.44	1150 0.43	1110 0.42	1066 0.42	1027 0.42	1005 0.42	7	6	8
275	1337 0.47	1284 0.47	1242 0.46	1194 0.46	1152 0.45	1130 0.46	8	8	10
300	1475 0.51	1418 0.51	1373 0.49	1321 0.49	1277 0.49	1255 0.49	10	9	12
325	1613 0.55	1552 0.54	1504 0.53	1449 0.52	1402 0.52	1380 0.52	11	11	13
350	1751 0.58	1686 0.58	1635 0.56	1576 0.56	1526 0.55	1505 0.55	12	12	15
375	1889 1.02	1819 1.01	1766 0.59	1704 0.59	1651 0.59	1629 0.59	14	13	17
400	2026 1.05	1952 1.05	1896 1.03	1831 1.02	1775 1.02	1753 1.02	15	15	19
425	2163 1.09	2086 1.08	2027 1.06	1958 1.06	1899 1.05	1877 1.05	16	16	20
450	2300 1.12	2218 1.12	2157 1.09	2084 1.09	2023 1.09	2001 1.09	18	18	22
475	2437 1.16	2351 1.15	2286 1.13	2211 1.12	2147 1.12	2124 1.12	19	19	26
500	2574 1.20	2484 1.19	2416 1.16	2337 1.16	2270 1.15	2247 1.15	21	21	28
525	2711 1.23	2616 1.22	2546 1.20	2463 1.19	2393 1.19	2370 1.19	22	22	29
550	2847 1.27	2748 1.26	2675 1.23	2589 1.22	2516 1.22	2492 1.22	23	24	31
575	2983 1.30	2880 1.29	2804 1.27	2715 1.26	2639 1.25	2614 1.25	25	25	33
600	3119 1.34	3012 1.33	2932 1.30	2840 1.29	2762 1.29	2736 1.29	26	26	35
625	3255 1.38	3143 1.37	3061 1.33	2966 1.32	2885 1.32	2858 1.32	27	28	36
650	3390 1.41	3275 1.40	3189 1.37	3091 1.36	3007 1.35	2980 1.35	29	29	38
675	3526 1.45	3406 1.44	3318 1.40	3216 1.39	3129 1.39	3101 1.39	30	31	40
700	3661 1.49	3537 1.47	3446 1.44	3341 1.42	3251 1.42	3222 1.42	31	32	41
725	3796 1.52	3668 1.51	3573 1.47	3466 1.46	3373 1.45	3342 1.45	33	34	43

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–013–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FL 290	FL 310	FL 330	FL 350	FL 370	FL 390	Correction on fuel consumption (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
725	3796 1.52	3668 1.51	3573 1.47	3466 1.46	3373 1.45	3342 1.45	33	34	43
750	3931 1.56	3798 1.54	3701 1.51	3590 1.49	3495 1.49	3463 1.48	34	35	45
775	4066 1.59	3929 1.58	3828 1.54	3714 1.52	3616 1.52	3583 1.52	35	36	46
800	4200 2.03	4059 2.01	3956 1.58	3839 1.56	3737 1.55	3703 1.55	37	38	48
825	4335 2.07	4189 2.05	4083 2.01	3963 1.59	3859 1.58	3823 1.58	38	39	50
850	4469 2.10	4319 2.09	4209 2.05	4087 2.02	3979 2.02	3943 2.02	39	41	51
875	4603 2.14	4449 2.12	4336 2.08	4210 2.06	4100 2.05	4062 2.05	41	42	53
900	4737 2.18	4578 2.16	4463 2.12	4334 2.09	4221 2.08	4181 2.08	42	44	54
925	4870 2.21	4708 2.19	4589 2.15	4457 2.13	4341 2.12	4300 2.12	43	45	56
950	5004 2.25	4837 2.23	4715 2.18	4580 2.16	4461 2.15	4418 2.15	45	46	58
975	5137 2.28	4966 2.27	4841 2.22	4703 2.19	4581 2.18	4537 2.18	46	48	59
1000	5270 2.32	5095 2.30	4966 2.25	4826 2.23	4701 2.22	4655 2.22	47	49	61
1025	5403 2.36	5223 2.34	5092 2.29	4949 2.26	4821 2.25	4773 2.25	48	51	62
1050	5536 2.39	5352 2.37	5217 2.33	5071 2.29	4940 2.28	4891 2.28	50	52	64
1075	5669 2.43	5480 2.41	5342 2.36	5193 2.33	5060 2.32	5008 2.31	51	54	65
1100	5801 2.47	5608 2.44	5467 2.40	5316 2.36	5179 2.35	5125 2.35	52	55	67
1125	5934 2.50	5736 2.48	5592 2.43	5438 2.40	5298 2.38	5242 2.38	54	56	68
1150	6066 2.54	5864 2.52	5717 2.47	5559 2.43	5417 2.42	5359 2.41	55	58	70
1175	6198 2.58	5991 2.55	5841 2.50	5681 2.46	5535 2.45	5476 2.45	56	59	71
1200	6329 3.01	6119 2.59	5965 2.54	5803 2.50	5654 2.48	5592 2.48	57	61	73
1225	6461 3.05	6246 3.02	6089 2.57	5924 2.53	5772 2.52	5708 2.51	59	62	74
1250	6593 3.09	6373 3.06	6213 3.01	6045 2.56	5890 2.55	5824 2.55	60	64	76
1275	6724 3.12	6500 3.10	6337 3.04	6166 3.00	6008 2.58	5940 2.58	61	65	77
1300	6855 3.16	6626 3.13	6460 3.08	6287 3.03	6126 3.02	6055 3.01	62	66	79
1325	6986 3.20	6753 3.17	6584 3.11	6408 3.07	6244 3.05	6171 3.05	64	68	80
1350	7116 3.24	6879 3.21	6707 3.15	6528 3.10	6361 3.08	6286 3.08	65	69	82

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–014–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	**310**	**330**	**350**	**370**	**390**	**FL290 FL310**	**FL330 FL350**	**FL370 FL390**
1350	7116 3.24	6879 3.21	6707 3.15	6528 3.10	6361 3.08	6286 3.08	65	69	82
1375	7246 3.27	7006 3.24	6830 3.19	6649 3.13	6479 3.12	6401 3.11	66	71	83
1400	7377 3.31	7132 3.28	6952 3.22	6769 3.17	6596 3.15	6515 3.14	67	72	85
1425	7507 3.35	7258 3.31	7074 3.26	6889 3.20	6713 3.18	6630 3.18	69	73	86
1450	7637 3.39	7384 3.35	7196 3.29	7009 3.24	6830 3.22	6744 3.21	70	75	87
1475	7766 3.42	7510 3.39	7318 3.33	7128 3.27	6946 3.25	6858 3.24	71	76	89
1500	7896 3.46	7636 3.42	7440 3.36	7248 3.30	7063 3.28	6972 3.28	72	77	90
1525	8025 3.50	7761 3.46	7561 3.40	7367 3.34	7179 3.32	7086 3.31	74	79	92
1550	8154 3.54	7887 3.49	7683 3.44	7486 3.37	7295 3.35	7200 3.34	75	80	93
1575	8283 3.57	8012 3.53	7804 3.47	7605 3.41	7411 3.38	7313 3.38	76	82	94
1600	8412 4.01	8137 3.57	7925 3.51	7724 3.44	7527 3.42	7427 3.41	78	83	96
1625	8541 4.05	8262 4.00	8045 3.54	7843 3.47	7643 3.45	7540 3.44	79	84	97
1650	8669 4.09	8387 4.04	8166 3.58	7962 3.51	7759 3.48	7653 3.48	80	86	98
1675	8798 4.12	8511 4.07	8286 4.02	8080 3.54	7874 3.52	7766 3.51	81	87	100
1700	8926 4.16	8636 4.11	8406 4.05	8198 3.58	7989 3.55	7879 3.54	83	89	101
1725	9054 4.20	8760 4.15	8526 4.09	8316 4.01	8105 3.58	7991 3.58	84	90	103
1750	9182 4.24	8884 4.18	8646 4.12	8434 4.04	8219 4.02	8103 4.01	85	91	104
1775	9310 4.28	9008 4.22	8766 4.16	8552 4.08	8334 4.05	8215 4.04	86	93	105
1800	9437 4.31	9132 4.26	8885 4.20	8670 4.11	8449 4.09	8327 4.07	88	94	107
1825	9564 4.35	9256 4.29	9005 4.23	8787 4.15	8563 4.12	8439 4.11	89	95	108
1850	9692 4.39	9379 4.33	9124 4.27	8905 4.18	8678 4.15	8551 4.14	90	97	109
1875	9819 4.43	9503 4.36	9243 4.31	9022 4.22	8792 4.19	8662 4.17	91	98	110
1900	9946 4.47	9626 4.40	9362 4.34	9139 4.25	8906 4.22	8773 4.21	92	99	112
1925	10072 4.50	9749 4.44	9480 4.38	9256 4.28	9020 4.25	8884 4.24	94	101	113
1950	10199 4.54	9872 4.47	9599 4.42	9373 4.32	9134 4.29	8995 4.27	95	102	114
1975	10325 4.58	9995 4.51	9717 4.45	9489 4.35	9247 4.32	9106 4.31	96	104	116

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–015–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1975	10325 4.58	9995 4.51	9717 4.45	9489 4.35	9247 4.32	9106 4.31	96	104	116
2000	10452 5.02	10117 4.55	9835 4.49	9606 4.39	9361 4.35	9216 4.34	97	105	117
2025	10578 5.06	10240 4.58	9953 4.53	9722 4.42	9474 4.39	9327 4.37	99	106	118
2050	10704 5.10	10362 5.02	10071 4.56	9838 4.46	9587 4.42	9437 4.41	100	108	119
2075	10829 5.13	10484 5.05	10188 5.00	9954 4.49	9700 4.45	9547 4.44	101	109	121
2100	10955 5.17	10606 5.09	10306 5.04	10070 4.52	9813 4.49	9656 4.47	102	110	122
2125	11080 5.21	10728 5.13	10423 5.07	10186 4.56	9926 4.52	9766 4.51	103	112	123
2150	11206 5.25	10850 5.16	10540 5.11	10301 4.59	10039 4.56	9875 4.54	105	113	124
2175	11331 5.29	10972 5.20	10657 5.15	10417 5.03	10151 4.59	9985 4.57	106	114	125
2200	11456 5.33	11093 5.24	10774 5.18	10532 5.06	10263 5.02	10094 5.00	107	116	127
2225	11581 5.37	11215 5.27	10891 5.22	10647 5.10	10376 5.06	10203 5.04	108	117	128
2250	11706 5.40	11336 5.31	11007 5.26	10762 5.13	10488 5.09	10311 5.07	109	118	129
2275	11830 5.44	11457 5.35	11123 5.29	10877 5.16	10599 5.12	10420 5.10	111	120	130
2300	11955 5.48	11578 5.38	11239 5.33	10992 5.20	10711 5.16	10528 5.14	112	121	131
2325	12079 5.52	11699 5.42	11355 5.37	11107 5.23	10823 5.19	10637 5.17	113	122	132
2350	12203 5.56	11819 5.46	11471 5.41	11221 5.27	10934 5.23	10745 5.20	114	123	134
2375	12327 6.00	11940 5.49	11587 5.44	11335 5.30	11046 5.26	10853 5.24	115	125	135
2400	12450 6.04	12060 5.53	11702 5.48	11450 5.34	11157 5.29	10961 5.27	117	126	136
2425	12574 6.08	12180 5.57	11818 5.52	11564 5.37	11268 5.33	11068 5.30	118	127	137
2450	12697 6.11	12299 6.00	11933 5.55	11678 5.41	11379 5.36	11176 5.34	119	128	138
2475	12820 6.15	12419 6.04	12048 5.59	11791 5.44	11490 5.39	11283 5.37	120	130	139
2500	12944 6.19	12538 6.08	12163 6.03	11905 5.48	11600 5.43	11390 5.40	121	131	141
2525	13067 6.23	12657 6.12	12278 6.06	12018 5.51	11711 5.46	11497 5.44	122	132	142
2550	13189 6.27	12776 6.15	12393 6.10	12130 5.55	11821 5.50	11604 5.47	124	133	143
2575	13312 6.31	12895 6.19	12508 6.14	12242 5.58	11931 5.53	11710 5.50	125	135	144
2600	13434 6.35	13014 6.23	12623 6.17	12354 6.02	12041 5.56	11817 5.54	126	136	145

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–016–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	**310**	**330**	**350**	**370**	**390**	**FL290 FL310**	**FL330 FL350**	**FL370 FL390**
2600	13435 6.35	13014 6.23	12623 6.17	12354 6.02	12041 5.56	11817 5.54	126	136	145
2625	13557 6.39	13133 6.27	12738 6.21	12465 6.05	12151 6.00	11923 5.57	127	137	146
2650	13679 6.43	13251 6.30	12852 6.25	12576 6.09	12260 6.03	12029 6.00	129	138	147
2675	13801 6.47	13370 6.34	12966 6.28	12687 6.13	12369 6.07	12136 6.04	130	139	149
2700	13923 6.50	13488 6.38	13081 6.32	12798 6.16	12479 6.10	12242 6.07	131	141	150
2725	14045 6.54	13606 6.42	13195 6.36	12909 6.20	12587 6.13	12348 6.10	132	142	151
2750	14167 6.58	13724 6.45	13308 6.39	13020 6.24	12696 6.17	12454 6.14	134	143	152
2775	14288 7.02	13842 6.49	13422 6.43	13130 6.27	12805 6.20	12560 6.17	135	144	153
2800	14409 7.06	13959 6.53	13536 6.47	13240 6.31	12913 6.24	12666 6.20	136	145	154
2825	14531 7.10	14077 6.57	13649 6.50	13351 6.34	13022 6.27	12772 6.24	138	147	155
2850	14652 7.14	14194 7.00	13763 6.54	13461 6.38	13130 6.31	12877 6.27	139	148	156
2875	14773 7.18	14311 7.04	13876 6.58	13571 6.42	13238 6.34	12982 6.30	140	149	157
2900	14894 7.22	14429 7.08	13989 7.01	13680 6.45	13346 6.37	13088 6.34	141	150	159
2925	15014 7.26	14546 7.12	14102 7.05	13790 6.49	13454 6.41	13193 6.37	143	151	160
2950	15135 7.30	14662 7.15	14214 7.09	13899 6.53	13562 6.44	13298 6.40	144	153	161
2975	15255 7.34	14779 7.19	14327 7.12	14009 6.56	13669 6.48	13402 6.44	145	154	162
3000	15376 7.38	14896 7.23	14440 7.16	14118 7.00	13777 6.51	13507 6.47	146	155	163
3025	15496 7.42	15012 7.27	14552 7.20	14227 7.04	13884 6.54	13611 6.50	148	156	165
3050	15616 7.46	15129 7.31	14664 7.23	14336 7.07	13991 6.58	13716 6.54	149	157	166
3075	15736 7.50	15245 7.34	14776 7.27	14444 7.11	14098 7.01	13820 6.57	150	158	167
3100	15856 7.54	15361 7.38	14888 7.31	14553 7.15	14205 7.05	13924 7.00	151	160	168

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.3 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3610 03301.000011 0250300 .7800 .00200 120 0300350 60 0 100 20 20 20 18590 FCOM-N0–03–05–20–017–100

GENERAL

Holding tables contain information about the total fuel flow that allows the flight crew to plan holding and reserve fuel requirements.
They are established for flight in a race track holding pattern for two different configurations:
· clean configuration at 210 knots and green dot speed
· configuration 1 at 170 knots and S speed.
Green dot speed in clean configuration and S in CONF 1 are speeds between the minimum fuel speed and the minimum drag speed.
These charts are established with air conditioning in normal mode and the center of gravity at 33 %.

R

RACE TRACK HOLDING PATTERN - GREEN DOT SPEED

MAX. CRUISE THRUST LIMITS CLEAN CONFIGURATION NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=33.0%		**N1 (%)** **FF (KG/H/ENG)**	
WEIGHT (1000KG)	**FL 15**	**FL 50**	**FL100**	**FL140**	**FL180**	**FL200**	**FL220**	**FL250**
46	48.8 832	51.1 803	55.0 773	58.6 772	62.5 773	64.2 771	66.0 770	68.9 774
48	49.7 859	52.1 830	56.1 808	59.8 808	63.6 807	65.3 805	67.1 805	70.0 809
50	50.6 886	53.2 859	57.3 841	61.0 844	64.6 841	66.4 838	68.2 840	71.0 844
52	51.5 914	54.2 889	58.4 875	62.2 879	65.7 874	67.4 873	69.3 876	72.0 880
54	52.5 942	55.2 919	59.5 912	63.3 913	66.7 908	68.4 909	70.4 912	73.0 916
56	53.4 971	56.1 950	60.6 948	64.3 947	67.7 943	69.4 945	71.3 947	74.0 952
58	54.3 1001	57.1 984	61.6 985	65.2 981	68.6 978	70.4 981	72.2 983	74.9 987
60	55.3 1033	58.0 1019	62.7 1020	66.1 1015	69.5 1015	71.4 1016	73.1 1019	75.8 1023
62	56.1 1062	59.1 1053	63.7 1056	67.0 1049	70.5 1051	72.2 1052	73.9 1056	76.7 1060
64	57.0 1093	60.0 1089	64.6 1090	67.9 1084	71.4 1087	73.0 1088	74.8 1092	77.5 1098
66	57.8 1128	60.9 1127	65.4 1124	68.7 1119	72.3 1123	73.9 1125	75.7 1127	78.4 1136
68	58.7 1163	61.8 1164	66.3 1159	69.6 1156	73.0 1159	74.7 1161	76.5 1164	79.2 1175
70	59.6 1198	62.8 1201	67.0 1193	70.4 1193	73.8 1196	75.5 1197	77.2 1202	80.1 1214
72	60.6 1235	63.7 1238	67.8 1228	71.2 1230	74.6 1233	76.3 1233	78.0 1240	80.7 1256
74	61.4 1273	64.7 1274	68.6 1264	72.0 1268	75.3 1270	77.0 1271	78.8 1278	81.4 1298
76	62.2 1312	65.4 1310	69.4 1300	72.9 1305	76.1 1306	77.7 1309	79.5 1318	82.1 1341
78	63.1 1350	66.2 1345	70.1 1338	73.6 1342	76.8 1342	78.4 1348	80.3 1358	82.8 1386
LOW AIR CONDITIONING △FF = – 0.3 %	**ENGINE ANTI ICE ON** △FF = + 6 %		**TOTAL ANTI ICE ON** △FF = + 10 %		**PER 1° ABOVE ISA** △FF = + 0.25 %		**STRAIGHT LINE** △FF = – 5 %	

R

RACE TRACK HOLDING PATTERN - 210KT

MAX. CRUISE THRUST LIMITS CLEAN CONFIGURATION NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=33.0%	**N1 (%)** **FF (KG/H/ENG)**

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL140	FL180	FL200	FL220	FL250
46	51.3 889	54.0 865	58.4 849	62.0 845	65.1 834	66.9 832	68.6 834	71.1 829
48	51.9 908	54.6 884	59.0 871	62.6 867	65.7 856	67.5 856	69.2 857	71.7 851
50	52.4 928	55.2 904	59.6 894	63.3 889	66.4 879	68.1 880	69.9 881	72.3 875
52	53.0 948	55.7 925	60.2 918	63.8 912	67.1 905	68.8 906	70.6 907	73.0 902
54	53.6 969	56.4 947	60.9 944	64.4 937	67.7 932	69.4 933	71.3 934	73.6 931
56	54.2 991	57.0 971	61.6 971	65.0 963	68.4 960	70.2 961	71.9 961	74.3 961
58	54.9 1015	57.7 998	62.3 998	65.7 991	69.0 989	70.9 991	72.5 990	75.1 991
60	55.5 1039	58.4 1026	63.0 1027	66.3 1020	69.7 1020	71.6 1021	73.2 1022	75.8 1023
62	56.1 1063	59.1 1055	63.8 1057	67.1 1050	70.5 1052	72.3 1053	73.9 1055	76.6 1058
64	56.8 1090	59.9 1085	64.5 1088	67.8 1082	71.3 1085	72.9 1086	74.7 1088	77.4 1094
66	57.5 1120	60.6 1118	65.1 1120	68.5 1115	72.0 1120	73.7 1122	75.4 1123	78.2 1131
68	58.2 1152	61.3 1153	65.8 1153	69.2 1150	72.7 1155	74.4 1158	76.2 1160	79.1 1170
70	58.9 1184	62.0 1187	66.5 1187	70.0 1187	73.4 1193	75.1 1195	77.0 1199	79.9 1210
72	59.7 1218	62.8 1224	67.2 1223	70.7 1225	74.1 1232	75.9 1233	77.8 1240	80.6 1253
74	60.4 1253	63.6 1261	68.0 1260	71.5 1264	74.9 1270	76.7 1274	78.6 1282	81.3 1297
76	61.2 1292	64.4 1300	68.7 1297	72.3 1305	75.6 1311	77.5 1317	79.5 1325	82.1 1343
78	61.9 1332	65.1 1339	69.4 1337	73.0 1347	76.4 1353	78.3 1361	80.4 1370	82.6 1378

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**PER 1° ABOVE ISA**	**STRAIGHT LINE**
△FF = – 0.3 %	△FF = + 6 %	△FF = + 10 %	△FF = + 0.25 %	△FF = – 5 %

R

RACE TRACK HOLDING PATTERN - S SPEED

MAX. CRUISE THRUST LIMITS
CONFIGURATION 1
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA CG=33.0%

N1 (%)
FF (KG/H/ENG)

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
46	49.9 876	52.3 846	56.3 812	58.1 812	59.9 820	61.9 827	63.7 830	65.5 828
48	50.9 906	53.4 876	57.5 849	59.2 854	61.1 863	63.0 868	64.9 867	66.7 865
50	51.8 936	54.5 905	58.6 888	60.4 897	62.4 905	64.2 906	66.0 904	67.8 904
52	52.8 966	55.5 934	59.7 931	61.6 940	63.5 945	65.3 943	67.1 941	68.9 943
54	53.8 995	56.5 965	60.8 974	62.8 982	64.5 982	66.4 980	68.1 980	70.0 982
56	54.8 1024	57.4 1002	61.9 1017	63.8 1021	65.6 1020	67.4 1018	69.2 1019	71.1 1022
58	55.7 1054	58.4 1039	63.0 1059	64.8 1059	66.6 1057	68.4 1056	70.2 1059	72.0 1063
60	56.5 1084	59.4 1078	64.0 1098	65.8 1097	67.6 1095	69.3 1096	71.2 1098	72.9 1103
62	57.4 1118	60.4 1122	64.9 1137	66.7 1135	68.5 1133	70.3 1135	72.1 1140	73.8 1142
64	58.3 1155	61.3 1165	65.8 1175	67.7 1172	69.4 1173	71.2 1175	73.0 1180	74.7 1181
66	59.2 1193	62.2 1209	66.7 1213	68.5 1210	70.3 1212	72.2 1216	73.8 1220	75.6 1220
68	60.0 1233	63.1 1251	67.6 1251	69.3 1249	71.1 1252	72.9 1257	74.6 1259	76.4 1261
70	60.9 1276	64.1 1291	68.5 1288	70.2 1289	72.0 1292	73.7 1297	75.4 1298	77.3 1302
72	61.7 1320	64.9 1331	69.3 1327	71.0 1329	72.9 1334	74.5 1337	76.2 1338	78.1 1344
74	62.5 1364	65.7 1370	70.0 1366	71.8 1369	73.6 1375	75.2 1376	77.0 1379	79.0 1385
76	63.3 1405	66.5 1408	70.8 1406	72.6 1410	74.3 1415	76.0 1417	77.8 1421	79.8 1427
78	64.2 1446	67.2 1447	71.6 1447	73.4 1452	75.0 1455	76.7 1457	78.6 1463	80.7 1470

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA	STRAIGHT LINE
ΔFF = – 0.3 %	ΔFF = + 6 %	ΔFF = + 10 %	ΔFF = + 0.25 %	ΔFF = – 5 %

R

RACE TRACK HOLDING PATTERN - 170KT

MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=33.0%		**N1 (%)** **FF (KG/H/ENG)**	
WEIGHT (1000KG)	**FL 15**	**FL 50**	**FL100**	**FL120**	**FL140**	**FL160**	**FL180**	**FL200**
46	50.1 876	52.5 846	56.5 817	58.3 818	60.1 825	62.1 827	63.8 826	65.7 824
48	50.9 905	53.5 875	57.5 852	59.3 857	61.2 864	63.1 866	64.9 864	66.8 862
50	51.8 936	54.6 905	58.6 888	60.4 898	62.4 905	64.2 905	66.0 903	67.8 903
52	52.8 967	55.5 935	59.7 931	61.6 940	63.5 947	65.3 946	67.1 944	68.9 946
54	53.8 998	56.4 967	60.8 975	62.7 984	64.5 990	66.4 989	68.2 988	70.1 990
56	54.8 1031	57.4 1006	61.9 1021	63.8 1029	65.6 1034	67.5 1033	69.3 1034	71.2 1037
58	55.7 1065	58.4 1046	63.1 1068	64.9 1075	66.8 1080	68.5 1080	70.4 1082	72.2 1085
60	56.6 1099	59.4 1087	64.2 1117	66.0 1123	67.9 1128	69.6 1129	71.5 1131	73.2 1134
62	57.5 1138	60.5 1135	65.2 1166	67.1 1172	68.9 1178	70.7 1180	72.5 1182	74.3 1183
64	58.5 1180	61.5 1186	66.4 1217	68.3 1223	70.0 1230	71.9 1231	73.6 1233	75.5 1238
66	59.5 1223	62.6 1238	67.5 1270	69.3 1277	71.1 1286	72.9 1287	74.6 1289	76.6 1297
68	60.5 1270	63.8 1295	68.6 1326	70.3 1334	72.2 1343	73.9 1344	75.8 1350	77.8 1359
70	61.5 1326	64.9 1354	69.6 1385	71.4 1392	73.2 1399	74.9 1400	76.9 1408	79.0 1416
72	62.6 1385	66.0 1412	70.6 1439	72.5 1446	74.2 1452	76.0 1458	78.0 1466	80.3 1475
74	63.6 1442	67.1 1466	71.7 1494	73.5 1500	75.2 1509	77.1 1518	79.2 1526	81.3 1540
76	64.8 1499	68.3 1524	72.8 1555	74.5 1563	76.4 1578	78.3 1588	80.5 1598	82.4 1615
78	66.0 1561	69.5 1587	73.9 1620	75.7 1630	77.5 1650	79.6 1658	81.7 1672	83.5 1693
LOW AIR CONDITIONING △FF = – 0.3 %	**ENGINE ANTI ICE ON** △FF = + 6 %		**TOTAL ANTI ICE ON** △FF = + 10 %		**PER 1° ABOVE ISA** △FF = + 0.25 %		**STRAIGHT LINE** △FF = – 5 %	

GENERAL

Descent tables are established for normal descent speed M.78/300kt/250kt and emergency descent at MMO/VMO with airbrakes extended, down to 1500 feet with :

- Normal air conditioning
- CG = 33 %
- Anti ice OFF

R For normal descent, cabin vertical speed is limited to 350 feet/minute.

DESCENT - M.78/300KT/250KT									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=33.0%		MAXIMUM CABIN RATE OF DESCENT 350FT/MIN				
WEIGHT (1000KG)	45				65				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	16.1	188	102	73.5	16.8	125	102	IDLE	241
370	14.6	158	90	74.5	16.0	121	97	IDLE	252
350	12.9	120	78	76.4	15.4	117	92	IDLE	264
330	11.6	89	68	IDLE	14.7	113	87	IDLE	277
310	11.1	87	64	IDLE	14.1	110	82	IDLE	289
290	10.6	84	61	IDLE	13.5	106	78	IDLE	300
270	10.1	81	56	IDLE	12.8	102	72	IDLE	300
250	9.5	77	52	IDLE	12.0	97	66	IDLE	300
240	9.2	75	50	IDLE	11.6	95	64	IDLE	300
220	8.6	71	46	IDLE	10.8	90	58	IDLE	300
200	8.0	67	42	IDLE	10.0	84	53	IDLE	300
180	7.3	63	37	IDLE	9.2	79	47	IDLE	300
160	6.7	58	34	IDLE	8.4	73	42	IDLE	300
140	6.1	54	30	IDLE	7.6	67	37	IDLE	300
120	5.5	49	26	IDLE	6.7	60	32	IDLE	300
100	4.8	44	22	IDLE	5.9	53	27	IDLE	300
50	1.8	18	8	IDLE	2.2	22	9	IDLE	250

CORRECTIONS	LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	–	+ 11 %	+ 12 %	–
FUEL	– 2.5 %	+ 57 %	+ 74 %	+ 0.4 %
DISTANCE	–	+ 11 %	+ 11.5 %	+ 0.5 %

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R

EMERGENCY DESCENT - M.82/350KT

IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=33.0%		**AIRBRAKES EXTENDED**				
WEIGHT (1000KG)	**45**				**65**				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	4.8	33	34	IDLE	6.5	45	47	IDLE	255
370	4.5	31	32	IDLE	6.1	44	44	IDLE	267
350	4.2	30	30	IDLE	5.8	42	41	IDLE	279
330	3.9	29	28	IDLE	5.5	40	39	IDLE	292
310	3.7	28	26	IDLE	5.2	39	37	IDLE	306
290	3.5	27	24	IDLE	4.9	37	34	IDLE	319
270	3.3	26	23	IDLE	4.7	36	32	IDLE	333
250	3.2	25	22	IDLE	4.5	34	31	IDLE	347
240	3.1	24	21	IDLE	4.3	34	29	IDLE	350
220	2.8	23	19	IDLE	4.0	32	27	IDLE	350
200	2.6	21	17	IDLE	3.6	30	24	IDLE	350
180	2.4	20	15	IDLE	3.3	28	22	IDLE	350
160	2.1	18	14	IDLE	3.0	25	19	IDLE	350
140	1.9	16	12	IDLE	2.6	23	17	IDLE	350
120	1.6	14	10	IDLE	2.3	20	14	IDLE	350
100	1.4	12	8	IDLE	1.9	17	12	IDLE	350
50	.7	6	4	IDLE	1.0	9	6	IDLE	350
0	.0	0	0	IDLE	.0	0	0	IDLE	350

10B -08F0A320–212 CFM56–5A3 23100000C5KG330 0 018590 0 0–1 .0 .0 .00 0 02 .820350.000 .000 0 FCOM-N0–03–05–30–003–100

GENERAL

In the go around configuration corresponding to the all engine procedure, the minimum steady gradient one engine inoperative required by the regulations is 2.1 % at a speed not exceeding 1.4 Vs. This requirement is also called approach climb performance by regulations.
The following pages allow to determine the go around limiting weight which satisfies the required gradient with the certified go around configurations 3 and 2.
The required gradient of 2.1 % is considered at the airport reference altitude. The power setting is «GO AROUND» thrust with the air conditioning ON. The speed is 1.23 Vs of the specified configuration. For the occasional cases where approach climb performance is found restrictive, a correction is given for an increased speed up to 1.4 Vs.

Note : Landing climb performance (2 engines running) is never limiting.

PROCEDURE

According to airport pressure altitude and temperature determine if the slats/flaps setting must be restricted as a function of the landing weight, in order to meet the go around gradient requirement of 2.1 %.
Establish the final approach configuration with one more step of flaps. If the approach is interrupted, retract the flaps by one step during the go-around.
In case of category II approach, JAR-OPS requires a regulatory approach climb gradient of 2.5 % to be maintained.
Use the tables for CAT II approach to determine the maximum approach climb limiting weight according to airport pressure altitude and temperature.

Note :
1. *If circumstances dictate, landing may be made at a weight corresponding to the maximum structural takeoff weight (refer to overweight landing procedure 3.02).*
2. *When icing conditions are predicted during the flight and TAT is less than 10° C and there is an evidence of significant ice accretion, to take into account ice formation on the non heated structure :*
   - *decrease the approach climb limiting weight by 4.5 %.*
   - R *in CONF FULL, the approach speed must not be lower than VREF + 5 knots*
     R *and the landing distance must be multiplied by 1.1.*
     R *or*
     R *in CONF 3, the approach speed must not be lower than VLS + 10 knots and*
     R *the landing distance must be multiplied by 1.15.*
3. *In the following tables corrections for anti ice are only valid for OAT lower than 10°C.*

APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.1 % High Air Conditioning Anti ice OFF V = 1.23 Vs	CONF 2

PRESSURE ALTITUDE (FT)											
OAT (°C)	**−1000**	**0**	**200**	**400**	**600**	**800**	**1000**	**1500**	**2000**	**5000**	**8000**
≤ 10	83.3	82.5	82.2	81.8	81.4	81.0	80.7	79.7	78.8	75.3	70.1
20	83.1	82.4	82.0	81.6	81.2	80.9	80.5	79.5	78.6	75.1	67.2
22	83.1	82.3	81.9	81.6	81.2	80.8	80.4	79.5	78.6	74.1	66.2
24	83.0	82.3	81.9	81.5	81.1	80.8	80.4	79.5	78.5	73.1	65.2
26	83.0	82.2	81.8	81.5	81.1	80.7	80.3	79.4	78.5	72.0	64.2
28	82.9	82.2	81.8	81.4	81.0	80.7	80.3	78.9	77.4	71.0	63.2
30	82.9	82.1	81.5	80.9	80.4	79.8	79.2	77.8	76.4	70.0	62.3
32	82.8	81.0	80.4	79.8	79.2	78.7	78.1	76.7	75.3	68.9	61.3
34	81.7	79.8	79.2	78.7	78.1	77.6	77.0	75.6	74.3	67.9	60.4
36	80.5	78.7	78.1	77.6	77.0	76.4	75.9	74.5	73.2	66.8	59.5
38	79.4	77.5	77.0	76.4	75.9	75.3	74.8	73.5	72.2	65.8	58.6
40	78.2	76.4	75.8	75.3	74.8	74.2	73.7	72.4	71.1	64.8	
42	77.1	75.2	74.7	74.2	73.6	73.1	72.6	71.3	70.0	63.8	
44	75.9	74.1	73.6	73.0	72.5	71.9	71.4	70.0	68.7	62.7	
46	74.8	72.8	72.2	71.7	71.1	70.6	70.1	68.8	67.5		
48	73.5	71.4	70.8	70.3	69.8	69.2	68.7	67.5	66.3		
50	72.0	69.9	69.4	68.9	68.4	67.9	67.4	66.2	65.1		
52	70.5	68.5	68.0	67.5	67.0	66.6	66.1	65.0			
54	69.1	67.1	66.6	66.1							
55	68.4	66.4									

AIR CONDITIONING OFF ADD 1500 kg	**ENGINE ANTI ICE ON SUBTRACT** 300 kg	**TOTAL ANTI ICE ON SUBTRACT** 900 kg	**SPEED INCREASE PER 0.01 VS ADD** 200 kg

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APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.1% High Air Conditioning Anti ice OFF V = 1.23 Vs	CONF 3

PRESSURE ALTITUDE (FT)											
OAT (°C)	–1000	0	200	400	600	800	1000	1500	2000	5000	8000
≤ 10	83.0	82.2	81.8	81.5	81.1	80.7	80.3	79.4	78.5	74.9	69.8
20	82.8	82.0	81.7	81.3	80.9	80.5	80.2	79.2	78.3	74.8	66.9
22	82.8	82.0	81.6	81.2	80.9	80.5	80.1	79.2	78.2	73.8	65.9
24	82.7	81.9	81.6	81.2	80.8	80.4	80.1	79.1	78.2	72.8	64.9
26	82.7	81.9	81.5	81.1	80.8	80.4	80.0	79.1	78.2	71.7	64.0
28	82.6	81.8	81.5	81.1	80.7	80.4	80.0	78.5	77.1	70.7	63.0
30	82.6	81.8	81.2	80.6	80.0	79.5	78.9	77.5	76.1	69.7	62.0
32	82.5	80.6	80.1	79.5	78.9	78.4	77.8	76.4	75.0	68.6	61.1
34	81.3	79.5	78.9	78.4	77.8	77.2	76.7	75.3	74.0	67.6	60.2
36	80.2	78.4	77.8	77.2	76.7	76.1	75.6	74.2	72.9	66.6	59.3
38	79.1	77.2	76.7	76.1	75.6	75.0	74.5	73.2	71.9	65.6	58.3
40	77.9	76.1	75.5	75.0	74.5	73.9	73.4	72.1	70.8	64.5	
42	76.8	74.9	74.4	73.9	73.3	72.8	72.3	71.0	69.7	63.5	
44	75.6	73.8	73.3	72.7	72.2	71.7	71.1	69.8	68.5	62.5	
46	74.5	72.5	71.9	71.4	70.9	70.3	69.8	68.5	67.3		
48	73.2	71.1	70.5	70.0	69.5	69.0	68.5	67.2	66.1		
50	71.7	69.7	69.2	68.6	68.1	67.6	67.2	66.0	64.8		
52	70.3	68.3	67.8	67.3	66.8	66.3	65.8	64.7			
54	68.8	66.8	66.4	65.9							
55	68.1	66.1									

AIR CONDITIONING OFF ADD 1500 kg	ENGINE ANTI ICE ON SUBTRACT 300 kg	TOTAL ANTI ICE ON SUBTRACT 900 kg	SPEED INCREASE PER 0.01 VS ADD 200 kg

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APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.5% High Air Conditioning Anti ice OFF	CAT II CONF 2

	PRESSURE ALTITUDE (FT)										
OAT (°C)	−1000	0	200	400	600	800	1000	1500	2000	5000	8000
≤ 10	79.9	79.2	78.8	78.4	78.1	77.7	77.3	76.4	75.5	72.1	67.2
20	79.7	79.0	78.6	78.3	77.9	77.5	77.2	76.3	75.4	72.0	64.3
22	79.7	78.9	78.6	78.2	77.8	77.5	77.1	76.2	75.3	71.0	63.4
24	79.6	78.9	78.5	78.2	77.8	77.4	77.1	76.2	75.3	70.0	62.5
26	79.6	78.8	78.5	78.1	77.8	77.4	77.0	76.1	75.2	69.0	61.5
28	79.5	78.8	78.4	78.1	77.7	77.4	77.0	75.7	74.3	68.1	60.6
30	79.5	78.7	78.2	77.7	77.1	76.6	76.1	74.7	73.4	67.1	59.7
32	79.4	77.8	77.2	76.7	76.2	75.6	75.1	73.8	72.4	66.1	58.8
34	78.5	76.8	76.3	75.7	75.2	74.6	74.1	72.7	71.4	65.1	57.9
36	77.5	75.7	75.2	74.6	74.1	73.5	73.0	71.6	70.3	64.1	57.1
38	76.4	74.6	74.0	73.5	72.9	72.4	71.9	70.5	69.2	63.1	56.2
40	75.3	73.4	72.9	72.3	71.8	71.3	70.7	69.5	68.2	62.1	
42	74.1	72.2	71.7	71.2	70.7	70.1	69.6	68.4	67.1	61.2	
44	72.9	71.1	70.5	70.0	69.5	69.0	68.4	67.2	65.9	60.2	
46	71.7	69.8	69.3	68.7	68.2	67.7	67.2	65.9	64.8		
48	70.4	68.4	67.9	67.4	66.9	66.4	65.9	64.7	63.6		
50	69.0	67.1	66.6	66.1	65.6	65.1	64.6	63.5	62.4		
52	67.7	65.7	65.2	64.7	64.3	63.8	63.4	62.3			
54	66.3	64.3	63.9	63.4							
55	65.6	63.7									

AIR CONDITIONING OFF ADD 1500 kg	ENGINE ANTI ICE ON SUBTRACT 300 kg	TOTAL ANTI ICE ON SUBTRACT 900 kg

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APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.5% High Air Conditioning Anti ice OFF	CAT II CONF 3

PRESSURE ALTITUDE (FT)											
OAT (°C)	−1000	0	200	400	600	800	1000	1500	2000	5000	8000
≤ 10	77.7	77.0	76.6	76.3	75.9	75.6	75.2	74.4	73.5	70.1	65.4
20	77.5	76.8	76.5	76.1	75.8	75.4	75.1	74.2	73.3	70.0	62.6
22	77.5	76.8	76.4	76.1	75.7	75.4	75.0	74.1	73.3	69.1	61.7
24	77.4	76.7	76.4	76.0	75.7	75.3	75.0	74.1	73.2	68.1	60.8
26	77.4	76.7	76.3	76.0	75.6	75.3	74.9	74.1	73.2	67.1	59.9
28	77.3	76.6	76.3	75.9	75.6	75.2	74.9	73.5	72.2	66.2	58.9
30	77.3	76.6	76.0	75.5	74.9	74.4	73.9	72.5	71.2	65.2	58.0
32	77.2	75.5	75.0	74.4	73.9	73.4	72.8	71.5	70.3	64.3	57.2
34	76.2	74.4	73.9	73.4	72.9	72.3	71.8	70.5	69.3	63.3	56.3
36	75.1	73.4	72.8	72.3	71.8	71.3	70.8	69.5	68.3	62.3	55.5
38	74.0	72.3	71.8	71.3	70.8	70.3	69.8	68.5	67.3	61.4	54.6
40	72.9	71.2	70.7	70.2	69.7	69.2	68.7	67.5	66.3	60.4	
42	71.9	70.1	69.7	69.2	68.7	68.2	67.7	66.5	65.3	59.5	
44	70.8	69.1	68.6	68.1	67.6	67.1	66.6	65.3	64.1	58.5	
46	69.7	67.9	67.4	66.8	66.3	65.8	65.3	64.1	63.0		
48	68.5	66.5	66.0	65.5	65.1	64.6	64.1	63.0	61.9		
50	67.1	65.2	64.7	64.3	63.8	63.3	62.9	61.8	60.7		
52	65.8	63.9	63.4	63.0	62.5	62.1	61.6	60.6			
54	64.4	62.6	62.1	61.7							
55	63.8	61.9									

AIR CONDITIONING OFF ADD 1500 kg	ENGINE ANTI ICE ON SUBTRACT 300 kg	TOTAL ANTI ICE ON SUBTRACT 900 kg

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INTRODUCTION

The alternate planning tables enable the flight crew to determine the fuel consumption and time required to cover a given air distance from go around at destination airport to landing at alternate airport.
These tables are established for :
- Go around : 100 kg or 220 lb
- Climb profile : 250KT/300KT/M.78
- Long range cruise
- Descent profile : M.78/300KT/250KT
- Approach and landing at alternate airport : 80 kg or 180 lb (4 min)
- ISA
- CG : 33 %
- Normal air conditioning
- Anti ice off

Note : *1. In the tables, a "*" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celcius above ISA temperature apply a fuel correction of
0.015 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)
or 0.033 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The alternate planning tables are based on a reference landing weight at destination.
The fuel consumption must be corrected when the landing weight is different from the reference landing weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE
DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 80 KG (4MIN)

REF. LDG WT AT DEST. = 55000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 100	120	140	160	180	200	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL120	FL140 FL160	FL180 FL200
50	597 0.14	591 0.14					3		
100	969 0.24	949 0.24	943 0.24	941 0.23	941 0.22	943 0.22	6	6	6
150	1341 0.34	1309 0.34	1290 0.34	1277 0.32	1266 0.31	1254 0.31	9	10	9
200	1715 0.44	1669 0.44	1638 0.43	1615 0.41	1591 0.39	1567 0.39	12	13	12
250	2090 0.54	2031 0.54	1987 0.53	1953 0.49	1917 0.48	1879 0.47	15	16	14
300	2466 1.04	2394 1.03	2337 1.03	2293 0.58	2244 0.56	2193 0.56	18	19	17
350	2843 1.14	2757 1.13	2688 1.12	2634 1.07	2572 1.05	2508 1.04	22	22	19
400	3221 1.24	3122 1.23	3040 1.22	2975 1.15	2900 1.13	2823 1.13	25	25	22
450	3600 1.33	3488 1.32	3394 1.31	3318 1.24	3229 1.22	3139 1.21	28	29	24
500	3981 1.43	3854 1.42	3749 1.41	3662 1.32	3559 1.30	3456 1.29	31	32	27
550	4362 1.53	4222 1.52	4104 1.51	4006 1.41	3890 1.38	3774 1.38	34	35	30
600	4745 2.03	4591 2.02	4462 2.00	4352 1.49	4221 1.47	4092 1.46	37	38	32
650	5129 2.13	4962 2.11	4820 2.09	4699 1.58	4554 1.55	4411 1.54	40	41	35
700	5514 2.22	5333 2.21	5179 2.19	5047 2.06	4887 2.04	4732 2.02	43	44	37
750	5900 2.32	5705 2.31	5540 2.28	5396 2.15	5221 2.12	5053 2.11	46	47	40
800	6288 2.42	6079 2.40	5902 2.38	5746 2.23	5555 2.20	5374 2.19	50	50	43
850	6676 2.52	6453 2.50	6265 2.47	6097 2.31	5891 2.29	5697 2.27	53	53	45
900	7066 3.01	6829 2.59	6629 2.56	6449 2.39	6227 2.37	6020 2.35	56	56	48
950	7457 3.11	7206 3.09	6995 3.05	6803 2.48	6564 2.45	6345 2.44	59	59	50
1000	7849 3.20	7584 3.19	7361 3.15	7157 2.56	6902 2.53	6670 2.52	62	62	53
1050	8242 3.30	7963 3.28	7729 3.24	7513 3.04	7241 3.02	6996 3.00	66	64	55
1100	8636 3.40	8343 3.38	8099 3.33	7870 3.12	7581 3.10	7323 3.08	69	67	58
1150	9031 3.49	8725 3.47	8470 3.41	8228 3.20	7921 3.18	7651 3.16	72	70	61
1200	9427 3.59	9107 3.57	8843 3.49	8584 3.28	8262 3.27	7980 3.25	76	73	63

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 1 %	△FUEL = + 3 %	△FUEL = + 7 %

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE
DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 80 KG (4MIN)

REF. LDG WT AT DEST. = 55000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR (NM)	FLIGHT LEVEL 230	270	310	350	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL230 FL270	FL310 FL350	FL390
150	1248 0.30	1257 0.29				10		
200	1543 0.38	1535 0.37	1538 0.36	1546 0.35		13	13	
250	1839 0.47	1814 0.44	1799 0.43	1794 0.42		16	17	13
300	2136 0.55	2094 0.52	2061 0.50	2043 0.49	2039 0.49	19	20	20
350	2433 1.03	2375 0.59	2324 0.57	2293 0.56	2280 0.55	22	23	24
400	2732 1.11	2656 1.07	2588 1.04	2544 1.02	2522 1.02	24	25	27
450	3031 1.19	2938 1.15	2852 1.12	2795 1.09	2764 1.09	27	28	31
500	3331 1.28	3221 1.22	3117 1.19	3047 1.16	3007 1.15	30	31	34
550	3632 1.36	3505 1.29	3382 1.26	3300 1.23	3251 1.22	33	34	38
600	3934 1.44	3789 1.37	3649 1.33	3554 1.29	3496 1.29	36	38	41
650	4237 1.52	4074 1.44	3916 1.40	3808 1.36	3742 1.35	39	41	45
700	4541 2.00	4360 1.52	4184 1.47	4063 1.43	3989 1.42	42	44	48
750	4845 2.08	4647 1.59	4453 1.54	4319 1.49	4238 1.48	45	47	52
800	5151 2.16	4934 2.07	4722 2.02	4575 1.56	4487 1.55	48	50	56
850	5457 2.24	5222 2.14	4993 2.09	4832 2.03	4734 2.02*	51	53	59
900	5765 2.32	5511 2.22	5264 2.16	5090 2.09	4992 2.08*	54	56	64
950	6073 2.40	5801 2.29	5536 2.23	5349 2.16	5250 2.15*	57	59	70
1000	6382 2.48	6092 2.36	5809 2.30	5608 2.23	5509 2.22*	60	62	75
1050	6692 2.56	6383 2.44	6082 2.37	5869 2.30	5768 2.28*	63	65	80
1100	7004 3.04	6675 2.51	6357 2.44	6130 2.36	6028 2.35*	66	68	85
1150	7316 3.12	6968 2.58	6632 2.51	6391 2.43	6289 2.42*	69	72	90
1200	7629 3.20	7263 3.06	6908 2.58	6654 2.49	6551 2.48*	72	75	95

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 1 %	△FUEL = + 3 %	△FUEL = + 7 %

GENERAL

R The ground distance/air distance conversion tables show the air distance for a given
R ground distance due to the influence of the wind.
R Tables are given for :
R – M.78
R – Long range speed.

M.78

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	**10**	11	13	15
20	15	16	18	**20**	23	26	30
30	22	25	27	**30**	34	39	45
40	30	33	36	**40**	45	51	60
50	37	41	45	**50**	56	64	75
100	75	82	90	**100**	113	129	150
200	150	164	180	**200**	225	257	300
300	225	245	270	**300**	338	386	450
400	300	327	360	**400**	450	514	600
500	375	409	450	**500**	563	643	750
1000	750	818	900	**1000**	1125	1286	1501
1500	1125	1227	1350	**1500**	1688	1929	2251
2000	1500	1636	1800	**2000**	2248	2572	3001
2500	1875	2045	2250	**2500**	2813	3215	3752
3000	2250	2454	2700	**3000**	3375	3858	4502
3500	2624	2863	3150	**3500**	3938	4501	5252
4000	2999	3272	3600	**4000**	4500	5144	6003
4500	3374	3681	4050	**4500**	5063	5787	6753
5000	3749	4090	4500	**5000**	5626	6430	7503

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LONG RANGE SPEED UP TO FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	**10**	11	13	16
20	15	16	18	**20**	23	27	32
30	22	24	27	**30**	34	40	48
40	29	32	36	**40**	46	53	64
50	36	40	45	**50**	57	66	79
100	73	80	89	**100**	114	133	159
200	146	160	178	**200**	228	266	318
300	219	241	267	**300**	342	398	477
400	292	321	356	**400**	456	531	635
500	365	401	445	**500**	570	664	794
1000	730	802	890	**1000**	1141	1328	1589
1500	1094	1203	1335	**1500**	1711	1992	2383
2000	1459	1604	1780	**2000**	2282	2656	3177
2500	1824	2005	2225	**2500**	2852	3320	3971
3000	2189	2406	2670	**3000**	3423	3984	4766
3500	2554	2807	3115	**3500**	3993	4648	5560
4000	2919	3208	3560	**4000**	4564	5312	6354
4500	3283	3609	4005	**4500**	5134	5976	7149
5000	3648	4010	4450	**5000**	5705	6640	7943

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-N0–03–50–003–001

LONG RANGE SPEED ABOVE FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	8	8	9	**10**	11	13	15
20	15	16	18	**20**	22	26	30
30	23	25	27	**30**	34	38	45
40	30	33	36	**40**	45	51	60
50	38	41	45	**50**	56	64	75
100	75	82	90	**100**	112	128	149
200	150	164	180	**200**	225	256	299
300	226	246	270	**300**	337	385	448
400	301	328	360	**400**	449	513	597
500	376	410	450	**500**	562	641	746
1000	752	820	901	**1000**	1124	1282	1493
1500	1128	1230	1351	**1500**	1685	1923	2239
2000	1504	1639	1802	**2000**	2247	2564	2985
2500	1880	2049	2252	**2500**	2809	3205	3731
3000	2256	2459	2703	**3000**	3371	3846	4478
3500	2632	2869	3153	**3500**	3933	4487	5224
4000	3008	3279	3604	**4000**	4494	5128	5970
4500	3383	3689	4054	**4500**	5056	5769	6716
5000	3759	4098	4505	**5000**	5618	6410	7463

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-N0-03-50-004-001

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INTRODUCTION

This chapter provides the single engine performance data to be used for the conduct and monitoring of the flight following an engine failure.
The diversion strategy (descent and cruise speed schedules) shall be selected, and specified in the operator's routes specifications, as a function of the prevailing operational factors (e.g. obstacles clearance requirements and/or ETOPS operation).

FLIGHT PREPARATION

In readiness for a possible engine failure occurring during the flight, any flight shall be planned so as to comply with any of the following requirements, as applicable :
· obstacle clearance,
· oxygen,
· maximum diversion distance (ETOPS operation).
The following FCOM sections provide flight preparation and fuel planning information :
· 2.05.10 thru 2.05.60, for Standard Fuel Planning,
· 2.04.40, for Extended Range Operation (ETOPS) and associated fuel requirements.

STRATEGY

Depending on the prevailing operational constraints, the most appropriate diversion strategy shall be selected, out of the following options :

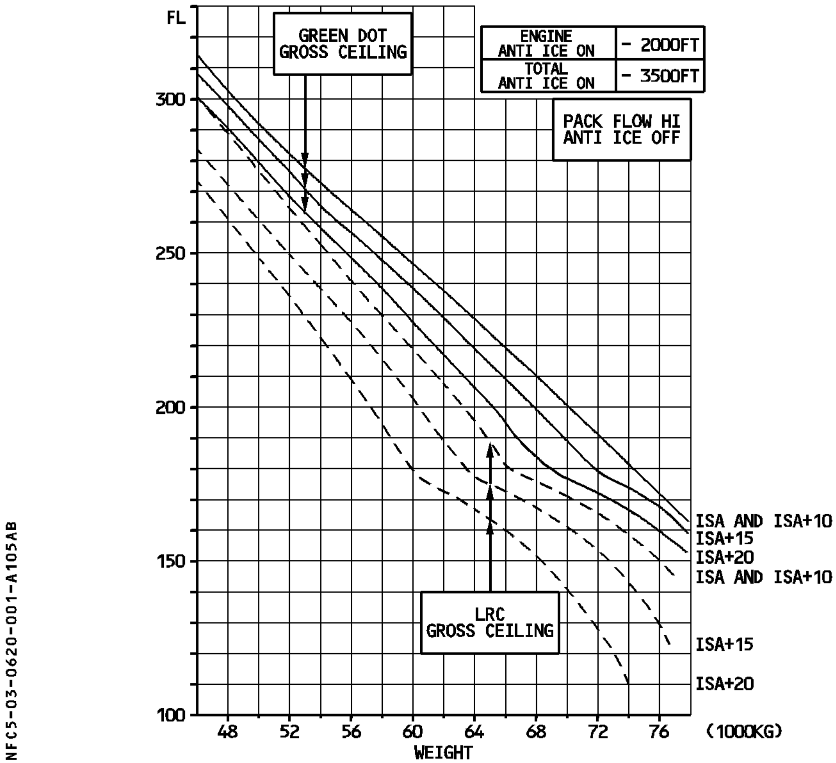
	STANDARD STRATEGY	OBSTACLE STRATEGY	FIXED SPEED STRATEGIES	
			320 KT	VMO
DESCENT TO CEILING	. M.78/300KT . MCT	. Green Dot Speed . MCT	. M.78/320KT . MCT	. M.80/350KT . MCT
CRUISE	LR ceiling LR speed	– Obstacle not cleared: Maintain Green Dot Speed at MCT – Obstacle cleared : Revert to standard strategy	FL per 2.04.40 MCT/320KT	FL per 2.04.40 MCT/350KT
DESCENT TO LANDING	IDLE/M.78/300KT/250KT			
Approx increase in fuel consumption compared with both engines operative	+ 33 %			

For ETOPS operations, any of the above diversion strategies can be used provided that the selected strategy and speed schedule is used in :

- establishing the area of operation (maximum diversion distance), as described in Section 2.04.40,
- calculating the diversion fuel requirements for the single engine ETOPS critical scenario, as provided in section 2.04.40,
- demonstrating the applicable obstacle clearance requirements (net flight path and net ceiling).

During the diversion, the flight crew is expected to use the planned speed schedule. However, based on the evaluation of the actual situation, the pilot in command has the authority to deviate from this planned one engine inoperative speed.

GROSS CEILINGS AT LONG RANGE AND GREEN DOT SPEEDS



Note : If severe icing conditions are encountered, ice formation may build up on non heated structure and therefore the ceiling will be reduced by 2000 feet.

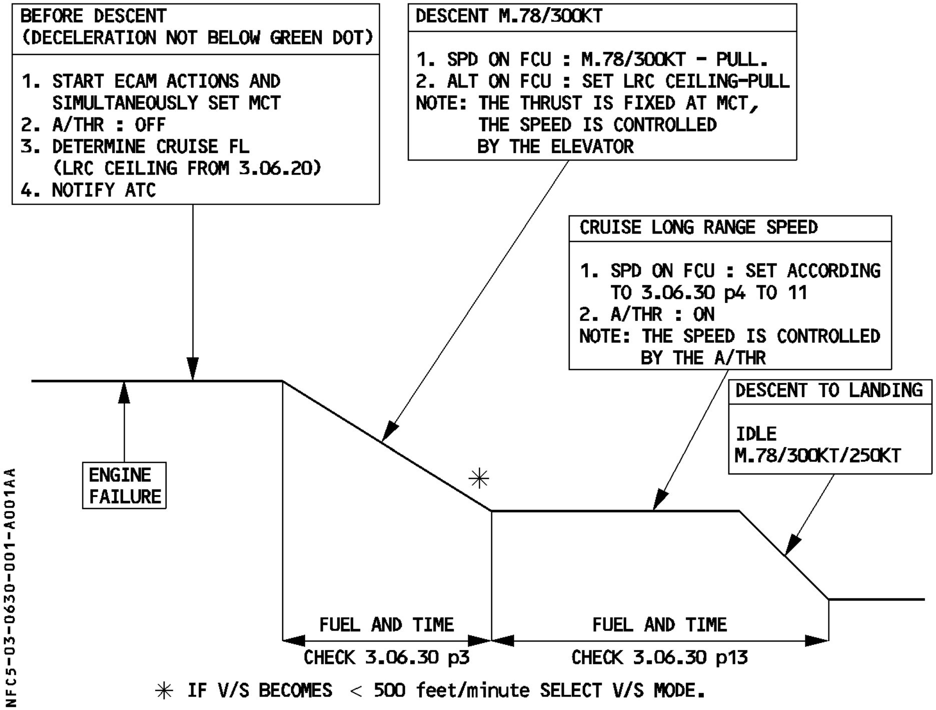
NET CEILING AT GREEN DOT SPEED

To obtain the net ceiling at green dot speed, apply the following corrections to the gross ceiling at green dot speed :

	WEIGHT (1000 KG)							
	48	52	56	60	64	68	72	76
≤ ISA + 10	– 4 700 FT	– 4 700 FT	– 5 400 FT	– 5 600 FT	– 6 600 FT	– 7 000 FT	– 7 000 FT	– 7 000 FT
ISA + 20	– 5 500 FT	– 5 900 FT	– 6 300 FT	– 6 300 FT	– 6 500 FT	– 6 500 FT	– 7 000 FT	– 7 500 FT

PROCEDURE

Unless a specific procedure has been established before dispatch (ETOPS, mountainous areas) the recommended procedure is as follows :



EXAMPLE

Given :

GW at engine failure	=	70 000 kg
FL at engine failure	=	310
Temperature	=	ISA
Distance to diversion airport	=	560 NM
No wind		

Find :

LRC ceiling : (see 3.06.20 p1)	FL170
Descent to cruise level : (FL170)	Distance = 235 – 85 = 150 NM
(see 3.06.30 p3)	Fuel = 1299 – 515 = 784 kg
	Time = 35.5 – 14 = 21.5 min

Cruise at long range speed (FL170) to landing
(Weight = 70 000 – 784 = 69 216 kg : Distance = 560 – 150 = 410 NM)
Determine on (3.06.30 p13) time and fuel consumption at ISA conditions and for a reference weight of 55 000 kg. Interpolate the remaining air distance of 410 NM at FL170.
Fuel : 2438 kg
Time : 1 h 25 min
Correction due to actual in-cruise weight
$\triangle$Fuel = + 26 kg per 1000 kg above reference weight
$\triangle$Fuel = + 26 kg × (69.2 – 55) ~ 370 kg

Result :

Total Fuel = 784 + 2438 + 370 = 3592 kg
Time = 1 h 25 min + 22 min = 1 h 47 min

DESCENT - M.78/300KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%		MINIMUM RATE OF DESCENT 500FT/MIN				
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	43.2	1459	292	MCT					241
370	41.5	1423	280	MCT	39.9	1411	268	MCT	252
350	39.8	1383	267	MCT	38.5	1379	258	MCT	264
330	38.2	1340	254	MCT	37.1	1342	247	MCT	277
310	36.6	1295	242	MCT	35.5	1299	235	MCT	289
290	35.0	1244	230	MCT	33.9	1249	223	MCT	300
270	32.6	1166	212	MCT	31.6	1171	205	MCT	300
250	29.7	1064	191	MCT	28.9	1079	185	MCT	300
230	26.0	931	165	V/S	25.8	965	163	MCT	300
220	24.0	857	151	V/S	24.0	897	151	MCT	300
210	22.0	784	137	V/S	22.0	821	137	V/S	300
200	20.0	711	124	V/S	20.0	743	124	V/S	300
190	18.0	638	111	V/S	18.0	666	111	V/S	300
180	16.0	566	98	V/S	16.0	591	98	V/S	300
170	14.0	495	85	V/S	14.0	515	85	V/S	300
160	12.0	423	72	V/S	12.0	441	72	V/S	300
150	10.0	352	60	V/S	10.0	366	60	V/S	300
140	8.0	281	47	V/S	8.0	292	47	V/S	300
100	.0	0	0	V/S	.0	0	0	V/S	300

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	– 0.1 %	– 0.5 %	–
FUEL	+ 2 %	+ 5.5 %	+ 0.3 %
DISTANCE	– 0.1 %	– 0.5 %	+ 0.3 %

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R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA
CG=33.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	78.6	.432	80.7	.451	82.2	.463	83.4	.475	84.9	.493	86.6	.516
	1747	238	1762	240	1741	237	1720	234	1722	234	1742	235
	157.7	275	162.2	286	167.3	291	172.4	297	177.1	305	181.8	317
50	80.1	.444	81.7	.457	83.1	.469	84.4	.484	85.9	.503	87.7	.528
	1842	245	1824	243	1803	240	1794	239	1804	239	1830	241
	153.9	283	158.7	290	163.5	295	168.2	302	172.7	311	177.1	324
52	81.1	.451	82.6	.463	83.9	.475	85.4	.493	87.1	.516	88.8	.540
	1909	249	1887	246	1867	243	1874	243	1897	245	1923	247
	150.7	288	155.3	293	159.9	299	164.2	308	168.5	320	172.5	332
54	82.1	.456	83.6	.469	84.8	.483	86.3	.501	88.1	.526	89.8	.549
	1973	252	1953	250	1941	248	1951	248	1982	250	2004	251
	147.6	291	152.0	297	156.3	303	160.4	313	164.4	326	168.5	338
56	83.0	.462	84.3	.475	85.8	.492	87.5	.514	89.1	.537	90.5	.554
	2038	255	2020	253	2024	252	2046	254	2069	255	2068	253
	144.7	295	148.9	301	152.8	309	156.8	321	160.6	332	164.6	340
58	83.9	.468	85.2	.482	86.7	.499	88.4	.523	90.1	.546	91.1	.555
	2104	259	2094	257	2101	256	2131	259	2156	260	2121	254
	141.8	298	145.8	305	149.5	314	153.3	327	156.9	338	160.9	341
60	84.7	.473	86.1	.490	87.7	.511	89.3	.532	90.9	.554	92.0	.561
	2172	262	2175	261	2197	263	2212	263	2236	264	2198	257
	139.1	302	142.7	310	146.4	322	150.0	332	153.5	343	156.8	345
62	85.4	.479	86.9	.497	88.6	.520	90.3	.543	91.5	.556	92.9	.569
	2244	265	2252	265	2282	267	2309	269	2290	265	2291	261
	136.4	306	139.8	315	143.4	327	146.7	339	150.3	344	152.6	350
64	86.2	.487	87.8	.506	89.4	.528	91.1	.552	92.0	.557	93.3	.564
	2322	269	2338	270	2362	271	2396	273	2343	265	2316	258
	133.7	311	137.1	321	140.5	332	143.7	344	147.2	345	149.6	346
66	87.1	.494	88.7	.516	90.3	.537	91.8	.556	92.9	.565	93.3	.550
	2403	273	2429	275	2452	276	2464	275	2434	269	2304	251
	131.2	315	134.5	327	137.6	337	140.8	347	143.6	350	146.5	338
68	87.8	.500	89.5	.523	91.2	.547	92.3	.557	92.9	.553	93.3	.527
	2480	277	2512	279	2550	281	2517	276	2424	263	2286	240
	128.8	319	131.9	331	134.9	344	138.2	348	141.3	343	141.6	324
70	88.7	.510	90.3	.531	91.9	.554	92.8	.559	93.0	.539		
	2572	282	2596	283	2630	285	2574	277	2413	256		
	126.5	325	129.5	336	132.4	348	135.5	349	138.3	334		
72	89.5	.518	91.1	.540	92.5	.557	93.7	.567	93.0	.517		
	2662	287	2694	289	2697	287	2673	281	2397	246		
	124.2	331	127.0	342	130.0	350	132.4	354	133.7	320		
74	90.2	.525	91.9	.549	93.0	.558	94.4	.570				
	2747	291	2790	293	2750	287	2750	283				
	122.1	335	124.7	348	127.7	351	129.4	356				
76	91.0	.532	92.6	.555	93.5	.560	94.7	.566				
	2834	295	2870	297	2806	288	2783	281				
	119.9	340	122.6	352	125.4	352	126.9	353				

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 3 %	△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA CG=33.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL210**		**FL220**		**FL230**		**FL240**		**FL250**		**FL260**	
48	87.4 1752 184.1	.527 236 323	88.4 1774 186.2	.542 238 330	89.1 1773 188.8	.551 237 335	89.5 1744 191.4	.552 233 334	90.2 1736 193.3	.558 230 336	91.1 1754 194.3	.568 230 341
50	88.7 1849 179.1	.541 242 331	89.4 1850 181.5	.551 242 336	89.8 1823 184.0	.553 238 335	90.4 1808 186.0	.557 234 336	91.4 1828 186.9	.568 234 342	92.5 1854 187.7	.580 235 348
52	89.6 1927 174.8	.550 247 337	90.1 1904 177.1	.553 243 337	90.5 1882 179.2	.556 239 337	91.5 1903 180.0	.567 239 343	92.6 1927 180.8	.579 239 348	93.4 1905 182.7	.581 235 348
54	90.3 1986 170.6	.554 248 339	90.7 1958 172.8	.555 244 338	91.7 1979 173.6	.566 244 343	92.7 1998 174.5	.577 243 349	93.4 1971 176.3	.577 238 347	93.4 1885 178.3	.561 226 336
56	90.9 2038 166.7	.555 249 340	91.8 2055 167.6	.565 248 344	92.8 2072 168.5	.575 248 349	93.4 2041 170.2	.575 242 347	93.4 1951 172.0	.558 230 336	93.4 1850 169.6	.523 211 314
58	91.9 2128 162.1	.564 253 345	92.9 2146 162.8	.574 252 349	93.4 2113 164.5	.573 247 348	93.4 2022 166.2	.556 234 336	93.4 1918 163.9	.522 215 314		
60	92.9 2219 157.6	.571 256 350	93.4 2185 159.1	.570 251 348	93.4 2095 160.8	.555 239 337	93.4 1991 158.9	.523 220 316				
62	93.3 2251 154.2	.567 254 347	93.4 2169 155.7	.554 243 338	93.4 2066 154.3	.525 225 319						
64	93.4 2238 151.0	.552 247 338	93.4 2143 149.8	.527 231 321								
66	93.4 2218 145.6	.528 236 323										
68												
70												
72												
74												
76												

ENGINE ANTI ICE ON △FUEL = + 3 %	**TOTAL ANTI ICE ON** △FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+10
CG=33.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	79.9	.429	82.0	.448	83.6	.461	84.9	.474	86.5	.492	88.2	.514
	1780	237	1794	238	1777	236	1763	234	1768	233	1787	235
	156.9	279	161.2	289	166.2	295	171.1	302	175.7	311	180.4	322
50	81.3	.441	83.0	.455	84.6	.468	86.0	.483	87.5	.501	89.2	.523
	1872	244	1862	242	1847	240	1842	238	1848	238	1866	239
	153.1	287	157.6	294	162.3	300	166.9	307	171.3	317	175.8	328
52	82.4	.448	84.1	.461	85.5	.475	87.0	.493	88.7	.513	90.4	.536
	1944	247	1931	246	1919	244	1924	243	1939	244	1963	245
	149.7	291	154.2	298	158.6	304	162.8	313	167.1	324	171.2	336
54	83.5	.454	85.1	.468	86.4	.483	88.0	.501	89.7	.523	91.5	.549
	2016	251	2000	249	1995	248	2002	247	2025	249	2061	251
	146.6	295	150.9	302	155.0	309	159.1	319	163.1	330	166.8	344
56	84.5	.461	85.9	.474	87.4	.491	89.0	.512	90.8	.535	92.3	.553
	2086	255	2072	253	2077	252	2094	253	2120	254	2126	253
	143.6	300	147.7	306	151.6	315	155.5	326	159.2	337	163.0	347
58	85.5	.467	86.7	.481	88.2	.498	90.0	.521	91.8	.547	92.9	.554
	2158	258	2147	256	2153	256	2179	257	2221	260	2180	254
	140.7	304	144.6	310	148.3	319	152.0	331	155.4	345	159.3	347
60	86.2	.473	87.6	.489	89.2	.508	90.9	.530	92.6	.553	93.8	.561
	2228	262	2229	261	2242	261	2267	262	2298	263	2264	257
	137.9	307	141.6	316	145.2	326	148.7	337	152.0	349	155.2	351
62	87.0	.479	88.5	.496	90.1	.518	92.0	.542	93.2	.555	94.6	.565
	2302	265	2308	264	2333	266	2373	268	2353	264	2345	259
	135.3	311	138.7	320	142.2	332	145.3	345	148.9	350	151.1	354
64	87.8	.486	89.3	.504	91.1	.527	92.8	.551	93.8	.556	95.0	.561
	2381	269	2391	269	2423	271	2463	273	2409	265	2384	257
	132.6	316	136.0	325	139.2	337	142.3	350	145.8	351	147.5	352
66	88.6	.493	90.3	.514	92.0	.537	93.5	.555	94.6	.562	95.0	.546
	2462	273	2488	274	2522	276	2530	275	2497	268	2372	250
	130.1	320	133.3	332	136.4	344	139.5	353	142.1	355	144.3	342
68	89.4	.499	91.1	.522	92.9	.547	94.0	.556	94.7	.551	95.1	.523
	2540	276	2578	279	2623	281	2585	275	2489	262	2354	239
	127.7	324	130.7	337	133.6	350	136.9	354	139.7	348	139.1	328
70	90.2	.508	91.9	.530	93.7	.554	94.5	.557	94.7	.536		
	2633	281	2666	283	2706	285	2642	276	2477	255		
	125.4	330	128.3	342	131.1	355	134.2	354	136.5	338		
72	91.1	.517	92.8	.540	94.2	.556	95.4	.564	94.7	.513		
	2730	286	2768	288	2769	286	2736	279	2461	244		
	123.1	336	125.9	348	128.8	356	131.1	359	131.7	324		
74	91.9	.525	93.6	.548	94.7	.557	96.2	.571				
	2821	291	2865	293	2822	287	2838	283				
	120.9	341	123.5	354	126.5	357	128.0	363				
76	92.6	.532	94.4	.555	95.2	.559	96.4	.564				
	2909	295	2952	297	2882	288	2848	279				
	118.9	346	121.4	358	124.2	358	125.8	358				

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 3 %	△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+10
CG=33.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
48	89.0	.524	90.0	.538	90.9	.550	91.3	.552	92.0	.557	93.0	.568
	1792	235	1812	236	1822	237	1796	232	1791	230	1808	229
	182.7	327	184.7	335	187.0	341	189.5	340	191.2	343	192.2	347
50	90.2	.537	91.1	.550	91.6	.552	92.2	.557	93.2	.568	94.3	.577
	1887	241	1900	241	1876	237	1867	235	1886	234	1901	233
	177.7	335	179.9	342	182.2	342	184.0	344	184.9	349	185.6	353
52	91.3	.549	91.8	.552	92.4	.556	93.4	.567	94.3	.575	95.0	.573
	1979	246	1957	242	1942	239	1963	239	1975	237	1952	232
	173.1	343	175.4	343	177.3	344	178.1	350	178.8	353	179.7	351
54	92.0	.553	92.5	.554	93.5	.565	94.4	.572	95.1	.573	95.3	.557
	2041	248	2014	243	2038	243	2044	241	2031	237	1954	225
	169.0	345	171.0	344	171.8	350	172.6	353	173.3	352	174.5	341
56	92.7	.554	93.7	.564	94.4	.569	95.2	.571	95.2	.554	95.3	.518
	2095	248	2114	248	2115	245	2107	241	2020	229	1917	208
	165.0	346	165.9	351	166.7	353	167.3	352	168.6	341	165.2	317
58	93.7	.563	94.5	.568	95.2	.570	95.2	.553	95.2	.517		
	2191	252	2189	249	2183	245	2091	233	1986	213		
	160.4	351	161.2	353	161.7	353	163.1	341	159.9	318		
60	94.5	.566	95.2	.568	95.2	.552	95.2	.518				
	2265	254	2254	250	2165	237	2059	218				
	156.0	353	156.6	353	157.9	342	155.2	320				
62	95.1	.565	95.2	.551	95.2	.520						
	2320	253	2238	242	2135	223						
	151.9	352	153.1	343	151.0	322						
64	95.1	.549	95.2	.523								
	2307	246	2212	229								
	148.5	343	146.9	325								
66	95.1	.524										
	2288	234										
	142.9	327										
68												
70												
72												
74												
76												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 3 %	△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=33.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	80.5	.427	82.7	.447	84.3	.460	85.7	.474	87.3	.492	89.0	.513
	1792	236	1814	238	1798	236	1785	234	1791	233	1806	234
	156.4	280	160.7	291	165.6	298	170.4	304	175.0	313	179.6	324
50	82.0	.440	83.8	.454	85.3	.467	86.7	.483	88.3	.500	90.1	.523
	1890	243	1885	242	1869	239	1865	238	1868	237	1890	239
	152.5	288	157.0	296	161.7	302	166.2	310	170.6	319	175.0	331
52	83.2	.448	84.9	.461	86.2	.474	87.8	.492	89.4	.512	91.3	.536
	1969	247	1956	246	1942	243	1947	243	1960	243	1992	245
	149.1	294	153.6	300	158.0	307	162.2	316	166.4	326	170.3	339
54	84.2	.454	85.8	.467	87.2	.483	88.7	.500	90.5	.522	92.4	.548
	2041	251	2026	249	2021	247	2025	247	2049	248	2089	251
	146.0	298	150.3	304	154.4	312	158.4	321	162.4	333	166.0	347
56	85.2	.460	86.6	.474	88.2	.491	89.8	.511	91.6	.534	93.1	.552
	2112	255	2098	252	2102	252	2119	252	2148	254	2154	253
	143.0	302	147.1	309	150.9	317	154.8	328	158.4	340	162.2	349
58	86.2	.466	87.5	.480	89.0	.498	90.8	.520	92.7	.547	93.7	.554
	2181	258	2173	256	2180	255	2208	257	2254	260	2208	253
	140.2	306	144.0	313	147.7	322	151.3	334	154.6	348	158.6	350
60	86.9	.472	88.4	.488	90.0	.508	91.8	.530	93.5	.553	94.6	.559
	2253	261	2255	260	2270	261	2301	262	2329	263	2288	256
	137.4	310	141.0	318	144.6	328	148.0	340	151.3	352	154.5	353
62	87.7	.478	89.2	.495	91.0	.517	92.8	.542	94.1	.554	94.7	.548
	2327	264	2336	264	2364	266	2407	268	2384	264	2291	251
	134.7	314	138.1	323	141.5	335	144.6	348	148.2	353	151.4	347
64	88.6	.485	90.1	.503	91.9	.526	93.7	.551	94.3	.549	94.7	.532
	2411	269	2422	268	2454	270	2496	273	2405	261	2279	243
	132.1	318	135.4	328	138.6	340	141.7	354	145.6	350	147.6	336
66	89.4	.493	91.1	.514	92.8	.536	94.3	.554	94.3	.537	94.8	.507
	2495	273	2521	274	2555	276	2563	275	2395	255	2263	231
	129.5	323	132.7	335	135.7	347	138.9	356	142.8	342	141.8	321
68	90.2	.499	91.9	.522	93.8	.547	94.9	.556	94.4	.521		
	2575	276	2612	279	2660	281	2618	275	2384	248		
	127.1	327	130.2	340	133.0	354	136.2	357	139.3	332		
70	91.0	.508	92.8	.530	94.6	.555	95.5	.558	94.4	.497		
	2669	281	2701	283	2750	286	2684	277	2367	236		
	124.8	333	127.7	345	130.5	359	133.5	358	133.8	317		
72	91.9	.517	93.7	.540	95.2	.558	96.1	.561				
	2766	286	2806	288	2814	287	2751	278				
	122.6	339	125.3	352	128.2	361	130.9	360				
74	92.7	.524	94.6	.551	95.7	.560	96.1	.550				
	2855	290	2917	294	2874	288	2741	272				
	120.4	344	123.0	359	125.9	362	128.7	353				
76	93.5	.531	95.4	.559	96.0	.556	96.2	.536				
	2944	294	3013	299	2897	286	2730	265				
	118.4	348	120.9	364	124.2	360	126.0	344				

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 3 %	△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=33.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
48	89.8	.523	90.9	.538	91.7	.550	92.2	.551	92.9	.557	93.9	.567
	1812	234	1837	236	1848	236	1821	232	1817	230	1835	229
	181.9	330	183.9	338	186.1	344	188.5	343	190.3	346	191.2	351
50	91.1	.537	92.0	.550	92.4	.551	93.1	.557	94.1	.566	94.8	.569
	1915	241	1929	241	1902	237	1895	235	1911	234	1904	230
	176.8	339	179.0	345	181.3	345	183.0	347	183.9	351	184.6	352
52	92.2	.549	92.7	.552	93.3	.556	94.2	.565	94.9	.567	95.0	.553
	2008	246	1985	242	1972	239	1987	238	1978	234	1901	223
	172.3	346	174.5	346	176.3	348	177.2	352	177.9	352	179.7	342
54	92.9	.552	93.4	.554	94.3	.563	95.0	.565	94.9	.549	95.0	.519
	2068	247	2045	243	2060	242	2048	238	1966	226	1872	209
	168.2	348	170.1	348	170.9	352	171.8	352	173.4	341	171.3	321
56	93.6	.553	94.4	.562	95.0	.561	95.0	.547	95.0	.516		
	2123	248	2136	247	2114	242	2034	230	1938	212		
	164.3	349	165.1	353	166.1	351	167.5	341	165.3	320		
58	94.5	.560	95.0	.558	95.0	.545	95.0	.517				
	2212	251	2180	245	2102	234	2013	217				
	159.6	353	160.8	351	162.0	341	160.0	322				
60	94.8	.553	95.0	.542	95.0	.517						
	2237	248	2169	238	2083	222						
	155.9	349	156.9	340	155.1	323						
62	94.9	.537	95.0	.516								
	2224	240	2151	226								
	152.2	338	150.6	324								
64	94.9	.512										
	2208	229										
	146.1	323										
66												
68												
70												
72												
74												
76												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 3 %	△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	81.1	.426	83.4	.447	85.1	.460	86.5	.473	88.1	.491	89.8	.512
	1807	235	1835	238	1819	236	1807	233	1814	233	1828	234
	155.9	282	160.0	294	164.9	300	169.7	307	174.3	316	178.8	327
50	82.7	.439	84.5	.454	86.1	.467	87.5	.482	89.1	.499	90.9	.523
	1911	243	1907	242	1892	239	1887	238	1891	237	1917	239
	152.0	291	156.4	298	161.0	305	165.5	312	169.9	321	174.1	334
52	83.9	.448	85.6	.461	87.0	.474	88.5	.491	90.2	.511	92.2	.537
	1995	247	1979	245	1964	243	1969	242	1985	243	2022	245
	148.5	296	153.0	303	157.4	309	161.5	318	165.7	329	169.5	343
54	85.0	.454	86.6	.467	87.9	.482	89.5	.499	91.3	.521	93.2	.548
	2066	251	2049	249	2044	247	2049	246	2074	248	2117	251
	145.4	300	149.7	307	153.8	314	157.7	323	161.7	335	165.3	350
56	86.0	.460	87.4	.473	88.9	.490	90.6	.510	92.4	.533	94.0	.552
	2136	254	2123	252	2129	252	2145	252	2175	254	2182	252
	142.5	304	146.5	311	150.3	320	154.1	331	157.7	343	161.5	352
58	86.9	.466	88.2	.480	89.8	.498	91.6	.520	93.5	.546	94.3	.547
	2207	257	2200	256	2209	255	2236	257	2283	260	2205	250
	139.6	308	143.4	315	147.0	325	150.7	337	153.9	351	158.4	349
60	87.6	.471	89.2	.488	90.8	.508	92.6	.530	94.0	.546	94.3	.534
	2277	261	2286	260	2302	261	2331	262	2320	260	2196	244
	136.8	312	140.4	321	143.9	331	147.3	343	151.3	351	155.2	341
62	88.4	.477	90.0	.495	91.8	.517	93.7	.542	94.0	.536	94.3	.517
	2354	264	2367	264	2396	266	2440	268	2313	255	2185	236
	134.2	316	137.5	325	140.9	337	144.0	351	149.0	345	151.0	330
64	89.3	.485	90.9	.503	92.7	.526	94.6	.552	94.0	.523	94.3	.490
	2442	269	2451	268	2485	270	2538	273	2305	249	2166	223
	131.5	321	134.8	330	138.0	343	141.0	358	146.0	337	144.5	313
66	90.2	.493	91.9	.513	93.7	.536	95.3	.556	94.0	.507		
	2529	273	2552	274	2588	276	2608	276	2296	241		
	129.0	326	132.1	337	135.1	350	138.3	361	142.0	326		
68	91.0	.499	92.7	.522	94.8	.550	95.8	.556	94.0	.480		
	2608	276	2645	278	2711	283	2649	275	2272	227		
	126.6	330	129.6	343	132.4	359	135.9	360	135.8	309		
70	91.8	.508	93.6	.530	95.6	.557	95.8	.546				
	2704	281	2736	283	2792	287	2642	270				
	124.3	336	127.2	348	130.2	363	134.0	354				
72	92.7	.517	94.8	.545	95.6	.550	95.8	.535				
	2802	286	2870	291	2787	283	2633	264				
	122.0	342	124.7	358	128.7	359	131.5	346				
74	93.5	.524	95.3	.548	95.6	.541	95.8	.519				
	2894	291	2928	293	2781	278	2623	257				
	119.9	347	123.1	360	127.0	353	128.3	336				
76	94.5	.536	95.3	.542	95.6	.531	95.8	.496				
	3009	297	2923	289	2773	273	2606	245				
	117.8	355	121.8	356	124.8	346	123.4	322				

ENGINE ANTI ICE ON
△FUEL = + 3 %

TOTAL ANTI ICE ON
△FUEL = + 7 %

R

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=33.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL210**		**FL220**		**FL230**		**FL240**		**FL250**		**FL260**	
48	90.7	.523	91.7	.538	92.6	.549	93.0	.550	93.8	.557	94.6	.561
	1837	234	1862	236	1873	236	1845	232	1843	230	1842	227
	181.1	333	183.0	341	185.2	347	187.6	346	189.3	349	190.2	350
50	92.0	.537	92.9	.550	93.3	.551	94.0	.556	94.6	.558	94.8	.548
	1943	241	1957	241	1929	237	1922	234	1908	230	1848	221
	176.0	342	178.1	348	180.4	348	182.1	350	183.3	350	185.0	342
52	93.1	.549	93.6	.551	94.2	.555	94.6	.553	94.7	.540	94.8	.520
	2037	246	2012	242	1998	239	1967	233	1897	223	1832	210
	171.5	349	173.7	350	175.5	350	177.0	348	178.5	339	177.4	325
54	93.8	.552	94.3	.554	94.6	.549	94.6	.535	94.7	.512		
	2096	247	2073	243	2025	236	1955	225	1880	210		
	167.4	351	169.3	351	171.1	346	172.3	337	170.6	321		
56	94.4	.552	94.5	.544	94.6	.531	94.7	.507				
	2149	247	2082	239	2013	228	1938	213				
	163.5	351	165.5	345	166.4	335	164.4	319				
58	94.4	.539	94.5	.526	94.6	.502						
	2140	241	2071	230	1996	215						
	160.2	343	161.0	333	158.8	317						
60	94.4	.521										
	2128	233										
	155.9	332										
62	94.4	.494										
	2110	221										
	149.0	314										
64												
66												
68												
70												
72												
74												
76												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 3 %	△FUEL = + 7 %

IN CRUISE QUICK CHECK AT LONG RANGE SPEED

R The following in cruise quick check tables allow the flight crew to determine the fuel consumption and time required to cover a given air distance from any moment in cruise to landing, with one engine inoperative.
R These tables are established for :
R – Cruise Mach number : long range
R – Descent profile : M.78/300kt/250kt
R – Approach and landing : 120 kg or 270 lb – 6 minute IMC
R – ISA
R – CG = 33 %
R – Pack Flow HI
R – Anti ice OFF

R *Note :* *1. In the tables, the asterisk (*) means that a step climb of 4000 feet must be flown to reach the corresponding flight level.*
R *2. The flight level shown on top of each column is the final flight level.*
R *3. For each degree Celsius above ISA temperature apply a fuel correction of 0.015 (kg/°C/NM) × △ ISA (°C) × air distance (NM) or 0.033 (lb/°C/NM) × △ ISA (°C) × air distance (NM).*

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The in cruise quick check tables are based on a reference initial weight.
A correction on the fuel consumption has to be made, when the actual initial weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference initial weight (see example 3.06.30 p2).

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 55000 KG PACK FLOW HI ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	**150**	**200**	**220**	**240**	**250**	**FL100 FL150**	**FL200 FL220**	**FL240 FL250**
200	1357 0.47	1198 0.45	1075 0.42	1030 0.42	997 0.41	974 0.41	10	8	8
250	1695 0.58	1514 0.55	1373 0.51	1320 0.51	1285 0.49	1259 0.50	14	12	12
300	2031 1.08	1828 1.05	1669 1.00	1609 1.00	1571 0.58	1544 0.58	17	16	16
350	2367 1.19	2142 1.14	1965 1.09	1898 1.08	1856 1.07	1827 1.07	21	19	21
400	2701 1.29	2454 1.24	2259 1.18	2185 1.17	2140 1.15	2110 1.15	24	23	25
450	3034 1.39	2765 1.34	2552 1.27	2471 1.26	2422 1.24	2392 1.24	28	27	29
500	3366 1.50	3075 1.44	2845 1.36	2756 1.35	2704 1.33	2673 1.32	31	30	33
550	3697 2.00	3383 1.54	3136 1.45	3040 1.44	2983 1.42	2954 1.41	35	34	37
600	4026 2.11	3691 2.04	3427 1.54	3323 1.53	3262 1.51	3234 1.49	38	38	41
650	4355 2.21	3997 2.14	3716 2.03	3605 2.02	3539 1.59	3513 1.57	42	41	45
700	4683 2.32	4303 2.24	4005 2.12	3886 2.11	3815 2.08	3791 2.06	45	45	50
750	5009 2.42	4607 2.34	4292 2.21	4166 2.20	4091 2.17	4066 2.14	49	48	54
800	5334 2.53	4910 2.44	4578 2.30	4446 2.29	4366 2.26	4339 2.23	52	52	58
850	5659 3.04	5212 2.54	4863 2.39	4724 2.38	4640 2.35	4610 2.32	56	55	61
900	5982 3.14	5513 3.04	5147 2.49	5001 2.47	4913 2.43	4880 2.41	59	58	65
950	6305 3.25	5813 3.15	5430 2.58	5278 2.55	5184 2.52	5150 2.50	62	62	69
1000	6626 3.35	6112 3.25	5712 3.07	5554 3.04	5455 3.01	5418 2.58	66	65	73
1050	6945 3.46	6410 3.35	5994 3.16	5828 3.13	5725 3.10	5684 3.07	69	69	77
1100	7264 3.57	6707 3.45	6274 3.26	6102 3.22	5993 3.19	5950 3.16	73	72	80
1150	7582 4.08	7004 3.55	6553 3.35	6375 3.31	6261 3.28	6215 3.25	76	75	84
1200	7899 4.18	7299 4.06	6830 3.45	6647 3.40	6526 3.37	6478 3.34	79	79	88
1250	8215 4.29	7594 4.16	7106 3.54	6918 3.49	6789 3.46	6740 3.43	83	82	92
1300	8530 4.40	7887 4.26	7382 4.04	7188 3.58	7051 3.55	7001 3.52	86	86	96
1350	8844 4.51	8180 4.36	7656 4.13	7458 4.07	7312 4.04	7262 4.01	90	89	99
1400	9155 5.02	8472 4.47	7930 4.23	7726 4.16	7572 4.13	7521 4.10	93	92	103

ENGINE ANTI ICE ON △FUEL = + 3 %	**TOTAL ANTI ICE ON** △FUEL = + 7 %

FLIP23A A320–212 CFM 56–5A3 3610 03301.001011 0300250 .7801 .00100 120 0300350 55 0 100100 40100 18590 FCOM-N0–03–06–30–013–105

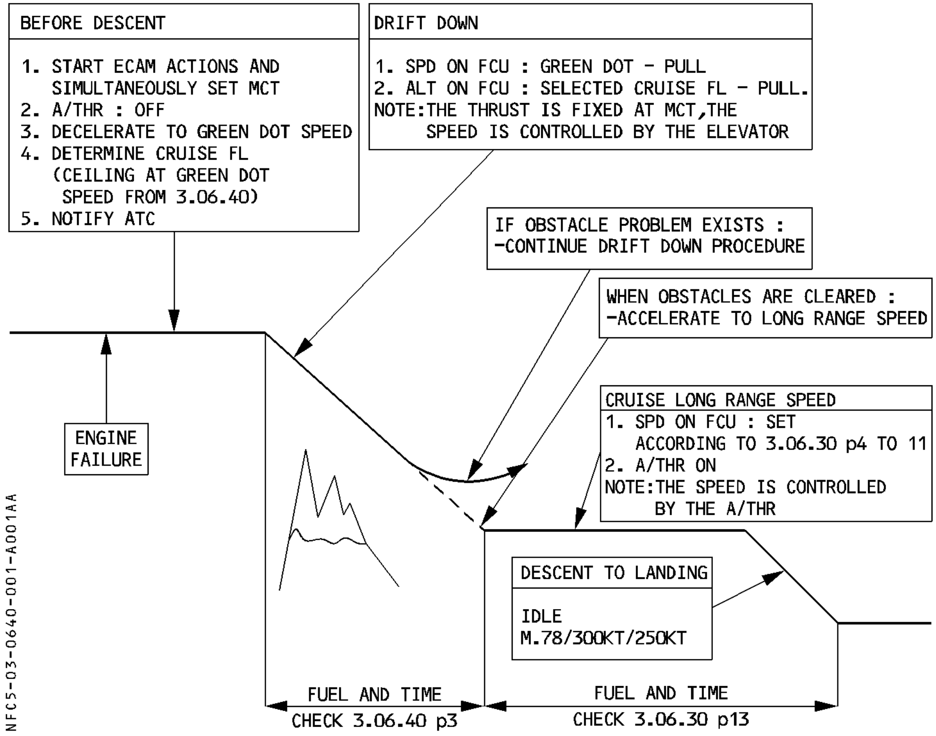
PROCEDURE

In order to maintain the highest possible level, the drift down procedure must be adopted. This requires maximum continuous thrust on the remaining engine at green dot speed.

- If, having reached drift down ceiling altitude, an obstacle problem remains, the drift down procedure must be maintained so as to fly an ascending cruise profile.
- If, after drift down, no obstacle problem remains, the speed should be allowed to increase to long range speed and maintained. The subsequent cruise should be made using either the long range speed by adjusting it as a function of aircraft weight or by maintaining the initial cruise speed.

Note : Due to the fact that the long range speed is higher than the green dot speed, the cruise will be made at an altitude lower than the drift down ceiling.

R



EXAMPLE

Given :

GW at engine failure	=	62000 kg
FL at engine failure	=	350
Temperature	=	ISA
Distance to destination airport	=	1500 NM

No wind

Find :

Level off (drift down ceiling) : 24300 ft
(see 3.06.40 p3)
Distance : 341 NM
Fuel : 1900 kg
Time : 1 h 04 min
LRC ceiling : (see 3.06.20 p1) FL208
Cruise at long range speed (FL200) to landing
(weight = 62000 – 1900 = 60100 kg : Distance = 1500 – 341 = 1159 NM)
Determine on (3.06.30 p13) time and fuel consumption at ISA conditions for a reference weight of 55000 kg. Interpolate the remaining air distance of 1159 NM at FL200.
Fuel : 6603 kg
Time : 3 h 37 min
Correction due to actual in-cruise weight
$\triangle$Fuel = + 75 kg per 1000 kg above reference weight
$\triangle$Fuel = + 75 kg × (60.1 – 55) = 383 kg

Result :

Total Fuel = 6603 + 383 + 1900 = 8886 kg
Time = 3 h 37 min + 1 h 04 min = 4 h 41 min

R

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA CG=33.0%	**DISTANCE (NM) TIME (MIN)** **INITIAL SPEED(KT) FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
50				12 2 194 .1 28900	188 37 196 1.0 29400	241 46 198 1.2 29500	273 52 200 1.3 29600	298 56 202 1.4 29600	318 59 204 1.5 29600
52				140 27 198 .8 28300	217 42 200 1.1 28500	258 49 202 1.3 28600	285 54 204 1.4 28600	308 58 206 1.5 28700	328 61 208 1.6 28700
54				185 36 202 1.0 27500	240 46 204 1.3 27600	273 52 206 1.4 27700	297 56 208 1.5 27700	319 60 210 1.6 27800	338 63 212 1.7 27800
56			128 25 204 .7 26400	215 42 206 1.2 26700	258 50 208 1.4 26800	287 55 210 1.5 26800	310 59 212 1.6 26800	329 62 214 1.7 26900	347 64 216 1.7 26900
58			179 35 208 1.1 25700	238 46 210 1.4 25800	273 52 212 1.5 25900	299 57 214 1.7 25900	321 60 216 1.7 26000	339 63 218 1.8 26000	355 66 220 1.8 26000
60		111 22 210 .7 24600	206 40 212 1.3 24900	250 48 214 1.5 25000	282 54 216 1.6 25100	305 58 218 1.7 25100	325 61 220 1.8 25100	343 64 222 1.9 25200	358 66 224 1.9 25200
62		170 33 214 1.1 23900	234 45 216 1.5 24000	272 52 218 1.6 24100	300 57 220 1.8 24200	321 61 222 1.9 24200	341 64 224 1.9 24300	358 66 226 2.0 24300	372 68 228 2.0 24300
64	79 16 216 .5 22700	205 40 218 1.3 23100	254 49 220 1.6 23200	287 55 222 1.8 23300	311 59 224 1.9 23300	333 62 226 2.0 23400	350 65 228 2.0 23400	366 67 230 2.1 23400	382 70 232 2.1 23500
66	156 31 220 1.1 22100	228 44 222 1.5 22300	270 52 224 1.7 22400	300 57 226 1.9 22500	323 61 228 2.0 22500	342 64 230 2.1 22500	358 66 232 2.1 22600	375 69 234 2.2 22600	389 71 236 2.2 22600
68	196 38 224 1.4 21400	250 48 226 1.7 21500	285 55 228 1.9 21600	312 59 230 2.0 21600	333 63 232 2.1 21700	351 65 234 2.2 21700	367 68 236 2.2 21700	382 70 238 2.3 21800	
70	224 44 228 1.6 20600	268 52 230 1.8 20700	299 57 232 2.0 20800	324 61 234 2.1 20800	343 64 236 2.2 20900	361 67 238 2.3 20900	376 69 240 2.3 20900	392 72 242 2.4 20900	
72	246 47 232 1.8 19800	284 54 234 2.0 19900	312 59 236 2.1 20000	335 63 238 2.3 20000	354 66 240 2.3 20000	370 69 242 2.4 20100	387 71 244 2.5 20100	401 73 246 2.5 20100	
74	270 52 236 2.0 19000	301 57 238 2.2 19100	325 61 240 2.3 19100	346 65 242 2.4 19200	365 68 244 2.5 19200	381 70 246 2.5 19200	397 72 248 2.6 19200		
76	296 57 240 2.2 18100	325 62 242 2.4 18100	348 66 244 2.5 18200	368 69 246 2.6 18200	385 71 248 2.6 18300	401 74 250 2.7 18300	415 76 252 2.8 18300		
78	264 50 244 2.0 17500	295 55 246 2.2 17500	319 59 248 2.3 17500	339 63 250 2.4 17500	357 65 252 2.5 17600	374 68 254 2.5 17600	390 70 256 2.6 17600		

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 5 %	+ 5 %	+ 15 %	– 100 FT
TOTAL ANTI ICE ON	+ 14 %	+ 13 %	+ 15 %	– 300 FT

R

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+10 CG=33.0%	DISTANCE (NM) TIME (MIN) INITIAL SPEED(KT) FUEL(1000KG) LEVEL OFF (FT)

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
50				33 6 194 .2 28900	195 37 196 1.0 29300	248 47 198 1.3 29500	281 52 200 1.4 29500	307 57 202 1.5 29600	328 60 204 1.6 29600
52				146 28 198 .8 28300	222 42 200 1.2 28500	265 50 202 1.4 28500	295 55 204 1.5 28600	318 59 206 1.6 28600	337 62 208 1.6 28700
54				191 37 202 1.1 27500	246 46 204 1.3 27600	281 53 206 1.5 27700	307 57 208 1.6 27700	328 60 210 1.7 27700	347 63 212 1.7 27800
56			135 26 204 .8 26400	221 42 206 1.3 26600	264 50 208 1.5 26700	294 55 210 1.6 26800	318 59 212 1.7 26800	338 62 214 1.8 26900	357 65 216 1.8 26900
58			184 35 208 1.1 25600	244 46 210 1.4 25800	281 53 212 1.6 25900	307 57 214 1.7 25900	329 61 216 1.8 25900	348 64 218 1.9 26000	364 66 220 1.9 26000
60		119 23 210 .8 24600	213 40 212 1.3 24800	257 48 214 1.5 25000	289 54 216 1.7 25000	314 58 218 1.8 25100	334 61 220 1.9 25100	353 64 222 1.9 25100	369 66 224 2.0 25100
62		176 34 214 1.1 23800	241 46 216 1.5 24000	280 53 218 1.7 24100	308 57 220 1.9 24200	331 61 222 2.0 24200	350 64 224 2.0 24200	368 67 226 2.1 24300	383 69 228 2.1 24300
64	95 18 216 .7 22700	210 40 218 1.4 23100	261 49 220 1.7 23200	294 55 222 1.9 23300	319 59 224 2.0 23300	341 63 226 2.1 23300	359 65 228 2.1 23400	377 68 230 2.2 23400	392 70 232 2.2 23400
66	163 31 220 1.1 22100	236 45 222 1.6 22300	277 52 224 1.8 22400	307 57 226 2.0 22400	330 61 228 2.1 22500	351 64 230 2.2 22500	369 67 232 2.2 22500	386 69 234 2.3 22600	
68	202 39 224 1.4 21300	258 49 226 1.8 21500	293 55 228 2.0 21500	320 59 230 2.1 21600	342 63 232 2.2 21600	359 66 234 2.3 21700	378 68 236 2.3 21700	392 70 238 2.4 21700	
70	229 44 228 1.6 20500	276 52 230 1.9 20700	307 57 232 2.1 20700	333 62 234 2.2 20800	354 65 236 2.3 20800	372 68 238 2.4 20900	388 70 240 2.5 20900	403 72 242 2.5 20900	
72	254 48 232 1.9 19700	292 55 234 2.1 19800	321 60 236 2.2 19900	343 63 238 2.3 20000	364 67 240 2.4 20000	380 69 242 2.5 20000	397 71 244 2.6 20100	413 74 246 2.6 20100	
74	279 53 236 2.1 18900	310 58 238 2.2 19000	336 62 240 2.4 19100	357 66 242 2.5 19100	376 69 244 2.6 19200	393 71 246 2.6 19200	409 73 248 2.7 19200		
76	304 57 240 2.3 18000	335 62 242 2.5 18100	358 66 244 2.6 18100	379 69 246 2.7 18200	395 72 248 2.7 18200	413 74 250 2.8 18300	428 77 252 2.9 18300		
78	272 50 244 2.1 17400	302 56 246 2.2 17500	326 60 248 2.4 17500	347 63 250 2.5 17500	365 66 252 2.5 17500	384 68 254 2.6 17600	400 71 256 2.7 17600		

CORRECTIONS	DISTANCE	TIME	FUEL	LEVEL OFF
ENGINE ANTI ICE ON	+ 5 %	+ 5 %	+ 15 %	– 100 FT
TOTAL ANTI ICE ON	+ 14 %	+ 13 %	+ 15 %	– 300 FT

R

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+15 CG=33.0%	**DISTANCE (NM) TIME (MIN)** **INITIAL SPEED(KT) FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
50				114 22 194 .6 28600	214 41 196 1.1 28900	261 49 198 1.3 29000	291 54 200 1.4 29100	317 58 202 1.5 29100	338 62 204 1.6 29100
52				182 35 198 1.0 27700	247 47 200 1.3 27900	284 53 202 1.5 28000	312 58 204 1.6 28000	333 61 206 1.7 28100	354 64 208 1.7 28100
54			118 23 200 .7 26600	217 41 202 1.2 26800	265 50 204 1.4 27000	297 56 206 1.6 27000	321 60 208 1.7 27100	342 63 210 1.7 27100	362 66 212 1.8 27100
56			177 34 204 1.1 25800	242 46 206 1.4 25900	281 53 208 1.6 26000	308 58 210 1.7 26100	332 61 212 1.8 26100	351 64 214 1.8 26200	370 67 216 1.9 26200
58		101 20 206 .6 24700	204 39 208 1.2 25000	256 49 210 1.5 25100	290 55 212 1.7 25100	317 59 214 1.8 25200	339 62 216 1.9 25200	357 65 218 1.9 25300	376 68 220 2.0 25300
60		167 32 210 1.1 24000	235 45 212 1.5 24100	273 52 214 1.6 24200	304 57 216 1.8 24300	327 61 218 1.9 24300	346 64 220 1.9 24400	366 67 222 2.0 24400	382 69 224 2.1 24400
62	79 15 212 .5 22800	205 39 214 1.3 23200	257 49 216 1.6 23300	291 55 218 1.8 23400	316 59 220 1.9 23400	340 63 222 2.0 23500	358 66 224 2.1 23500	376 68 226 2.1 23500	391 70 228 2.2 23600
64	159 31 216 1.1 22100	234 45 218 1.5 22300	274 52 220 1.8 22500	305 57 222 1.9 22500	330 61 224 2.0 22600	350 64 226 2.1 22600	369 67 228 2.2 22600	385 70 230 2.2 22700	401 72 232 2.3 22700
66	205 40 220 1.4 21300	259 49 222 1.7 21500	293 55 224 1.9 21600	320 60 226 2.1 21700	342 63 228 2.2 21700	363 67 230 2.2 21700	381 69 232 2.3 21800	397 72 234 2.4 21800	
68	240 46 224 1.7 20500	285 54 226 2.0 20600	316 60 228 2.1 20700	341 64 230 2.2 20800	361 67 232 2.3 20800	380 70 234 2.4 20800	397 72 236 2.5 20900	413 75 238 2.5 20900	
70	266 51 228 1.9 19600	305 58 230 2.1 19700	334 63 232 2.3 19800	356 66 234 2.4 19800	377 70 236 2.5 19900	395 72 238 2.5 19900	412 75 240 2.6 19900	427 77 242 2.7 20000	
72	290 55 232 2.1 18700	323 61 234 2.3 18800	350 66 236 2.4 18800	371 69 238 2.5 18900	390 72 240 2.6 18900	407 74 242 2.7 19000	423 77 244 2.7 19000		
74	287 54 236 2.1 17800	324 61 238 2.3 17800	355 66 240 2.5 17900	382 71 242 2.6 17900	405 74 244 2.8 18000	421 77 246 2.8 18000	436 79 248 2.9 18000		
76	268 50 240 2.0 17300	298 55 242 2.1 17300	322 59 244 2.3 17300	343 63 246 2.4 17400	362 66 248 2.5 17400	380 68 250 2.5 17400	395 70 252 2.6 17400		
78	263 49 244 2.0 16800	291 53 246 2.1 16800	313 57 248 2.2 16800	332 60 250 2.3 16800	350 63 252 2.4 16900	366 65 254 2.5 16900	383 67 256 2.5 16900		

CORRECTIONS	DISTANCE	TIME	FUEL	LEVEL OFF
ENGINE ANTI ICE ON	+ 5 %	+ 5 %	+ 15 %	– 100 FT
TOTAL ANTI ICE ON	+ 14 %	+ 13 %	+ 15 %	– 300 FT

R

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=33.0%	**DISTANCE (NM) TIME (MIN)** **INITIAL SPEED(KT) FUEL(1000KG)** **LEVEL OFF (FT)**

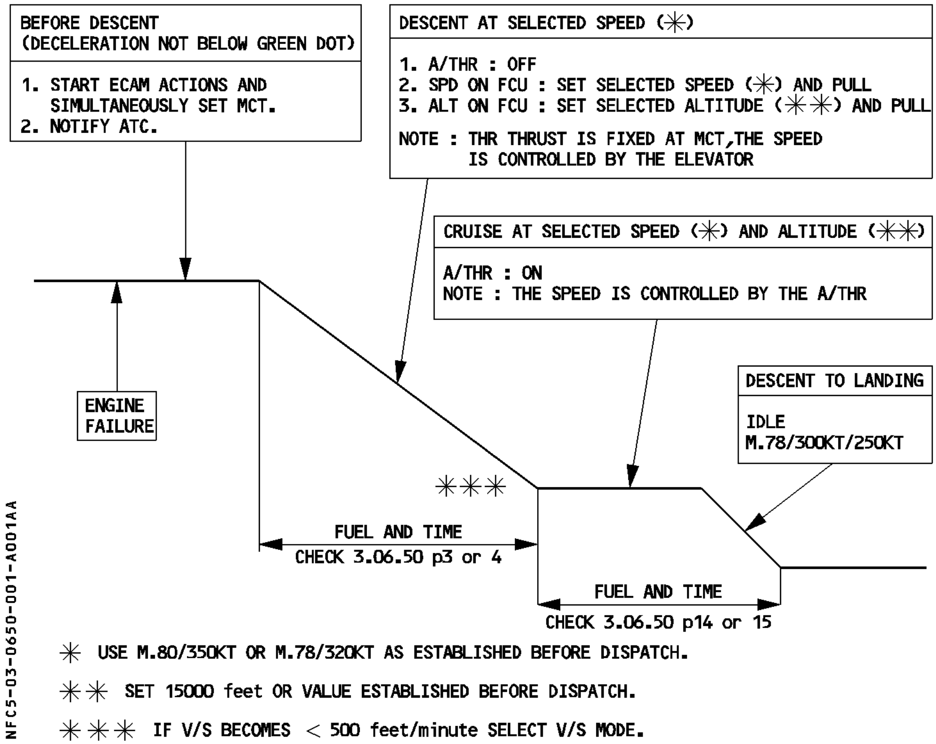
INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
50				162 31 194 .9 28100	235 45 196 1.2 28200	277 52 198 1.4 28300	306 57 200 1.5 28400	331 61 202 1.6 28400	351 64 204 1.7 28500
52			83 16 196 .5 26800	207 40 198 1.1 27100	259 49 200 1.4 27300	294 55 202 1.5 27300	319 59 204 1.6 27400	342 63 206 1.7 27400	360 66 208 1.7 27500
54			167 32 200 1.0 26000	239 46 202 1.3 26200	279 53 204 1.5 26300	308 58 206 1.6 26400	334 62 208 1.7 26400	354 65 210 1.8 26400	372 68 212 1.9 26500
56		79 15 202 .5 24800	209 40 204 1.2 25100	263 50 206 1.5 25200	300 57 208 1.7 25300	327 61 210 1.8 25400	348 65 212 1.9 25400	369 68 214 1.9 25400	386 70 216 2.0 25500
58		167 32 206 1.0 24000	238 46 208 1.4 24200	281 53 210 1.6 24300	310 58 212 1.8 24400	335 62 214 1.9 24400	355 66 216 2.0 24500	372 68 218 2.0 24500	390 71 220 2.1 24500
60	83 16 208 .5 22700	210 41 210 1.3 23100	264 51 212 1.6 23300	300 57 214 1.8 23400	328 62 216 1.9 23400	349 65 218 2.0 23500	369 68 220 2.1 23500	387 71 222 2.1 23600	403 73 224 2.2 23600
62	169 33 212 1.1 22000	243 47 214 1.6 22200	286 55 216 1.8 22400	317 60 218 1.9 22400	342 64 220 2.1 22500	362 67 222 2.1 22500	381 70 224 2.2 22600	399 73 226 2.3 22600	415 75 228 2.3 22600
64	213 42 216 1.4 21200	268 52 218 1.8 21300	304 58 220 1.9 21400	333 63 222 2.1 21500	356 67 224 2.2 21500	375 70 226 2.3 21600	393 72 228 2.3 21600	410 75 230 2.4 21600	
66	246 48 220 1.7 20300	290 56 222 1.9 20400	321 61 224 2.1 20500	348 66 226 2.2 20500	370 69 228 2.3 20600	388 72 230 2.4 20600	405 74 232 2.4 20700	420 77 234 2.5 20700	
68	275 53 224 1.9 19300	312 60 226 2.1 19400	341 65 228 2.3 19500	364 69 230 2.4 19600	384 72 232 2.5 19600	403 75 234 2.5 19700	418 77 236 2.6 19700	434 79 238 2.6 19700	
70	300 58 228 2.1 18400	332 63 230 2.3 18500	358 68 232 2.4 18500	380 71 234 2.5 18600	399 74 236 2.6 18600	417 77 238 2.7 18700	433 79 240 2.7 18700		
72	278 53 232 2.0 17600	312 59 234 2.2 17600	340 64 236 2.3 17700	363 68 238 2.4 17700	385 71 240 2.5 17700	401 73 242 2.6 17800	420 76 244 2.7 17800		
74	265 50 236 1.9 17100	295 55 238 2.1 17100	319 59 240 2.2 17200	339 62 242 2.3 17200	358 65 244 2.4 17200	374 68 246 2.4 17200	391 70 248 2.5 17200		
76	261 49 240 1.9 16600	287 53 242 2.0 16600	311 57 244 2.2 16700	330 60 246 2.3 16700	348 63 248 2.3 16700	365 65 250 2.4 16700	381 67 252 2.5 16700		
78	262 49 244 1.9 16100	285 52 246 2.1 16200	308 56 248 2.2 16200	325 59 250 2.3 16200	344 61 252 2.3 16200	360 64 254 2.4 16200			

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 5 %	+ 5 %	+ 15 %	– 100 FT
TOTAL ANTI ICE ON	+ 14 %	+ 13 %	+ 15 %	– 300 FT

- For LONG RANGE CRUISE table (Refer to 3.06.30 p4 to 11)
- For IN CRUISE QUICK CHECK (Refer to 3.06.30 p12)

PROCEDURE

This section provides single engine performance data for two fixed speed diversion strategies (fixed descent and cruise speed schedules) recommended for ETOPS operation, provided that the requirements set forth in section 3.06.10, GENERAL, are complied with.



✳ USE M.80/350KT OR M.78/320KT AS ESTABLISHED BEFORE DISPATCH.

✳✳ SET 15000 feet OR VALUE ESTABLISHED BEFORE DISPATCH.

✳✳✳ IF V/S BECOMES < 500 feet/minute SELECT V/S MODE.

EXAMPLE

Given :

GW at engine failure	=	70000 kg
FL at engine failure	=	350
Temperature	=	ISA
Distance to diversion airport	=	500 NM
Speed selected before dispatch	=	350 KT
Cruise level for diversion Selected before dispatch	=	FL180

Find :

Descent to cruise level : Distance = 198 – 101 = 97 NM
(See 3.06.50 p3) Fuel = 1172 – 723 = 449 kg
Time = 26.7 – 14.4 = 12.3 min

Cruise
Weight = 70000 – 449 = 69551 kg
Distance = 500 – 97 = 403 NM
Determine (3.06.50 p14) time and fuel consumption at ISA conditions for a reference weight of 55000 kg
Interpolate the remaining distance of 403 NM at FL180
Fuel = 2536 kg
Time = 1 h 12 min
Correction due to actual in-cruise weight : no correction here
$\triangle$Fuel = + 2 kg per 1000 kg above reference weight
$\triangle$Fuel = + 2 kg × (69.5 – 55) ~ 29 kg

Result :

Total Fuel = 2536 + 29 + 449 = 3014 kg
Time = 1h12 min + 13 min = 1 h 25 min

DESCENT - M.80/350KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%	**MINIMUM RATE OF DESCENT 500FT/MIN**					
WEIGHT (1000KG)	**50**				**70**				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	28.1	1175	208	MCT					248
370	26.6	1144	197	MCT	28.0	1201	208	MCT	260
350	25.2	1110	186	MCT	26.7	1172	198	MCT	272
330	23.9	1075	176	MCT	25.5	1138	188	MCT	284
310	22.6	1038	166	MCT	24.2	1101	178	MCT	297
290	21.4	1000	157	MCT	22.9	1061	168	MCT	311
270	20.3	962	148	MCT	21.6	1019	158	MCT	324
250	19.3	925	140	MCT	20.4	977	149	MCT	338
230	18.3	887	132	MCT	19.3	931	139	MCT	350
220	17.6	859	126	MCT	18.4	898	133	MCT	350
210	16.8	827	120	MCT	17.5	860	126	MCT	350
200	16.0	791	114	MCT	16.6	818	118	MCT	350
190	15.1	751	107	MCT	15.5	772	110	MCT	350
180	14.1	708	99	MCT	14.4	723	101	MCT	350
170	13.0	657	91	MCT	13.1	666	92	MCT	350
160	11.6	591	81	MCT	11.7	594	81	MCT	350
150	9.9	506	69	MCT	9.9	507	69	MCT	350
140	8.0	408	55	V/S	8.0	408	55	V/S	350
100	.0	0	0	V/S	.0	0	0	V/S	350

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	– 0.5 %	– 1.5 %	–
FUEL	+ 1.5 %	+ 3 %	+ 0.3 %
DISTANCE	– 0.5 %	– 1.5 %	+ 0.3 %

10B -08F0A320–212 CFM56–5A3 23200010C6KG330 0 018590 0 0 3 .0 .0 500.00 0 02 .800350.000 .000 0 FCOM-N0–03–06–50–003–100

DESCENT - M.78/320KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%		**MINIMUM RATE OF DESCENT 500FT/MIN**				
WEIGHT (1000KG)	**50**				**70**				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	38.0	1411	267	MCT					241
370	36.3	1375	254	MCT	35.6	1367	250	MCT	252
350	34.6	1335	241	MCT	34.3	1335	239	MCT	264
330	32.9	1292	229	MCT	32.8	1297	228	MCT	277
310	31.4	1247	217	MCT	31.3	1255	217	MCT	289
290	29.9	1200	205	MCT	29.8	1209	205	MCT	302
270	28.4	1153	195	MCT	28.3	1159	193	MCT	315
250	26.7	1091	181	MCT	26.4	1092	179	MCT	320
230	24.4	1005	164	MCT	24.0	1002	161	MCT	320
220	23.1	953	154	MCT	22.7	950	151	MCT	320
210	21.6	894	143	MCT	21.2	892	141	MCT	320
200	19.9	825	131	MCT	19.6	828	129	MCT	320
190	18.0	744	118	V/S	17.9	755	117	MCT	320
180	16.0	659	104	V/S	16.0	673	104	MCT	320
170	14.0	576	90	V/S	14.0	587	90	V/S	320
160	12.0	493	77	V/S	12.0	502	77	V/S	320
150	10.0	410	64	V/S	10.0	417	64	V/S	320
140	8.0	327	50	V/S	8.0	333	50	V/S	320
100	.0	0	0	V/S	.0	0	0	V/S	320

CORRECTIONS	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**PER 1° ABOVE ISA**
TIME	– 0.1 %	– 0.5 %	–
FUEL	+ 2 %	+ 5 %	+ 0.3 %
DISTANCE	– 0.1 %	– 0.5 %	+ 0.3 %

10B -08F0A320–212 CFM56–5A3 23200010C6KG330 0 018590 0 0 3 .0 .0 500.00 0 02 .780320.000 .000 0 FCOM-N0–03–06–50–004–100

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CRUISE - MCT/VMO - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA CG=33.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL180**		**FL200**		**FL220**	
50	94.2	.616	94.7	.632	94.7	.633	93.1	.614	93.4	.618	93.5	.616
	3311	343	2948	320	2863	315	2506	294	2383	284	2237	272
	118.8	393	134.2	396	138.0	395	151.8	380	159.2	380	167.7	375
52	94.2	.615	94.7	.630	94.7	.630	93.1	.611	93.4	.613	93.5	.609
	3309	342	2945	319	2859	314	2501	292	2378	281	2231	269
	118.6	393	133.9	394	137.6	393	151.2	378	158.3	377	166.3	371
54	94.2	.613	94.7	.627	94.7	.628	93.1	.606	93.4	.607	93.5	.602
	3307	341	2941	318	2856	312	2496	290	2372	279	2225	265
	118.4	392	133.5	393	137.2	392	150.4	375	157.3	373	164.9	367
56	94.2	.612	94.7	.624	94.7	.625	93.1	.601	93.4	.601	93.5	.595
	3305	340	2938	316	2851	311	2490	287	2365	276	2218	262
	118.2	391	133.1	391	136.7	390	149.5	372	156.1	369	163.4	362
58	94.2	.610	94.7	.621	94.7	.621	93.1	.596	93.4	.594	93.5	.585
	3302	339	2933	315	2847	309	2485	284	2358	273	2209	258
	117.9	389	132.7	389	136.2	388	148.5	369	154.8	365	161.4	357
60	94.2	.608	94.7	.618	94.7	.617	93.1	.590	93.4	.587	93.5	.573
	3299	338	2928	313	2841	307	2479	282	2351	269	2197	252
	117.6	388	132.2	387	135.6	385	147.4	366	153.4	361	159.0	349
62	94.2	.606	94.7	.614	94.7	.613	93.1	.584	93.4	.578	93.5	.557
	3296	337	2923	311	2836	305	2473	279	2343	265	2181	245
	117.3	387	131.6	385	134.9	383	146.3	362	151.6	355	155.7	340
64	94.2	.604	94.7	.610	94.7	.608	93.1	.577	93.4	.567	93.5	.531
	3293	336	2917	309	2829	302	2466	275	2333	260	2155	233
	117.0	385	131.0	382	134.1	379	144.9	357	149.4	348	150.2	324
66	94.2	.601	94.7	.605	94.7	.602	93.1	.569	93.4	.553		
	3290	334	2910	306	2822	299	2459	271	2321	253		
	116.6	384	130.2	379	133.2	376	143.2	352	146.5	340		
68	94.2	.599	94.7	.600	94.7	.597	93.2	.558	93.5	.532		
	3287	333	2903	304	2815	296	2450	266	2304	243		
	116.3	382	129.4	376	132.3	373	141.0	345	142.0	327		
70	94.2	.596	94.7	.595	94.7	.591	93.2	.545				
	3283	331	2898	301	2809	293	2438	259				
	115.8	380	128.6	373	131.3	369	138.3	337				
72	94.2	.593	94.7	.589	94.7	.584	93.2	.525				
	3280	329	2892	298	2802	290	2423	250				
	115.3	378	127.6	369	130.1	365	134.2	325				
74	94.2	.589	94.7	.583	94.7	.576	93.2	.491				
	3277	327	2885	295	2793	286	2396	233				
	114.8	376	126.5	365	128.7	360	127.0	304				
76	94.2	.585	94.7	.575	94.7	.566						
	3272	325	2877	291	2783	281						
	114.2	374	125.2	360	126.9	353						
78	94.2	.581	94.7	.566	94.7	.554						
	3268	323	2867	286	2771	274						
	113.5	371	123.6	354	124.8	346						

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 4 %

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CRUISE - MCT/VMO - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF							ISA+10 CG=33.0%		**N1 (%) KG/H NM/1000KG**		**MACH IAS (KT) TAS (KT)**	
WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL180**		**FL200**		**FL220**	
50	95.8	.615	96.4	.630	96.4	.631	94.8	.613	95.2	.616	95.3	.614
	3366	342	3011	320	2926	314	2571	293	2452	283	2308	271
	118.7	400	133.6	402	137.2	402	150.4	387	157.4	386	165.4	382
52	95.8	.613	96.4	.628	96.4	.629	94.8	.609	95.2	.611	95.3	.607
	3364	341	3007	318	2923	313	2567	291	2447	281	2302	268
	118.5	399	133.3	401	136.8	400	149.7	384	156.5	383	164.0	378
54	95.8	.612	96.4	.625	96.4	.626	94.8	.604	95.2	.605	95.3	.600
	3362	340	3004	317	2919	311	2562	289	2440	278	2297	265
	118.3	398	132.9	399	136.4	398	149.0	382	155.3	379	162.5	373
56	95.8	.610	96.4	.623	96.4	.623	94.8	.600	95.2	.599	95.3	.593
	3360	339	3000	316	2915	310	2556	286	2434	275	2289	261
	118.1	397	132.5	398	135.9	396	148.1	378	154.1	375	160.9	368
58	95.8	.608	96.4	.620	96.4	.619	94.8	.594	95.2	.592	95.3	.583
	3358	338	2996	314	2910	308	2551	283	2428	272	2280	257
	117.8	395	132.0	396	135.4	394	147.0	375	152.9	371	158.9	362
60	95.8	.606	96.4	.616	96.4	.615	94.8	.588	95.2	.585	95.3	.571
	3355	337	2991	312	2905	306	2545	281	2421	268	2268	251
	117.5	394	131.5	393	134.7	391	145.9	371	151.4	367	156.4	355
62	95.8	.604	96.4	.612	96.4	.611	94.9	.582	95.2	.576	95.3	.554
	3352	336	2986	310	2900	304	2539	278	2413	264	2252	243
	117.2	393	130.9	391	134.0	389	144.7	368	149.6	361	153.0	345
64	95.8	.602	96.4	.608	96.4	.606	94.9	.575	95.2	.565	95.3	.527
	3349	335	2980	308	2893	301	2533	274	2403	258	2227	231
	116.8	391	130.2	388	133.2	385	143.3	363	147.3	354	147.2	328
66	95.8	.599	96.4	.603	96.4	.600	94.9	.566	95.2	.550		
	3346	333	2974	305	2886	298	2526	270	2391	252		
	116.5	390	129.4	385	132.3	382	141.6	358	144.2	345		
68	95.8	.597	96.4	.598	96.4	.595	94.9	.555	95.2	.528		
	3344	332	2967	303	2880	295	2516	264	2374	241		
	116.0	388	128.6	382	131.4	378	139.4	351	139.4	331		
70	95.8	.594	96.4	.593	96.4	.589	94.9	.542				
	3341	330	2962	300	2874	292	2505	258				
	115.6	386	127.8	378	130.4	375	136.5	342				
72	95.8	.591	96.4	.587	96.4	.582	94.9	.521				
	3338	328	2956	297	2867	289	2490	248				
	115.1	384	126.8	375	129.2	370	132.1	329				
74	95.8	.587	96.4	.580	96.4	.574						
	3334	326	2949	293	2859	285						
	114.5	382	125.7	371	127.7	365						
76	95.8	.583	96.4	.573	96.4	.564						
	3330	324	2941	289	2848	279						
	113.9	379	124.3	366	125.8	358						
78	95.8	.579	96.4	.563	96.4	.551						
	3326	322	2932	285	2837	273						
	113.2	377	122.7	360	123.6	351						
ENGINE ANTI ICE ON △FUEL = + 1.5 %							**TOTAL ANTI ICE ON** △FUEL = + 4 %					

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CRUISE - MCT/VMO - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=33.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
50	95.4	.599	96.0	.614	96.1	.616	94.5	.595	94.8	.598	95.1	.597
	3224	333	2879	311	2807	306	2459	284	2348	275	2224	263
	121.8	393	137.5	396	140.9	396	154.3	379	161.2	379	168.5	375
52	95.4	.597	96.0	.612	96.1	.613	94.5	.591	94.8	.593	95.1	.590
	3223	332	2876	310	2803	305	2455	282	2343	272	2218	260
	121.6	392	137.1	394	140.5	394	153.4	377	160.0	375	167.0	371
54	95.4	.596	96.0	.609	96.1	.610	94.5	.586	94.8	.587	95.1	.583
	3221	331	2873	308	2799	303	2451	280	2338	269	2212	256
	121.3	391	136.6	392	139.9	392	152.5	374	158.8	371	165.4	366
56	95.4	.594	96.0	.606	96.1	.607	94.5	.581	94.8	.580	95.1	.573
	3220	330	2869	307	2795	301	2447	277	2333	266	2204	252
	121.0	390	136.1	390	139.3	389	151.3	370	157.4	367	163.2	360
58	95.4	.592	96.0	.602	96.1	.603	94.5	.575	94.8	.573	95.1	.561
	3218	329	2865	305	2790	299	2442	274	2326	262	2194	246
	120.7	388	135.5	388	138.7	387	150.1	367	155.8	362	160.5	352
60	95.4	.590	96.0	.599	96.1	.598	94.5	.569	94.9	.564	95.1	.545
	3216	328	2861	303	2786	297	2437	271	2319	258	2183	239
	120.3	387	134.8	386	137.9	384	148.8	363	153.8	357	156.9	342
62	95.4	.588	96.0	.595	96.1	.593	94.5	.562	94.9	.552	95.1	.521
	3214	326	2857	301	2781	294	2431	267	2309	252	2166	228
	120.0	386	134.1	383	137.0	381	147.2	358	151.2	349	150.9	327
64	95.4	.585	96.0	.590	96.1	.588	94.5	.553	94.9	.536		
	3211	325	2852	298	2776	292	2425	263	2298	245		
	119.6	384	133.2	380	136.1	378	145.3	352	147.6	339		
66	95.4	.583	96.0	.585	96.1	.583	94.5	.541	94.9	.513		
	3209	324	2848	296	2771	289	2416	257	2283	234		
	119.1	382	132.3	377	135.0	374	142.7	345	142.3	325		
68	95.4	.580	96.0	.580	96.1	.577	94.5	.526				
	3206	322	2843	293	2765	286	2405	250				
	118.6	380	131.4	373	133.9	370	139.3	335				
70	95.4	.576	96.0	.574	96.1	.569	94.6	.504				
	3203	320	2838	290	2758	282	2389	239				
	118.0	378	130.3	370	132.5	365	134.3	321				
72	95.4	.572	96.0	.567	96.1	.561						
	3200	318	2831	286	2751	278						
	117.4	376	129.0	365	130.9	360						
74	95.4	.568	96.1	.559	96.1	.550						
	3196	316	2824	282	2741	272						
	116.7	373	127.5	360	128.7	353						
76	95.4	.564	96.1	.548	96.2	.536						
	3192	313	2815	277	2730	265						
	116.0	370	125.5	353	126.0	344						
78	95.4	.560	96.1	.535	96.2	.515						
	3189	311	2804	270	2715	255						
	115.2	367	123.0	345	121.9	331						

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
$\triangle$FUEL = + 1.5 %	$\triangle$FUEL = + 4 %

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CRUISE - MCT/VMO - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=33.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL180**		**FL200**		**FL220**	
50	94.9	.583	95.6	.598	95.7	.600	94.1	.578	94.4	.579	94.6	.577
	3094	324	2754	303	2685	298	2355	276	2241	265	2120	254
	124.8	386	141.3	389	144.8	389	157.9	372	165.1	370	172.5	366
52	94.9	.582	95.6	.596	95.7	.597	94.1	.573	94.4	.573	94.6	.569
	3092	323	2752	302	2682	296	2352	273	2236	263	2114	250
	124.5	385	140.8	387	144.2	387	156.8	369	163.7	366	170.7	361
54	94.9	.580	95.6	.593	95.7	.594	94.1	.568	94.4	.567	94.6	.560
	3091	322	2750	300	2679	295	2348	271	2232	260	2107	246
	124.2	384	140.2	386	143.6	385	155.6	365	162.2	362	168.4	355
56	94.9	.578	95.6	.590	95.7	.590	94.1	.562	94.4	.559	94.6	.547
	3089	321	2747	298	2676	293	2343	268	2226	256	2098	240
	123.8	382	139.6	383	142.8	382	154.4	362	160.4	357	165.3	347
58	94.9	.576	95.6	.586	95.7	.586	94.1	.556	94.4	.550	94.7	.530
	3087	320	2744	296	2673	290	2339	265	2220	251	2087	232
	123.4	381	138.8	381	141.9	379	152.9	358	158.2	351	161.0	336
60	94.9	.574	95.7	.582	95.7	.580	94.1	.548	94.4	.537	94.7	.504
	3085	318	2741	294	2668	288	2333	261	2211	245	2071	221
	123.0	380	138.0	378	140.9	376	151.1	353	155.1	343	154.2	319
62	95.0	.571	95.7	.577	95.7	.575	94.1	.539	94.5	.521		
	3083	317	2737	291	2664	285	2327	256	2200	238		
	122.5	378	137.0	375	139.9	373	148.9	346	151.1	332		
64	95.0	.568	95.7	.572	95.7	.570	94.1	.526	94.5	.495		
	3081	315	2733	289	2660	282	2319	250	2184	226		
	122.0	376	136.1	372	138.8	369	146.0	339	144.9	316		
66	95.0	.565	95.7	.566	95.8	.563	94.2	.510				
	3078	313	2729	286	2655	279	2310	242				
	121.4	374	135.0	368	137.5	365	142.1	328				
68	95.0	.561	95.7	.560	95.8	.556	94.2	.486				
	3075	311	2724	283	2649	275	2290	230				
	120.8	371	133.7	364	135.9	360	136.4	312				
70	95.0	.557	95.7	.553	95.8	.546						
	3072	309	2718	279	2642	270						
	120.0	369	132.2	360	134.0	354						
72	95.0	.553	95.7	.544	95.8	.535						
	3069	307	2712	274	2633	264						
	119.3	366	130.4	354	131.5	346						
74	95.0	.549	95.7	.533	95.8	.519						
	3066	304	2704	269	2623	257						
	118.4	363	128.1	346	128.3	336						
76	95.0	.544	95.7	.519	95.8	.496						
	3062	302	2694	261	2606	245						
	117.5	360	125.1	337	123.4	322						
78	95.0	.538	95.8	.498								
	3058	298	2680	251								
	116.4	356	120.9	324								

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 4 %

R

CRUISE - MCT/320KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF							ISA CG=33.0%		N1 (%) KG/H NM/1000KG		MACH IAS (KT) TAS (KT)	
WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
50	90.9	.576	94.6	.631	94.7	.633	93.1	.614	93.4	.618	93.5	.616
	2866	320	2940	320	2863	315	2506	294	2383	284	2237	272
	128.4	368	134.5	395	138.0	395	151.8	380	159.2	380	167.7	375
52	91.1	.576	94.7	.630	94.7	.630	93.1	.611	93.4	.613	93.5	.609
	2884	320	2945	319	2859	314	2501	292	2378	281	2231	269
	127.6	368	133.9	394	137.6	393	151.2	378	158.3	377	166.3	371
54	91.2	.576	94.7	.627	94.7	.628	93.1	.606	93.4	.607	93.5	.602
	2902	320	2941	318	2856	312	2496	290	2372	279	2225	265
	126.8	368	133.5	393	137.2	392	150.4	375	157.3	373	164.9	367
56	91.4	.576	94.7	.624	94.7	.625	93.1	.601	93.4	.601	93.5	.595
	2922	320	2938	316	2851	311	2490	287	2365	276	2218	262
	125.9	368	133.1	391	136.7	390	149.5	372	156.1	369	163.4	362
58	91.6	.576	94.7	.621	94.7	.621	93.1	.596	93.4	.594	93.5	.585
	2942	320	2933	315	2847	309	2485	284	2358	273	2209	258
	125.1	368	132.7	389	136.2	388	148.5	369	154.8	365	161.4	357
60	91.8	.576	94.7	.618	94.7	.617	93.1	.590	93.4	.587	93.5	.573
	2963	320	2928	313	2841	307	2479	282	2351	269	2197	252
	124.2	368	132.2	387	135.6	385	147.4	366	153.4	361	159.0	349
62	91.9	.576	94.7	.614	94.7	.613	93.1	.584	93.4	.578	93.5	.557
	2985	320	2923	311	2836	305	2473	279	2343	265	2181	245
	123.2	368	131.6	385	134.9	383	146.3	362	151.6	355	155.7	340
64	92.1	.576	94.7	.610	94.7	.608	93.1	.577	93.4	.567	93.5	.531
	3010	320	2917	309	2829	302	2466	275	2333	260	2155	233
	122.2	368	131.0	382	134.1	379	144.9	357	149.4	348	150.2	324
66	92.4	.576	94.7	.605	94.7	.602	93.1	.569	93.4	.553		
	3036	320	2910	306	2822	299	2459	271	2321	253		
	121.2	368	130.2	379	133.2	376	143.2	352	146.5	340		
68	92.6	.576	94.7	.600	94.7	.597	93.2	.558	93.5	.532		
	3063	320	2903	304	2815	296	2450	266	2304	243		
	120.1	368	129.4	376	132.3	373	141.0	345	142.0	327		
70	92.8	.576	94.7	.595	94.7	.591	93.2	.545				
	3091	320	2898	301	2809	293	2438	259				
	119.0	368	128.6	373	131.3	369	138.3	337				
72	93.1	.576	94.7	.589	94.7	.584	93.2	.525				
	3121	320	2892	298	2802	290	2423	250				
	117.9	368	127.6	369	130.1	365	134.2	325				
74	93.3	.576	94.7	.583	94.7	.576	93.2	.491				
	3154	320	2885	295	2793	286	2396	233				
	116.7	368	126.5	365	128.7	360	127.0	304				
76	93.6	.576	94.7	.575	94.7	.566						
	3185	320	2877	291	2783	281						
	115.5	368	125.2	360	126.9	353						
78	93.8	.576	94.7	.566	94.7	.554						
	3219	320	2867	286	2771	274						
	114.3	368	123.6	354	124.8	346						
ENGINE ANTI ICE ON △FUEL = + 2 %							TOTAL ANTI ICE ON △FUEL = + 6 %					

R

CRUISE - MCT/320KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+10 CG=33.0%	**N1 (%) KG/H NM/1000KG**	**MACH IAS (KT) TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL180**		**FL200**		**FL220**	
50	92.6	.576	96.4	.630	96.4	.631	94.8	.613	95.2	.616	95.3	.614
	2948	320	3011	320	2926	314	2571	293	2452	283	2308	271
	127.1	375	133.6	402	137.2	402	150.4	387	157.4	386	165.4	382
52	92.8	.576	96.4	.628	96.4	.629	94.8	.609	95.2	.611	95.3	.607
	2966	320	3007	318	2923	313	2567	291	2447	281	2302	268
	126.3	375	133.3	401	136.8	400	149.7	384	156.5	383	164.0	378
54	92.9	.576	96.4	.625	96.4	.626	94.8	.604	95.2	.605	95.3	.600
	2985	320	3004	317	2919	311	2562	289	2440	278	2297	265
	125.5	375	132.9	399	136.4	398	149.0	382	155.3	379	162.5	373
56	93.1	.576	96.4	.623	96.4	.623	94.8	.600	95.2	.599	95.3	.593
	3005	320	3000	316	2915	310	2556	286	2434	275	2289	261
	124.7	375	132.5	398	135.9	396	148.1	378	154.1	375	160.9	368
58	93.3	.576	96.4	.620	96.4	.619	94.8	.594	95.2	.592	95.3	.583
	3026	320	2996	314	2910	308	2551	283	2428	272	2280	257
	123.8	375	132.0	396	135.4	394	147.0	375	152.9	371	158.9	362
60	93.5	.576	96.4	.616	96.4	.615	94.8	.588	95.2	.585	95.3	.571
	3047	320	2991	312	2905	306	2545	281	2421	268	2268	251
	123.0	375	131.5	393	134.7	391	145.9	371	151.4	367	156.4	355
62	93.7	.576	96.4	.612	96.4	.611	94.9	.582	95.2	.576	95.3	.554
	3070	320	2986	310	2900	304	2539	278	2413	264	2252	243
	122.0	375	130.9	391	134.0	389	144.7	368	149.6	361	153.0	345
64	93.9	.576	96.4	.608	96.4	.606	94.9	.575	95.2	.565	95.3	.527
	3095	320	2980	308	2893	301	2533	274	2403	258	2227	231
	121.0	375	130.2	388	133.2	385	143.3	363	147.3	354	147.2	328
66	94.1	.576	96.4	.603	96.4	.600	94.9	.566	95.2	.550		
	3122	320	2974	305	2886	298	2526	270	2391	252		
	120.0	375	129.4	385	132.3	382	141.6	358	144.2	345		
68	94.3	.576	96.4	.598	96.4	.595	94.9	.555	95.2	.528		
	3147	320	2967	303	2880	295	2516	264	2374	241		
	119.0	375	128.6	382	131.4	378	139.4	351	139.4	331		
70	94.5	.576	96.4	.593	96.4	.589	94.9	.542				
	3174	320	2962	300	2874	292	2505	258				
	118.0	375	127.8	378	130.4	375	136.5	342				
72	94.8	.576	96.4	.587	96.4	.582	94.9	.521				
	3203	320	2956	297	2867	289	2490	248				
	117.0	375	126.8	375	129.2	370	132.1	329				
74	95.1	.576	96.4	.580	96.4	.574						
	3234	320	2949	293	2859	285						
	115.9	375	125.7	371	127.7	365						
76	95.3	.576	96.4	.573	96.4	.564						
	3264	320	2941	289	2848	279						
	114.8	375	124.3	366	125.8	358						
78	95.6	.576	96.4	.563	96.4	.551						
	3298	320	2932	285	2837	273						
	113.6	375	122.7	360	123.6	351						

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 2 %	△FUEL = + 6 %

R

CRUISE - MCT/320KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=33.0%

N1 (%) — **MACH**
KG/H — **IAS (KT)**
NM/1000KG — **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
50	93.5	.576	96.0	.614	96.1	.616	94.5	.595	94.8	.598	95.1	.597
	2989	320	2879	311	2807	306	2459	284	2348	275	2224	263
	126.5	378	137.5	396	140.9	396	154.3	379	161.2	379	168.5	375
52	93.6	.576	96.0	.612	96.1	.613	94.5	.591	94.8	.593	95.1	.590
	3007	320	2876	310	2803	305	2455	282	2343	272	2218	260
	125.7	378	137.1	394	140.5	394	153.4	377	160.0	375	167.0	371
54	93.8	.576	96.0	.609	96.1	.610	94.5	.586	94.8	.587	95.1	.583
	3026	320	2873	308	2799	303	2451	280	2338	269	2212	256
	124.9	378	136.6	392	139.9	392	152.5	374	158.8	371	165.4	366
56	94.0	.576	96.0	.606	96.1	.607	94.5	.581	94.8	.580	95.1	.573
	3046	320	2869	307	2795	301	2447	277	2333	266	2204	252
	124.1	378	136.1	390	139.3	389	151.3	370	157.4	367	163.2	360
58	94.1	.576	96.0	.602	96.1	.603	94.5	.575	94.8	.573	95.1	.561
	3065	320	2865	305	2790	299	2442	274	2326	262	2194	246
	123.3	378	135.5	388	138.7	387	150.1	367	155.8	362	160.5	352
60	94.3	.576	96.0	.599	96.1	.598	94.5	.569	94.9	.564	95.1	.545
	3085	320	2861	303	2786	297	2437	271	2319	258	2183	239
	122.5	378	134.8	386	137.9	384	148.8	363	153.8	357	156.9	342
62	94.5	.576	96.0	.595	96.1	.593	94.5	.562	94.9	.552	95.1	.521
	3106	320	2857	301	2781	294	2431	267	2309	252	2166	228
	121.7	378	134.1	383	137.0	381	147.2	358	151.2	349	150.9	327
64	94.7	.576	96.0	.590	96.1	.588	94.5	.553	94.9	.536		
	3129	320	2852	298	2776	292	2425	263	2298	245		
	120.8	378	133.2	380	136.1	378	145.3	352	147.6	339		
66	94.9	.576	96.0	.585	96.1	.583	94.5	.541	94.9	.513		
	3153	320	2848	296	2771	289	2416	257	2283	234		
	119.9	378	132.3	377	135.0	374	142.7	345	142.3	325		
68	95.2	.576	96.0	.580	96.1	.577	94.5	.526				
	3178	320	2843	293	2765	286	2405	250				
	119.0	378	131.4	373	133.9	370	139.3	335				
70	95.4	.576	96.0	.574	96.1	.569	94.6	.504				
	3203	320	2838	290	2758	282	2389	239				
	118.0	378	130.3	370	132.5	365	134.3	321				
72	95.4	.572	96.0	.567	96.1	.561						
	3200	318	2831	286	2751	278						
	117.4	376	129.0	365	130.9	360						
74	95.4	.568	96.1	.559	96.1	.550						
	3196	316	2824	282	2741	272						
	116.7	373	127.5	360	128.7	353						
76	95.4	.564	96.1	.548	96.2	.536						
	3192	313	2815	277	2730	265						
	116.0	370	125.5	353	126.0	344						
78	95.4	.560	96.1	.535	96.2	.515						
	3189	311	2804	270	2715	255						
	115.2	367	123.0	345	121.9	331						

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 2 %	△FUEL = + 6 %

R

CRUISE - MCT/320KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=33.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL180**		**FL200**		**FL220**	
50	94.3	.576	95.6	.598	95.7	.600	94.1	.578	94.4	.579	94.6	.577
	3024	320	2754	303	2685	298	2355	276	2241	265	2120	254
	126.1	381	141.3	389	144.8	389	157.9	372	165.1	370	172.5	366
52	94.5	.576	95.6	.596	95.7	.597	94.1	.573	94.4	.573	94.6	.569
	3040	320	2752	302	2682	296	2352	273	2236	263	2114	250
	125.4	381	140.8	387	144.2	387	156.8	369	163.7	366	170.7	361
54	94.6	.576	95.6	.593	95.7	.594	94.1	.568	94.4	.567	94.6	.560
	3056	320	2750	300	2679	295	2348	271	2232	260	2107	246
	124.8	381	140.2	386	143.6	385	155.6	365	162.2	362	168.4	355
56	94.8	.576	95.6	.590	95.7	.590	94.1	.562	94.4	.559	94.6	.547
	3074	320	2747	298	2676	293	2343	268	2226	256	2098	240
	124.1	381	139.6	383	142.8	382	154.4	362	160.4	357	165.3	347
58	94.9	.576	95.6	.586	95.7	.586	94.1	.556	94.4	.550	94.7	.530
	3087	320	2744	296	2673	290	2339	265	2220	251	2087	232
	123.4	381	138.8	381	141.9	379	152.9	358	158.2	351	161.0	336
60	94.9	.574	95.7	.582	95.7	.580	94.1	.548	94.4	.537	94.7	.504
	3085	318	2741	294	2668	288	2333	261	2211	245	2071	221
	123.0	380	138.0	378	140.9	376	151.1	353	155.1	343	154.2	319
62	95.0	.571	95.7	.577	95.7	.575	94.1	.539	94.5	.521		
	3083	317	2737	291	2664	285	2327	256	2200	238		
	122.5	378	137.0	375	139.9	373	148.9	346	151.1	332		
64	95.0	.568	95.7	.572	95.7	.570	94.1	.526	94.5	.495		
	3081	315	2733	289	2660	282	2319	250	2184	226		
	122.0	376	136.1	372	138.8	369	146.0	339	144.9	316		
66	95.0	.565	95.7	.566	95.8	.563	94.2	.510				
	3078	313	2729	286	2655	279	2310	242				
	121.4	374	135.0	368	137.5	365	142.1	328				
68	95.0	.561	95.7	.560	95.8	.556	94.2	.486				
	3075	311	2724	283	2649	275	2290	230				
	120.8	371	133.7	364	135.9	360	136.4	312				
70	95.0	.557	95.7	.553	95.8	.546						
	3072	309	2718	279	2642	270						
	120.0	369	132.2	360	134.0	354						
72	95.0	.553	95.7	.544	95.8	.535						
	3069	307	2712	274	2633	264						
	119.3	366	130.4	354	131.5	346						
74	95.0	.549	95.7	.533	95.8	.519						
	3066	304	2704	269	2623	257						
	118.4	363	128.1	346	128.3	336						
76	95.0	.544	95.7	.519	95.8	.496						
	3062	302	2694	261	2606	245						
	117.5	360	125.1	337	123.4	322						
78	95.0	.538	95.8	.498								
	3058	298	2680	251								
	116.4	356	120.9	324								

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 2 %	△FUEL = + 6 %

GENERAL

The following in cruise quick check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to landing with one engine inoperative.
These tables are established for :
- Cruise speed : MCT/VMO, MCT/320 KT.
- Descent profile : M.78/300KT/250KT
- Approach and landing : 120 kg or 270 lb – 6 minute IMC
- ISA
- CG = 33 %
- Pack flow HI
- Anti ice OFF

Note : *1. In the tables, the asterisk "*" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree celsius above ISA apply a fuel correction of
0.015 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)
or 0.033 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The in cruise quick check tables are based on a reference initial weight.
The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight (see example 3.06.50 p 2).

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/VMO - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 55000 KG PACK FLOW HI ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL **100**	**150**	**160**	**180**	**200**	**220**	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) **FL100 FL150**	**FL160 FL180**	**FL200 FL220**
200	1627 0.38	1361 0.38	1313 0.38	1184 0.39	1112 0.40	1042 0.40	0	0	0
250	2050 0.46	1736 0.46	1679 0.46	1518 0.47	1431 0.48	1346 0.48	0	0	2
300	2473 0.53	2111 0.54	2044 0.54	1851 0.55	1750 0.56	1650 0.56	1	1	3
350	2895 1.01	2486 1.01	2409 1.01	2184 1.03	2068 1.04	1954 1.04	1	1	4
400	3318 1.09	2861 1.09	2774 1.09	2516 1.11	2386 1.12	2257 1.12	1	2	5
450	3740 1.16	3236 1.16	3139 1.17	2849 1.19	2703 1.20	2559 1.21	1	3	6
500	4162 1.24	3610 1.24	3503 1.24	3181 1.27	3020 1.28	2862 1.29	2	3	8
550	4584 1.32	3984 1.32	3867 1.32	3512 1.35	3337 1.36	3163 1.37	2	4	9
600	5006 1.39	4359 1.39	4232 1.39	3844 1.43	3653 1.43	3465 1.45	2	5	10
650	5427 1.47	4733 1.47	4596 1.47	4175 1.51	3969 1.51	3766 1.53	3	5	11
700	5849 1.54	5106 1.54	4960 1.55	4506 1.59	4286 1.59	4067 2.01	3	6	12
750	6270 2.02	5480 2.02	5323 2.02	4837 2.07	4601 2.07	4367 2.09	3	6	13
800	6691 2.10	5853 2.09	5687 2.10	5167 2.15	4917 2.15	4667 2.17	4	7	14
850	7113 2.17	6227 2.17	6050 2.17	5498 2.22	5232 2.23	4967 2.25	4	7	15
900	7534 2.25	6600 2.25	6413 2.25	5828 2.30	5547 2.31	5267 2.33	4	8	16
950	7954 2.32	6973 2.32	6776 2.32	6157 2.38	5862 2.39	5566 2.41	5	8	16
1000	8375 2.40	7346 2.40	7139 2.40	6487 2.46	6176 2.47	5864 2.49	5	9	17
1050	8796 2.48	7718 2.47	7501 2.48	6816 2.54	6490 2.55	6163 2.57	5	9	18
1100	9216 2.55	8091 2.55	7864 2.55	7145 3.02	6804 3.02	6461 3.05	6	10	19
1150	9637 3.03	8463 3.02	8226 3.03	7474 3.10	7117 3.10	6758 3.13	6	10	20
1200	10057 3.10	8835 3.10	8588 3.10	7803 3.17	7431 3.18	7056 3.21	7	11	21
1250	10477 3.18	9207 3.17	8950 3.18	8132 3.25	7744 3.26	7352 3.29	7	11	21
1300	10897 3.26	9579 3.25	9312 3.25	8460 3.33	8057 3.34	7649 3.37	7	12	22
1350	11317 3.33	9951 3.32	9674 3.33	8788 3.41	8369 3.42	7945 3.44	8	12	23
1400	11737 3.41	10323 3.40	10035 3.40	9116 3.49	8682 3.49	8241 3.52	9	12	24

ENGINE ANTI ICE ON △FUEL = + 2 %	**TOTAL ANTI ICE ON** △FUEL = + 5 %

FLIP23A A320–212 CFM56–5A3 3611 03301.001011 0250300 .7800 .00100 120 0300350 55 0 100100 40100 18590 FCOM-N0–03–06–50–014–100

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/320KT - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 55000 KG PACK FLOW HI ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	**150**	**160**	**180**	**200**	**220**	**FL100 FL150**	**FL160 FL180**	**FL200 FL220**
200	1531 0.40	1361 0.38	1313 0.38	1184 0.39	1112 0.40	1042 0.40	1	0	0
250	1926 0.48	1736 0.46	1679 0.46	1518 0.47	1431 0.48	1346 0.48	2	0	2
300	2319 0.56	2111 0.54	2044 0.54	1851 0.55	1750 0.56	1650 0.56	3	1	3
350	2713 1.04	2486 1.01	2409 1.01	2184 1.03	2068 1.04	1954 1.04	4	1	4
400	3106 1.12	2861 1.09	2774 1.09	2516 1.11	2386 1.12	2257 1.12	5	2	5
450	3498 1.21	3236 1.16	3139 1.17	2849 1.19	2703 1.20	2559 1.21	6	3	6
500	3890 1.29	3610 1.24	3503 1.24	3181 1.27	3020 1.28	2862 1.29	7	3	8
550	4282 1.37	3984 1.32	3867 1.32	3512 1.35	3337 1.36	3163 1.37	8	4	9
600	4673 1.45	4359 1.39	4232 1.39	3844 1.43	3653 1.43	3465 1.45	9	5	10
650	5063 1.53	4734 1.47	4596 1.47	4175 1.51	3969 1.51	3766 1.53	10	5	11
700	5454 2.01	5108 1.54	4960 1.55	4506 1.59	4286 1.59	4067 2.01	11	6	12
750	5843 2.10	5483 2.02	5323 2.02	4837 2.07	4601 2.07	4367 2.09	12	6	13
800	6232 2.18	5857 2.10	5687 2.10	5167 2.15	4917 2.15	4667 2.17	13	7	14
850	6621 2.26	6231 2.17	6050 2.17	5498 2.22	5232 2.23	4967 2.25	14	7	15
900	7010 2.34	6606 2.25	6413 2.25	5828 2.30	5547 2.31	5267 2.33	15	8	16
950	7397 2.42	6980 2.32	6776 2.32	6157 2.38	5862 2.39	5566 2.41	16	8	16
1000	7785 2.50	7354 2.40	7139 2.40	6487 2.46	6176 2.47	5864 2.49	17	9	17
1050	8172 2.58	7728 2.47	7501 2.48	6816 2.54	6490 2.55	6163 2.57	18	9	18
1100	8558 3.07	8101 2.55	7864 2.55	7145 3.02	6804 3.02	6461 3.05	19	10	19
1150	8945 3.15	8475 3.03	8226 3.03	7474 3.10	7117 3.10	6758 3.13	20	10	20
1200	9330 3.23	8836 3.10	8588 3.10	7803 3.17	7431 3.18	7056 3.21	21	11	21
1250	9716 3.31	9204 3.17	8950 3.18	8132 3.25	7744 3.26	7352 3.29	22	11	21
1300	10101 3.39	9571 3.25	9312 3.25	8460 3.33	8057 3.34	7649 3.37	23	12	22
1350	10486 3.47	9938 3.33	9674 3.33	8788 3.41	8369 3.42	7945 3.44	25	12	23
1400	10870 3.55	10304 3.40	10035 3.40	9116 3.49	8682 3.49	8241 3.52	22	12	24

ENGINE ANTI ICE ON △FUEL = + 2 %	**TOTAL ANTI ICE ON** △FUEL = + 6 %

FLIP23A A320–212 CFM56–5A3 3611 03301.001011 0250300 .7800 .00100 120 0300350 55 0 100100 40100 18590 FCOM-N0–03–06–50–015–100

HOLDING

RACE TRACK HOLDING PATTERN AT GREEN DOT SPEED - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
CLEAN CONFIGURATION
PACK FLOW HI
ANTI-ICING OFF

ISA CG=33.0%

N1 (%) **FF (KG/H)**

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
48	65.0 1467	68.3 1492	72.8 1502	74.5 1503	76.3 1504	78.2 1508	80.4 1514	82.2 1527
50	66.3 1543	69.6 1560	73.9 1568	75.6 1568	77.5 1570	79.5 1577	81.6 1586	83.3 1600
52	67.5 1616	70.7 1626	75.0 1633	76.8 1635	78.7 1640	80.8 1647	82.7 1661	84.4 1674
54	68.8 1689	71.8 1695	76.1 1699	77.9 1702	79.9 1709	82.0 1719	83.7 1734	85.5 1749
56	69.9 1758	72.9 1763	77.2 1766	79.1 1771	81.2 1779	83.1 1793	84.7 1808	86.6 1826
58	71.0 1825	74.0 1828	78.3 1834	80.2 1841	82.4 1852	84.0 1867	85.7 1883	87.6 1909
60	71.9 1894	75.0 1894	79.3 1903	81.4 1912	83.3 1926	85.0 1942	86.7 1960	88.5 1994
62	72.9 1960	75.9 1961	80.4 1974	82.5 1985	84.2 2001	85.9 2017	87.7 2039	89.4 2078
64	73.9 2025	76.8 2029	81.5 2046	83.5 2059	85.1 2076	86.8 2093	88.6 2125	90.4 2174
66	74.9 2091	77.7 2098	82.6 2119	84.3 2134	86.0 2151	87.7 2172	89.5 2212	91.3 2258
68	75.8 2159	78.6 2167	83.6 2193	85.2 2209	86.8 2227	88.6 2254	90.3 2303	92.3 2345
70	76.6 2229	79.6 2237	84.4 2266	86.0 2285	87.7 2305	89.5 2342	91.2 2393	93.3 2433
72	77.4 2298	80.5 2309	85.2 2342	86.8 2361	88.5 2385	90.3 2435	92.1 2475	
74	78.3 2369	81.4 2383	85.9 2419	87.6 2438	89.4 2469	91.1 2525	93.0 2565	
76	79.1 2440	82.4 2457	86.7 2497	88.4 2518	90.1 2561	91.9 2609		

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
△FF = + 4 %	△FF = + 9 %	△FF = + 0.3 %

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DESCENT TO LANDING

DESCENT - M.78/300KT/250KT - 1 ENGINE OUT									
IDLE THRUST PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%						
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	14.8	75	90	IDLE					241
370	14.1	72	84	IDLE	17.0	87	103	IDLE	252
350	13.5	69	80	IDLE	16.3	84	97	IDLE	264
330	12.9	67	75	IDLE	15.7	81	92	IDLE	277
310	12.4	65	72	IDLE	15.0	78	88	IDLE	289
290	11.9	63	68	IDLE	14.4	76	83	IDLE	300
270	11.2	60	63	IDLE	13.6	72	77	IDLE	300
250	10.5	57	58	IDLE	12.7	68	71	IDLE	300
240	10.2	55	56	IDLE	12.3	67	68	IDLE	300
220	9.5	52	51	IDLE	11.5	63	62	IDLE	300
200	8.9	49	46	IDLE	10.6	59	56	IDLE	300
180	8.2	46	42	IDLE	9.8	55	50	IDLE	300
160	7.5	42	37	IDLE	8.9	50	45	IDLE	300
140	6.8	39	33	IDLE	8.0	46	39	IDLE	300
120	6.1	35	29	IDLE	7.1	41	34	IDLE	300
100	5.4	31	25	IDLE	6.2	36	29	IDLE	300
50	2.0	12	9	IDLE	2.3	14	10	IDLE	250
15	0.0	0	0	IDLE	0.0	0	0	IDLE	250

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	–	+ 2 %	+ 0.4 %
FUEL	+ 15 %	+ 35 %	+ 0.4 %
DISTANCE	–	+ 3 %	+ 0.4 %

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GENERAL

The ground distance/air distance conversion tables are used to calculate the air distance for a given ground distance due to the influence of the wind.
Tables are given for :
- LONG RANGE SPEED
- FIXED SPEEDS

LONG RANGE SPEED

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	–50	–100	–150
10	7	8	9	**10**	12	14	17
20	14	16	18	**20**	23	28	34
30	21	24	26	**30**	35	41	51
40	28	31	35	**40**	46	55	68
50	35	39	44	**50**	58	69	85
60	42	47	53	**60**	70	83	102
70	50	55	62	**70**	81	97	119
80	57	63	70	**80**	93	110	136
90	64	71	79	**90**	104	124	153
100	71	78	88	**100**	116	138	170
200	142	157	176	**200**	232	276	341
300	212	235	264	**300**	348	414	511
400	283	314	352	**400**	464	552	681
500	354	392	439	**500**	580	690	852
600	425	470	527	**600**	696	828	1022
700	495	549	615	**700**	812	966	1193
800	566	627	703	**800**	928	1104	1363
900	637	706	791	**900**	1044	1242	1533
1000	708	784	879	**1000**	1160	1380	1704
1100	778	863	967	**1100**	1276	1518	1874
1200	849	941	1055	**1200**	1392	1656	2044
1300	920	1019	1143	**1300**	1508	1794	2215
1400	991	1098	1231	**1400**	1624	1932	2385
1500	1062	1176	1318	**1500**	1739	2070	2555
1600	1132	1255	1406	**1600**	1855	2208	2726
1700	1203	1333	1494	**1700**	1971	2346	2896
1800	1274	1411	1582	**1800**	2087	2484	3067
1900	1345	1490	1670	**1900**	2203	2622	3237
2000	1415	1568	1758	**2000**	2319	2760	3407

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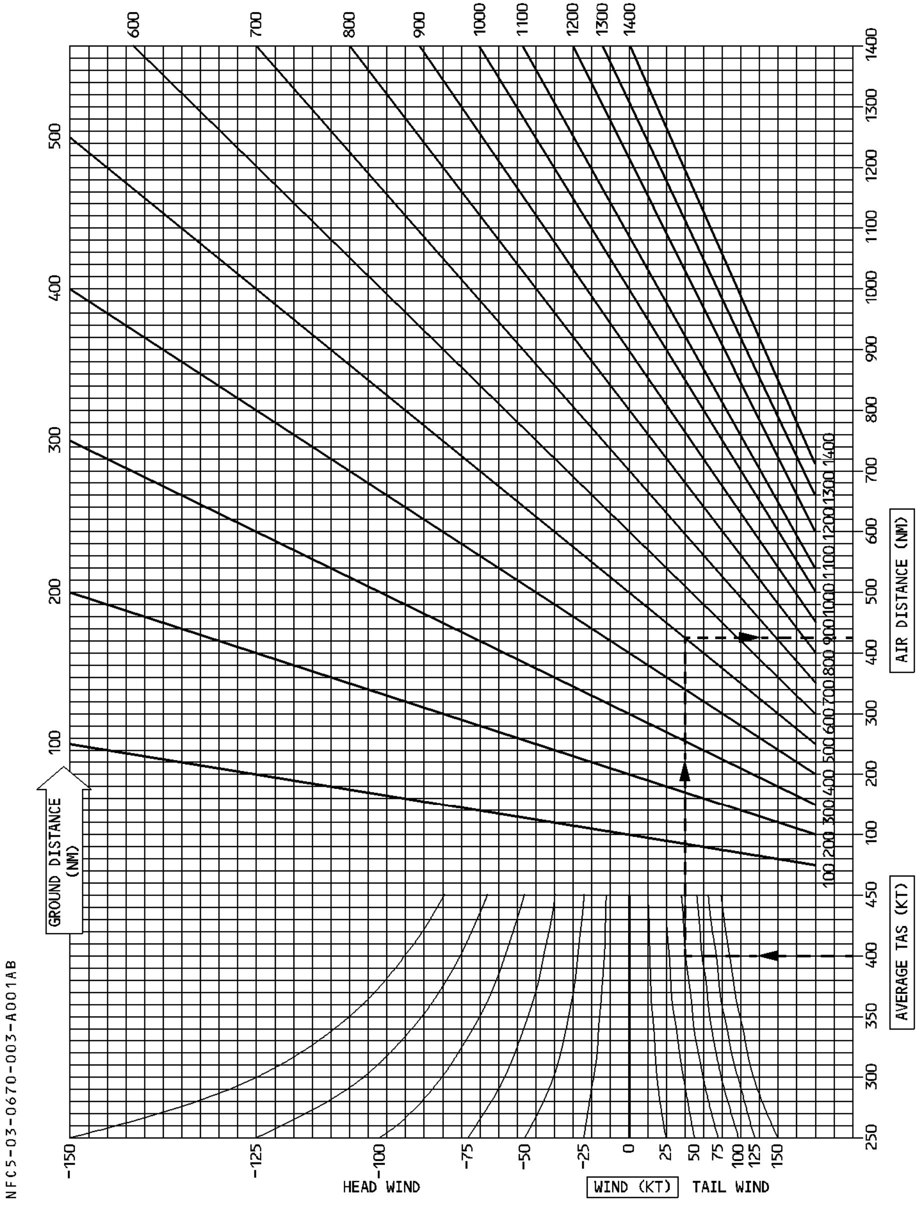
FIXED SPEEDS



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07.10 GENERAL DESCRIPTION 1/2

07.20 LIST OF EFFECTIVE OEB

07.30 STATUS . . . . 1 to 2

DEFINITION

Operations Engineering Bulletins (OEB) supplement the information and procedures contained in the different sections of the FCOM. OEB's are issued if there is a need for fast transmission of technical and/or procedural information having an operational impact to all flight crews concerned.
They are the result of continuous monitoring of the in-service performance of the aircraft fleet.
If compliance with an OEB has been identified as having a significant impact on aircraft operation, based on all information available at the time of issuance of this OEB, this OEB is printed on orange coloured paper. Associated with this OEB, a temporary revision of the Quick Reference Handbook (QRH) sets forth the correct related procedure.
However, the recommendations contained in all outstanding OEB's should also be reviewed with the highest attention.
Although the OEB's are not approved by the Airworthiness Authorities, the content might be subject to incorporation into the approved Airplane Flight Manual (AFM) or issuance of a Consigne de Navigabilité (CN)/Airworthiness Directive (AD).

DISTRIBUTION

Operating Engineering Bulletins are distributed to all identified holders of a FCOM and to those who need fast information concerning new or revised operational issues. Responsible persons within the operators organization are requested to ensure fast and complete distribution to all flight crews concerned.
R OEB's are filed in numerical order in FCOM chapter 7
This chapter contains a STATUS LIST and a LIST OF APPLICABLE OEB's (PER ATA CHAPTER) which are updated and re-issued with each normal FCOM revision.

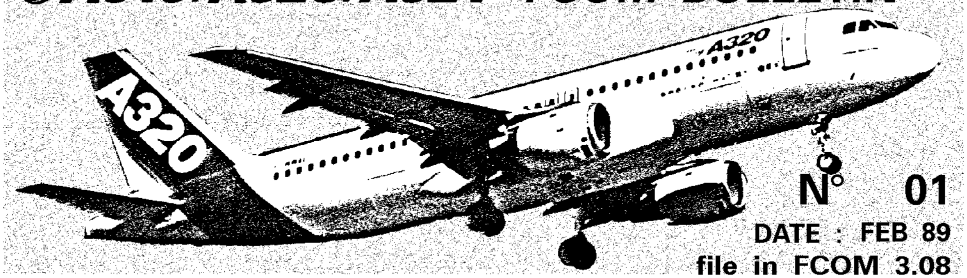
COMPLIANCE

Airbus Industrie recommends that all flight crews review on a regular basis all applicable OEB's and strictly adhere to the contained information, procedures and warnings.

N°	TITLE
"To be filled by the operator, if needed"	

N°	TITLE
"To be filled by the operator, if needed"	

A319/A320/A321 - FCOM BULLETIN



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DATE : FEB 89

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INTRODUCTION

It appears that there is a need for additional information concerning technical / operational matters closely related to the three volumes of the FCOM.
This information will be different in content from that of the OPERATIONS ENGINEERING BULLETINS.
OEB's are issued as the need arises to quickly transmit technical and procedural information when a specific problem arises which has an operational impact. They are normally the consequence of a detected defect / abnormal behaviour of the airplane or of one of its systems.

The new bulletin will be issued periodically and will be called « FCOM BULLETIN ».
It will deal with one or several subjects and will include additional information with regard to procedures, system descriptions, performance, regulations... and will contain explanations which are very often difficult to incorporate in the FCOM itself.

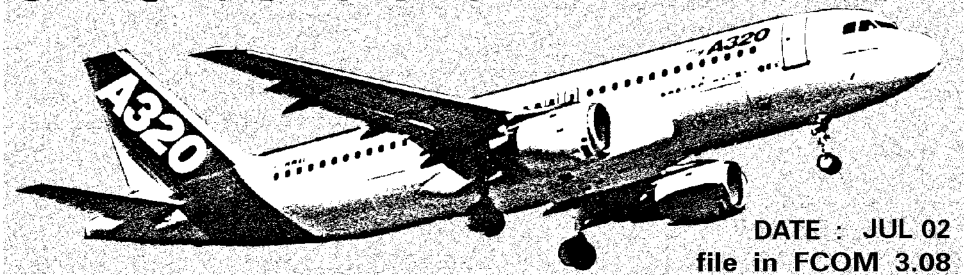
It may sometimes happen that the boundary between OEB's and the FCOM BULLETINS is not apparent, but remember that our main target is to inform airline crews about their aircraft.

It is sincerely hoped that this additional means of communication will benefit all of us and will help to keep a closer contact between AIRBUS INDUSTRIE operations Engineering and its customers.

Obviously all of your suggestions will be welcomed.

We suggest that the FCOM BULLETINS are filed in FCOM Volume 3 Section 8. These bulletins will not be updaded.

A318/A319/A320/A321 - FCOM BULLETIN



DATE : JUL 02
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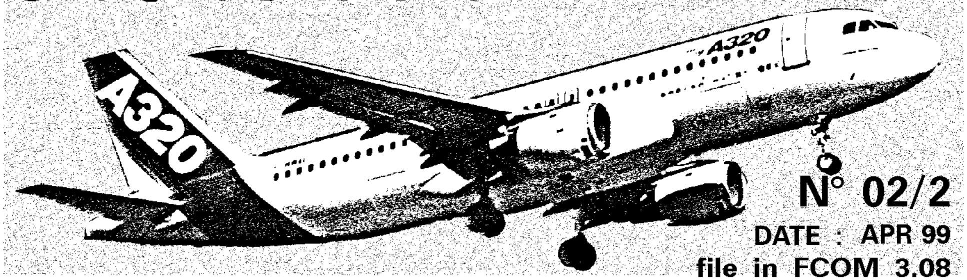
LIST OF EFFECTIVE FCOM BULLETINS

BULLETIN N°	SUBJECT
01/1	INTRODUCTION
02/2	CARBON BRAKES WEAR
05/2	OPERATION IN WINDSHEAR/DOWNBURST CONDITIONS
07/2	IAE V2500 N1 MODE
15/2	CABIN FANS
22/3	AVOIDING TAILSTRIKES
23/2	ENGINE STARTING WITH APU IN CROSSWIND CONDITIONS
26/2	FQI ACCURACY
30/1	ELECTRONIC INTERFERENCE FROM PORTABLE EQUIPMENT CARRIED ON BY PASSENGERS
33/2	THRUST ACCELERATION IN A/THR MODES
34/1	AVOID DISORDER IN THE COCKPIT
36/2	RADIO ALTIMETER ANOMALIES DURING ADVERSE WEATHER CONDITIONS
37/1	FMGS NAVIGATION DATABASE
39/2	SPECIFIC FEATURES OF THE FMGS FULL STANDARD
40/1	STOWAGE OF THIRD OCCUPANT SEAT
41/2	VMO / MMO DETERMINATION
43/2	OPERATION OF FLEETS WITH/WITHOUT CPIP
44/2	A320 IAE AUTOLAND LONG FLARE
46/2	CHARACTERISTIC AND PROTECTION SPEEDS

	BULLETIN N°	SUBJECT
	47/2	GROUND SPEED MINI FUNCTION
	48/2	MMEL AND MEL USE
	49/2	ILS1/ILS2 GLIDESLOPE DISCREPANCY ON SPECIFIC TYPE OF ILS
	50/2	PUBLICATION OF SOME ATTENDANT INFORMATION BULLETINS
	51/2	ERRONEOUS AIRSPEED/ALTITUDE INDICATIONS
	52/1	EGPWS DATABASE
	53/2	USE OF FINAL APP MODE AND NAV DATABASE VALIDATION
R	54/2	AIRCRAFT HANDLING IN FINAL APPROACH
R	55/1	USE OF RUDDER ON TRANSPORT CATEGORY AIRPLANES

A318/A319/A320/A321 - FCOM BULLETIN



N° 02/2

DATE : APR 99

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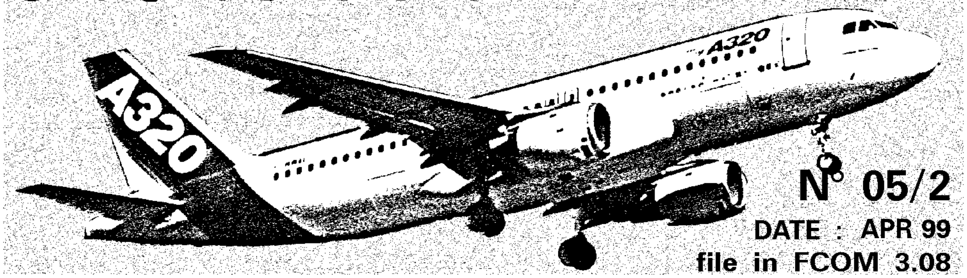
SUBJECT : CARBON BRAKES WEAR

- Steel-brakes are such that wear is directly proportional to the energy applied. In other words, the strongest the brake demand, the greatest the wear.
  This no longer applies with Carbon-brakes where more complex phenomenons (such as temperature) interface.
  One of them must be underlined due to its great contribution to brakes-wear :
  - Numerous tests have shown that around 50 % of the carbon-brakes wear appears when taxiing before take off with coldbrakes. What must be kept in mind is that cold carbon-brakes are very touchy to numerous solicitations. Wear is proportional to the number of brake applications and not to the energy applied.

- That is why, and despite the obvious lack of procedure as far as braking is concerned, it is worth recalling that when taxiing before takeoff, brake should not be solicited too often. Needless to add that nosewheel steering must be done with the appropriate cockpit command and not through brake pedals.

A318/A319/A320/A321 - FCOM BULLETIN



N° 05/2
DATE : APR 99
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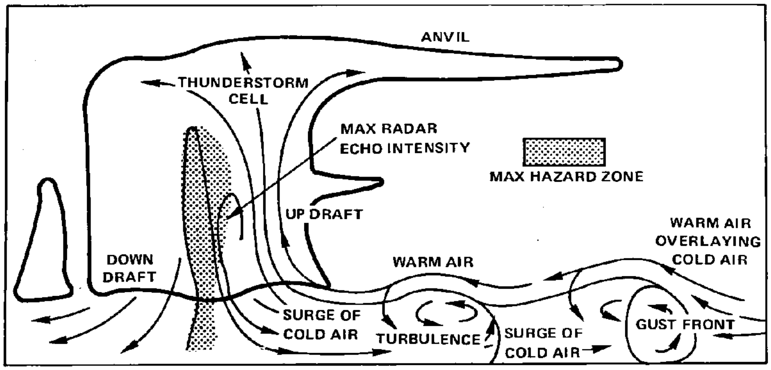
SUBJECT : OPERATION IN WINDSHEAR / DOWNBURST CONDITIONS

GENERALITY

Windshear-related problems are generally connected to « a change in wind direction and/or speed over a very short distance in the atmosphere ». The most prominent meteorological conditions conducive to this are :
– convective storm shear (air mass and frontal thunderstorms, downburst, wet and dry microburst),
– non-convective (cold and warm) frontal systems,
– windshear associated with strong winds near the ground.

WINDSHEAR ASSOCIATED WITH CONVECTIVE CLOUDS AND STORM CELLS

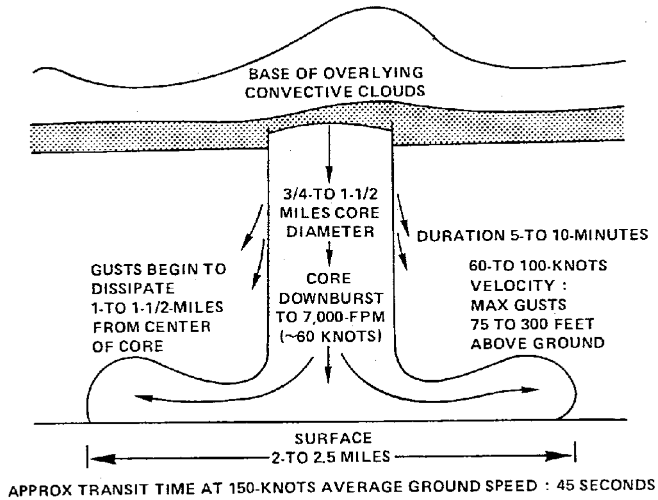
– The air-mass thunderstorm develops from localized earth surface heating with air rising and cooling to form cumulus clouds. As these keep growing, heavy rain and hail precipitation begins to develop in the higher areas thereby cutting off the updraft energy source and eventually dissipating the thunderstorm cell. A surge of cold air emerging from the heavy rain and associated downdraft can produce :
  · a downburst, i.e. strong downdrafts inducing an outburst of damaging winds on or near the ground,
  · a gust front with blowing dust on the earth surface,
  · a shear boundary with turbulent flow due to interaction with the warm, undisturbed environmental air,



Air-Mass Thunderstorm

– Frontal thunderstorms are usually more tilted in the vertical, allowing precipitation to fall away from the updraft and airflow intensity within the storm accelerating much more than for the simple air-mass thunderstorm, sometimes resulting in a tornado.

– Microbursts consist of intense, non rotating, highly localized downward airflows with velocities up to 7 000 fpm that may emanate below a convective cloud base. Some of these microbursts will expose penetrating aircraft to major safety hazards whatever technique is used in anticipation / reaction.



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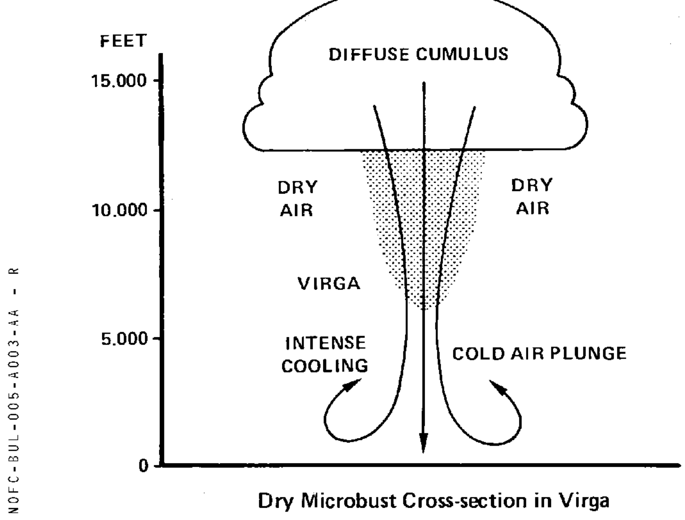
Wet Microburst Cross-section

Microbursts can take 2-5 minutes to develop maximum intensity and may then be sustained for an equal period of time. They tend to develop in groups which may be merged, delaying dissipation to 30 minutes. Present knowledge contends that approximately one in a hundred heavy rain thunderstorms produce microbursts. It was determined that microbursts can also occur in relatively dry conditions. Once it gains sufficient downward momentum, a downflow with evaporative cooling accelerates to the earth's surface to induce a «dry microburst» with very light or non-existant precipitation, called virga. «Wet microbursts» are expected to occur in the wet regions of the world. Dry microbursts are commonly seen in the dry areas and most likely below cumulus cloud when dew point is 30 ∘ C or more below ambient temperature.
Changes in meteorological conditions associated with both macro and microbursts tend to be very complicated.

CONDITIONS	MACROBURSTS	MICROBURSTS
Air temperature	: ISA + 15 ∘ decreasing	ISA + 15 ∘ increasing or decreasing
Dew point spread	: increase (20-40 ∘ C)	increase (20-40 ∘ C)
Surface pressure	: rise or fall (up to 2/3 mb)	rise or fall (up to 2/3 mb)



Dry Microbust Cross-section in Virga

WINDSHEAR ASSOCIATED WITH NON-CONVECTIVE FRONTAL SYSTEMS

Substantial differences in winds can be encountered by approaching and departing aircraft close to low pressure centers and their associated cold, warm and occluded fronts.

Penetrating a cold front on either side leads to a headwind increase, potentially bringing a performance increasing shear. Pilots are advised to beware of thunderstorms in the vicinity that may contribute to amplify windshear conditions.

Penetrating a warm front on either side exposes to a headwind decrease, potentially resulting in a performance decreasing shear generally not exceeding performance limits of the aircraft.

Windshear at a warm front is more severe than at a cold front with large head/tail and vertical wind changes in the lowest 1 000 feet above ground level.

The magnitude of the windshear may become significant when :

- the temperature difference across the front is at least 6 ° C.
- the temperature gradient of the front shows a minimum of 6 ° C over 50 Nm,
- the speed of frontal movement is greater than 30 kts.

WINDSHEAR ASSOCIATED WITH STRONG WINDS NEAR THE GROUND

Very similar to a surface boundary layer with increasing winds and approximately constant wind direction.

Low altitude jet streams may be found in a variety of situations such as strong low altitude jet winds, nocturnal jet winds, terrain-induced low altitude windshear, mountain-wave and downslope flows, strong surface winds combined with small hills or large buildings, lake and seabreeze windshear due to temperature gradients between sun-heated terrain and water-cooled air. In particular, strong temperature change across an inversion may trigger very variable wind conditions.

DETECTION OF CONDITIONS

OPTIONAL SYSTEMS INTEGRATED ON THE AIRCRAFT

PREDICTIVE WINDSHEAR

Predictive Windshear is incorporated into the weather radar system to enable the detection of a microburst windshear event within 5NM forward of the aircraft. It is based on dynamic Doppler effects.

When a windshear is detected, the system generates the appropriate annunciation to the crew to alert them of a potential danger. There are different alert levels depending on :

- the severity of the windshear event detected,
- the distance and angular position between the aircraft and the windshear,
- the altitude and speed of the aircraft,
- the flight phase.

The Predictive Windshear system provides advanced warning for the crew to escape a windshear event using normal handling technique or to initiate a recovery maneuver earlier.

REACTIVE WINDSHEAR

Reactive Windshear advises the crew when windshear conditions have been entered. The system generates an audio and visual warning to the crew. The FAC measures the difference between the impredicate energy state and the minimum energy state for flight security. At a defined threshold, a message is displayed on the PFD and an aural warning alert is provided to the crew :

- at takeoff, from 5 seconds after lift off up to 1300 feet RA.
- at landing, from 1300 feet RA down to 50 feet RA,

BRIEFING AND PREPARATION

a) ANALYSE weather information during preflight :

- weather messages provided by the airline,
- aviation surface observations,
- NOTAMS,
- SIGMETS, particularly convective sigmets,
- terminal forecasts,
- area forecasts, possibly mentioning the Low Level Wind Shear Alert System (LLWSAS) installed on the periphery of certain airports (USA only).

b) LISTEN to pilot reports (PIREPS) on wind shear. PIREPS should include :

- location of shear encountered,
- altitude of shear encountered,
- airspeed change experienced (knots gained or lost)
- type of aircraft undergoing the shear,

Note : Pilots should always report any windshear encountered to Air Traffic Control.

c) LOOK OUT for weather clues on the way to the airport and/or from the cockpit (parked, taxi or airborne) such as :

- extreme variations in wind velocity/direction in a very short time span,
- isolated rainshowers with or without lightning showing divergences from the raincore and clear curling horizontal vortex rolls, within 5 miles of the airport,
- heavy precipitation along intended flight path,
- lightning, thunderstorms or evidence of any tornadic feature in airport vicinity,
- evidence of a gust front such as blowing dust on the airport surface, suggesting the possible passage of a thunderstorm within 15 minutes,
- evidence of convective activity particularly with anvil clouds in dry areas, supercells, low echos, mushroom, sinkhole and/or giant ant-eater clouds, cumulo nimbus mamatus and altocumulus.

Note : The existence of other types of shear can occur due to local obstruction, topographical and meteorological conditions. It is important for crews to realize that windshear conditions should be considered cumulative : simultaneous conditions can increase the severity of effects.

d) **EXAMINE** the approach or take-off area with the airplane weather radar to determine whether returns are in the vicinity of the airport or intended flight path,

- flight operations below 10,000 ft such as take-off and landings require 2 to 3 degrees upward tilt for target detections up to 40Nm ; if there is significant weather activity, the tilt angle should be adjusted to provide a solid ground return outside of the desired range to ensure that no overscanning will occur.

Note : since radar echoes are due to precipitation reflection, dry environment situations and conditions to dry microbursts may not be detectable by weather radar ;

e) **MONITOR** the aircraft instruments whenever windshear is suspected :

- any rapid change in the relationship between airspeed and groundspeed represents a windshear ; groundspeed must be compared with airspeed, on the ND's. (GS/TAS)

- airspeed tendency (Vc trend) :
  - acceleration in headwind/updraft,
  - deceleration in tailwind/downdraft,

- direction and intensity of wind (computed by the IRS and displayed on ND's) allows a comparison at the initial approach altitude (1 500 to 2 000 ft AGL), with the reported runway surface wind to check any shear situation between the airplane and the runway,

- speed margin from α-prot speed (shown by a red and amber strip along the speed scale of the PFD's),

- rate of descent (on stabilized ILS approach) :
  - high rate suggesting a strong tailwind,
  - low rate suggesting a strong headwind,

- rate of climb :
  - high rate suggesting a strong headwind,
  - low rate suggesting a strong tailwind.

· pitch attitude :
increasing - with headwind shear,
- with downdraft shear,

decreasing - with tailwind shear,
- with updraft shear,

· power needed :
to hold the glideslope :

- less power necessary suggesting a strong tail wind,
- more power necessary suggesting a strong headwind

to hold a climb angle :

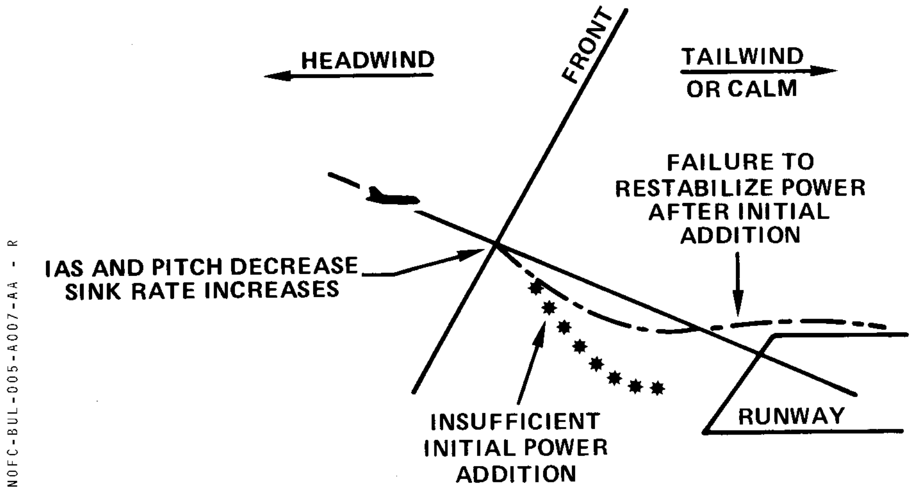
- less power necessary suggesting a strong headwind,
- more power necessary suggesting a strong tailwind,

INFLUENCE OF WINDSHEAR ON AIRCRAFT PERFORMANCE

DECREASED PERFORMANCE

Headwind to tailwind
Headwind to calm
Calm to tailwind
Headwind to decreased headwind.

APPROACH WITH A TAILWIND SHEAR



· airspeed decreases, lift decreases,
· A / C nose begins to pitch down,
· A / C begins to drop below the glide slope,

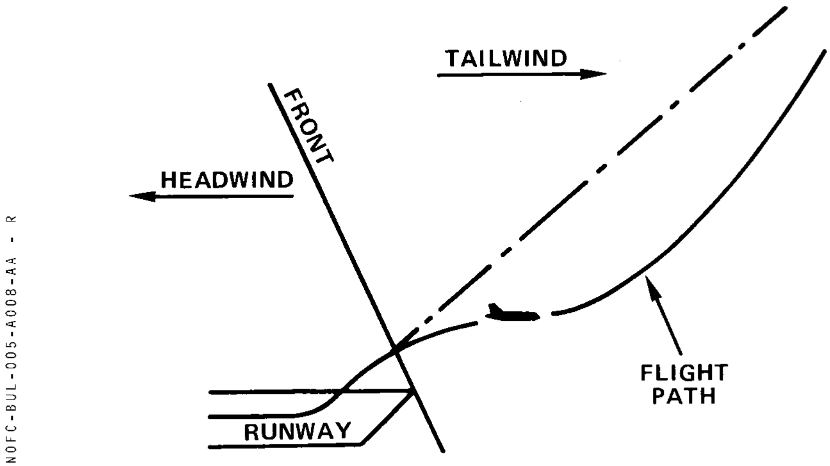
In this case the A/C is both slow and low in a « power deficient » state.

Consequences :

. If the pilot pulls the nose up to recapture the glide slope without selecting sufficient power : the A / C will loose altitude very rapidly and may even reach the ground before the power deficiency is corrected, resulting in a hard landing.

. or if sufficient power is set to regain the glideslope before reaching the ground : the « double negative » problem may arise if the pilot does not quickly retard the throttles after glide recapture, i.e. throttles set too high for a stabilized approach in a no-wind condition leading to a long and fast landing.

TAKE OFF WITH A TAILWIND SHEAR



. airspeed decreases, lift decreases,
. A / C nose begins to pitch down,
. A / C drops below its nominal flight path,

Consequences :

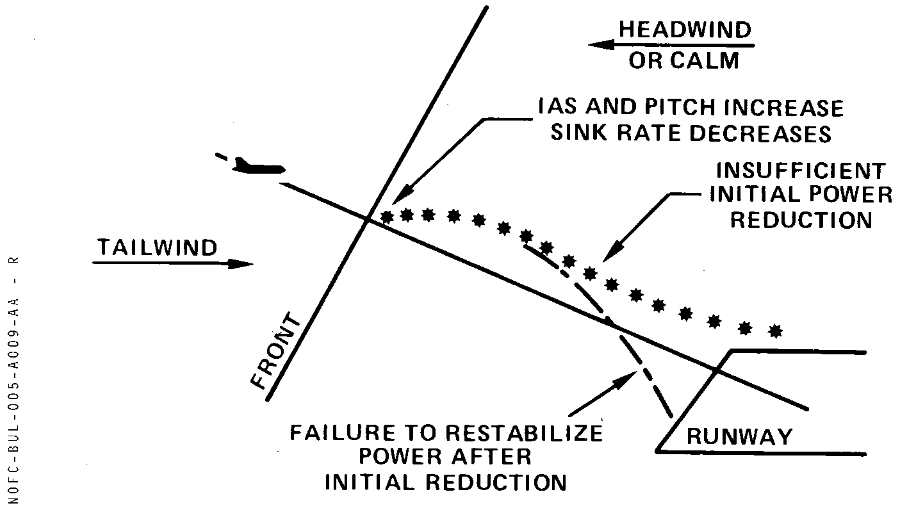
. Because of aircraft inertia, attitude and ground speed will be initially maintained upon encountering windshear but airspeed will decrease, causing a reduction in lift which will result in a downward acceleration and a nose down pitching moment.

. If there is no pilot action, the aircraft will descend below its nominal flight path. Because of aircraft stability, original angle of attack and airspeed will eventually be recovered, but on a reduced flight path.

INCREASED PERFORMANCE

Tailwind to headwind
Calm to headwind
Tailwind to calm
Headwind to increased headwind

APPROACH WITH A HEADWIND SHEAR



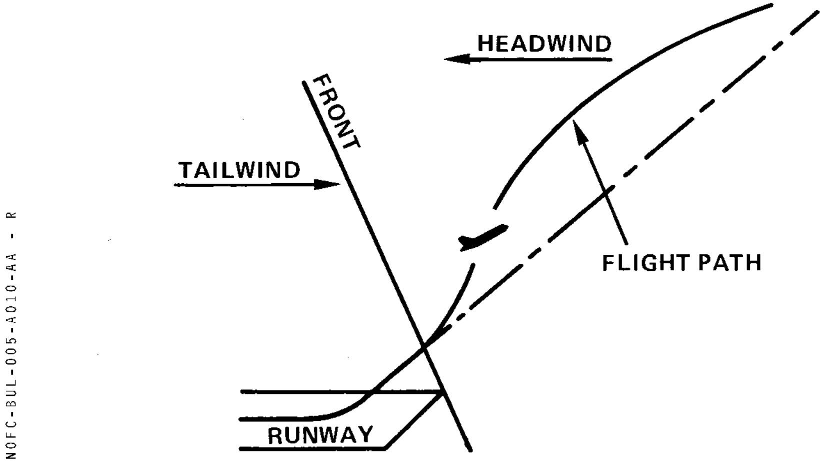
The reverse of the previous case prevails :
. airspeed increases, lift increases,
. A / C nose begins to pitch up,
. A / C balloons above the glide slope,
In this case the A / C is both fast and high in a « power excessive » state.

Consequences :

. the pilot does not initially reduce power, the aircraft will gain altitude and airspeed resulting in a long, fast landing with the possibility of an overrun.

. or if the pilot reduces thrust to regain the glideslope and initial airspeed : the « double negative » problem can arise if the thrust is not recovered which leads to a high sink rate and possible short, hard landing.

TAKE OFF WITH A HEADWIND SHEAR



The reverse of the previous case prevails :
. airspeed increases, lift increases,
. A / C nose begins to pitch up,
. A / C rises above its nominal flight path

Note

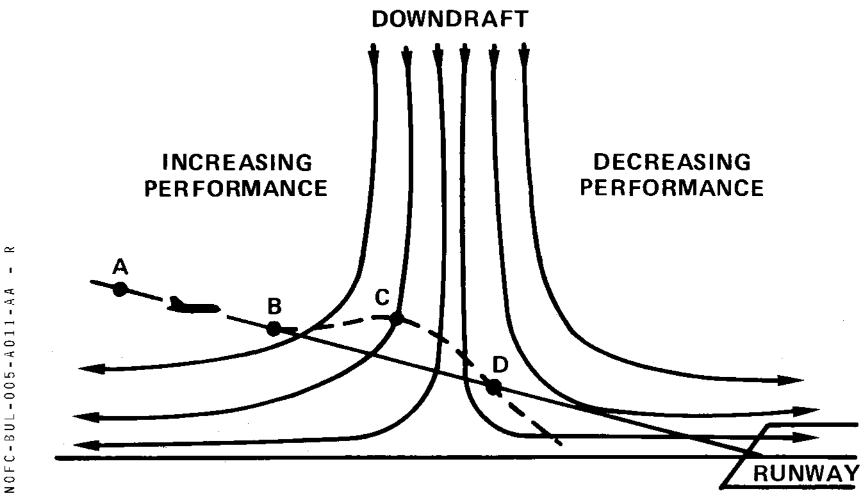
. A headwind shear usually leads to increased aircraft performance.

. The resulting increase in lift may however lead to an excessive angle of attack which could eventually trigger the α-prot function once out of the shear.

INCREASED PERFORMANCE FOLLOWED BY DECREASED PERFORMANCE

Downdraft + tailwind shear

APPROACH THROUGH MICROBURST



. at point A the aircraft is on speed and on glide slope.

. at point B it encounters an increasing headwind. Its airspeed and pitch increase and it balloons above the glide slope.

. at point C the « moment of truth » occurs :

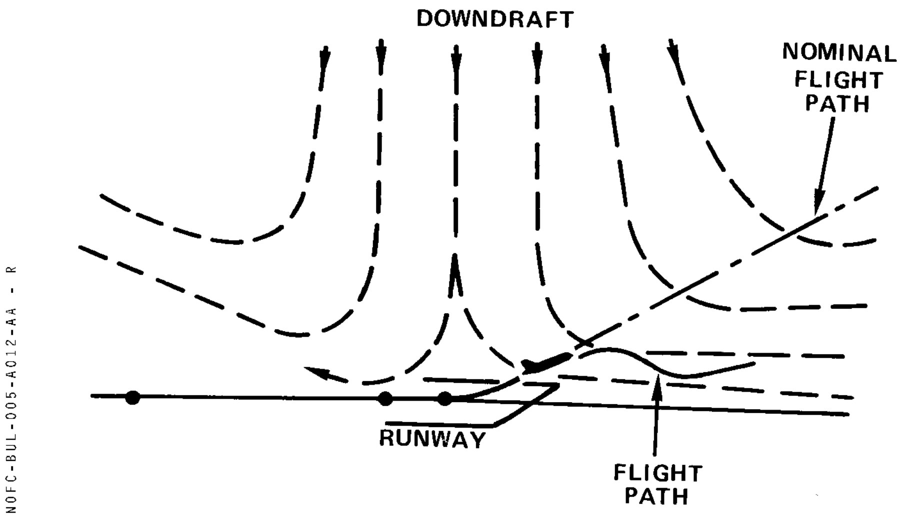
If the pilot does not fully appreciate the situation, he may attempt to regain the glide slope by reducing power and pushing the nose down.
But between C and D the headwind ceases, a strong downdraft is entered and the tailwind begins to increase. The skin rate occurs rapidily and ground impact may become difficult to avoid.

Consequences :

. a go-around initiated at point C or sooner would probably be successful since the A/C is fast and high at this point,

. gradual groundspeed decay shortly after point B coupled with rapidly increasing airspeed could have allowed detection of signs of impending downdraft.

TAKE OFF THROUGH MICROBURST



. airspeed decreases
. A / C nose begins to pitch down
. A / C drops below its nominal flight path.

Consequences :

. Initially the pilot may not fully appreciate the situation since he is taking off in increased performance shear conditions. Progression into the downburst core causes a violent and rapid loss of lift, followed by a high sink rate with very little loss of airspeed. Exiting the downburst core below the nominal flight path (after 20 to 40 seconds) is then followed by a low-level decreased performance tailwind shear.

. In this microburst example, the angle of attack is instantly decreased causing an immediate loss of lift.

5. CLIMB GRADIENT and ACCELERATION CAPABILITY

– This section presents an example of A / C ability to maintain an horizontal flight at a given airspeed, in case of tailwind shear or downdraft conditions by adjusting the thrust.

– In practice, windshear conditions will very often be a combination of horizontal and vertical shear components. This will make it necessary to establish a tradeoff between climb gradient and acceleration requirements.

a) Acceleration capability

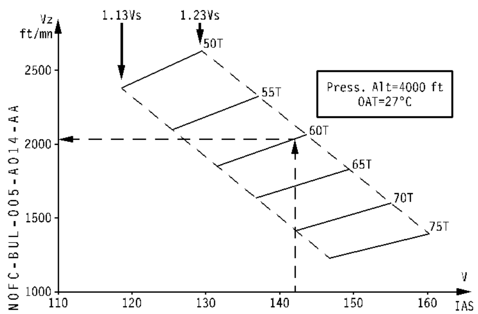
In case of tailwind shear, the aircraft oppose a level flight acceleration capability. For example, an A320 powered with CFM56-5A1 engines (a / c weight = 60 000 kg (132 300 lb), FLAPS 3, pressure altitude = 0 ft, OAT at ISA) is able to maintain an horizontal flight in a 4 kt / s decreased performance shear, keeping a constant airspeed and increasing ground speed of 4 kt/s.
If the horizontal shear exceeds the flight level acceleration, the airspeed will decrease and will descend unless pitch attitude is increased.

b) Climb gradient maintainability

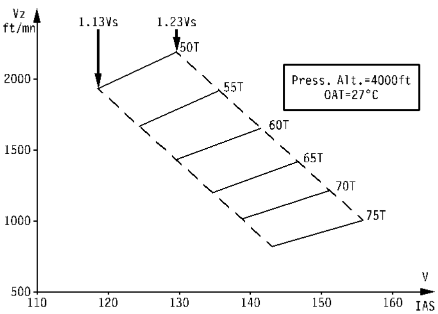
In downburst conditions, level flight will be maintained with the climb gradient maintainability. In the following example (CFM 56-5A1, a/c weight = 60 000 kg (132 300 lb) pressure altitude 4 000 ft, OAT = 27° C, V = 142 kts), the aircraft has the capability to maintain level flight in a 2 040 ft / mn downdraft without any airspeed change. If the downdraft exceeds this climb gradient capability, the A / C will descend unless pitch attitude is increased to adapt angle of attack.

For information, a typical example :

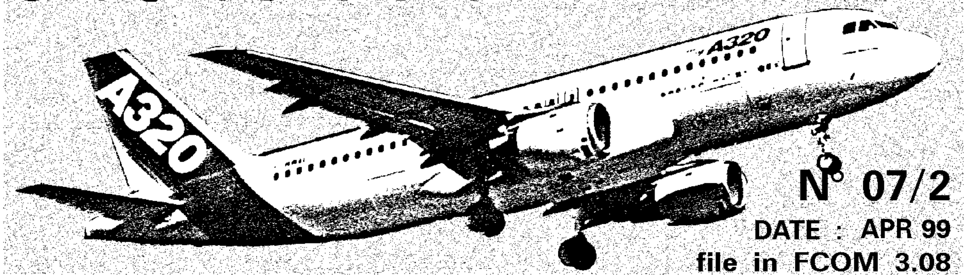
CFM 56-5A1



IAE V2500-A1



A318/A319/A320/A321 - FCOM BULLETIN



N° 07/2

DATE : APR 99

file in FCOM 3.08

SUBJECT : IAE V2500 N1 MODE

Note : this Bulletin is only valid for aircraft powered by IAE V2500 engine.

The FADEC NORMAL mode is EPR mode which requires various inputs including :
Thrust Lever Angle (TLA) altitude, mach number, ambient temperature, engine inlet total air temperature (T2) and the service bleed. If any of these inputs are not available, the FADEC automatically reverts to a reversionary which may be :

- N1 RATED mode
- N1 UNRATED mode (named DEGRADED mode on ECAM).

NI RATED MODE

DESCRIPTION

The N1 RATED MODE is a FADEC reversionary mode which occurs :

- either AUTOMATICALLY if P2 (engine inlet total pressure) and/or P5 (LP turbine exit total pressure) engine parameters are not available,
- or MANUALLY if the pilot presses the N1 MODE pushbutton.

The FADEC, in this mode, processes the N1 power management as a function of TLA, T2 and altitude, for the following ratings :

- MAX TO or GO AROUND
- MAX CONTINUOUS
- MAX CLIMB.

Additionally the FADEC provides the following data to the crew via ECAM E/W display :
- N1 rating limit corresponding to the selected Thrust Limit mode (CLB, MCT, TO)
- selected THRUST LIMIT mode as a function of TLA
- N1 TLA corresponding to the thrust lever position
- Actual N1

OPERATIONAL CONSEQUENCES

1. Reversion from EPR → N1 RATED mode on the GROUND :
   - This is a GO ITEM (please refer to MMEL 01-73-20)
   - Autothrust control is lost and thus alpha-floor protection is not available
   - Performance penalties must be applied (please refer to MMEL 02-73-20) :
     – for takeoff max weights and associated speeds
     – for single engine cruise, drift down net ceiling.
   - Flexible takeoff is not permitted.

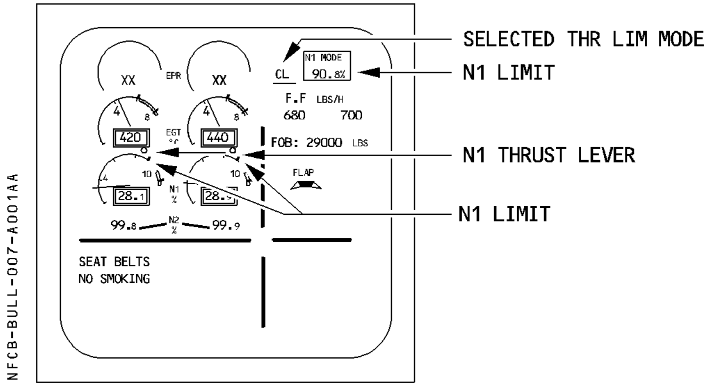
2. Reversion from EPR → N1 RATED mode during T/O Phase
   The thrust remains EQUIVALENT to the thrust initially obtained with EPR mode, up to 2500 ft above runway level.

3. Reversion from EPR → N1 RATED mode in FLIGHT :
   A cockpit caution and audio message are triggered with the associated ECAM procedure "EPR MODE FAULT".

   In addition, the ATHR will disengage and the alpha floor will be lost. If the thrust levers were in the CLB detent (MCT for single engine operation), the THRUST LOCK function will be activated. It will be deactivated as soon as a thrust lever is moved from the CLB (MCT) detent.

Note : No particular precautions are required when pressing the N1 MODE pushbutton.

The ECAM E / W display correct data on the N1 indicator, when N1 RATED MODE is active for both engine .



N1 UNRATED MODE

DESCRIPTION

The N1 UNRATED MODE reversion occurs in the event of the loss of the engine inlet total air temperature (T2) or the ambient temperature (ambient pressure engine sensor).

The N1 is defined as a function of TLA only and is limited by the FADEC to either the lower of maximum N1 or N1 redline (if T2 is available) or N1 redline (if T2 is not available).

The only data provided to the crew by the FADEC is :

N1 ACTUAL

There is a difference between N1 provided in EPR MODE or N1 in RATED MODE and UNRATED MODE, for a given TLA. As a consequence, switching from EPR to EPR to N1 UNRATED may result in a N1 change

- In case the reversion occurs when ATHR is engaged and thrust levers are out of a detent or subsquently moved out of a detent
- or when pressing the N1 MODE pushbutton.

OPERATIONAL CONSEQUENCES

1. If reversion to N1 UNRATED MODE occurs on the GROUND :
This is a NO GO ITEM.

2. If reversion occurs in FLIGHT :

   A cockpit caution and audio message are triggered with an ECAM procedure. Please refer to FCOM 3.02.70, "EPR MODE FAULT" to have the detail of the corresponding ECAM procedure.

Additionally the ATHR will disengage and alpha-floor protection will be lost :

- If thrust levers were in CLB detent (or MCT notch with one engine inop), the THRUST LOCK function will be activated. Moving thrust levers or depressing the N1 MODE pushbutton will cause the THRUST LOCK system to be deactivated and N1 will follow TLA position.
- If thrust levers were not in CLB / MCT notches, the N1 change would occur immediately.

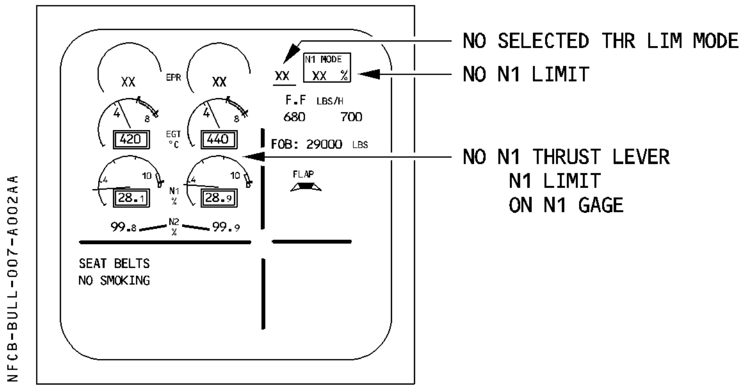
In the case both FADECs revert to N1 UNRATED MODE, in order to ensure a proper power management and satisfy N1 LIMIT values, N1 tables are provided in FCOM VOL 3 – 3.05.05 "Thrust ratings", N1 MCT, N1 MAX CLB, N1 MAX CRZ, N1 GO AROUND.
Furthermore SINGLE ENG DRIFT ON NET CEILING penalties will be also published there.

③ It would be more likely to have a MIXED CASE where a failure is experienced on one engine, while the other is working normal. If this occurs, the CAUTION / AUDIO / ECAM messages will be identical except for one additional message (NOT EXCEED N1 LIMIT) : indeed both N1 MODE pushbutton will have to be pressed so as to help the crew to properly adjust the ACTUAL N1 on the engine where the FADEC is in N1 UNRATED MODE, by using the data provided by the other FADEC (N1 ACTUAL, N1 LIMIT). As a consequence, the crew will have to adjust the thrust lever, on the failed side, to a position (which depends on flight conditions) so as to align its N1 ACTUAL to the other N1 ACTUAL provided on ECAM. In this case there will be a thrust lever misalignment.

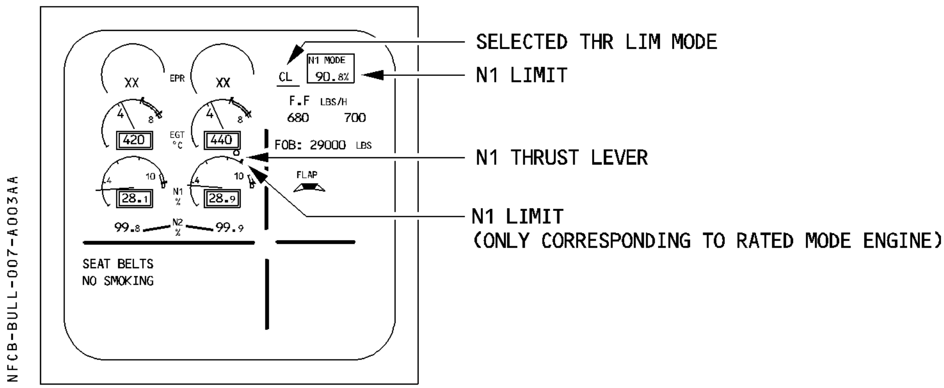
Single engine cruise drift down net ceiling penalties should also be used, in case that a subsequent engine failure occurs.

④ The ECAM E / W display indicates the following data on the N1 guage, depending upon 2 FADECs in N1 UNRATED mode, or 1 FADEC in N1 RATED and the other in N1 DERATED mode

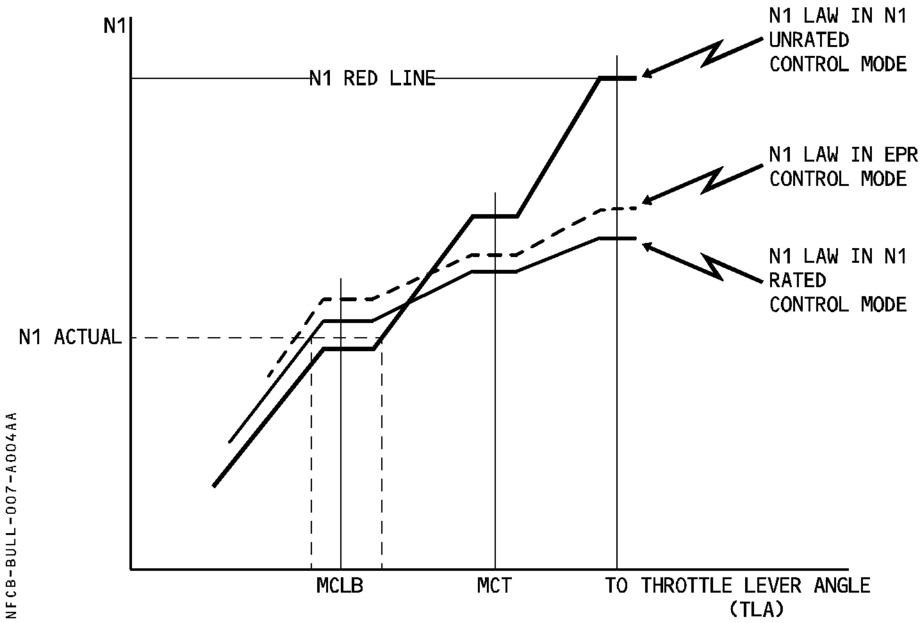
2 FADEC N1 DEGRADED MODE



MIXED CASE : Eng 1 Degraded, Eng 2 Rated mode



N1 COMMAND VERSUS THRUST LEVER POSITON RELATIONSHIP

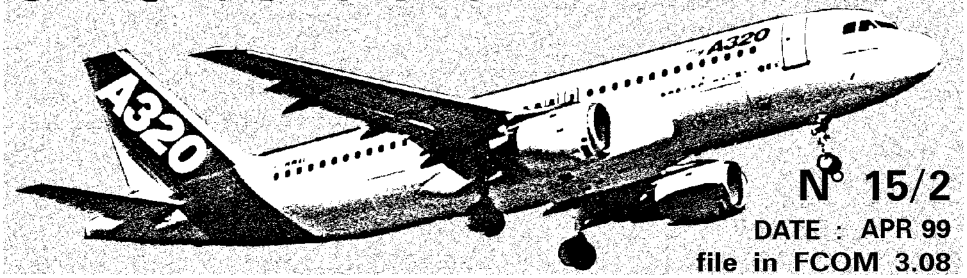


This figure indicates that, in the MIXED case, the thrust lever position on both engines will be quite different in order to achieve the same N1 actual :

For example in order to achieve an N1 actual lower than MAX CLB.

- the thrust lever position on the side where FADEC is in UNRATED mode may be FORWARD of MAX CLB notch, while
- the thrust lever position on the side where FADEC is in RATED mode is systematically AFT of MAX CLB notch.

A318/A319/A320/A321 - FCOM BULLETIN



N° 15/2

DATE : APR 99

file in FCOM 3.08

SUBJECT : CABIN FANS

CABIN FANS

Several airlines have requested a procedure to reduce cockpit noise during transit i.e to switch off cabin fans.

SYSTEM

Cabin fans are used to recirculate cabin air into the mixing unit. This is to increase the volume of air which can be moved

- into the cabin.
- into the avionic ventilation system when the AIR COND inlet valve is open.

PROCEDURE

To reduce cockpit noise during transit, cabin fans can be switched to OFF provided avionic ventilation system is in normal configuration (BLOWER and EXTRACT pb not set at OVRD). Cabin fans should be selected ON when passengers are on board.

SUBJECT : AVOIDING TAIL STRIKES

Inadvertent tail strikes may occasionally occur, and may result in expensive structural damage.

Several tail strikes have been reported throughout service life.

They are very often associated with such adverse conditions as crosswind, turbulence, windshear, etc.

A/C GEOMETRY LIMITS

Two limits need to be considered :

– The geometry limit corresponding to the main gear oleo fully extended (Θ_1)
– The geometry limit corresponding to the main gear oleo fully compressed (Θ_2).

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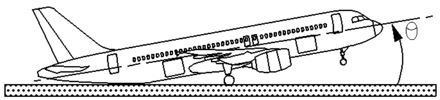


	Pitch attitude Θ		
Main Gear Oleo Position	A319	A320	A321
Fully extended	15.5°	13.5°	11.2°
Fully compressed	13.9°	11.7°	9.7°

Note : On the A321, the installation of a TFTS antenna decreases these values.

CLEARANCE AT TOUCHDOWN

The following table provides the ground clearance in degrees for the A319, the A320, and the A321 at landing (all numbers are mean values).

Aircraft	Geometry limit at Touchdown	Pitch attitude at Vapp (VREF + 5) (1)	Pitch attitude at Touchdown (Vapp – 8) (2)	Clearance (3)
A319	15.5°	3.4°	7.7°	7.8°
A320	13.5°	3.3°	7.6°	5.9°
A321	11.2°	2.4°	6.6°	4.6°

Notes : *(1) Flight path in approach = – 3°*

(2) Mean value of pitch attitude at touch down assuming a deceleration of 8 kt during flare (VAPP – 8), and a flight path of – 1° at touch down (approximately 3 ft/second).

(3) Clearance = Geometry limit - Pitch attitude at touchdown.

When the approach speed is decreased by 5 knots, clearance decreases by approximately 1.3° (attitude at touchdown increases by 1.3°).

TAIL STRIKE FACTOR AT TAKEOFF

Early rotation, over-rotation, excessive pitch rate, or a combination of these three factors are the main causes of tail strikes at takeoff.

EARLY ROTATION

Early rotation occurs when :

– A too low VR is computed;
– The rotation is initiated prior to VR.

- Erroneous VR computation may occur when the takeoff speeds are not cross-checked, or when incorrect loadsheet data is used. At hot-and-high elevation airfields, the error can be critical.
- Rotation initiated prior to VR due to :
  – Flaps improperly set for the calculated VR.
  – Bird or obstacle avoidance leading to early rotation.
  – Early rotation due to windshear, encountered during the takeoff roll. In such an event, the FAA recommends rotation 2000 feet before the end of the runway.

OVER-ROTATION OR EXCESSIVE PITCH RATE

These two causes are generally associated with a second factor in tail strike incidents (one engine-out, aircraft out of trim, additive inputs from both pilots, early rotation, etc.).

Certification requires demonstration of a safe takeoff at V_R-10 knots (2 engines) and V_R-5 knots (1 engine).
The pitch and the pitch rate, obtained during these tests, are for information purposes only, and are not certified limits.

Aircraft	Weight (kg)	CG	Config.	Rotation speed	θ° Per Sec	θ° at lift-off
A319 CFM	62 550	21.4 %	Conf 2	V_R-10 knots 2 engines	5.8°/s	12.5°
	63 440	21.3 %	Conf 2	V_R–5 knots 1 engine-out	5.9°/s	12.8°
A320	67 200	17.8%	Conf 2	V_R-10 knots 2 engines	5.8°/s	9.5°
	65 300	16.5%	Conf 2	V_R-5 knots 1 engine-out	5.4°/s	9.0°
A321 IAE	75 950	14.9 %	Conf 2	V_R–10 knots 2 engines	6.3°/s	8.5°
	73 720	15 %	Conf 2	V_R–5 knots 1 engine-out	5.4°/s	9.0°

Note : *V_R represents the speed at aircraft rotation in order to obtain V_2 at 35 feet, in the event of an engine failure.*

Normal rotation of 3°/second prevents a tail strike, unless the rotation is initiated at a speed which is far too low. This rotation is obtained in 5 to 6 seconds for an average 15° to 18° takeoff attitude.

TAIL STRIKE AT LANDING

Industry statistics show that tail strikes are more likely to occur at landing than at takeoff (2 to 1).

Although most of them are due to deviations from normal landing techniques, some are associated with such external conditions as turbulence and wind gradient.

DEVIATION FROM NORMAL LANDING TECHNIQUES

Deviations from normal landing techniques are the most common causes of tail strikes, the main reasons for this being :

a) Allowing speed to decrease well below Vapp before flare.

Flying at too low speed means high a AOA and high pitch attitude, thus reducing ground clearance. When reaching flare height, the pilot will have to significantly increase the pitch to reduce the sink rate. This may lead the pitch to go beyond the critical angle.

b) Prolonged hold off for a smooth touchdown

As the pitch attitude increases, the pilot needs to focus further ahead to assess the aircraft's position in relation to the ground. The attitude and distance relationship can lead to a pitch attitude increase beyond the critical angle.

c) Too high flare

A high flare can result in a combination of decreased airspeed and long float. Since both lead to increased pitch attitude, the result is reduced tail clearance.

d) Too high a sink rate, just prior reaching the flare height.

In case of a too high sink rate close to the ground, the pilot may attempt to avoid a firm touchdown by commanding a high pitch rate.
This action will significantly increase the pitch attitude and, as the resulting lift increase may be insufficient to significantly reduce the sink rate, a firm touchdown may occur. In addition, the high pitch rate may be difficult to control after touchdown, particularly in case of bounce.

e) Bouncing at touchdown

In case of bouncing at touchdown, the pilot may be tempted to increase the pitch attitude so as to ensure a smooth second touchdown. If the bounce results from a firm touchdown associated with a high pitch rate, it is important to control the pitch so that it does not further increase beyond the critical angle.

APPROACH AND LANDING TECHNIQUES

A stabilized approach is essential for achieving successful landings. It is imperative that the flare height be reached at the appropriate airspeed and flight path angle. A/THR and FPV are effective aids to the pilot.

The Vapp should be determined with the wind corrections, given in FCOM/QRH, using FMGS functions.

As a reminder, when close to the ground, the wind intensity tends to decrease and the wind direction to turn (direction in degrees decreasing in northern latitudes).

Both effects may reduce the headwind component close to the ground, and the wind correction to Vapp is there to compensate this effect.

When close to the ground, high sink rates should be avoided, even in an attempt to maintain a close tracking of the glideslope. Priority should be given to attitude and sink rate. If a normal touch down distance is not possible, a go-around should be performed.

If the aircraft has reached the flare height at Vapp with a stabilized flight path angle, the normal SOP landing technique will lead to repetitive touchdown attitude and airspeed.

Assuming a 8 knots speed decrease during flare, and a − 1° flight path angle at touchdown, the pitch attitude will increase by approximately 4.5°.

During flare, the pilot should not concentrate on the airspeed, but only on the attitude with external cues.

Note : Airspeed indication during flare is influenced by the static error due to the ground effect.

The PNF should monitor the pitch attitude on the PFD and call "PITCH", whenever the following pitch value is reached :

For A319/A320 : 10°
For A321 : 7.5°

After touchdown, the pilot must "fly" the nosewheel smoothly, but without delay, on to the runway, remaining prepared to counteract any residual pitch up effect of the ground spoilers.

Note : The main part of the spoilers' pitch up effect is compensated by the flight control laws.

BOUNCING AT TOUCHDOWN

In case of a light bounce, maintain the pitch attitude and complete the landing, while keeping thrust at idle.

Do not allow the pitch attitude to increase, particularly following a firm touchdown with a high pitch rate.

In case of a high bounce, maintain the pitch attitude and initiate a go-around.
Do not try to avoid a second touchdown during the go-around. Should it happen, it would be soft enough to prevent damage to the aircraft, if pitch attitude is maintained.
Only when safely established in the go- around, retract flaps one step and the landing gear.
A landing should not be attempted immediately after a high bounce, as thrust may be required to soften the second touchdown, and the remaining runway length may be insufficient to stop the aircraft.

SUBJECT : ENGINE STARTING WITH APU IN CROSSWIND CONDITIONS

Note : This FCOM bulletin is valid only for A320 or A321 equipped with an old standard of ECB. The new ECB 304817-1 and 304817-2 prevent from the phenomenon described hereafter. Please refer to SIL 49-037 for more details.

INTRODUCTION

On the A320, the examination of failed engine starters showed that a relatively high proportion (25%) of failures was caused by crash re-engagement, i.e. the coupling of the starter to the engine at a speed in excess of the maximum allowed N2.

These crash re-engagements were thought to be caused by starter air pressure fluctuations during the wind-up phase of the engine start.

Investigations carried out have verified that the phenomenon can result on the downwind engine because from an interaction between the engine exhaust gas and the APU intake during a crosswind start when the upwind engine is started first.

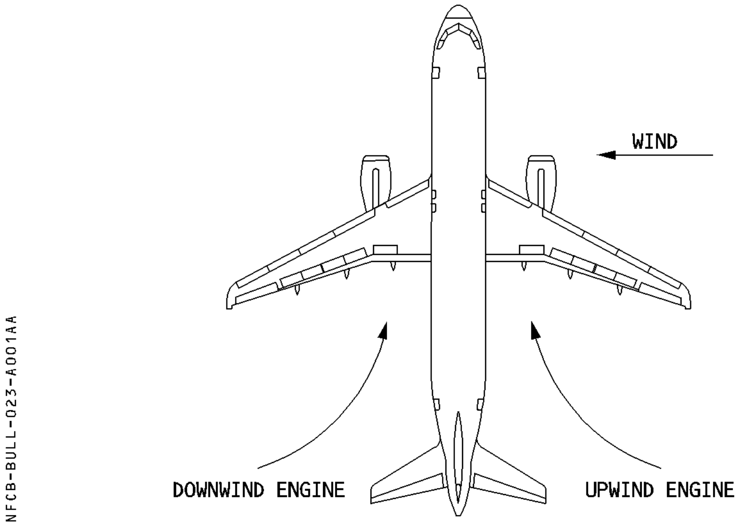


Figure 1. Definition of terms

OPERATION OF THE APU BLEED SUPPLY SYSTEM

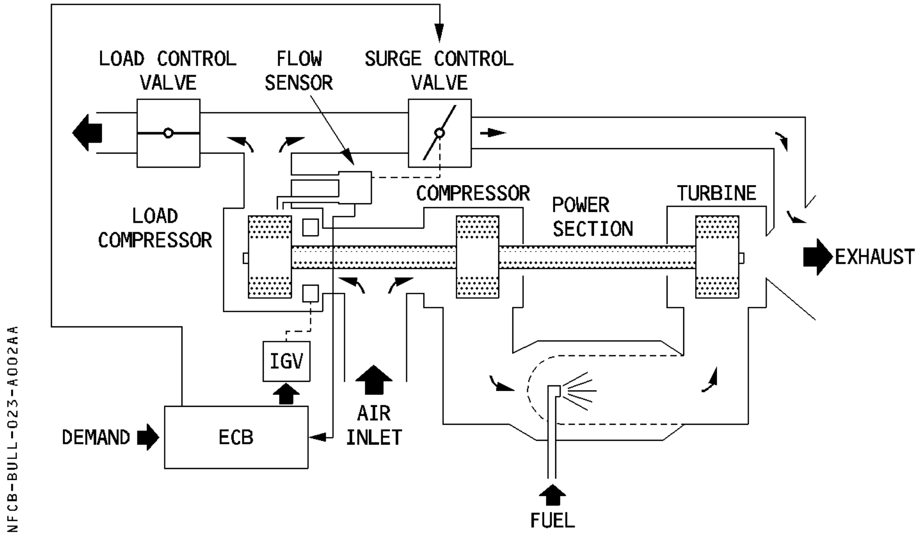


Figure 2. Schematic of the APU pneumatic system

The APU provides compressed air to the aircraft by directing part of the air sucked in by the APU air inlet through a load compressor which is driven by the power section of the APU. The load compressor delivers air to the aircraft systems (PACKS, engine starting system, anti icing system). It is protected against surge by a surge control valve which uses pressure sensors located downstream of the load compressor.

This surge control valve, controlled by the ECB, operates in case of sudden reduction of the flow demand and dumps overboard the excess air which the load compressor delivers.

The surge control valve logic includes a "kicker" function which kicks the surge valve wide open when the onset of a surge is detected. When this happens, the bleed pressure delivered to the aircraft essentially drops to zero instantaneously, then recovers progressively.
The whole cycle takes 10 to 15 seconds.

Example :

- The wind blows from the right to the left of the aircraft, which means that engine 2 is the upwind engine and engine 1 is the downwind engine.

  With engine 2 started, its exhaust gases are pushed by the wind towards the APU air inlet.

- The turbulent flow is felt downstream of the load compressor and affects the pressure sensors (Pr/△p) used to control the surge control valve.

- The fluctuations can occasionally exceed the trigger threshold of the "kicker" function, which causes the load control valve to cycle.

- If the cycling occurs while engine 1 is being started, the pressure drop and recovery will cause the starter clutch to disengage then to re-engage and this may inflict damage to the starter of the type encountered with a crash re-engagement.

- The schematic in Figure 3 shows the range of wind direction within which the phenomenon can occur, according to our experience, if the windward engine is, for instance, engine 2.

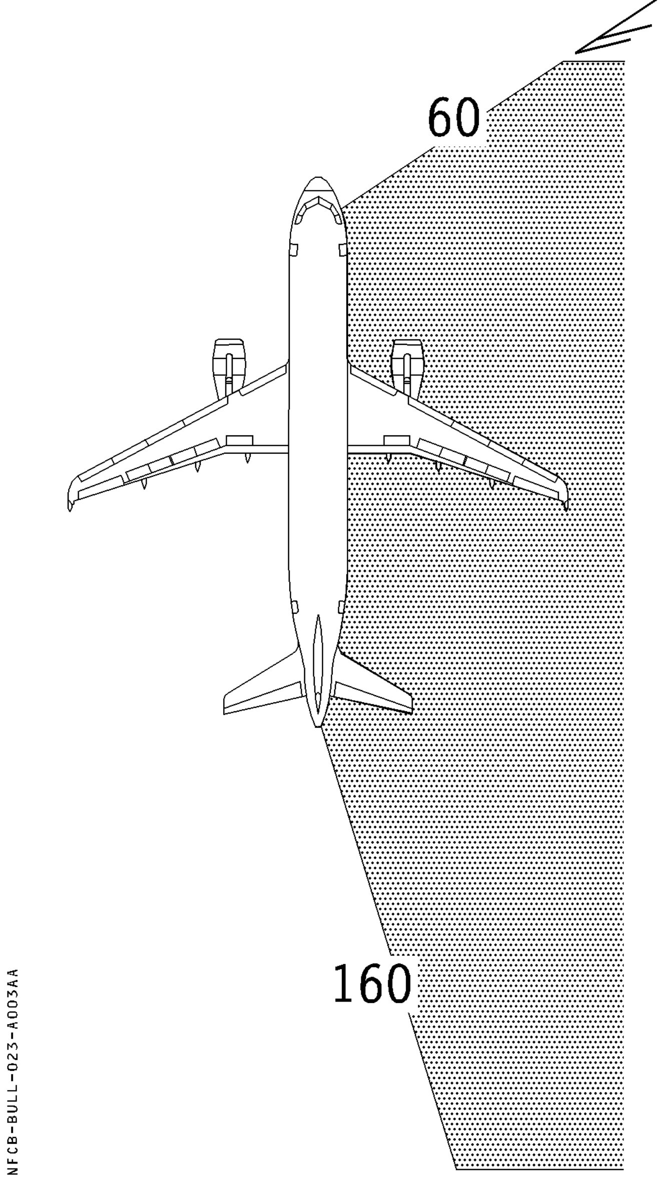


Figure 3. Critical crosswind range for the leeward engine

The same phenomenon could even occur without an engine running during very strong tailwind conditions. Pack cycling has been observed during strong tailwind conditions when the APU is used to supply air.

OPERATIONAL CONSEQUENCES

On the A320/CFM-56, the phenomenon described is likely to cause starter clutch failure or starter drive shaft failure if it occurs between 38% and 45% N2 during the engine start. It is possible that many of the starter failures recorded between entry into service and November 1991 could be attributed to this condition.

On the A320/V2500, a recent outbreak of starter failures due to crash re-engagement could be to the same cause.

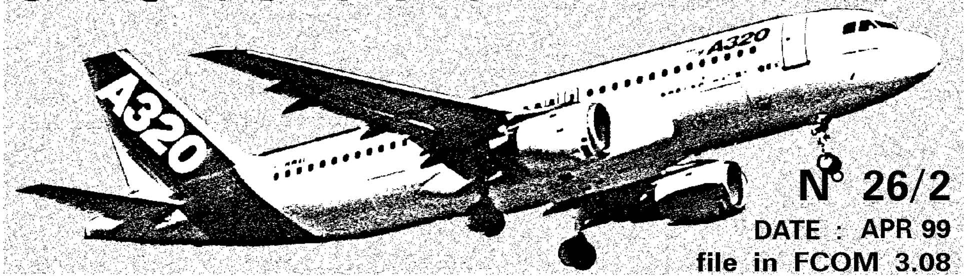
This phenomenon has occasionally been responsible for start aborts, due to starter pressure drop which causes a momentary reduction in N2 acceleration rate, and is detected by the FADEC as a hung start.

The phenomenon can also generate a cycling of the packs, which does not seem to have harmful consequences.

SOLUTION

A modified surge control value logic has been developped. These modifications have been done on the new standard of ECB. The aircraft and the APU can be modified with the ECB 304817-1 or the ECB 304817-2 (Please refer to SIL 49-037).

A318/A319/A320/A321 - FCOM BULLETIN



N° 26/2

DATE : APR 99

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SUBJECT : FQI ACCURACY

INTRODUCTION

The FQI system installed on Airbus aircraft use probes to measure the quantity of fuel in the different fuel tanks.

Each FQI probe consists of two fixed concentric tubes which form the plates of a capacitor. The dielectric of this capacitor is provided by air and fuel which have different dielectric constants. Therefore the capacitance of a vertically installed probe varies with the fuel level and gives an indication of fuel quantity in the tank.

FQI ACCURACY ON AIRBUS INDUSTRIE PRODUCTS

The accuracy of any measuring device such as the FQI system, is dependant on various parameters.

There are bias and random errors that can affect FQI system accuracy. Errors can involve tank manufacturing tolerances, FQI computer inaccuracies, error in density determination, probe-mounting tolerances, water that causes FQI over-reads, wing deflection, aircraft reference improperly taken into account.

The following figure gives, the Airbus Industrie standard specifications for FQI system accuracies on the A319/A320/A321

– **Accuracy :** ± **1 % of max tank capacity** ± **1 % of actual fuel quantity.**

– Supplier :
  – A319/A320 : Smiths and Intertechnique managed by **Smiths**
  – A321 : BFE Goodrich and Sextant managed by **BFE Goodrich.**

– New probes compared to A310/A300-600

– Density sensors measuring all in-tank fuel as opposed to up-lifted fuel only for A310/A300-600

– Attitude correction from IRS in addition to fuel surface probe cutting.

Each aircraft is checked on ground prior to delivery to be within the tolerances shown on the following graphs (Figure 1).

FAR/JAR 25.1337 requires that "each fuel quantity indicator is calibrated to read "zero" during level flight when the quantity of fuel remaining in the tank is equal to the unusable fuel supply..."
Tolerances are reduced when there is low level in the tanks in order to achieve an under-reading of the FQI as required by the regulations.

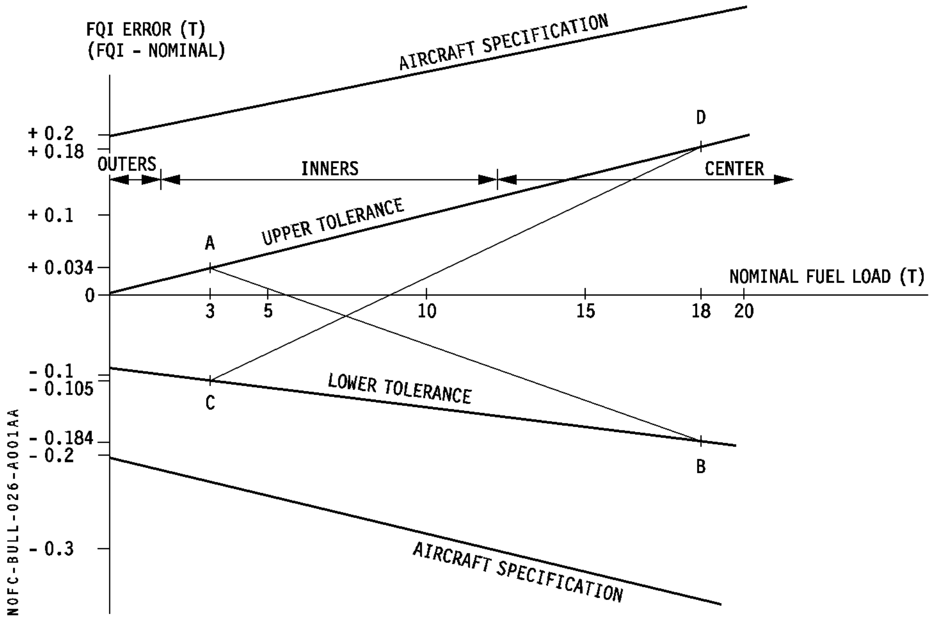


FIGURE 1

UNDERSTANDING FQI DISCREPANCIES

ON GROUND

Refueling personnel sometimes report discrepancies at the end of refueling, between the uplifted quantity based on FQI (total after refuel–total before refuel) and the uplifted quantity from the bowser (litres × measured density).
These discrepancies may be due to the following tolerance considerations.

Max discrepancy ($\triangle$) = **Fuel load [per bowser]** – **Fuel added [FQI end – FQI start]**
= ± **FQI error** (end) ± **FQI error** (start) ± **Bowser Qty** and **Density error** + **APU fuel burn** (during refueling)

Example (A320-200) :

Actual FOB before refueling = 3 tonnes (6600 lbs)
Actual FOB after refueling = 18 tonnes (39600 lbs)

- **Bowser quantity and density error**

– Volume tolerance is generally lower than ± 0.5 %

– Density error due to both temperature accuracy and density reading : $\triangle d = \pm 0.002$. Or ± 0.25 % on tolerance at any fuel loading.

Total bowser quantity and density error = ± 15 000 × 0.75 % ≃ ± 115 kg. (253 lbs)

- **APU fuel used**

When comparing bowser data versus FQI data as indicated above, the reported discrepancy includes the fuel used by the APU between FQI readings before and after refueling.

Depending on external conditions and generator load, the APU fuel consumption on ground is between 100 (220) and 150 kg/h (330 lb/h). For a refueling time of 30 minutes, APU burn would be at least **50 kg (110 lb).**

- **FQI errors**

The three following cases should be considered.

1) Significant FQI system changes have been performed (FQI computer, probes change etc...) on the aircraft since delivery or its last FQI ground calibration.

   The FQI accuracy to be taken into consideration should be the one given by the aircraft specification i.e. ± 1 % of maximum tank capacity ± 1 % of actual fuel quantity.

Assuming a maximum fuel capacity of 19 tonnes (418 000 lb) :

FQI at start = 3 tonnes ± 220 kg (6600 lb ± 484 lb)
FQI at end = 18 tonnes ± 370 kg (39600 lb ± 814 lb)

△1 = ± 220 kg ± 370 kg ± 115 kg ± 50 kg (△1 = ± 484 lb ± 814 lb ± 253 lb ± 110 lb)

△ 1 max ≃ ± 755 kg (1661 lb)

2) No FQI system modification has been performed since the last FQI calibration. All FQI readings are within the ground tolerances (refer to Figure 1).

Maximum positive △ is obtained when FQI presents the maximum over-reading at start and the maximum under-reading after refuel, i.e. when the particular aircraft calibration curve runs from A to B.

Maximum positive △ = 15,000 – [(18,000 – 185) – (3,000 + 35)] + 115 + 50 = + 385 kg

Conversely, maximum negative △ is obtained when particular aircraft calibration curve runs from C to D.

Maximum negative △ = 15,000– [(18,000 + 180) – (3,000 – 105)] – 115 + 50 = –350 kg

△ 2 max ≃ ± 385 kg (847 lb)

3) Particular aircraft FQI calibration curve is available.
In this case, although the reported discrepancy can be of the same magnitude as △2 maximum given above, after correction of FQI reading according to the calibration curve, the remaining difference should be due to bowser error and APU burn only.

△ 3 max ≃ ± 165 kg (363 lb)

- **Conclusion**

  – When comparing bowser uplift versus FQI readings on ground, the maximum difference is :

  △1 max= [FQI over-read (start)] – [FQI under-read(end)] + bowser error + APU burn

  – Difference can be significant when FQI over/underreadings before and after refueling are very different.

  – An aircraft presenting a △ ≃ 0 does not confirm its FQI system is more accurate than another aircraft with a difference. It suggests (bowser error and APU burn not taken into account) that over/underreadings before and after refueling are very close but not necessarily equal to 0.

IN FLIGHT

As a routine, crews should check the fuel on board (FOB) plus fuel used (FU) against the block fuel during flight. This would detect fuel leaks and provide a more reliable basis of calculation in case of either FQI or FU failure during flight.

Discrepancies have been observed during routine checks. These discrepancies are made up from the three following inherent errors :

– BLOCK FUEL (error constant throughout flight)
– FU (error increasing during flight)
– FOB (error decreasing during flight).

Example : A320 with 18 tonnes

– BLOCK FUEL : 18 tonnes → error = ± 370 kg (814 lb)
– FOB : 3 tonnes → error = ± 220 kg (484 lb)
– FU : 15 tonnes → error = ± 225 kg (495 lb)

In an extreme case :

Block Fuel = FOB + FU ± 815 kg (1793 lb) + APU FU if any

and this with no system fault.

Consequently, it is important to know the FQI tolerances to understand discrepancies.

Notes

1) FU indication accuracy, which is an integration of the FF, is estimated to be better than ± 1.5 %. The error of the fuel flow (FF) meter is dependent upon fuel flow rate and temperature conditions. For normal cruise conditions, this error is around ± 1 %.

2) FQI errors for both Block Fuel and FOB are as per the specification because ground calibration curve is not applicable in flight. Block Fuel error, ground tolerances may be used if applicable (refer to 3.1). In this case, Block Fuel error is ± 185 kg (407 lb) instead of ± 370 kg (814 lb).
If the particular ground calibration curve is known, there should not be any substantial error on Block Fuel.
Possible discrepancy due to FOB and FU errors remains significant :

Block Fuel = FOB + FU ± 450 kg (990 lb) + APU FU if any

3) APU fuel used in flight, which is not recorded, is between 40 (88) and 100 kg/h (220 lb/h).

4) With the Flight Management and Guidance System (FMGS), FOB is also available on the appropriate page of the FMGS. FOB is computed by the FMGS using both FQI and FF data.

   In the event of a FQI failure, the FMGS will continue to display FOB by means of the last available FOB and by FF integration.

USE OF MANUAL MAGNETIC INDICATORS

It often happens that when a discrepancy has been detected either on ground or in flight as explained above, some airline procedures request to make a check of the FOB after refueling or after landing by means of the Manual Magnetic Indicators (MMI).

It has to be highlighted that MMI readings involve several measurements and interpolations (on rods, on clinometers, on charts) in addition to the MMI indication accuracy itself.

This is why the accuracy of a MMI reading is approximately ± **5 %** and thus **worse than FQI** system accuracy.

Therefore, MMI readings should not be used to check FQI system. They should only be used when the FQI system is inoperative.

REDUCING FQI DISCREPANCIES

FQI system accuracy continue to improve. Operational accuracy goals have been established by ARINC in cooperation with airframe and equipment manufacturers and in agreement with airline requirements.

The discrepancies described are inherent in the FQI system.

- **Both on-ground and in-flight reported discrepancies are generaly due to FQI errors on Block Fuel.**

  The Block Fuel maximum error should be reduced. This will depend on a responsible judgement based on knowledge of a particular aircraft FQI calibration curve ; i.e. assuming no FQI modification following aircraft delivery, this curve will be reasonably constant (on ground) and thus, for a given FQI reading, real Block Fuel can be deduced.

  This calibration may be done by any operator while it is not applicable to the correction of in-flight reading.

  A FQI calibration procedure is a maintenance function and will be introduced in the AMM in the future.

- FU (fuel used) is the primary parameter to determine fuel consumption (max error = ± 1.5 %). Nevertheless, on certain high-fuel-capacity aircraft, the FOB error (decreasing during flight) may become lower than FU error (increasing during flight) by end of flight.

  Example : A320 with 19 tonnes (41 800 lb) maximum capacity.

  – BLOCK FUEL = 18 tonnes (39 600 lb)

  – FOB = 3 tonnes $\pm \frac{1}{100}$ (3 t + 19 t) = 3 t ± 220 kg

  (FOB = 6600 lb $\pm \frac{1}{100}$ (6600 lb + 41800 lb) = 6600 lb ± 484 lb)

  – FU = 15 tonnes × (± 1.5 %) = 15 t ± 225 kg

  (FU = 33000 lb × (± 1.5 %) = 33000 ± 495 lb)

In this example, when FOB is less than 3 tonnes (6600 lb), FOB error may be assumed to be lower than FU error. Furthermore :

- If Block Fuel is confirmed as per a particular calibration curve :
  - When FOB > 3 tonnes (6600 lb) :
    Use FU parameter to determine both FOB and FU
  - When FOB < 3 tonnes (6600 lb) :
    Use FOB parameter to determine both FOB and FU

OPERATIONAL CONSIDERATIONS

Some economic aspects relating to FQI accuracy are approached here and should be considered when operating an aircraft.

TECHNICAL DELAYS

Incorrect application of MMI check, may cause a possible delay.

Knowing the FQI calibration curve helps to understand and reduce discrepancies.

EXTRA FUEL LOADED

- Crews uplift more fuel than required for a particular flight, as a contingengy factor, when they are unsure of the FQI accuracy.
- An under-reading FQI leads also to carrying extra fuel.
- 1 extra tonne will increase fuel consumption up to 1.2 %, depending on airframe and flight conditions.

PAYLOAD PENALTY

Extra fuel loaded due to uncertainty of FQI may lead to decreasing the payload.
Payload = **TOW** + **TAXI fuel** – **OEW** – **Fuel loaded**
TOW = **Take-Off Weight**
OEW = **Operating Empty Weight**

We have seen, that adding 130 kg (286 lb) of fuel can allow the payload to be increased by 870 kg (1914 lb) on a 4 hours flight.

- When the payload is **limited by MTOW** as TOW cannot be increased, **any extra fuel** will **decrease** and replace payload by the **same amount.** Also, **any defueling will significantly decrease the payload.**
- When the payload is limited by the max fuel capacity :
  - if the FQI under-reads, the payload could be increased
  - if the FQI over-reads, the payload should be decreased

For example, an inaccuracy of ± 130 kg (286 lb) on fuel can affect the payload by ±870 kg (1914 lb).

Again, knowing your FQI calibration curve allows to adjust the payload.

Note : *Although not approved by DGAC/JAA as it is a non compliance item, using the 2 % thermal expansion volume as extra-fuel could be authorized by national airworthiness authorities to increase max fuel capacity.*
In this case the FQI reading is limited somewhere above high level until fuel quantity falls below this value.

CONCLUSION

Airbus Industrie has always improved FQI systems, because it is essential for crews to have a reliable and accurate fuel quantity indication system.

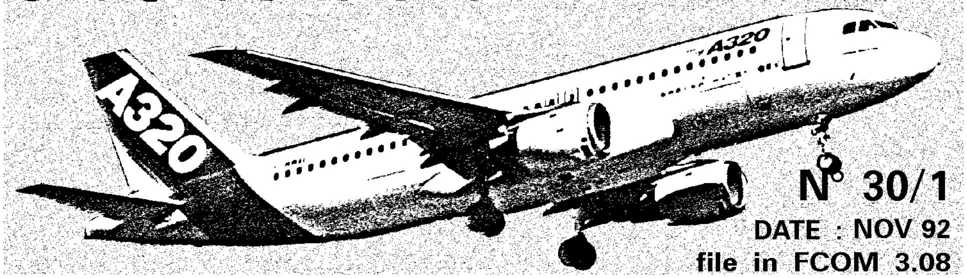
Taking into account the difficulty of measuring the weight of a liquid stored in complex-shaped tanks always moving, FQI system installed on Airbus aircraft has a good accuracy, well within specifications and international standards.

It is important on certain flights with certain aircraft fitted with a FQI system presenting large over-/underreadings, to know the particular FQI ground calibration curve.
Crews should know this curve and FQI tolerances in order to :

– understand and reduce FQI discrepancies
– avoid delays
– save fuel
– adjust the payload.

FQI calibration should be done when deemed necessary by each operator as this will be profitable for both operational and economic aspects.

A318/A319/A320/A321 - FCOM BULLETIN



N° 30/1

DATE : NOV 92

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SUBJECT : ELECTRONIC INTERFERENCE FROM PORTABLE EQUIPMENT CARRIED ON BY PASSENGERS

- Airlines often wonder whether they should allow passengers to operate electronic devices in the cabin without any limit.

  Federal Aviation Regulation (FAR) section 91.19 allows passengers to operate :

  " – Portable voice recorders
  – Hearing aids
  – Heart pacemakers
  – Electric shavers
  – Any other portable electronic device that the operator of the aircraft has determined will not cause interference with the navigation or communication system of the aircraft on which it is to be used."

  It is obvious that the myriad portable devices that now exists or that may be available in the future cannot be tested.

- As far as aircraft specific electrical flight controls and engine control computers on Airbus aircraft are concerned, there is no chance of their operation being affected by passenger-operated electronic devices, due to the high level of protection applied to these systems.

- Nevertheless, this question arises for navigation and communication receivers and is applicable to any aircraft.
  A study has been conducted by an RTCA (Radio Technical Commission for Aeronautics) special commitee.

- The conclusion is that the probability of a passenger-operated device interfering with the ILS localizer during a typical flight is about one in a million.
  Airbus Industrie recommendations is that no portable device should be used during take-off and landing.

- Concerning radio phones Airbus Industrie recommends to prohibit the use of those devices.

SUBJECT : THRUST ACCELERATION IN A/THR MODES

These are specific thrust acceleration logics when A/THR is engaged in thrust or speed mode. The crew should be aware of each.

The purpose of the logic is to obtain adapted thrust variation to the whole flight envelope, depending on the current mode engaged, "G" load limitation, and vertical modes switching if any.

This is based on different logics which can be summarized as following :

1. LOGIC IN THRUST MODE "CLB" (ASSOCIATED WITH OP CLB/EXP CLB/CLB) :

1.1 WHEN AP IS ENGAGED

During thrust increased, the maximum acceleration rate is 20 %/sec until the N1 reaches N1 target minus 5 %. At that point, the acceleration logic is speed mode. This acceleration limit is defined to achieve a smooth and rapid transition without noticeable speed excursion. However normal acceleration rate is between 1.5 %/sec and 20%/sec.

When target N1 minus 5 % is reached, N1 rate becomes 1.5 %/sec until target N1 (Max Clb Thrust) is obtained.

Note : When decelerating (more than 10 knots between current speed and speed target), the N1 rate is maintained at 1.5 %/sec.

1.2 WHEN AP IS OFF

It has been revealed, that during manual flying with AP off, the rate limit up to 20 %/sec was not as optimum as with AP engaged. The reason for this is that during transition the system was using A/THR speed mode logic to obtain N1 rate limit of 20 %/sec MAX ; if the pilot did not fly the FD bars, established CLB thrust was not always obtained.
Consequently, the current system maintains the fixed value of 1.5 %/sec which represents the best value when following the FD bars.

Flight tests proved this logic (it means to provide maximum rate of 20 %/sec only if autopilot is engaged) to be the optimum compromise through the flight envelope.

WARNING : If FD bar commands are not smoothly followed or not followed at all, a speed excursion may occur, due to the fact that the change of attitude is not adapted to the thrust acceleration rate.
If required, additional manual thrust may be briefly added by the pilot during the transition.

2. LOGIC IN THRUST MODE "IDLE" (ASSOCIATED WITH OP DES/EXP DES/DES) :

The N1 rate limit is 2 %/sec (IS8) and 1 %/sec (full standard). Both rates were selected to preclude speed excursion and improve passenger comfort (smooth attitude variation during transition).

3. LOGIC IN SPEED MODE :

The N1 rate limit is 20 %/sec MAX, however it can be lower depending upon the difference between the current speed and the target speed.

There is no difference in A/THR speed mode linked to AP ON or OFF. The speed hold is the same with AP ON or OFF.
When pilot is flying manually, a temporary speed loss can occur if an increased load factor is required. This authority is not possible with AP due to system.

SUBJECT : AVOID DISORDER IN THE COCKPIT

REASON FOR ISSUE

The purpose of this FCOM Bulletin topic is to remind pilots of the importance of maintaining an orderly cockpit environment and highlight the hazards caused by misplaced objects.

BACKGROUND INFORMATION

Many hazards are caused by placing objects in improper places in the cockpit. The most common being the following.

- Coffee cups placed on the glareshield or pedestal, unexpected turbulence or unintentional knocking by the crew may cause fluid to be spilled onto the cockpit control panels causing damage to the equipment which may have an immediate effect on the flight or at best lead to an early and expensive overhaul of the equipment.
- Books placed on the glareshield. These may fall off and operate some switches/ pushbuttons or even damage equipment.
- Books placed on the pedestal. These may cause switches or pushbuttons to be activated, especially if they have to be pushed around while operating other controls.
  At worst the rudder trim might be activated or even a fuel lever pushed off, at best a radio selection could be deselected.

RECOMMENDATIONS

It is highly recommended that all objects are placed and stored at their designated place in the cockpit.
Cups should be placed in the cupholders provided.
Books should be kept in the library space provided and put back as soon as you have finished using them.
A rubbish sack should be provided behind the crew seating and used for all rubbish.
Meal trays should be collected by flight attendants as soon as possible, or be placed on the floor behind the crew when finished.

SUBJECT : RADIO ALTIMETER ANOMALIES DURING ADVERSE WEATHER CONDITIONS.

INTRODUCTION

All radio altimeters are very sensitive to adverse weather conditions.

Reflections from hail clouds or heavy precipitation located between the ground and the aircraft, may cause the radio altimeter to indicate a false height value momentarily.
These erroneous indications are also transmitted to other systems which may induce spurious warnings or unexpected AP/FD guidance.

Example :
Under heavy rain condition at 2 600 ft, at least one of the radio altimeter delivered a height indication of 480 ft during 13 seconds.
The warning "L/G gear not down" was displayed.
No other anomaly was reported until landing.

EXPLANATION

ORIGIN

A radio altimeter measures the shortest distance between the aircraft and the closest obstacles below it.
During adverse weather conditions, returns can be generated due to reflection on hail clouds or heavy rain. The energy which is reflected depends directly upon the hail or rain density.
If the energy received by the radio altimeter is powerful enough, it will be validated and a height lower than the distance to the ground will be measured and sent to system users.
If the return is too weak, the measurement will be validated but the increased noise level may hide the return from the ground and thus no height indication would be provided.

CHARACTERISTICS

This phenomenon is rare. Typical weather conditions which trigger these effects are not frequent and generally isolated.
It is less likely with increased height.
Due to the physical nature of the hail and rain and the radio altimeter characteristics, the radio altimeter indication will only be influenced if the distance between the a/c and the clouds is equal or greater than 300 ft for rain and 80 ft for hail.
Both radio altimeters are likely to be affected simultaneously.

OPERATIONAL CONSIDERATIONS

If both radio altimeters are affected simultaneously the crew may experience :

- If the value is greater than 150 ft :
  - spurious auto call out
  - spurious ECAM or GPWS warnings

- If the value ranges between 150 ft and 80 ft :
  * During automatic approach
    - degradation of the guidance, glide slope is no longer flown, excessive deviation may occur.
    - variation of the longitudinal pitch and/or vertical speed leading to GPWS warning.

  * During manual approach :
    - no adverse effect could be reproduced during simulation but GPWS or auto call out warning might be spuriously triggered.

CONCLUSION AND OPERATIONAL RECOMMENDATIONS

Very few cases of spurious radio altimeter indications have been reported to Airbus. Radio altimeter sensitivity issues have been tuned to the limits of improvement. There is no practical solution to cure the phenomenon without reducing system performance to an unsatisfactory level. Crews need to be aware that erroneous radio altimeter behavior is rare, but can occur during severe weather conditions. During approach and landing, crews need to consider this phenomenon.

The weather radar may be used to detect heavy rain or hail.

The interpretation of the color codes is as follows :

Black rainfall rate	less than	0.7 mm/hr
Green rainfall rate	between	0.7 and 4 mm/hr
Yellow rainfall rate	between	4 and 12 mm/hr
Red rainfall rate	greater than	12 mm/hr

As an example stormy tropical shower rate can be as high as 500 mm/hr and uppest limit for hail may reach 4700 mm/hr.

SUBJECT : FMGS NAVIGATION DATA BASE

REASON FOR ISSUE AND SCOPE

The aim of this FCOM Bulletin is to highlight the importance of the Navigation Data Base accuracy and therefore the importance of its update and its correctness.
As any NAV data base discrepancy or false coding may induce navigation errors and lateral or vertical misguidances, this FCOM Bulletin provides flight crews with operational recommendations.

INCORRECT NAV DATA BASE CASES

NAVIGATION DATA BASE DISCREPANCIES

- Numerous in service events have been reported during the last few years, which are caused by 3 different types of Navigation Data Base discrepancies :
  - Nav data base not updated on time,
  - Incorrect coding or impossibility of coding of published procedures.
  - Coding errors.

NAV DATA BASE NOT UPDATED ON TIME

When a Nav Data Base is not updated on time, this may lead to incorrect position or misguidance :

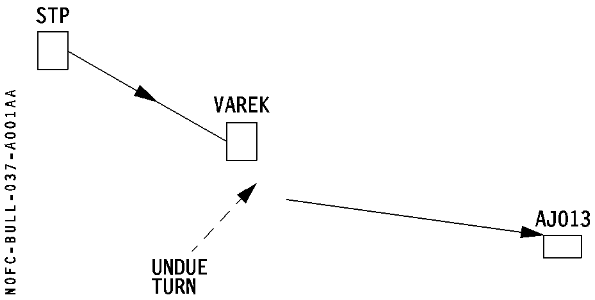
- 1st example
  STAR MEN2 (LFBO) was modified but not incorporated in the Nav D.B. As a result the STAR displayed on the ND was not the published one.

- 2nd example
  TRANS between STAR VAREK and NDB03 was not coded at Ajaccio (LFKJ). Misguidance was the consequence.

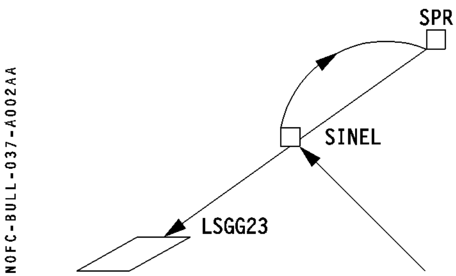
NAV DATA BASE INCORRECT CODING

Incorrect coding in the NAV D.B. induces misguidance in SID or STAR :

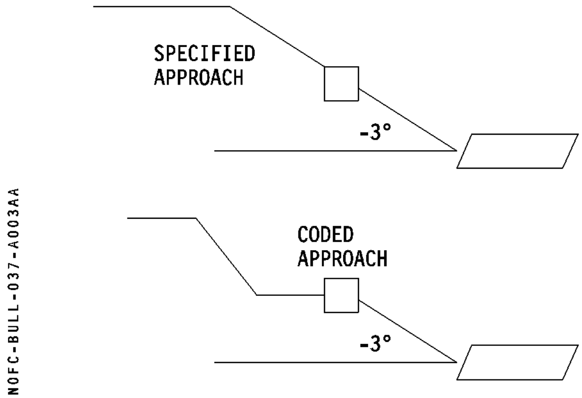
– 1st example
  STAR VAREK at Ajaccio (LFKJ).
  The leg STP-VAREK was coded as a TF (track to fix) and the following leg was coded as a CF (course to fix). Due to the imprecision of the magnetic variation in the area, both legs were not lined up and the a/c had to turn, after VAREK WPT, to capture the next leg.



– 2nd example
  STAR PERIK 1 and GORON 1 AT Genova (LSGG).
  These STARs end at WPT SINEL located in the middle of the APPR 23.
  This creates a F-PLN discontinuity and the procedure is not flyable. The Nav D.B. error is linked to both coding and procedure concept.



– 3rd example
On several non precision approaches, the final descent angle is coded for the last leg only instead of the last 2 legs. Again this creates a level off segment which does not exist.



CODING ERRORS

Coding errors generally have very similar effects on the FMGS system and may induce position errors as well as misguidance.

– 1st example
Erroneous position of runway threshold at LFMT RWY 32R inducing a lateral offset during non precision approach

– 2nd example
ILS/DME coded as an ILS only preventing autotuning of the DME in approach (IWW and IGG at EGKK).

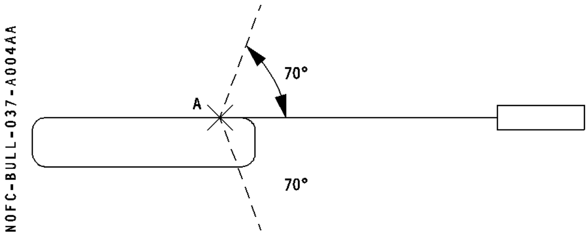
PROBLEMS LINKED TO ARINC 424 SPECIFICATION

If an item is not specified in the ARINC 424, it will not be part of the Nav D.B.

For example :
No specific field reserved for THR RED/ACC ALT. As a result, it is not possible to link such information to a company route (e.g noise abatement). Defaulted value is provided instead.

SYSTEMATIC CODING OF HF LEG IN PROCEDURES

When a Final Approach procedure displays a Holding Pattern, this pattern is systematically coded in the APPR VIA or STAR as an HF leg ; this means that this holding is always taken into account in the F-PLN, assuming one turn ; in certain cases, this is realistic but in most circumstances, it is not.



If the HF leg is of no use, it corrupts all predictions and performance computations. Furthermore if a holding pattern is ATC required, by then the crew has all means to insert it into the F-PLN, and be then provided with realistic estimates.

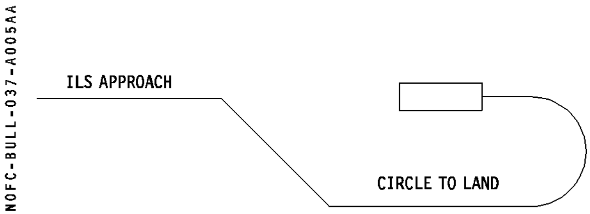
As a consequence, realistic coding of procedure turns should be requested.

CIRCLE TO LAND

At many airports approaches are defined only in one direction ; while the landing runway may be in the other direction.

If the weather is poor, a defined instrument approach is carried out down to circle to land MDA, and then a circle to land trajectory is flown.

Circle to Land feature is not part of current ARINC specification ; this forces the crews to improvise in order to get a realistic trajectory on the ND, and to get proper predictions on CDU.



RECOMMENDATIONS

In order to control and correct NAVIGATION Data Base all pilots are encouraged to report to their flight operations any misbehaviour which may have been induced by an incorrect data base.

This can be done during normal operations :

* during preflight by checking the consistency of the MCDU F-PLN versus ATC F-PLN. Refer to current FCOM ;
* in flight by performing the navigation accuracy assessment on a regular basis as described in the FCOM procedures and techniques chapter, or VOL 4.

CONCLUSION

Tomorrow, the increasing number of RNAV approaches will require faultless Nav Data Base procedures since it will not always be possible to monitor the guidance by using raw data.

On a short term basis, the Nav Data Base improvement is a matter of step by step error detection which mainly requires pilot attention during preflight and in flight.

On a longer term basis, the Nav Data Base improvement requires decisions and actions of concerned agencies/ authorities and Nav Data Base manufacturers.

It has to be reminded that the aircraft constructor has no control over the data base used by each operator.

SUBJECT : SPECIFIC FEATURES OF THE FMGS FULL STANDARD

Note : This FCOM bulletin is only valid for aircraft equipped with FMGS full standard.

The FMGS full standard was introduced in 1992. During the first months of service, questions have been raised on particularities of the system.

1. ALTITUDE PREDICTIONS NOT ACCURATE ON GROUND

Predicted altitudes indicated on the F-PLN A page are not accurate until take off ; an error of a few hundred feet may be noticed on predicted altitudes at all waypoints until lift off.

Explanation

The predictions are computed using simplified model for the take off run. This causes a minor error on the altitude predictions. Predictions are continuously updated during the take off roll and once airborne, they are accurate.

2. SPURIOUS "FMS1/FMS2 SPD TGT DIFF" MSG

When changing of CRZ FL using the FCU altitude knob, the message "FMS1/FMS2 SPD TGT DIFF" may come up.

Explanation

The new FCU altitude is sent by the master FMGC to the slave, therefore predictions are not computed at the same time on both FMGCs ; a speed target difference may occur during a very short period, triggering the message.

Procedure

Disregard the message.

3. "IRS ONLY NAVIGATION" MSG TRIGGERED AT DESCENT PHASE SWITCHING

When the A/C is in IRS ONLY NAV mode, the message "IRS ONLY NAVIGATION" is triggered when the a/c starts the descent.

Explanation

The system logic is triggered when the FMGS navigation mode has been in inertial only for more than 10 minutes in cruise or when the a/c is transitionning to descent phase without radio updating.
If the FMGS is in IRS only navigation mode at descent phase switching, the message is immediately triggered, reminding the crew that the A/C is operating without radio position.

Procedure

Perform a NAV ACCY CHECK.

4. VERTICAL DEVIATION DIFFERENT ON BOTH SIDES

In descent or approach the vertical deviation (V DEV) indicated on the PFD and PROG page may differ on side 1 and 2.

Explanation

The vertical deviation (V DEV) is computed independently on side 1 and 2 ; if FM 1/2 position ground speed or other data used for V DEV computation differ slightly from side 1 and 2, a small difference of V DEV will be observed during descent and/or approach.

5. INCREASE OF VERTICAL SPEED IN DES MODE

The vertical speed may increase noticeably for a short period of time during descent with DES mode engaged. The V/S regains the normal value when intercepting the path.

Explanation

When the A/C is above path and an increase of speed target is required manually or automatically, the V/S will increase temporarily until the vertical profile is intercepted.

6. VLS COMPUTATION

6.1 The VLS computed by the FMGS uses the same algorithm and performance table as the FAC. Nevertheless some differences may be observed due to the fact that the FAC computes the VLS from flight parameters and the precision of the computation provides an accuracy of ± 3 kt (PFD VLS).

6.2 In CONF3, the performance table used to compute the VLS assumes the gear up although the table provided in the QRH and VOL2 assume gear down. A VLS difference of 2 kt can be observed between performance table and FAC/FMGS in CONF3.

7. A/C POSITION INVALID

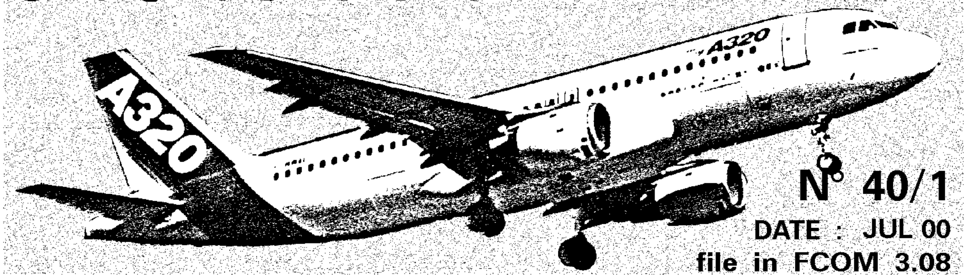
When a fast realignment is performed, the message A/C POSITION INVALID is triggered. The message disappears when the realignment is completed.

Explanation

During an IRS alignment, the ADIRS send no data to the FMGS and the FMGS cannot process any position.

The POS MONITOR page is empty and the msg "A/C POSITION INVALID" is automatically triggered. Once the IRS are realigned, the ADIRS provide data to the FM and a mix IRS position is recomputed ; the message disappears.

A318/A319/A320/A321 - FCOM BULLETIN



N° 40/1

DATE : JUL 00

file in FCOM 3.08

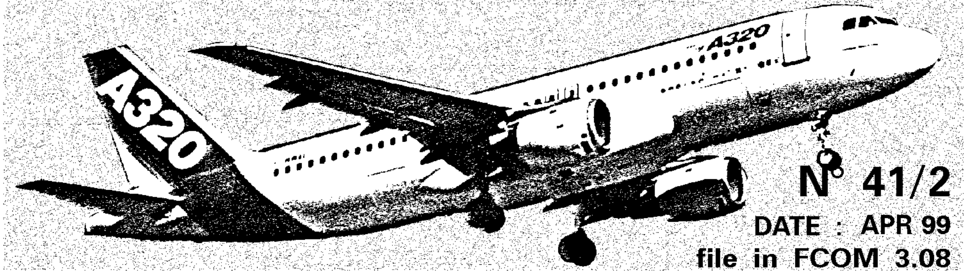
SUBJECT : STOWAGE OF THIRD OCCUPANT SEAT

It has been reported that a Copilot was injured when he tried to stow the observer seat, while remaining seated at the controls. This emphasizes the need to remind everyone of the correct way to stow the observer seat.

First of all, the crew should ask the observer to stow their seat when they leave.

If the observer seat is not stowed, it is possible to unlatch its horizontal part by kicking the underside of the seat. Once the seat is in the vertical position, it can be stowed by using the unlatch control, without any risk of finger pinching. The unlatch control is closer to the Captain's side and can more easily be reached by the Captain than by the Copilot.

A318/A319/A320/A321 - FCOM BULLETIN



N° 41/2

DATE : APR 99

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SUBJECT : VMO / MMO DETERMINATION

GENERAL

VMO / MMO determination

VMO (the design cruising speed) is the maximum operating speed that the crew may fly within the normal flight envelope. It is not authorized to fly intentionnally above this limit.

VD is the design dive speed. VMO and VD must comply with load requirements (gust loads, manoeuvering loads). For example, the aircraft must be able to sustain a load factor of 2.5 up to VD. The range between VMO/VD considers normal reaction time to the crew to use standard recovery techniques for returning the aircraft to normal attitude at a speed of VMO/MMO.

The A319/A320/A321 are protected by the High Speed Protection law which automatically makes the recovery if VMO is exceeded (between VMO and VMO + 6) as shown in the following table.

HIGH SPEED / MACH TABLE

MD = .89	VD = 381 kt	VD = VMO + 31kt
MMO + 0.04	VMO + 20 kt	Structural inspection required. (AMM. 05.51.17)
MMO + 0.01	VMO + 6 kt	Upper limit for entry into HSP
MMO + 0.006	VMO + 4 kt	Overspeed warning
MMO = .82	VMO = 350 kt	Max operating SPEED/MACH and lower limit for entry into HSP
MMO – 0.006	VMO – 3 kt	Max upper speed range in DES mode.
MMO – 0.02	VMO – 10 kt	Managed speed target limit (ECON mode)

Depending upon the speed trend, the autopilot will disconnect at or below VMO + 6 kt / MMO + 0.01 and an automatic pitching up will allow VMO to be regained.

Per design, in DES mode or OP DES mode, autopilot authority is limited to 0.1 g compared to 0.15 g in EXPEDITE. This limitation was required by the launching customers for passenger's comfort.
Due to the load factor limitation, some flight paths or environment conditions depending on their magnitude, may not be counteracted by the autopilot leading to VMO / MMO overshoot.

A short exceedance of few knots above VMO has no consequences on the aircraft.
Nevertheless, an intentional exceedance is not authorized :

– by regulation.
– Because above VMO / MMO the HSP (high speed protection) may be activated automatically. Any pilot input to recover the target speed may be added to the HSP order, leading to a load factor incompatible with passenger's comfort.

For this reason, it is recommended to be smooth on the stick when manually recovering from a VMO / MMO exceedance. In order to prevent this exceedance during descent, a procedure has been described in FCOM 4.05.60.

SUBJECT : OPERATION OF FLEETS WITH/WITHOUT CPIP

INTRODUCTION

In order to continuously improve the man/machine interface, Airbus developed continuous product improvement programmes (CPIP), the modifications of which are available for retrofit and are commonly introduced on all new A320/A321 and on A319.
This FCOM bulletin details the differences which crews should be aware of.

DEFINITION

Basic aircraft :
The A320 equipped with full standard FMGS without CPIP (continuous production improvement programme) nor ENERGY MANAGEMENT.

Advanced standard :

The A319/A320/A321 with CPIP 1+2+3, LOW ENERGY warning and ENERGY MANAGEMENT. This standard is basic on the A319/A321 and A320 in current production and can be retrofitted to all A320.

MODIFICATION DESCRIPTION

CPIP1 (FCU MODIFICATION)

- Altitude selection change inhibited during push/pull action. This modification prevents any change of altitude during mode engagement.
- HDG and V/S preselection time increased from 10 to 45 seconds.
- V/S/FPA click differentiation for rapid selection :
  1 click = 1° FPA
  2 clicks = 100 ft/min V/S

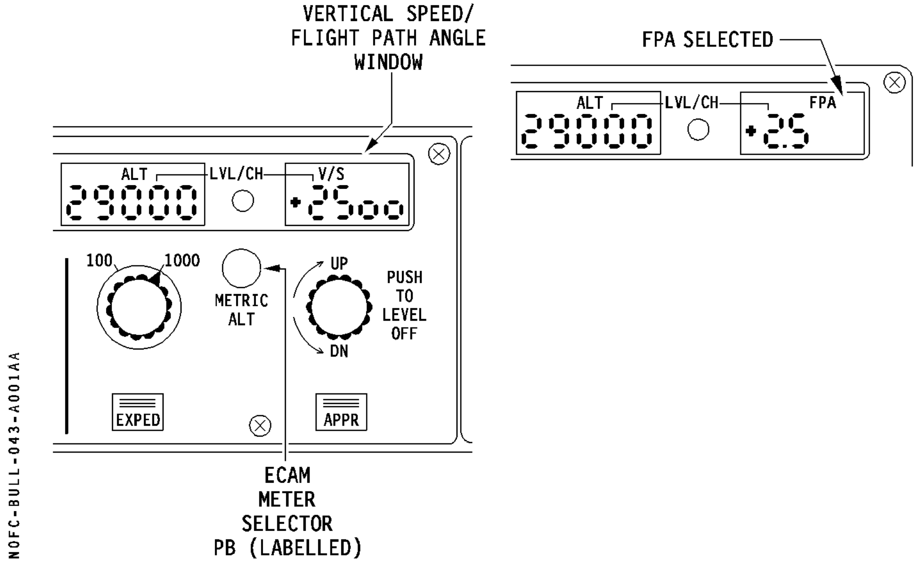
CPIP2 (FCU MODIFICATION)

– V/S/FPA "push to level off" function.
 When pushing the V/S/FPA selector knob, V/S/FPA target is set to zero.

– 4 digits for V/S target.
 The V/S and FPA target are displayed in the window as followed :
 V/S : 4 digits
 FPA : 2 digits

– HDG/TRK target is synchronized when switching from HDG to TRK or vice versa.

– SPD/MACH, HDG/TRK, METRIC ALT switching pushbuttons are labelled.



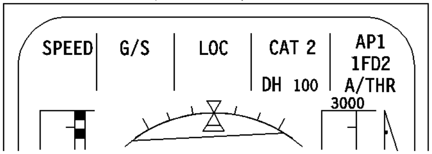
LOW ENERGY WARNING (FAC and FWC modification)

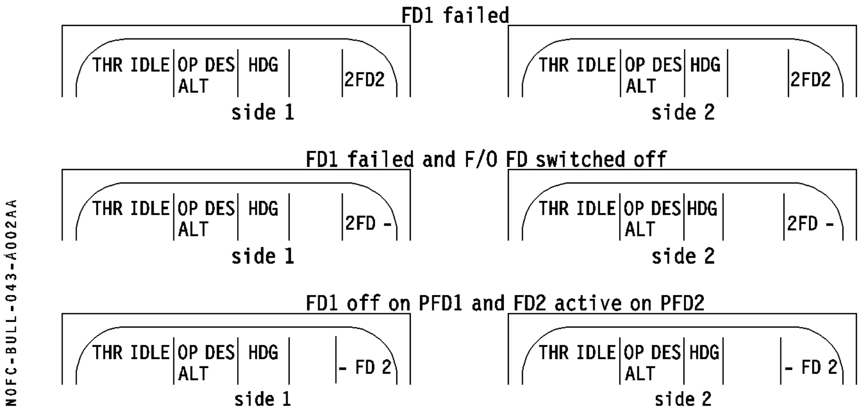
The low energy warning consists of an aural warning "speed speed speed" triggered every 5 seconds. This warning is available when conf ⩾ 2 and 100 ft < RA < 2000 ft ; it indicates that the energy level is not sufficient to recover to a positive flight path angle with only pitch command. The thrust must be increased. This warning is generated before the alpha floor is triggered.

CPIP3 : FMA IMPROVEMENTS (DMC AND FWC MODIFICATION)

– Engagement status of both FDs are displayed on both PFDs :

NORMAL DISPLAY



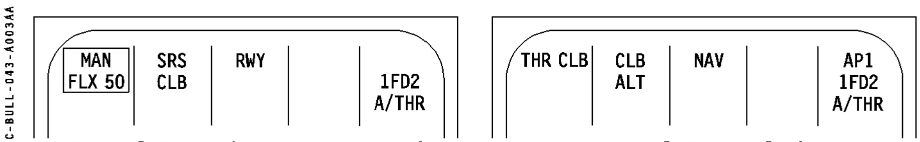


– A/THR annunciations are changed as follows :

* White colour and MAN label when the thrust levers are set manually in the corresponding detent. e.g. MAN TOGA, MAN FLEX, MAN MCT.
  MAN THR when the thrust levers are set above the applicable detent. The A/THR is armed (A/THR blue on FMA).

* LVR white (or amber) label whenever the thrust levers are not in the correct detent : (e.g. LVR CLB, LVR MCT, LVR ASYM)

* THR green label when the Thrust mode is active :
  THR CLB, THR MCT, THR IDLE.



Typical FMA with RWY mose engaged

Typical FMA in climb

– All AP/FD modes are displayed as abbreviations (no dashes) : (e.g. NAV, ALT CRZ, ALT CSTR).

– V/S or FPA target are displayed in the FMA : e.g. V/S:+0800

– Message and msg colours are changed as follows :
"MORE DRAG" white message instead of "AIRBRAKES"
"CHECK APP SEL" white message instead of "CHECK APP GUIDANCE"
"SET MANAGED SPD" white message instead of "SET AUTO SPEED"
"SET GREEN DOT SPD" white message instead of "SET VFTO"

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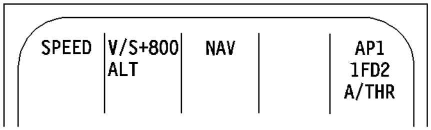


ENERGY MANAGEMENT IMPROVEMENT

(FAC, FWC, DMC, FADEC modification)

The ENERGY MANAGEMENT package is related to A/THR logic modification and additional ECAM announcements. The package eases the normal procedure of A/THR disconnection and improves the crew information on the current thrust setting.

A/THR disconnection using the instinctive disconnect pushbutton

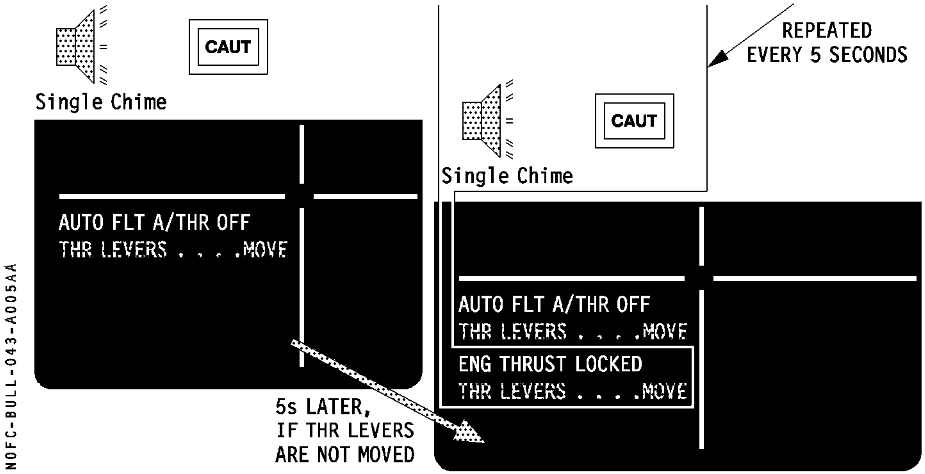
When the instinctive disconnect pushbutton is depressed :

* Thrust is immediately set to the thrust corresponding to the thrust lever position. (Thrust lock no longer effective).

* A gong sounds and the master CAUTION light illuminates for 3 seconds.

* AUTO FLT A/THR OFF is displayed on the ECAM for 9 seconds maximum.

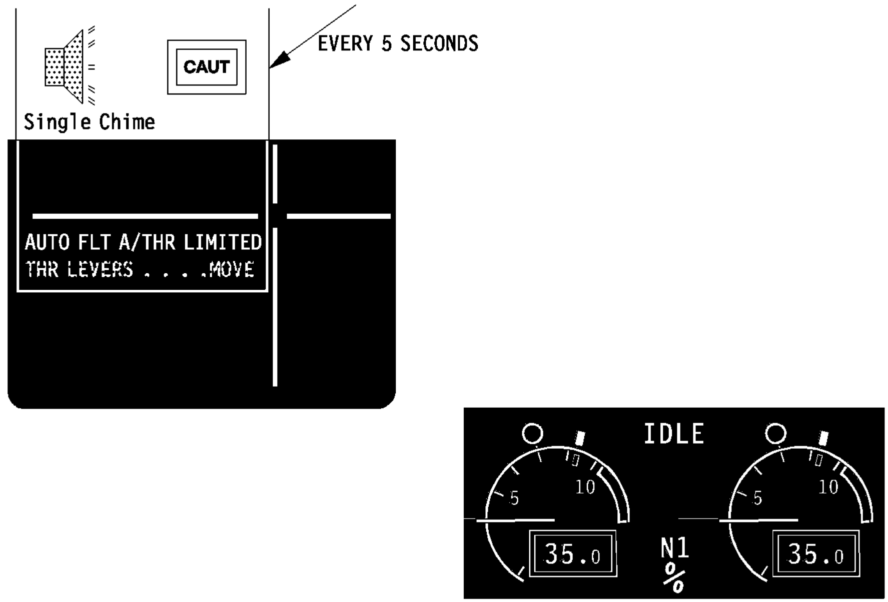
A/THR disconnection due to a failure or an action on the ATHR FCU P/B when illuminated green :



- THRUST LOCK is active until the thrust levers are moved out of corresponding detent (or alpha floor activates).
- Annunciation is enhanced as follows :
  * Repetitive gong and master CAUTION light
  * THR LK amber displayed on both PFDs
  * AUTO FLT A/THR OFF displayed on ECAM
  * Blue "THR LEVERS.....MOVE displayed on ECAM
  * With a five second delay, flashing "ENG THRUST LOCKED"

Thrust levers set below CL detent :

* Repetitive gong and master CAUTION light
* "AUTO FLT A/THR LIMITED" and "THR LEVER...MOVE" displayed on ECAM.
* LVR CLB displayed on FMA



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IDLE announcement on ECAM.

When thrust is set automatically or manually at IDLE thrust, IDLE legend flashes green for 10 seconds then steady on ECAM EWD (adjacent to N1/EPR scale).

OPERATIONAL CONSIDERATIONS

• **FCU Modification (CPIP1 and CPIP2)**

The introduction of FCU modifications does not significantly modify the published procedures :

– V/S push to level off function
  V/S = 0.0 selection may still apply ; the "push to level off" function is a easier action. In both cases, the crew must crosscheck with FMA.

– Different digits for V/S and FPA
  The procedure which consists of crosschecking (and announcing) V/S or FPA value obtained on PFD remains mandatory.

– Synchronisation of HDG/TRK target
  This allows the switching from HDG to TRK or vice versa with bank angle.
  Airbus still recommends the switching with wings level.

LOW ENERGY WARNING

This feature provides an advanced warning to the crew before alpha floor is triggered. Standard procedures are unchanged and flight envelope remains the same.
Alpha floor and alpha protection are identical.

CPIP3

The announciations of the FMA are self explanatory. The procedure remains the same :

– Any mode change is to be checked and announced.

– When a new target is selected and activated through the FCU, the resulting guidance has to be checked on the PFD.

ENERGY MANAGEMENT

The main feature of the ENERGY management is the suppression of the thrust lock when the A/THR instinctive disconnect pushbutton is used.

The A/THR disconnection technique remains unchanged (described in Vol 3 Suppl Techniques 3-04-70), and may be summarized as follows :

– When A/THR is to be disconnected :

  * Move the thrust levers out of the applicable detent, to the current or desired thrust level

  * Depress the instinctive disconnected pb.

The new ECAM features facilitate the crew action but do not modify the procedures.

SUBJECT : A320 IAE AUTOLAND LONG FLARE

Note : This Bulletin is only valid for aircraft equipped with FMGS full standard and powered with IAE engines.

REASON FOR ISSUE

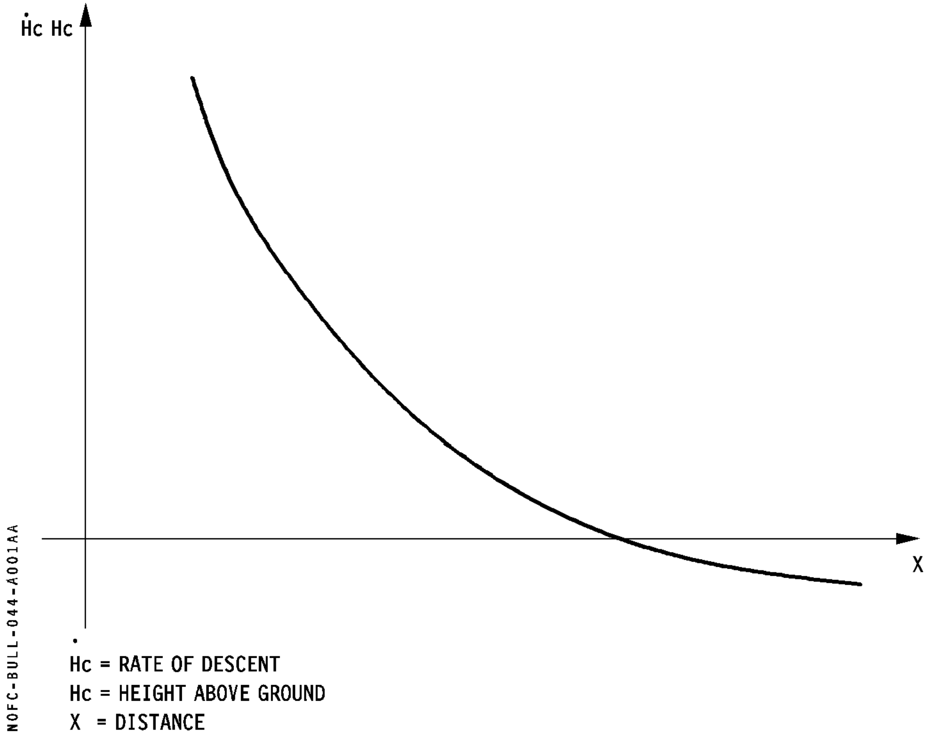
There has been long flares experienced at some airfields during autolands with A320 fitted with IAE engines.

AUTOLAND FLARE MODE

All Airbus aircraft use a similar flare mode for autoland. Flare Mode is initiated at a given radio altitude (RA) which can be either advanced or delayed by the rate of descent (ROD) – measured as a rate of change of radio altitude. The A320, flare mode is engaged at a mean RA of 43 ft, but it may occur as early as 50 ft.

Once the flare mode is engaged, the flare is commenced by an open-loop (pre-command) elevator input which is modified slightly according to the CG. The flare is continued with an additional closed-loop signal, and the aircraft tries to satisfy a profile with a given ROD and RA which both vary with distance (or time). The ROD is calculated as a rate of change of RA. See Figure 1.

The pitch demand given by the flare pre-command is modified by pitch demands for both the error between desired and actual RA and the desired and actual rate of change of RA to bring the pitch to zero ; the intent is to reduce both as a function of distance (or time) so that the aircraft touches down with a reasonable rate of descent in a reasonable distance.



This flare is effectively what a pilot does during manual flare. As the ground approaches a pitch input is introduced to reduce the ROD ; the size of the input varies according to perception of the rate at which the ground is approaching.

CERTIFICATION REQUIREMENTS

The certification requirements for autoland are complex and impose many requirements on the system. Among performance requirements are limits on touch down vertical speed and distance from runway threshold. The ultimate limits on these parameters are a probability of less than one in a million (10^{-6}) of exceeding a touchdown velocity (Vz) of 10 ft/sec, and a landing distance less than 60 m or more than 900 m from runway threshold. There are also limits on lateral deviation from the centre-line at touchdown and throughout the roll-out and on bank and slip angle at touchdown. Flight test demonstrations and simulations must cover the full range of GW's, CG's, and winds.

There is no certification requirement to prove that the autoland system will work at all conceivable airports ; flight test demonstrations are done at any airport that is equipped with a Cat II capable ILS. However, simulations have to cover certain specific unusual runway profiles in addition to a standard (flat) profile. Runway slopes of ± 0.8% have to be considered, as well as a step of 20 ft occuring just before the threshold, and a rising slope of 12.5% occuring before the runway but terminating in a flat surface 60 m before the runway threshold. There is no requirement to consider them all at the same time. Both CFM and IAE versions of the A320 met all the certification requirements for autoland.

Landing distance calculations are also performed for autoland, and there is no specific autoland landing distance requirement if the calculated autoland distance is less than the certified manual landing distance. This is the case for both versions of the A320. The landing distance calculation for autoland uses a realistic airborne distance obtained from the flight test demonstrations – a mean distance plus 3 sigma variation – which is then added to a ground distance obtained from the manual landing tests but calculated for touchdown speeds obtained during the autoland tests.

Although a smaller factor is added to the combined air and ground distances – 15% instead of 67% – the same overall safety margin is considered to be achieved. Certified landing distance is always calculated using maximum braking and that airborne distances used to calculate manual landing distances are short and based on a speed of VLS (VREF) at 50 ft with the thrust levers reduced to idle at 50 ft.

DIFFERENCE BETWEEN IAE and CFM VERSIONS

The A320 fitted with CFM engines was the first to be certified. There are some small aerodynamic differences between the IAE and CFM aircraft (flap setting and different nacelle shape), it was necessary to develop a separate flare law for the A320-IAE. It was decided to take the opportunity to improve the autoland by reducing the touchdown vertical speed. This lead to a slight increase in touchdown distance. Figure 2 illustrates the difference in performance for the 2 aircraft. The values given are mean values for specific conditions ; there will be some scatter about these values.

	α Location of impact point from runway threshold	Vz at impact
CFM	454 m	– 3.1 ft/s
IAE	503 m	– 2.7 ft/s

The A320-CFM usually has a slightly higher vertical speed at touchdown, and the A320-IAE often has a longer landing distance, although both always remain within the cerfication limits when predicted scatter is taken into account. The desired improvement of a softer autoland touchdown with the A320-IAE was fully achieved while staying within the cerfication requirements.

IAE AUTOLAND FLARE

To achieve the desired reduction in touchdown Vz, the precommand open-loop elevator input was strengthened. The RA signal filtering has also changed, and although the profile of ROD versus RA was not modified, a more gradual round out is achieved with the different filtering of RA signal. This effectively softens the aircraft reaction to an error between the desired (value according to the profile) and actual values of RA and rate of change of RA.

The transition to the flare will occur at the same height – between 40 and 50 ft. The initial pitch change will be more positive ; thus, the ROD is reduced more rapidly with a slightly higher attitude during the initial part of the flare. When compared to some other autoland systems, the flare may last longer, the nose attitude at touchdown may be higher, the airspeed at touchdown may be lower ; but the touchdown will usually be softer !

EFFECT OF HIGH RATE OF DESCENT

A higher than usual rate of descent in the last part of the approach will cause the flare mode to engage earlier and thus the flare will be started earlier than is usual. This is similar to the reaction of a pilot doing a manual landing, with a high rate of descent at flare initiation.

EFFECT OF RUNWAY PROFILE

Variations in runway profile affect all autoland systems. In the case of the A320-IAE, a rising slope before the runway can cause the flare to be engaged at about 50 ft (instead of the mean value of 43 ft), and the aircraft may temporarily level out at about 20 ft with a relatively high nose-up attitude of about 10° before the pitch attitude is reduced and the descent is continued gently down to the runway. If, in addition, the runway has a negative slope, the descent will be further prolongued. However, the aircraft will always be seeking to re-establish itself on its flare profile. Some airfields may combine both situations.

In general, those systems designed to have higher touchdown vertical speeds will be susceptable to firm landings on up sloping runways whereas those systems which have soft touchdowns will be more susceptable to having long flares on descending runways.

A flare is a dynamic maneuver, and no two flares are ever exactly the same. The RA signal is filtered to avoid irregular variations, and the aircraft pitch reaction is limited in order to prevent over-reaction in the event of erroneous variations in signal. This limiting has been strengthened in order to satisfy the demands of the European certification authorities, and therefore modern systems are slightly more sluggish to respond to variations in RA signal which restricts the ability to cope with large variations in runway profile.

Although a flare may be prolonged, this does not necessarily mean that the touchdown distance is excessive.

The mean flare duration (from 50 ft to touchdown) recorded during certification flight test demonstrations was 8.1 sec for A320-IAE and 7.1 sec for A320-CFM with maximum flare durations of 10.5 sec (CFM) and 12 sec (IAE) on the two types.

SUBJECT : CHARACTERISTIC AND PROTECTION SPEEDS

INTRODUCTION

The different speeds displayed to the crew on the main cockpit interfaces : PFD, MCDU, ND are computed by the FACs, the FMGCs and the ADIRS.

PFD	MCDU PERF PAGE
FAC COMPUTATION Computed on current aircraft status and configuration.	FMGC COMPUTATION Computed for take off, go around and landing.
VLS F S "O" Green Dot Vαprot Vαmax Vsw (stall warning speed)	VLS of the selected landing configuration. F S "O" Green Dot

Each FAC computes its own speeds which are displayed on the relevant PFD.

FAC 1 on side 1
FAC 2 on side 2

Each FMGC computes its own speeds displayed on the relevant MCDU :

FMGC 1 on side 1
FMGC 2 on side 2

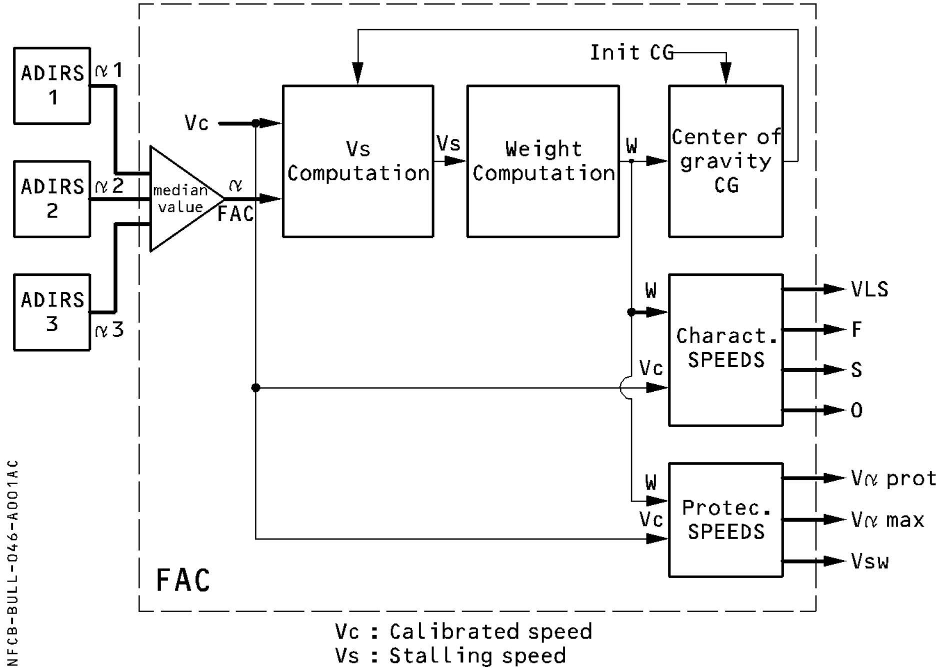
The algorithms used to compute the characteristic speeds are the same in both FAC and FMGC but as the inputs are different, the resulting values may differ.

CHARACTERISTICS SPEEDS COMPUTED BY THE FAC

The FAC computes its characteristic speeds with 2 main inputs from ADIRS (Angle of Attack (α) and calibrated airspeed (Vc)). It also uses THS position, SFCC data and FADEC data.

From these inputs, the FAC computes a stall speed Vs which is used to determine the aircraft weight.

The following sketch gives the basic architecture for FAC speed computation.

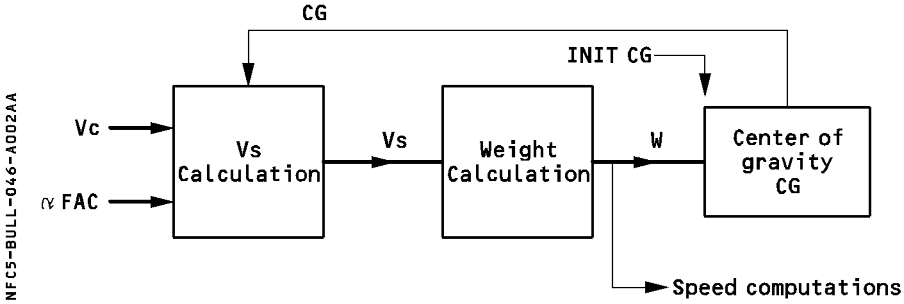


AOA DETERMINATION

The angle of attack value used to compute the characteristic speeds is the mean value of the 3 AOAs (Vote).

Accuracy of the AOAs is a paramount factor in the weight calculation.
0.3 degree of error in the AOA results in a 3 ton error in weight.

WEIGHT COMPUTATION



The weight is computed provided the following conditions are met.

- Aircraft altitude below 14600 ft and speed (Vc) below 240 kt
- Bank angle less than 5°
- Speedbrakes retracted
- No dynamic maneuver (vertical load factor lower than 1.07 g)
- No change of aircraft configuration and not in conf full.

When one of these conditions is not met, the last calculated weight value is considered and updated for the fuel consumption based on actual engine N1.

CHARACTERISTIC SPEEDS COMPUTATION

A320

VLS is computed from Weight and Vc and corrected for the current CG.

- If the current CG is forward of 15 %, 15 % CG is used to compute the speeds.
- If the current CG is between 15 % and 25 %, the speeds are computed using an interpolation between 15 % and 25 % CG.
- If the current CG is aft of 25 %, 25 % CG is used for speed computation.
  F, S, and Green dot are independent of CG.

A319-A321

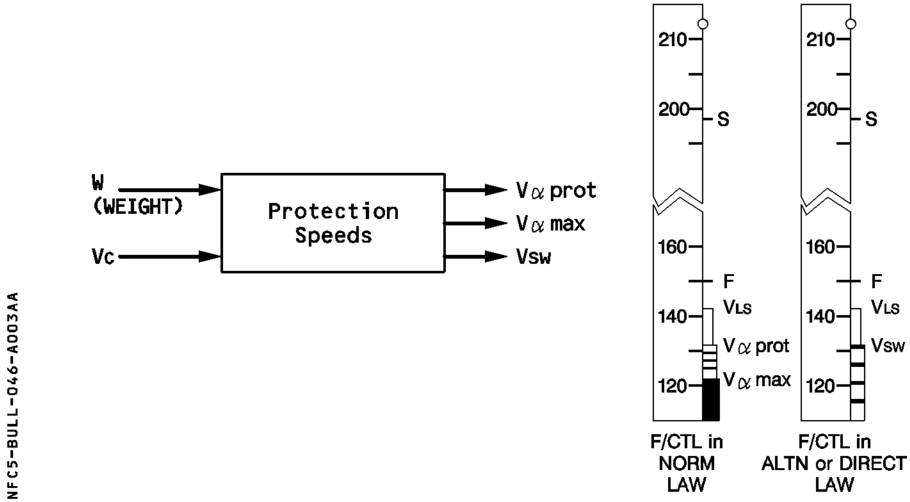
VLS, F, S and Green Dot are computed for a forward CG. No CG correction is applied for A319/A320 VLS as it has a negligible effect.

PROTECTION SPEEDS CALCULATED BY THE FAC

Vαprot and Vαmax are displayed in normal law.

The FAC does not trigger alpha prot and alpha max protection.
(The alpha prot and alpha max protection are activated by the ELAC).

VSW, the stall warning speed is computed by the FAC in ALTN or DIRECT law. At VSW speed, an audio warning (crickets – STALL synthetic voice) is triggered.



TOLERANCE OF FAC COMPUTED SPEEDS

Due to the data accuracy used to compute the characteristic speeds, and specifically the AOA accuracy, the precision of the computation is specified to be within 2.5 %.

During acceptance flight, the tolerances are as following :

Clean aircraft	Green Dot	± 5 kt
	VLS	± 4 kt
	Vαprot	± 5 kt
	Vαmax	± 5 kt
Conf full	VLS	± 3 kt
	Vαprot	± 5 kt
	Vαmax	± 5 kt

CHARACTERISTICS SPEEDS COMPUTED BY THE FMGC

Characteristic speeds computed by the FMGC are based on a predicted GW, CG (and selected configuration for landing) at a given time at landing for example.

GW and CG values are computed from entered ZFW and ZFWCG corrected for the predicted FOB and CG variation.

When the Approach phase is activated, the characteristic speeds are recomputed using the actual weight and CG.

The performance model used to compute the characteristic speeds, is accurate enough to provide speed errors of less than ± 2 kt from the certified speeds.

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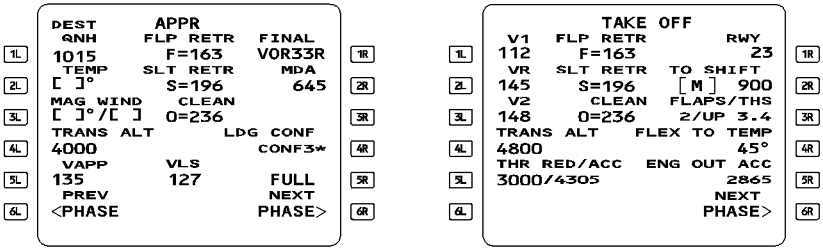


THE MOST FREQUENT QUESTIONS ON SPEED COMPUTATION

– **Why are the characteristic speeds computed by the FAC subject to inaccuracy greater than FMGC computation ?**

Answer :

The precision of the AOA measurement is usually the cause of speed differences.
An error of 0.3 ° in AOA measurement causes a weight inaccuracy close to 3 tons.

– **Is the FMGC computation more accurate than the FAC computation ?**

Answer :

Algorithms are the same but the initial data are different.
The FAC computes current dynamic speeds.
The FMGS computes characteristic speeds for given phases (and configuration for landing).
Usually, the FMGC characteristic speeds for landing are more accurate due to the tolerance of FAC inputs, if the ZFW was correct initially.

Note : To determine the GW at landing, the FMGC uses the ZFW entered by the crew and adds the fuel on board.

A significant difference between PFD and MCDU characteristic speeds may also indicate an error in the ZFW as entered by the crew.

– **Why are there two characteristic speed calculations ?**

Answer :

· The computation done by the FAC is independent of any manually entered data and provides permanent speed values displayed on the PFD.

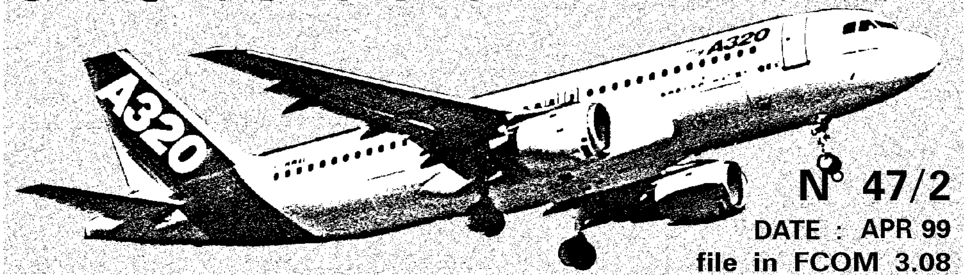
· During approach, the comparison of characteristic speeds allows the crew to detect any speed discrepancy which may affect approach and final phases;

– **When a difference exists between computed speeds from FAC and FMGC, what are the best speeds to be relied on ?**

Answer :

Whenever differences are observed, Airbus recommends to rely on QRH values.
Refer to FCOM 4.06.20 p 7.

A318/A319/A320/A321 - FCOM BULLETIN



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DATE : APR 99

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SUBJECT : GROUND SPEED MINI FUNCTION

GENERAL

When an approach is flown in managed speed mode, the crew will notice that the target speed (magenta) displayed on the PFD, is variable during the approach.
This approach target speed, also called IAS target, is computed in the FMGS using the "ground speed mini function".

The purpose of the Ground speed mini function is to take advantage of the aircraft inertia, when the wind conditions vary during the approach. The aircraft flies a target speed during the approach and the energy of the aircraft is maintained above a minimum level ensuring standard aerodynamic margins over stall.

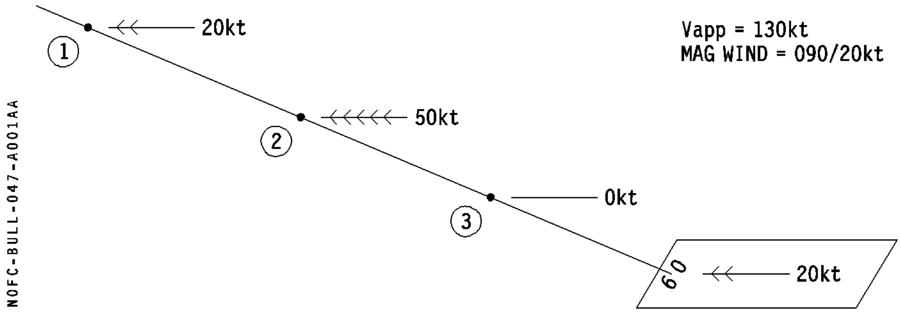
If the A/THR is active in SPEED mode, it will automatically follow the IAS target, ensuring efficient thrust management during the approach.

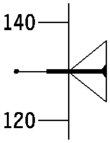
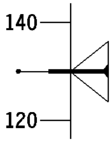
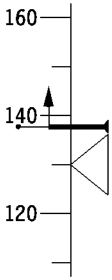
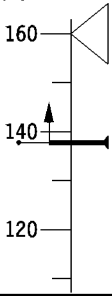
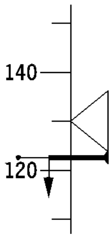
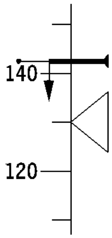
PRINCIPLE

The minimum energy level is based upon the ground speed the aircraft should have at touchdown, when landing at VAPP with the expected wind. It is called "GROUND SPD MINI".

During the approach, the FMGS continuously computes the IAS target to keep the ground speed at or above the "Ground Speed Mini", based upon the actual winds.
This IAS target is limited to VAPP
The IAS target is displayed on the PFD speed scale in magenta, when approach phase and managed speed are active. It is independent of the AP/FD and/or the A/THR engagements.

The following examples provide a comparison between the ground speed mini function versus the conventional selected speed hold function, in terms of speed target, and thrust management during an approach where winds are varying.



Conventional selected speed hold function	GS mini function
(1) Headwind 20 kt  N1 = 55% Speed Target 130 kt	**(1) Headwind 20 kt**  N1 = 55% IAS target 130 kt
(2) Headwind increases to 50 kt  * Current speed increases * Speed Trend is going up. * Thrust will be reduced to IDLE in order to match the speed target which remains unchanged.	**(2) Headwind increases to 50 kt**  * IAS target and current speed increases. * Speed trend is going up. * Thrust will be increased
(3) Headwind decreases to 0 kt  * Current Speed drops down * Speed Trend goes down. * Thrust is initially low and can be close to IDLE. ===> A/C energy is low. Thrust has to be significantly increased.	**(3) Headwind decreases to 0 kt**  * Current speed drops down from a higher speed. * Target speed drops down to VAPP * Speed trend goes down. * Thrust is initially high. ===> A/C energy is high. Thrust has to be smoothly reduced.

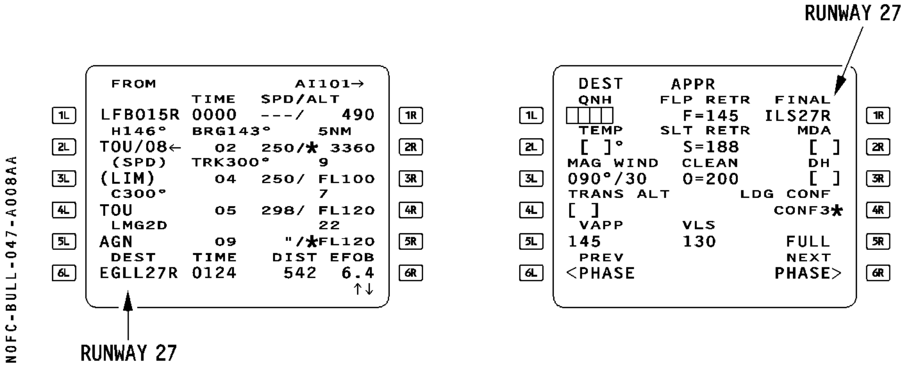
Ground speed mini function provides all the information necessary to manage the thrust smoothly and efficiently during the approach, in the event of gusts or horizontal windshears.

BASIC COMPUTATION

Wind is a key factor in the ground speed mini function.

TOWER WIND

It is the MAG WIND entered in the PERF approach page. It is the average wind as provided by the ATIS or the tower. Gusts are not inserted ; they are taken into account during ground speed mini computation.



TOWER HEADWIND COMPONENT

Component of the MAG WIND relative to the FMS runway axis.
The FMS Runway axis is the landing runway axis entered in the F-PLN and indicated on the PERF APPR page.

CURRENT WIND COMPONENT

Component of the actual wind measured by ADIRS, relative to the aircraft axis.

The three following formulae explain how the approach speed target (IAS target) is computed using the ground speed mini function. Note that this computation is different for the A320 and the A319, A321 or A320 with the modification which reduces VAPP (mod 25225).

VAPP COMPUTATION

	VAPP COMPUTATION
A320	VAPP = VLS + 5 kt + $\frac{1}{3}$ OF THE TOWER HEADWIND COMPONENT
A320 with Mod 25225 A319 / A321	VAPP = VLS + MAX (5, $\frac{1}{3}$ OF THE TOWER HEADWIND COMPONENT)

Wind correction limit : mini 0 kt, maxi 15 kt

VAPP may be changed manually by the crew if desired.

The 5 knots increment to VLS is an Airworthiness requirement when autoland is used. (CAT2 – CAT3)

Tower headwind component is counted positively.

In case of a tower tailwind, the wind correction is zero and VAPP = VLS + 5.

GROUND SPEED MINI COMPUTATION

The ground speed mini value is not displayed to the crew, but it is of interest to understand its principle.

GS mini = VAPP – TWR HEADWIND COMPONENT

- The TWR HEADWIND COMPONENT is counted positively.
- Its minimum value is 10 knots
- If the TWR HEADWIND COMPONENT is below 10 knots or if there is a TWR TAILWIND COMPONENT, GS mini = VAPP –10

APPROACH SPEED TARGET COMPUTATION (IAS target)

Approach speed target, also called IAS target is computed as the higher of :

- VAPP
- GS mini plus current wind component

IAS target = MAX(VAPP, GS mini + CURRENT WIND COMPONENT)

CURRENT HEADWIND COMPONENT is counted positively. CURRENT TAILWIND COMPONENT is counted negatively.
No max value limitation exists.

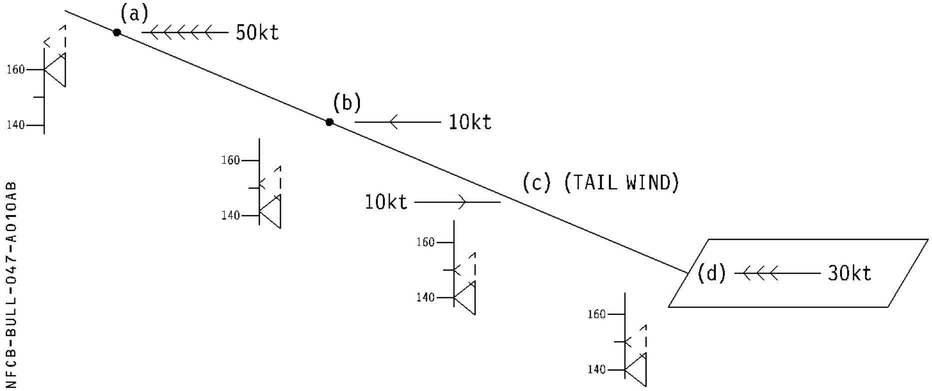
EXAMPLES

NORMAL APPROACH

- Approach on Runway 09 - FMS Runway 09
- TWR wind on PERF APPR page : 090/30
- VLS = 130 kt

COMPUTATION	A320 (basic configuration)	A320 (with Mod 25225) A319 – A321
VAPP	VAPP = 130 + 5 + $\frac{1}{3}$ of 30 = 145 kt	VAPP = 130 + MAX (5, $\frac{1}{3}$ of 30) = 140 kt
GS Mini	GS Mini = 145 – 30 = 115 kt	GS Mini = 140 – 30 = 110 kt

Current wind in Approach	IAS target (◁) A320 (basic configuration)	IAS target (◁) A320 (with Mod 25225) A319, A321
(a) 090/50	MAX (VAPP, 115 + 50) = 165 kt	MAX (VAPP, 110 + 50) = 160 kt
(b) 090/10	MAX (VAPP, 115 + 10) = 145 kt	MAX (VAPP, 110 + 10) = 140 kt
(c) 270/10	MAX (VAPP, 115 – 10) = 145 kt	MAX (VAPP, 110 – 10) = 140 kt
(d) 090/30	MAX (VAPP, 115 + 30) = 145 kt	MAX (VAPP, 110 + 30) = 140 kt



CIRCLING APPROACH

The crew will insert (Primary F. PLN) the instrument approach to be flown to MDA. The secondary flight plan should contain final approach for the landing runway with the associated wind information.

During the circling maneuver, the crew must activate the secondary in order to provide valid ground speed mini information.

Example :

Instrument Approach on RWY 27
Circling Approach to RWY 09

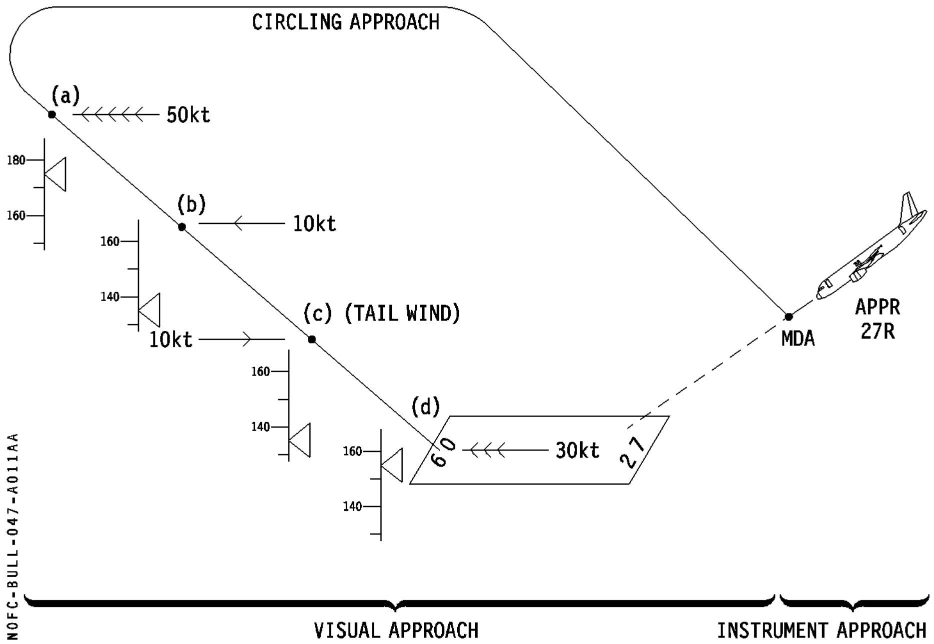
Winds a) 090/50 kt
b) 090/10 kt
c) 270/10 kt
d) 090/30 kt (TWR wind on PERF APPR)
VLS = 130 kt

The 3 formulae give the following results :

1. VAPP = 130 + 5 + Zero* = 135 kt for A320 basic configuration
= 130 + MAX (5kt, Zero*) = 135 kt for A320 with Mod 25225, A319, A321
* wind is considered as tail wind because RWY 27 is selected in the F-PLN.

2. GS Mini = 135 – 10 = 125 kt (10 kt default wind value)

3. IAS target = MAX (135, 125 + current headwind component).



The IAS target is function of the runway which is selected in the active flight plan.

Let us consider that the aircraft is actually on Final Approach onto Runway 09, the approach target speed in final will vary as follows in case Runway 27 or Runway 09 are inserted in the FMS F-PLN :

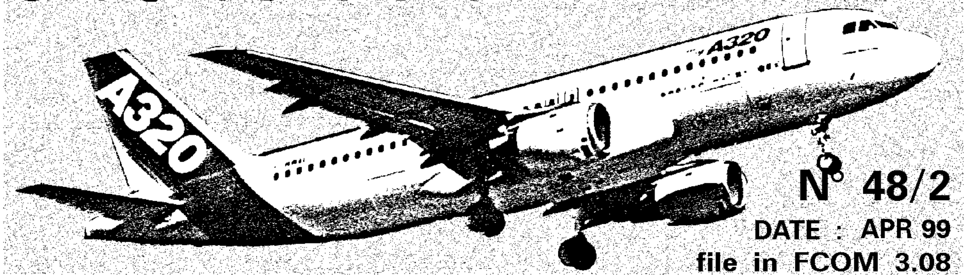
	A320 (basic configuration)	A320 (Mod 25225) A319, A321
Runway 27 selected in the F-PLN	Runway 09 selected in the F-PLN	Runway 09 selected in the F-PLN
VAPP = 135 kt GS MINI = 125 kt	VAPP = 145 kt GS MINI = 115 kt	VAPP = 140 kt GS Mini = 110 kt

SELECTED RUNWAY IN F-PLN	VAPP VALUE (PERF APPR PAGE)	GS MINI	ENCOUNTERED WINDS	IAS TARGET IN FINAL FOR RUWAY 09
(1) RUNWAY 09 A320	145 kt	115 kt	(a) 090/50 (b) 090/10 (c) 270/10 (d) 090/30	165 kt 145 kt 145 kt 145 kt
(1) RUNWAY 27 A320 (Mod 25225) A319, A321	140 kt	110 kt	(a) 090/50 (b) 090/10 (c) 270/10 (d) 090/30	160 kt 140 kt 140 kt 140 kt
(2) RUNWAY 27	135 kt	125 kt	(a) 090/50 (b) 090/10 (c) 270/10 (d) 090/30	175 kt 135 kt 135 kt 155 kt

CONCLUSION

If the landing runway inserted in the FMGS F.PLN is different from the actual landing runway, MANAGED APPROACH SPD shall not be used since the resulting targets may be significantly too high. (This rule applies wherever the FMS landing runway axis is different by 30° to the actual landing runway axis).
In this case, select the approach speed directly on the FCU.

A318/A319/A320/A321 - FCOM BULLETIN



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This FCOM Bulletin supersedes the FCOM Bulletin n° 18.
Item A of Bulletin n° 18 has been incorporated in FCOM Vol. 3.
Item C is no longer applicable.

SUBJECT : MMEL AND MEL USE

REASON FOR ISSUE

To provide Airbus operators with a simple explanation of the relationship between the MMEL and MELs, and how to use an MEL.

PURPOSE OF THE MMEL

The main purpose of the MMEL is to **permit the dispatch** of an airplane with pieces of equipment or functions inoperative, when a failure has been detected in the previous flight or in transit, and to avoid as much as possible delays and cancellations.
The MMEL is issued by Airbus Industrie and approved by DGAC for non US operators and issued and approved by FAA for US operators.

FROM THE MMEL TO AN MEL

Regulation requires that each operator prepares and keeps current an MEL using the MMEL as a guide line. **The MMEL cannot in any case be used as an MEL.**
A MEL cannot be less restrictive than the MMEL and should **cover all the items depending on National Regulations.** In particular, conditions indicated "as required by regulations" in the MMEL should be fully identified in the MEL.
The MEL is agreed/approved by National Authorities.

CONTENTS OF THE MEL

An airline's MEL should contain the following information :

- The list, agreed/approved by National Authorities of all pieces of equipment or functions which may be inoperative for dispatch.
  This list is established using the DGAC approved section 01 of the MMEL.
- The operational procedures extracted from the MMEL Section 02
- The maintenance procedures extracted from the MMEL Section 03 and / or from the AMM. (Aircraft Maintenance Manual).
- The list of the ECAM warnings, associated with the corresponding MEL entry point, extracted from the MMEL Section 00.

HOW TO USE AN MEL

When a failure is identified, the crew must enter in the airline's MEL **to determine if a subsequent dispatch is allowed and under which conditions.**

- The agreed/approved section of the MEL indicates the conditions which must be fulfilled for dispatch.
  All items are listed following ATA (Air Transport Association) classification (see below).
  All items not listed in this section are NO-GO (dispatch prohibited) except equipment or functions which are obviously not affecting airworthiness or flight safety.
- If an (o) is associated with the item, an operational procedure must be applied.

  On ground and / or in flight, crew actions are required and described in the operational procedures section of the MEL.
- If an (m) is associated with the item, a maintenance procedure must be applied.

  Before dispatch, maintenance actions are required and described in the maintenance procedures section of the MEL or in the AMM.
  If approved by National Authorities, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment should be accomplished by maintenance personnel.

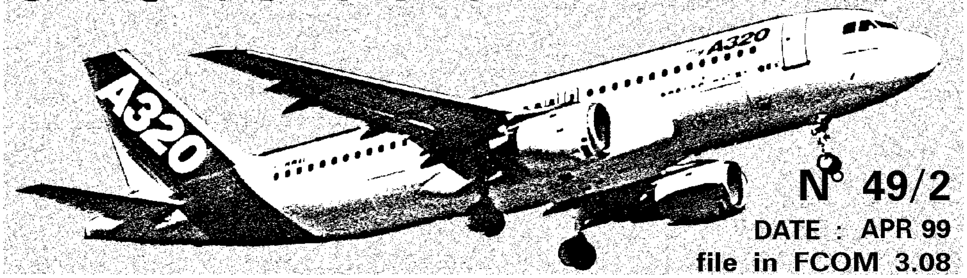
ATA 100 FORMAT

The ATA (Air Transport Association) format is the official reference for the classification of airplanes systems and / or functions.

This is achieved using 6 digits (ex : 21-23-00 ELECTRONICS RACKS AIR EXTRACTION).

The two first digits for the ATA chapter (ex : 21 – AIR CONDITIONING), and remaining digits for system and function classification in the ATA chapter.

A318/A319/A320/A321 - FCOM BULLETIN



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SUBJECT : ILS1/ILS2 GLIDESLOPE DISCREPANCY ON SPECIFIC TYPE OF ILS

Note : This FCOM Bulletin is only valid for aircraft equipped with ILS Allied Signal receivers standard anterior to RIA 35A standard (mod 23315).

SITUATION

A discrepancy has been determined on aircraft equipped with Allied Signal ILS receivers at specific ILS ground station type. This is due to a combination of Allied Signal ILS performance degradation associated to specific dual carrier frequency ILS transmitter.

TECHNICAL EXPLANATION

When the Allied signal ILS receiver ages, the oscillator frequency controlled by a crystal starts drifting. As a consequence, the glide slope intermediate frequency is distorted. This induces a change of the glide slope signal amplitudes and generates an incorrect glide slope indication to the crew.
Due to the specific dual carrier frequency ILS, it always generates a fly up indication on the corresponding PFD.

This fly up indication results in flying a higher than normal glide slope.
Since receivers do not age in the same way, the second ILS usually provides a normal indication.

OPERATIONAL CONSEQUENCES

All consequences of this ILS malfunction were assessed and results are considered as minor either during manual or automatic landing.

* When the crew flies the ILS affected by this discrepancy, the aircraft is guided on a higher than normal glide slope but the touch down zone is not modified.
* Aircraft landing performance are not affected by this discrepancy.

In the most adverse cases, the crew would receive the following warnings : excessive deviation alert followed by autoland warning if the aircraft is below 200 ft.

When encountering this discrepancy, the crew shall apply the normal procedure as described in FCOM 4.05.70 or SOP 3.03.18).

Airworthiness review meeting agreed with the technical explanations and the effectiveness of the current procedures.

This discrepancy is addressed by Airbus Industrie service bulletin A320-34-1056 and Allied Signal service bulletin RIA-35A-34-95.

SUBJECT : PUBLICATION OF SOME ATTENDANT INFORMATION BULLETINS

EMERGENCY LIGHTING SYSTEM

REASON FOR ISSUE :

Some cases of exit signs not illuminating during takeoff, landing and on ground have been reported.
In normal operation with the "EMER EXIT LT" switch 4WL (25VU) in "ARM" position and the "NO SMOKING" switch 190RH (25VU) in auto position the exit signs extinguish only when the "NO SMOKING" signs extinguish at landing gear retraction and illuminate again at landing gear extention.

Investigation revealed that the emergency power supply unit could remain frozen after power transfer.

PROCEDURE :

During taxi and before landing check exit signs for proper illumination.
If one or more exit signs are not illuminated, perform a reset of the emergency power supply by :

I) From attendant panel
   - Press the "EMERGENCY" push button 120RH once on flight attendant panel.
   - Wait approximately 4 seconds
   - Press the "EMERGENCY" push button 120RH again to recover normal configuration.

or

II) From the cockpit
   - Select the "EMER EXIT LT" switch on panel 25VU to "ON" position
   - Select the "EMER EXIT LT" switch to "ARM" position.

If normal operation is not recovered, maintenance action is due before the next flight unless the dispatch is authorized by the MEL.

DELIBERATE INHIBITION OF AMBIENT LAVATORY SMOKE DETECTORS

(A/C WITH MOD 22561)

EXPLANATION :

When the smoke detector grill is removed and foreing objects like tissue paper or plastic bags are packed around the detector (see graphic overleaf), the result will have a serious impact on the detection system. The detector may not be able to "sample" the air.

PROCEDURE :

The cabin crew is recomended to inspect the lavatory smoke detectors for tampering before every flight. If foreign bodies or sign of tampering are found, line maintenance should be informed.

VACUUM TOILET RINSE VALVE LEAKAGE (A/C WITH MOD 26145)

EXPLANATION

An increase in vacuum toilet rinse value leakage has been experienced. Leakage at the vacuum toilet rinse valve in the forward lavatory may lead to water flooding in the cockpit with possible water spillage in the avionic bay.

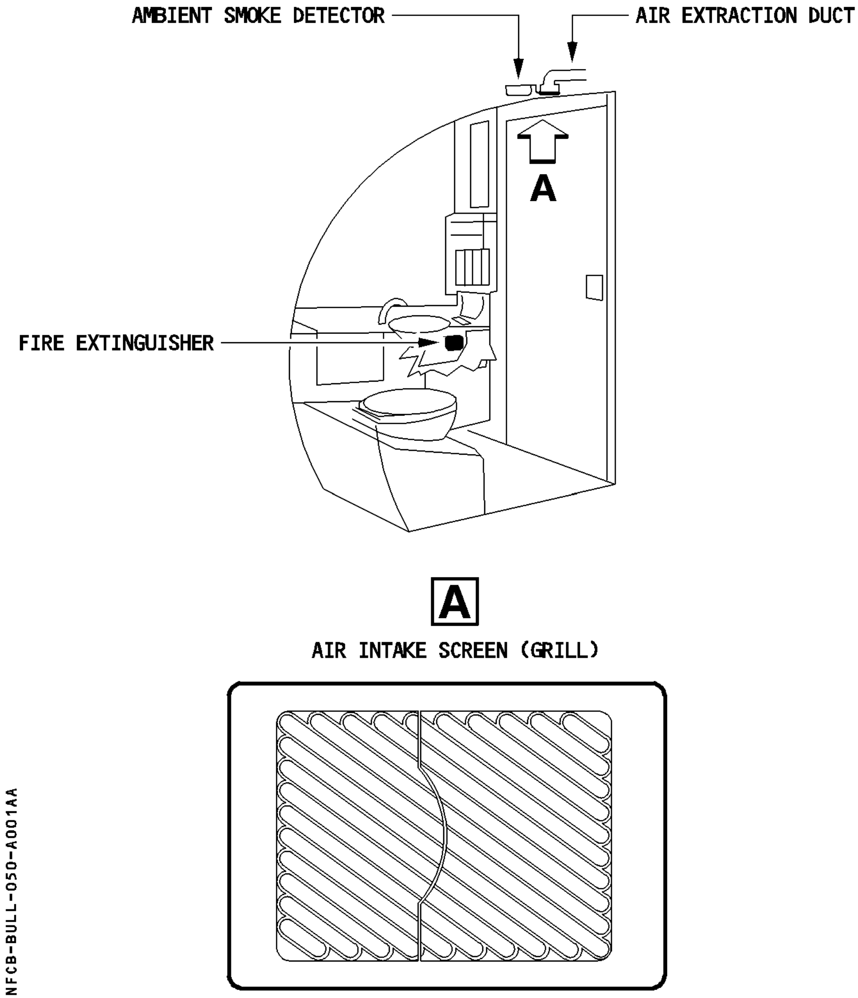
ACTION

Airbus Industrie has initiated a modification consisting of the introduction of an improved rinse valve.

PROCEDURE

Pending the introduction of the improved rinse valve, it is recommended that the cabin crew perform a toilet flush in each lavatory before the first flight of the day. This should minimize the effect of possible overnight deposit inside the valve by draining the content.

The cabin crew should advise the maintenance if abnormal water accumulation is found.



This grill is a cover for the ambient smoke detector and the air extraction duct. The view shown is how the grill would appear when looked at from below.
This grill can be removed. Foreign objects (tissues, plastic bags) have been found packed around the ambient smoke detector.

SUBJECT : ERRONEOUS AIRSPEED/ALTITUDE INDICATIONS

BACKGROUND

Two recent fatal accidents on non-Airbus aircraft and several reported incidents attributed to unreliable speed and/or altitude indications have prompted the need to improve flight crew awareness to identify and tackle failures described in this bulletin.

Most failures modes of the airspeed/altitude system are detected by the ADIRS and lead to the loss of the corresponding cockpit indications and the triggering of the associated ECAM drills.

However, there may be some cases where the airspeed or altitude output is erroneous without being recognized as such by the ADIRS. In these cases the cockpit indications are apparently normal but false and pilots must rely on their basic flying skills to identify the faulty source and take the required corrective actions. When only one source provides erroneous data, the straightforward cross check of the parameters provided by the 3 ADR's allows the faulty system to be identified. This identification becomes more difficult in extreme situations when two, or even all three, sources provide erroneous infomation.

This FCOM Bulletin provides the following information :

1 – Recall of pitot/static system layout

2 – Situations which may lead to erroneous airspeed/altitude indications

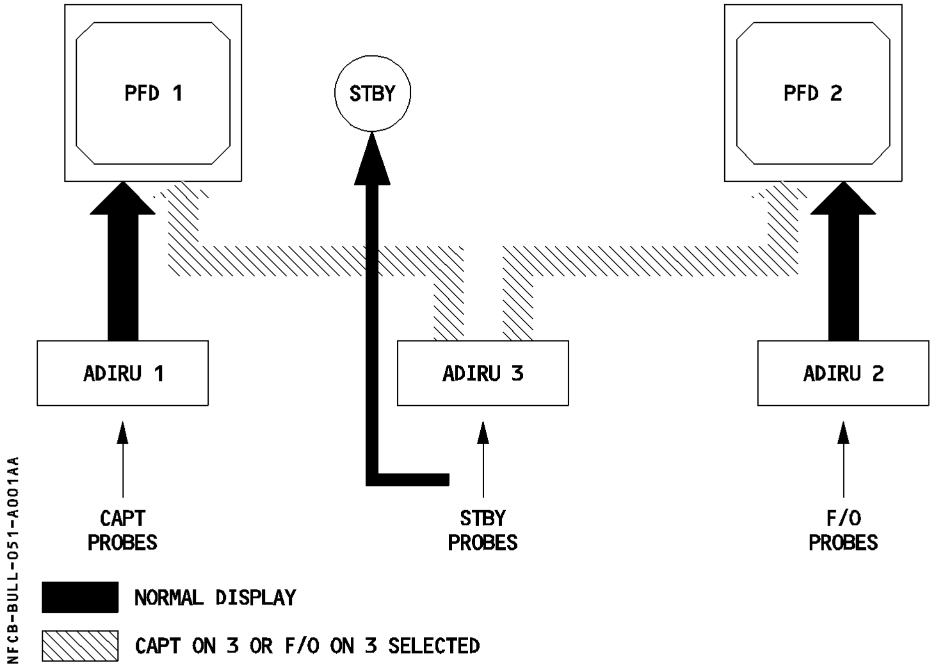
3 – Consequences of various failure cases

4 – Recall of AI recommended operational procedures

DISPLAY ARCHITECTURE

The CAPT side pitot and static probes supply the ADIRU 1 which is used, normally, for display on CAPT PFD.
The F/O side pitot and static probes supply the ADIRU 2 which is used, normally, for display on F/O PFD.

The STBY pitot and static probes supply the ADIRU 3, which can be used for display on either PFD in case of failure. They also supply directly the stand-by instruments.



MAIN REASONS FOR ERRONEOUS AIRSPEED-ALTITUDE DATA

The most probable reason for erroneous airspeed and altitude information is obstructed pitot tubes or static sources. Depending on the level of obstruction, the symptoms visible to the flight crew will be different but on all cases the data provided by the obstructed probe will be false. Since it is highly unlikely that the probes on an aircraft be obstructed at the same time, by the same amount and in the same way, the first indication available to flight crews of erroneous airspeed-altitude data will most probably be a discrepancy between the various sources.

CONSEQUENCES OF OBSTRUCTED PITOT TUBES OR STATIC PORTS

All aircraft systems using anemometric data have built-in fault accommodation logics. The fault accommodation logics are not the same for the various systems but all rely on voting principles whereby when one source diverges from the average value it is automatically rejected and the system continues to operate normally with the remaining two sources. This principle applies to flight controls and flight guidance systems.

Normal situtation

Each ELAC receives the speed information from all ADIRU.
It compares the 3 values.
Pressure altitude information is not used by the ELAC.

Each FAC (Flight Augmentation Computer) receives the speed information from all ADIRU.
It compares the 3 values.
Same check is performed by the FMGC on speed and altitude information.

If one ADR output is erroneous and the two remaining ADR are correct :

The ELAC, the FAC and/or the FMGC eliminate it without any cockpit effect (no caution, normal operation is continued), except that one display is wrong and CATIII dual can no more be available on the FMA.

If two ADR outputs are erroneous but different, and the remaining ADR is correct, or if all three are erroneous but different :

The autopilot and the autothrust are disconnected (whichever autopilot is engaged).
The ELAC triggers the F/CTL ADR DISAGREE ECAM caution.
It reverts to Alternate law (without high and low speed protection).
On both PFD, "SPD LIM" flag is shown, no V_{LS}, no V_{SW} and no V_{MAX} is displayed.

This situation is latched until an ELAC reset is performed on the ground without any hydraulic pressure.

However, when one ADR is correct but the other two ADR provide the same erroneous output or when all three ADR provide consistent and erroneous data, the systems will reject the "good" ADR and will continue to operate normally using the two "bad" ADR. This condition can be met when, for example, two or all three pitot tubes are obstructed at the same time, by the same amount and in the same way. Flight through cloud of volcanic ash, takeoff with two pitots obstructed by foreign matter (mud, insects).

The human being (the pilot) tends to use the same type of "fault accommodation" principles to detect an erroneous IAS/altitude indication. Flight crews will tend to reject the outlier information if the two other outputs are consistent. This choice is, in the great majority of cases, correct, but all flight crews should be aware of very extreme and unlikely situations where two (or even three) speed/altitude indications can be consistent and wrong.

BEWARE OF INSTINCTIVELY REJECTING AN OUTLIER ADR

The following chart provides a, non-exhaustive, list of the consequences on the airspeed and altitude indications of various cases of partially or totally obstructed pitot tubes and static ports. It should be noted that the cases described below cover extreme situtations (e.g totally obstructed or unobstructed drain holes) and that there could be multiple intermediate configurations with similar, but not identical, consequences.

FAILURE CASE	CONSEQUENCES
Water accumulated due to heavy rain Drain holes unosbtructed	Transient speed drop until water drains IAS fluctuations IAS step drop and gradual return to normal
Water accumulated due to heavy rain Drain holes obstructed	Permanent speed drop
Ice accretion due to pitot heat failure or transient pitot blocked due to severe icing Unobstructed drain holes	Total pressure leaks towards static pressure IAS drop until obstruction cleared/fluctuation if transient erratic ATHR if transient
Ice accretion due to pitot heat failure or pitot obstruction due to foreign objects Obstructed drain holes	Total pressure blocked Constant IAS in level flight until obstruction cleared In climb IAS increases In descent IAS decreases Abnormal AP/FD/ATHR behavior : a) AP/FD pitch up in OPN CLB to hold target IAS b) AP/FD pitch down in OPN DES to hold target IAS
Total obstruction of static ports on ground	Static pressure blocked at airfield level Normal indications during T/O roll After lift-off altitude remains constant IAS decreases after lift-off IAS decreases when aircraft climbs IAS increases when aircraft descends

From the information given in the preceeding chart, it is clear that no single rule can be given to identify conclusively all possible cases of erroneous airspeed/altitude indications. However, any case of erroneous speed/altitude indications will always be associated to one (or more) of the following cues :

a) Fluctuations of airspeed indications
b) Abnormal correlation of the basic flight parameters (IAS, pitch attitude, thrust, climb rate)
   - IAS increasing with large nose-up pitch attitude
   - IAS decreasing with large nose down pitch attitude
   - IAS decreasing with nose down pitch attitude and aircraft descending

c) Abnormal AP/FD/ATHR behavior
d) Undue stall warning or overspeed warnings
d) Reduction of aerodynamic noise with increasing IAS
e) Increase of aerodynamic noise with decreasing IAS

RECOMMENDED PROCEDURES

The procedures described below are intended to provide flight crews with general guidelines to be applied in case of suspected erroneous airspeed/altitude indications.

FOLLOW ECAM ACTIONS If failure undetected : CROSS-CHECK ALL IAS/ALTITUDE SOURCES : ADRI, ADR2, ADR3 AND STAND-BY INSTRUMENTS

If it is obvious that the outlier is wrong, select the corresponding ADR OFF and reconfigure the PFD indications accordingly by applying the ECAM drill which will be displayed automatically.

Flight crews should however be aware that in very extreme circumstances, it may happen that two, or even all three ADR may provide identical and erroneous data. Therefore the suspect ADR should only be switched OFF if it is positively confirmed that the two other ADR are correct. If in doubt :

DISCONNECT AP, FD AND ATHR FLY TARGET PITCH ATTITUDE AND THRUST SETTING

The immediate pitch attitude and thrust values given in the QRH should be considered as "Memory Items" since they ensure safe aircraft control and flight path during the time necessary for the crew to refer to the QRH. These target pitch attitude and thrust value ensure that the aircraft will climb what ever the flight phase and aircraft configuration (weight and slat/flaps).
Once the target pitch attitude and thrust values have been stabilized, the expanded data of the QRH (Flight with Unreliable Speed Indication) should be followed to determine the precise pitch attitude and power setting required as a function of the aircraft's weight, configuration and desired speed.

After applying the QRH procedure and when the aircraft is stable, the flight crew should try to identify the faulty ADR (one or more). Once the discrepant ADR has (or have) been positively identified, it (they) should be switched OFF. This will trigger the corresponding ECAM warnings and the associated drills which should be followed to address all the consequences on the various aircraft systems.

SUBJECT : EGPWS DATABASE

Purpose

Airbus Industrie has received some reports of EGPWS warnings that were unduly triggered due to airport data missing from the database.
It is the Airlines responsibility to identify the airport(s) where the terrain data is missing from the database. During operation around such airports, the enhanced function must be switched off (TERR pushbutton OFF on overhead panel) when the aircraft position is less than 15NM from the runway.

The purpose of this bulletin is to provide the operators and the flight crews with additional information regarding the EGPWS database and the EGPWS system reaction when the airport/terrain data is not included in the database.
The FCOM 3.01.34 and the Aircraft Flight Manual (AFM) refer, providing limitations of the system.

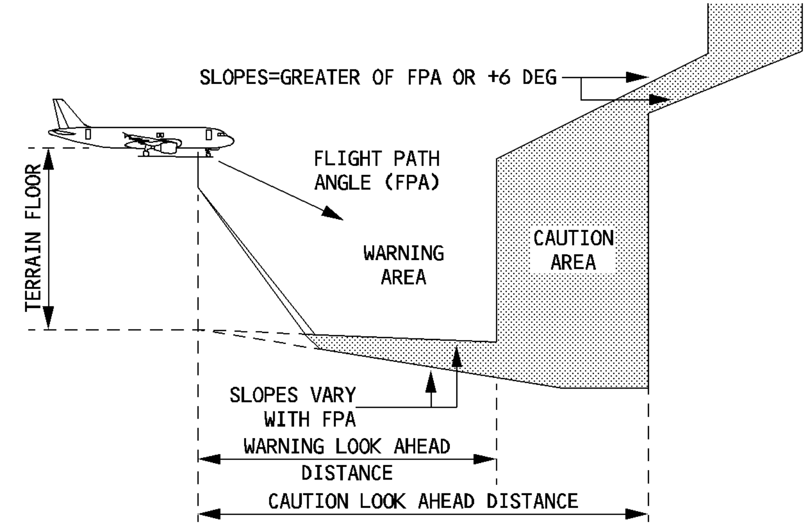
1. The Enhanced GPWS functions

The purpose of the Enhanced Ground Proximity Warning System (EGPWS) is to alert the crew of potential hazardous conditions with regards to Controlled Flight into Terrain (CFIT).

Two enhanced functions have been added to the basic modes of the GPWS. These functions are the following :

– Terrain Awareness and Display (TAD)
– Terrain clearance Floor (TCF)

- The Terrain Awareness and Display (TAD) function compares the aircraft FMS position with the local terrain in the database. It also computes two envelope boundaries ahead of the aircraft. When terrain data conflicts with one of these envelopes, specific aural and visual alerts are triggered.
  This function also provides terrain data display on the Navigation Display (ND)



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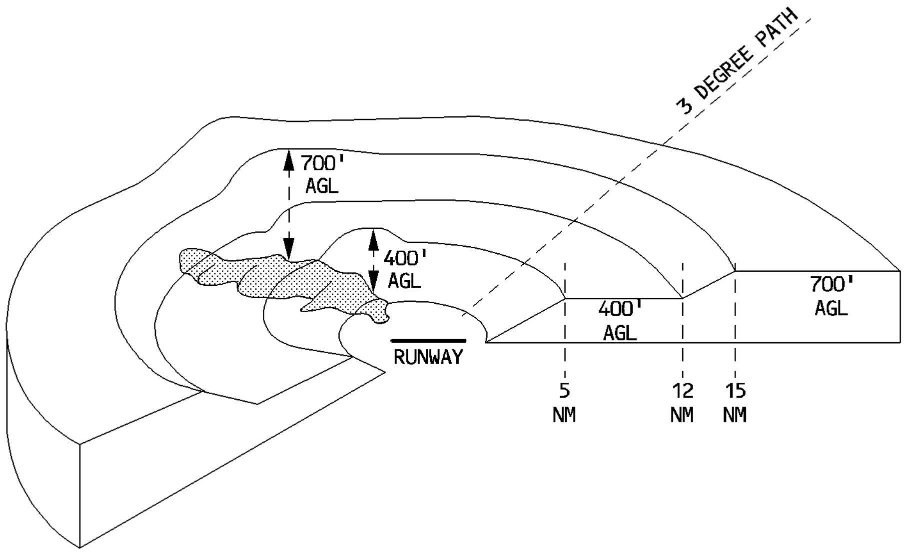
- The Terrain Clearance Floor (TCF) function computes a terrain clearance envelope around the airport runway. It is based on current aircraft location, nearest runway center point position included in the database and radio height. When the aircraft enters this envelope, an alert "TOO LOW TERRAIN" is produced even if the aircraft is in landing configuration. This alert protects against an attempt to land where there is no airfield. This can be the case for example when descending by mistake on a wrong vertical path during a non-precision approach. This function operates during any flight phase.



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2. The EGPWS database

The terrain database divides the Earth surface into grid cells. These cells are recorded upon the WGS-84 geographic coordinate system for longitude and latitude data. Each cell records the highest terrain altitude in the respective terrain area.
The resolution of the grid varies upon the geographic location, ranging from :

– 0.25 NM x 0.25 NM
– 0.5 NM x 0.5 NM
– 1 NM x 1 NM
– 2 NM x 2 NM
– 5 NM x 5 NM

The highest resolution (0.25NMx0.25NM) is used around the airports. This is to avoid producing alerts during normal procedures (the terrain database has to reflect as closely as possible the actual terrain). The lowest resolution (5NMx5NM) is used outside airports where such a coarse terrain database cannot interfere with normal en-route trajectories. The database also contains the position of the airport runway center point. This concerns all hard surface runways (wathever the surface type is) longer than or equal to 3500 ft.

Additionally, the database gives the possibility of incorporating data regarding man-made obstacles in the vicinity of the major airports.

3. EGPWS reaction when airport data is missing from the database.

When an airport/terrain data is not yet covered by the database, the TCF envelope cannot be defined. The system uses the lowest map resolution (5NMx5NM) as no airport is detected. Therefore, early and unexpected TAD cautions and warnings are triggered. The red EGPWS legend of the GPWS/G/S pushbutton comes on, the aural warnings ″TERRAIN AHEAD″ and ″TERRAIN AHEAD, PULL-UP″ sound and the terrain image pops up on the Navigation Display. When within 15NM, it is recommended to switch off the enhanced functions (EGPWS TERR pushbutton switched to OFF on overhead panel) for operations from/to runways not incorporated in the database (FCOM 3.01.34 refers).

4. The EGPWS database update

The database update is under the responsibility of the vendor.
The vendor may use one or more sources of data for a particular airport :

1) Data from in-country government and/or regulatory agencies.
2) Data from airlines that have surveyed an airport while establishing layout, approach/departure procedures, etc.
3) Data from commercial vendors who also produce data sets for FMS and other navigational systems.
4) Data from commercial and military surveying agencies that make such information publicly available.
5) Airport layout and physical properties from high-resolution maps and/or digitized data sources.
6) Airport layout and physical properties from imagery.

Some difficulties may be encountered in some areas to compile and validate airport data

For an official indication of the latest EGPWS database, as well as a list of covered airports, please review the manufacturer document, EGPWS Terrain Database Airport Coverage list. This document can be acquired by contacting.

Christine STAHL, Database Manager,
Allied Signal – 1500 NE 36th Street
REDMOND WA USA 98073
Telephone : (1)(425) 885-8847
Fax : (1)(425) 885-2994
Email : christine.stahl@allied.signal.com
Internet : WWW.egpws.com

5. Conclusion

The enhanced functions of the EGPWS are not reliable when operating around airports which are not included in the database. In this case, these functions must be switched off (TERR pushbutton off on the overhead panel).
It is the airlines responsibility to identify with the database manufacturer the airports where terrain data is missing.

Airbus Industrie strongly recommends to the airline to report to the database manufacturer and to their local airworthiness authorities any EGPWS warning occurence due to airport data missing from the database. It is also recommended that airlines request that their national authorities publish the necessary data in order that the database manufacturer can extend the database coverage to all operated airports.

R This FCOM BULLETIN supersedes the bulletin N° 53/1 dated OCT 00

SUBJECT : USE OF FINAL APP MODE AND NAV DATABASE VALIDATION.

1. BACKGROUND

The purpose of this FCOM Bulletin is to highlight SOP recommendations for the use of the FINAL APP mode.

The current body of published Instrument Approach Procedures (IAP) includes "old style" procedures in overlay to radio navaid based procedures, which cannot always be coded in the navigation database in a suitable manner for satisfactory FMGS guidance in approach.

Note : RNAV procedures are in general designed and coded for optimum FMGS guidance in FINAL APP mode.

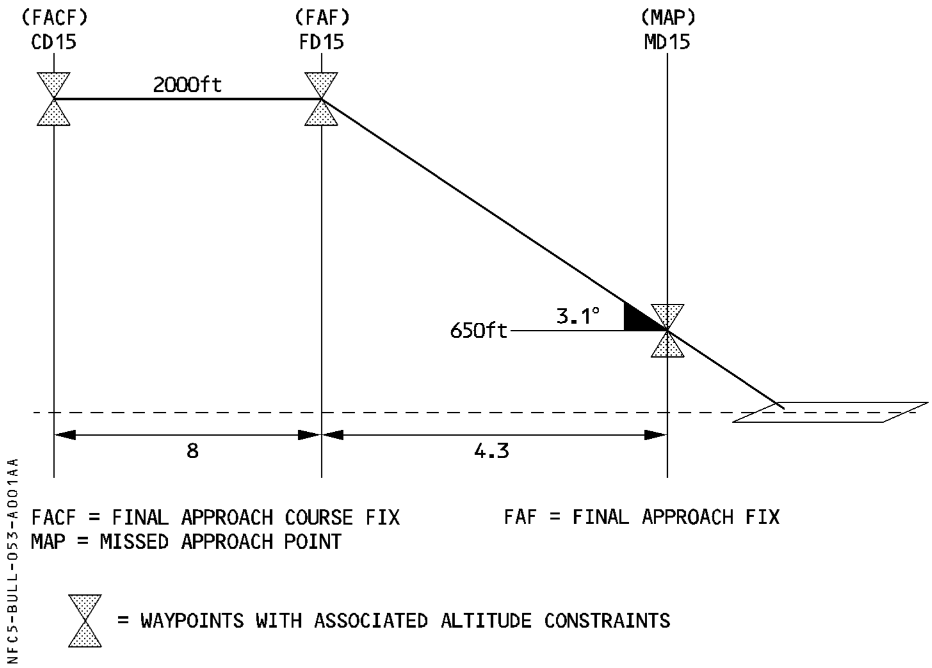
A validation of the navigation database should ensure that the IAP is of a type eligible and is correctly coded so that the aircraft in FINAL APP mode will fly a constant flight path angle from FAF to the runway with the required obstacle margins.

Different methods or processes can be used to validate the IAP coded in the navigation database, or to ensure crews do not attempt to use FINAL APP when not authorized.

One method is to fly each approach in a simulator or with the aircraft in VMC conditions.
An IAP that is regularly and correctly flown in FINAL APP mode can be considered as validated.
Airbus Industrie Flight Operations Support gives another method of validation in the document "Navigation Database Validation for FINAL APP mode use".
This method requires dedicated software to read the navigation database diskette. The listing of the coded IAP is then assessed by comparison with the approach chart.
Airlines should provide crews with a list of IAP approved for use of FINAL APP mode, or remove the IAP that are not validated from the navigation database.

R **2. IAP AND CODING REQUIREMENTS**

In addition to the navigation database validation, the crew is expected to perform a FM F-PLN check prior starting the appraoch.
To perform this check, including the check of the vertical flight path on MCDU, before starting the approach, the flight crew needs to have some basic knowledge of approach coding requirements.
To illustrate our purpose, the following drawings show the coding of an IAP with the MAP before the runway and the associated MCDU display.



	UTC	SPD /	ALT
....	......	......	......
C144°			
CD15L	......	......*	2000
C144°	TRK144°	8	
FD15L	......	......*	2000
C144°		4	-3.1°
MD15L	......	......	650
....			

The final approach consists in a sequence of at least two waypoints but more often of 3 or 4 waypoints.
In the above example the 3 waypoints are the FACF, the FAF and the MAP. Sometimes the MAP is located at the runway threshold or after the runway threshold. We will see that it is important for the crew to identify the position of the MAP.
Sometimes a Step Down Fix (SDF) is added on the approach final descent between the FAF and the MAP.
The SDF is not necessarily identical to the waypoints published on the approach chart. The identification of the waypoints shown on MCDU are often different from the identification shown on the approach chart.

The lateral F-PLN

The FACF and the FAF must be aligned with the approach course.
If the FACF and the FAF are collocated, the course change at the FAF should be small. A sharp turn would prevent the aircraft from over flying the FAF and the final descent would start before the FAF not being established on the final approach course.
Distances and courses must be coded between the waypoints.

R Approach procedures including a PI-CF Leg (PROC T displayed between 2 waypoints on
R MCDU F-PLN page) are not authorized with AP or FD managed guidance. It must be flown
R using published approach chart and raw data.

The vertical F-PLN

An altitude constraint must be coded at each waypoint.
An AT or ABOVE constraint can be use for a SDF.
When the **MAP is located at or before runway threshold a FPA (≠ 0°) must be coded at the MAP or the runway threshold (RW).**

R *Note : The MAP of RNAV approaches must be located at the runway threshold.*

When the **MAP is located after the runway threshold a FPA = 0° must be coded at the MAP.**
A FPA (≠ 0°) must be coded for each SDF lying on the final approach descent.

3. FLIGHT CREW PROCEDURES

The SOP of FCOM 3.03.19 for Non Precision Approach are applicable. The following recommendations are given here to highlight specific aspects of the vertical navigation when FINAL APP mode is being used.
As applicable, the crew should first check that the approach is approved by the Airline for FINAL APP mode use, unless the Airline option is to remove from the navigation database the IAP that are not validated.

3.1 Approach F-PLN verification

Before starting the approach, the crew will check the FMS F-PLN, on MCDU and ND in PLAN mode with CSTR displayed, starting from the beginning of the STAR down to the runway and the missed approach procedure, and verify the profile against the published IAP chart.

For the final approach procedure, the crew should check :

- The approach course
- The waypoints and associated altitude constraints
- R The IAP must not include a Procedure Turn (PROC T indicated on MCDU)
- The distance from FAF to RW or to MAP
- The approach angle (shown on the MCDU line above related waypoints)
  - **If MAP after runway threshold : FPA = 0° at MAP**
  - **If MAP before or at runway threshold : FPA ≠ 0° at MAP**
  - **For each Step Down Fix a FPA ≠ 0° must be defined**
- The altitude at MAP or runway threshold
  - If crossing altitude at MAP is not shown on the approach chart, check consistency with the distance to the runway and the approach angle.

3.2 Limitations to approach F-PLN modifications

When performing an IAP with use of NAV and FINAL APP modes, modifications of the active F-PLN extracted from the navigation data base can be made provided the following limitations are observed :

1. F-PLN modifications

- No lateral modification of F-PLN from FACF (inclusive) to RW or MAP.
  Modification before FACF is permitted provided the resulting change of flight path course will not be so large to prevent the aircraft from being laterally stabilized on the final approach course before reaching the FAF.
- No altitude constraint modification from FACF to MAP. Even in case of very low OAT, no altitude correction can be entered by this means. This may require defining a minimum OAT so that the vertical flight path will clear the obstacles with the required margin. This minimum OAT should be given to the crew when appropriate. In the future, for RNAV approaches, minimum OAT will be published on the approach chart itself.
- When the FAF is the TO waypoint, the FROM waypoint must not be cleared in an attempt to perform a DIR TO/INTERCEPT
- To take benefit of managed speed and to have a correct location of the DECEL point, it is recommended to enter Vapp as a SPD CSTR at FAF.

2. DIR TO...

- DIR TO FACF is permitted provided resulting change of flight path course at FACF is not so large to prevent the aircraft from being laterally stabilized on the final approach course before reaching the FAF.
- DIR TO FAF is permitted provided the resulting change of flight path course at FAF is small.

3. Lateral F-PLN interception in HDG/TRK

- F-PLN must be intercepted before FACF and the interception angle should not be so large to prevent the aircraft from being laterally stabilized on the final approach course before reaching the FAF.
  or
- before FAF at the latest provided the interception angle is small.

CAUTION

– Before arming NAV, check correct "TO" waypoint is displayed on ND.

– The intercept path in HDG/TRK must not cause premature sequencing of FAF. FAF should be sequenced in NAV mode when established on final approach course.

4 Vertical F-PLN interception

- The crew should manage the descent so that the vertical F-PLN is intercepted before FAF at the latest.

3.3 Approach monitoring

Except for RNAV IAP, the approach navaids should be tuned and the associated raw data displayed and actively monitored. This active monitoring should include the vertical navigation with use of altimeter reading versus DME distances or equivalent.
For RNAV IAP the vertical navigation can be monitored using the distance to the RW or the MAP displayed on ND and the altimeter reading.
After passing the FAF when stabilized on final descent, the crew should check that the X-TRK and V-DEV are correct, and that the FPV is consistent.

When APPR is selected on FCU, the crew shall verify :

- Correct FMA display (APP NAV green, FINAL blue)
- Correct TO waypoint on ND
- Blue descent arrow at FAF and correct F-PLN
- Correct Vertical Flight Path deviation indication

When passing the FAF, the crew shall verify :

- Correct altitude indication
- Correct FMA display (FINAL APP green)
- Correct TO waypoint on ND
- Correct blue track on ND, armed for Missed Approach
- That the aircraft starts the descent and follows the correct lateral and vertical flight path

If HIGH ACCUR is lost during the approach but active radio navaid monitoring confirms correct navigation, the approach can be continued in FINAL APP mode. Otherwise the crew should revert to TRK/FPA mode to fly the aircraft with navaids raw data.

The IAP shall be discontinued when one of the following warning occurs :

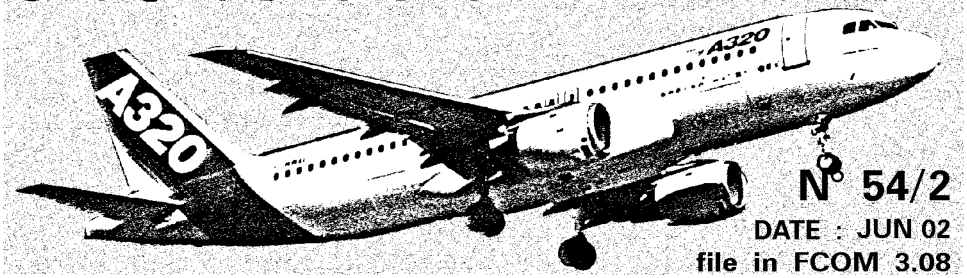
- GPS PRIMARY LOST if GPS accuracy is required
- NAV ACCUR DOWNGRAD during a RNAV approach
- FM/GPS POS DISAGREE if GPS installed and not deselected, and no navaid raw data is available to revert to selected modes.
- FM1/FM2 POS DIFF except if navaid raw data is available to revert to selected modes.

3.4 Crew Reporting

The crew must report any lateral or vertical NAV guidance anomaly to the Flight Operations. The report must be fully documented for further investigation and corrective actions :

- Approach designation and airport
- A/C type, MSN, GW, wind/temp
- Navigation database cycle
- Pilot selections, FMA, ND, MCDU displays
- Description of anomaly, flight path
- DFDR/QAR reading

A318/A319/A320/A321 - FCOM BULLETIN



SUBJECT : AIRCRAFT HANDLING IN FINAL APPROACH

General

The purpose of this FCOM Bulletin is to highlight certain aspects of aircraft handling during final approach, and to illustrate that the feedback received from in service experience merits further attention.

Although approach in turbulence is part of this discussion, windshear in approach is not addressed here. For more details on the subjects of "Windshear in Approach" and "Operations in Windshear or Downburst Conditions", refer to the FCOM 3.04.91.

Approach Stabilization Criteria

The first prerequisite for a successful final approach and landing is to laterally, vertically, and longitudinally stabilize the aircraft on the final approach flight path.

This signifies that the :

- Aircraft is established on the :
  - Final approach course, and only minor heading corrections are necessary (except for indirect approaches) to correct the effect of external conditions, acting on the roll axis ;
  - Final approach vertical flight path, and only minor pitch corrections are necessary to correct the effect of external conditions ;
- Engines are spooled up with the thrust (at least out of idle) necessary to maintain the VAPP target at the required flight path angle.

Airbus policy requires that stabilized conditions be reached at 1,000 feet HAT in IMC, and 500 feet HAT in VMC, and that they be kept down to the flare height.

In turbulent conditions, there may be heading, pitch, and thrust corrections of such a magnitude that it could be difficult to determine when to consider the approach stabilization criteria as being lost. Thrust corrections, in particular with the A/THR ON, could lead engines to temporarily reduce thrust to idle, which would not be desirable close to the ground.

The PNF callout for excessive deviation is certainly an indication for the PF to decide/determine if the approach becomes destabilized. However, the answer to this question is generally a matter of pilot judgement. The pilot must assess whether or not it is possible to return to nominal conditions early enough : That is, at the latest before flare initiation. If the pilot judges that it will not be possible to start the flare at the correct height with the correct attitude, sink rate, and thrust, or if the pilot starts to feel "out of the loop", then it is time to perform a go-around.

PNF Callout

In approach, the PNF is expected to monitor the PFD and to make a callout when some parameters are exceeded.

The Airbus FCOM SOP (3.03.18 and 3.03.19) states that a callout should be made, if :

- Speed becomes lower than the speed target − 5 knots, or greater than the speed target + 10 knots.
- Pitch attitude becomes lower than 0° (2.5° nose down for the A320 family), or greater than 10° nose up.
- Bank angle becomes greater than 7°.
- Descent rate becomes greater than 1000 feet/min.
- Excessive LOC or GLIDE deviation occurs (3.03.18 only).

The suitable PF response would be to immediately take appropriate actions to control the exceeded parameter and evaluate whether stabilized conditions will be recovered early enough. Otherwise, a go-around must be initiated. The PF should acknowledge the PNF callout so that crew coordination remains effective.

Aircraft Handling of the Longitudinal Axis

The pilot's objective, with respect to the longitudinal axis, is to control airspeed and the vertical flight path. For thrust and speed control, use of FMGS managed speed is recommended, in order to benefit from the minimum GS function. Due to the fact that, statistically speaking, A/THR provides the best protection, its use is recommended even in turbulent conditions, unless thrust variations become excessive.

A/THR response to airspeed variations is the result of a design compromise between performance and comfort so that, in some turbulent conditions, the pilot may find it to be too slow or lagging. In particular, the pilot may find it uncomfortable to have the engines at idle, while approaching flare height with a decreasing speed. To reduce the engines' response time in this kind of situation, it is possible, above 100 feet RA, to move the thrust levers slightly beyond the CL detent to temporarily disengage the A/THR. As soon the speed target is recovered, and before the thrust becomes too high, the pilot should move the thrust levers back to the CL detent to resume A/THR operations.

Note : Moving thrust levers above the CL detent, when below 100 feet, will result in A/THR disconnection (Refer to the FCOM, 1.22.30 - page 62).

In the final approach, use of the speedbrakes, when available, is not recommended due to their destabilizing effect. The drag, in CONF 3 or CONF FULL with the Landing Gear down, is normally sufficient to cope with all kinds of situations, including a tailwind landing.

The pilot's objective, with respect to vertical navigation, is to maintain a constant flight path angle down to the runway threshold, using the vertical deviation indication of an ILS, the FMGS VDEV indication, the indication of an external lighting system, or visual cues. However, when approaching flare height, the pilot's primary objective should be to progressively shift to pitch attitude and sink rate.

The vertical speed reduction that can be achieved during flare may be insufficient to avoid a hard landing, if the sink rate is too high prior to starting the flare. The aircraft may touch down with an excessive residual vertical speed and pitch rate, which may lead to bouncing and exposure to tail strike. (Refer to FCOM Bulletin N° 22 on Tail Strike Avoidance).

The pilot should also consider that the flare height might vary slightly from one aircraft type to another, depending on aircraft inertia. In the event of turbulence and wind gradient, pitch monitoring is of primary importance when close to the ground. The pilot should react promptly to any uncommanded pitch down tendency to avoid ducking under, with a risk of premature touchdown.

If the vertical speed and the pitch attitude become the primary objective, the touchdown point might occur slightly further ahead on the runway, thereby reducing the available stopping distance. In the large majority of landings, and based on the pilot's judgement, this effect should be acceptable. However, in case of doubt, it is always best to perform a go-around.

Aircraft Handling on the Lateral Axis

Generally speaking, lateral handling of fly-by-wire aircraft is conventional. But, in very gusty conditions, it is necessary to recall the principle of the flight control law in roll. With the sidestick, the pilot can order a roll rate up to a maximum of 15°/second. However, the aerodynamic capacity of the roll surfaces, when fully deflected, is much higher : That is, up to about 40°/second. This means that, if the aircraft is flying through turbulence that produces a roll rate of 25°/second to the right, the aircraft still has the capacity to roll to the left at a rate of 15°/second, with full sidestick command. This is more than what is necessary in the worst conditions.

The sidestick's ergonomical design is such that the stop at full deflection is easily reached. This may give the pilot the impression that the aircraft is limited in roll authority, because there is a time delay before the pilot feels the result of his/her action. In conventional aircraft, due to the control wheel inertia, the pilot needs considerably more time to reach the flight control stop.

The fly-by-wire system counteracts the effects of gust, even with the sidestick in the neutral position ; the pilot's task is to give overall corrective orders. In other words, the pilot should smoothen and filter inputs and should resist moving the sidestick from one stop to the other.

Every sidestick input is a roll rate demand, superimposed on the roll corrections already initiated by the fly-by-wire system. The pilot should only apply "longer-term" corrections as needed.

Before flare height, heading corrections should only be made with roll. As small bank angles are possible and acceptable close to the ground, only small heading changes can be envisaged. Otherwise, a go-around should be initiated.

Use of rudder, combined with roll inputs, should be avoided, since this may significantly increase the pilot's lateral handling tasks. Rudder use should be limited to the "de-crab" maneuver in case of crosswind, while maintaining the wings level, with the sidestick in the roll axis.
(Refer to the FCOM's SOP, for Crosswind Landing Techniques).

Summary

In summary, the following are the main points addressed by this Bulletin :

- Strictly observe the approach stabilization criteria to decide whether to land, or to perform a go-around.
- Be prompt to react to any pitch down at low height, to avoid ducking under.
- Reach flare height with the correct pitch attitude and sink rate.
- In turbulent conditions, use of the A/THR is recommended, unless it becomes impractical.
- Refrain from excessive sidestick roll activity ; order ”longer-term” roll corrections.
- Restrict used of rudder to ”de-crabbing” in crosswind.

SUBJECT : USE OF RUDDER ON TRANSPORT CATEGORY AIRPLANES

REASON FOR ISSUE

On February 8th, 2002, the National Transportation Safety Board (NTSB), in cooperation with the French "Bureau Enquetes Accidents (BEA)", issued recommendations that aircraft manufacturers re-emphasize the structural certification requirements for the rudder and vertical stabilizer, showing how some maneuvers can result in exceeding design limits and even lead to structural failure.

The purpose of this FCOM Bulletin is to re-emphasize proper operational use of the rudder, highlighting certification requirements and rudder control design characteristics.

YAW CONTROL

General

In flight, yaw control is provided by the rudder, and directional stability is provided by the vertical stabilizer.

The rudder and vertical stabilizer are sized to meet the two following objectives :

- Provide sufficient lateral control of the aircraft during crosswind takeoffs and landings, within the published crosswind limits (refer to FCOM's Operating Limitations chapter 3.01.20) ;
- Provide positive aircraft control under conditions of engine failure and maximum asymmetric thrust, at any speed above Vmcg (minimum control speed on ground).

The vertical stabilizer and the rudder must be capable of generating sufficient yawing moments to maintain directional control of the aircraft.

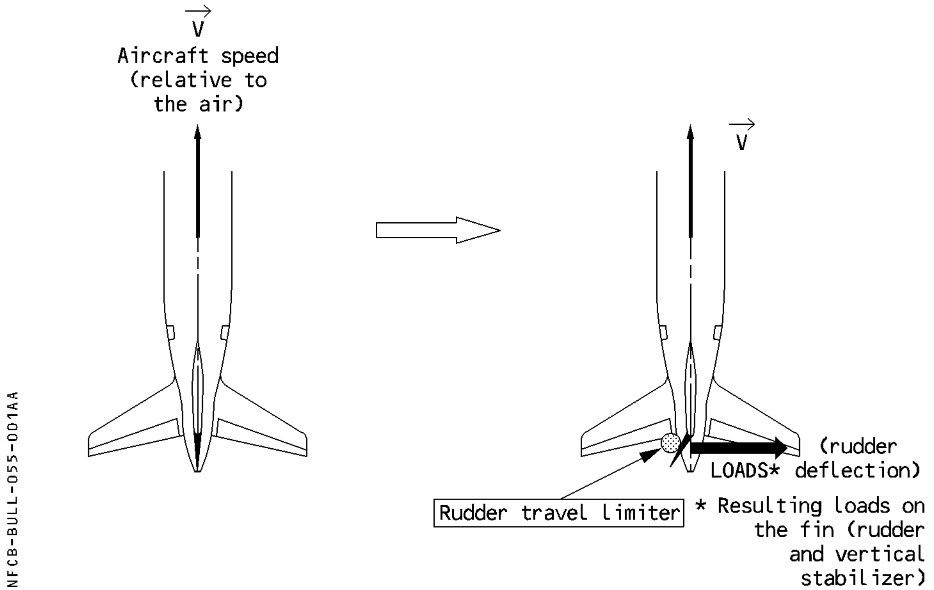
The rudder deflection, necessary to achieve these yawing moments, and the resulting sideslip angles can place significant aerodynamic loads on the rudder and on the vertical stabilizer.

Both vertical stabilizer and rudder are designed to sustain loads as prescribed in the JAR / FAR 25 certification requirements which define several lateral loading conditions (maneuver, gust loads and asymmetrical loads due to engine failure) leading to a required level of structural strength.

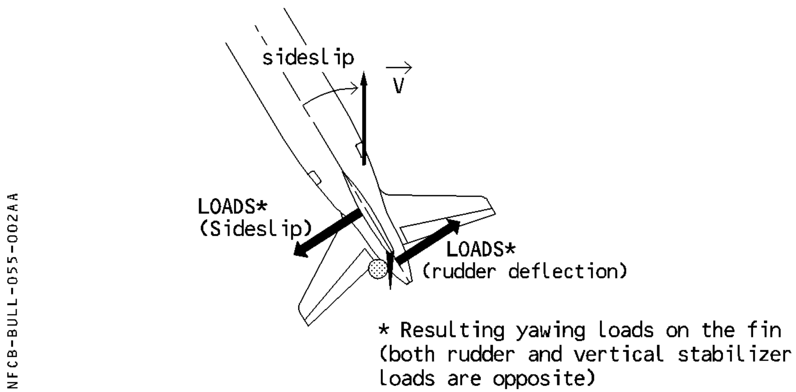
Certification requirements

For certification in accordance with JAR / FAR 25.351, loads on the stabilizer and the rudder are defined, considering yawing maneuvers as shown below, for a range of speeds from VMC (minimum control speed) to VD/MD (maximum design speed), from sea level up to maximum altitude, and over the full range of aircraft weights and Center of Gravity limits :

1 - With the aircraft in unaccelerated and stabilized straight flight, the rudder pedal is suddenly displaced to the maximum available deflection at the current aircraft speed.

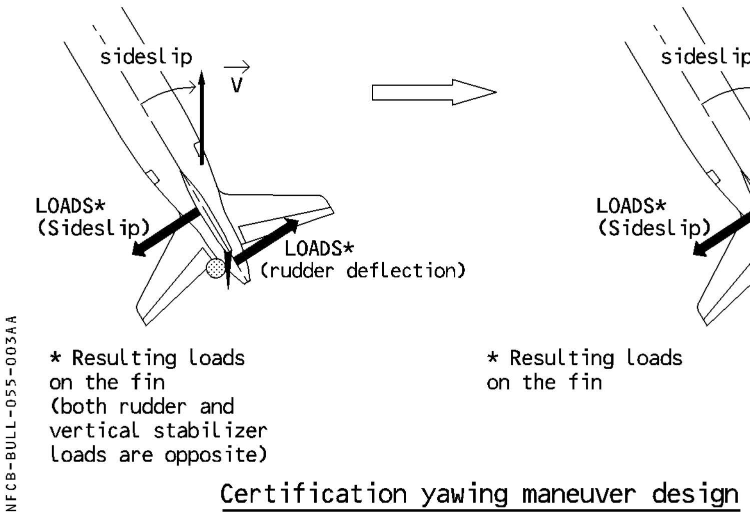


2 - With the rudder deflected as shown above, the aircraft yaws to the resulting overswing sideslip angle, and then stabilizes at a somewhat smaller steady-state slideslip angle.



3 - With the airplane yawed to the steady-state (static) sideslip angle corresponding to the above rudder deflection, the certification regulations assume that the rudder pedal is released to neutral.

Note : Because the aircraft has natural yaw stability, returning the rudder to neutral will also result in returning the sideslip angle to neutral



Certification yawing maneuver design

JAR/FAR 25 requires the above yawing maneuver to be analyzed over the full range of specified conditions. The most severe loads imposed on the vertical stabilizer and rudder are identified.

The same analysis is performed for lateral gusts, rolling maneuvers and asymmetrical engine failure conditions. The most severe of all these cases and associated loads provides the design basis for the vertical stabilizer and rudder.

The above loads define the limit loads according to JAR / FAR 25 requirements. These loads correspond to the maximum loads that may be expected in service.

According to JAR / FAR 25 requirements, the ultimate loads are defined as the limit loads multiplied by a prescribed safety factor of 1.5 unless otherwise specified.

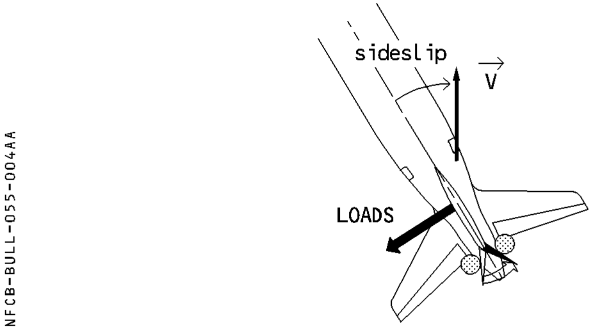
The aircraft structure must be able to sustain limit loads without detrimental permanent deformation and ultimate loads without failure for at least 3 seconds.

Higher loads could lead to structural failure.

CAUTION

Sudden commanded full, or nearly full, opposite rudder movement against a sideslip can generate loads that exceed the limit loads and possibly the ultimate loads and can result in structural failure.

This is true even at speeds below the maximum design maneuvering speed, VA.



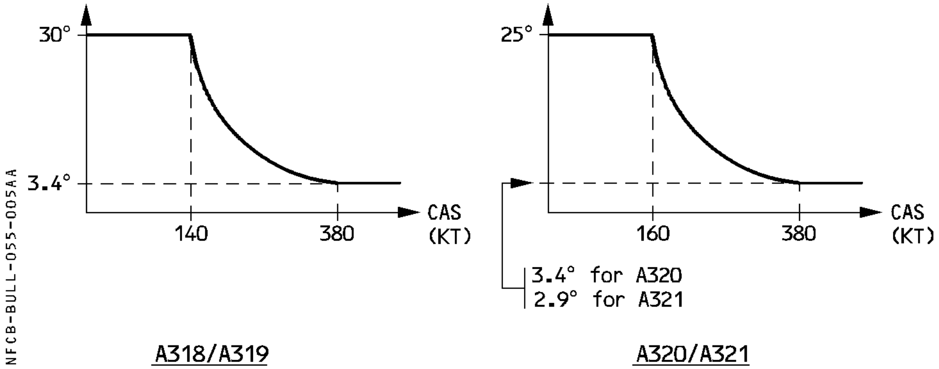
Certification regulations do not consider the loads imposed on the structure when there is a sudden full, or nearly full, rudder movement that is opposite to the sideslip.

Rudder control

The rudder surface is controlled by 3 actuators, commanded by a cable run from rudder pedals, to which the flight control input (yaw damping and turn coordination functions coming from the ELACs and the FACs) are added.

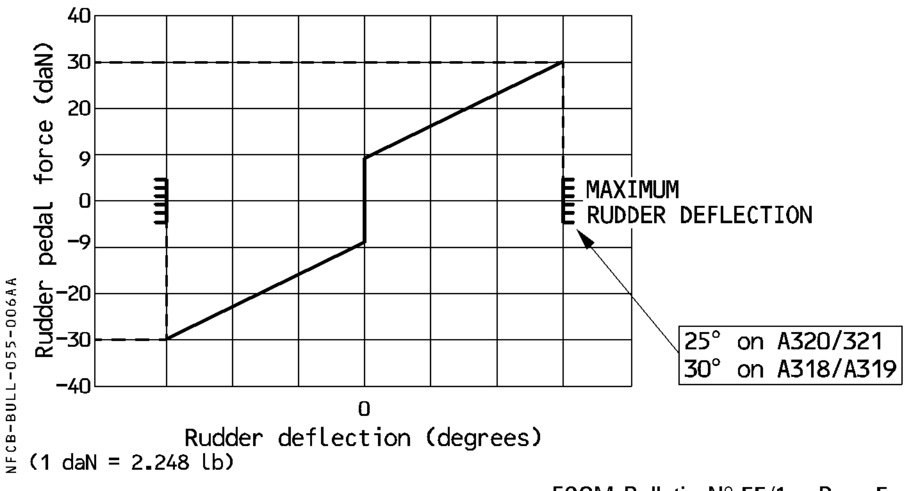
The rudder travel limiter, controlled by the FACs, is designed to progressively reduce the available total rudder travel depending on aircraft speed.
This provides sufficient yaw control within the entire flight envelope, including engine failure and maximum asymmetric thrust, limiting the lateral loads on the stabilizer and rudder so that they remain within the certification limits.

Rudder travel is limited as a function of the aircraft speed, as shown below :



- At low speeds, the rudder deflection required to maneuver the aircraft in yaw is large, and so are the resulting pedal displacement and forces ;
- At high speeds, the rudder authority is limited but the gearing between the pedals and the rudder does not change. Therefore, less force will be required to achieve maximum available rudder deflection.

As speed increases, the rudder deflection required by any yaw maneuver (eg, engine failure and maximum asymmetric thrust) decreases, and consequently, so do rudder pedal displacement and associated forces.
Rudder pedal displacement is almost linearly proportional to rudder deflection.



Thus, to explain the two preceding graphs :

The rudder pedal displacement and the resulting pedal forces required to achieve a given rudder deflection are independent from aircraft speed.

– To start moving the rudder pedals from the neutral position, a minimum force of +/-9 daN must be applied ("breakout force").

– At low speeds, i.e. up to approximately 150 kt, maximum available rudder deflection (25° for the A320/A321 and 30° for the A318/A319) is obtained by moving the rudder pedals to their maximum travel which represents a 30 daN force applied on the pedals.

– At higher speeds, for example at 350 kt, the maximum available rudder deflection is reduced to approximately 4 degrees. It is consequently obtained with less rudder pedal displacement which represents approximately a 13 daN force applied on the pedals (approximately 40 % of the maximum force to reach full pedal travel).

Operational recommendations

In order to avoid exceeding structural loads on the rudder and vertical stabilizer, the following recommendations must be observed.

1. THE RUDDER IS DESIGNED TO CONTROL THE AIRCRAFT, IN THE FOLLOWING CIRCUMSTANCES :

1.1 In normal operations, for lateral control :

- During the takeoff roll, when on ground, especially in crosswind conditions ;
- During landing flare with crosswind, for decrab purposes.
- During the landing roll, when on ground.

In these circumstances, large and even rapid rudder inputs may be necessary to maintain control of the aircraft.
Rudder corrections should always be applied as necessary to obtain the appropriate aircraft response.

On Airbus aircraft, the rudder control system includes a turn coordination function to achieve acceptable turn coordination.

1.2 To counteract thrust asymmetry :

Full rudder authority can be used to compensate for the yawing moment of asymmetric thrust.

Note : At high speed (i.e. slats retracted), thrust asymmetry (eg. due to an engine failure) has relatively small effect on yaw control of the aircraft.
The amount of rudder required to counter an engine failure and center the sideslip is small.

1.3 In some other abnormal situations :

The rudder may also be used in such abnormal situations as :

- Loss of both yaw damper systems. The rudder may be used as deemed necessary, for turn coordination to prevent excessive sideslip.
- Rudder trim runaway. The rudder may be used to return the rudder to neutral.
- Landing with abnormal landing gear position. The rudder can be used for directional control on ground.

In all of the above mentioned normal or abnormal circumstances, proper rudder maneuvers will not affect the aircraft's structural integrity.

Note : In the event of a rudder travel limit system failure, refer to the relevant RUDDER TRAVEL LIMIT FAULT procedure.

2. THE RUDDER SHOULD NOT BE USED :

– To induce roll, or
– To counter roll, induced by any type of turbulence.

Whatever the airborne flight condition may be, aggressive, full or nearly full, opposite rudder pedal inputs must not be applied. Such inputs can lead to loads higher than the limit, and can result in structural damage or failure.

The rudder travel limiter system is not designed to prevent structural damage or failure in the event of such rudder system inputs.

Note : Rudder pedal reversals must never be incorporated into airline policy, including so-called "aircraft defensive maneuvers" to disable or incapacitate hijackers.

As far as dutch roll is concerned, yaw damper action and natural aircraft damping are sufficient to adequately dampen dutch roll oscillations. The rudder should not be used to complement the yaw damper.

Note : Even if both yaw damper systems are lost, the rudder should not be used to dampen the dutch roll. Refer to the YAW DAMPER FAULT procedure.

3. SPECIAL CASES

Recovery techniques from upset situations

Proper use of the rudder, particularly during maneuvers intended to address upset recovery, are emphasized in the Airbus Training Program, supported by the industry-produced 1998 "UPSET RECOVERY TRAINING AID".