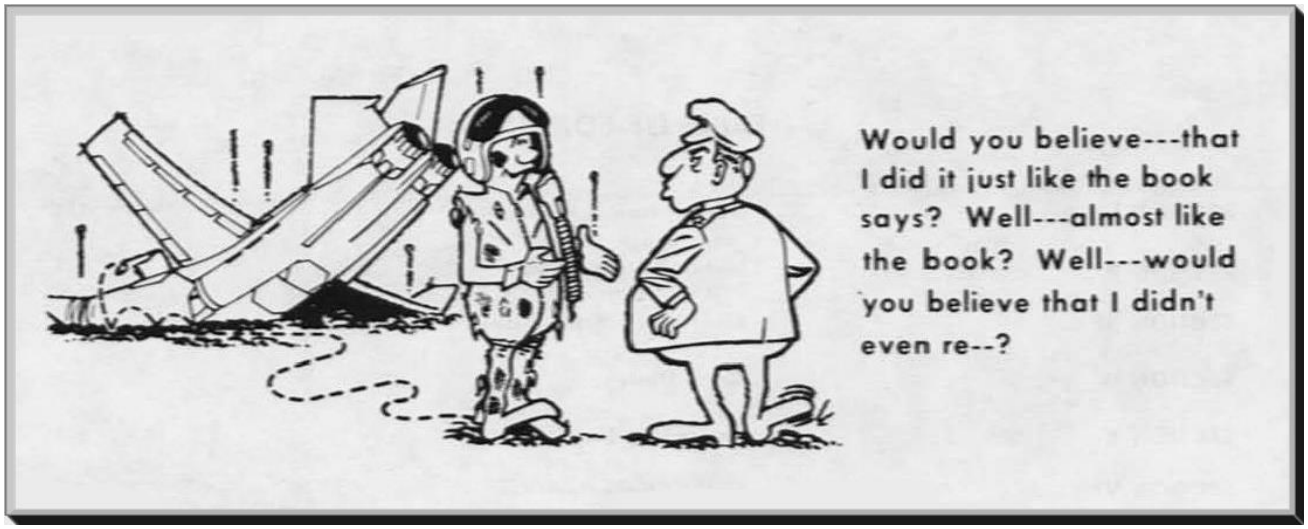
F-111

FLIGHT MANUAL

MODIFIED F-111 INSTRUMENT PANEL

EFFECTIVE : 08 August 2013



This manual is provided as a reference document.

The F-111 is in all probability as easy to fly in the flight simulator as a general aviation aircraft such as the Cessna , however the F-111 Pig HUD panel configuration , and it's instrumentation give the aircraft incredible capabilities , and in doing so necessitate a detailed functional description.
This document not only describes the instruments , their functions , and operation , it also covers unique functions and applications that were discovered during development , and testing , this information is scattered throughout the following pages.
It is provided to enable the pilot to maximise the considerable capabilities that it contains.
A sincere effort has been made to address all operators be they novices or seasoned professional military aviators.

F-111 MANUAL APPLICABLE TO FSX VERSION ONLY

SUBJECT: Modern digital instrument panel.

AIRCRAFT: ALPHASIM F-111.

OBJECTIVES: (A) SITUATIONAL AWARENESS

(B) FULL IFR CAPABILITY

(C) EXTENSIVE NAVIGATIONAL CAPABILITIES

(D) MAXIMUM EXTERNAL VIEWS

GENERAL: The ALPHASIM F-111 has exceptional flight and control characteristics, with an abundance of thrust and outstanding maneuverability. In a properly trimmed state (emphasis here on "Trimmed") there is very little that cannot be done when flying it

That being said, the external view from the cockpit is somewhat limited by the canopy frame . When flying nap of the earth, at tree top heights through winding valleys in mountainous terrain a better external view is required . Additionally, after following torturous valleys in the mountains the pilot becomes hopelessly confused as to the exact current geographical location.

This panel was developed to address these and other issues and to provide the pilot with more information, and to have that information on one panel without the need or , somewhat limiting the need for pop up windows.

This panel is fictitious and does not represent, nor try to represent a real world panel . It is however configured to maximize the aircraft's capabilities and those of the pilot. It enables precise flying in zero visibility, as well as on landing approaches. Low flying, be it at tree top level or lower can be undertaken with crisp precision and confidence. The difficult task of 'Carrier Landings' is made slightly easier through the reduction of the pilots scan in the critical final approach . An emphasis has been made on the provision of considerable navigation aids and data , all tied together with the centrally located unified autopilot, which is positioned in prime visual real estate to enhance control duties during both navigational and TFR exercises , enabling a heads up external visual scan while using the autopilot .

The provision of data to the pilot both in critical phases and normal operations is greatly enhanced by :-

(A) The Scott Prinz HUD , an absolutely brilliant instrument .
(B) Three DATA MFDs.
(C) Nearest airport listing .
(D) Ground Mapping and Air to Air Intercept Radar complete with scrollable Flight Plan listing .
(E) Integrated Mission Adaptive Flight Plan Editor .

Sufficient navigational information is provided by these instruments to guarantee that the pilot is constantly aware of his exact location at all times , be it by Latitude and Longitude or by visual map reference . The progress of an active flight plan can be constantly monitored . In the 'Nearest Airport ' instrument , the pilot can nominate either the airport of departure or destination , or in fact any airport worldwide as a reference point and display the distance and bearing to that reference at all times in the HUD .

The Mission Adaptive Planner allows rapid creation of flight plans or modification of existing flight plans in a totally flexible and simple manner , enabling creation of diversions or alternates , airport ICAO or Latitude-Longitude in three formats can be entered as waypoints by the keyboard , additionally locations on the touch screen Radar can be entered as waypoints.

While this panel , hopefully provides enjoyable fun flying it does have a serious capacity and capability . Its instrumentation and precise handling invite the pilot to strive towards a higher standard of flying , be it in IFR or navigation exercises .

A rudimentary Virtual panel exists , with most of the instruments just dropped on top of pre existing panel artwork/bitmap , as well as a navigator/ bombardier panel . The F-111 can be flown from all three panels .

This figure depicts an autopilot controlled ILS approach to landing at the middle marker , at a height of 198' . The aircraft is 'onspeed' as evidenced by both the AoA indexer and the HUD indexer relationship to the velocity vector . Note both the dive angle and the VSI in the HUD .The aircraft had nearly full tanks ,resulting in 144KIAS with 32,003 lbs of fuel .
Flown later at a lighter weight , it was 'onspeed' on the approach at 122KIAS with 4,707 lbs of fuel .

F-111 PIG HUD PROJECT

*** WARNING *** This manual covers the FSX version only .

CREDITS

ALPHASIM F-111 Aardvark ... ALPHASIM are now VIRTAVIA .

Scott Prinz The magnificent HUD - Head Up Display

Rob Barendregt Tailhook/Arm - Carrier Operation Package for Military Jets

Don Kuhn Superb WAAS

Glenn Copeland Timer & SALS etc , great gauges

Edi Hirsch Superb Nav-Info

Other unidentified / unknown authors , whose efforts are also deeply appreciated.

To members at FSDeveloper and AVSIM panel forums , a sincere thank you .

This panel created by :- Karol Chlebowski
Australia .
Who wishes to thank the RAAF and all its past and present members , with a special thank you for the magnificent flying displays which have afforded the public with a great deal of enjoyment and pride .

HIGHLY RECOMMENDED , but optional additional software.

1. The Weapons Package available freeware from Simviation.
   Conduct a Search for author ' Chris Sykes '. (Required for Ripple Switch operation)
2. Carriers 2006 , this does function in FSX and has ILS and radio NAVAIDS.
3. FSX Carrier Operation Package you can add to existing military aircraft in FSX, and enables you to perform takeoff and approach/landing on aircraft carriers of both the fixed and moving varieties. Available from (rcbco-30.zip from FlightSim.com) .This panels cfg already includes the relevant carrier gauge call up lines.
4. The superb freeware Jarvier FSX aircraft carrier.
5. The ORBX FTX commercial sceneries , it is absolutely superb and is ideal for low visual flight which is this aircrafts specialty. It really does make a drastic difference to the experience. Suggest check videos and screenshots at ORBX - FTX forums to make own evaluation.
6. For USAF training Flight plans the freeware series done by Bill McClellan are highly recommended.
7. For F-111 repaints go to , flightsim.com website , in search , type in (F-111 aardvark) , several pages of available downloads will appear .

TABLE OF CONTENTS

SECTION I
description & operation

SECTION II
normal procedures

SECTION I

description & operation -

A very crowded office , however it does provide the 'Driver' with an abundance of information pertinent to various phases of flight . It provides the pilot with choices to cover most missions ,but by the same token can be ignored when 'fun flying'.

The canopy frame has been purposefully reduced to a skeleton to enhance external vision, in the actual real world cockpit environment , head movements and spatially separated eyes together with the brains visual interpretation tends to mitigate obstructions to some degree.

This is a military aircraft , and accordingly has been fitted out with the following effects .

Bombs , Missiles , Flares , Dump and Burn , which are selectable , and has dual 3D Exhaust plumes lasting 15 seconds .

It is recommended that :

1. At a minimum a joystick and throttle combination be utilised and that as many as possible button assignments be activated . Specifically : incremental flaps , elevator trim , gear, airbrake , tailhook , pause ,etc .
2. There are countless hotspots ,switches and buttons on this panel , too numerous to cover adequately in this brief document , therefore it is suggested that tooltips be enabled in options and while the aircraft is sitting on the runway the panel be explored with the mouse and the hotspots and switches activated . This sort of exploratory exercise while informative will result in a 'messed up' configuration , just exit flight sim and restart it for a normal flight . It is purely to find and learn the switch behaviour .

1. HUD

This HUD is the work of Scott Prinz and is truly worthy of placement in quite a few other aircraft types, it has been slightly modified by the addition of :
(A) thrust % for two engines (B) Ground Speed . (C) Bank Angle (D) Dive angle .
As well as , on/off selectable data fields :-
(E) NEAREST : Selected Airport Data ,comprising –Distance –Bearing –Steering arrow .
(F) INTERCEPT : AI Data , comprising - Altitude - VSI - Groundspeed - Bearing - Distance - closing speed .
These parameters are useful in interception of AI aircraft when used in conjunction with the Radar .
They enhance military operations , navigation , and enable fully informed aircraft control in all available views when the HUD overlay is activated by Shift 5 .

Superlatives fail to adequately describe this HUD , it is a 'must have' item, it totally revolutionizes the aircraft, pilot , flying interaction. The Velocity Vector (7, below) accurately depicts where you are going to go. For example, hold it constantly on a branch of a tree and you will go through that branch . Not above or below , but through it .

This particular HUD has been purposefully calibrated with the horizon bar configured slightly below the actual horizon . The method used is :-
With 47 degree wing sweep , stabilize cruise speed at 350 and latter at 450kts at a low altitude of for example 100 ft above the sea , with a clear view of the horizon, place the Velocity Vector on the horizon with the horizon cutting the velocity vector circle in two , hit the pause button and observe the following :

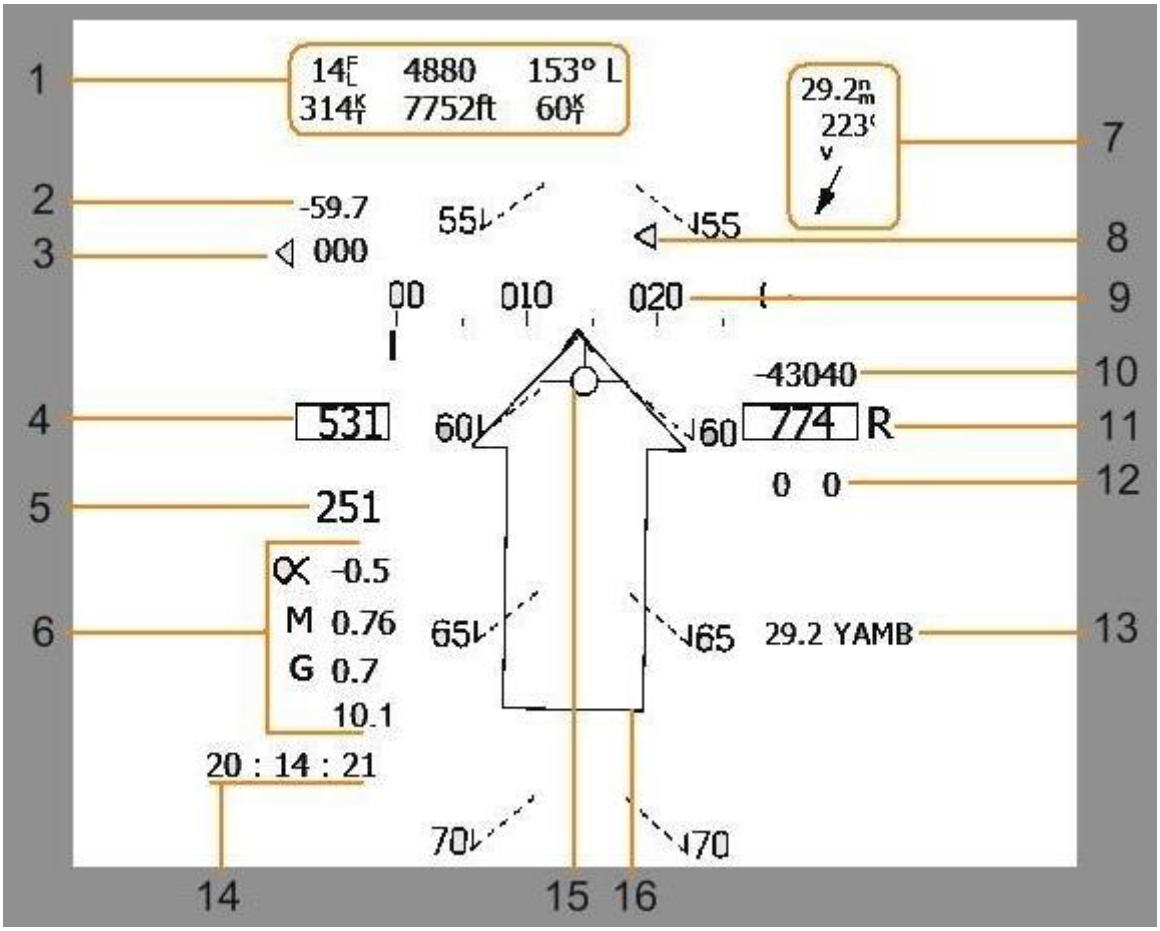
(A) Horizon bar of the pitch ladder is slightly below the actual horizon .
(B) Velocity Vector accurately on the horizon, ie: it's little wings on the horizon.
..naturally the velocity vector above the horizon bar is indicative of a slight climb
(C) What this panel set up is after , in the described scenario is:

350 kts……VSI 90 FPM
450 " …….. " 300 '
The REASON= this aircraft is extensively used at very low altitudes (20-100 ft AGL) at these altitudes placing the velocity vector on the ground ahead would result at speeds of around 400 kts rapidly converging with the ground . This set up overcomes that problem.
It should be noted that the velocity vector on the horizon bar remains accurate in this aircraft setup .

HUD FEATURES
1. Shift 5 : HUD overlay in 'all' views.
2. Shift 5 : In Virtual cockpit , provides helmet visor HUD following panning movement.
3. HUD : can be turned off by power on/off switch on HUD control head.
4. HUD : colour can be selected.
5. HUD : full control implementation , read Scott Prinz instructions included in 'Docs' folder.
6. HUD : in this panel is optimised to allow flight in region 10'-20' above ground at speeds of about 400kts.
7. HUD : added data to facilitate air intercepts , dive bombing dive angle , and aircraft carrier approaches . Also full control when in outside views .
8. HUD : provide directional reference or guidance with respect to any 'selected' airport .
9. HUD : facilitates airspeed/thrust management .
10. HUD : generally provides ground impact warning .
11. For air intercepts , outside view panned to the rear , then (SHIFT 5) together with (SHIFT 9) provide HUD and radar overlay with all data required for the task .
12. HUD : Selectable data fields for repeated Radar and Nearest instrument data are displayed in the HUD if nominated at the respective instrument .

CAUTION : The HUD can be selected "OFF" in 3 ways .
1. ON/OFF power switch in the HUD control head .
2. SHIFT 5 on keyboard or button assignment .
3. HUD colour (CLR in HUD control head) , cycling HUD colours -white-green-dark-**NIL** .

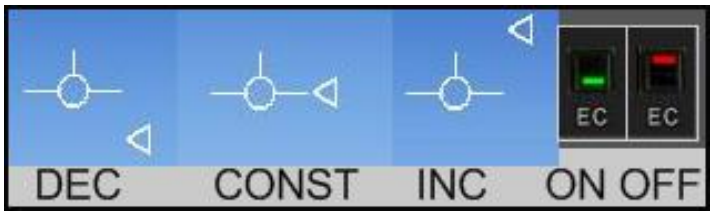
If the HUD is not displaying , check status of the above 3 items .



1. Radar target AI information box , Altitude-VSI-Groundspeed-Relative Bearing-Distance-Closing Speed .
2. Dive angle , reads 0.00 when autopilot in stabilized cruise , ideal for capture of 3 degree glideslope at airports that do not have ILS , or a 30 degree Dive bombing run in .
3. Bank angle , arrowhead indicates direction of bank , at bank angles greater than 45 degrees arrowhead turns red .
4. Indicated Airspeed
5. Groundspeed , ideal for intercepts and formation with AI utilizing AI groundspeed provided by the radar .
6. Alpha/angle of attack , Mach , Current G's , Highest G's .
7. Selected Airport information box , Distance-Bearing-Steering arrow , for Airport selected in LH MFD NRST , only displays if Runway Detail Data page is open , will display if MFD subsequently switched to any of PFD-NAV-FREQ-TGT functions . If 'APT' selected on NRST page it effectively acts as an off switch .
8. Energy Caret , aids in setting precise airspeed.
9. Heading tape .
10. VSI , Vertical speed in FPM .
11. Altitude normally barometric , but radar altitude if selected .
12. Thrust percentage for 2 engines .
13. NAVAID - Next Waypoint information box .
14. Clock with stopwatch functions
15. Velocity Vector .
16. Pull up warning arrow , indicates pull up direction .

When flying in formation with AI aircraft. (A) Ensure the HUD Ground Speed equals the AI aircraft Ground Speed as indicated on the Radar. (B) Use very small throttle movements as indicated by the HUD Thrust display to maintain the required Ground Speed. (C) Keep the Velocity Vector Centred on Horizon Bar with 'extremely small' pitch inputs. (D) As (C) is difficult to achieve , especially if abeam the AI aircraft , try the autopilot with only 'Altitude Hold' selected and altitude same as AI . Of course it only works if AI is in level cruise .

2. HUD PRECISION AIRSPEED



The 'Energy caret' in the HUD has been altered to be visible by default .
Considering the mission of the F-111 in the strike role , precise airspeed management is an essential ingredient .
1. If the triangular energy caret is maintained exactly next to the small wings of the velocity vector the ASI will remain constant .
2. Energy caret above velocity vector , ASI increasing .
3. Energy caret below velocity vector , ASI decreasing .
It is apparent that both climb or dive will effect this relationship .
To maintain a fixed and constant ASI , either increase or decrease throttle setting .
Additionally wing sweep angle affects increases or decreases in drag and hence can also be utilised , as can airbrake for more drastic ASI reductions .
The Energy caret can be turned ON/OFF in the HUD control head .

3. HUD CONTROL HEAD PANEL

1. Switch to select (2 below) .
2. Enables setting ….course /heading …. Will appear on ADI , Autopilot
3. HUD clock…….Greenwich/UTC or local …..stopwatch
4. HUD ON / OFF
5. HUD presentation / visual display attributes :-
Top L to R
…REJ unclutters HUD
….LDDR unclutters HUD
….**CLR Selects HUD print colour fluro green , dark green , white , NIL**
Bot. L to R
….EC Energy Caret on / off
….ILS crosshair bars on / off
….**ALT enables selection of '*Radio Altitude' or 'Barometric'**
*** the 'Radio Altitude' should be selected as the primary operating mode in this F-111**
6. Enables selection of either as navigational guidance basis for the autopilot

4. AUTOPILOT & MISC

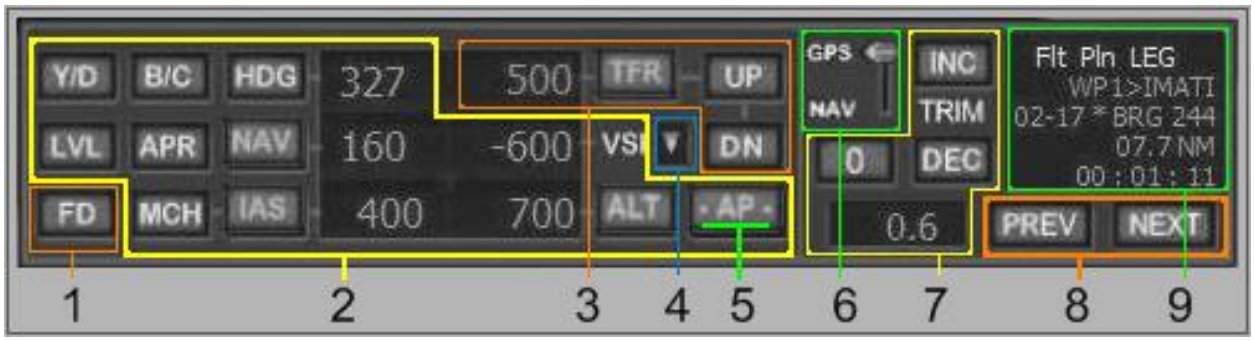
1. Autopilot ON warning light .
2. Eyebrow Warning Lights .
3. Autopilot - Unified Control Unit .
4. TFR Indicator Light .
5. Digital Radio Altitude functions as a ground proximity warning by progressively changing from green to yellow to red at preset AGL settings (red 0-200, yellow 200-500, green 500+) or (yellow 0-250 .green 500+)
6. Afterburner indicator , red when engaged .
7. Stall warning light , also On /Off switch for Approach and Landing ' V ' Display.

5. AUTOPILOT - UNIFIED CONTROL UNIT

As can be seen this is several instruments rolled into one to form a one stop shop specific to the automated control requirements of this F-111 .

Effectively the aircraft can be controlled and flown from here and being high on the panel it allows external vision while doing so .

It is optimised for use in conjunction with the TFR function , an ideal arrangement .



1. Flight Director On/Off . Flight Director indicated by cerise coloured bars in LH MFD - PFD .
2. Autopilot , active hold buttons highlighted in green , parameter values are adjusted in the near central window , mouse clicks change the relevant autopilot settings .

NOTE : " ALT " window settings are :-
- Left click = decrease by 100' .
- Right click = increase by 100' .
- Mouse Wheel Up/Down = increase/decrease by 1,000' .

3. TFR - Terrain Following Radar , On/ Off switch , and Up/Down in 100' increments , and display window .

The numerical figure set in the autopilot "ALT" window becomes the TFR AGL command height when the TFR button is switched on , also the TFR command height is displayed on the LH MFD PFD , the reason being that the current ground elevation is added to the TFR command height and that figure is subsequently displayed in the autopilot ALT window , however the TFR window and PFD will continue to display the actual TFR . Confusing to describe , but try it and see .

TFR - CP RESET USEAGE NOTES

This allows the TFR height AGL to be varied on the go while both the Autopilot and TFR remain engaged and on.

* Current TFR Clearance Plane setting display.
* TFR On/Off button
* UP TFR-CP increase button.
* DN TFR-CP decrease button.

- CP = Clearance Plane = The set height in feet that the TFR (Terrain Following Radar) will attempt to keep the aircraft AGL (Above Ground Level).

The CP is sometimes referred to as SCP (Set Clearance Plane).

The TFR useage comprises :

a. Initially set the desired TFR CP in the 'Altitude window' of the autopilot.
b. Switch On the autopilot 'AP' .
c. Switch On 'ALT' hold.
d. Switch On the TFR at the "TFR" button , the SCP figure will then appear in the TFR window.
e. There after alter the SCP to that desired using the above TFR CP RESET ('UP' or 'DN') as often as is deemed necessary.
f. Remember that the Elevator trim instrument can be used to loft over larger obstacles using the procedures described at page 67 of the Flight Manual.

4. Climb - Dive indicator , can be switched On/Off .
5. Autopilot ON/OFF master switch , can be utilised as Auto Trim.
6. NAV / GPS mode switch , sets autopilot operation basis . (GPS=Flt Pln and NAV=ILS Appr.)
7. **Elevator trim position switches and display** . A click on the '0' , returns elevator Trim to neutral (0.0) with one click . The trim can changed on the instrument , but it is recommended that a button be assigned on the joystick.
This is an incredibly important instrument , and its use is essential to your enjoyment of the flight experience .
8. PREV - NEXT buttons , enables current Active leg of Flight Plan to be altered incrementally .
9. Mini MFD text display , click on screen to scroll through 4 pages, -Active leg, -Speeds, -Winds , -the forth page is dependent on radio NAVAID's being tuned and within radio reception range, and, -blank .

***AUTOTRIM . Elevator trim can be rapidly set automatically for the current flight condition .**
Switch the 'Autopilot Master Switch' (5 above) ON , it will light up , as will LVL (wings level) .
Switch Autopilot Master Switch OFF , the trim will now have been set for you by the autopilot .
Works best for level flight and up to 30 degrees of climb or dive .
Will only work if Flight Director bars are OFF in LH MFD-PFD , the 'FD' is On/Off button .

NOTE 1: Watching military aircraft turning it rapidly becomes obvious that the Bank Angles are vastly steeper than those of airliners . For this reason and to keep the turning circle size to a smaller distance figure at the higher airspeeds the maximum bank angle in the autopilot section of the Aircraft cfg has been changed to 60 degrees instead of the usual 25 degrees. * A bank of 60 degrees at 400KIAS is a Rate 1 turn . *
Note also that the bank angle direction arrows on the HUD turn red at a bank greater than 45 degrees.
NOTE 2: In the autopilot HDG and IAS increases or decreases occur gently and gradually as the parameters nominated in the respective window are approached , that is fine for the sensitivities of fare paying passengers on airliners . However in military applications occasionally a very rapid change of HDG or IAS is required , to expedite the **rate of change** set a figure well above or below that required , then as the required figure is reached quickly set the window back to the required figure . This expedites the rate of change . This is particularly useful in TFR HDG changes to avoid a mountain and in IAS approach to land speed reductions .
NOTE 3: The Flight Simulation autopilot speed capture function or performance is woeful , and is probably worse in FSX . If conducting **autopilot coupled** ILS approach and landing set the approach speed at about 7 NM out and deploy the airbrake . (OR) If no airbrake used , set IAS hold 10 kts higher than approach speed , and when that speed is achieved , quickly set the actual approach speed .

6. ACTIVE LEG CONTROL UNITS

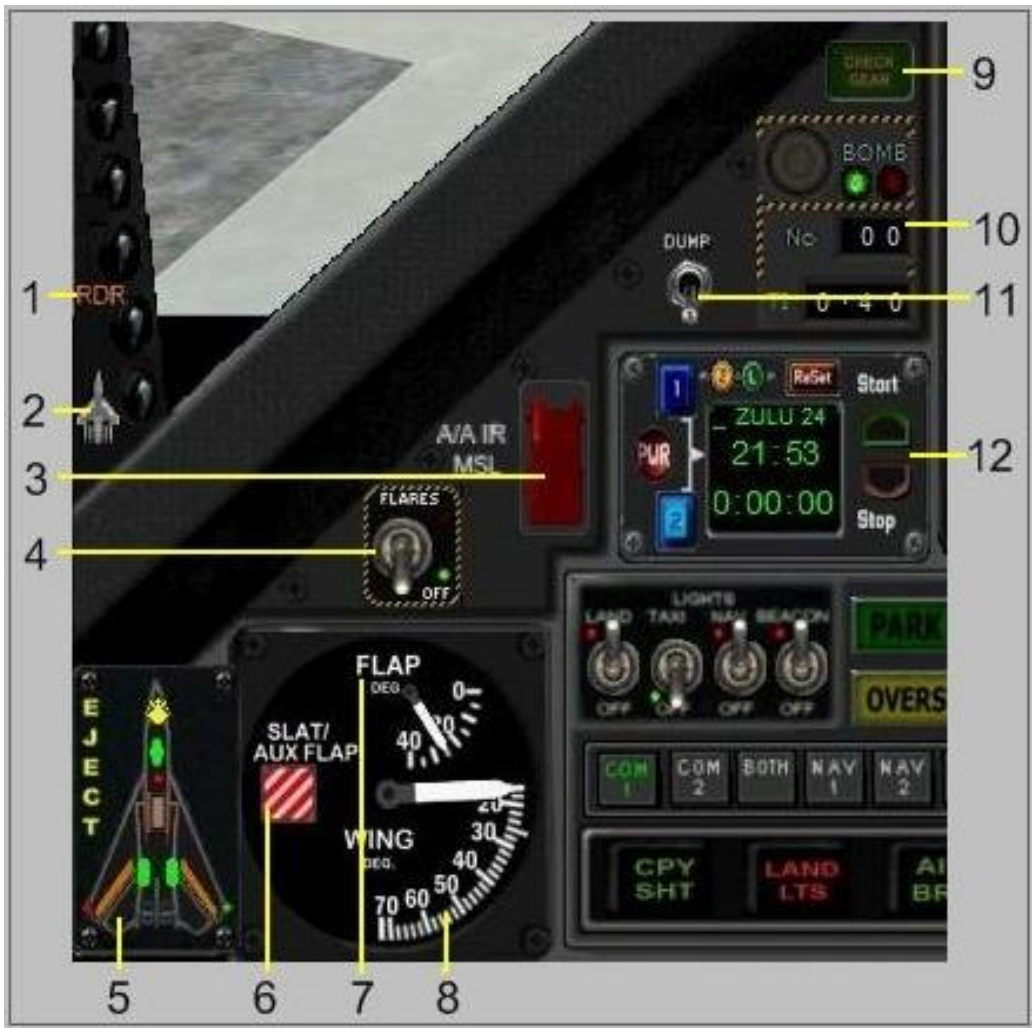
1. The 'PREV' 'NEXT' buttons change the current Active leg SEQ number up or down by one number per click.
2. The square "SEQ" active leg unit located bottom centre of the panel can be set to any SEQ number at the thumbwheel , the thumbwheel SEQ is entered at the button next to it.
Thumbwheel Tens and units Digits are set by Left , Right or wheel , mouse function .
Possible uses are : - To set the autopilot Flight plan active to a preferred waypoint .
- to set a Mode 6 Radar view . - To return to a earlier waypoint .
- To make adjustments following use of the Flight Plan Editor . - Or just to have fun .
- The main function is to provide the pilot with options and flexability .

7. EYEBROW WARNING LIGHTS

1. G's warning.
2. Lo Alt warning.
3. Catapult Engage advisory.
4. Airbrake deployed warning.
5. Gear Alert warning.

1. Warns when the G's being pulled reach following parameters.
-orange cautionary light between 5.7 and 7.32 G's.
-red danger light when 7.33 G's or greater , structural limitation.
-purple light when negative 2 G's or greater, negative G avoidance.
2. The "Lo Alt warning" is basically a low impact advisory , as follows:
-red light at 200' AGL and less.
-orange light between 200' and 500' AGL.
-fluro green between 500' and 1,000' AGL.
- dark green when 1,000' AGL or greater, default colour shown above.
3. The Catapult engage is an advisory , it flares and flashes red when the aircraft is in the catapult zone to advise pilot to stop taxying or risk exiting the small catapult zone.
This particular light is only functional on fixed aircraft carriers such as carriers 2006 and must have rcbco -30 installed together with the relevant INI which contains the carrier engage zone co ordinates.
4. The airbrake out/in , flashes a red warning when the airbrake is deployed.
5. The Gear Alert flashes red at differing pulse rates to indicate either of two critical conditions exist:
a. approaching to land , 'gear not lowered', at airspeed 160 kts or less and altitude 500' AGL or less.
b. in flight , 'gear not retracted' , at airspeed 295 kts or greater , exceeding structural limitations..

8. LEFT CORNER PANEL



1. Click icon Radar Display .
2. Click icons , initiates pop up overlay Comprising – (A) throttle –fuel tank gauges – and switches>Bat , Gen , Avionics , Fuel , Start .
3. Missile launch switch (assign pitot heat to joystick button)
4. Flares switch , flashes red when flares are being dispensed (assign lights/strobe to throttle button)
5. Aircraft configuration display , includes the following:
   - Landing lights
   - Landing gear position
   - Rotating beacon
   - Bombay / Pave tack
   - Airbrake
   - Navigation lights
   - Flaps / Slats
   - Tailhook
6. Slat/Aux Flap flag . L.E. slats indicator , turns red barred
7. Flaps/Slats…. 3clicks , L.E. slats , then 25 and 34 degrees flaps}
8. Wing sweep……5 clicks , 72-58-47-38-26-16 degree sweep } total 8 clicks
9. Gear position warning / Reminder
10. Bomb Ripple release switch , programmable , Weapons Package reliant .
11. Dump and burn switch
12. Multi function timer/clock , 2 x stopwatches

9. PROGRAMMABLE RIPPLE BOMB RELEASE SWITCH

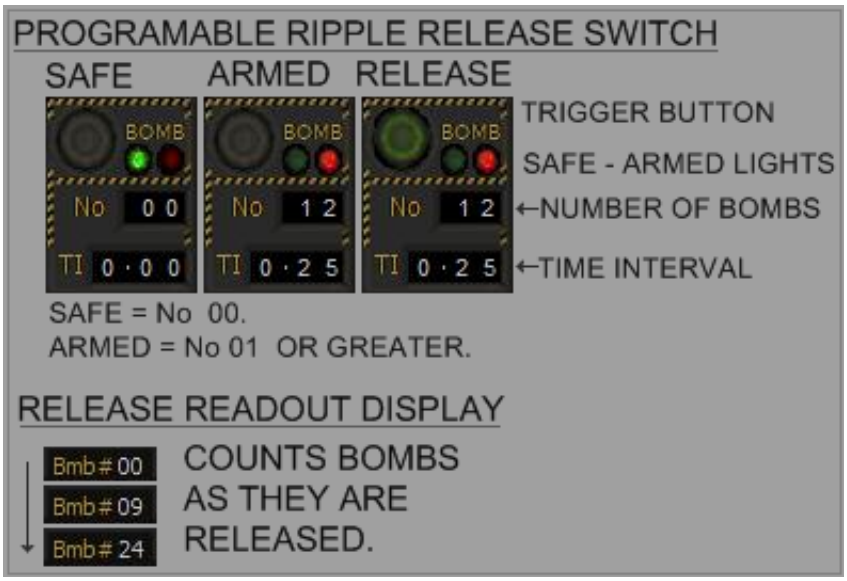
** " Enables multiple bombs to be dropped at a SINGLE click ". **

This switch enables the user to set both the number of bombs , and the time interval between each of those bombs.
That set number of bombs is then released at a single click of either the button on the switch , or a button on a controller assigned to **ROTOR_BRAKE** .

To observe Bombs release , drop and ground impact explosions while in a cockpit view open the Pave Tack instrument , and use the "Bmb" instant reset button .

** IMPORTANT PRE CONDITION **

This switch requires that the Freeware " Weapons Package " By Chris Sykes available from Simviation be downloaded and installed in FSX.
A saved flight must be created with the applicable weapon/bomb entry made as per instructions contained in the Weapons Package.



Firstly set both the "No" (number of bombs) and the "TI" (time interval-seconds).
Setting is by Left or Right mouse click OR mouse Wheel Up or Wheel Down.
(1) . " No " has 2 setting hotspots enabling 00 to 99 to be set.
(2) . " TI " has 3 setting hotspots enabling 0.00 to 9.99 (seconds) to be set.

If the " No " setting is 00 then the " SAFE " green light is on and no bombs can be dropped.
If the "No " is set from 01 to 99 then the " ARMED " red light is on.

With both "No" and "TI" set , the bomb ripple is initiated by a single click of either :
1. The round button on the switch instrument , which will light up momentarily.
OR
2. **Assign ROTOR_BRAKE to a Controller button** , this is the better option for two reasons , (A) the assigned button can be used in all views , including external views , (B) it enables a HOTAS (Hands On Throttle And Stick) concept which is now being incorporated in most modern military aircraft , as it allows the pilot to keep both hands on the controls during this busy phase of the flight.

Examples.
"No 12 - TI 0.01" = concentrated drop zone.

While
"No 24 - TI 0.50" = strung out drop pattern, it will take 12 seconds for all 24 bombs to drop from your aircraft . All from a Single click.

To reset the Readout Display following a prior drop , change the "No" window to 00 , then click the round trigger button , the Readout will then be 00 , no bombs can drop as the switch is in ' Safe ' mode.

TIME INTERVAL vs GROUND IMPACT SEPARATION

For information , a table of horizontal bomb spacing in feet for several Time Intervals (seconds) versus 3 different Groundspeeds.

Distance interval chart .

Ripple Bomb Release
Ground impact separation in feet
for Time Interval vs Groundspeed
Level flight only

Interval (sec)	Speed (GS) kts 300kt	400kt	500kt
0.1	51	68	84
0.2	101	135	169
0.3	152	203	253
0.4	203	270	338
0.5	253	338	422
0.6	304	405	506
0.7	354	473	591
0.8	405	540	675
0.9	456	608	760
1.0	506	675	844

WEAPONS PACKAGE INDEX - PDF

This PDF is specifically in a " Copy Allowed " format .
The user can Highlight any weapon ID code , and Copy , then go to a "Saved Flight" open the " FLT file " document and , Paste in a new weapon preference , all weapons can be used with the Ripple switch , and weapon changes can be made as often as desired.

The images within the PDF aid in identifying the various weapons , and it is recommended that the PDF be retained for future reference purposes.

10. LOWER LEFT PANEL

1. Light switches ….landing , taxi , navigation , strobe , ..green=off , red= on . Strobe is actually beacon . **NOTE :** If 'Landing Lights' fail to operate , try cycling 'Clear Vue' button ending with it off . Then operate Landing Lights .
2. Audio panel
3. Switches / indicator lights for nominated functions
4. Park brake switch / indicator
5. Overspeed indicator
6. OAT ambient temperature (C or F) , and Temperature friction heating of aircraft skin (C or F) .
7. Clear Vue switch , In FSX is Stealth button , hit it and observe outside views , and switch OFF .
8 . Pave Tack Display window On/Off icon .
9. Turn rate , enables a constant rate to be held for precise IFR work (rate 1)
10. AI Hunter Display window On/Off icon .
11. Total accumulated engine time . OR in this simulator , pilots hours on this particular aircraft/panel combination . From memory 90 hours to qualify on the F-111 , prior to commencement of combat qualification training flying hours which would be a variable figure and subject to ongoing training and exercises . Basically this emphasises that taking this aircraft out for a half hour fling does little to advance proficiency , it demands hours of varied exercises .
12. Illuminated Button Sets Flight Plan leg SEQ number dialled into thumbwheel to active .
13. Display of current active leg SEQ number , and total number of flight plan legs .
14. Thumbwheel to set or dial SEQ number , left, right click and mouse wheel .
15. Bank Angle ….handy to set a constant precise bank and keep it there .

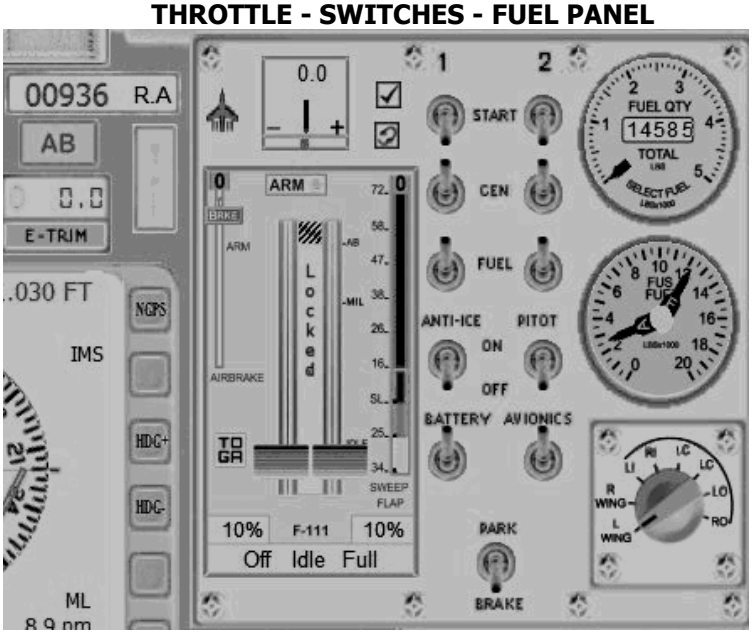
11. APPROACH AND LANDING 'V' DISPLAY

A transparent fixed pop up instrument has been added , it appears over the WAAS screen , it is an Approach and Landing guide presenting recommended Approach and Touchdown speeds for various aircraft/fuel weights , at the bottom of the chart is the constantly updated aircraft and fuel weights .

This pop up is activated ON/OFF by clicking on the Stall warning light , which is appropriate , as insufficient airspeed in this critical flight regime would result in a STALL at a very low altitude .
Its transparent background enables the WAAS or Radar to still be seen .

GENERAL NOTE
The area occupied by the WAAS instrument in the 2D cockpit has been utilised as a convenient location to display several Pop Up instruments .
They are:-
- Radar Display
- Throttle panel
- Approach and Landing speed display
- Clipboard

THROTTLE - SWITCHES - FUEL PANEL



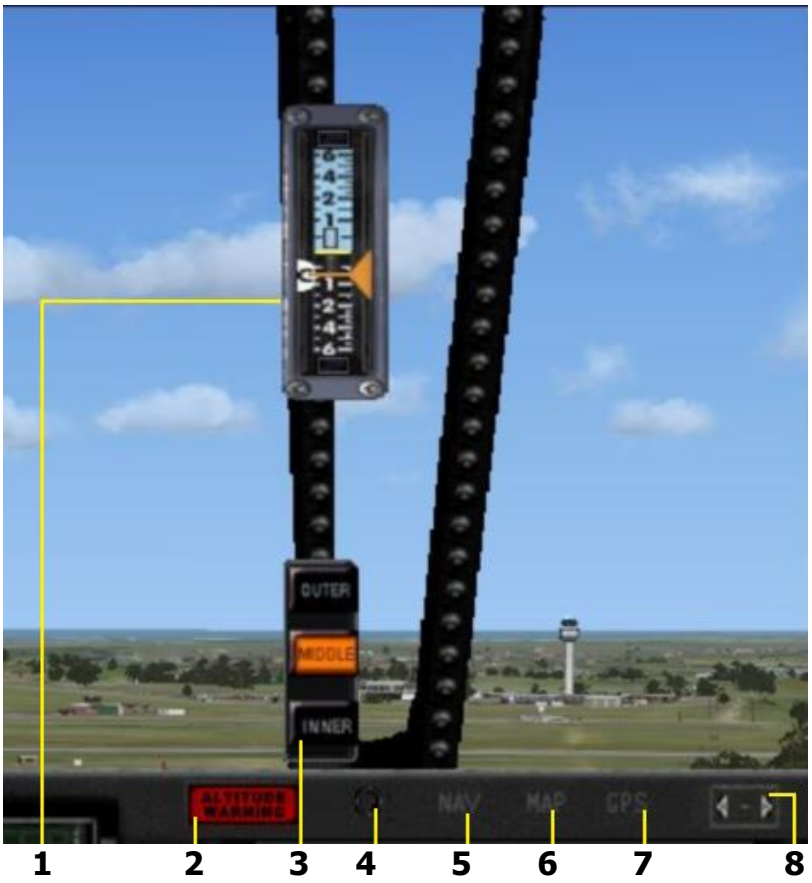
12. LOWER RIGHT PANEL

1. SALS, (Satellite Assisted Landing System) is a GPS ILS like approach to all airports , including those that do not have an ILS facility .
Select your Airport , then select you runway , then conduct a ILS style approach.
"P" - Power on button.
"DOWNARROW" - Scrolls selection cursor text line.
"ENTER" - Activates selected line , and advances to next screen display.
"C" - Is clear button.
The Approach screen has 3 vertical lines of differing sensativity , when all align you are laterally in line with the runway centre line.
The right hand on screen moving arrow indicates on glideslope when in depicted centre zone.
A digital glideslope angle readout enables the correct angle to be maintained till touchdown.
It also lists eight nearest airports with ICAO code … in conjunction with reference to , Data pages in two MFD instruments and the Radar map fixes the current geographic location of the aircraft .
2. Fuel … percentage remaining , weight remaining , fuel flow rate , in lbs or gal .

DATA MFD , Navigation and general DATA MFD:-

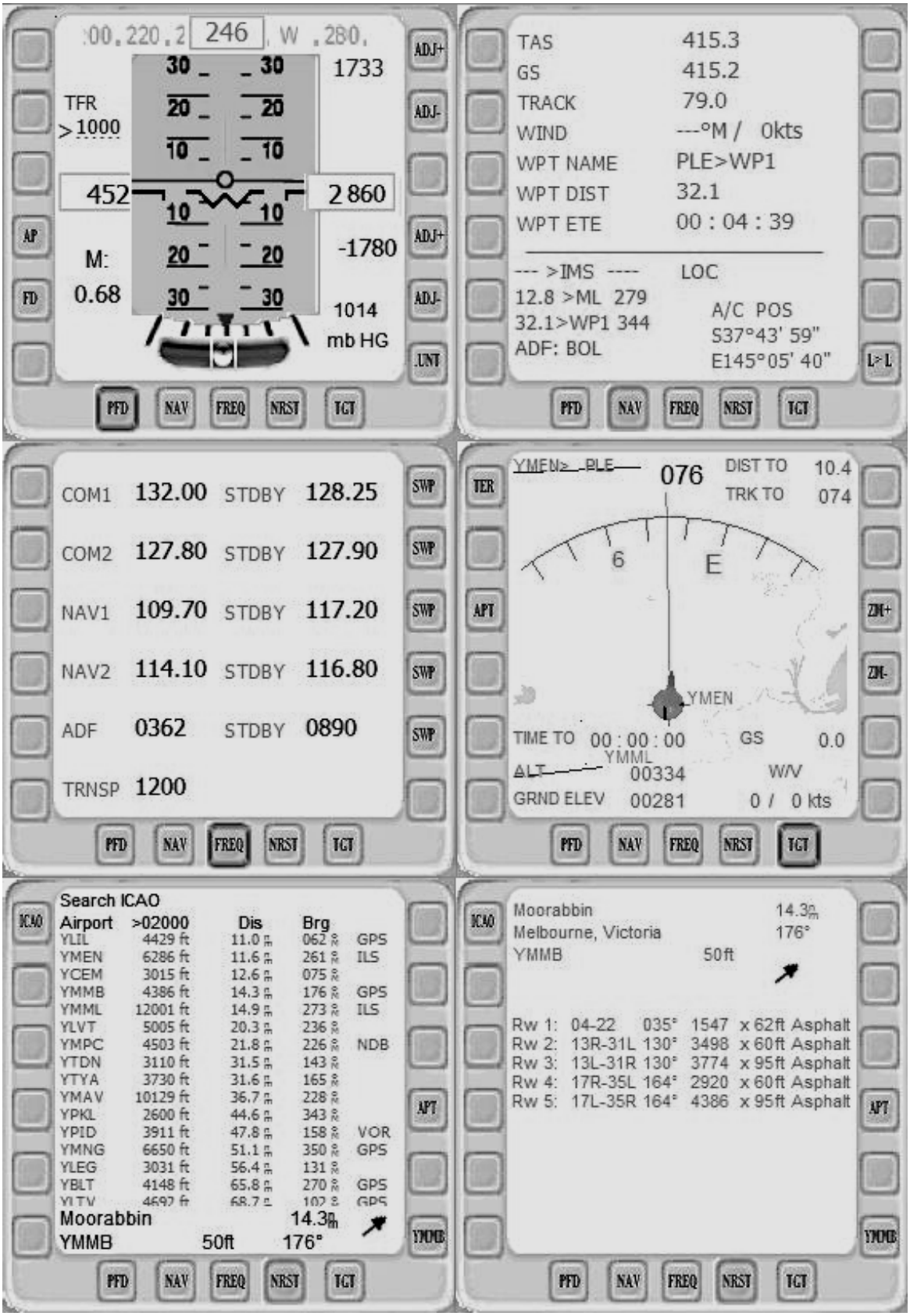
3. Click zone to change format of next Wpt Lat/Long .
4. NAV..speeds , current location , and waypoint , Click change format Present Pos'n Lat/Long.
5. WPT LEGS.. Flight plan waypoint page , plus Leg selection , Lat/Long in 3 formats.
6. Engine data .
7. Control surface and trim positions
8. Attitude …AoA , pitch , dive angle .
9. Electrical loads .
10. Target data .
11. Magnetic Variation ... Current aircraft weight and fuel .

13. CENTRE CANOPY FRAME



1. VSI gauge
2. Low altitude warning , turns red at 1,000' AGL .
3. OMI marker lights , has a great orange middle marker !
4. Click zone for pop up Clipboard listing of ICAO .
5. Click zone for pop up NAV information screen ..comms and NAVAID frequency etc….airport information …..can auto set frequencies
6. Click zone for pop up GPS like map
7. Click zone for pop up GPS 500
8. Click zone to swap from left hand pilot panel to right hand navigator / bombardier panel

14. LEFT HAND MFD



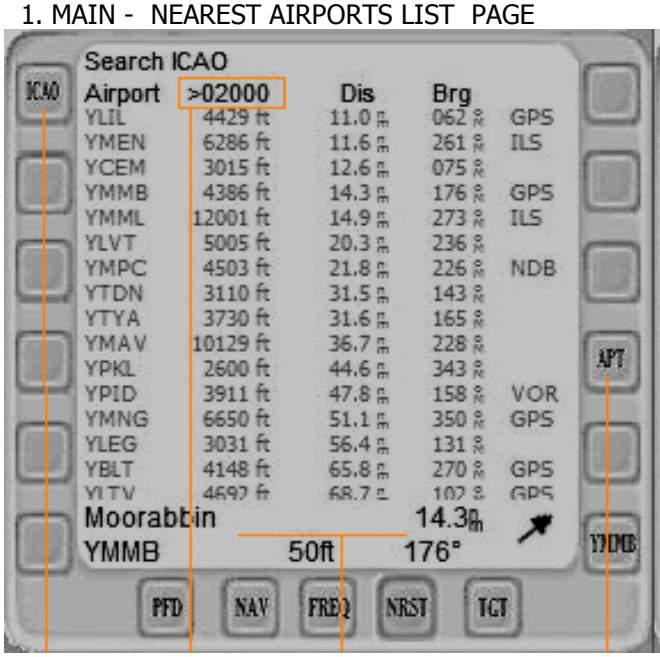
The operation of the MFD is more or less self explanatory.

- Bottom row of buttons select a instrument to be displayed on the MFD screen.
- Left and right buttons change various functions within the selected instrument.
- NAV page , aircraft Lat/Long now available in 3 formats, click LL .

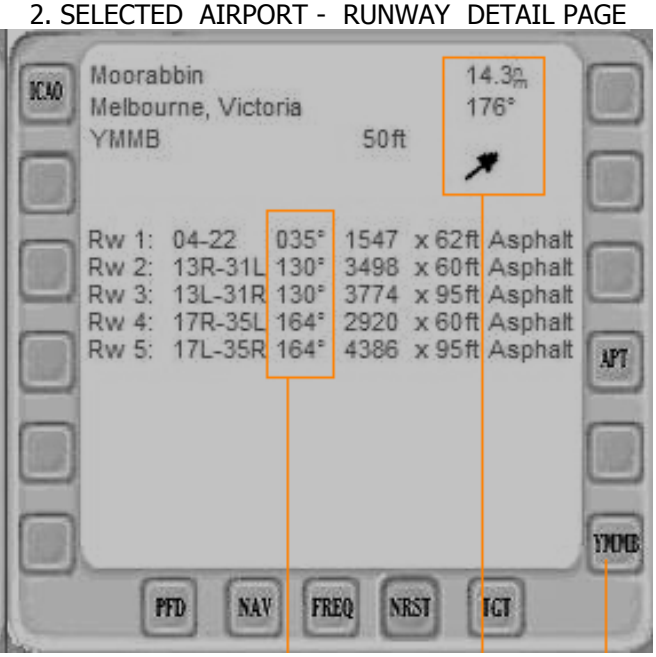
15. NEAREST AIRPORTS

This is accessed on the LH MFD , but ONLY in the 2D pilots panel , by a mouse click on the NRST button .
Although it displays the 16 Airports nearest to the aircraft any Airport in the world can be called up by entering its ICAO code , using the "ICAO" button search and keyboard entry facility.
The orange boxed information can repeated and displayed on the HUD in all views .
There are actually two pages associated with NRST and they can be toggled.
The beauty of this instrument is that **it displays the full City/Town name** of the selected Airport .

1. MAIN - NEAREST AIRPORTS LIST PAGE



2. SELECTED AIRPORT - RUNWAY DETAIL PAGE

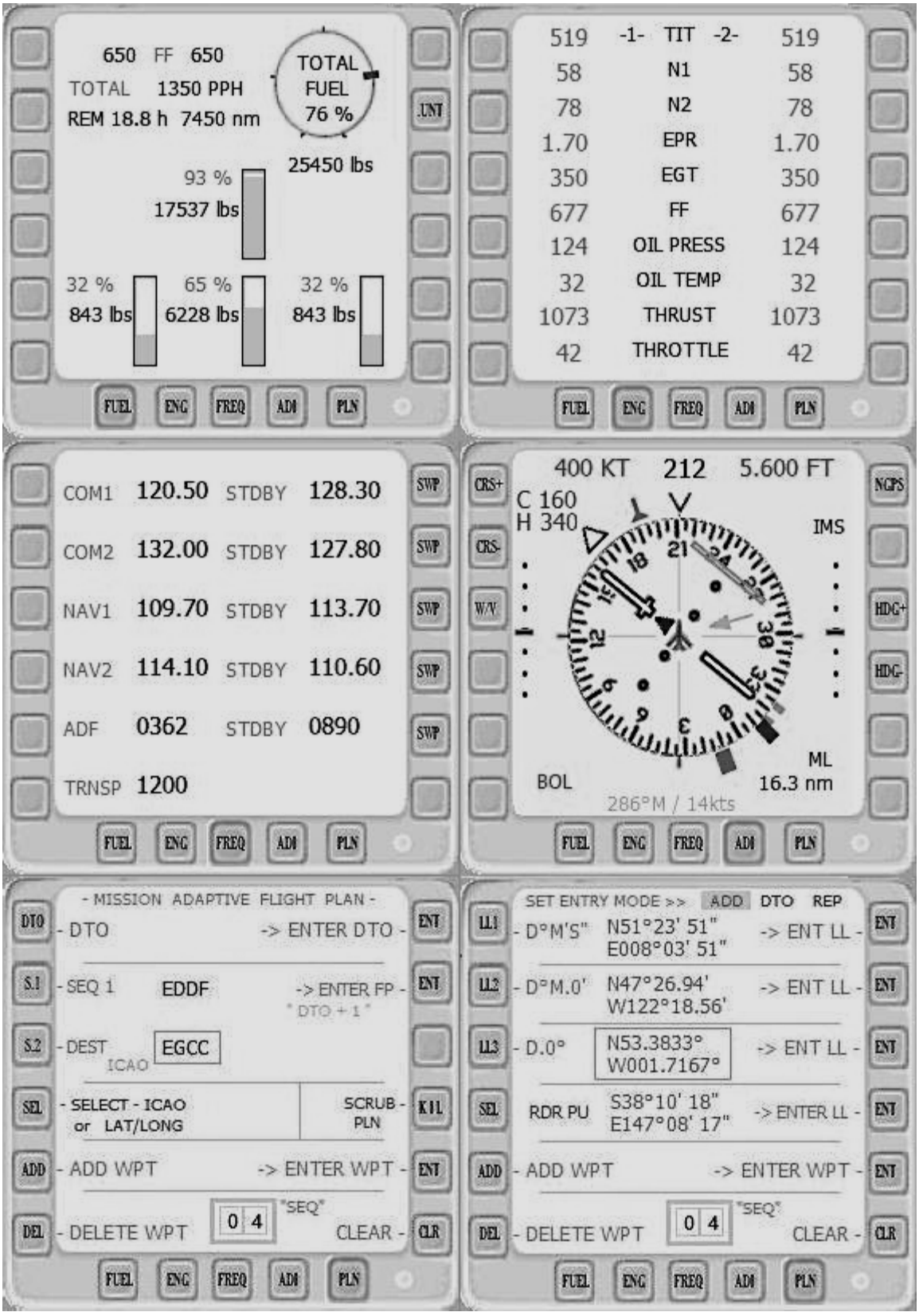


1 2 3 4 5 6 7

1. ICAO Button , a mouse click brings up "Enter ICAO ….." OR Abort search .
On selecting "Enter ICAO" the 4 digit ICAO code is typed using the keyboard .
Bingo….the nominated Airport appears on the MFD screen .
2. Clicking on '>2000' title increases or decreases the basic runway length . By clicking on the '+' end several times the listing extends a further distance up to 250NM , but only for Airports of the nominated length or greater ,still it's a handy feature .
For each of the 16 Airports listed it is possible to select one by clicking on the beginning of the relevant line. It will then be displayed in detail .
3. The area at the bottom of the page below the listings displays detail of the selected Airport .
4. The 'APT' button and the button two down from it are used to toggle between the two pages shown above .
5. Precise runway heading , for use with ILS and approach vectoring .
6. The orange boxed information shown on the 'Airport Runway detail data' page is repeated and displayed on the HUD BUT ONLY when the second page is active . IE: leave the Runway Detail PAGE open OR with that page open click to one of PFD-NAV-FREQ-TGT , the repeated data will remain visible in the HUD .
To remove the display from the HUD make the first page , the listing page active . Basically toggling between page 1 and 2 of 'NRST' acts as an ON / OFF switch for the HUD data field .
7. When an Airport is selected this button changes from ---- to the ICAO selected .
** To select another airport , return to 'Main - Nearest Airports Page' by depressing the button at '4' above . Then , click on any line , or depress button at '1' above to obtain "Enter ICAO" , type desired ICAO in using the keyboard , the desired airport will now be displayed , if runway details are required and / or data display is desired in the HUD ,depress button at '7' above .

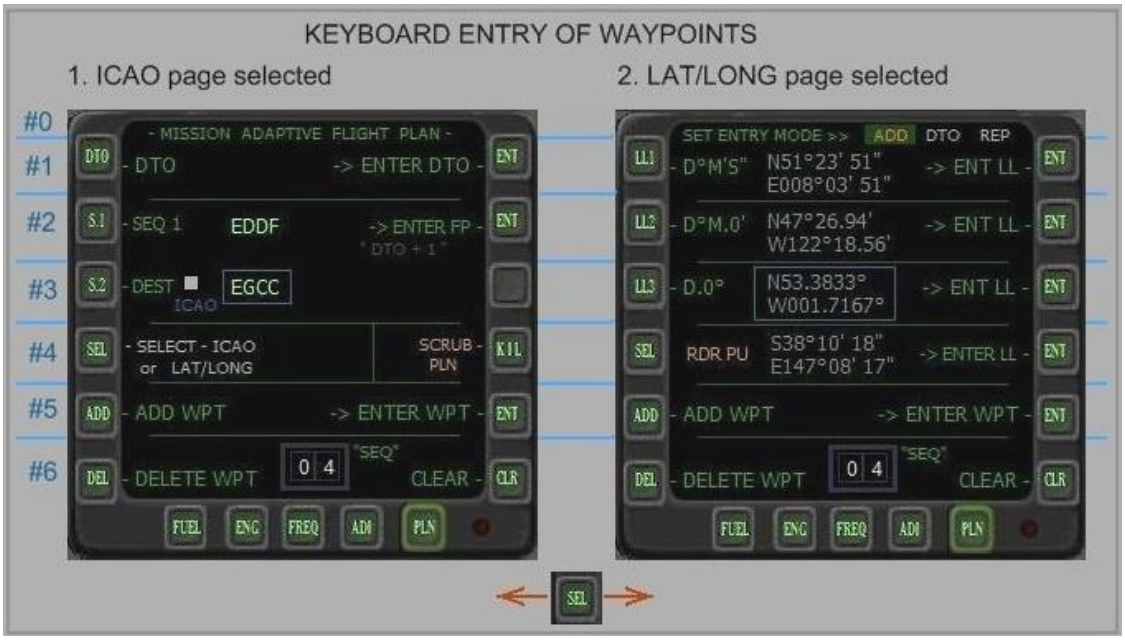
NOTE 1: Operation of this instrument and the NAV Info instrument in the same flight session results in a conflict causing the steering arrow to 'hunt' between two airports . Still , both are extremely important instruments to include in the panel .
NOTE 2: Fixed Aircraft carrier ICAO codes can be entered in 'search' , also they show up on the nearest 16 airports screen if (-) end of '>2000' runway length is zoomed down sufficiently .
Alpha numeric ICAO codes can also be entered in the search function .

16. RIGHT HAND MFD



Radio frequencies set or changed by mouse on STBY side of screen .
ADI wind arrow and text only appear if "W/V" button selected and if there is a wind .

17. MISSION ADAPTIVE FLIGHT PLAN EDITOR



The Left 'SEL' button alternates the above two pages.

Description: This unit enables flight plans to be created or existing flight plans to be altered as required. It is extremely flexible , easy and fast to use during flight operations.

-> Flight plan lengths , any length up to 99 legs.
-> Enables input of Airport ICAO or Latitude/Longitude in 3 different formats.
-> Locations on the Radar screen (RDR PU) can be entered in all 3 entry modes .
-> Following **entry modes** are available for **all** input types :-
** ADD Waypoint , requires SEQ number to be set.
** DTO , 'Direct To' , with 1 or 2 legs .
** REP , Replace or swap an existing Waypoint , requires a SEQ number to be set.
-> Individual Waypoints can be deleted , requires a SEQ number to be set.
-> Complete Flight Plans , regardless of length , can be deleted at a single click.

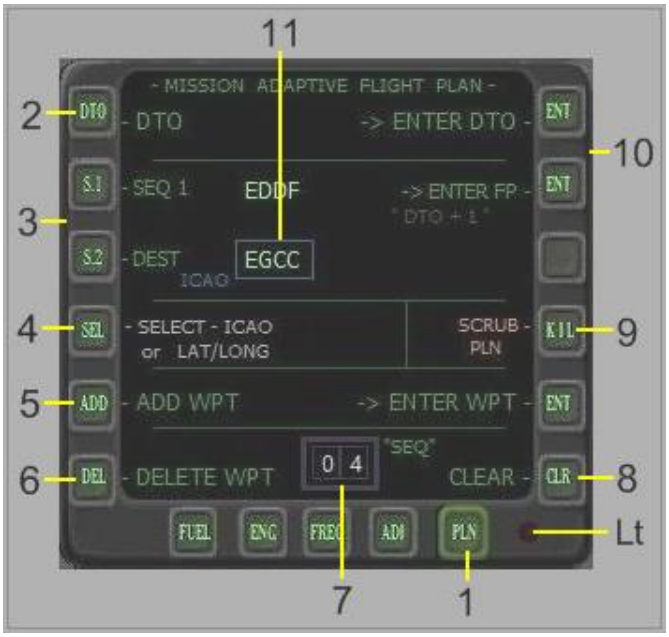
->> Existing or Saved Flight Plans can be modified by addition or deletion of Waypoints.

->>> If **no** Flight Plan exists , one can be created by starting with a DTO , thereafter adding as many Waypoints as desired .
" It must initially be started with a DTO. "

-> Flight Plans can be altered or modified as often as desired in flight or on the ground.
->>>> Waypoints can be added at any point in a Flight Plan , this includes before the first , and after the last Waypoint , there are no limitations.
-> The desired location and placement of a Waypoint addition within a Flight Plan is dictated by SEQ , this is the Flight Plan Index number , it is set at the Thumbwheel .

-> The F-111 Radar is a companion instrument to this Editor it provides visual displays of :
- At Mode 3 a scrollable Flight Plan listing , a source of Flt Pln SEQ numbers.
- At Modes 1 , 2 , 4 , 5 , and 6 map display view , ICAOs and Flight Plan lines with SEQ labels.
- At Mode 6 'Stand Off' the Map can be projected forward to a distant Waypoint.
- Touch screen nomination of a location for entry by the Editor.
These aid in visualising where Add Waypoints can be placed in the Flight Plan.
-> Use of the ' Active Leg Thumbwheel ' , located at lower centre of the panel , enables any Leg or SEQ to be actively used by both the autopilot and the Radar Mode 6 Stand Off.
This is a very handy and useful facility . Try it and vary the SEQ at that Thumbwheel , it has interesting applications. Experiment to maximise these available capabilities.

ICAO PAGE - Airport ICAO only.



1. PLN button opens the Mission Adaptive Flight Plan Editor.
2. DTO normal single leg Direct To.
3. S1 and S2 two leg Direct To.
4. **SEL Toggles ICAO and LAT/LONG pages.**
5. ADD , ICAO entry mode dependant on Mode setting at Lat/Long page.
6. DEL deletes Wpt that is set in Thumbwheel .
7. **THUMBWHEEL , sets the required SEQ / INDEX number.**
   Digits are set by Left , Right or wheel , mouse function .
8. CLR , clears errors and unlocks the Keyboard.
9. KIL , deletes in entirety any Flight Plan regardless of length.
10. ENT , enters the entry into a Flight Plan.
11. Blue waypoint box , indicates keyboard is available for typing of waypoint.

Functions :

(1). " DTO " This creates a ' Direct To ' comprising of 1 waypoint .
The left button opens the entry register enabling the keyboard function ,
a blue ICAO entry box will appear , and the bezel red light will commence flashing .
The required ICAO is typed on the keyboard.
That ICAO is entered as a flight plan by depressing the right "ENT" button , at which time the red light will be automatically extinguished.

(2). " S1 " - " S2 " This creates a DTO Direct To comprising of 2 waypoints (1 + DTO) .
It functions like DTO , except that the second button enables a second ICAO entry , then both ICAO's are entered simultaneously at the right button.

(3). **" ADD "** This add waypoint enables a new waypoint to be added anywhere in a Flight plan
It is similar in function to the previous , except that a ' SEQ ' Sequence number **must** be set in the thumbwheel, this SEQ number indicates **where** in the flight plan the added waypoint is to be placed.

(4). " DEL " This enables any waypoint to be deleted from the flight plan , set the flight plan SEQ number to be deleted in the thumbwheel , then depress the left ' DEL ' button.

(5). " CLR " This enables entries to be aborted or cleared if an error is made , it also unlocks the keyboard and extinguishes the red light.

(6). " SEQ " this thumbwheel comprises of separate window click zones for each digit .
Digits are set by Left , Right or wheel , mouse function .

The number set (04 in above example) is the flight plan sequence or index number that dictates where in a flight plan a waypoint is to be added or deleted , " ADD WPT " and " DELETE WPT " are totally dependant on that thumbwheel number.
A number **must** be set in the thumbwheel prior to the use of either " ADD WPT " or " DELETE WPT " .

This thumbwheel only functions in the ADD - DELETE context of this flight plan instrument , it should not be confused with another one in the panel which has a separate function and identity.
The difference being this thumbwheel is only associated with Flight plan entries .
Whereas the other is only associated with nomination of a active leg .
They do not interfere with each other at all .

LATITUDE / LONGITUDE PAGE

1. LL1 , Lat/Long in > Degrees : Minutes : Second format.
2. LL2 , Lat/Long in > Degrees : Minutes to 2 decimal places.
3. LL3 , Lat/Long in > Degrees to 4 decimal places.
4. **SEL , toggles ICAO and LAT/LONG pages.**
5. ADD , the ADD cycles to ADD - DTO - REP , depending on the Entry Mode that has been set.
6. **SET ENTRY MODE >> ADD DTO REP , Mode is cycled by click on screen at top of screen.**
   Mode in orange text determines how any of the 5 horizontal lines will be entered .
   ENTER any of the 5 lines as either , Add Waypoint , or DTO (Direct To) , or Replacement.
7. ENT buttons enter subject line into Flight Plan.
8. RDR PU , Radar Pick up , this Lat/Long is set by a click anywhere on the Radar screen.
   That point's Lat/Long is then available for entry by this Editor.
9. Notation , a click on the right side of line 5 results in a advisory grey pop up.
   At times a search will result in a Lat/long that is prefixed with + or - instead of the usual N , S , E , W characters , the pop up is a decode advisory.

****

KEYBOARD TYPING FORMAT FOR LATITUDE LONGITUDE :
THIS FORMAT MUST BE STRICTLY ADHERRED TO :

(A). Click "LLn" button , this accesses the keyboard , a blue box will appear.
(B). - Type characters as shown below .
- This typing format must be adhered to.
- Use small case only for the letter N , S , E , W characters on keyboard .

- You **must** include in your typing any zero **(0)** and decimal point **(.)** where ever it might appear in the Lat/Long.
- As must the number of characters , (LL1 = 15) , (LL2 = 17) , (LL3 = 17) .

FORMAT :-

1. "LL1" button , D:M:S = Degrees : Minutes : Seconds .
   Type **all** the following characters.
   N530815W0012330 (a total of 15 characters)

OR

2. "LL2" button , D:M.00 = Degrees : Minutes to 2 decimal places .
   Type **all** the following characters.
   N5313.82W00125.31 (a total of 17 characters)

OR

3. "LL3" button , D.0000 = Degrees to 4 decimal places .
   Type **all** the following characters.
   N51.3945E008.0681 (a total of 17 characters)

(C). This will now appear correctly formatted in the blue box.
(D). In the thumbwheel set SEQ/INDEX number to where you wish to slot that Lat/Long Waypoint into your Flight Plan. A SEQ number must always be nominated.
(E). Click the "ENT" button that is on the same horizontal line as the "LLn" .
The Lat/Long will now have been entered in the Flight Plan at the SEQ/INDEX number that you nominated.
(F). To clear a register , just click "CLR" button .

****

SAMPLE PROCEDURE:

1. Hit " PLN " button of the MFD.
Flight Plan Editor then displays (1) ICAO page view .

2. Hit " DTO " button , then a blue box appears on screen.

3. On your computer Keyboard , type in your preferred ICAO ie; EGCC
That ICAO appears in the blue box.

4. Hit the " ENT " button that is on the same horizontal level.
Your DTO is now entered as a flight plan that can be flown.

ALTERNATELY.
Putting in a Lat/Long Wpt in D:M:S format , into an existing Flt Pln.
1. Hit " SEL " button , screen view will change from (1) ICAO page view
to (2) LAT/LONG page view.

2. Select your preferred entry mode (ADD - DTO - REP) by clicking at the top of the screen and cycling through the options.

3. At the Thumbwheel set the SEQ/INDEX number that will dictate where the Wpt is to be inserted in the Flt Pln.

4. Hit " LL1 " button , blue box appears.

5. On Keyboard type in the Latitude and Longitude.

6. Hit the " ENT " button , your Wpt has now been added to the flight plan at the SEQ number that you nominated.

GENERAL NOTES

CAUTION : There are two reasons to apply caution.
1. The above buttons are always active , careless or accidental use will effect the flight plan.

2. When the entry register buttons are operated the keyboard is hijacked for an ICAO to be typed , at this time the keyboard is unavailable for normal aircraft control functions , when the right hand enter buttons are used the keyboard is automatically switched back to aircraft control duties.
The Red Flashing light is a reminder in case due to an interruption the entry keyboard register is left open.
IF THE RED LIGHT IS FLASHING IN THOSE CIRCUMSTANCES , SIMPLY HIT THE CLEAR BUTTON.

If a session was started with a saved flight plan , and Mission Planner was used to delete all of that flight plan, then in that case a full flight plan can be re created using just the ADD WPT facility without having to start with a DTO ,
otherwise if session is started with no flight plan loaded then the DTO facility needs to be used to start flight plan creation , then followed by ADD WPT additions .

FLIGHT PLAN OPTIONS :
Basically your flight planning options are endless and unlimited.
You can make your Departure point the Destination at the end of the plan, you can create large multi leg loops off a specific waypoint and return to the same waypoint then continue your plan.
Create diversions or alternates , or a holding point to hold at , pending weather , then decide which of several destinations is open , then add it as your terminal destination .
It is suggested that many additions and deletions and re routings be tried during several flights.
All the above functions can be carried out either on the ground or when airborne , you can create a large multi leg flight plan mid flight or whenever desired .
Entries can be made with the autopilot on or off.

RECOMMENDATION :
It is recommended that the Flight Plan Listing page Mode 3 of the Radar be open and visible or referred to as it displays the relevant flight plan SEQ numbers needed for ADD - DELETE WPT purposes.

DATA MINING :
You do not necessarily need to fly a flight Plan or Direct To , sometimes it is handy to use it to ascertain information , such as distance and bearing to a point or it's latitude and Longitude or radar view it with Mode 6 Standoff. If you require a waypoints Lat/Long , then page 2 of the Data MFD has the active WPT Lat/Long , by simply clicking on that Lat/Long area you will get it in 3 different formats , basically a conversion .
The data available for ICAO waypoints in this panel are :
- Distance and Bearing and a Directional indicator arrow to it .
- Lat/Long in 3 text formats .
- Full name or title , elevation , all runway lengths , widths , and headings , terminal guidance ILS/GPS if any .
NOTE - a separate thumbwheel based instrument allows you to scroll through all waypoints contained in any flight plan , thereby allowing you to interrogate any waypoint for data - information .

SOURCES OF ICAO's :
The Clipboard has 5 pages of global ICAO's.
The Nearest page in the LH MFD has 16 nearby ICAO's .
The Radar , switch on Airports you will get ICAO's out to about 900 NM.
Both aviation maps , the internet and some specialty flight simulation magazines list ICAO's .
Keep a list of you own preferred ICAO's as a databank .
The Free Flight menu page of FSX under airports contains the database of over 24,000 of them.

SOURCES OF LAT/LONG's :
From Maps , Charts , and Hiking Charts.
Aviation Maps and Charts
The family Atlas.
Do a Google search , ie: ' Latitude Longitude of Machu Picchu '
From Google Earth , go to region , zoom in , place hand on target , read Lat/Long.
From automobile GPS units , record favorite locations.
From modern Cameras that have the ' GEO ' function.
From articles and books that may have a Lat/Long location of interest.
Read off the Radar screen (RDR PU) .
Read aircraft's current location , is given as Lat Long in several instruments .

NOTES AND TIPS :

1. Flight plan structure.
The "SEQ" or index structure of a Flight plan is along the following lines,
0 , 1 , 2 , 3 , 4 , ... , 12 , 13 , 14 , 15
'0' - being either , initial location or a Departure airport.
- then a series of interim waypoints.
'15' - being , the last waypoint or Destination airport.

Direct To is slightly different , it is a straight line from where you were when it was created , to the ICAO or point that you entered as the " Direct To ".
'0' - " is the point in space " at which the Direct To was created .
'1' - is the Direct To , it is the Destination created by your Direct To entry.

A Flight Plan " leg " is the line between any two points or waypoints in a flight plan or Direct To.

2. When you add a waypoint to a flight plan with the " ADD WPT " button , you also attach a "SEQ" number to it, what actually happens is , that waypoint is added at your specified SEQ number , and the Flight plan SEQ that previously had that number is incremented by "1" as are all the following SEQ numbers , similar occurs with " DELETE WPT " only in reverse , the SEQ are decreased.
Experimenting with both ADD WPT and DELETE WPT will quickly clarify what is occurring , grasping this aspect is important to your future flight plan manipulations.

3. Usually a Flight Plan consists of a Departure airport , a Destination airport , and a series of intervening waypoints between departure and destination airports , and the flight plan is loaded prior to Take off.
With this Mission Planner no such restrictions exist , you might not have any flight plan , but wish to create one in flight to deal with mission requirements , for example operating in a battle zone .
It is totally flexible and can be manipulated as often and as much as is needed to meet your circumstances.

4. You might happen to require airport information , in such a case open the "NRST" page of the LH MFD , then click the top LH ICAO button , ICAO search will appear , now go to the Mission Planner and type in the ICAO that you want , you will simultaneously get a Mission Planner entry , plus the NRST page will snap to a full airport detail display that includes distance and bearing to the airport.

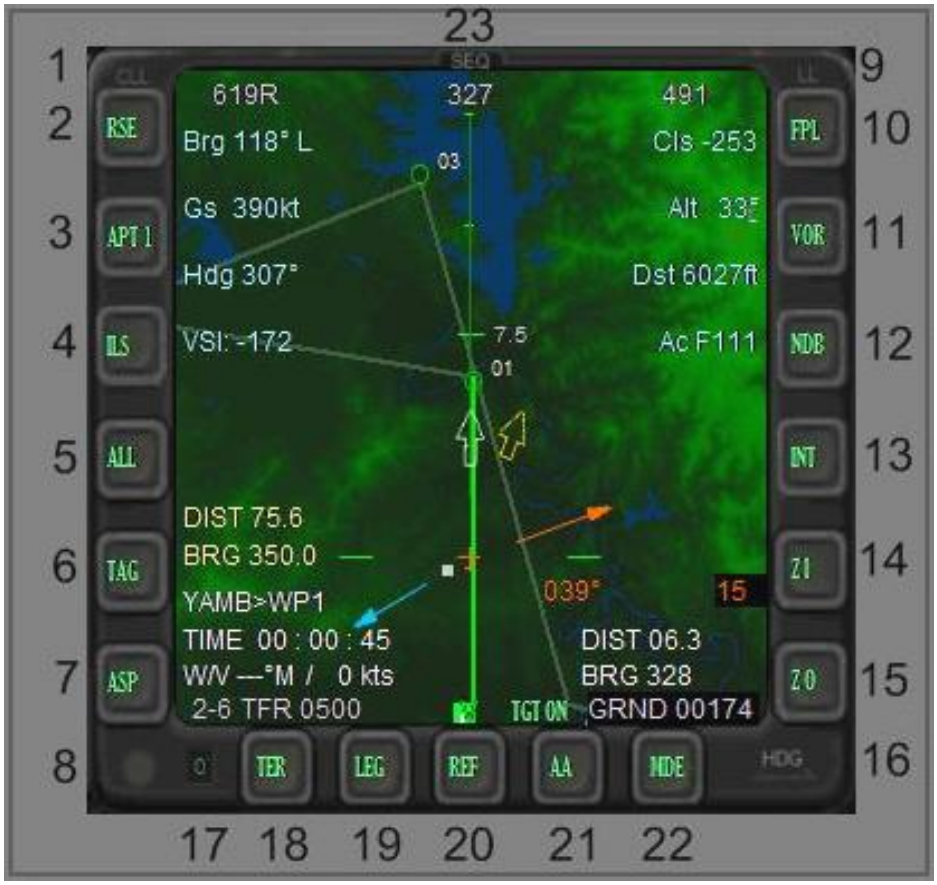
5. If you have an extremely long flight plan and want to delete it all quickly , click the "KIL" button.

6. Creating distant Flight plans , how you utilise this is up to you.
Example : You are in Melbourne airport (YMML) , and you wish to create a distant flight plan , say on the other side of the world , open the Clipboard and select your ICAO , we will use EGCC Manchester airport , enter EGCC as a DTO in the Mission Planner.
Now in the Radar select Mode 6 (Standoff) , your Radar display in that Mode will be centred on the Manchester airport EGCC , switch on the radar airports and flight plan line ,you will now see plenty of UK ICAOs to add to your flight plan , by changing your Active leg , and hence the view in Mode 6 to gather more ICAO's for entry , you can progressively leapfrog your flight plan all over Europe from that starting point , remember that you can delete your 00 SEQ thereby making EGCC your initial waypoint .
Also remember all this was done while sitting on the runway half a world away.
This is a important method , experiment with it at varying distance Stand Off locations , it will become apparent how powerful an application it is .

7. If you use " Carriers 2006 " , the fixed aircraft carrier package , each carrier has it's own ICAO listed in the documentation . They are : AC01 , AC02 , AC03 , ... , AC17 , AC18 .
Entering any of those ICAO's will result in a Flight Plan line on the radar map display plus Distance and bearing to your carrier thus making them easy to locate , carriers are notoriously difficult to find in a large expanse of sea , problem solved .

8. A small caution to be aware of ; if you are flying a flight plan on autopilot and your current active leg is about half way through that flight plan , then adding or deleting a " later " waypoint is fine ,
if however you add or delete a waypoint that is " earlier " in the flight plan than your current active leg , then the autopilot will snap the active leg back to a earlier part of the flight plan.
Be aware of this and 'note' your current active leg prior to your change , then just 'reset' your desired active leg quickly if necessary and all is well .

18. RADAR - GROUND MAPPING AND AIR TO AIR INTERCEPT



1. CLL , cycles through 3 formats of touch screen Lat/Longs.
2. RSE , compass rose.
3. APT 1 , selects , airport diagram , then airport name , then off.
4. ILS , selects ILS feather but only at close zooms.
5. AIR , AI cycles - AIR , GRND , ALL.
6. TAG , selects 2 levels of AI descriptive text.
7. ASP . Airspace diagram , on/off.
8. Wear spot , hides Radar instrument .
9. LL . Activates the Radar Touch Screen to enable onscreen location nomination.
10. FPL , Flight Plan Line , on/off.
11. VOR , VOR symbol , on/off.
12. NDB , NDB symbol , on/off.
13. INT , Intersection symbols . on/off.
14. ZI , Zoom In , Closer view , current Zoom setting displayed on screen next to button.
15. ZO , Zoom Out , further out view.
    ZOOM distance is calibrated ; From aircraft icon ; To tick near top of screen.
    ZOOM has both ; one quarter markers ; and a one half marker with readout.
    In the above example , at Zoom 15nm , the total screen height is a little over 20nm.
    Above the icon wings is in front of your aircraft , and below wings is behind aircraft.
16. Faint horizontal line selects orange autopilot heading hold direction arrow. Arrow is rotated or controlled in either , AP heading window , or , ADI page of RH MFD.
17. Dimmer switch and indicator , 3 Dim levels , ideal for use in "both" Day or Night.
18. TER , Terrain , on/off.
19. LEG , selects , current active leg text plus arrow , or , track error text for that leg.
20. REF , Selects , selected nearest airport text plus arrow , but only if nominated at NRST in LH MFD.
21. AA , selects , Air to AIR , activates screen for AI selection and relevant data text plus arrow.
22. MDE , Mode selection (+/-) , 6 modes -> 1,2, 4,5 are maps -> 3 is scrollable Flight Plan Listing , -> 6 is Stand Off map view.
23. SEQ , displays or hides SEQ - Flight Plan Index number labelling for the Flight Plan line.

WARNING : The following **" all "** have "On Screen" click hot spots , and all can be selected "on" at the same time resulting in **blocking** of click functions .
Ensure that only one (1) is selected on at any one time.

(1). **AA** - the AI selection , on screen large Hot Spot.
(2). **LL** - the Lat/Long nomination , touch screen large Hot Spot.
(3). **Mode 3** - the Flight Plan Listing , on screen Scroll bar Hot Spot.

Description: This Ground Mapping Radar instrument is a pop up window , it can be displayed or hidden using clickable icons .
It can be selected in the 2D pilots or bombardiers panel or in the virtual panel.
Zooms are, 1,3,6,9,12,15,24,30,54,75,96,150,220,300,400,500,and 900 NM . The zoom figure on the right of the instrument represents the top three quarters of the screen , starting from the wing/fuse intersection of the aircraft icon . Therefore a zoom of 30 ,represents a total screen height of 40 NM.
The area of the screen above the aircraft icon's wings is the area in front of your aircraft , and below is behind you .
Both airport and airport text increase in detail as zoom approaches 1 nm.
The figure at the lower right of screen is the ground elevation directly below the aircraft icon .

Functions : It displays differing elevations in differing colour tints , thereby detailing mountains ,valleys and water. The AI aircraft are displayed , then by clicking the 'AA' button to ON , text will appear on both the instrument and HUD relating to a specific AI Target that is cycled and selected by clicking repeatedly anywhere on the screen surface , the specific AI momentarily turns red . This cycle can be repeated as often as desired , the cycle selection only functions out to about 40 NM from your aircraft . For distances greater than 40 NM , text data can be derived by various clicks of the 'TAG' button , or use of the AI Hunter .
Airports and navigation aids are selected by the labelled buttons. Both APT and TAG are 2 step buttons .

Touch screen Position Nomination: By clicking at extreme top right corner of the Radar activates the Touch screen , and " LL" appears , together with "CLL' horizontally opposite.
The whole of the Radar screen is now active , clicking at any desired location on the screen nominates that position , and text overlay appears at the top of the screen detailing that positions Latitude and Longitude , as well as the distance and heading from your aircraft or focal point at the aircraft icon.
This Latitude and Longitude also appears in the Flight Plan Editor , and can be entered as a Waypoint if desired. Touch screen position nomination is fully functional in both Normal Modes and Stand Off Mode.
Complete flight plans can be generated using only this method if desired.
The "CLL" enables the Latitude/Longitude text format to be altered , effectively a conversion unit.

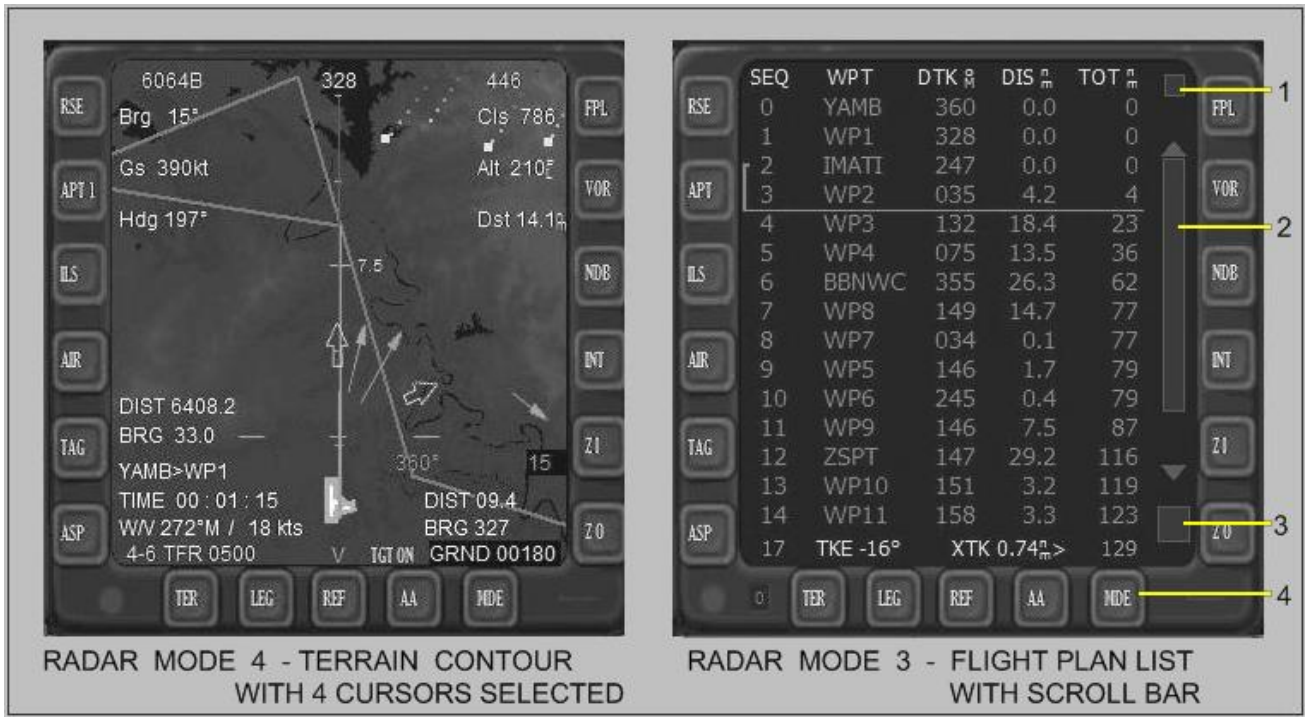
Icons: The clickable icons are " RDR " in an orangeish colour .
An off zone on the instrument is the little wear patch , lower left corner .

Buttons: The left and right buttons enable various features to be switched ON/OFF.
These include Navaids etc. The ZI and ZO are your zoom level buttons.
If all are selected at the same time the screen becomes hopelessly cluttered.
Bottom Buttons:
TER - clears the map contours leaving a dark background .
LEG - displays data relevant to the current leg of a flight plan if one is loaded and active (FPL- displays it graphically) .
REF - displays bearing , distance and a arrowhead to a selected airport , will only display if an airport has been nominated in the 'NRST page of the left hand MFD' on the panel (2D pilots only)
AA - This switches the target text display in both the radar screen and the HUD ON or OFF , and activates the screen for click selection of desired AI.
MDE - Display Modes , switches through the 6 displays, selected mode indicated at lower left of screen ;
Modes 1, 2, 4, and 5, identical maps each with different contour colours ;
Mode 3 is a text based Flight Plan listing that is scrollable , it has 3 sub modes;
Mode 6 is the Stand Off map display , it is focussed at the selected "Active" Flight Plan leg (Index/SEQ).
General: This is a tool for you the pilot in command to use as and when you deem it necessary . The reason for the large size , is this instrument would be approximately 6" X 6" in a cockpit panel , however the average computer screen size would halve these dimensions making detail difficult to read .

Utilization:

1. Generally can be used to aid navigation , and Flight Planning .
2. For air intercept on AI aircraft the zooms of 1, 3 and 6 NM are optimal as the AI is approached.
3. For very low level flight , such as flying deep in valleys the 6 to 24 NM zoom range are ideal , they allow you to determine and anticipate where the valley is turning next and to avoid dead ends .
4. The larger zooms of 150, 225 and 300 NM enable you to quickly orient yourself geographically .
5. Circuit pattern work with runways displayed .

19. RADAR MODE 3 - COMPLETE FLIGHT PLAN LIST



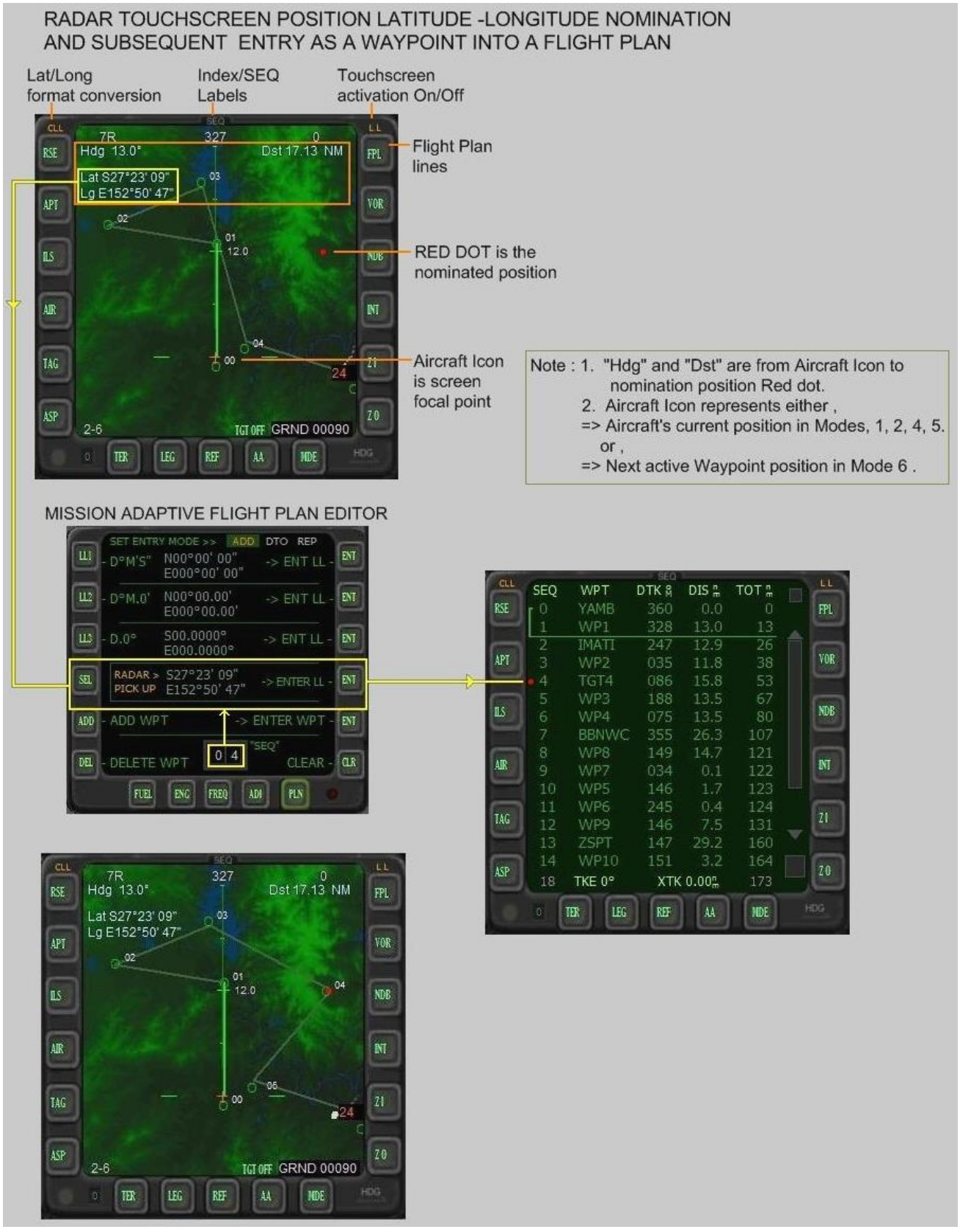
RADAR MODE 4 - TERRAIN CONTOUR WITH 4 CURSORS SELECTED

RADAR MODE 3 - FLIGHT PLAN LIST WITH SCROLL BAR

1. Active leg Cursor bar On/Off switch .
2. Scroll bar , click and drag .
3. Sub Modes , 3 pages of text switch .
4. Radar Mode Switch , scrolls through the 6 display pages .

20. OPERATION OF RADAR TOUCHSCREEN

A visual example of the process involved and relevant displays .
Refer to General notes below .



GENERAL NOTES .
1. Click "LL" at the top right hand corner to activate the Radar Touchscreen.
Clicking the "LL" acts as an On/Off switch , when clicked On both "LL" and "CLL" change colour to orange.
The whole of the Radar display screen is now sensitive to a mouse click nomination of a position.
2. As stated in a previous "warning" , there are 3 conditions when the screen is active ,
- AA button : for selection of AI aircraft Lock On.
- Mode 3 : Flight Plan Listing Scroll bar .
- LL : This Touchscreen for position nomination .
Warning only one of these three can be active at a time , if more than one is active there will be a blocking of on screen click function , Please remember this aspect .
3. Map initialisation : When starting a flying session it is important to "Initialise" the Radar map , this is acheived by taxi your aircraft a small distance , it only needs to be one or two feet , this small movement results in accurate position nomination on the screen from then on .
4. It is recommended that both , "FPL" button at top right , and "SEQ" top centre , be clicked On .
They provide , a Flight Plan line and SEQ labelling on the display , both facilitate any subsequent flight plan entries that might be made .
5. With the "LL" selected On , you can now click anywhere that you desire on the display screen.
A click on the screen results in a Red dot appearing at that location , and a text overlay comprising of , Hdg , Dst , and Lat/Long of the position that you have just nominated .
If you wish to "Hide" the text overlay , simply Right mouse click will do it .
6. The "Hdg" and "Dst" are from the map focal point at the little Aircraft Icon to the Red dot position, this by itself provides useful information .
7. The Lat/Long of the nominated position is simultaneously displayed in the "Radar Pick Up" field of the " Mission Adaptive Flight Plan Editor " , second page (Lat/Longs) , accessed by the "PLN" button on the Right Hand MFD .
This allows you to enter your nominated position as either , a Direct To or by adding a SEQ you can enter it anywhere in a existing flight plan.
8. You can create long multi leg flight plans based on a series of nominated positions by the following procedure ,
- enter your first position as a DTO (Direct To) ,
alter your entry mode from "DTO" to "ADD" (add waypoints) ,
- thereafter each position is added together with an incremented "SEQ" number in the editor .
9. It should be Noted that the Red dot is an instantaneous representation of your selected nominated position , unfortunately it does not remain locked at that location visually , you will see that it continues to move over the map , however the important aspect is that the , Lat/Long is frozen at your nominated position , and remains accurate .
10. The Touchscreen position nomination works in all the Radar map display modes , including the Mode 6 "Stand Off" mode.
In this mode the display is focused at a "Next Waypoint" of a flight plan , it can be any of the waypoints contained in you flight plan .
In this instance , your nominated position will be relative to the Active Waypoint that is currently displayed at your map focal point , which of course is at your little Aircraft Icon .
The above may be a little confusing , however , using it in flight plan creation will clarify what is happening , and it will become simple to use , and understand .

This facility provides powerful capabilities to your flight planning arsenal .

21. AIR TO AIR INTERCEPTS

AIR TO AIR INTERCEPTS
INITIATE : Ensure target script is turned ON at AA button .
CYCLE : The target selection cycle only works out to a distance of about 30 to 40 NM from the aircraft being flown . By clicking repeatedly on the body of the screen it progresses from the nearest AI out to about 40 NM , and then back to the start of the cycle.
TAG : Has 3 steps , off , compact data , and expanded data .
This is utilised to locate AI aircraft any distance out to Max Zoom .
The text displays the AI aircraft type , its altitude , and its groundspeed .
Graphically from the screen it can be determined where it is in relation to your aircraft's nose (HDG) and the direction the AI is travelling in , as well as its distance .

PROCEDURES
1. Turn your aircraft to get the target AI showing under the screen HDG lubber line.
2. Climb or descend to target AI altitude .
3. Apply necessary power to achieve an overtake speed .
4. As you start closing in on the AI , progressively zoom in .
5. When the AI appears at the very top of the screen at Zoom 30 NM ,
   repeatedly click on the screen area to cycle the AI target selection .
   When your particular AI of interest turns 'red' , stop the cycling .
6. With your AI highlighted in red you will now have the data text displaying in both the screen

and HUD relevant to that selected AI ,
-- LH and RH side top of radar screen , plus blue pointer arrow .
-- Top area of the HUD .

SAMPLE TEXT DATA FIELDS
Radar Screen:
LEFT:
15L = bearing 15 degrees left of nose , 0 is directly ahead.
460kt = AI's Groundspeed .
36 = AI's heading (degrees T)
2500 = AI's VSI. (+/-)
RIGHT:
165 = closing speed , approaching AI at 165 kts .
-165 would mean , AI is moving away at 165 kts . (+/-)
350FL = AI's altitude (ie. 350 add 00 = 35,000')
28.4nm = AI's distance ; in nm if greater than 1.6nm ; or ; in feet if 9,500' or closer .

HUD:
350FL 2500 15L
460kt 28.4nm 165

350FL = AI altitude
460kt = AI Groundspeed
15L = AI bearing , Left or Right
28.4nm = AI distance , Nm or feet
165 = closing speed
2500 = AI VSI

NOTE : The "AA" button at the bottom of the screen switches ON/OFF the text in both the radar screen and the HUD .

**** DETAIL ***
1. Formating on AI aircraft with a groundspeed below 180 kts is difficult in the F-111.
2. If high power results in supersonic airspeeds , start reducing power and airspeed at about 15 NM from the target .
3. Remember , if closing speed is too high apply ;
--reduced power
--Airbrake
--Gear down
--Wing sweep forward
--Full flaps .
in any or all combinations , with all deployed , the aircraft will slow dramatically .
Not pretty , but you will need it occasionally to prevent a massive overshoot .
4. If you have AI text selected in FSX options , the text will appear at 10 NM or less .
If above 28,000' then contrails will be visible at considerably greater than 10 NM .
5. By 10 NM your closing speed should be down to 60-80 kts .
6. By 4 NM your closing speed should be down to 20-30 kts .
7. By 0.8-0.6 NM closing speed should be down to 6-10 kts .
NOTE; 5, 6, and 7 above assume you are already directly behind the target .
8. TRIM ,TRIM , TRIM .
Always important , but at 0.6 NM or less , it is extremely important .
Trim with:
-- Trim button on joystick .
-- OR , TRIM instrument in the autopilot on panel (more accurate)
-- "AUTO TRIM" , momentarily switch on Autopilot master switch (only) ,
then off , that will "auto Trim" for you (a very handy facility) .
9. IN CLOSE -- 0.6 NM OR LESS.
Decide on where you will keep station , ie, 50' higher than the AI or its wingtip .
** STABILIZE THE VELOCITY VECTOR ** , if the AI is in level cruise at a
constant altitude , then keep the velocity vector VERY accurately on the Horizon

Bar , OR , if you wish , maintain the circle of the velocity vector on the AI's wingtip .

10. AI changes of heading , roll the aircraft with smooth and gentle application of aileron to turn with the AI , keeping the velocity vector on the horizon bar .
11. At 0.5 NM or less it is probably best to have the screen zoom at 1 NM . (TER button , will turn the screen background dark if the map contours annoy)
12. The trim if properly done will reduce the velocity vector bouncing about and slightly reduce your workload .

13. At 0.2 NM or less everything becomes twitchy - the slightest movement of the velocity vector on the horizon bar results in the AI moving dramatically in the field of view . Keep it smooth .
14. In close , maintain a constant and regular check of the closing speed . It must be very , very small or 0 .
15. If you overshoot the AI , deploy the Airbrake and concentrate on keeping the velocity vector on the horizon bar ,also refer to the radar screen to see where the AI is , a blue directional arrow has been added to assist in such circumstances .
16. In the F-111 the HUD display can be called up in all views , including the camera views . The nominated AI data text will appear in the HUD , thereby aiding formation or station keeping .
17. As an exercise , at a distance of about 1-2 NM from the AI with the velocity vector on the horizon bar . Slowly and gently , roll with aileron and sweep the velocity vector from one side of the AI to the other keeping the velocity vector accurately on the horizon bar .
18. The close in formation work is hard initially .
    - relax your grip on the joystick (very light touch)
    - do not fixate on one element , maintain a scan of text , radar screen , velocity vector and AI , AND CLOSING SPEED .
    - always be aware of the closing speed and maintain what you want with the application of Power and Airbrake .
    - again relax and enjoy yourself , avoid tensing up , as tense muscles create jerky control movements .
19. During turns , try to match the bank angle of the velocity vector wings with the AI wings .

22. MULTI MODE GROUND MAPPING RADAR

(A) GROUND MAPPING

1. The primary function of the radar in the F-111 is ground mapping and navigation.
The earlier radar fitted to this panel provided extremely good ground mapping functions and contour elevations at lower AMSL elevations up to about 4-6,000' , but were virtually useless in the 7-17,000'range.
2. A Multi Mode aspect has now been added to the radar to provide a comprehensive coverage of elevations from sea level to 17,000' .
A further addition is a Stand Off detail view of a nominated Target area.
3. This is enacted at the button labelled ' MDE ' , it comprises 6 steps which are annotated in the text at the lower left corner of the screen.
eg: 2-6 , is the 2nd page of 6 pages.
4. The first 5 pages are used by the pilot to best portray the ground elevation contours. The page selected by the pilot is the one that is considered to best portray the elevation contours that are currently being flown over, and are a matter of the pilots choice.
5. In steep , and rugged mountains , the closeness of the contour lines will necessitate zooms of 3, 6, and 9 NM , these will need to be alternated with larger zooms to maintain a general awareness and orientation of the terrain being flown over, and of that ahead of the aircraft.
6. The differing contour elevation tint colours used on each page of the display are optimised to display contours at either low , medium or high elevations , the pages are switched as required.
7. These 5 pages have been tested at the following locations , and it is recommended that the radar be tried in each of these locations.

* KCVS Cannon AB, New Mexico USA.
* KSEA Seattle Tacoma USA .
* LIPA Aviano AB Italy , Alps to Nth.
* VNKT Kathmandu Nepal in Himalayas.

* YMML , YLIL Australia , mountains to the East.

23. INTERACTIVE : TARGET OR FLIGHT PLAN WAYPOINTS

- Mode 6 -

1. The 6th Mode introduced (6-6) is totally dependant upon either,
   (1) a Flight Plan or
   (2) a Direct To

existing in the background. Mode 6 will function regardless of that background flight plan being enacted or not. If there is no ' Flight Plan ' or ' Direct To ' , then page 6 will be blank .

2. Clicking 'MDE' to Mode 6 will result in the radar screen portraying a display that is fixed at the next WPT (WayPoinT) or Direct To.

3. It is irrelevant to the display where the next WPT is geographically , it can be on the other side of the world , it will still be displayed .

4. That display is fixed , and centred at the point of the aircraft icon on the screen, and will not move regardless of the aircrafts travel , page 6 differs from the first 5 pages as they do reflect the aircrafts movement as advances of on screen topography.
If , however in 6-6 the aircraft is turned through 180 degrees , the radar view rotates to reflect the aircrafts current Heading.

5. At any time the radar can be selected from the WPT view to the aircrafts current position view by selecting any of the other 5 pages. The ' MDE ' button can be scrolled forward continuously , but only backwards to a limited degree.

*** MODE 6 VARIATION ***

6. Where a multi leg Flight Plan exists , each of the waypoints in the Flight Plan can be viewed at will by the following procedure.
In the autopilot, you will see " PREV " and " NEXT " buttons , these are hot spot buttons to scroll forward or backwards through the Flight Plan legs . The Mode 6 radar view will automatically display the scrolled WPT on the screen and the Data MFD at page 2 will display the name/title of that WPT.

7. If RTB (Return To Base) is enacted by clicking " PREV " to its maximum extent , when a DIRECT TO is loaded , then the radar will depict the point at which the DIRECT TO was originated or created at ; ie. any where in flight or on the ground that you were located when you originally set up the DIRECT TO .

8. Mode 6 was originally conceived to represent a close in detail view of a " Target area " from a Stand Off range , typically this would be required immediately prior to a 'run in' on a bombing exercise.

9. The 'DIRECT TO' function can be easily entered in flight using the Mission Adaptive Flight Planner instrument and can be changed as often as required in any flight.

* IMPORTANT NOTE *

A Mission Adaptive Flight planner has been added to the RH MFD that enables Direct To and Flight plan creation or alteration , and a complete Flight Plan listing added to the radar at Mode 3.
Useage of both FLIGHT PLAN and DIRECT TO are an essential ingredient and aid to both navigation and situational awareness , in this panel set up, that data is then reflected in various instruments.
It is important to note that having them loaded in the background does not mandate the use of the autopilot, but having them loaded provides valuable navigational reference points.

10. It should be noted that in Mode 6 the normal radar button functions still work.
ie. radio NAVAIDS, airports , FLTPLN, SEQ , Touch screen nomination , and zoom levels , etc.

11. If the aircraft is on the ground taxying around in circles will rotate the Mode 6 radar view .

12. Sitting on the ground at an airport create a rectangular Flight Plan with relatively shortish legs, it should terminate at an airport that is extremely close to your airport.
In the radar select page 6-6 , select FLTPLN button to graphically show the flight plan, then zoom out to encompass the whole of the flight plan graphics on the screen,
Now, in autopilot toggle through the various legs with the " NEXT " and " PREV " buttons.
Observe , BOTH the screen display AND the location of the aircraft icon on the screen flight plan.
Cycle both NEXT and PREV several times and observe .

LATEST CHANGES TO PIG RADAR

1. TFR Set Clearance Plane height now displays as text when TFR is active.
2. Major changes have been made to the Radar to improve presentation of elevation contours from sea level to 17,000' and a Stand Off capability has been added.
3. An ' ASP ' Airspaces button has been added to the Radar that allows Airspace outline graphics screen overlay to be selected if desired.
4. A directional blue arrow has been added that indicates the direction of the current Locked On target AI aircraft, the arrow is visible when the AA button is selected.
5. The 'LEG' button is now a 2 step function, first click displays current active Flight Plan text data , the second click displays track error text data relating to the current active leg.
6. Mode 3 now provides text data for all legs of the current Flight Plan, this page comprises 14 lines (legs) , but can be scrolled at the scroll bar to enable viewing of long flight plans with any number of legs.
Currently the active leg cursor is not syncronised to the scrolling action, it can be selected On/Off at the on screen button above the scroll bar.
7. Mode 3 has 3 sub modes activated by the small on screen button below the scroll bar, the first 2 sub modes present MFD style text data appertaining to the current active leg, the third sub mode presents generic flight data.
8. Mode 5 now provides an extreme amount of elevation contour detail that is specifically useful from sea level to about 800' AMSL especially at close in zooms.
9. Another addition is a orange cursor arrow , it's purpose is steering guidance when on TFR with autopilot Heading Hold on , the arrow is steered by making changes in the autopilot heading hold window to lay the arrow over radar valleys , and thereby steer the aircraft's path as desired.
The arrow and heading text are selected On/Off at the faint line lower right corner.
10. Three stage dimming now added , it is switched at the small window at the lower left corner.
11. The airport colour now changed to , Towered - orange , Untowered - green .
12. Mode 1 radar display only shows Towered airports to reduce clutter at larger zooms in some areas.
13. All buttons now have momentary illumination to confirm use .
14. Touch screen mouse nomination of on screen location , provides , heading and distance from aircraft and Lat/Long , that Lat/Long is fed to Flight plan editor , and can if desired be entered as a Flight Plan Waypoint. Normal Modes and Mode 6 Stand Off screen locations can be entered into a Flight Plan.
15. SEQ , top centre generates SEQ or index numbers on Waypoints of the flight plan diagram.
GENERAL NOTE.
This Radar is configured to provide the pilot with comprehensive options to access the maximum possible useful data during all phases of flight, it remains a tool that can be utilized as desired by the pilot to enhance operational and situational awareness.

24. CAMERA VIEWS

In FSX and on this F-111 Camera Views are available , there are 10 view positions , including the F-111 specific 'Pave Tack' .

Click ALT on keyboard , at top of screen click views , then view mode on pop up , then aircraft , next pop up lists the views , make your selection , it will be included in the normal joystick view cycle .

OR

Go to outside view , rear view , then cycle through the 10 Camera views by repeated clicks of 'A' on the keyboard .

These views can be panned left , right ,up and down with the hat switch , and zoomed in and out .
HUD overlay can be called up and aircraft flown in any of these views utilizing HUD data .
Missiles , flares and bombs can also be activated if joystick/throttle button assignments have been made .

Cockpit Fwd view is particularly convenient for inverted flight and flying deep in winding valleys as both demand a better upward view , the HUD in these views is not aligned with the flight path but provides flight control data , such as thrust ,IAS , radar altitude , etc .

Select 'Pave Tack' view in low level flight and HUD overlay , pan till view is forward , for precision , fire missiles , pan horizontally till velocity vector aligns with their destination , then pan vertically till velocity vector / horizon bar are on sim horizon ,if done at a low altitude (100-200') the velocity vector will provide accurate guidance , perfect for sightseeing or deep valley work .
'Pave HUD' and 'HUD Top' views have precise HUD overlay alignment for accurate flight .

25. WSO/NAVIGATOR/BOMBARDIER PANEL

Basically the same instruments as on the pilots side .
Aircraft can be flown from this side in the normal manner .

Clicking any of the 3 hotspots at above rectangles Displays or Hides the Pop Up window MFD at the left , the default page "RDR" shown has all the radar control buttons on screen.
The following MFD on screen buttons , LEG , OPS , TGT , BMB , CLR change the left and right Radar text .
The MDE button steps through the different Radar display formats.
The screen OFF - ON button controls both Radar and MFD.
Clicking Radar on screen Time area hot spot changes L or Z Time presentation.
The upper and lower bezel buttons change the MFD page Displays.

To return to the 2D Pilot's side panel Click on the opposed arrows area , left top of glareshield .

26. VIRTUAL COCKPIT

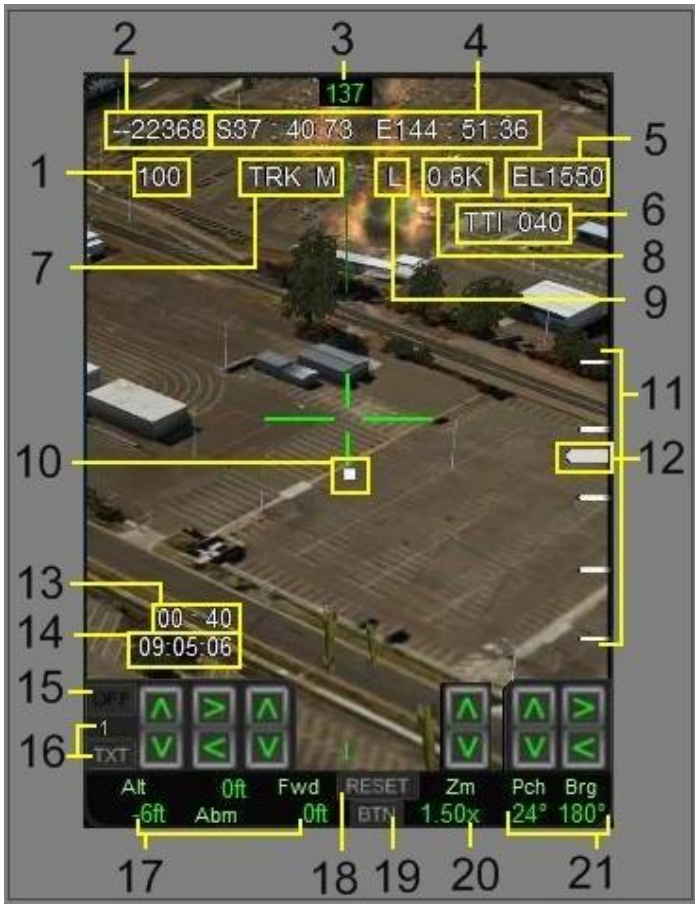
The Virtual Cockpit is a rudimentary presentation of the instrumentation found in both the 2D Pilots side Panel , and the 2D WSO side Panel.
Due to limitations inherent in the Virtual Cockpit model structure some of the instruments are placed in locations that differ from their locations in the two 2D Panels.

It should be noted that this " F-111 Pig HUD panel set up is optimised to be flown from the 2D Pilot's Side Panel , while it can be flown from all three cockpits full functionality primarily resides in the 2D Pilot Panel.

27. CLIPBOARD

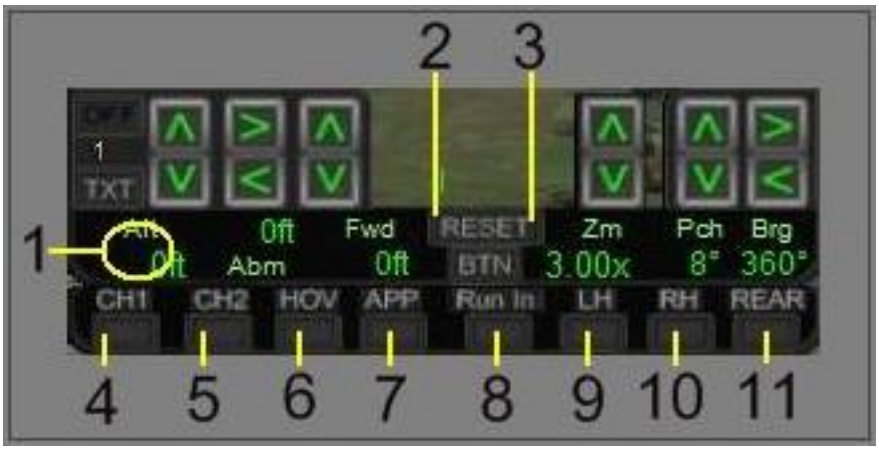
The Clipboard is activated by a click on the very faint bulls eye on the glareshield .
It comprises eight pages of abbreviated global airport ICAO and ILS approach data , the pages are selected in the boxed legend , with the active page displaying a red LED .
The ICAO are provided for entry into either the "NRST" - Nearest ICAO Search or "PLN" - Mission Adaptive Flight Plan Editor instruments contained in the MFDs as required .
The ILS data is for both Radio and Autopilot entry .

28. PAVE TACK DISPLAY AND PAGE ONE TEXT



1. Sequence No. - 100 is departure point decreasing by 1 at each Wpt.
2. Distance in feet to next Wpt below 99,999' else -00000.
3. Aircraft heading.
4. Aircrafts current Latitude / Longitude.
5. No function.
6. Time in seconds to next Wpt.
7. Orientation of display.
8. Aircraft Radio Altitude AGL in thousands of feet.
9. Cue. 'C' or flashing 'L' laser ranging on countdown.
10. DoF , Direction of Flight rotating arrowhead or square indicator.
11. Countdown ladder, 30 second range.
12. Moving countdown index pointer.
13. Time to next Wpt in minutes and seconds.
14. Calender date. YY:MM:DD.
15. Off button to hide Pave Tack window, On is 'PT' button on panel.
16. Text overlay page button and counter, 4 pages of text and clear.
17. Stand off buttons and readouts , moves viewpoint.
18. Reset button - Left to Original - Right to Bomb views.
19. Button clears/recalls button area to improve screen view.
20. Zoom button and readout.
21. Steering buttons and readouts , change view angles. buttons are single click or repeated if held down.

29. PAVE TACK OPTIONAL RESET BUTTONS



1. Secret Hot spot area to open or hide Lower Optional Buttons.
2. Reset button Left selects original start up view.
3. Reset button Right sets Low level Pave bomb view.
4.CHIN 1 - 15 degree down Fwd , at 500' view.
5. CHIN 2 - 45 degree down Fwd, at 500' view.
6. HOVER - 90 degree down , at 500' view.
7. APPROACH - 8 degree down FWD , at 3.0 zoom.
8. RUN IN - enables low level bomb targeting .
9. LEFT view.
10. Right view.
11. REAR view , at 8 degree up.

NOTES;
- On start up the lower buttons are hidden, they are called up at the Secret Hot Spot.
- Due to aircraft speed and time constraints it is often difficult to set the desired view configuration, the Resets greatly assist in that respect .
- The above buttons represent 10 optional views that are set instantaneously by the click of a single button.
- The selected Reset button is highlighted by a LED light.
- Having set any of these options , the view can then be further refined with the primary control buttons.
- The two Bomb Resets are "Run In" for targeting and "Reset Lo Bmb" which displays a view of bombs falling and exploding if the Weapons Package is loaded and relevant saved flight is used.
- The central button 'BTN' hides/opens the upper button area.

30. PAVE TACK DISPLAY

The Pave Tack Display unit provides the pilot views in all directions . including up and down. These views can be physically moved to standoff distances from the aircraft to enhance the desired view, additionally the views can be magnified or zoomed.
A multitude of viewing settings are available (refer to Table).
This unit has 10 reset options available that instantly set various useful views, considering the speed of fast jets and the time constraints on a busy pilot these reset options represent a vital pilot aid.

There are 4 text overlay options available , including an authentic simulation of the F-111 Pave Tack display.

Two of the reset views are configured to represent typical bombing views as are obtain in the F-111 , a further reset view is the approach view configured for landing on either a runway or aircraft carrier.

This instrument has a variety of uses :
- Pave Tack views under the aircraft .
- Targeting and Bombing.
- BDA - Bomb Damage Assessment .
- Look Down - if on the runway and altitude is increased , then a top down view of the airport or adjacent city is available .
- Reconnaisance - when at any altitude the screen altitude and zoom allow large areas to be viewed , this includes airport being approached at ranges of 10 NM while at 30,000'.
- BVR - Beyond Visual Range , aircraft identification while conducting radar intercepts .
- Approach observations of runway during approach to landing .

Additionally , flares , and Dump and burn can be observed while flying in the cockpit .
For the Targeting and Bombing exercises the Weapons Package must be installed.

NOTE:-
1. It is recommended that a multiple leg flight plan be flown and that Text page 1 be open when approaching the waypoints , the display actively responds to the waypoints in an interesting manner during the final 90 seconds.
This display response also occurs with a Direct To .

2. The following pages detail buttons , resets, and control functions together with the underlying function of this instrument and the included table lists the control settings available.

GENERAL NOTES
The Pave Tack has several modifications to radically improve its capabilities.

1. Both the relative Bearing and Pitch control functions operate in one degree increments, this is both more pleasing , but more importantly it adds greater versatility . At higher zoom levels it eliminates visual gaps that previously existed under the older large increment steps.
2. Selectable four pages of text overlay has been added, the first page functions best if a Flight Plan or Direct To is loaded in the background . The Range or Distance to the next WPT provides a readout in both NM and Feet , the latter being important when used in conjunction with Stand Off and Ranging capabilities.
3. The control buttons can now be selected OFF or ON as required to maximise the screen view. Button control function only exists when the buttons are visible.
4. A small irritant with the flight simulator is LOD (Level Of Detail) at large distances or zooms , The simulator decreases the level of detail resulting in a featureless , bland and fuzzy image.
This aspect has now been overcome to a large degree by " Stand Off " a new feature that has now been added to the PAVE TACK . In essence it enables crisp and highly detailed images at large Stand Off distances.
5. For quick conversion purposes- 1 NM = ~ 6,000 feet , (more precisely 6,076 - 6,080)
6. Stand Off -- Fore and Aft
This is the reason for the addition of this feature. It is to allow the pilot a clear and detailed view of the proposed Target area from a Stand Off range prior to conducting a 'run in' on a bombing exercise . At the ' Fwd ' button , the Camera view can be moved forward in steps given in feet measurements out to a distance of 80NM, the three negative steps are to allow viewing of bomb falls if the 'Weapons Package' is installed .
7. Stand Off -- Left and Right move the camera abeam , and were added to provide a feature or option for the pilot to use as desired.
8. These control functions can be used together to achieve a desired view.
Its versatility and variety are only limited by our imagination and inventiveness .
It is worthy of a little persistence and experimentation.

9. It can be demanding in single pilot operations , the actual F-111 has a WSO to share the workload. The 10 Reset buttons are a positive pilot aid.
It is recommended that the following be tried:
- Hit pause to allow time to make desired changes. or
- Engage autopilot with or without TFR to free pilot to make your changes.

10. RANGING. In a dive place the velocity vector on a target , say a house , then set Stand Off to 6,000' , when the house fills the Pave Tack screen your range is exactly 6,000' and its time to execute a pull up. For this to work accurately all other button parameters must read "0" .
11. The Pave Tack cannot see your own aircraft , it can see the cockpit and the effects such as, rotating beacons , exhaust , flares and dump and burn.
12. An interesting aspect is if flying towards an object , for example an aircraft either on the ground or airborne set the Stand Off at a figure past that aircraft then pan the relative bearing to 180 degrees and you will be looking at the other side of that aircraft .
13. The Stand Off feature is also useful when conducting Aircraft Carrier approaches.
14. It is important to remain aware of all button settings and their consequent influence , if you are aimed at a tower and zoom in , but the screen is showing a completely different scene , it may well be something as simple as the Stand Off right is set at say 12,000' , and as a consequence you are seeing scenery that is 12,000' to the right of your intended aimpoint .
15. A further addition to the Pave Tack is the DoF (Direction of Flight) arrowhead , this aids with orientation when the Pave Tack is panned about by the Relative Bearing buttons during flight.
16. Altitude in this instrument is a measure of 'up' displacement from the **current plane** of the aircraft , it is not an altimeter. If the aircraft is inverted, that measure is then in a downwards sense.

A DESCRIPTIVE EXAMPLE

In this example the aircraft is in level flight at 4,000'.
The first setting is Stand Off increase to 60,000 feet , this moves the Camera that distance directly in front of your aircraft . Then we set Stand Off right to 12,000 feet , this moves the Camera from its current position laterally to a location 12,000' to the right . Then we set Altitude to 15,000' , this moves the Camera up from its present position by that amount.The camera has now been moved from the pilots eyepoint at the aircraft, forward, then to the right, then up , to its current location . We can now point it in the direction that we desire to get the view that we might want ,for example , we turn it around by setting the relative bearing to 180 degrees.Then we tilt it downwards towards an object on the ground by setting the pitch to 45 degrees . We can now zoom in by the amount that we require to observe that object.
The sequence order of settings is irrelevant , as are the figures used above , it was just a description of the cameras movement and directional pointing relative to its origin at the aircraft.
Experimenting with the settings will clarify what they are achieving for you.

NOTE LIMITATIONS

1. This instrument will incur some degree of frame rate impact.
2. When setting Stand Off to large distances it may take the simulator a moment or two to load the Pave Tack screen scenery , suggest the Alt be popped up a few steps , then back down.
3. This instrument can cause transient confusion and disorientation which is only to be expected when you consider the complex spatial geometry that is being manipulated.
4. The pitch range is from 90 degrees down to 0 , then up to -90 degrees , please note there is no stop at 90 degrees down.

XX. The following information is important to understanding the principles underlying Pave Tack and its control and possible uses.

A. It is a sensor that we will call a Camera.
B. Its fundamental starting point is the Pilots Eyepoint in the aircraft.
C. The zoom function is the usual magnification of the current view.
D. **ALL the control buttons <u>move the camera</u> away from the standard reference point which is the Pilots Eyepoint.**
E. The Relative Bearing and Pitch actually only rotate and steer the camera regardless of its current location.
F. This ' pilots eyepoint ' is locked to the plane of orientation of the aircraft in Pitch ,Roll and Yaw.

The following applies to our concept of UP:
- Up in level flight = up.
- Up in 90 degree bank = horizontal
- Up in inverted flight = down

- Up in a absolute vertical climb = horizontal

All of the above applies to our Camera and its resultant views. This leads to interesting , but at times odd views. If flying at 2,000' and in a 45 degree dive and we have placed the Camera 10 NM ahead of our aircraft ..... Guess where the Camera is ? Correct , its a couple of miles underground ! Rather than being comical , these properties afford rich opportunities with a little thoughtful manipulation.

LOW LEVEL TARGETING AND BOMBING

Pave Tack "Run In" Reset button option
This is a low level targeting and bombing configuration which will be reasonably accurate in the height range 200' to about 700' AGL- above ground.
For Precision Fly at 500' to 550' AGL.
For convenience when conducting this bombing exercise both the " Reset Lo Bmb " and " Run In " buttons are in close proximity and near vertical alignment.

PROCEDURE:
For Precision Fly at 500' to 550' AGL.
Choose Flat level terrain.
Level flight with Velocity vector on or very near Horizon bar in HUD.
Having autopilot on helps.
Select " Run In " button to obtain optimum view.
From aircrafts current speed enter table below , chose applicable angle and enter that angle with the PCH (Pitch) button.
Fly accurately towards target , when crosshairs on target click " Droppable Objects " switch , then Click "Reset Lo Bomb" switch which is above the "Run In" button , your view will now be changed to the rear and down and you will see the bomb strike the target and explode.
Go back to "Run In" and proceed to your next target.

Following is ASI then degrees down:-

KIAS	PITCH DEGREES DOWN
350	22
360	21
380	20 - Default " Run In " setting.
400	19
420	18
435	17
460	16
485	15
510	14
545	13
610	12

Tested the "Run In" at 500' to 550' AGL .
Bomb placement accuracy is +/_ 20' , roads at right angles to the flight path used as targets during testing.

The default "Run In" button view is set at 20 degrees down which matches the 380 knot airspeed .
Check your current airspeed , enter table to determine optimum angle and enter that angle with the Pitch buttons , this adjusts the "Run In" button view crosshairs to provide accurate and precise targeting for that specific airspeed.

TABLE 1 - PAVE TACK CONTROL PARAMETER STEPS

1. ** STANDOFF

The Alt , Fwd and Abm all move the camera by the specified distance from the default position , which is the pilots eye point in the aircraft.

Alt - altitude.
Above A/C
0' 6' 100' 200' 500' 800' 2,000' 4,000' 6,000' 10,000' 15,000' 20,000' 28,000' 35,000'
Below A/C
-6' -100' -500' -5,000' -10,000' -15,000' -20,000' -25,000' -30,000'

Fwd - forward.
In front A/C
0' 3,000' 6,000' 10,000' 15,000' 20,000' 30,000' 40,000' 50,000' 60,000'
91,200' 121,520' 151,900' 182,280' 303,800' 486,080'
Behind A/C
-3,000' -6,000' -12,000'

Abm - abeam.
Right or Stbd of A/C
0' 3,000' 6,000' 12,000' 18,000' 24,000'
Left or Pt of A/C
-3,000' -6,000' -12,000' -18,000' -24,000'

2. ** STEERING

Both Pch and Brg are used to point the camera in any required direction, regardless of the cameras current location.

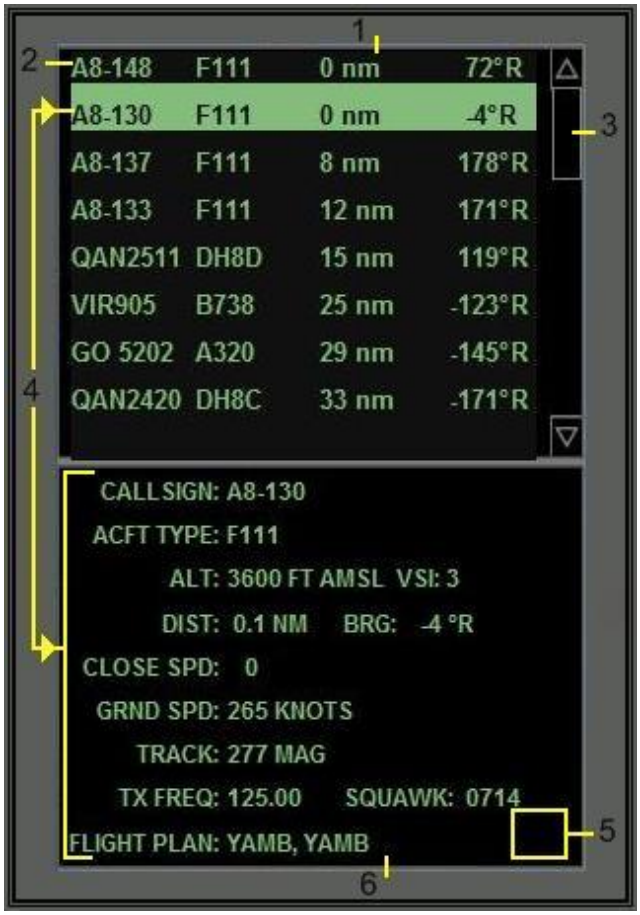
Pch - pitch.
From level 0 up 90 degrees
From level 0 down 90 degrees

Brg - bearing.
From nose 360 degrees either Right or Left

3. ** ZOOM

Is the normal magnification.
0.25 0.50 0.75 1.00 1.50 2.00 2.50 3.00 4.00 6.00 8.00 10.00 12.00 15.00
20.00 25.00

31. AI TRAFFIC HUNTER



1. Upper pane, scrollable AI aircraft listing.
2. User aircraft, the one being flown.
3. Scroll bar , single click or click and drag.
4. Selected AI aircraft, selected at upper pane, displayed at lower pane.
5. Close window hot spot, open window button on panel with Jerusalem cross.
6. Lower pane, displays the selected AI aircraft detail.

AI aircraft data instrument

1. Pop up window instrument.
2.Provides data on AI aircraft up to about 80 NM from user aircraft.
3. Lists AI on the ground , or in the air , or both.

USES:
Situation awareness , air to air interception , location of tanker aircraft, hostile aircraft alerting, fighter duties.
Can locate and home in on AI aircraft that are beyond visual range or hidden in clouds, simply turn till relative bearing is 0 or near 0, apply power to achieve a reasonable Closing Speed and climb or descend to AI altitude.

DESCRIPTION:
Comprises upper and lower panes.
Upper pane = a scrollable listing of aircraft starting with user
aircraft based on distance from that aircraft. Scroll is at right , is single click or click and drag.
3 rd column = distance
4 th column = relative bearing of AI, bearing basis is,
0 degrees = nose of user aircraft
minus values = left of nose
positive values = right of nose
180 degrees = behind user aircraft
Clicking any of 8 lines in upper pane selects that AI aircraft, the selected aircraft is highlighted in green, and the selected aircrafts details are then displayed in lower pane.
Lower pane = selected AI aircraft details.

EXTRA NOTES
1. With the radar on selecting a AI in this instrument is visually displayed as the AI turning red briefly, a neat indication.
2. Selecting an AI in this Hunter instrument does not nominate that AI in the radar.
To nominate an AI in the radar the usual steps must be taken, switch AA button, and click radar screen till required AI turns red, then that nominated AI's details will show up on both radar screen and HUD.
3. The advantage of the above is that you can be tracking a specific AI in the radar/HUD, and at the same time be independantly interrogating the AIs in the Hunter instrument.
4. The Hunter instrument by default lists 'all' AIs, both on the ground and airborne, however if the radar is ON then the radar controls the selection of 'air', 'grnd', 'all' , this selection can be varied for both the radar and Hunter by the forth button down on left side of the radar.
5.The Hunter is an ideal complement to the radar in the F-111 Pig HUD panel, it overcomes the clutter sometimes caused by the use of the radar TAG button.

32. WAAS

This instrument emulates the new WAAS (Wide Area Augmentation System) that basically provides horizontal and vertical navigation based on satellite signals rather than land based signals. This means horizontal and vertical navigation guidance to any runway at any airport in the GPS database regardless of the navigational equipment at the airport. You can use this gauge to make an ILS-like approach and landing to any runway in the database .

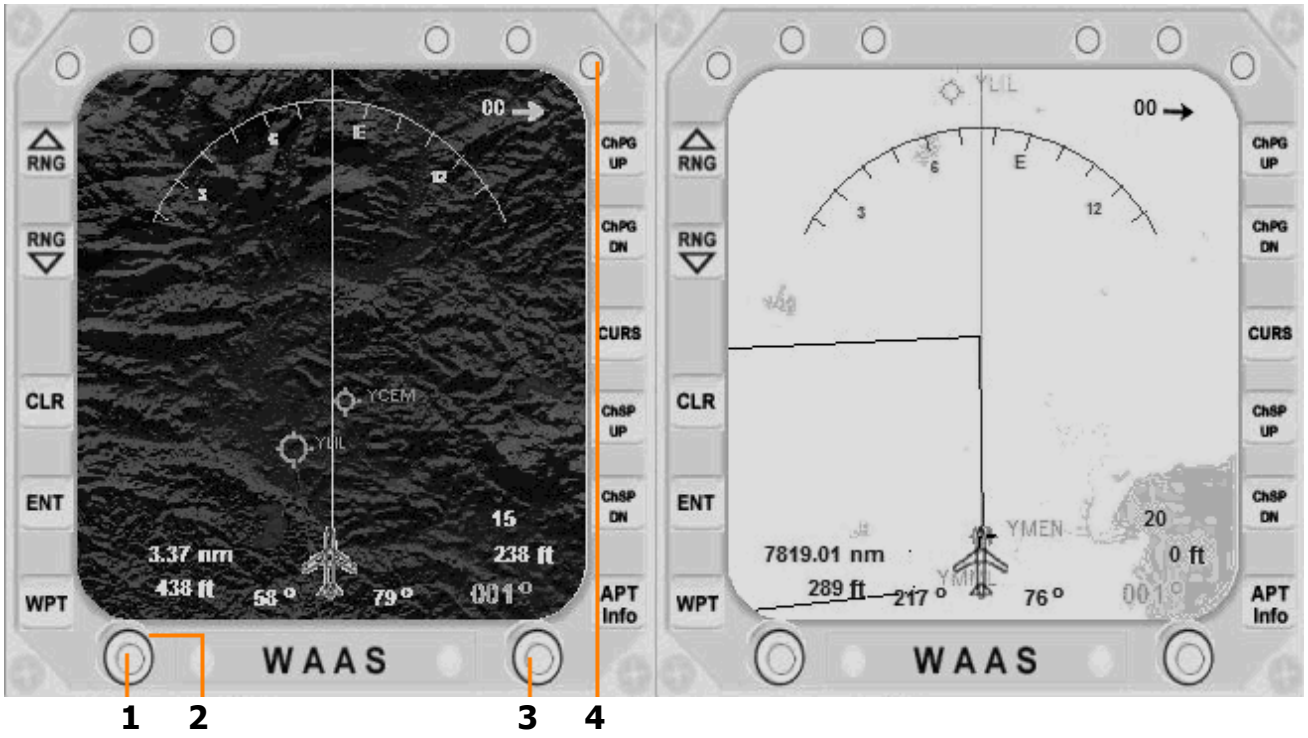
This instrument is similar to a GPS , additionally it enables ILS like landing approaches to airports that do not have NAVAIDS , ICAO code entry of airports , a ‘direct to’ capability . Most importantly it is compact enough to be permanently placed on the panel , a rather useful addition . Use it at all times .

Another feature is that FS Flight Planner flight plans are displayed on the screen , as well as 'Direct to'.

The zoom function has 19 incremental range settings ,providing screen coverage from 500 feet through to 500 NM .

It features a Darker screen for day/night flight or to contrast a flight plan when one is active , and a Terrain screen that generally requires 2-3 clicks of the dimmer .

It is recommended that the instructions covering its operation be read .



1. On / off switch
2. Screen dimmer
3. Guidance bars on / off
4. Compass rose

****

***** NOTE - IMPORTANT**************

DIRECT TO ON AUTOPILOT

SET

(A) ICAO ENTRY :

1. Set darker screen 2nd button top LH .
2. Click 'APT info' button bottom RH corner
3. Consecutive Clicks , 'ChPG up' , 'CURS' , 'ChSP up' buttons , ICAO info box on screen will blink .
4,Enter airport ICAO on keyboard .
5.Click twice 'ENT' button . The data on screen bottom LH side is now to the selected ICAO .

THEN SET

(B) DIRECT TO :

6. Click 'WPT' button , the ICAO will now blink .
7. Click twice 'ENT' button .

The entry has now been made , a flight plan line will appear on screen .

(C) THEN :

8. Autopilot ON .
9. NAV / GPS switch to GPS .
10. Click NAV hold in autopilot to ON .

The aircraft will now turn and head to the selected ICAO location . On arrival at the ICAO airport the aircraft will circle it endlessly until the autopilot is disconnected . All the time you need for a cup of coffee or whatever .

****

NOTES:

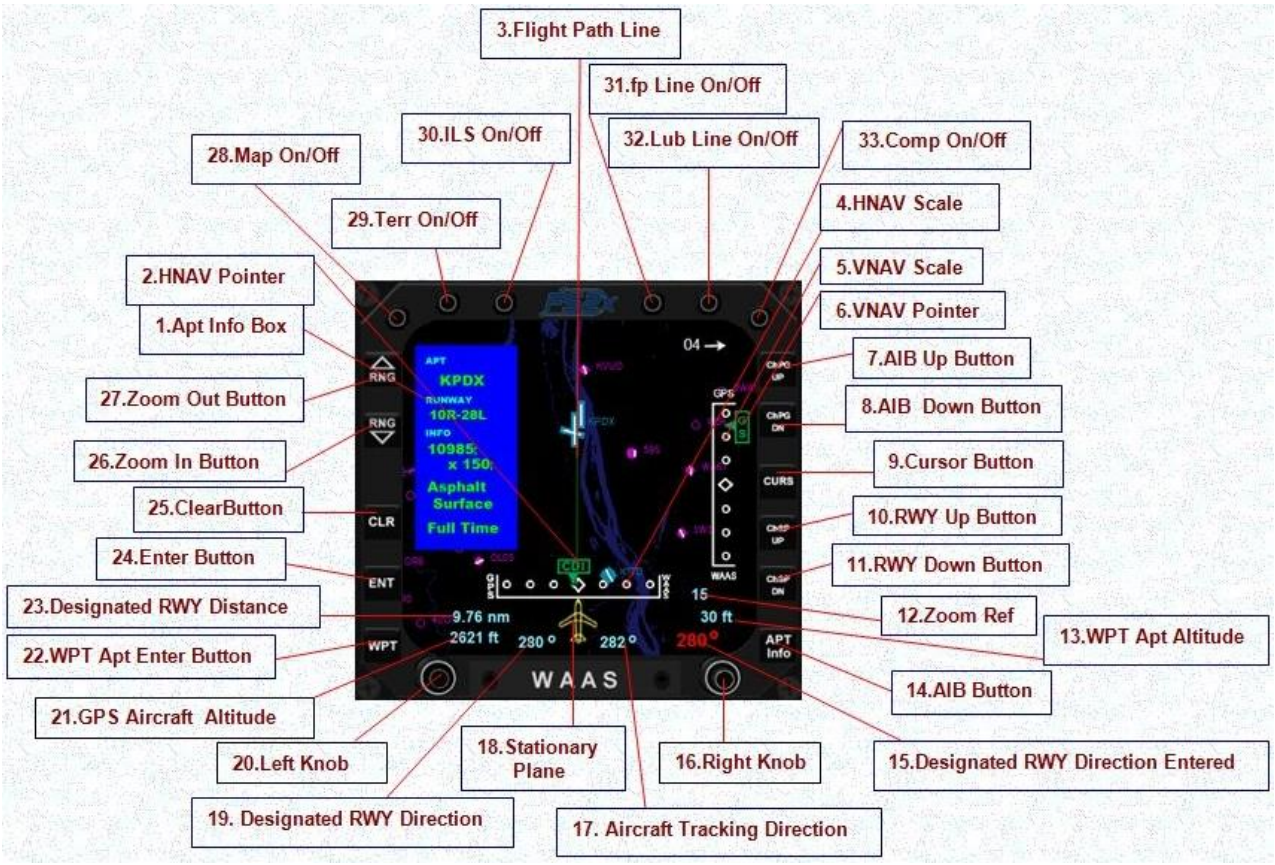
-- at any time the selected airport can be changed by repeating the above procedure , again and again , during any flight .

--extremely handy .... please use it frequently , both with and without autopilot selection . This is a very useful facility .

--use it in conjunction with 'NAV' or 'TGT' page of the LH Data MFD , which provides dist , time , etc. Also 'Data MFD which provides a range of info pertinent to flight to selected/entered airport .

-- it can also be used in conjunction with the TFR function .

33 . WAAS DETAILED USERS GUIDE



This WAAS gauge is not a copy of any known real WAAS gauge. It was designed to emulate the new WAAS (Wide Area Augmentation System) that basically provides horizontal and vertical navigation based on satellite signals rather than land based signals. This means horizontal and vertical navigation guidance to any runway at any airport in the GPS database regardless of the navigational equipment at the airport. You can use this gauge to make an ILS-like approach and landing to any runway in the database, including small private grass and water strips.

Definitions

1. Airport Info Box: A popup window that provides target airport and runway information based on user input. Turn display on/off by clicking on the AIB Button. The blue background disappears when the aircraft is within 5 nmiles of the target airport.
2. HNAV Pointer: Indicates the position of the aircraft relative to the target runway direction. If the pointer is left of center the aircraft is to the right, and if it is right the aircraft is to the left of the target runway.
3. Flight Path Line: Use this stationary line to line up the aircraft with the target runway displayed on the moving map.
4. HNAV Scale: Stationary scale used with the HNAV Pointer to indicate the position of the aircraft relative to the target runway latitude.
5. VNAV Scale: Stationary scale used with the VNAV Pointer to indicate the position of the aircraft relative to the glide slope.
6. VNAV Pointer: Indicates the position of the aircraft relative to the glide slope. If the pointer is above center the aircraft is below the glide slope, and if it is below center the aircraft is above the glide slope.
7. AIB Up Button: Used to display information on the Airport Info Box, and to toggle the cursor from airport choice to runway choice.
8. AIB Down Button: Used to toggle the cursor from runway choice to airport choice.
9. Cursor Button: Used to highlight data fields that can be changed by the user.

10. RWY Up Cursor Button: Used to scroll the cursor forward through runway choices. Also used to toggle moving map from north orientation to aircraft heading orientation.
11. RWY Down Cursor Button: Used to scroll the cursor backwards through runway choices. Also used to toggle moving map from aircraft heading orientation to north orientation.
12. Zoom Ref: A reference value in nmiles used in zooming in or out. The lower this number the more zoomed in, and visa versa when the number is high.
13. WPT Apt Altitude: Displays the altitude of the next active WPT in feet ASL.
14. AIB Button: Click on this location to display or hide the popup Airport Info Box.
15. Designated RWY Direction Entered: Actual direction of the designated runway in degrees not rounded off.
16. Right Knob: Used to enter the designated Runway direction in degrees, and to toggle the Flight Path Line, and HNav and VNav scales and needles on and off.
17. Aircraft Tracking Direction: Direction the aircraft is moving over the ground.
18. Stationary Plane: A stationary plane used to represent the actual aircraft.
19. Designated RWY Direction: Direction of the designated runway from the current aircraft position in degrees.
20. Left Knob: Turn the unit on/off, and adjusts the brightness level of the screen.
21. GPS Aircraft Altitude: Displays the current aircraft altitude in feet ASL.
22. WPT Apt Enter Button: Used to enter desired waypoint. This button has a function very similar to a 'Direct-To' function in the GPS. Setting the wpt with this button also sets the wpt in the GPS.
23. Designated RWY Distance: Displays the distance to the target runway in nmiles.

24. Enter Button: Used to enter user chosen data on the pages and sub-pages. Click on this button until the cursor rectangle disappears.
25. Clear Button: Used to clear data entered.
26. Zoom In Button: Used to zoom in on the moving map.
27. Zoom Out Button: Used to zoom out on the moving map.
28. Map On/Off Button: Used to add/remove the background map. Map on by default.
29. Terr On/Off Button: Used to switch between the background map and terrain views. Map on by default.
30. ILS On/Off Button: Used to add/remove ILS markers. Off by default.
31. fp Line On/Off Button: Used to add/remove the flight plan line. Line on by default.
32. Lub Line On/Off Button: Used to add/remove the lubber line. Line on by default.
33. Comp On/Off Button: Used to add/remove the compass. Compass off by default.

Instructions

As noted above, this gauge provides both horizontal and vertical navigation guidance for landing at any airport in the GPS database using GPS input only.

The target airport/runway must be set as the 'destination' waypoint. This can be done using the WPT Airport Enter Button or set directly in a GPS unit using the Direct-To button and then designating the target runway.

Vertical navigation is provided in a typical ILS manner with a pointer that moves vertically over a fixed scale to indicate the position of the aircraft relative to the glide slope.

Horizontal navigation is provided in a typical ILS manner with a pointer that moves horizontally over a fixed scale to indicate the position of the aircraft relative to the runway position and alignment. In addition, horizontal reference is provided using the 'Flight Path Line'. The idea is to align the aircrafts flight path with the target runway displayed on the moving map. The map can be zoomed in or out to show the target runways position and orientation.

A popup window is available that displays the user chosen airport, runway, runway length and width, surface type, and available lighting at any user chosen airport by clicking on the AIB Button.

The zoom buttons are very helpful for successful horizontal navigation.

Using the autopilot during approach is highly recommended.

Typical Use:

1. Turn on the unit by clicking on the middle knob of the 'Left Knob'.

2. Set the target airport and runway to the desired setting.
   To enter the wpt apt and target runway using the WAAS:
   1. Click on the 'AIB Button' button to display the 'Airport Info Box'.
   2. Click on the 'AIB Up Button'.
   3. Click on the 'Cursor Button' to highlight the apt name in the info box.
   4. Click on the 'RWY Up Button' to start entering data.
   5. Use your keyboard to enter the desired wpt apt.
   6. Next click on the enter button to enter the apt choice.
   7. Click on the 'WPT Airport Enter Button' and then 2 times on the Enter Button. The apt is now set to that entered (also set in a GPS as a 'direct-to' function).
   8. To set the correct runway, first click on the 'Cursor' button to highlighted the apt wpt. Then click on the 'AIB Up Button' to scroll the cursor to the runway line in the 'Apt Info Box'.
   9. Next click on the 'RWY Up Button' to display a popup listing the available runways at the wpt apt. Keep clicking on the 'RWY Up Button' until the desired runway is highlighted.
   10. Click on the Enter Button 2 times to enter and set the highlighted runway. (*note: you can enter the desired runway following step 6 by clicking on the AIB Up Button while the apt name is highlighted and then click the RWY Up Button. Use the RWY Up or Down Button to select the desired runway. Next click 1 time on the enter button, once on the 'WPT Airport Enter Button' and then twice on the Enter Button. This enters the choice of airport and runway at the same time.)
   11. If you have trouble, click on the CLR button and start again.

3. Set the actual direction of the target runway using the Right Knob.
   To enter the Designated RWY Direction value in degrees use the 'RightKnob':
   1. Click on the upper right or upper left side of the right knob to place the red rectangle background over the digit you want to change. Click on the lower right or lower left to enter the desired number into the highlighted digit. Continue to click on the upper part of the Right Knob until the rectangle moves off to the right or left and is gone.

4. Horizontal navigation:
   1. Maneuver the aircraft so that its flight path is aligned with the target runway using the HNAV needle and scale (i.e., center the HNAV needle on the HNAV scale).
   2. Also use the green Flight Path Line extending from the Stationary Plane to make the alignment. When the green line is directly on top of, and in the exact same direction to, the target runway the aircraft is heading in the right direction.
   3. Use the 'zoom in' function to keep the target runway on-screen as the aircraft gets nearer the runway.

4. Set the autopilot heading hold function to the current heading.

*Note: Sometimes the runway numbering does not match the actual runway direction. For example, according to the heading indicator Rwy25 at KDEN is actually 259, not 250 degrees. One or 2 things can be done.

1) set the designated runway direction to the actual runway direction, in this example 259 degrees, or
2) if you don't know this number, line up the green Flight Path Line with the runway on the moving map and then change the designated runway direction with the Right Knob until the HNav needle is centered on the scale.

5. Vertical navigation:
   1. Adjust the aircraft altitude so that the VNAV Pointer is positioned in the center of the 'VNAV Scale'.
   2. When the VNAV pointer is centered, set the autopilot altitude hold value to 100-200 feet AGL and the descending vertical speed value to 500 or 600 ft/min.
   3. Keep the pointer centered by making adjustments to the vertical speed.

6. Keep the HNav needle centered on the HNav scale and the green line directly on top of the target runway, and the VNAV pointer centered on the VNAV scale, and you will end up at to the start of the target runway.

7. The Clear button can be used at any time to remove the cursor and clear data entry.

SECTION II

Normal procedures -

1. START PROCEDURE

(From a dark and cold condition – every thing off)

1. Click on little aircraft/throttle icon , located on lower LH canopy frame member to access switches
2. Ensure 'ENG' button selected on RH MFD . Note the location of N2 on that screen .
3. Battery ON
4. Rotating beacon ON

(A) LH Engine	THEN >>>	(B) RH Engine
5. Fuel ON	^	Fuel ON
6. Gen ON	^	Gen ON
7. Start ON , observe N2	^	Start ON
As it passes 20% engine will fire ,	>>>>--^-	

8. Monitor engine parameters .
9. Navigation lights ON
10. Avionics ON .
11. Exit throttle/switches window by clicking icon .

2. PANEL ACTIVATION PROCEDURE

AFTER ENGINE START OR BEGINNING SIM WITH STARTED AIRCRAFT FROM SAVE FLIGHT FACILITY .

The following procedures activate the panel in preparation for takeoff , some variations will be made to suit the individual , but are generally standard .

1. Clock PWR ON .
   --- If flight elapsed time/duration required – click timer '1' , then green start button ,then either 'L' or 'Z' to get back to normal clock – timer will operate in background and can be Accessed at any time by clicking '1' .
2. Select HUD colour --preferably white -- in HUD control head click 'CLR' to cycle to colour required , and then 'ALT' , this will configure Radar Altitude on HUD .
3. On SALS, (Satellite Assisted Landing System) click 'P' to power up unit , 7 nearest airports will show , click down arrow to scroll list , then enter for highlighted airport detail , then enter again to get ILS like instrument for landing approach guidance , click 'C' to go back to list .
4. WAAS instrument , well worth using , even if only as a moving map .
   A. Click centre of LH bottom circular button for ON switch .
   B, Click centre of RH bottom circular button , if horizontal and vertical guidance bars are to be cleared from screen.
   C. Click top extreme RH circular button to add compass rose .
   D. Map can be zoomed out to 500 miles , very handy . Zoom is 'RNG' near top LH .
5. WINGS/FLAPS . --- Set wing sweep to 16 degrees .
   --- Set flaps to 25 degrees .
6. On either of the MFD units , click FREQ button , check and set frequencies on radios as required .
7. If required , at LH MFD NRST button select airport of departure or as required to display on HUD .
8. LH MFD select PFD button .
9. RH MFD select ADI button .
10. Ensure 'E-TRIM' is set at 0.8 for takeoff .

…….. Aircraft is now ready for takeoff …….

3. TAKEOFF PROCEDURE

1. Wing sweep set 16 Degrees .
2. Flaps set 25 Degrees .
3. Release brakes .
4. Smoothly advance throttle fully forward to full afterburner .
5. At 15 knots below rotate speed of 140 kts , initiate back stick pressure .
6. Takeoff 160 kts
7. When airborne retract undercarriage . (Virtually Immediately)
8. Retract flaps fully and set wing sweep to 26 Degrees . (3 clicks down)
9. Reset elevator trim
10. Position stick to achieve up to 10 degrees pitch on the HUD pitch ladder . Angle of Attack up to 8 to 10 Degrees acceptable , not to exceed 10 Degrees . (or as required)
11. Accelerate to 350 knots and reduce power to below 90 % . Set as required .
12. Trim as required .

4. LANDING PROCEDURE

1. **CIRCUIT ENTRY .** Deaccelerate to **300** knots or below prior to joining circuit .
2. Set wing sweep to **16** Degrees when below **330**kts .
3. Extend landing gear and slats at **295**KIAS or less .
4. On down wind leg , reduce thrust to obtain **250** KIAS or below .
5 . Do not deaccelerate below **240** KIAS prior to full extention of L.E. Slats . (slats extention is represented by red barred window on the flap gauge)
6. Flaps should be extended by a two step procedure;
   - First , extend flaps to **25** degrees when at **250** or below .
   - Continue to slow aircraft to approximately **220** KIAS and lower flaps full down to **34** degrees .
7. Trim aircraft progressively as required .
8. **FINAL .** Reduce speed to **160** KIAS and continue approach to landing .
9. **SHORT FINAL .** Prior to touchdown , on very short final reduce speed to **125** to **150** KIAS .
10. Do NOT flare at touchdown , maintain constant attitude till runway contact .
11. Thrust to idle on touchdown .

ALTERNATE PROCEDURE

Onspeed or constant Angle of Attack final approach can be made , this precisely allows for varying aircraft gross weights , the attitude is flown , not the airspeed , thrust is used (in very small adjustments) to adjust the approach .

Two instruments on the panel , either or both , can be utilized to execute this type of approach ,
(A) The AoA , Angle of Attack Indexer mounted on the glareshield OR
(B) The large capital 'E' shaped indexer that appears on the HUD when gear is down and airspeed reduces sufficiently .
Of these 'B' is more accurate , easier to use and more intuitive .

1. On final with airspeed at 160 KIAS and decreasing , the objective is to set the attitude to achieve :
   - Green donut displaying constantly in centre of AoA indexer .
   - Keep the small wing of the Velocity vector next to the central horizontal bar of the 'E' indexer . (to maintain runway view , the lower indexer bar is a better option)
2. Decrease speed below 160 , with the gear down , the 'E' indexer will appear ,continue to decrease Power/Airspeed until :-
   - FINAL ... velocity vector wing is next to lowest horizontal bar of E indexer .
   - SHORT FINAL/TOUCHDOWN ... velocity vector wing is next to middle horizontal bar of E indexer .
2. Adjust pitch / power to achieve and maintain the above .
3. Adjust power to achieve glideslope to the runway.

EVEN EASIER ---raise or lower the nose to place the Velocity Vector on the runway (at a point at far end of runway) ----- keeping the Velocity Vector constantly on your aimpoint , now , decrease or increase power slightly to get the 'E' to align with the velocity vector , once its aligned adjust the power as necessary to keep it there , do this all the way till touchdown .

SO what was that again ??
1. Velocity vector on runway aimpoint .
2. 'E' indexer on Velocity Vector .

****
By the way …….. approaching to land …????? NO ' E ' INDEXER …. !!!!!!!!

******LOWER YOUR GEAR >>>IT WILL APPEAR ……

GREAT REMINDER THAT.
****

******* **WARNING** ******
1. In the above text it was stated that the Velocity Vector be placed on the runway .
That is incorrect it should be positioned just above the far end of the runway and the VASIS lights or threshold should be just in the outside field of view above the glareshield .
The reason being , this panel setup allows errors to become apparent at slow approach speeds .
2. On approach to the runway , the airspeed will be initially 160 kts .
Then at about 7 NM from the threshold transition to ONSPEED .
Most of the final approach should be conducted with the velocity vector wings next to the lower horizontal bar of the AoA indexer E . At short final transition to the velocity vector wings being next to the middle horizontal bar of the AoA indexer E for touchdown.

******* **ONSPEED** *****
The underlying principles are described in , Angle of Attack .

Basically you do not fly the approach by reference to a 'set' airspeed .
Rather , the Angle of Attack is the determining factor .
This is provided by the **' E ' Angle of Attack indexer** on the HUD .
The 3 horizontal bars on the ' E ' represent an acceptable range .
Top bar - very slightly slow .
Middle bar - exactly ' onspeed ' .
Lowest bar - very slightly fast .

This configuration is attained when the small wings of the velocity vector are horizontally next to the given bars of the ' E ' indexer . It is a graphical representation .

What you are achieving is that this E indexer - velocity vector relationship will provide the correct lift for your aircrafts current weight .
Therefore when 'onspeed' with this graphical presentation in the HUD , you will notice that , the greater the aircraft weight , the greater the airspeed .

The lowest bar is used on final , to give a small safety margin .

5. ZERO - ZERO VISIBILITY APPROACHES

1. In preference utilize ILS guidance .
Where no ILS facilities exist for approaching runway .
2, Utilize the . SALS, (Satellite Assisted Landing System)/GPS instrument near the bottom right of the panel .
OR
3. The WAAS instrument top right of panel.

Both of these instruments can provide runway approach guidance similar to that given by ILS .
Instructions for operation of both instruments are included in the included DOCS Folder .

6 . GLIDESLOPE DISTANCES

Final approaches to land utilizing ILS radio navigation aids guidance are made at a 3 degree downwards slope .
The following list details the horizontal distance covered from various heights above the runway threshold during that 3 degree glideslope .
Basically it gives an idea of when to commence the 3 degree descent .

HEIGHT	DISTANCE
1000'	3.14 NM
2000'	6.28 NM
2500'	7.85 NM
3000'	9.42 NM
4000'	12.55 NM
5000'	15.69 NM
6000'	18.83 NM
7000'	21.97 NM

NOTE 1 : The above are heights above the threshold , to determine altitude add the ground elevation of the airport to the height .

Airport elevation can be determined from (A) a chart or plate (B) in the Nearest airports , airports detail page of LH MFD (C) the SALS -Satellite Assisted Landing System instrument towards the lower right of the panel , but the airport must be selected by clicking the enter button twice , see the instruments notes in DOCS folder .

Distance to the threshold are best obtained obtained from the same instrument (SALS) as it measures to a point 5% down the length of the runway that you are approaching , ie ; about your touchdown point.
Other instruments such as the HUD ,GPS and ADI give distances to points such as NAVAID antennas and Aerodrome reference points which are scattered about the airport and are sometimes several nautical miles past the touchdown point .

The SALS instrument is by Glenn Copeland , it is well worth having it on during ILS approaches and becoming aquainted with its operation . This instrument enables you to conduct an ILS like approach at airports that do not have radio NAVAIDS. , very handy to say the least .

7. ANGLE·OF·ATTACK.

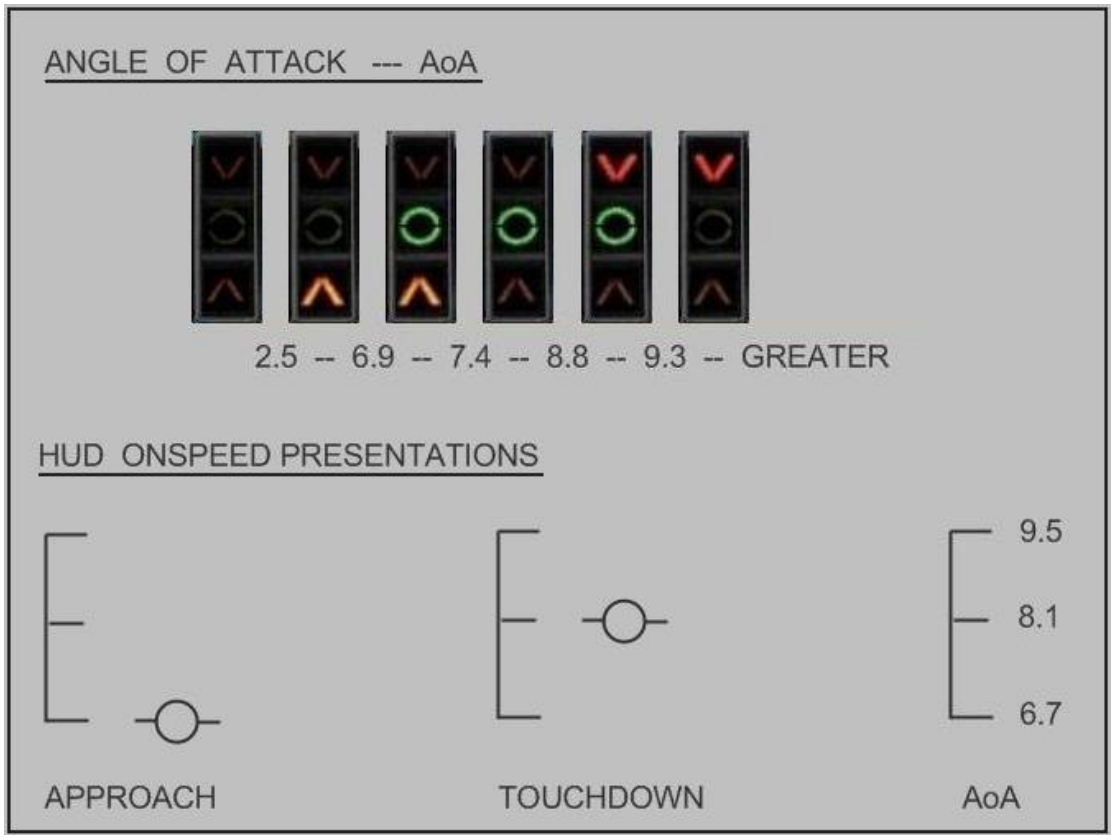
The angle-of-attack indication system provides an indication of the angular position of the wing chord in relation to the aircraft flight path. Angle-of.attack is of primary importance since, for a given aircraft weight and airspeed, sufficient lift can be generated to maintain one "g" flight only at a particular angleof-attack. That is, lift is a function of airspeed and angle-of-attack. Thus, at one "g" flight if airspeed is held constant, angle-of-attack will remain constant. If airspeed decreases, angle-of.attack must increase if one "g" flight is to be maintained. Conversely, if airspeed increases, angle-of-attack must decrease to maintain one "g" flight. This direct relationship of angle.of attack and airspeed with lift allows angle-of-attack to be used in place of airspeed. Angle-of·attack can be held constant and calibrated airspeed will remain relatively constant varying in proportion to gross weight but remaining essentially independent of altitude. Further, rate of descent or climb can be controlled by power changes and airspeed will remain constant as long as angle-of.attack remains constant . During normal landings, the recommended approach is 8.1 degrees angle-of-attack regardless of gross weight. The **angle-of-attack indexer** is programmed so that the **onspeed** symbol is lighted in the range of 7.4 to 8.8 degrees .
Note : The actual F-111 onspeed is 10 degrees instead of 8.1 , however 8.1 is utilised in this panel

8. TABLE OF ONSPEED AIRSPEEDS

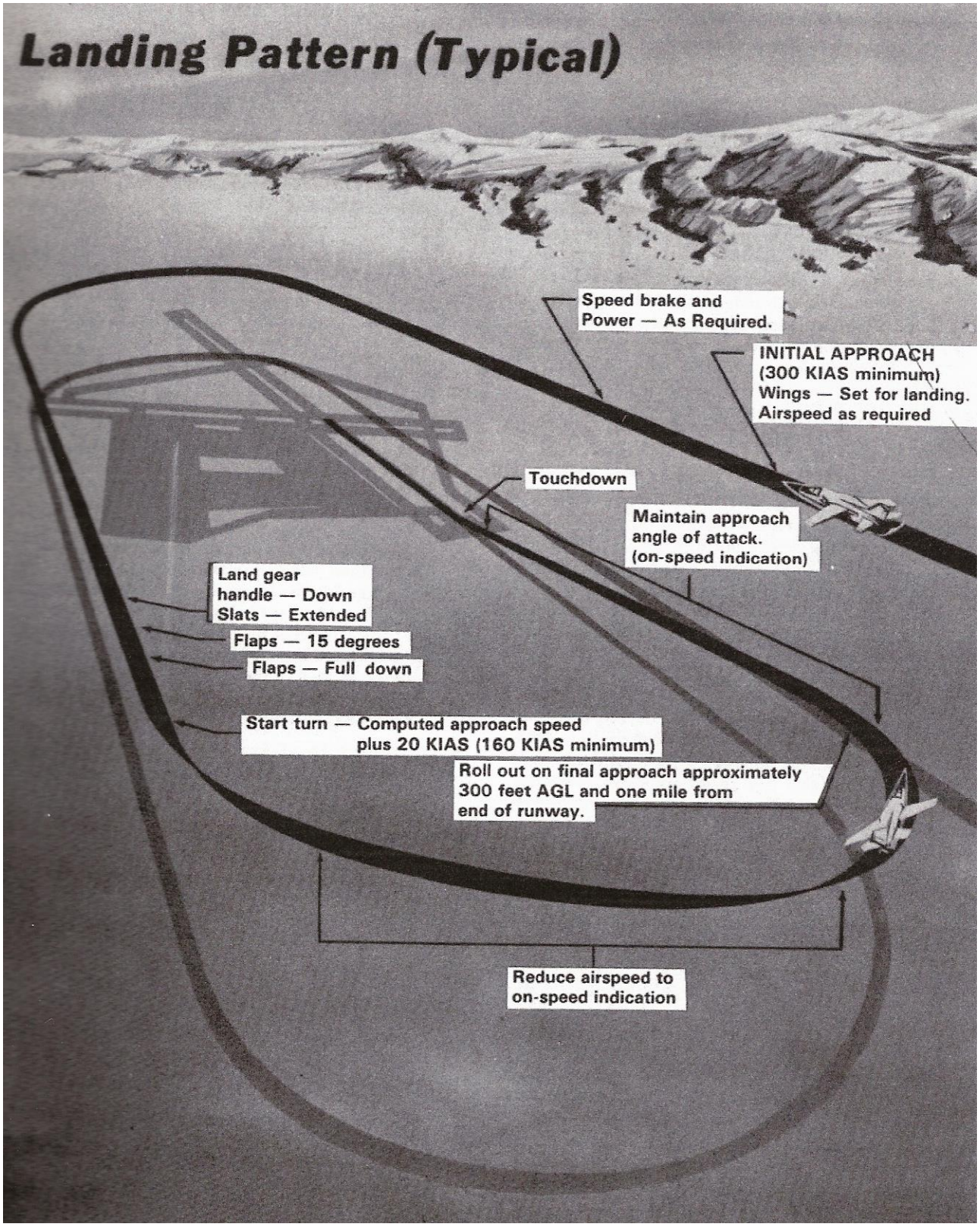
The following table lists both approach and touchdown airspeeds for given total fuel percentages and weights , as well as the applicable aircraft weight .

FUEL %	FUEL WEIGHT	AIRCRAFT WEIGHT	APPROACH IAS	TOUCHDOWN IAS
16	5,420	68,290	126	121
24	8,050	70,940	128	123
32	10,650	73,540	131	125
39	13,200	76,100	133	127
48	16,170	79,050	136	130
58	19,400	82,250	139	133
66	22,230	85,100	142	135
73	24,750	87,630	144	137
82	27,750	90,640	145	139
93	31,470	94,350	149	142

The Navigation and general data MFD instrument in the lower right corner of the panel displays current Aircraft and Fuel weights , together with the percentage of fuel remaining .
It is shown on the MISC page by activating the final button .



9.


Landing Pattern (Typical)
Speed brake and
Power — As Required.
INITIAL APPROACH
(300 KIAS minimum)
Wings — Set for landing.
Airspeed as required
Touchdown
Maintain approach
angle of attack.
(on-speed indication)
Land gear
handle — Down
Slats — Extended
Flaps — 15 degrees
Flaps — Full down
Start turn — Computed approach speed
plus 20 KIAS (160 KIAS minimum)
Roll out on final approach approximately
300 feet AGL and one mile from
end of runway.
Reduce airspeed to
on-speed indication

10.

Approach Speed

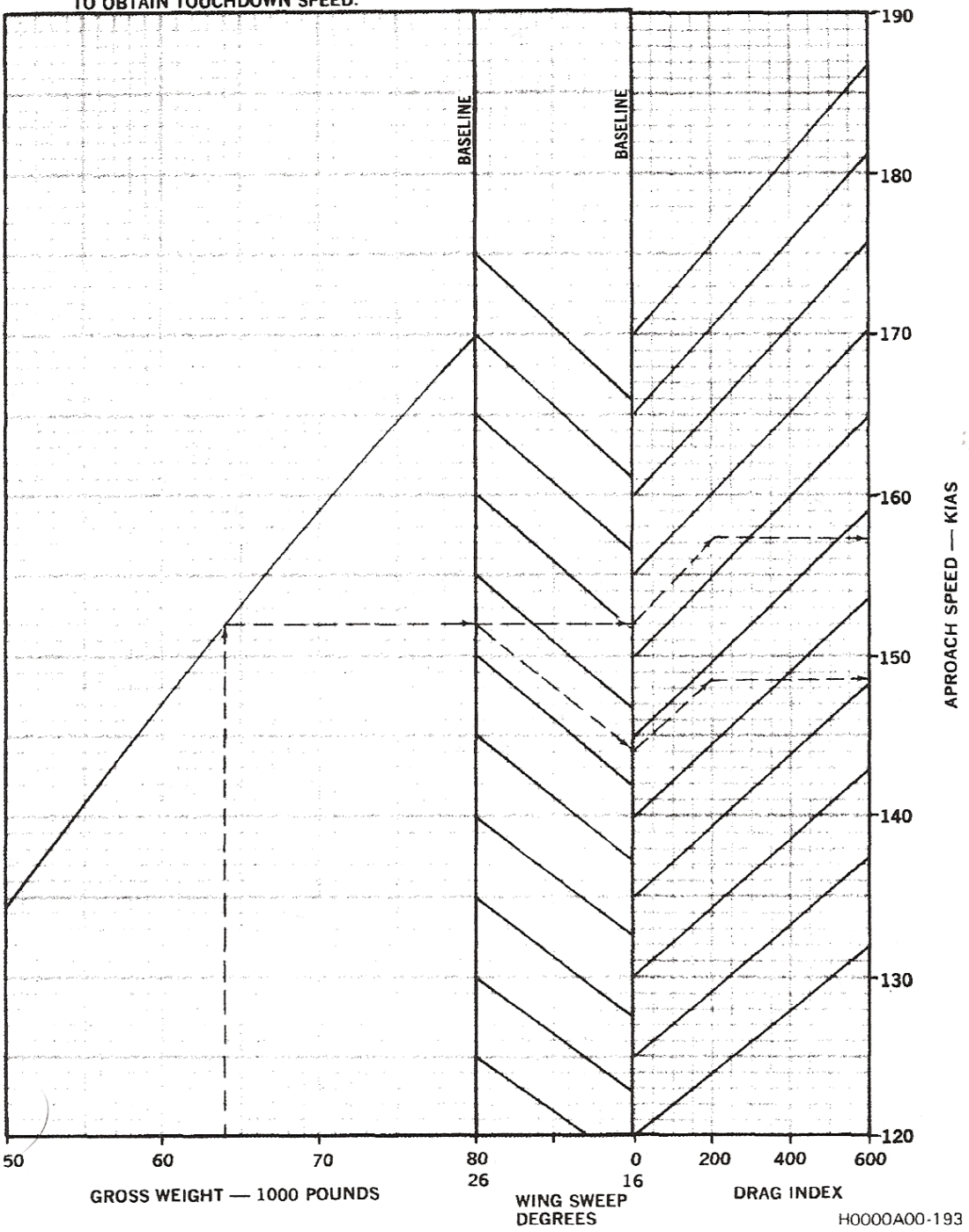
DATA BASIS: FLIGHT TEST
DATE: 25 MARCH 1977

CONFIGURATION:
- FULL FLAPS AND SLATS
- 16 TO 26 DEGREES WING SWEEP

CONDITIONS:
- INDEXER = 10 DEGREES WING ANGLE OF ATTACK
- CG AT MOST FORWARD ALLOWABLE POSITIION

FUEL GRADE: JP-4
ENGINES: TF30-P-100

NOTE: DECREASE APPROACH SPEED BY 5 KIAS TO OBTAIN TOUCHDOWN SPEED.



11. PRECISION TURNS

(A) GENERAL LEVEL

At any altitude , even down to 200' AGL , with the airspeed at about 450kts bank the aircraft. Now in the HUD , KEEP the velocity vector exactly centred on the HUD horizon bar by applying an appropriate amount of back pressure on the joystick.
Note that the turn and bank ball in the PFD on LH MFD remains centred , also there will be no loss or gain in altitude . Be precise and smooth with the velocity vector .
Now continue increasing the bank till 70 degrees is reached , maintain the turn for at least one complete circle . Then smoothly roll the aircraft into a similar turn in the opposite direction . Do not tolerate even a 10' altitude change , with the HUD it is both possible and even easy . The HUD VSI will indicate even the very smallest trend away from level flight , thus enabling extreme accuracy .

Why do it ? (1) Simple , even in real world flying two consecutive steeply banked (60 degree bank) figure eights blow away the cobwebs , dispense with the pilots natural reluctance to assume unusual attitudes and a steep turn forces the pilot to be accurate and precise . Done at a safe height a very good skill and confidence builder.

(2) Precision , Accuracy and smoothness are the hallmarks of flying skills . They are what we all must constantly strive to improve and achieve .

(B) CLIMBING AND DESCENDING TURNS

Obviously the velocity vector will no longer be on the horizon bar , so to achieve a balanced turn apply stick back pressure needed to keep the ball centred in the turn and bank indicator .

(C) LOW LEVEL TURNS

When flying between trees and turning to fly through a gap in trees ahead , try to develop an appreciation of the rate at which the velocity vector sweeps over the scenery to judge the amount of bank required , and when to stop the turn accurately aligned with the required gap .

NOTE : Rudder use can and should be completely dispensed with when flying the aircraft , except for taxi , landing ,takeoff and to achieve odd special effects . To turn the aircraft , use bank combined with a balanced amount of pull on the joystick , refer to the turn and bank ball to achieve balance .

12. RATE 1 TURNS

The standard rate of turn in IFR instrument flying is a 3 degree change of heading per second .
Resulting in the following 'timed' heading changes:-

90	degrees	in	30	seconds	
180	"	"	60	"	= 1 minute
270	"	"	90	"	
360	"	"	120	"	= 2 minutes , as seen on Turn and Bank indicators .

The Rate of turn is a function of airspeed and bank , it is estimated as follows :

AoB = Divide airspeed by 10 , then add one half the answer .

Example for 400KIAS.

$$AoB = \frac{400}{10} + \left[\frac{1}{2} \times \frac{400}{10} \right]$$

$$= 40 + 20$$

$$= 60 \text{ degrees}$$

The following Table provides data relevant to RATE 1 turns in the F-111 .
It lists data for straight and level (**S/L**) and then data for when stabilized in the Rate 1 turn (**TURN**) .
The data was compiled in FS9, in flight at an altitude of 4000' . Whilst the figures have not been verified in FSX they should still represent a very good guide .

Example:-
From the table below , in level flight at 350 knots with wing sweep at 26 degrees commence turn by smoothly banking with aileron to 52.5 degrees , increase power from 58 to 65% and increase trim from 0.5 to 3.1 , maintain bank angle , and keep the velocity vector on the horizon bar . If a 180 degree 'U turn' is required , hit start button on timer at start of turn , and ensure a smooth rollout to wings level exactly as timer reaches 60 seconds . You are now on the reciprocal of the initial heading . Setting the heading bug on the ADI prior to commencement is a helpful cross check .

13. TABLE OF RATE 1 TURNS

CONDITION	KIAS	AoB	PWR %	TRIM	WING	Gs	AoA
S/L TURN	**200** "	**30**	61 64	0.8 2.9	16'+flap25' w/o gear	1.0 1.1	0.4 1.1
S/L TURN	**200** "	**30**	64 66	0.8 2.7	16'+flap25' w. gear	1.0 -	0.4 1.8
S/L TURN	**300** "	**45**	54 62	1.0 3.3	26' "	1.0 1.4	1.7 3.3
S/L TURN	**350** "	**52.5**	58 65	0.5 3.1	26' "	1.0 1.6	0.7 2.6
S/L TURN	**400** "	**60**	61 67	0.2 3.3	26' "	1.0 2.0	0.0 2.4
S/L TURN	**450** "	**67.5**	66 75	-0.1 3.8	26' "	1.0 2,5	-0.6 2.6
S/L TURN	**450** "	**67.5**	65 74	0.3 4.1	38' "	1.0 2.5	0.1 3.2
S/L TURN	**500** "	**75**	72 86	-0.2 5.0	26' "	1.0 3.5	-1.1 3.8
S/L TURN	**500** "	**75**	69 87	0.1 5.4	38' "	1.0 3.7	-0.3 4.1
S/L TURN	**500** "	**75**	69 87	0.3 5.5	47' "	1.0 3.8	0.2 4.8
S/L TURN S/L TURN S/L TURN S/L TURN S/L TURN	**550** " " " " " " " " "	**82.5**	79 97 74 97 73 97 73 97 73 97	-0.4 8.2 0.0 8.7 0.2 8.9 0.4 9.0 0.7 9.4	26' " 38' " 47' " 58' " 72.5' "	1.0 7.0 1.0 7.1 1.0 7.1 1.0 7.1 1.0 7.1	-1.4 5.7 -0.6 6.5 0.0 7.0 0.5 7.4 1.1 8.1

14. APPROACH AT UNFAMILIAR AIRPORT

1. On LH MFD , select NRST button.

2. The 16 nearest Airports will be displayed, and any of these can be selected by a mouse click on the beginning of the relevant line.
OR
A. The ICAO button at the top LH side clicked/selected and the 4 digit ICAO code of a desired Airport entered with the keyboard.
OR
B. At the "<2000" (length of Runway title) mouse click and increase the runway length and thereby giving Airports further away, up to 250NM , but only those of the nominated runway length or greater.

3. The selected Airport will be displayed on the Airport detailed page with runway data.
It is possible to toggle between the 2 pages with the RH buttons.
NOTE 1 : only when the runway detail data page is selected will the DIST-BRG-STEERING ARROW be displayed on the HUD (effectively an on/off switch).
NOTE 2 : to change an Airport selection , go back to the "APT" page and make a new selection on that page.

However WITH that page (runway detail data) selected , it is possible to go back to MFD buttons PFD-NAV-FREQ-TGT and STILL have the selected Airport display visible on the HUD .

4. Relating HUD BEARING to ADI HEADING.
By turning the aircraft until the ADI heading matches the bearing of the selected Airport as displayed on the HUD , the aircraft will be accurately tracking to the Airport and the steering arrow will be pointing precisely to the top of the screen.

5. From the Airport detail data page NOTE the required Runway Number , that will provide a reasonably accurate (+/_ 5 degree) extended runway centre line heading.

6. For a normal circuit , track to Airport, and join circuit as per usual procedures.

7. For a straight in alignment approach the following procedure applies.

8. Depending upon the runway chosen , turn the aircraft several degrees left or right of the bearing to the Airport displayed on the HUD .
Maintain this heading and OBSERVE the HUD arrow and bearing as they change.
IMPORTANT: When the HUD bearing coincides/matches the required extended runway centre line heading (SEE 5. above) you are on a direct straight in approach to the runway and a landing .
It is advisable to anticipate the runway heading by plus or minus about 10 degrees, and commence a progressive turn to align with the runway . (the final couple of degrees should be delayed until the HUD bearing actually becomes that chosen in 5 above …then promptly complete the turn to the runway centre line) .
Ideally , intercept the the runway extended centre line at an height of 2000-2500 AGL , and about 7-10NM from the Runway with the aircraft configuration set to that required for landing .
ie: speed reducing to near 160 kts , gear down and sweep/flaps set
.
9. Having aligned the aircraft with the runway , start the descent to land.
Position the HUD Velocity Vector on the runway ahead
At the top LH side of the HUD is a DIVE Angle indicating to 2 decimal places , ideally this should now display 3.00 degrees (ie: a 3 degree glideslope) .
Make the following corrections to get near 3.00:-
A. If DIVE angle LESS than 3 degrees….nose up (below glideslope)
B. If DIVE angle GREATER than 3 degrees…. Nose down (above glideslope)
Repeat until 3 degree Dive angle is achieved and a precise approach will be made.
Note: the SALS, (Satellite Assisted Landing System) / GPS instrument located lower right panel could be utilized as an alternative or complimentary procedure .

10. Regards the ICAO entry facility (2A above) , this is not restricted to nearest Airports. It has access to all 24,000 plus Airports in the flight simulator database , thus an Airport on the other side of the world can be entered and will display on both the MFD and the HUD .

15. TFR OPERATIONS

**** It is advisable to take the aircraft out to an area with very flat terrain and experiment with the TFR and AUTOPILOT , with both ON vary the autopilot hold button combinations and additionally change the figure settings in the different autopilot windows , specifically HDG , IAS , ALT and VSI .
Next try the same in gently rolling or undulating countryside , if an obstacle or mountain looms ahead use the heading hold window to change direction . With a 60 degree bank available to the autopilot a change of 20 to 30 degrees in that window results in a brisk change of direction .
**** With the TFR ON it is not possible to change the 'ALT' window , click TFR to OFF , make the required change in the ALT window , then click TFR back on .
**** Previously , in the description of the autopilot at item 9 mention was made to the addition of the TFR command height to the ground elevation and the sum of these two being displayed in the 'ALT' window of the autopilot . This feature can be turned to our advantage as follows . The aircraft is on TFR , with TFR set at 200' , a small mountain appears in our line of flight , click off the TFR , then click it back on , then off , then on , do this several times ending with the TFR ON , OBSERVE what has happened to the figure in the autopilot window !! A quick and easy way to reset the TFR .
***** It should be noted that the TFR in the flight sim has limitations . It does not look ahead . It reads only the changes in height directly under the aircraft , ie: radar altitude , hence it will never detect a cliff in front of it , and as a consequence fly straight into it . This is the reason for the usual cautions to set the airspeed as low as possible and the TFR set as high as possible .
While all that is inescapably true it is still possible to fly with the TFR set low and the IAS set high by actively interacting with the autopilot (eg: TFR 400 feet , IAS 400 kts) . Make the necessary changes in the autopilot windows to weave through passes in the smaller mountains and look for shallow uphill inclines that give the autopilot more time to react .

TFR LOFT / POP UP

When flying on TFR at a low terrain clearance height , eg: 200' , and a mountain looms ahead that the TFR will be unable to cope with , leave both the TFR and Autopilot active and ON .
At the E-Trim instrument 'click and hold down' the (+) to increase the trim setting value ,
the aircraft will pitch up , when you judge that the pitch angle is sufficient to clear the obstacle , release it , then click the 'Red 0' to reset trim value to 0.0 and thereby kill the climb .
The TFR-Autopilot will slowly return the aircraft to its original TFR configuration , if you wish to expedite the transition , click (-) with due caution .

16. TFR EMERGENCY PULL UP

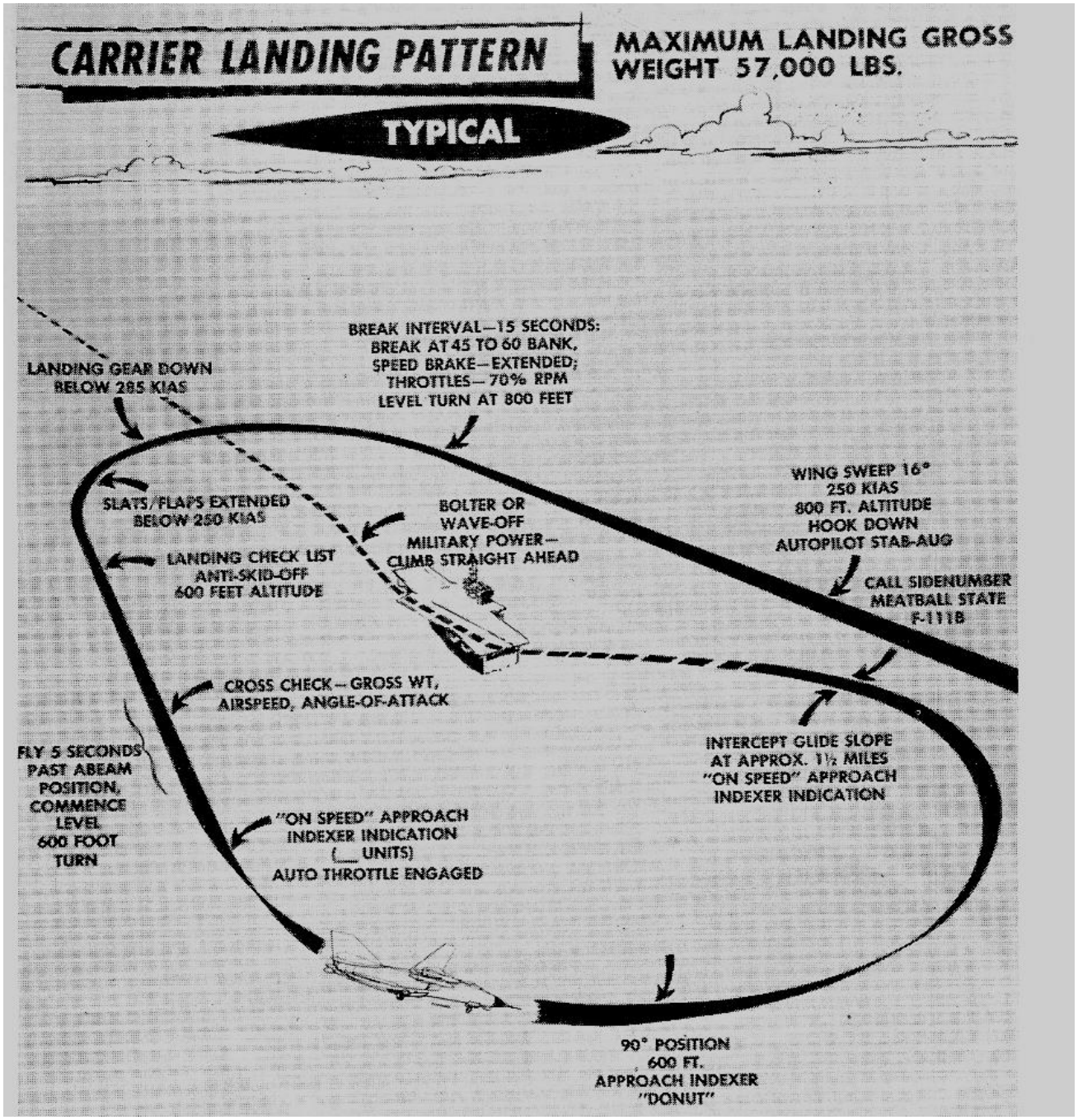
In the actual F-111 , bit test protocols check the TFR system , if a fault is detected it initiates an emergency pull up to a safe height .
To conduct this procedure load either a flight plan or direct to :
- Set TFR at 200' AGL (over a flat terrain)
- Set IAS at 400 kts
- Set GPS/NAV switch to GPS
- Set Autopilot and TFR to ON
- Set NAV in Autopilot

When the aircraft has stabilized in TFR-Autopilot flight :
- In the E Trim instrument ,click and continue to hold down the (+) hot spot , initially the trim setting will be reluctant to accept this input , after a second or two the trim setting will respond , allow the trim setting to rise to its maximum value of 15.0 , maintain the hold down .
- The aircraft will now pitch up dramatically .
- Observe the pitch ladder in the HUD , when it reaches either near or an absolute vertical climb , INSTANTLY click the Red 0 on the E Trim instrument to reset the trim setting to a 0.0 value .
- That's it !
- The vertical zoom will have given the aircraft sufficient height for the TFR-Autopilot to effect a recovery and progressively return it to it's original track and TFR clearance height .
- This can be initiated even if in a 60 degree banked turn .

NOTE : No control inputs are made during this procedure , The only inputs are via the E trim instrument . All control is done by the TFR-Autopilot .
A variation on the above is :
- When in the vertical zoom/climb , reset trim to 0.0 , pause a second or two to allow the aircraft to gain height . Then click E Trim (+) to 15.0 ,the aircraft will pitch up till it is inverted , click Red 0 and let the TFR-Autopilot do the recovery .

The preceding can be quite dramatic when viewed from outside .

17. AIRCRAFT CARRIER OPERATIONS



The following does not represent actual carrier procedures , but rather expands the circuit to allow time to configure the aircraft and then stabilize the approach to landing . When the pilot has become practiced and comfortable with the endeavour the circuit can be tightened and lowered .

Carrier landings are very intensive and hard .

When all does not go as desired it is not cause for concern or discouragement , just persevere and slowly it will improve , mind you it will still be hard !

It is recommended that no more than six consecutive circuits be conducted in any one session , a break is needed as no improvement will be made trying more . It just gets to being an overload .

Hint: arrest any deviation from desired approach smoothly , but quickly (ie; at the very , very earliest) .The deviations tend to add together and make later phases frantic and messy . Remember you are in command , and in carrier operations especially you have to exercise that command over both the aircraft and its flight path .

NOTE :- The moving FSX default carriers do not have either ILS or ICAO designated . However 'CARRIERS 2006' (freeware) does and can be installed in both FS9 and FSX , these carriers have radio NAVAIDS allowing ILS approach guidance also useful in locating the carrier when it is in radio range . The zoom function of the WAAS GPS map also helps in that regard as does the NRST function and Radar .
Aircraft carriers available : (carr2006.zip from FlightSim.com or Avsim.com)
Also freeware available from similar websites are :
rcbco-30 for FSX
these provide catapult and arrestor capabilities , as well as sonic boom .

18. PRE TAKEOFF

1. Set fuel –click ALT on keyboard –click Aircraft – click change fuel and payload
In fuel box -click and change left and right tanks to zero %
- " centre 2 tank to zero %
- " centre (front) tank to 40 %

This reduces the approach airspeed and balances the aircraft on arrest/trap .
2. Set radio Navaid frequencies .
3. Set Runway heading in CRS (course) window .
4. Set BRC , the reciprocal of Carrier Runway heading PLUS about 8 degrees (BRC= Base Recovery Course= Carrier's heading or direction of travel) in ADI (right MFD) , by using autopilot HDG window (observe heading BUG on ADI).
5. Set NRST onto HUD (LH MFD) carrier is found by (-) clicks on "<2000" as carrier RWY is very short . The HUD display will help with orientation with respect to the carrier (arrow and dist.) .

19. TAKEOFF - CATAPULT

1. Taxi slowly at about 5 knots by reference to groundspeed on HUD to Catapult groove .
2. Align accurately and slowly on the Catapult groove .
3. Move forward on the groove until the red central glareshield Catapult Engaged light starts to flash . Hit the brakes immediately , the engage zone is very small . The engaged light only works for fixed Aircraft Carriers with INIs providing catapult location - INI included in this panel package .
4. Set - Wing 16 degrees
- Flap 25 "
- Elevator trim 0.8 or 0.9

5. Set park brake ON .
6. Catapult launch is initiated by application of full power .
7. After takeoff……Gear up….flaps up …..Wing to 26 degrees.

20. APPROACH - ARRESTOR

1. Prior to circuit entry , slow aircraft to below 400kts , say 350kts and wing sweep to 26 degrees .
2. Turn onto downwind , tracking the reciprocal of the carrier's direction of movement (BRC) as set on heading bug on ADI , at 3000' altitude with the aim to pass the side of the carrier at a distance of 1.5 to 2NM .
3. Slow to 300kts by abeam the carrier , note abeam distance in HUD when arrow points directly to the left .
4. Maintain Heading Bug direction and 3000' , Wing sweep to 16 degrees ……past the abeam position the ILS command bars will appear in the HUD.
5. Ensure aircraft trimmed .
6. Maintain regular watch of HUD distance to carrier . At about 7.4NM from the carrier the velocity vector and the ILS horizontal bar will coincide . START turn back towards carrier .
7. Keep the velocity vector accurately on the ILS Horizontal bar for the rest of the approach .
8. Gear down .
9. Flaps/slats full down
10. Airbrake down……and TRIM
11. Tailhook down .

NOTE; 8 to 11 above can be done late downwind prior to commencement of turn , to relieve workload if desired .
12. During turn , frequently consult the ADI (RH MFD)
- White needle is Runway heading
- Green " is ADF pointer
- Gold " is NAV2 pointer
- Magenta bar is ILS/NAV1 lateral deviation indicator

As the green and gold needles close in and approach the white needle , the aircraft heading should be close to the runway heading displayed in the 'CRS' window . The Magenta command deviation bar will move rapidly towards the central alignment with the White needle . KEEP it aligned .
The ILS bars are on the HUD , but do not give a trend type warning as does the ADI .
Try to visualize the picture the ADI is giving you , it is brilliant the way it allows you to anticipate interception of the EXTENDED Runway centre line . The **'closing in'** of the needles/pointers is a fundamental part of IFR (Instrument Flight Rules) work .
13. Transfer attention to the HUD ILS bars , steer the aircraft as necessary to KEEP the crossed ILS bars dead centered in the little circle of the velocity vector and accurately KEEP them there .
14.The airspeed should be about 130kts……adjust power as necessary.
15. A symbol like a capital 'E' will be visible in the HUD .
ADJUST power to get the middle horizontal arm of the 'E' NEXT to the tiny wing of the VELOCITY VECTOR ……KEEP them aligned ….. and KEEP the ILS bars in the velocity vector by power adjustment.
In this configuration you are on a constant Angle of Attack and……
ONSPEED AND ON GLIDESLOPE .
16. Progressive trim should have been already applied .. now trim as accurately as possible.
17. IF speed drops try momentary retraction of airbrake to regain it ie; 1-2 seconds.
18. As you get close to the carrier joystick movement must be smooth and small .
19. In all probability you will be making constant power adjustment all the way down to touchdown , to keep them reasonably small consult the engine thrust displayed in the HUD .

21. LOW LEVEL BOMB TOSS

REFERENCES:-
1. Series of articles by Carlo Kopp Carlo.Kopp@aus.net
Very good quality articles with a vast amount of detail ,an essential for those who want to learn more.
2. Aardvark specific website , www.f-111.net a treasure wharehouse of F-111 related matter .
3. Best detail book on the subject is:
Title…. F-111 Aardvark about 192 pages
Author… Peter E. Davies and Anthony M. Thornborough
Publisher… Crowood (UK)
Year… 1997 Comment, Excellent book , Very , very good .

The following is an extract from ' Driving the pig ' by Carlo Kopp .
****

The configuration for the toss bombing delivery is 550 *KIAS* and 44 degrees of sweep, in this instance at 400 ft terrain clearance altitude. Toss bombing is the preferred low level delivery method for laser guided or electro-optically guided bombs, as the aircraft need not overfly the target. With the proliferation of good man portable SAMs, mobile radar directed AAA, automatic command to line of sight point defence SAMs (SA-8 Gecko, Crotale, Roland and Rapier) and the customary small arms fire, the low level autobomb delivery over a defended target is no longer considered a viable proposition. With terminally guided munitions, tossing the weapons allows the aircraft to avoid the point defences and engage the target with no loss in accuracy of impact.

The toss bombing low level delivery using radar and Pave Tack to support a laser guided munition is one of the most difficult delivery profiles in modern military aviation. The established method is to approach the target and just prior to the release point, pull 4G for automatic bomb release. Once the weapon is released, the pilot will roll 110 degrees to kill the climb rate, and fly a steep level turn to quickly reverse heading away from the target, whilst providing the best possible field of view for the Pave Tack which must "paint" the target with its laser designator during the final seconds of the bomb's flight. Flying the toss delivery is not a trivial task, as it involves in effect a semi-aerobatic manoeuvre under instrument conditions at 500 KlAS low level. Definitely not for the faint of heart !

Approaching the target, the weapon release is armed by depressing the control column "pickle" button, the TFR is disengaged using the "paddle" switch on the control column, and a 4G pull up maintained by using the "fly-to" command bar on the ADI or LCOS, while using the strip G-meter as a cross reference. The nav attack system releases the weapon, at which point the aircraft is immediately rolled 110 degrees, after which the nose is pulled around and down to the horizon, killing the climb produced by the pull-up.

Once the nose approaches the horizon, back stick is slightly relaxed to reduce the pitch rate, and opposite aileron (stabilator) is applied to reduce the AOB to 70 degrees. The 70 degree AOB steep turn is held until the nose is on the egress (escape) heading, where the aircraft is rolled level, the TFR scope is then checked for obstacles, the TFR paddle switch released and the aircraft allowed to descend below 1000 ft for a TF egress from the target area. The entry procedures to the delivery are colloquially referred to as "pickle, paddle, pull", and needless to say, timing and aircrew coordination are vital to the success and safety of the manoeuvre.

****

EXERCISE: LOW LEVEL BOMB TOSS

1. Set up aircraft - altitude 400' AGL
   - airspeed 550 KIAS
   -thrust/power 73%
   -wing sweep 47 degrees
   - Set Heading BUG to reciprocal of current heading
   - Set Radar Altitude on HUD (ALT in HUD control head)
2. Initially altitude and airspeed roughly near the above figures as you will have to go through the procedure quite a few times as it is very difficult , but it does come together in the end .
3. Deploy Pave Tack (Bombay switch)
4. Set trim to between -0.7 and -1.0 …this helps to minimize G overshoot
5. Bomb drop switch on

NOW THE HARD PART

6. Note ` G ` figure in lower LH HUD ..in level flight = 1.0
7. Pull back on joystick till Gs = 4.0 AND keep the reading at 4.0
8. When Velocity Vector HITS 30 degrees on HUD pitch ladder release stick back pressure
9. Immediately , with the stick roll the aircraft to 110 degrees Bank , as indicated by Bank Indicator on the HUD just above the Airspeed , PULL back hard on the stick (if you have time and want to see if the aircraft turn is balanced check if Turn and Bank ball is centred in PFD in LH MFD) . Maintain this configuration until the velocity vector has passed through the horizon

10. Reduce Bank from 110 to 70 degrees , and slightly reduce pull on stick
11. If time permits Bomb switch off
12. Keep 70 degree bank turn going till nearing heading BUG , then wings level
13. Aircraft should be in a reasonably steep dive , Pull up arrow should start flashing , ease back on stick to level off at 400' AGL
14. Trim

Initially above will appear impossible , but it WILL improve with practice
And it is possible …. But it is a hard manoeuvre to execute.

For practice , forget most of the above , but repeat the following .
From level flight ….then 7,8 and 9
It's the 4.0 Gs pull up and 110 bank that require lots of practice to get them right .

Suggested pull up point is 7.1NM prior to simulated target

22. INVERTED FLIGHT

For inverted flight at for example 70 - 200' AGL

1. Roll inverted , the upward view , now down to the ground is limited in the 2D panel .
2. There are 2 methods to maximize the view of the ground :-
   (A) Set -Wing sweep back to 72 degrees - Power to 72% - IAS about 570-580 kts
   - Trim to -1.0 .
   (B) Best Method - Assign "Shift 2" to a button , the panel now disappears - Select HUD with "Shift 5" , the view of the ground is now increased by a significant margin . The velocity Vector is now accurate , place it on an object , and that is where you will go . Settings as in (A) are again best .
   In both (A) and (B) , the velocity vector on the horizon bar is accurate - no climb/ descent.
3. Ensure HUD control 'ALT' is set to radio altitude .
4. Remember the bank and pitch inputs are reversed , strange at first but after a couple of minutes it gets better .
5. Push or pull the velocity vector to where you want to go , its relatively intuitive , additionally the pull up arrow works nicely ….do not pull rather push !!
6. If at low level , push nose up , away from ground by about 5 to 10 degrees , then briskly roll upright .
7. In FSX Camera view Cockpit Fwd together with HUD overlay is available .
8. NOTE : to initialize "Shift 2" view , **"Shift 1"** must be selected on the keyboard in the first instance , thereafter the button assignment (Shift 2) works , this avoids a black bar at lower screen . (I know it is weird , but "Shift 1" seems to make it work , no idea why !)

23. ELEVATOR TRIM

NOTE ; the location of the **'E-TRIM'** instrument on the panel .

This is an underrated , yet extremely important aspect of flying , be it in the flight simulator or the actual aircraft . An aircraft in an untrimmed condition is difficult to fly , the control imputs are erratic to say the least , smooth accurate controlled flight borders on the impossible . Joystick inputs are jerky and overshoot the pilots desired intentions , resulting in erratic and frustrating flight .
Whenever a flight parameter is changed , be it attitude , airspeed , thrust or configuration such as flaps , gear and wing sweep the aircraft becomes untrimmed .
The action that then must be taken are :-

1. An initial quick and roughly judged trim , with absolutely no concern nor time given to accuracy .
2. **Allow the aircraft time to stabilize** . Hold the aircraft in the flight position or condition that you have commanded until it reaches an equilibrium .
3. Trim to the accuracy you desire , now that the aircraft has stabilized .

The aircraft , should now fly as you require it to , release the stick completely to test if that is the case . Essentially , a properly trimmed aircraft will fly as required with hands off the stick .

Important : the aircraft must be allowed time to stabilize in its new condition prior to final and accurate trimming in (3) above .

It is not necessary to always trim the aircraft , for example when manoeuvring hard and repeatedly . Then if it is done at all , it is usually quick and rough.

Practice trimming to obtain a high level of proficiency and to be able to do it quickly and naturally . It does make a huge difference to your enjoyment of flying .

AUTO TRIM : This can be effected by manually holding the aircraft pitch attitude either straight and level or in a shallow climb or dive , click ON 'autopilot master switch' (only) , after 2-3 seconds switch it OFF . The autopilot has now set the correct trim for your present condition of flight .

Due to the lack of accuracy of most joysticks available for flight simulation , there is an area around their centre null position where smooth control imputs are impossible (a sort of breakout force is required that results in overshoots , this condition would be considered dangerous in real flight controls , and result in refusal of aircraft certification) . Where accuracy is required such as formation or extreme low altitude work , it is suggested that the trim be 1-2 clicks in the nose down sense and compensation be made by holding a very small stick back pressure .

24. WING SWEEP ANGLE SELECTION

GENERAL CONDITIONS:

A. 16 Degrees….for airspeeds below 330 kts , very slow speed flight , take off and landing .

B. 26 Degrees….for most normal flight speeds that do not fall into high speed flight.

C. **A simple method to determine the optimum sweep is to refer to the AoA (Angle of Attack) display in the HUD . Select a sweep that results in the AoA reading closest to 0.0 .** This would result in a close approximation to the lowest trim drag and hence the best aerodynamic efficiency for the aircraft at it's current airspeed . This method is applied in straight and level cruise , but having determined the sweep / IAS relationship it can then be used in maneuvering flight conditions .

The determination of the wing sweep angle is covered in detail as follows:-

SECT III - Operating limitations , 3.Airspeed limitations Configuration chart

SECT IV - Flight characteristics , subsonic ,transonic and supersonic paragraphs

25. DIVE BOMBING

Bombing dive angle 30 degrees or 3 degrees as in glideslope for approach to land .

Push nose down to get desired angle , it can be any angle . For this example use 30 degree dive in HUD Dive Angle Display , now hold this configuration very accurately steady/stable for 2-3 seconds , then hit autopilot Master switch . The autopilot will indicate ON and LVL ,the aircraft will now maintain reasonably precisely the dive angle set , if the dive angle is relatively steep , select airbrake to minimise speed buildup .

Remember to SW autopilot OFF before impact .

DIVE BOMBING DISTANCES

Distance covered horizontally in Dive Bombing scenarios .

Table of dive bombing runs .

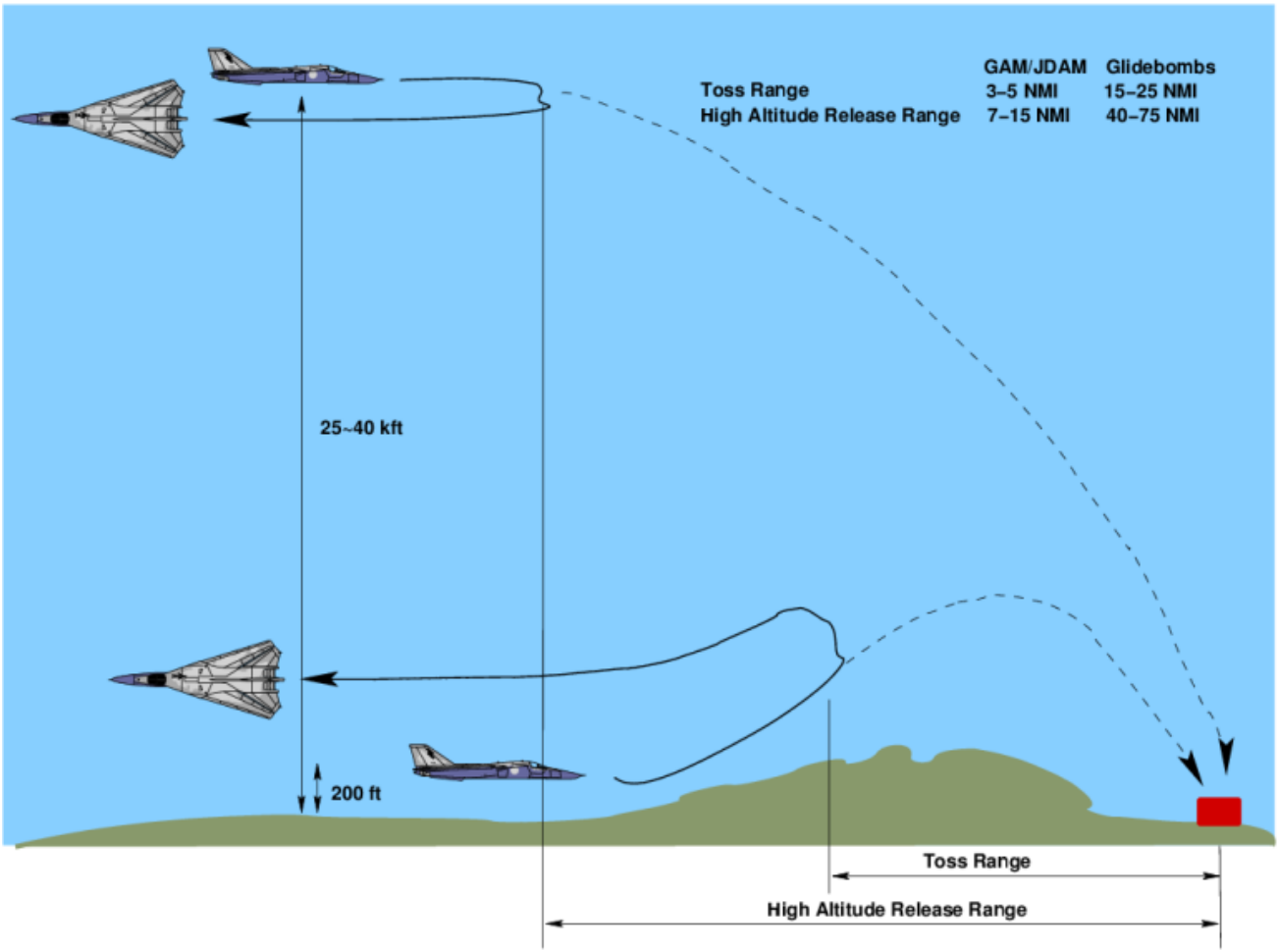
Distance NM given ; Dive angle in Degrees , Height in 000s above target.

	10	15	**20**	30	40
1	0.93	0.61	0.45	0.28	0.20
2	1.87	1.23	0.90	0.57	0.39
3	2.80	1.84	1.36	0.85	0.59
4	3.73	2.46	1.81	1.14	0.78
5	4.66	3.07	2.26	1.42	0.98
6	5.60	3.68	2.71	1.71	1.18
7	6.53	4.30	3.16	1.99	1.37
8	7.46	4.91	3.62	2.28	1.57
9	8.39	5.52	4.07	2.56	1.76
10	9.33	6.14	4.52	2.85	1.96
11	10.26	6.75	4.97	3.13	2.16
12	11.19	7.37	5.42	3.42	2.35
13	12.13	8.00	5.87	3.70	2.55
14	13.06	8.59	6.33	4.00	2.74
15	13.99	9.21	**6.78**	4.27	2.94
16	14.92	9.82	7.23	4.56	3.14
17	15.86	10.44	7.68	4.84	3.33
18	16.79	11.05	8.13	5.13	3,53
19	17.72	11.66	8.59	5.41	3.72
20	18.66	12.28	9.04	5.70	3.92

Example : In the case highlighted in bold on the above table the aircraft must have its nose pointing down at the 20 degree dive angle at 15,000' at a horizontal distance of 6.78 NM before the target .

NOTE 1 : The altitudes nominated in the table are above the target .
If the ground elevation of the target is 4,000' , then that 4,000' would be added to the 15,000' and the aircraft altimeter would read 19,000' in the above situation .
The table would still be entered at 15,000' as that is the aircraft height above the target .

NOTE 2 : No allowances are made for ordinance ballistics in the above table .



DELIVERY PROFILES FOR GPS/INERTIAL GUIDED WEAPONS

SECTION III
operating limitations

1 & 2.

CAUTION

Summary Table of Limitations

THOSE ITEMS INDICATED BY AN ASTERISK (*) HAVE EXPANDED INFORMATION ELSEWHERE IN THIS SECTION. WEIGHTS AND SPEEDS ARE BASED ON 30-PLY RATED MAIN GEAR TIRES.

WEIGHTS — POUNDS

MAX TAXI AND TAKEOFF	100,000	MAX LANDING (600 FPM RATE OF SINK)	82,500
MAX INFLIGHT	100,000		

LIMITS/SPEEDS—KIAS AND MACH UNLESS OTHERWISE INDICATED

*MAX TAXI:
- Straight 25 (Up to 30,000 ft) >
- Turning 10

TIRE:
(Flaps 25° - Full)
- Max Main Gear Tire 196 Groundspeed
- Max Nose Gear Tire
  - (20 Ply) 196 Groundspeed
  - (16 Ply) 179 Groundspeed
- Emer Ldg Main Gear Tire 217 Groundspeed
- Emer Ldg Nose Gear Tire
  - (20 Ply) 217 Groundspeed
  - (16 Ply) 200 Groundspeed

(0-25° Flaps With Max GW 62,000 lbs)
- Max Main Gear Tire 190 Groundspeed
- Max Nose Gear Tire
  - (20 Ply) 190 Groundspeed
  - (16 Ply) 173 Groundspeed

*LANDING GEAR:
- 330 or 0.62 whichever is less
- 1.2 "g" during extension

*FLAPS EXTEND/RETRACT
- 0 - 30° 330 or 0.62 whichever is less
- 31° - Full 300 or 0.56 whichever is less

*SLATS EXTEND/RETRACT:
- 330 or 0.62 whichever is less

*SPEED BRAKE:
- Mach 2.2

*WEAPON BAY DOOR:
- 590 or 2.0 whichever is less (Prior to 1F-111-1066)
- 2.0 (After 1F-111-1066)
- 0.90 w/Ext Stores on Pivot Pylons
- −1 to +4 "g" During Activation

FUEL DUMP:
- 350 or 0.75 whichever is less
- Approximately 1 "g" flight

AIR REFUEL RECPT:
- 400 or 1.0 whichever is less

*FLT CONTROL SYS (Prior to T.O. 1F-111-1090):
- 295 or 0.62 whichever is less (With flaps/slats retracted and T.O. & LAND manually selected)

CANOPY HATCH:
60 kts (Relative Wind)

MAX SINK RATE AT TOUCHDOWN:
- 360 FPM with fuel in external tanks.
- 600 FPM with no fuel in external tanks.

SYSTEM LIMITS

STARTER:
- Pneumatic 5 consecutive; then 1 hr cooling
- Cartridge 2 in 15 min period; then 1 hr cooling
- Continuous Operation: (Then 15 Min Cooling)
  - Left 10 min
  - Right 2 min

*RPM
- Idle (Ground Operation) 58 - 70%
- Max 101.1%

TIT:
- Norm Oper Range 300 - 1240°C
- Starting:
  - Ground 670°C (Momentary)
  - Air 870°C (Max)
- Max Mil 1200°C (45 minutes)
- Max & Partial A/B 1240°C (45 minutes)
- During Accel 1250°C (2 minutes)
- Max Continuous 1035°C (Unlimited)

FUEL FLOW:
- Fluctuations ±300 pph

OIL PRESSURE:

• Min (Idle)	35 psi
• Norm Operations	40 - 50 psi
• Maximum	50 psi
• Fluctuations	±5 psi within limits

HYDRAULIC PRESSURE:

• Normal	2950 - 3250 psi
• Maximum	3250 psi

*CREW MODULE:

• Combined Crew Wt	430 lbs
• Differential Wt	65 lbs

*TFR:

• Weather Mode (500 WX)	0.85 mach
• All Other Options	1.2 mach
• Bank Angle	30°

*EMER JETTISON LIMITS (WEAPONS)

FLAPS/SLATS RETRACTED:

- Normal Release Envelope

FLAPS/SLATS EXTENDED:

• Wing Sweep	16 - 26°
• Altitude	10,000 ft
• Airspeed	250 KIAS

EMER JETTISON LIMITS (TANKS):

- Less than 50 or more than 1800 pounds of fuel

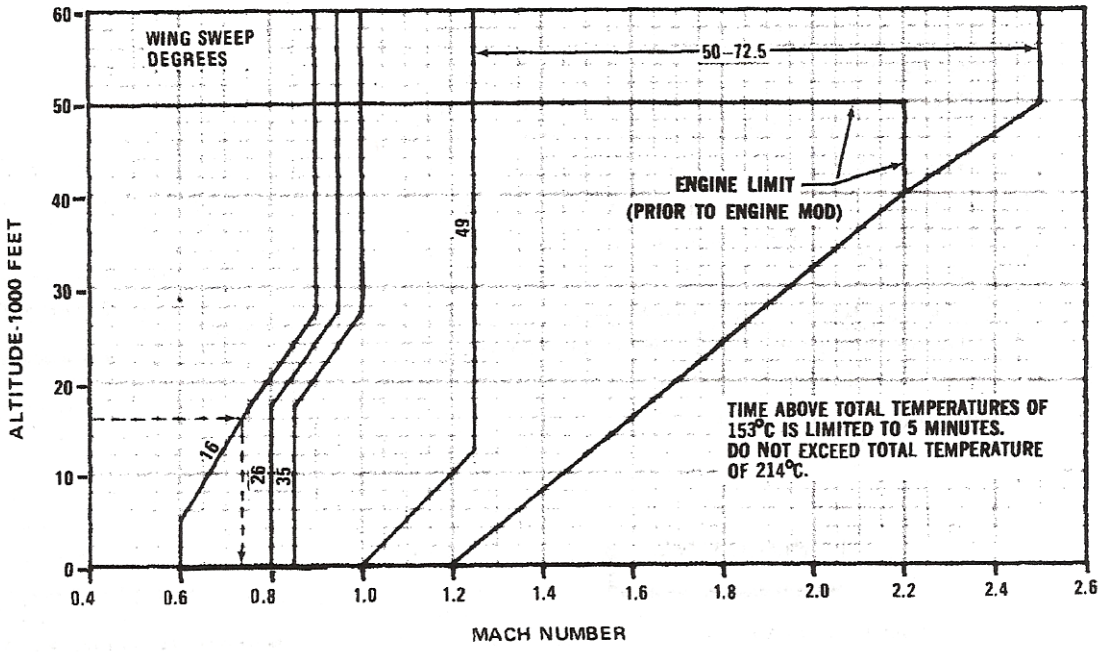
• Wing Sweep	16 - 26°
• Altitude	10,000 ft
• Airspeed	300 KIAS
• Flaps/Slats	Extended or retracted

3.

Airspeed Limitations

DATA BASIS: FLIGHT TEST
DATE: 21 MAY 1976

CONFIGURATION:
FLAPS AND GEAR UP



4. SLATS/FLAPS LIMIT SPEEDS.

The flaps and slatS have been structurally cleared to the following limits during travel, or when fully extended:

• Slats only	330 KIAS or mach 0.62	whichever is less
• Flaps 0'·30	330 KIAS or mach 0.62	whichever is less
• Flaps 31 '·Full	300 KIAS or mach 0.56	whichever *is* less

However, to ensure slat/flap extension, and from component life and handling considerations, the following limitations should be observed:

Flaps:

During Extension

• Flaps-l0 to 25 degrees	250 KIAS or 0.62 mach	whichever is less
• Flaps-26 degrees to full down	220 KIAS or 0.48 mach	whichever is less

Static Extended Condition or During Retraction
- Flaps-0 to 25 degrees 270 KIAS or 0.62 mach whichever is less
- Flaps-26 degrees to full down 245 KIAS or 0.48 mach whichever is less
- Slat limit speed is 295 KIAS or 0.62 mach which· ever is less.

5. GENERAL AIRSPEED GUIDE

Rotate 140 kts
Take0ff 160 kts
Cruise 350 kts to 2.6M
Approach 160 kts or ONSPEED
Touchdown 135-150 kts or ONSPEED

CONFIGURATION SPEEDS:

Slats-	Normal MAX	295KIAS	
	Structural MAX	330KIAS or 0.62M	whichever is less
Flap 25'-	Normal MAX	250KIAS or 0.62M	whichever is less
	Structural MAX	330KIAS or 0.62M	"
Flap 34'-	Normal MAX	220KIAS or 0.48M	"
	Structural MAX	300KIAS or 0.56M	"
Wing 16'-	Takeoff / Landing		
	Slow airspeeds below	330KIAS or 0.62M	
26'-	Up to	0.80M	
38'-	Up to	0.80M	
47'-	Up to	0.80	
	Transonic	0.80M to 1.10M	
58'-	Transonic	0.80M to 1.10M	
	1.10M and	greater	
72.5'-	Transonic	0.80M to 1.10	
	1.10M and	greater	

Landing gear - Normal MAX 295KIAS or 0.62M whichever is less
Structural MAX 330KIAS or 0.62M "
Airbrake - 2.2M

GENERAL LOWER ALTITUDE OPERATIONS

~350KIAS to 600KIAS is a reasonable airspeed range .
~350 – 420KIAS suggested for extreme low level manoeuvring
(slow enough to give the pilot 'time')
Below 350KIAS control is not crisp and positive .
The F-111 flies best at 350 , or 350 plus knots .

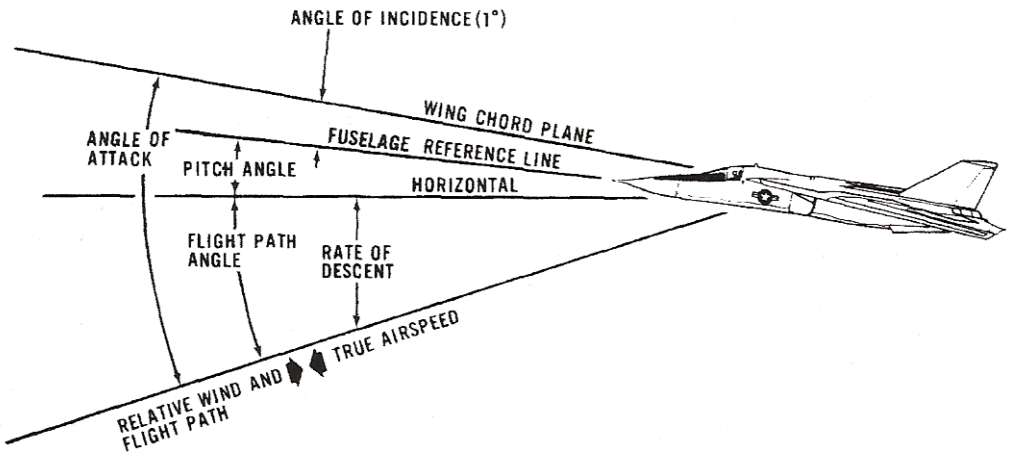
Note ; Energy and consequent airspeed bleed off during hard manoeuvring , manipulate the throttle as appropriate to maintain desired airspeed .

Special note ; although the aircraft is limited to 60,000' in the simulator it is possible to go higher , but control becomes difficult and quirky , the autopilot will however manage if not too much is demanded of it . Additionally , at the right altitude the airspeed will max out at about 2.52M , but the overspeed warning will annoy , the solution is to turn the audio down or off .
A well executed vertical zoom climb will result in an altitude of about 140,000' being achieved .

SECTION IV
FLIGHT CHARACTERISTICS

1. DEFINITION OF LONGITUDINAL REFERENCE ANGLES •

An illustration describing flight path angle, pitch angle, angle·of-incidence, angle-of-attack and relative wind is presented below.



2. SUBSONIC FLIGHT.

Operation of the aircraft at subsonic speeds up to mach 0.80 should normally be accomplished with a wing sweep of 26 to 47 degrees. Generally, response and damping about all axes in this speed range are considered excellent based on flight experience to date.

3. TRANSONIC FLIGHT.

During operation of the aircraft at transonic mach numbers (mach 0.80 to 1.10) wing sweep angles of 47 to 72.5 degrees should be utilized. At 20,000 feet and above, sweep angles of 47 degrees are recommended to keep the aircraft angle-of-attack low which will result in better acceleration characteristics. At the lower altitudes, more aft sweep angles are recommended to optimize acceleration. Although the spoilers will be locked out with the more aft sweeps, roll performance will be improved due to the lower angle.of.attack and higher dynamic pressure. During transonic flight above 25.000 feet a relatively small directional trim change may occur just prior to achieving supersonic flight. As altitude is decreased in this speed regime, the trim change is more noticeable and below 10,000 feet may be exhibited as a small Dutch roll transient accompanied by mild buffet. No trim changes occur longitudinally or laterally.

4. SUPERSONIC FLIGHT.

Flight in the supersonic flight spectrum (mach 1.10 and above) should normally be accomplished with the wings fully swept. Some external store loadings preclude full aft sweep and as such are limited to 58 degrees. Flight can be performed in the supersonic speed range with wing sweep angles as low as 47 degrees; however, such sweep angles are detrimental to optimum performance. Deceleration at supersonic speeds can be greatly enhanced by sweeping the wing forward to obtain increased drag. This allows the pilot to either pull power back to aid deceleration or maintain power for more rapid acceleration should the need arise. During wing sweeping and ensuing deceleration or acceleration, aircraft trim changes will be small and will appear to the pilot principally as attitude changes. Throughout the supersonic flight spectrum covered to date, response and damping characteristics have been good; however the potential of directional instability associated with angle-of-attack in excess of handbook limits still exists.

SECTION V

FLIGHT EXERCISES

These exercises , together with those included elsewhere in the Flight Manual are provided to assist in maximising both the capabilities that exist in this panel package and the F-111 aircraft .
Whilst some may appear strange , they will , if practiced sharpen appropriate military skills .

EX 1 - DUMP AND BURN PLUS EXHAUST TRAIL

1. Find medium height mountain ranges .
Eg; East of Melbourne (YMML) , Victoria , Australia all the way up the east coast to past Brisbane (YBBN) , Queensland , Australia are ideal mountains .
2. Set autopilot ALT window at about 2200' or as required , IAS window at 450KIAS
3. In flight , set autopilot ON , and then TFR ON .
4. Direct aircraft with heading hold window as required .
5. Dump and Burn switch on .
6. Go outside the aircraft to the front quarter position and view the aircraft with the Dump and Burn plus the 15 second long dual exhaust trail that is triggered by thrust of 60% or greater .
7. On the keyboard , FSX SHIFT 5 will bring up the HUD overlay if desired .
8. In the cockpit , switch off IAS hold and Dump and Burn , then set the thrust to 68% . Go outside , the exhaust is now continuous .
9. The outside view with the exhaust trail shows the TFR at work rather well .
10. In the cockpit with the IAS hold on again , observe the dynamics of both the (A) thrust in the HUD and (B) the trim in the E-Trim instrument on the panel … it gives an insight into what you automatically do in flight , even though hopefully not as often . A dramatic display of the importance of trimming .
11. Bombs and Flares can be switched on in the panel and observed outside . The first runs for about 400 seconds unless switched off and the second runs till switched off . If a control button is assigned to missiles , they can be fired from outside .
(If speed of 1.40M is set , try ALT hold of 2500'- 2800')

EX 2 - NAP OF THE EARTH ITALY TO EUROPE

1. Go to Aviano , Italy (LIPA) .
2. Set either :
Manchester , United Kingdom (EGCC) or
Frankfurt , Germany (EDDF)
On NRST HUD display .
3. Flying manually enter the Alps at very low altitude ie ; 200' – 500' or less .
4. Stay deep down in the valleys and passes exercising Radar shielding .
5. Enjoy the views , they are spectacular .
6. Regularly observe the NRST Arrow in the HUD to get an idea where your selected airport is .
7. Following the valleys the arrow will go all over the place . If it has been over to the left for a while keep a lookout for a valley that goes to the right to roughly average out the direction required .
8. After a while you will emerge from the Alps into Europe reasonably on track to your desired airport .
9. We have all been hopelessly lost in the Alps at some time(s) ….. Not any more !!!!

EX 3 - VERTICAL DIVE PULL OUT

1. Over relatively flat to undulating countryside .
2. Altitude about 2000' – 5000' with airspeed around 450 kts .
3. Pull nose up to the vertical and hold it precisely vertical .
4 As speed reduces pull off all power and hold the vertical . Once the IAS decays to 60KIAS , release all controls and let the aircraft do its thing .
5. Pointing down hill , once the airspeed passes 150KIAS resume control and hold it in the vertical dive.
6. Use airbrake if necessary to keep speed build up under 500 , say 450KIAS .
7. When the Pull up cue flashes hesitate briefly as it gives ample warning .
8. Try to delay the pull out so that a smooth pull out leaves you level at tree top height , and the HUD G display does not exceed the 7G aircraft limit .
9. It might seem hard to execute , but is actually quite easy to achieve after a couple of attempts .

EX 4 – TOUCH AND GOES CITY ROOFTOPS
This is hard , but a good challenge . It allows you to explore slow speed flight at high alpha .
This F-111 has incredible precision and controllability .
1. At about 2000' to 4000' with the city looming ahead , slow the aircraft .
2. Set up as follows :-
-Wing 16 degrees
-Flaps full down 34 degrees
-Gear down
-Trim nose up ie. 6.0
-Airspeed 123 - 129 knots
3. Go outside the aircraft and get directly behind it
4. On the keyboard SHIFT 5 will bring up the HUD overlay with all flight data .
5. Adjust the view so that you are behind and very slightly above the aircraft
6. Select a rooftop to land on
7. Adjust the view so that the bottom of the main wheels are in a direct line of sight with the chosen rooftop (ie. Wheels superimposed on rooftop) AND KEEP them there with power and pitch, while keeping speed in range 123-129 knots … Trim , it will require a large amount and will make control smoother
8. Keep this up until contact with the roof
9. On roof contact , apply IMMEDIATE full power and fly away
10. If time permits , hit pause and admire the skid marks and smoke on the roof

It is very hard and draining .
If you get near to 50% success rate you are doing extremely well.

Note ; not all buildings have hardened roofs , therefore try to remember the location of those that do .
Also , try to chose a lower building with a longer roof , most high rise buildings have only tiny rooftops .
Level flight 10 ft above rooftop , if roof hardened pullup arrow indicates momentarily.

EX 5 - DEEP STALL
The (sim) F-111 is difficult to stall .
To set up a stall scenario fly at low level <5000 , increase airspeed to 500+ kts , then pull the nose up to the vertical as indicated in both HUD pitch ladder and dive angle . Set wing sweep fully back to 72 DEG.
As airspeed decays towards zero pull power OFF , aircraft should reach approx 30,000 .
At zero as it begins to fall ,trim completely nose up (15.0) , stick fully , repeat fully back , and keep it there .
Observe stall warning light and both AoA and VSI in HUD , the figures are absolutely astonishing .
Aircraft will hunt AoA and airspeed , may occassionally experience a high frequency Dutch Roll ,keep stick back and central .
At 7,000AGL by RADALT (next to stall light) release stick , **immediately** zero trim (red target on E-TRIM instrument) , sweep to 26 and add power .

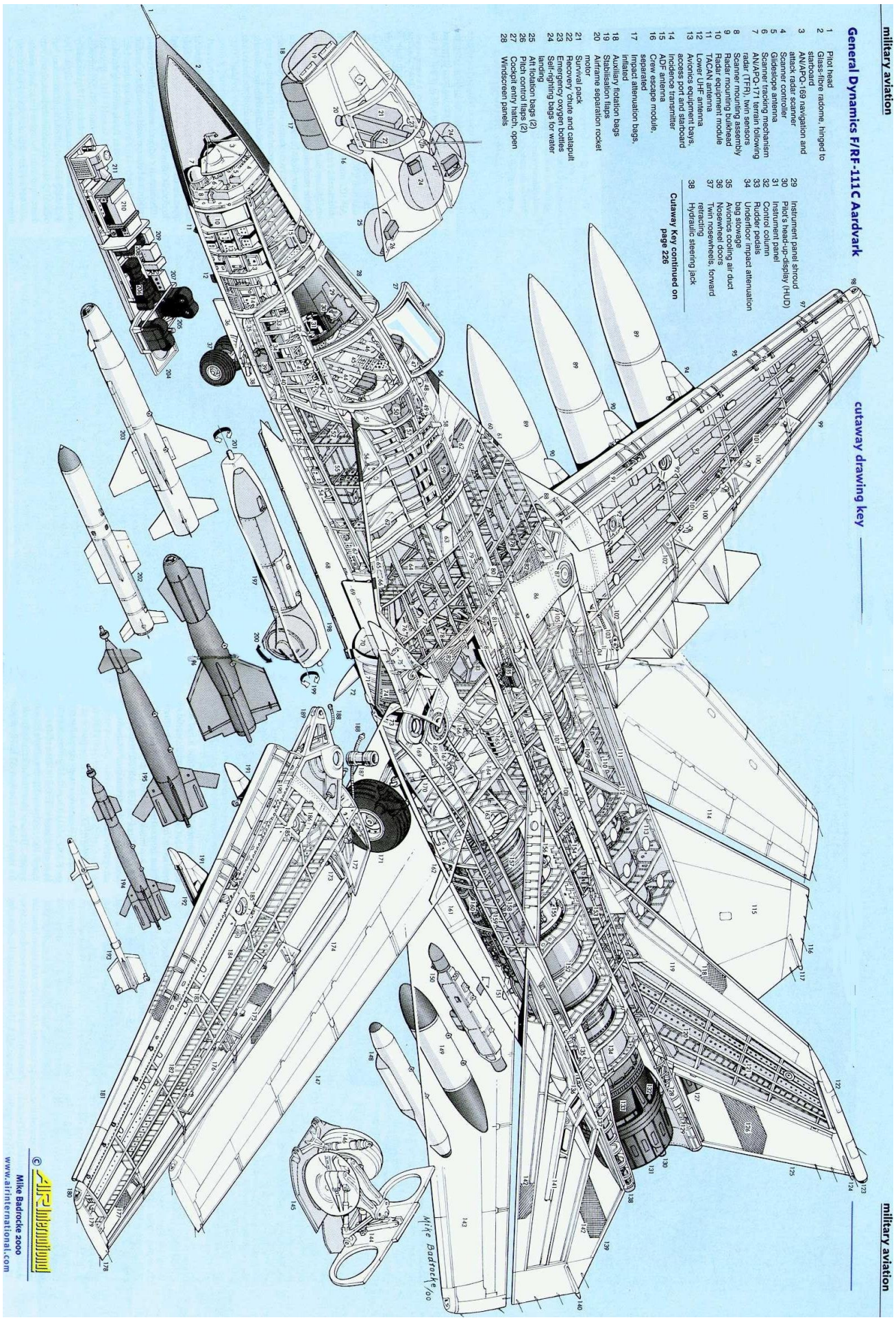
EX 6 - TERRAIN FOLLOWING RADAR OPS
Select a large area with totally flat terrain .
In flight at an altitude of about 5,000' .
1. Set autopilot : ALT hold to 200' and MACH hold to 1.40
2. Set autopilot master switch to 'ON'
3. Set TFR switch to 'ON'
The aircraft will now descend to 200' at a speed of 1.40M .
4. Change the heading in the autopilot HDG window until the ADI HDG BUG in the ADI page of the right hand MFD is either 90 degrees left or right of the aircrafts current heading .
5. Set autopilot HDG hold to 'ON' .
6. Go to outside views , and in FSX Camera views and observe the TFR turns .
7. Continue to reset the HDG hold window by up to 180 degrees off the current heading as often as you wish to . In FSX MACH can be increased up to about 2.52M

EX 7- SKIPPING STONES ON WATER

As children , most have thrown at a shallow angle and skipped flat stones on the surface of rivers and dams to see how often the flatish stone can be made to rebound .
In the F-111 at an IAS of 350-500kts , with trim set 2-3 clicks nose down from neutral ,
'very slowly' lower the aircraft down to the surface of the sea .
Ensure 'aircraft casts shadow' has been enabled in options , as this does aid with the judgement ,
go to the outside rear view and select HUD overlay as it aids considerably .
The last several feet have to be executed very gently (in FSX a reflection appears as well as the shadow) , on contact with the water , a plume will appear behind the aircraft , and if in cockpit view spray on the windshield/canopy .
Do not let the aircraft sink more than about 50% into the water , as the sim will rebound the aircraft up to a safe height and possibly reset the thrust .
Now gently pull the aircraft up to about 10' and then lower and repeat .
Keep at it and see how many times you can do it
Hit pause and enjoy the scene .
Its a good exercise to develop precise control and to see how capable the F-111 flying model is .

EX 8- GROUND IMPACT RECOVERY

The F-111 has a exceptional operational role whereby it flies at high speed down low , very close to the ground , to achieve that requires practice and skill development.
Fast and close to the ground obviously invites the occasional disaster , an effort should be made to take those risks and cut your margins very close to the edge , initially you will impact the ground.
If you lose it and hit the ground it is not necessary to restart the sim , the F-111 is a powerful brute that will recover easily regardless of the terrain.
To develop a comfort zone try the following.
Over mountainous terrain put it into a very steep dive and pull the power off completely.
After impact the aircraft will bounce about in an insane fashion .
1. Lower the gear.
2. Wing sweep and flaps set for take off.
3. Apply full power.
4. Do not steer it , let it find it's own line of least resistance , usually down hill.
5. Watch the airspeed , you are after about 115 to 125 knots .
When the speed gets to about that level pull back fairly hard on the stick.
If the area ahead is clear of terrain you will get airborne.
In very hilly terrain it may take several attempts before you clear the terrain and get airborne , but regardless of even the worst terrain you will get there.
The most important aspect of doing this exercise is that it gives confidence to take extreme low level risks , and it is in that environment that skill development occurs.
With practise you will end up being able to weave between trees turning at bank angles of 70-75 degrees at speeds of 400 - 460 knots at well below 100' AGL.


military aviation
General Dynamics F/RF-111C Aardvark
cutaway drawing key
1 Pilot head
2 Glass-fibre radome, hinged to starboard
3 AN/APQ-168 navigation and attack radar scanner
4 Scanner controller
5 Glideslope antenna
6 Scanner tracking mechanism
7 AN/APQ-171 terrain following radar (TFR), twin sensors
8 Scanner mounting assembly
9 Radar mounting bulkhead
10 Radar equipment module
11 TACAN antenna
12 Lower UHF antenna
13 Avionics equipment bays, access port and starboard
14 Incidence transmitter
15 ADF antenna
16 Crew escape module, separated
17 Impact attenuation bags, inflated
18 Auxiliary flotation bags
19 Stabilisation flaps
20 Airframe separation rocket motor
21 Survival pack
22 Recovery 'chute and catapult
23 Emergency oxygen bottles
24 Self-righting bags for water stabilising
25 Aft flotation bags (2)
26 Pitch control flaps (2)
27 Cockpit entry hatch, open
28 Windscreen panels
29 Instrument panel shroud
30 Pilot's head-up-display (HUD)
31 Instrument panel
32 Control column
33 Rudder pedals
34 Underfloor impact attenuation bag stowage
35 Avionics cooling air duct
36 Nosewheel doors
37 Twin nosewheels, forward retracting
38 Hydraulic steering jack
Cutaway Key continued on page 226
Mike Badrocke 2000
www.airinternational.com
military aviation

FB-111A AIRCRAFT DIMENSIONS

General
- Overall Wingspan . . . . . 70 ft
- Overall Length . . . . . 75 ft, 6.5 in.
- Overall Height (at vertical fin tip) . . . . . 17 ft, 0.5 in.
- Fuselage Width (glove maximum width) . . . . . 16 ft, 1.6 in.

Wings (sweep 16°)
- Total Wing Area (L & R) (not including glove area) . . . . . 550.0 sq ft
- Total Wing Area (17% flap extension) (L & R) . . . . . 630.3 sq ft
- Total Wing Area (wings swept 72-1/2°) . . . . . 655.5 sq ft
- Mean Aerodynamic Chord . . . . 105.6 in.
- Aspect Ratio 8.91
- Aspect Ratio (wings swept 72-1/2°) 1.57
- Taper Ratio 0.250
- Sweep Angle (1/4 chord line) . . . 12° 12'
- Dihedral Angle (outboard of span station 83.55) . . . . . 1°
- Angle of Incidence of Root-to-Fuselage Reference Line . . . 1°

Flaps (double-slotted Fowler)
- Distance CL to Inboard Edge . . . 99.50 in.
- Distance CL to Outboard Edge . . 414.95 in.
- Maximum Deflection . . . . . 34°
- Deflection for Takeoff and Landing . . . . . 34°
- Total Area Stowed (L & R) . . . . 126.7 sq ft

Vanes
- Total Area Stowed (L & R) . . . 37.95 sq ft
- Deflection . . . . . 20°

Rotating Glove
- Deflection . . . . . 15°

Spoilers
- Total Area Stowed (L & R) . . . 28.6 sq ft
- Deflection . . . . . 45°

Slats (leading edge)
- Total Area Stowed (L & R) . . . 65.8 sq ft
- Deflection
  - No. 1 & 2 Inboard . . . . . 50°
  - No. 3, 4, & 5 Outboard . . . . 45°

Horizontal Tail (all movable)
- Total Area (movable) (L & R) . . 154.2 sq ft
- Total Area (exposed) (L & R) . . 174.3 sq ft
- Span . . . . . 107.80 in.
- Aspect Ratio 1.419
- Incidence-to-Fuselage Reference Line . . . . . -1°
- Dihedral Angle . . . . . -1°
- Taper Ratio (exposed) 0.334
- Deflection
  - Trailing Edge (UP) . . . . . 30°
  - Trailing Edge (DOWN) . . . . 15°
- Mean Aerodynamic Chord . . . . 137.50 in.

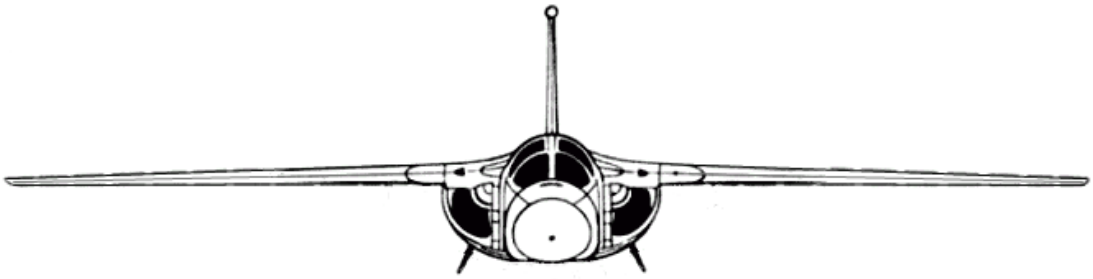
Vertical Tail
- Mean Aerodynamic Chord . . . . 159.36 in.
- Total Area . . . . . 111.7 sq ft
- Span . . . . . 106.85 in.
- Taper Ratio 0.411
- Aspect Ratio 1.419
- Thickness Ratio 3.204%
- Rudder Area . . . . . 29.3 sq ft
- Rudder Deflection From Neutral . . . . . 30°

Strakes
- Total Area (L & R) . . . . . 25 sq ft

Dive Brakes (speedbrakes)
- Total Area . . . . . 26.3 sq ft
- Deflection (maximum) . . . . . 77° 40'

83

F-111



THE PIG