F.27

Operating Manual

Version 6.0 May 2011

For use with Mike Stone's F.27 Mk 200 & 500 models for Flight Simulator 2004
by Fraser A. McKay

Weather Radar requires rdrwdw.zip, from flightsim.com, by Eric Marciano*
The weather radar will show AI traffic provided a registered copy of Peter Dowson's FSUIPC is installed.

Please read this manual to get the most out of the aircraft. A text only version can be read on the aircraft kneeboard, as can the expanded checklist.

NOTE

The only panel controlled conditions which can cause an engine to fail;

Prolonged excessive RPM and/or excessive TGT.
Failure to operate the Power Unit De-icing Controls effectively.
Failure to operate the Fuel Filter De-icing controls effectively.
Fuel starvation

Please read and understand these sections in particular before calling for support.

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F.27 V6

INSTALLATION

Running the self installer will install the complete aircraft and subsidiary files in Microsoft Flight Simulator 2004, which will be referred to as FS9. The default path of the self installer is thus;

C:\Program Files\Microsoft Games\Flight Simulator 9

If your own setup differs there is an opportunity to edit the path as the installer is run. It is recommended that if you already have any Fokker F.27 models on your system that you first move them out of the FS9 directory, for example to the Desktop. This is not essential (the installer won't overwrite anything) but may avoid confusion when selecting aircraft from the simulator menu. You can move suitable textures back after installation if desired.

The installation will set up three aircraft folders within the FS9 Aircraft folder; Fokker F.27 100 300 V6, Fokker F.27 200 400 600 V6 and Fokker F.27 500 V6. The folders share common Panel and Sound folders contained within the Fokker F.27 200 400 600 V6 folder. Gauges will be automatically placed in the FS9 Gauges directory. Additionally an FM_Cockpit_Sounds folder is installed.

Please use the aircraft configuration and air. files supplied with this package. These provide my interpretation of the aircraft's characteristics and enable certain systems to function correctly, which those provided with the original model, or indeed others, may not.

SUMMARY OF FOLDERS INSTALLED BY SELF INSTALLER.

LOCATION WITHIN FS9 FOLDER	FILES INSTALLED
AIRCRAFT	FOKKER F.27 100 300 V6
	FOKKER F.27 200 400 600 V6
	FOKKER F.27 500 V6
	FM_COCKPIT_SOUNDS
GAUGES	F276.cab
	dsd_xml_sound3.gau
	dsd_xml_config.gau

F.27 aircraft are powered by a variety of Dart engine marks, with varying operating parameters. For simplicity, the simulator is programmed with Dart 6 Mk 514-7 engines on the Mark 100 and 300 and Dart 7 Mk 528-7E engines on the Mark 200, 400 and 600. The Mark 500 is fitted with various marks of Dart 532-7 engine, and the gauges are programmed accordingly. The panel is programmed to sense which of the models is the user aircraft. Therefore engine and propeller parameters for Dart 514-7 will be applied to the Mark 100/300 those for Dart 528-7E engines to the Mark 200/400/600 and those for Dart 532-7 engines to the Mark 500.

Once the installer has been run and the files installed successfully, start FS9. From the aircraft selection menu choose Fokker from the aircraft manufacturers list. The aircraft model list should offer each of the marks, 100 through 600, select as desired.

ADDING NEW OR EXISTING TEXTURES.

You can add new or textures you may already have for Mike Stone's models following the conventions listed below. The texture folders for each mark go in the appropriate aircraft folder and the aircraft cfg within that folder should be edited.

Each texture, or paint scheme, requires a separate entry in the appropriate aircraft.cfg file. The [fltsim.xx] line requires to be edited to the next sequential number in the texture list. The first in the list is always 0. Ensure that the sim= line in each entry matches the name of the model's air.file. This is F27_MK100, for the Mark 100/300, F27_MK200 for the Mark 200/400/600 and F27_MK500 for the Mark 500. The blue text lines are individual to each paint. (Note that the ui_type line should be one of F.27 Mk 100, F.27 Mk 200, F.27 Mk 300, F27 Mk 400, F.27 Mk 500 or F.27 Mk 600)

Example:

[fltsim.xx]
title=Fokker F.27 Mk 100 Alisarda
sim=F27_MK100
model=
panel=
sound=
texture=Alisarda
panel_alias =
sound_alias =
kb_checklists=F.27 200 Check
kb_reference=F.27_Ref
atc_id_color=0xffffffffff
atc_id=I-SARO
ui_manufacturer=Fokker
ui_type=F.27 Mk 100
ui_variation=I-SARO Alisarda
ui_typerole="Propliner"
ui_createdby="Mike Stone"
description=F.27 Mk 100. Model by Mike Stone. Panel and Sounds by Fraser McKay, Textures by Fraser McKay.
atc_heavy=0
atc_airline=Alisarda
atc_flight_number=225

NEW FEATURES SINCE V5

- **New high resolution gauges and switch panels. 99% of the gauges have been redrawn to a high standard for extra clarity.**
- **New 'Zoom' view. A close-up view of the flight and main engine instruments. The aircraft is fully flyable from this view.**
- **Working Ground Power Unit. Available on the ground, the GPU will power the electrical system without battery depletion.**
- **New internal sound pack, with GPU sounds.**
- **Improvements in systems accuracy.**
- **Engine parameters individual to aircraft type.**
- **New cockpit sounds.**
- **New textures included and available separately.**

CREDITS
Panel, gauge programming, sounds and textures by Fraser McKay.
F-27 models by kind courtesy of Mike Stone.
Panel surround views supplied by Leen de Jager.
Autopilot manual functions devised by David Maltby.
Cockpit sound gauge by Doug Dawson.
Sound samples supplied by Gary C.Orlando and Nico van der Linden.

Many thanks to you all. Many others have given me advice on the subject of the F.27 family over the years, for which I'm extremely grateful.

SECTION 1 - INSTRUMENT PANEL

CAPTAIN'S FLIGHT INSTRUMENTS.

1. AIRSPEED INDICATOR.

The airspeed indicator is a pressure operated instrument. The pointer travels over an outer scale calibrated in knots IAS. A rotating disc within the instrument face displays hundreds of knots. The instrument requires no electrical power.

2. ATTITUDE INDICATOR.

Requires 115V AC power.

3. SERVO ALTIMETER.

The instrument is both pressure and electrically operated. A pointer rotating round the outer scale shows hundreds of feet. Thousands and hundreds of feet are displayed by revolving drums through an aperture in the centre of the instrument. The subscale shows millibars by default, clicking on the subscale toggles between millibars and inches of mercury. The servo altimeter requires 115V AC power. If this is not available a hatched flag will cover the counter window.

4. RADIO ALTIMETER.

The radio altimeter displays precise altitude information above the ground from zero to 2500 feet. This information is also supplied to the Ground Proximity Warning System. The decision height cursor can be rotated using the knob, and the light will come on any time the pointer is below the DH cursor. A striped flag appears at any time AC power is not being supplied to the instrument.

5. RADIO MAGNETIC INDICATOR.

The RMI can display VOR or ADF bearing information relative to the compass card for both No1 and No2 systems. Selection is made using the switches (5a) marked NAV and ADF. The instrument is powered by the 115VAC system.

6. COURSE INDICATOR.

See Radio Installation & Autopilot.

7. VERTICAL SPEED INDICATOR.
Pressure operated.

9. BRAKE PRESSURE INDICATOR.
Shows system pressure and pressure at left and right brakes.

10. TURN AND BANK INDICATOR.
Powered by the 115VAC system through a 26VAC 3 phase transformer.

11. AUTOPILOT TRIM INDICATOR.
The Engage and Trim Indicator shows elevator trim movements on the centre scale. Additionally three flags marked IN will appear when the relevant control surface channel is engaged.

12. FUEL QUANTITY GAUGES.
A fuel contents gauge is provided for each tank. The gauges are calibrated in kgs and require 115V AC power

13. CLOCK.
Clicking the knob on the lower right of the clock will start the elapsed time counter, shown on the fourth pointer. Clicking the knob again will stop the counter and a third time will reset elapsed time to zero.

14. PNEUMATIC SYSTEM PRESSURE GAUGE & WARNING LAMPS.

15. AC POWER FAILURE INDICATOR.
An AC power failure magnetic cats-eye indicator is fitted to the main instrument panel, the top half of which will show white should a failure in the 3 phase 26V supply to the T & S occur. The white inner sphere will begin to show when the system drops to 22V, and is fully exposed at 18V.

16 & 17. GROUND PROXIMITY WARNING LIGHTS & ISOLATING SWITCHES.
The GPWS provides visual and aural warning of a potentially hazardous flight condition relative to terrain closure;

Excessive rate of descent with respect to terrain clearance.

Excessive radio altimeter rate of closure with terrain.

Height loss after take off or overshoot.

Flight into terrain when not in the landing configuration.

Excessive glidepath deviation.

The flashing red PULL UP warning annunciator will be activated by the above scenarios, together with a PULL UP or GLIDESLOPE aural warning. The Glideslope channel may be isolated by operation of the adjacent guarded switch labelled G/S. The entire system may be isolated using the guarded GPWS switch. The system requires 115V AC power and has a failure lamp and G/S Isolated lamp.

18. RADAR.

The range can be increased or decreased between 10 and 40 nm by clicking on the area to the right of the screen. The screen layout can be altered by clicking on the area to the left of the screen. The radar requires a registered copy of Peter Dowson's FSUIPC, and the gauge by Eric Marciano, rdrwdw.zip, available from flightsim.com

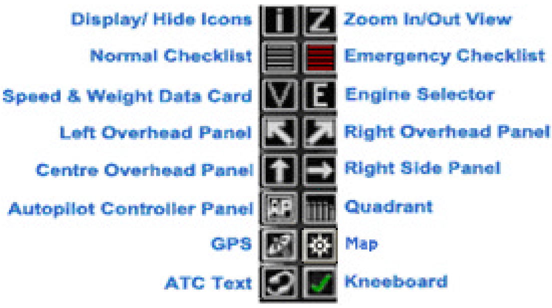
19. MARKER LIGHTS.

The Marker on/off switch is on the radio panel.

20. PARKING BRAKE HANDLE.

21. ICON GROUP.

The group of icons is used to open the various sub panels. By default all except the "i" icon are hidden. Clicking the "i" icon reveals the remaining icons.



22. NOSEWHEEL STEERING TILLER.

ZOOM IN VIEW.

Clicking the "Z" icon toggles the normal and zoom panel views. The aeroplane can be flown almost entirely from the zoom view, which provides larger and more readable flight and engine instruments. All of the other sub panels are also available in zoom in view. Due to obvious space restrictions, certain instruments may be clicked to cycle through alternative instruments, viz;

The engine oil pressure gauge can be clicked to substitute the undercarriage indicator. The oil temperature gauge is clicked at the top to substitute the fuel trim position indicators. The TGT gauges can be clicked to substitute the fuel flowmeters. Clicking on the synchroscope cycles through the flap position indicator and outside air temperature gauge. The clock and pneumatic pressure indicator are clicked to substitute the fuel contents gauges. The oil pressure gauge in the main view only can toggle the cross feed cock.

ENGINE INSTRUMENTS.

1. TORQUE PRESSURE GAUGES.

On the ground, the face can be clicked to set the dry (yellow) and wet (green) minimum torque indices compensating for temperature and altitude.

2. TURBINE RPM GAUGES.

An RPM gauge is provided for each engine and is powered independently of the aircraft's electrical system. Each gauge has two pointers, an inner pointer shows 0-20000 RPM, and an outer pointer hundreds of RPM.

3. TURBINE GAS TEMPERATURE GAUGES. (JPT on DART 6)

Operated by a series of thermocouples, the TGT gauges are effectively millivoltmeters independent of the aircraft's electrical system. A green arc shows the normal operating range, with an amber arc showing the limited range.

4. FUEL FLOWMETERS.

Powered by the normal AC system. Use adjacent knobs to reset counters.

5. SYNCHROSCOPE.

6. DUAL OIL PRESSURE GAUGE.

7. DUAL OIL TEMPERATURE GAUGE.

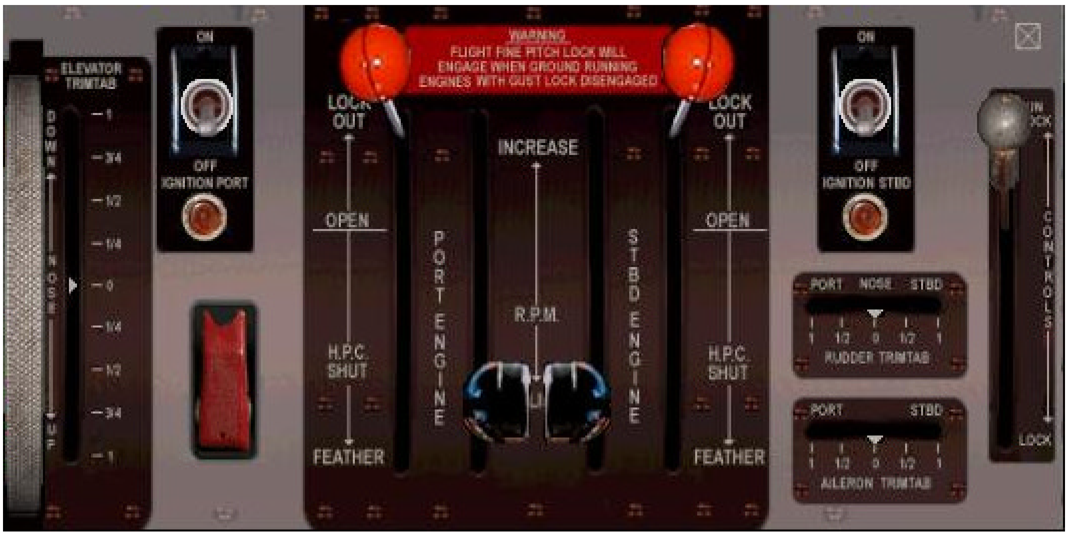
8. OUTSIDE AIR TEMPERATURE GAUGE.

SECTION 2 – ENGINE AND PROPELLER CONTROLS

The Rolls-Royce Dart RDa7 is a single shaft three stage turbine engine (two stage on Dart 6), driving a four bladed constant speed, fully feathering propeller through a reduction gearbox. The mass air flow through the engine is therefore directly proportional to propeller speed.

THROTTLE & HIGH PRESSURE FUEL COCK LEVERS.

Fuel flow and propeller RPM are selected through a single lever referred to as the throttle. Movement of each lever will automatically select propeller RPM for that throttle position as well as the required fuel for that RPM. Keyboard or joystick propeller and mixture commands will be ineffective and should be avoided. The throttle quadrant can be opened with the icon. There are mouse areas and tooltips in each lever slot to move the throttle levers, however it is more convenient to use the engine selector in conjunction with the joystick or keyboard controls. Clicking on 1 or 2 will select that particular engine, or on the A selects both engines. The U position selects both engines slightly unsynchronised.



Outboard of the throttle levers are two high pressure (HP) fuel cock levers, each having four/three positions. The functions of each position from fully forward (default) to fully rearward are: (Red text not applicable to Dart 6 engines)

Lock Out – In this position fuel is supplied to the engine under pressure and the propeller cruise lock is mechanically withdrawn. (See propeller indicating lamps).

Open - Fuel is supplied to the engine under pressure. The propeller cruise lock will withdraw and engage automatically as the propeller requires to pass through it.

Shut – The fuel supply to the engine is cut off. This is the normal way of shutting down the engine.

Feather – Fuel supply to the engine is cut off. The lever must be placed in this position before manual feathering can take place, and after automatic feathering has taken place. (See Engine and Flight Handling).

The mouse areas to move the levers forward are at the top of each lever slot, while those to move them backward are at the bottom. Care should be exercised when moving the levers, particularly from lock out to open or open to lock out to avoid mistakenly selecting the shut position.

FUEL TRIMMING SYSTEM.

The characteristics of the engine are such that a 1'C rise in ambient air temperature produces a 4'C rise in jet pipe temperature, therefore to avoid the risk of overheating the fuel flow must be reduced. Adjusting the fuel trim varies the interconnected propeller RPM and fuel flow controls so that fuel flow is reduced without alteration of RPM. However reduction in fuel flow will produce a concomitant reduction in power.

Fuel trimming is accomplished by clicking on the associated desynn indicator on the instrument panel (click the Oil Temperature gauge in either view to reveal the Fuel Trim indicators). The indicators are calibrated in percentages, with 100% representing the fully rich, untrimmed condition. The area beneath the scales may be used to set both pointers simultaneously. The fuel trimmers must be set to 50% for start if the OAT exceeds 14'C otherwise set to 100% for start. After starting is completed the trimmers should bet set in accordance with the fuel trim computer on the starboard overhead panel. Clicking the + sign adjacent to the computer will enlarge it for easier legibility. To obtain the correct take-off fuel trim setting, rotate the inner dial of the computer such that the airfield pressure altitude* is aligned with the ambient airfield temperature on the upper outer scale. Read off the fuel trim setting on the lower outer scale.

In this example the airfield pressure altitude is 2000ft. The ambient temperature is 21'C. The computer shows the correct trim setting is 74%.

*Pressure altitude is the equivalent of indicated altitude with 1013mb set on the subscale.

After takeoff and subsequent climb fuel trim is adjusted to as near 100% as possible, remaining within TGT limitations. Some operators chose to reduce the trim setting in the cruise to prolong engine life. Full decrease, 0%, should be set at the top of descent before retarding the throttles, then the trimmers should be reset to the destination airfield conditions in the final approach so that the engines are trimmed ready for a possible baulked landing.

Tip: The average environmental temperature lapse rate is 1.98'C per 1000 ft. An estimate of the destination airfield temperature, if not known, can be made by adding 6'C to the OAT at 3000ft , or 4'C at 2000ft above airfield elevation.

WATER METHANOL SYSTEM.

As previously described, in order to remain within engine temperature limits at high ambient temperatures the rate of fuel flow must be reduced, by way of the fuel trimmers, with a resultant power loss. Water Methanol introduced in the first stage compressor is used as a power restorative in conditions where ambient air temperature/pressure would otherwise limit the performance of the engine on take off or go around. The W/M effectively cools and densifies the pre-combustion air before being burnt in the normal way.

If required the system should be switched on before taxying and off once established in the climb after takeoff. The system should be selected on in the initial approach if required and off after landing. A metering unit senses any power loss with the throttles set to produce in excess of 14500 RPM, with the system switched on and operates the injection system. The checklist will prompt if W/M is required.

The pumps are controlled by two switches on the starboard overhead panel. The green warning lamps indicate sufficient system pressure. A W/M contents gauge is positioned above the lights, clicking on its face while the aircraft is on the ground will replenish the tanks. Each tank has a maximum capacity of 140 kg.

Each torquemeter has two indices, which show the minimum dry and minimum wet takeoff power, i.e. with water methanol. In practice the figure for each engine is very much individual, the power measurement being an oil pressure related system, clicking on the face of the instrument whilst on the ground sets the indices compensating for temperature and altitude.

PROPELLERS.

Each propeller blade can travel between 0’ and 87’ pitch. There is a fixed stop at the 0’ position called the ground fine pitch stop. This finest of angles provides a powerful brake on landing and minimum air resistance rotationally during start. Additionally the fine angle avoids overheating of the engine on the ground at low speeds. When the propeller is feathered, the blades can travel no further than the 87’ feathering stop.

There are also two removable pitch locks; the flight fine pitch lock and the cruise pitch lock. The flight fine pitch lock is at approximately 20’ and when engaged prevents the propeller returning to the ground fine range during flight (i.e. blades below 20’ pitch). The locks are wired in series and two amber Flight Fine Unlocked warning lamps provides a single indication that the locks have been demanded to withdraw. When the throttles are opened beyond approximately the 13900 position the locks will engage and the lamp will extinguish. There is also a red Prop Below Lock warning lamp for each propeller which illuminates when the blades reach approximately 18’ or below.

On touchdown ground fine pitch is selected by fully retarding the throttles and ensuring all six/four propeller warning lamps are on. A secondary means of withdrawing the locks is by engaging the gust locks. The circuit to the fine pitch locks can be broken in an emergency by moving the Isolating Switch adjacent to the lights to the Emergency position. A warning buzzer sounds whenever the fine pitch locks are engaged on the ground and RPM is less than approximately 13900 and airspeed is less that 55 knots.

(Dart 7 only) - The safety or cruise locks engage at approximately 32’ blade angle, and were introduced on Dart 7 engines to cater for the higher airspeeds the aircraft would be operating at. The purpose of the cruise lock is to prevent the propeller fining off should its control unit fail at high airspeeds and subsequently causing control difficulties. The cruise lock is mechanically withdrawn with the HP cock at Lock Out for takeoff and climb. During the cruise the HP cock is moved back to the Open position in which the cruise lock is electrically controlled and will automatically withdraw and engage as the propeller needs to pass approximately 32’ in normal operation. The condition for the cruise lock to withdraw must be met on both engines before the locks will withdraw, unless any propeller is feathered. There are two blue Flight Saf. Unlocked warning lamps which illuminate when the locks have withdrawn. The HP cocks should be left at Open during the descent then returned to Lock Out during the approach, and illumination of the cruise lock lamps confirmed.

FEATHERING.

The propeller can be manually feathered by moving it’s associated HP cock to the feather position then pressing the feather button on the emergency panel. The integral feather pump lamp will light indicating the propeller is feathered. In reality the lamp would only glow while the feather pumps were working. Unfeathering is accomplished by pulling the button out and extinguishing the light.

The autofeather system operates when the throttles are set to approximately 13000 RPM or greater and the engine torque is sensed at 50 PSI or below. Under this condition the blades will feather automatically, however the manual feathering drill must be completed to safely shut down the engine.

STARTING CONTROLS.

The starting controls are located on the overhead centre panel. The controls for normal ground starting consist of a starter master switch, an engine selector switch and a starter button. For a normal ground start the master should be selected to START, the appropriate engine selected on the start selector (normally No2 then No1) and the starter button depressed to initiate the start cycle. The starter lamp will illuminate and extinguish at the end of the cycle, at which time the button will also pop out. The opposite starter cannot be operated while the other start cycle is in progress. When the master switch is selected to MOTOR the engine can be motored over without ignition by running the starter motor. When operating the igniters in the air the start master switch must be OFF. A Rapid Start facility is available by clicking the icon in the top centre when the engines are stopped.
Air relights are accomplished using the Ignition switches on the pedestal.

EMERGENCY CONTROLS.

The emergency engine controls are located on the glare shield panel.

Each engine has a feathering/unfeathering button with integral warning lamp, a fire warning lamp and dual test switch, an emergency fuel shut off handle and a dual shot fire extinguisher guarded switch.

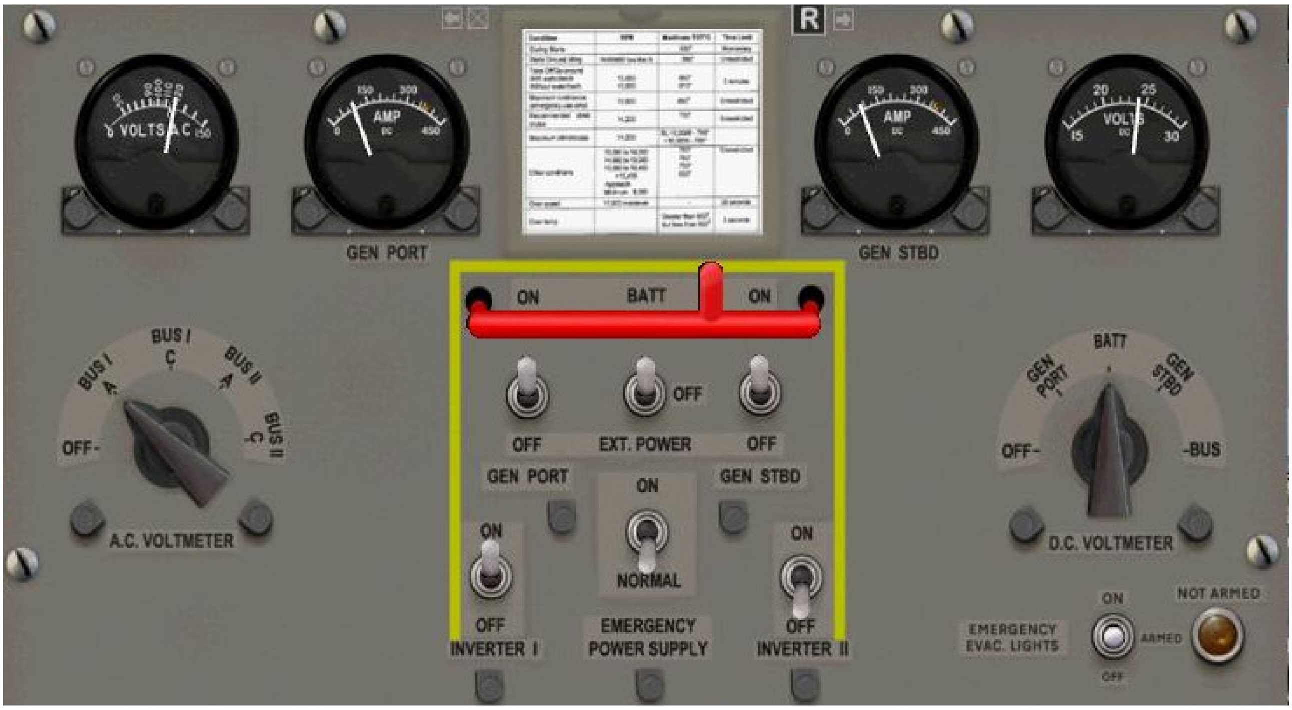
Operation of the emergency fuel shutoff handle shuts off fuel upstream of the flowmeters, This is for emergency use only and should not be used under normal circumstances for shutting off the fuel supply.

SUMMARY OF ENGINE AND PROPELLER CONTROLS.

- **The engine fuel flow and associated propeller RPM are selected through a single lever referred to as the throttle. Game controller propeller and mixture controls should be left at the maximum setting at all times.**
- **High Pressure Fuel Cock levers outboard of the throttle levers are used as both fuel on/off levers and perform propeller pitch lock functions.**
- **Fuel trimming is used to adjust TGT for a given throttle setting. Any setting below 100% produces a concomitant power loss.**
- **Water-Methanol injection is used as a power restorative to compensate for the reduction in fuel flow when the engines are trimmed to less than 100%.**
- **Propellers have two fixed and one/two removable pitch locks operated by electrical circuitry and manual inputs from the HP cocks. Associated warning lights show the condition of the locks.**
- **The propeller will feather automatically if the throttle levers are set to produce in excess of 13000 RPM and torque pressure is sensed at less than 50 PSI.**
- **Propeller may be manually feathered at any time.**

SECTION 3 – ELECTRICAL SYSTEM

The controls pertaining to the electrical system are grouped mainly on the overhead centre panel which is accessed with the icon.



28VDC SUPPLIES

The 28VDC system is powered by a generator mounted on each engine accessory gearbox which feed a DC Main bus bar. An ammeter is provided for each generator and a single voltmeter can show either generators output, the battery output or main bus voltage through an adjacent rotary switch.

Each generator has an on/off control switch, and there are failure and overheat red warning lamps on the glare shield panel.

The battery master switch is located between those for the generators and has three positions; On (default), Off and Ext. Power. Before the engines are shut down the battery switch must be moved either to On or Ext. Power otherwise there will be no electrical supply when the generators drop off line. With the switch in the Ext. Power position, the ground power unit can be brought on line providing the aircraft is stationary with the parking brake applied. Note that the ground power unit consumes fuel at a rate of approximately 140 kg/hr. With the switch at On only the battery supply is available.

The gang bar may be pulled at any time to shut off all electrical supplies, or the battery switch moved to off if there is no generated power.

115VAC SUPPLIES

Some of the instruments and equipment require 115VAC supply, or in some cases 26VAC via a transformer, and this is provided by either of two main inverters, which take their supply from the DC Main bus bar, and an emergency inverter which is supplied by the emergency bus bar with emergency power selected on. Inverter I switch is on by default, with inverter II off as a standby. Either inverter may be used to supply the AC bus bars I, II and III bus not both. A voltmeter and rotary switch is provided to check busbar voltages. An AC power failure magnetic indicator is fitted to the main instrument panel, the top half of which will show white should a failure occur. The inverters will fail when main bus volts drop below approximately 19V. Systems supplied by the inverters are:

HSI
Autopilot
Fuel Contents Gauges
ADF2
ADF1
VHF1
Turn & Bank
Gyro Horizons
Engine Fire Warning
VOR/ILS
RMI
VHF 2
Oil Pressure Gauge
Flap Position Indicator
AC Fail Indicator

EMERGENCY POWER

In the event of a complete generated power failure, the emergency power switch should be moved to On. This connects the Essential Bus Bar to the battery bus bar and engages the emergency inverter. Services NOT AVAILABLE with emergency power selected are:

VHF NAV2
ADF2
Markers
GPWS
Igniters
Feathering Pumps
Flight Fine Lock Withdrawal
Cruise Lock Withdrawal *
Fuel Heater Operation
Fuel Flowmeters
Fuel Contents
Water-Methanol System
Undercarriage Indication
Nose-wheel Steering
Pressurisation Auto-dump
Landing Lights
Stbd. Pitot Heat
Power Unit De-icing
Wing & Tail Deicing
Stbd Windshield Heat
Windshield Wipers

***Manual cruise lock withdrawal available – HP Cocks to LOCK-OUT.**

With Emergency Power selected on, the batteries are good for 30-40 minutes.

208VAC SUPPLIES

An alternator mounted in each nacelle provides 208VAC for the de-icing of its associated engine intake, propeller & spinner. The controls are on the port overhead side panel and consist of two three position switches labelled Start/Run/Off, two red Under-volt/Earth Leakage warning lamps and two amber Off lamps. The Alternators are on by default but may trip off line when loading a flight, so check that the lamps are all out. The alternators are started by moving the switch momentarily to Start then releasing it to the Run position. The alternator field windings require Main DC Bus power.

SUMMARY OF ELECTRICAL SERVICES.

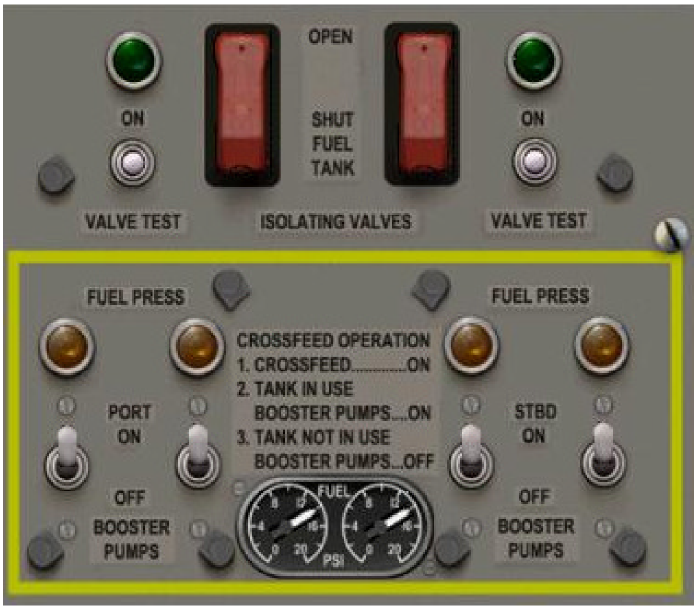
- **The main DC system is powered by two engine driven generators.**
- **The DC system can be energised when the engines are not running by the batteries or the external power supply.**
- **DC distribution is via three bus bars; Main, Emergency and Battery.**
- **The AC system is normally powered by one of two inverters, supplied by the DC system.**
- **Selection of Emergency Power in case of total generated power failure disconnects the Main DC Bus and connects The Emergency Bus to the batteries. Additionally the Emergency Inverter is brought into operation.**
- **A 208V alternator is driven by each engine. The generator field control requires DC power.**

SECTION 4 - FUEL SYSTEM

Fuel is carried in integral tanks in each wing outboard of the nacelles. Each tank holds a maximum of 541 imperial gallons/650 US gallons/1966 kg. The tanks feed by gravity respective collector tanks in each nacelle. Duplicated booster pumps in each collector tank raise the pressure of the fuel prior to delivery to the engine.

FUEL CONTROLS.

The booster pump control switches are on the starboard overhead panel, together with four amber low pressure warning lights. Both pumps in each tank should normally be switched on for start, taxy and take-off approach and landing, and should be switched off after shut down, when the pressure warning lamps will light.



The fuel tanks can be isolated by means of two guarded switches on the starboard overhead panel which control a valve between the fuel tank and collector tank. Test Switches and associated green warning lamps allow testing of the valve circuit.

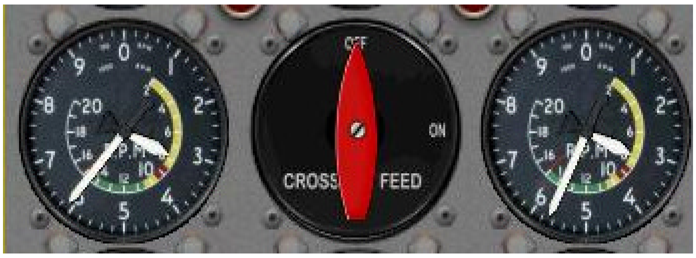
The Emergency Fuel Shut-Off Valves are controlled by two T handles which are pulled out of the Emergency Panel. These mechanically close the valve in the corresponding nacelle at a point just aft of the firewall.

Fuel flowmeters are located on the centre instrument panel. The dials is calibrated from zero to 1000 kilogrammes per hour and have an integral fuel consumed counter which is reset by an adjacent knob..

There are two gauges on the main instrument panel which show the contents of each tank in kilogrammes.

FUEL MANAGEMENT.

Under normal circumstances each tank feeds its respective engine, however a cross feed valve can be used to supply both engines from a single tank in an emergency. The cross feed valve can be opened by clicking the Oil Pressure gauge in the main view only. To use the cross feed facility open the cross feed valve, ensure both pumps in the tank to be used are on and the LP lights are out then switch off both pumps in the tank which is not to be used.



FUEL HEATERS.

A fuel heater is mounted in each engine supply pipe, downstream of the flowmeter, to raise the temperature of the fuel and prevent particles of ice forming and causing a blockage.

The heaters are controlled by two switches on the starboard overhead panel. Normal procedure calls for the fuel heaters to be switched on for two minutes during the approach if the temperature is below 20'C . Additionally the heaters should be switched on for two minutes while taxying for takeoff if the OAT is below 5'C or in conditions of high humidity. There are two fuel filter icing red warning lamps on the panel which illuminate when there is a difference in fuel pressure across the filter of 3 PSI or more.

Use of fuel heat causes a slight power loss, therefore they should be switched off for takeoff and landing.

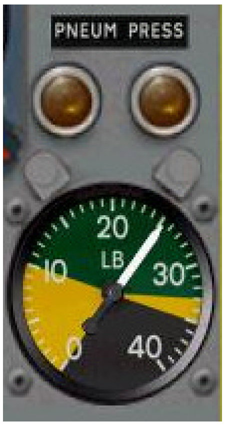
SUMMARY OF FUEL SYSTEM.

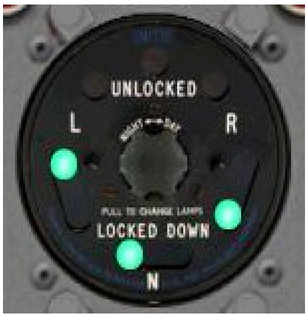
- **The aircraft has two main fuel tanks, one outboard of each nacelle.**
- **Fuel flows to collector tanks in each nacelle before being raised in pressure and delivered to the engine.**
- **There is a cross feed facility to supply both engines from either tank in an emergency.**
- **Fuel system gauges are AC powered.**
- **Thermal fuel filter heating is provided.**

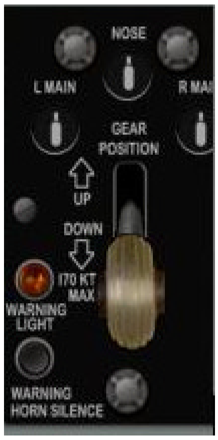
SECTION 5 – PNEUMATIC SYSTEM, FLYING CONTROLS & FLAPS

PNEUMATIC SYSTEM & LANDING GEAR

The pneumatic system is charged by engine bleed air, and is used to operate the wheel brakes, nose-wheel steering and raise and lower the landing gear. A system pressure gauge is on the main panel together with two amber failure lamps for the left and right supply.







The Undercarriage Selector is to the right of the engine instruments and a standard six lamp position indicator is fitted beneath.

Green Lights : Gear locked down
Red Lights: Gear unlocked or in transit.
No lights: Gear locked up

The nose red lamp will glow if the flap lever is selected beyond the 16½ ' position and any gear leg is not locked down. The centre knob selects an alternative set of down lock filaments.

Maximum speed for undercarriage extension
Or with undercarriage extended – 168kt IAS

GUST LOCKS

The internal gust locks for the flying controls are operated by a lever on the quadrant. Operation of the lever rearward locks the elevator and ailerons, but leaves the rudder free for steering on the ground. With the locks engaged either engine may be run up to full power but not both.

TRIM CONTROLS

The trimming controls for the elevator are on the quadrant. The elevator is trimmed using the hand wheel. The ailerons and rudder can be trimmed by clicking in their respective areas on the Autopilot Trim Indicator on the instrument panel.

WING FLAPS

The flaps are electrically operated from the DC Main Bus and have five settings;

0’ Fully retracted.
11 ½ ’ Takeoff setting.
16 ½ ’ Takeoff setting
26 ½ ’ Approach setting
40’ Landing setting

The inboard flap section between the fuselage and nacelle is always less than the outboard sections. At 40’ extension on the outboard flaps the inboard flaps reach 26 ½’

The flap position indicator is to the right of the engine instruments on the main instrument panel.

Maximum speed for flap operation 0 ’- 16 ½ ’ 177kt IAS
Maximum speed for flap operation 16 ½ ’- 26 ½ ’ 157kt IAS
Maximum speed for flap operation 26 ½ ’- 40 ’ 144kt IAS

An aural warning sounds if the flaps are extended beyond 16 ½’ and the landing gears are not down.

SECTION 6 – DE-ICING SYSTEMS

The electrical de-icing controls are located on the starboard overhead panel.

PITOT HEATERS.

Two switches control the electrical supply to the pitot heaters, and two amber failure warning lamps are fitted. Pitot heat should be switched on before takeoff and off at the end of the landing run.

POWER UNIT DE-ICING.

Two alternators provide 208VAC power for the Power Unit De-icing as well as de-icing of the windshield, the de-icing circuits being controlled by two switches on the starboard overhead panel. A rotary switch between these switches controls the cyclic timers, which have a fast and slow setting. The oleo switch restricts the supply on the ground to prevent overheating. Ammeters show the current drawn as each cycle operates, and a selector switches allow the current to be displayed. The ammeter should read 20amps when the cycle is on and 3.5 amps between cycles, however the reading will be higher with windshield de-icing selected on. Blue warning lamps glow dim and bright in accordance with the operation of the cyclic timer.

The PUDs should be selected to fast when the outside air temperature falls below +10’C and to slow in temperatures below -6’C.

Note that the system has been arranged such that engine flame out may occur if the de-icing equipment is not used correctly in icing conditions.

WINDSHIELD DE-ICING.

The windshield de-icing is controlled by a single rotary switch which has a low and high setting. Two magnetic indicators confirm integrity of the system.

AIRFRAME DE-ICING

The leading edges of the wing, fin and tailplane are de-iced by pneumatic boots which inflate cyclically when a quantity of ice has been allowed to form, thus removing it in pieces of a predetermined size. The boots are held flush with the leading edge by vacuum pressure. The system requires power from the Main DC Bus. The controls for the system are on the co-pilots side panel.

The rotary switch has three positions OFF/HEAVY ICE/LIGHT ICE. A green Pneumatic Deicer On lamp will light with the system selected on, and a set of green lamps representing the sections of the system will light cyclically as each section is inflated. Spring loaded Manual Override switches enable any section of the system to be manually operated.

There are suction and pressure gauges forward of the control panel.

SUMMARY OF DE-ICING SYSTEMS

- **The engine intakes, oil cooler intakes, propeller and spinner are de-iced electrically using 208VAC power from a corresponding engine driven alternator. The alternator also supplies windshield de-icing.**
- **Current is applied cyclically and continuously via a two position cyclic timer.**
- **Generator field current requires DC power from the DC Main Bus.**
- **Leading edges of wing, tailplane and fin are de-iced by pneumatic boots cyclically. DC Main Bus power is required.**

SECTION 7 - PRESSURISATION SYSTEM

CABIN PRESSURISING CONTROLS.

The cabin is pressurised with air supplied from blowers driven by each engine.

The controls for the pressurisation system are grouped on the co-pilots side panel and consist of a Dump Valve switch, two Spill Valve switches and associated position indicators, two Blower Failure red lamps, a pressure controller, and cabin height, pressure differential and rate of climb indicators. A manual depressurising valve is also provided.

The Dump Valve is normally closed at all times. Prior to departure, set desired cabin height with the right knob on the pressure controller; the subscale will show maximum aircraft altitude at maximum pressure differential for the cabin height selected. Close the No2 Spill Valve before take-off and the No1 after takeoff. At the top of descent set the controller to destination airfield altitude. No1 Spill Valve should be opened in the final approach and No2 after landing. The left hand Rate knob controls the cabin rate of change and this is set at +/- 500 fpm by default.

The oleo weight switch will depressurise the cabin when it is closed.

Cabin altitude and differential pressure are displayed on a single instrument; the differential on the outer scale and cabin altitude on the inner.

Maximum operating altitude - 20000 ft. Maximum differential pressure - 4.42 psi
Normal differential limit – 4.16 psi

SECTION 8 - RADIO INSTALLATION & AUTOPILOT

RADIOS

The radio panel forms part of the centre overhead and is accessed with the same icon.

The aircraft is fitted with dual Nav and Comm VHF radios and two ADF receivers. The mouse areas for the Nav/Comm radios are on the tuning knobs below the dialled frequency, those for the ADF sets are on the three tuning knobs on each set. VOR or ADF information is displayed on the radio magnetic indicator on the main panel and two selector switches at the top of the main panel enable any combination of bearings to be displayed. Note that the pointers will not respond to ILS frequencies. Indicators for DME1 and DME2 are mounted above the glare shield between the pilots. Buttons on the units enable either Nautical Miles, Frequency, Speed and Minutes to be displayed.

The Horizontal Situation Indicator has two knobs; the left adjusts the course pointer and the right adjusts the heading index, which can be used to alter heading in the autopilot heading mode. A switch to the right of the flight instruments allows either Nav1 or Nav2 information to be selected to the HSI. The central bar represents course displacement in VOR or ILS. A glide slope deviation pointer and scale are on the right of the instrument. The scale is obscured by a red and yellow flag when glide slope information is unreliable. A compass fail flag is at the top of the instrument.

AUTOPILOT CONTROLLER

The autopilot controller is opened with the icon.

1. Power Switch. The Power switch must be pulled to initiate the supply to the Autopilot. This is effectively the FS Autopilot master. When the AP is ready for use the amber Ready lamp will illuminate. (Approx 45 seconds)
2. Engage Button is pressed to engage the AP and hold the current pitch attitude. This must be pressed initially before selecting any AP function.
3. Channel Switches . May be used to isolate the Rudder, Elevator or Aileron channels from the Autopilot.
4. Height Lock. Turned to engage the height lock. Note that the Airspeed lock is inoperative.
5. Heading Hold Button. When engaged the aircraft may be steered by altering the Heading Index on the HSI.
6. Beam Coupling Switch. Pull to engage the FS Nav1 hold function.
7. Glide Coupling Switch. Pulled to engage FS Approach Hold function. This will also cause the Beam Switch to engage.
8. Pitch Switch. Used to vary the nose up or down pitch.
9. Turn Knob. Used to make manual turns with the AP engaged but Heading Lock disengaged.
10. Ready Lamp. The lamp will extinguish when any function is engaged.

Note that the Autopilot will only respond to Nav1 information.

ENGAGE & TRIM INDICATOR

The Engage and Trim Indicator shows elevator trim movements on the centre scale. Additionally three flags marked IN will appear when the relevant control surface channel is engaged. The trim scale may be used to alter elevator trim during manual flight.

SECTION 9 - MINOR SYSTEMS

EXTERNAL LIGHTING

The switches for the wing mounted landing lamps are located on the overhead centre panel as is the switch for the nose taxy light. The Navigation lamps and anti collision beacons are controlled by switches on the port forward overhead panel. The panel also houses the control switches for the passenger notices.

PANEL LIGHTS

The panel lights are operated by any of the rheostats on the overhead panels.

VITAL DATA CARD

A card detailing the vital speeds can be opened with the icon.

CHECKLISTS

The normal and emergency checklists can be opened with the and icons.

SECTION 10 – LIMITATIONS

AIRFRAME LIMITATIONS.

	F.27 Mk 100/300 DART 6-514	F.27 Mk 200 DART 7-528	F.27 Mk 500 DART 7 532
Max Zero Fuel Weight	16193 kg	16193 kg	17917 kg
Max Ramp Weight	18597 kg	19277 kg	20689 kg
Max Takeoff Weight	18370 kg	19050 kg	20412 kg
Max Landing Weight	18144 kg	18600 kg	19051 kg
Max out of Balance Fuel	500 kg	500 kg	500 kg
Never Exceed Speed Vne	254 kt IAS*	254 kt IAS*	254 kt IAS*
Max Operating Speed Vno	223 kt IAS**	223 kt IAS**	223 kt IAS**
Manoeuvring Speed Va	167 kt IAS	167 kt IAS	173 kt IAS
Rough Air Speed *** Vb	175 kt IAS	175 kt IAS	180 kt IAS
Ldg Gear Extended Vle	168 kt IAS	168 kt IAS	168 kt IAS
Ldg Gear Operation Vlo	168 kt IAS	168 kt IAS	168 kt IAS
Flap Ext'd 0 - 16 ½ Vfe	177 kt IAS	177 kt IAS	177 kt IAS
Flap Ext'd 0 - 26 ½ Vfe	157 kt IAS	157 kt IAS	157 kt IAS
Flap Ext'd 26 ½ - 40 Vfe	144 kt IAS	144 kt IAS	144 kt IAS

*** Above 20000 ft Vne is decreased to 234 lt IAS.**
**** Above 20000 ft Vno is decreased to 204 kt IAS.**
***** At Max AUW, reducing to 161 kt at 13600 kg.**

ENGINE LIMITATIONS F.27 Mk 100/300

DART 514-7	RPM	MAX JPT 'C	TIME LIMIT
Starting	-	640	Momentary
Idling	6500-7500	525	Unrestricted
Approach Idling	10400 +/- 100	525	Unrestricted
Takeoff Dry	14500	595	5 min
Takeoff Wet	14500	600	5 min
Max Continuous	14500	590	Unrestricted
Op. Ess. Power	14000	520 + OAT/2	Unrestricted
Rec.Climb / Cruise	13800-14000	520 / 500 + OAT/2	Unrestricted
Max Overspeed	17000	-	20 sec

ENGINE LIMITATIONS F.27 Mk 200/400

DART 528-7	RPM	MAX TGT 'C	TIME LIMIT
Starting	-	930	Momentary
Idling	7000 MIN	550	Unrestricted
Approach Idling	11000 +/- 100	680	Unrestricted
Takeoff Dry	15000	795	Unrestricted
Takeoff Wet	15000	810	5 min
Max Continuous	15000	780	Unrestricted
Op. Ess. Power	14500	770	Unrestricted
Rec.Climb & Cruise	14200	730	Unrestricted
Max Overspeed	17000	-	20 sec

ENGINE LIMITATIONS F.27 Mk 500

DART 532-7	RPM	MAX TGT ‘C	TIME LIMIT
Starting	-	930	Momentary
Idling	Incidental	550	Unrestricted
Approach	8000 Minimum	550	Unrestricted
Takeoff Dry	15000	810	5 min
Takeoff Wet	15000	860	5 min
Max Continuous	15000	850	Unrestricted
Op. Ess. Power	14500	770	Unrestricted
Rec.Climb & Cruise	14200	730	Unrestricted
Max Overspeed	17000	-	20 sec

MINIMUM IN FLIGHT TORQUE FOR ALL MARKS – 60 PSI

SECTION 11 – ENGINE AND FLIGHT HANDLING

ENGINE STARTING

Having completed the Before Start checks:

1. **Fuel Trimmers...SET**
2. **Brakes...ON**
3. **Throttles..CLOSED**
4. **HP Cocks..CLOSED**
5. **Booster Pumps...ALL ON, LAMPS OUT**
6. **Prop Lamps....................................GROUND FINE ON, CRUISE OUT**
7. **Start Master...START**
8. **Engine Selector...SELECT STBD**
9. **Propellers..ALL CLEAR**
10. **Starter Button..PRESS**
    ...STARTER LAMP ON
    ....1500-1800 RPM HP COCK OPEN
    ……………………………CRUISE LOCK LAMP ON
    ....CHECK OIL PRESSURE, FUEL FLOW
    ....STARTER LAMP OFF appx. 4500 RPM
    ..MONITOR RPM and TGT
    ....TGT & RPM STABLE, HP COCK LOCK OUT

    Repeat for port engine
11. **Start Master...SAFE**
12. **Engine Selector...SELECT STBD**
13. **Prop Lamps...ALL ON**
14. **AC & DC supplies……………………………..………………..CHECK**
15. **Alternators……………………………………………..………RUNNING**
16. **Battery Switch...ON**

Note that maximum TGT may be MOMENTARILY exceeded on startup, however if this appears to be the case , Fuel Trim must be reduced , then reset when the engine has stabilised.

TAXYING

After completion of the Before Taxy checks, open the throttles to approximately 11000 RPM and release the brakes. Once the aircraft is moving maintain 10500 - 11500RPM checking the speed with the brakes. Complete the Taxy checks.

TAKE-OFF

If there has been a change in OAT and/or ambient pressure between start up and take-off the Fuel Trimmers must be reset. When the Taxy and Before Take-Off checks have been completed and clearance received, enter the runway and return the throttles to idle. At the commencement of take-off , open the throttles smoothly to approximately 12000 RPM, observing the Oil Pressure and TGTs, then fully open the throttle to full power, 15000 RPM and ensure the minimum torque has been achieved. Check that the TGTs are within the limits, and that the Prop Below Lock and Flight Fine Unlocked lamps have extinguished. Do not open the throttle too rapidly, or with the F4 key, as there is a danger that the Autofeather system will operate if sufficient power has not built up before the throttles are fully forward.

When a positive rate is established, retract the undercarriage. Climb out initially at 125kt to the acceleration height, Ha, usually 400ft above airfield level, then reduce power to 14200 RPM, (max continuous). Adjust pitch to maintain initially 140-150kt. Complete the After Take-Off and Climb checks. Once established in the climb, the Fuel Trimmers should be set to give the recommended 730'C TGT. Complete the After Take-Off and Climb/Cruise Checks, paying particular attention to ice protection.

CRUISE

Cruise power should be left at 14200 RPM, TGT trimmed to 730'C and the airspeed allowed to build up. During the cruise the HP Cocks should be moved back one position from Lock Out to Open, and check that the Cruise Lock lamps have extinguished.

DESCENT

The aircraft can be descended initially at high speed, at 1500fpm with the engines at cruise power. The engines can overheat when the throttles are retarded as well as when accelerating , therefore the Fuel Trimmers must be set to full decrease, 0%, before the power is brought back. As the speed approaches 220kt, reduce descent rate or reduce power to around 11000 RPM. Torque should not be allowed to drop below 60psi to ensure the layshafts are loaded. At top of descent, set the pressure controller to airfield elevation.

APPROACH & LANDING

Ensure that the HP Cocks have been returned to Lock Out and that the Cruise Lock lamps are on. For an ILS approach it is desirable to be level at approximately 2300-2500ft, at around 140kt . As the glide slope deviation pointer on the HSI approaches the centre of the instrument, select flap 16 ½' and undercarriage down. Complete Approach Checks and set fuel trim for destination airfield. Once established on the glide path select flap 26 ½' reducing power as required (120-140 PSI approx). Complete Final Checks. Gradually reduce speed to Vat + 15 kt. Select flap 40' at about 400ft aal and reduce speed to reach the threshold at Vat. On touchdown, close the throttles and ensure that the prop lamps are all on. If the lamps do not come on, under no circumstances may the throttles be opened as instantaneous turbine burnout may occur.

CLOSING DOWN

On stand apply the parking brake and check the throttles are closed, allow the TGT's to stabilise and close the HP Cocks. Turn off all the Booster Pumps and complete the Shutdown checks.

EMERGENCY PROCEDURES

Manual Feathering

Should the need arise to shut down an engine in flight:

1. HP Cock...TO FEATHER
2. Feathering Button..PRESS IN
3. Throttle...CLOSE

Automatic Feathering

The Autofeather system will feather the propeller blades if the throttle is set to produce more than 13500 RPM and the torque pressure is less 50 psi. If the system operates it MUST be followed by completion of the Manual Feathering Drill, i.e.

1. HP Cock...TO FEATHER
2. Throttle...CLOSE

Flame Out

If propeller has not autofeathered:

1. Throttle…………………………………………………. CLOSE
2. Ignition……………………………………ON (15 min MAX)
3. Booster Pumps……………………………….. …..ALL ON
4. Throttle……………………………………………….OPEN
5. Ignition…………………………………………………....OFF
6. Anti Icing………………………………….AS REQUIRED

Unfeathering and Relighting

1. Flaps..UP
2. Fuel Trimmer.. 50% MIN
3. Throttle ....CLOSE
4. Ignition Switch...ON
5. HP Cock...OPEN
6. Feathering Button...............................PRESS UNTIL LIGHT OUT
7. Throttle...................................OPEN SLOWLY UNTIL RPM RISES
8. TGT...CHECK
9. Ignition Switch...OFF
10. Throttle..OPEN TO MATCH OTHER
11. Fuel Trimmer...SET

Ice Ingestion

1. Ignition……………..….ON, UNAFFECTED ENGINE (15 min MAX)

If Propeller has not autofeathered………………..FLAMEOUT DRILL
Otherwise……………………………………….……..RELIGHT DRILL

Late Anti Icing Selection

1. Ignition………………………………….…….ALL ON, (15 Min MAX)
2. PUDS……………………………………………………..…PORT ON

If Engines run normally for 3 minutes:

3. PUDS……………………………………………………..…...STBD ON
4. Ignition……………………….......... OFF AFTER A FURTHER 6 Min

Fuel Starvation

Fuel Filter and/or Low Pressure lamps on:

1. Fuel Heaters…………………………………...……..ALL ON
2. Booster Pumps ……………………………….......ALL ON
3. LE Deicing……………………………….…ON (+10' & BELOW)
4. RPM………………………….…..MAX CONTINUOUS IF POSS
5. Fuel Contents………………………………….....….CHECK

The information contained in this manual is based on Fokker F.27 data, and is for Flight Simulation use only and should not be considered for use with the real aircraft.

Fraser A. McKay, May 2011.