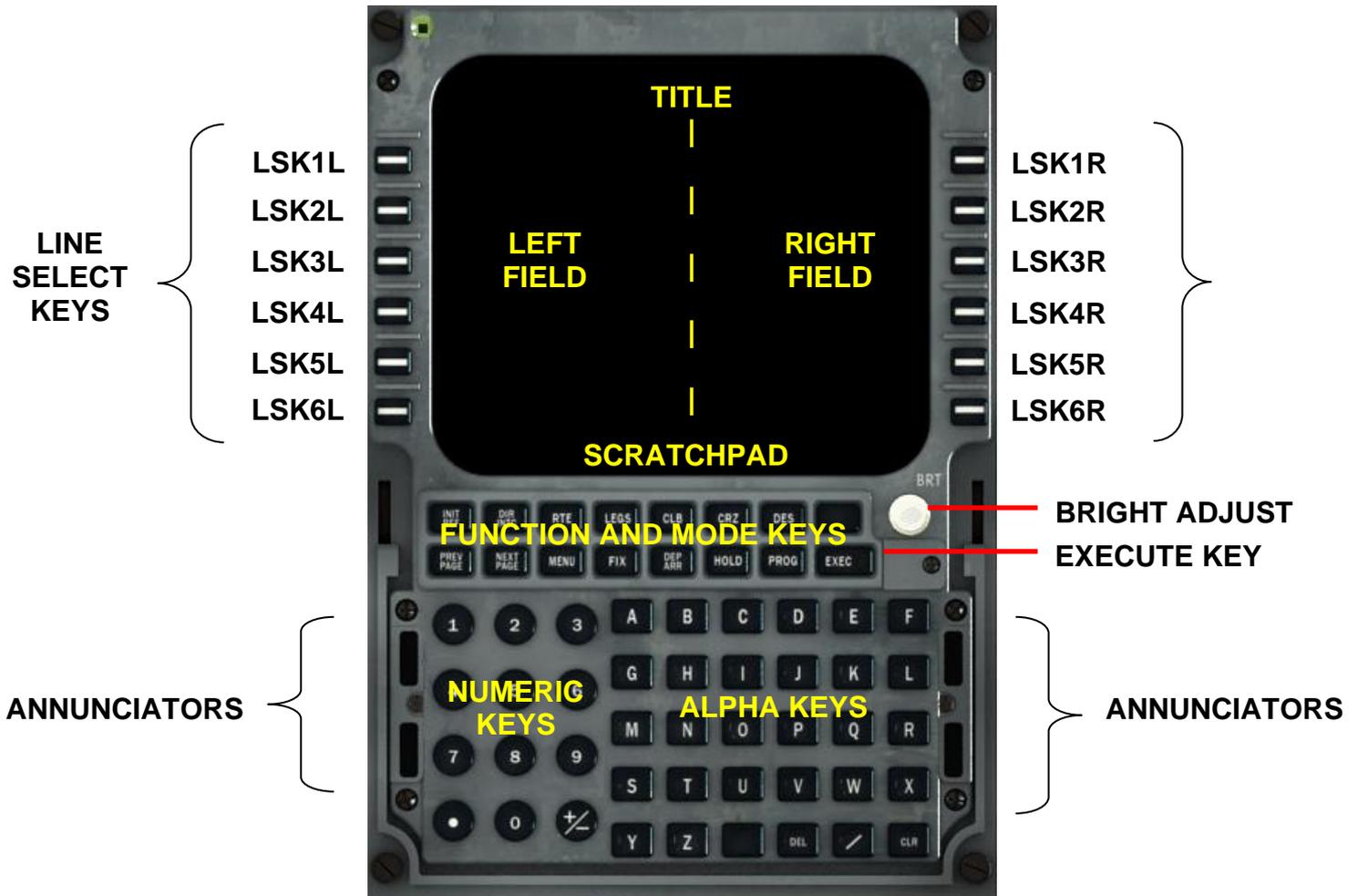


FMS OVERVIEW



DISPLAY: The DISPLAY is divided into four areas. The first line is the title of the displayed page. The left/right fields display data of selected page. The last line (SCRATCHPAD) shows typed alphanumeric data and system generated messages.

LINE SELECT KEYS: the LSK are 12 keys that permit entry of data from the scratchpad to the desired line or, if the key is pressed with the scratchpad empty, it will enter the content of that line into the scratchpad, if applicable.

DELETE KEY: Pressing this key inserts the word DELETE into the scratchpad. Then pressing a line select key deletes data in the corresponding field, where permitted.

CLEAR KEY: The CLR key it is used to delete, character by character, the data in the SCRATCHPAD.

BRIGHT ADJUST: To regulate brightness of DISPLAY.

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MODE SELECT AND FUNCTION KEYS

This array consists of 15 keys, one of which is not used:

- **INIT REF** Accesses the pages of data required for initialization of the FMS and IRS for flight.
- **DIR/INTC** Accesses the direct to and course intercept pages.
- **RTE** Accesses the pages which define the route to be followed.
- **LEGS** Accesses the pages which define each leg of the route.
- **CLB** Accesses the climb page.
- **CRZ** Accesses the cruise page.
- **DES** Accesses the descent page.
- **PREV PAGE** and **NEXT PAGE** Accesses additional pages of a set when another page is required to complete the display of data.
- **MENU** Accesses a menu of systems connected to the MCDU such as ACARS.
- **FIX** Access to the page which defines a geographical reference that is not on the flight plan.
- **DEP/ARR** Accesses pages defining departure and arrival segments of the route.
- **HOLD** Accesses pages that establish holding parameters.
- **PROG** Accesses the progress pages.
- **EXEC** This is the command key of the FMS. It contains a light bar that illuminates whenever a modification is pending. Pressing the key while the light bar is illuminated results in the execution of the modification. Every page that has modification capability will contain an ERASE prompt which will enable the operator to cancel the pending modification. Pressing the illuminated EXEC Key or the ERASE prompt LSK extinguishes the illuminated light bar on the EXEC Key.

ANNUNCIATORS

There are four annunciators located on the keyboard, two on the left side and two on the right side. These annunciators display the following:

- DSPY** Illuminates when the current display is not related to the active route leg or the currently operational performance mode.
- MENU** Illuminates whenever any non-active subsystem has a request pending.
- MSG** Illuminates when an FMC-generated message is displayed in the scratchpad.
- OFST** Illuminates when a parallel offset path is in use.

MCDU PAGE FORMAT

NOTE: Hold the TAB key to activate the PC keyboard to input data directly in the FMS. When the keyboard is enabled a small letter K will appear at the right of the page number.



 MANDATORY DATA ENTRY FOR MINIMUM FMS OPERATION.

 OPTIONAL DATA ENTRY.

 OR  PRESS THE CORRESPONDING LSK TO ACCES THE DESIRED PAGE.

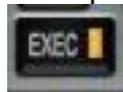
 SCRATCHPAD.

There are two different character size in the MCDU display:
Computer generated data. (Small character size).

Pilot entered data or FMS database constraint or wpts identifier. (Large character size).



Anytime a modification is introduced to the FMS, such as a constraint, a waypoint, a direct-to, etc., the world MOD appears beside the page title to indicate that a modification to the active route or vertical profile is pending and awaiting confirmation and activation. The prompt ERASE will be displayed in field 6L and the EXEC key will illuminate.



Pushing the EXEC all the pending modifications will be activated, while pushing the LSK6L will cancel modifications and return to the active route.



CAUTION:

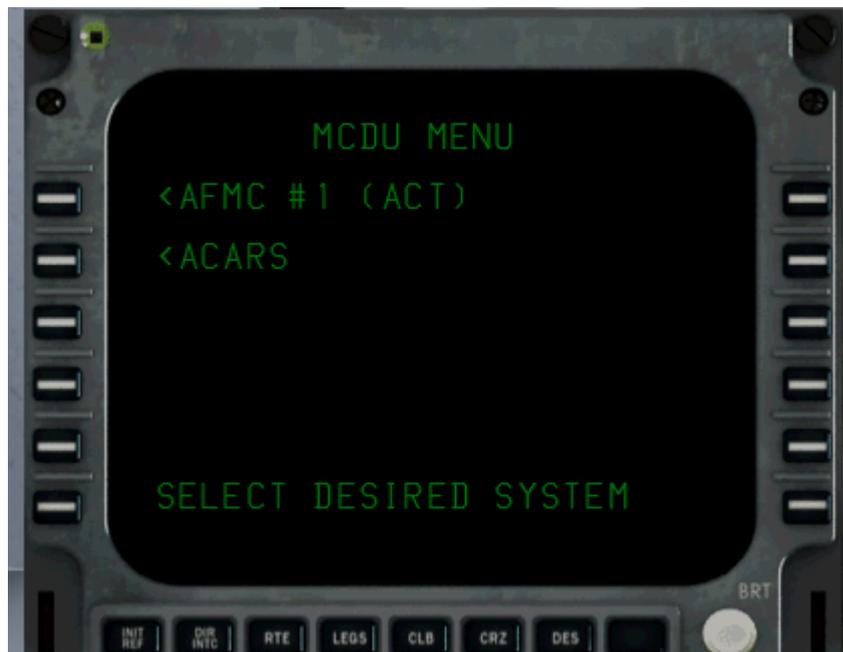
In order to avoid activation of unknown entries, if the EXEC key illuminated and the reason cannot be determined, the ERASE prompt must be pushed to remove pending modifications.

FMS PROCEDURES

The use of the FMS will be described with a flight plan as an example.
The flight plan is LIEE-LIRF via KOVAS L125 TALIN UL5 VALMA

POWER UP PAGE

If after power up the MCDU shows the following page press LSK1L to access the IDENT page.



IDENT PAGE

This page shows the aircraft model, the engine types and the AIRAC database in use.



Press LSK63 to access the POS INIT PAGE.



The position initialization task aligns the FMS to the present ground position of the aircraft. The LAT/LON coordinates of airplane's last position, prior to shutoff of power, is displayed in field 1R. REF AIRPORT can be used to display the database's ARP coordinates.

Type LIEE, which will be displayed in the SCRATCHPAD, and insert the data in the field REF AIRPORT pushing the LSK2L. The coordinates of the airport will be displayed in field 2R. Now press LSK2R (or LSK1R or LSK4R) to display the coordinates in the scratchpad, and then LSK5R to insert the coordinates in the SET POSITION mandatory field. The position initialization it is now completed.



Press the LSK6R (or RTE key) to access the ROUTE page. The flight plan route can be inserted into FMS in three ways:

- 1) Loading a company route.
- 2) By means of “airway to waypoint” using the ROUTE page.
- 3) By means of “point to point” using the LEGS page.

Method 2) is the fastest if there are no company routes saved.

First, we must insert the destination airport in the field LSK1R, LIRF. The departure airport it is already defined from the POS INIT page.

Next, we start inserting the route, typing the name of the first wpt, KOVAS, and then pushing key LSK4R. We have now defined a direct to from the departure airport to KOVAS. After KOVAS we must follow airway UL125 up to TALIN, so we type UL125 and push LSK5L to insert it, and then TALIN which we insert in field 5L. We must now press the key NEXT PAGE to go to page 2/2 and insert the next airway, UL5 (filed 1L) to VALMA (in field 1R). At this point we activate the route pushing LSK6R and confirm with the EXEC key.

In the route page in the left fields we normally insert airways, and in the right fields the last point that we want to reach in the inserted airway. If we insert a wpt without an airway in the corresponding left field, the FMS will generate a direct-to waypoint, and the word DIRECT will be displayed in the left field. It is also possible to insert an airway after another airway without a TO point, and the FMS will automatically calculate the intersection point.





After the route has been inserted and activated, push LSK6R to access the PERF INIT page, where we must insert mandatory data for the FMS operation. First, we insert the cruise flight level of our flight plan, in this example FL280, by typing 280 and then push LSK1R. Next, we insert the zero fuel weight from our load sheet (see also the Load Manager manual). If our ZFW is 47.225Kg, we type 47.2 and then push LSK4L. The MCDU will automatically calculate the gross weight. If we want, we can modify the cost index (higher values of the cost index will force the FMS to calculate a higher CLIMB and CRUISE speed, and vice versa).



NOTE: The fuel quantity must be inserted specifying the schedule, /A or /N.

In field 5R we can insert the transition altitude if it differs from the displayed value. When all the data are inserted, push LSK6R to access the TAKEOFF page.



If some data in the previous pages has not been inserted, the name of the page will be displayed in lines 4 or 5 and the message PRE-FLT STATUS. If all the data are correct, these lines will be blank and the MCDU will display the message PRE-FLT COMPLETE.

Values for V1, VR, and V2 may be entered on the right side of the page for crew reference at LSK 1R, 2R, and 3R respectively. All values blank after takeoff.

NOTE



The route created can be saved for future flight (to load a saved route insert the name in field LSK2L of the route page). To save the route, push key INIT REF and then LSK6R (MAINT). Type the name of the route (or recall the name proposed by the FMS) and push LSK1L (SAVE ROUTE).

ADDING DEPARTURE AND ARRIVAL PROCEDURES

SID, STAR and Approaches procedures must be inserted by pushing the DEP/ARR key and then select DEP (LSK1L). From the DEP page it is possible to select the departure runway and the SID procedure that we want to follow after takeoff. If we have already inserted a dep. Runway in the route page it will also be selected here. We now select runway 32 and the SID KOVAS6E.



Now push LSK6L to go back to the main DEP/ARR page.

The procedure to insert a STAR, APPROACH or TRANSITION is similar. From page DEP/ARR we must select ARR to access the page with the APPROACH, STAR and TRANSITION for the desired runway. In our example, we must select ILS16L with transition TAQ and star VALMA3B (VALMA-TAQ).



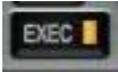
Selecting the RTE page we can now check the inserted route.



DISCONTINUITIES

A DISCONTINUITY is an interruption in the route that the FMS creates when we insert a procedure that does not *connect* with the present route or when we modify the route (for example with a direct to) and must be eliminated before the autopilot can follow the lateral and vertical profile created.



We must confirm the modifications with the EXEC  key.

After a route is completed, we should check the LEGS page (which shows all the fixes of our route) for any discontinuity or other errors. If we select the PLAN view in the Navigation Display (ND) it is possible to go through all the fixes by pushing the LSK6R (STEP).



When the route has been checked and all the errors eventually present fixed, the FMS is ready and the autopilot (or the pilot, by means of the FD's bars) can follow the lateral and vertical profiles calculated.

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PERFORMANCE DATA PAGES – GENERAL

The Performance Mode Select Keys are CLB, CRZ, and DES. Performance data is derived from the required preflight entries on the PERF INIT page and the stored aircraft performance information.

MCDU performance pages automatically transition between CLB, CRZ, and DES when the aircraft passes points defining the vertical profile.

The FMC climb phase is from takeoff until the airplane reaches the preflight designated initial cruise altitude called the Top of Climb point (T/C). The cruise phase begins at T/C and ends at the Top of Descent point (T/D). The T/D point is predicated upon the descent path required to meet the End of Descent point (E/D). The T/D is calculated in one of two ways:

- Descent to meet the requirements of a selected arrival or approach procedure.
- Descent to meet the lowest waypoint associated altitude constraint below the cruise altitude.

VNAV CLIMB AND DESCENT

To initiate a climb or descent when VNAV is engaged, first set and arm the new altitude in the FGCP Altitude Window. Then type the new altitude in the Scratch Pad of the CLB or CRZ page and line select it with LSK 1L. Cruise descent altitudes are entered on the CRZ page as well. Next press the EXEC Key on the MCDU, and finally press VNAV on the FGCP to begin the climb or descent.

CLB PAGES

The CLB Key displays the climb speed and altitude targets. CLB is a one-page format. Unless speed / altitude restrictions exist, the default schedule is 250 KT climb to 10,000 feet and economy climb to cruise altitude.

In CLB the left side of the MCDU screen is speed and altitude related. The right side defines waypoint speed and altitude constraints.

Pushing the CLB Key displays the active FMC climb page. Upon reaching the T/C point, the MCDU automatically displays the CRZ page. Pushing the CLB Key after reaching T/C would display a blank climb page.

Waypoint associated speed and / or altitude constraints may be deleted in the following ways:

- Delete the waypoint from the RTE or LEGS page by the DEL Key or by route modification.
- The DEL Key and appropriate speed / altitude LSK on the right side of the LEGS page.
- The DEL Key and LSK 1R on the CLB page.
- Lowering the cruise altitude to below the constraint altitude.

The waypoint associated speed and / or altitude constraints can be entered or changed only on the LEGS pages.

Selecting a new CRZ ALT creates a new altitude target on the climb page and a new CRZ ALT on the cruise page. Entering a CRZ ALT higher than the maximum certificate altitude is rejected and a MCDU message, LIMIT ALT FLXXX, is displayed.

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CRZ PAGES

The display changes from CLB to CRZ automatically upon reaching the T/C.

The CRZ mode is also displayed anytime the CRZ Mode Select Key is pushed.

The cruise page is inactive until T/C is reached.

Upon reaching the CRZ ALT, the page title reflects that it is active. The FMC tracks the ACT ECON CRZ performance unless another selection is made.

The desired speed is entered in the Scratch Pad, line selected to LSK 2L, and executed with the EXEC Key. Selecting and executing ENG OUT at LSK 5R or LRC at LSK 6R makes either of these speeds the ACT CRZ speed. If one of these speeds is activated, ECON CRZ is available at LSK 5L. Economy, LRC, and selectable speed cruise pages display the optimum (OPT) cruise altitude. Optimum altitude is based upon existing weight, cost index, trip length, and the same wind at all altitudes.

STEP TO a higher altitude appears at LSK 1R when the aircraft is more than 200 miles from T/D.

Cruise climbs and cruise descents are made on the CRZ page. If the cruise altitude (CRZ ALT) is changed to a higher altitude, the FMC commands a cruise climb (CRZ CLB). Conversely, line selecting an altitude lower than CRZ ALT creates a cruise descent (CRZ DES).

DES PAGES

The DES Key displays descent performance data on a single descent page.

This page becomes active automatically at the T/D (Top of Descent).

The aircraft starts descent only if the Digital Flight Guidance System (DFGS) is engaged in VNAV and a lower altitude has been set in the altitude select window of the FGCP.

The FMC calculates an optimum descent path using idle thrust to meet all speed / altitude and waypoint associated speed / altitude constraints to arrive at the FA (Final Approach fix) at the proper altitude and 170 KTS. In the absence of other speed constraints, the descent path is based on an ECON DES speed to 10,000 feet, deceleration to 240 KTS by 10,000 feet, 240 KT DES below 10,000 feet, and finally a deceleration to 170 KTS by the FAF.

With the DFGS engaged in VNAV, the FMC attempts to maintain the descent path using the elevators. If the speed drops 15 KTS below target speed above 10,000 feet or 10 KTS below target speed below 10,000 feet, the FMC advances the throttles to regain the target speed. The MCDU message DRAG REQUIRED appears if the speed exceeds the target speed by 15 KTS above 10,000 feet or 10 KTS above target speed below 10,000 feet. The crew should use speed brakes to enable the FMC to maintain the desired descent path.

Before reaching the T/D, DES may be initiated and the page activated by selecting and executing DES NOW at LSK 6R.

VNAV CLIMB

In the CLB (Climb) page of MCDU it is possible to modify the speed that the FMS will command for the climb phase of the flight. ECON SPD (LSK3L) is the optimal speed calculated by the FMS. SPD TRANS (LSK3L) is a speed restriction (250KIAS) below FL100.



The following modifications can be done in the CLB page.

Delete the restriction 250/FL100: Push the DEL  key and then LSK4R
To add again a restriction (i.e. 230KIAS below FL080) type 230/8000 and push LSK4L.

Change the climb speed: type the desired speed, i.e. 300 (for 300 KIAS) or .760 (for MACH .760) and push LSK2L. If the speed is entered in the format 300/.760 the FMS will use the IAS or the MACH as a function of aircraft altitude.

Push LSK6R (prompt CLB DIR), to bypass altitude constraint associated to waypoints and continue climb to FGCP armed altitude, or FMS CRZ inserted altitude, if lower.

Push LSK5R (ENG OUT), to continue climb with one engine after an engine fails. The MCDU will display the message "SELECT MCT" as a reminder to select Maximum Continuous Thrust in the TRP.



The calculated top of climb point is indicated in the ND with a green dot, and it is called T/C. A green arc shows the estimated position where the aircraft will reach the altitude indicated in the ALT readout of the FGCP.

VNAV CRUISE

The page CRZ (Cruise) holds all the data concerning the cruise phase of the flight. The page cruise is active when the DFGS is in VNAV LVL mode.



The page displays the cruise level, speed ECON, SEL or LRC, the estimated fuel at destination, the distance a time to the T/D (top of descent) point and wind data.



The following modifications can be done in the CRZ page.

Change the cruise level (LSK1L). The new altitude must be also armed in the FGCP, and then the key VNAV must be pushed to start cruise climb or descent.

Change the cruise speed: type the desired speed, i.e. 300 (for 300 KIAS) or .760 (for MACH .760) and push LSK2L. If the speed is entered in the format 300/.760 the FMS will use the IAS or the MACH as a function of aircraft altitude.

Push LSK6R (LRC), to activate the speed that allows the airplane to have the best distance autonomy.

Push LSK5R (ENG OUT), if an engine fails. The MCDU will calculate a much lower speed. The message "SELECT MCT" will display as a reminder to select Maximum Continuous Thrust in the TRP.

The Top of Descent Point (T/D) display on the ND as a green dot.

When the airplane is approaching the T/D, and a lower altitude it is not armed in the FGCP, the MCDU will display the message "RESET FGCP ALT". If a new altitude is armed on the FGCP, the airplane will start the descent after passing over the T/D point.

VNAV DES

The page CRZ (Cruise) holds all the data concerning the descent phase of the flight. The page descent is active when the DFGS is in VNAV DES mode.



The DES page displays the estimated distance and time of arrival to the end of descent point (E/D), calculated speed and speed restriction.



The following modifications can be done in the DES page.

Delete the restriction 250/FL100: Push the DEL  key and then LSK4R
To add again a restriction (i.e. 230KIAS below FL080) type 230/8000 and push LSK4L.

Change the descent speed: type the desired speed, i.e. 300 (for 300 KIAS) or .760 (for MACH .760) and push LSK2L. If the speed is entered in the format 300/.760 the FMS will use the IAS or the MACH as a function of aircraft altitude.

Push LSK5L to select the policy speed for descent (300KIAS).

Push LSK6R (DES NOW) to start the descent to the FGCP armed altitude before the aircraft reaches the T/D point.

Push LSK5R (ENG OUT), to continue descent with one engine after an engine fails. The MCDU will display the message “SELECT MCT” as a reminder to select Maximum Continuous Thrust in the TRP.



During the descent the ND will show the distance from the vertical profile. The range of the indicator is plus/minus 1000 feet.

FORECASTS

Push LSK5R to display the Forecasts page, where optional wind data and altitude at which airfoil anti ice will be activated can be inserted to allow FMS to calculate optimal descent path.

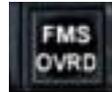


Push LSK6R to return to DES page.

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FMS OVERRIDE

When the VNAV mode is active (VNAV CLB, VNAV LVL, VNAV DES), it is possible to 'bypass' the speed control of the FMS with the FMS OVRD function. To activate the override mode, push the FMS OVRD on the FGCP.



In FMS OVRD it is possible to select the desired speed with the SPD Selector of the FGCP regardless of the speed calculated by the FMS.



When the FMS OVRD is active the FMA shows the following message:



To resume the normal FMS operation, push the FMS OVRD button again on the FGCP.

DIRECT-TO WAYPOINT / INTERCEPT LEG

This function can be used in any moment to direct the aircraft to a specific point, even if it is not part of the actual flight plan. All the data associated with the bypassed waypoints are removed.

Push the DIR/INTC key to access the page. Note the field 6L where the direct to wpt name must be inserted. Type the name of the waypoint (or select a LSK to copy the name in the SCRATCHPAD) and then push LSK6L.

Confirm the modification with the EXEC key.



INTC LEG is similar to DIRECT TO, with the difference that the intercept course to the direct-to waypoint must be inserted in field 6R after the waypoint name.



PROGRESS

To access the PROGRESS page, push the PROG key. The progress page display data relative to the previous and next wpts, destination, and fuel consumption.



To obtain information about any active route wpt as well as alternate airports, insert the desired wpt/apt identifier in field 4L. To return to destination apt information, delete (DEL Key) the entered identifier.

The second page (2/2) display wind data, lateral and vertical errors and estimated fuel quantity.



HOLDINGS

To access the HOLDINGS, push the HOLD key on the MCDU.

If the loaded approach contains a missed approach holding, or other holdings, that hold will be initially presented after pushing the HOLD key.

To insert a new holding push LSK6L (unless the page to select the holding fix it is already on the MCDU display).



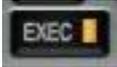
Select the holding fix with one of the LSK or type the fix name and insert it in field 6L.



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Insert holding data:

- Inbound course, and turn direction (Left or Right)
- Leg time or...
- ...leg length.
- Optional speed/altitude restriction.

Confirm the modification by pushing the EXEC  key.

The FMS calculates and displays the optimal holding speed in field 6R.



To cancel the holding before reaching the holding fix, delete the 'HOLD AT' fix from the fix page and close any discontinuities created.

To exit the holding, push EXIT HOLD (LSK6R) from the HODLINGS page. The message will change to EXIT ARMED and the aircraft will leave the holding, and resume route navigation, at the next passage over the holding fix.

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PILOT DEFINED WAYPOINTS

In the LEGS or DIRECT TO page it is possible to insert pilot defined waypoints.

LATITUDE/LONGITUDE WAYPOINTS

Insert in the SCRATCHPAD the coordinates in the format

(N or S) DDMM.M(E or W) DDDMM.M, where D is degrees and M minutes and tenths of minutes. I.e.: N39 12.44 E009 04.21 (space characters are optional).

Push the LSK corresponding to the position where the point must be inserted.

PLACE-BEARING/DISTANCE

Insert the desired point in the scratch with the format

TAQ012/10, where TAQ is the fix identifier, 012 is the bearing and 10 is the distance in nautical miles.

Push the LSK corresponding to the position where the point must be inserted.

COURSE INTERCEPT WAYPOINTS

Insert the data in the format: <fix1><dir1>/<fix2><dir2>, i.e. CAG180/CAR270 will create a point at the intersection of radial 180 from CAG and radial 270 from CAR.

ALONG TRACK WAYPOINTS

An along track wpt can be inserted in the format <fix><+-dist>, i.e. CAR12 will create a point 12 miles after CAR along the route LEG.

The <fix> identifier must be a point of the route, the distance (+ ahead, -before) can't be greater than the distance of the next or previous waypoint of the route.

Close any discontinuities and confirm the modification with the EXEC key.

APPROACH REF

APPROACH REF, when airborne, is accessed directly by pressing the INIT REF key. It displays the reference data relating to the approach.



Approach speeds are displayed for various landing flap configurations and gross weight.

The displayed gross weight is the current aircraft gross weight.

GROSS WT may temporarily be changed by entering proposed weight in the SCRATCH PAD and line selecting it with LSK 1.

The approach runway, runway length, ILS/LOC frequency, and front course are displayed as well.

FIX INFO

The FIX INFO page it is used to obtain information on a waypoint from the navigation database.

Insert the name of the wpt in field 1L, and the desired down track radial in field 2L. The MCDU will show the data relative to the intersection between the active leg and the inserted radial. The Navigation Display will show the radial from the wpt as a green dashed line.



To activate RTE 2 press LSK 6R on RTE 2 page, pushing the activate prompt will show RTE 2 legs direct-to page. Insert the desired direct to waypoint.



PMS (PERFORMANCE MANAGEMENT SYSTEM) OVERVIEW

All flight profile computations are done by a series of equations, relating airplane performance to trip parameters, referred to as Performance Optimization Algorithm (POA). The PMS continuously computes an optimum flight profile from present position to the Bottom of Descent (BOD) point based on current flight data; this is referred to as "POA Active" operation. When current trip data is not available to the PMS, only limited system operation is possible, this is referred to as "POA Inactive" operation.

POA Inactive operation occurs when any of the following conditions exist:

- a) Trip distance not entered on PLAN page; or
- b) BOD point passed and new BOD distance and altitude not entered; or
- c) Airplane is in climb past the computed TOD, or
- d) BOD distance and altitude cleared from PLAN page.

PMS Thrust and speed limits

When in FGS PERF mode, the engine limits are computed by PMS in a manner identical to but independent of the Thrust Rating Computer (TRC). The PMS reads the selected limit mode selected on TRP and computes a numerical limit in accordance with the following:

Selected TRP Mode	PMS Limit Mode
CL	CL
CR	CR
MCT, TO, TO FLEX, GA	MCT

The PMS VMAX/VMIN speed limits are so defined:

VMAX: Lower of 1.1g high buffet and VMO/MMO for airplane configuration.

VMIN: Higher of 1.1g low speed buffet and 1.5 Vs (Flaps/Slats retracted) OR 1.5 Vs (Flaps/Slats extended).



PMS KEYBOARD OPERATIONS

Data Entry	<ol style="list-style-type: none"> 1. Enter all data by means of numerical (right hand) keyboard. 2. Data will first appear in scratchpad. 3. Push corresponding line select key to transfer data to appropriate data line. 4. Data separated by a "/" are entered by first pushing the key the appropriate number of times required to enter the data into the desired field. For example, on expanded BOD page, to enter wind 270°/15 kts push: /270/15 and the line would then be: 250KT/WIND 270/15 									
Clearing an entry (from scratchpad)	<ol style="list-style-type: none"> 1. Number entered in scratchpad can be cleared by pushing CLEAR key once 									
Clearing an entry (from LSKs), i.e: 250/290/310 To clear only 250 290 310	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; text-align: right;">CLEAR</td> <td style="width: 20%;"></td> <td style="width: 10%; text-align: center;">①</td> </tr> <tr> <td style="text-align: right;">CLEAR</td> <td style="text-align: center;">/</td> <td style="text-align: center;">①</td> </tr> <tr> <td style="text-align: right;">CLEAR</td> <td style="text-align: center;">/ /</td> <td style="text-align: center;">①</td> </tr> </table>	CLEAR		①	CLEAR	/	①	CLEAR	/ /	①
CLEAR		①								
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PMS PLANNING

This procedure contains the steps and actions to be performed during final cockpit preparation for the use of PMS during climb, cruise, and descent phases of flight.

Note

If initial PLAN page data is not entered during final cockpit preparation, at engine start the "ENTER PLAN" CDU message will appear in the scratchpad.

Push plan key and observe initial PLAN page is displayed.



Initial PLAN page (on ground)

Notes

All data on this page is required for POA active operation. If partial data is entered, only limited operation is available (POA Inactive: refer to Summary Table)

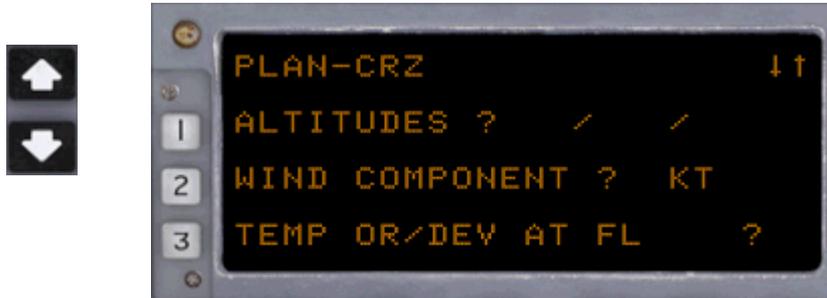
No other pages are available except the STS/TEST page, until planning data is entered.

- Enter estimated ramp gross weight into scratchpad by using the data entry keys. Push line select key ① to transfer gross weight into data line 1.
- Enter total fuel (as indicated on fuel qty display) into scratchpad by using the data entry keys. Push line select key ② to transfer total fuel into data line 2.
- Enter trip distance (nautical miles) into scratchpad by using the data entry keys. Push line select key ③ to transfer trip distance into data line 3.

Observe ↑ flashing in scratchpad. BOD GWT and BOD FUEL weights are now being computed and are displayed as '---' until computation is completed. Computation is based on a descent profile at the [NON OPT] Mach/IAS schedule displayed on the STATUS page. This is the automatic PMS descent speed profile.

If time available for completion of flight plan data loading:

Move the slew switch up or down to have the PLAN-CRZ page displayed



Initial PLAN CRZ page.

Note

Data on PLAN-CRZ page is not necessary for system engagement and may be entered later if desired. If no data is entered, flight profile will be based on: no altitude constraints, zero wind, standard day (ISA) temperature and a maximum of five step-climb segments to reach optimum cruise level.

- Enter cleared cruise altitude(s) as flight levels into scratchpad using data entry keys. Push line select key ① to transfer selected value(s) into data line 1.
- Enter enroute wind component into scratchpad (+ for tailwind, — for headwind).

Example: (-8 kts):



Push line select key ② to transfer the wind component to data line 2.

- Enter the temperature at initial cruise altitude or the corresponding deviation from ISA preceded by a slash (/) into scratchpad. Use the data entry keys to make entry. Push line select key ③ to enter temperature/deviation into data line 3.

Note

The loaded temp/dev continues to be displayed and can be edited up to 15000 ft. Beyond that point, POA computations are based on current deviation and edits of temp/dev are inhibited.

If time available and BOD geographic definition available for loading:

Note

The basic definition of the Bottom of Descent (BOD) point is based on loaded trip distance and is used by PMS to compute an initial flight profile in case a precise BOD geographic location is not loaded; the basic BOD is assumed to

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be 10 nm less than trip distance, at an altitude of 10000ft and a speed of 250kts; the PMS will simply count down the distance as flight progresses and descend to BOD altitude as defined above.

Slew up or down to return to initial PLAN page.
 Push ③ and observe expanded BOD page is displayed.

Note

When PLAN page is displayed, any time line select key □ is pushed, the expanded BOD page is called up.

Line 1 represents geographic definition of the BOD which can be loaded as a co-located VOR/DME frequency alone (no offset with the station) or as frequency, radial and distance in nm. To complete loading after correct figures appear on scratchpad, push ① and observe data on line 1.

(Example: 114.90/243°/15nm)



Expanded BOD Page after freq/rdl/distance loading)

Line 2 defines the desired speed, expected wind direction and velocity at BOD. Any or all of these can be loaded. To complete loading after correct figures are set on scratchpad, push ② and observe data on line 2 (example: 210kts, 200° and 10kts).

Line 3 represents BOD distance and altitude and can be edited at any time except distance when BOD VOR is tuned and BOD distance is updated by DME. To complete loading after correct figures are set on scratchpad, push ③ and observe data on line 3.

Note

BOD distance will be updated to agree with the precisely defined BOD when the airplane is within 200 nm of BOD and PMS is receiving valid VOR/DME inputs (relevant to loaded frequency).

Whenever it is desired to verify the sequence of planned vertical events:

Note

Vertical events are points at which a transition occurs in the vertical profile of the flight; included are: speed mode change point, armed altitude (ARM), top of climb (TOC), start of step climb (STEP), top of descent (TOD), bottom of descent (BOD) and Altitude/Distance inquiry (ALT) where commanded.

Push the vertical waypoint key (if other than Vert Wpts page displayed) and observe TO page with the first three vertical events is displayed. For display of successive events (if planned), operate the slew switch.

Notes

- 1) Data lines are blanked until PMS trajectory is computed.
- 2) Next (first in sequence) vertical event is normally displayed as line 1 of the CLB, CRZ and DES pages.



①

②

③

	EVENT	ALTITUDE OR FUEL AT EVENT	DISTANCE TO EVENT	TIME TO EVENT	
	TOC↑				← LINE FORMAT
	296KT	10000	12NM	0:03	
	ARM*	FL150	27NM	0:06	
	TOC*	FL270	71NM	0:12	} Two cruise altitudes entered
	STEP*	FL270	XXNM	0:XX	
	TOC*	FL310	XXNM	0:XX	
	TOD*	4.5T	181NM	0:25	
	250KT	10000	213NM	0:34	← Displayed in flight after climb beyond 10000 ft
	BOD*	4000	241NM	0:38	
	ALT*	21247	[50NM]	0:09	← Altitude inquiry commanded

(Continued)

PMS CLB (FGS PERF MODE)

PMS includes three climb options: Climb optimum, climb non optimum and maximum climb (best angle).

FGS PERF mode can be selected only if: PMS valid, TRC not in takeoff or go-around modes, either FD or AP engaged, ATS engaged within 5 seconds of PERF selection and flaps less than 16°. GS PERF automatically enters climb optimum mode of operation (CLB mode annunciator on) whenever an altitude above current altitude is selected (on alt preselect readout) and armed.

Once FGS PERF mode is engaged selected altitudes, even if not armed, will always be honored by PMS as a limit through which it will not climb or descend.

FGS PERF MODE ENTRY AT ENGAGEMENT SUMMARY TABLE

Current V/S	Current Altitude	>512 ft below selected altitude	Within ±512 ft of selected altitude	>512 ft above selected altitude
greater than +240 fpm		CLB to selected altitude	CRZ at selected altitude	See NOTE 2
between ±240 fpm		CLB to selected altitude	CRZ at selected altitude	CRZ at nearest 1000 ft altitude
greater than —240 fpm		See NOTE 3	CRZ at selected altitude	DES to selected altitude

Notes

- 1) *Change from one condition to another requires new condition to exist for at least 1.2 seconds.*
- 2) *PMS computes altitude 20 sec ahead at current climb rate and couples into CLB to capture that altitude, then transitions to CRZ.*
- 3) *PMS computes altitude 20 sec ahead at current descent rate and couples into DES to capture that altitude, then transitions to CRZ.*



CLB OPT page (POA active)

250 Kt Speed Restriction Removal

Press CLEAR Key and then line Select Key ①; observe SPD-SEL alternately displayed in line 1 with unrestricted (opt) speed displayed.

Push again ① to complete the removal of the restriction. CLB OPT page will display the new profile and vertical event.

Notes

1) Removal of the speed restriction can be obtained in two ways: editing of CLEAR in line 1 or in line 3.

2) Removal of speed restriction can also be obtained by calling up the vertical waypoint TO page and edit of CLEAR in the line where restriction is displayed.

Maximum Climb

Move the slew switch as required to have the CLB MAX page displayed and observe illumination of line select key ① and on same line SPD-SEL alternately flashing.

Push ① to command max climb mode).

Climb Non-Optimum

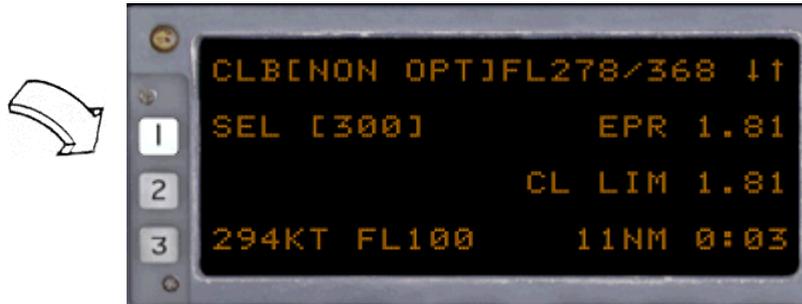
Enter desired climb speed into scratchpad using the data entry keys (e.g. 300).

Note

Edit of speed on either CLB OPT or CLB MAX page creates a CLB [NON OPT] display.

Push line select key 1, observe key ① illuminated, SPD-SEL alternately flashing and page title changed to CLB (NON OPT). Push ① again to engage mode (light off).

Further edits may be made to change speed as required.



CLB [NON OPT] display

Notes

- 1) *Display changes from speed to mach at leading digit of speed entry (4 or less - IAS, 5 or more - Mach).*
- 2) *If leading decimal is used, any legal mach entry will be accepted by the system.*

PMS ALTITUDE/DISTANCE INQUIRY

This procedure allows the entry of an altitude or distance in data line ③ of any CLB page, thus creating a new unplanned vertical event, identified ALT*, with its corresponding altitude/distance/time data. The procedure is valid only from present position on the profile to the next TOC point.

PMS REPLAN

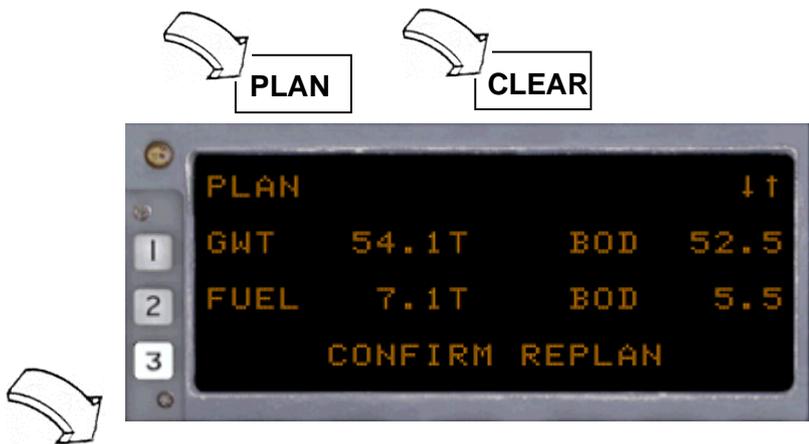
Note

When edits are made on the basic PLAN page, the PMS makes adjustments as required to the current computed profile.

The replan procedure completely clears the current profile from the PMS and allows for the definition of a new profile. Replan is automatically done at the end of the PMS profile but can be manually initiated at any time that a new profile (climb, cruise, descent) is desired.

To begin a replan:

Push, in sequence, the plan, clear, and line select key ③ to call up the PLAN page (for replanning) as shown below; line select key ③ comes on.



Push line select key ③ again. At this point:

GWT and FUEL weight are retained and continue to be updated by PMS (POA inactive operation).

All other flight plan data previously entered into the PMS is cleared, including all of the PLAN CRZ page and the geographic definition of BOD, if previously entered.

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PMS CRZ (FGS PERF MODE)

PMS includes three cruise options: Cruise optimum, cruise non optimum and hold/endurance (minimum F/F).

FGS PERF automatically engages cruise mode of operation (CRZ mode annunciator on) provided conditions described under PMS CLB/FGS PERF MODE procedure are satisfied. At capture of planned altitude (as in PLAN CRZ page) the PMS will automatically switch from climb to CRZ OPT mode; at capture of any other altitude (intermediate level-off) PMS will switch to CRZ [NON OPT] at currently commanded speed.

Push cruise function key and observe initial CRZ OPT page is displayed.

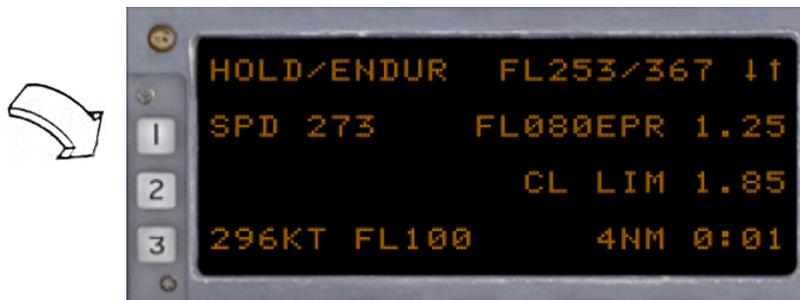
Notes

- 1) *Speed value in line 1 represents the PMS computed IAS/mach.*
- 2) *Speed display changes from IAS to mach number at and above FL270.*

Hold/Endurance

Operate the slew switch in either direction until HOLD/ENDUR page is displayed; observe line select key ① comes on and SPD-SEL flashing in line 1

Push Key ① (light off) to command the mode.



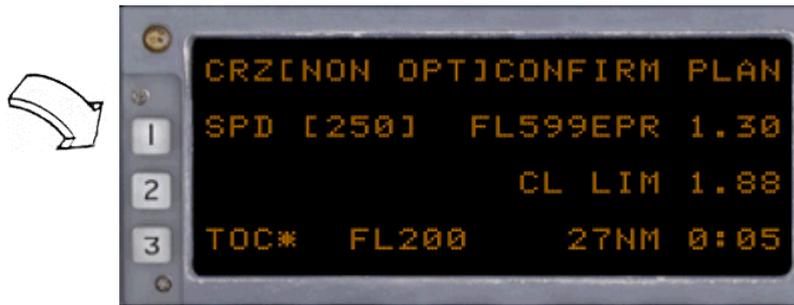
HOLD/ENDUR Page

Cruise Non-Optimum

Enter desired Mach (or IAS) into scratchpad by using the data entry keys.

Push ① (It on) to transfer selected value from scratchpad to line 1 and observe alternate flashing of SPD and SEL on same line.

Push ① again (It off) to command CRZ [NON OPT] mode and page.

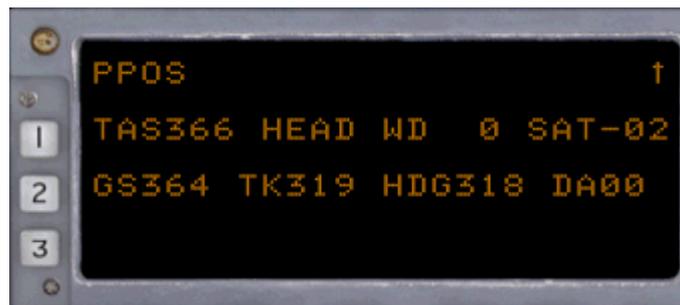


CRZ [NON OPT] Page

EXPANDED PRESENT POSITION DISPLAY

Select VERT WPTS page and slew down to have the PPOS (present position) display in line 1 of the TO page.

Push ① for expanded present position page. The page is primarily for display of current data measured/computed by PMS.



Expanded PPOS Display

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PMS DES (FGS PERF MODE)

PMS Descent Modes

There are three DES modes available: DES [NON OPT], OPT and [V/S]; the PMS maintains, through FGS PERF mode, control of pitch and thrust on all modes.

The DES [NON OPT] is the automatic DES mode to BOD using a Mach/IAS schedule (displayed on STATUS page) which can be changed by the pilot. The TOD point and idle thrust profile are computed by PMS. The speed schedule is preset to M.75/290 kts but can be changed in two ways: on DES [NON OPT] page editing a desired speed for current flight and on STATUS page (on ground only) editing a desired Mach/IAS schedule. Once in DES [NON OPT], to correct for unplanned winds, the PMS will allow speed to vary 10 kts above or below speed displayed on DES [NON OPT] page.

DES OPT mode also computes an idle thrust profile to the BOD; the mode is not automatic and shall be armed. In DES OPT, speed is allowed to vary as required within VMIN/VMAX limits to correct for unplanned winds.

DES [V/S] mode allows for early descents in response to ATC requirements. It holds vertical speed and/or IAS as commanded by the pilot. It is not intended to be used to intercept BOD directly, but can be used to intercept the OPT or [NON OPT] profile to the BOD.

PMS Thrust Lever Control

PMS descent profiles to BOD are computed based on idle thrust setting. However, thrust will be applied in following cases:

- If the airplane is behind the computed profile, vertical speed will first be reduced to correct the condition. If this is not sufficient, partial thrust will be applied when the airplane falls 6 nm behind the profile.
- In DES [V/S], thrust is applied as required to maintain edited values of IAS and vertical speed.
- If Air Foil Ice Protection is applied in descent and an ICE PROT TEMP LOW Ann. Comes on, the thrust levers are advanced slowly until the light goes off. Once the condition is cleared the thrust levers may be manually retarded. The PMS will retard them if Air Foil Ice Protection is turned off.

DESCENT PREPARATION

Five minutes before computed TOD, the following PLAN page is auto-selected:



PLAN page 5 mins before TOD

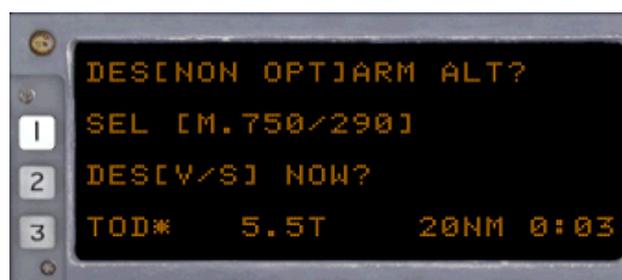
CAUTION

Prior to initiating a descent under PMS control, it is essential that the distance to BOD be confirmed. Errors in distance to BOD can be caused by diversions from the originally planned route of flight or dropouts of VOR/DME data to the PMS during flight.

If the BOD is defined relative to a VOR and the BOD distance displayed is less than 200nm, verify that BOD definition is correct, the BOD VOR tuned and no VOR/DME flags in view; in all other cases, BOD distance must be crosschecked against other navigation systems or charts. Push CLEAR to clear the "DIST TO BOD?" message.

Note

After clearing the "DIST TO BOD" message, the armed DES page will automatically be displayed and the message "ARM ALT?" is displayed on scratchpad if a lower than cruise altitude is not selected and armed.



DES [NON OPT] Page after DIST TO BOD?
cleared and lower altitude not selected.

Notes

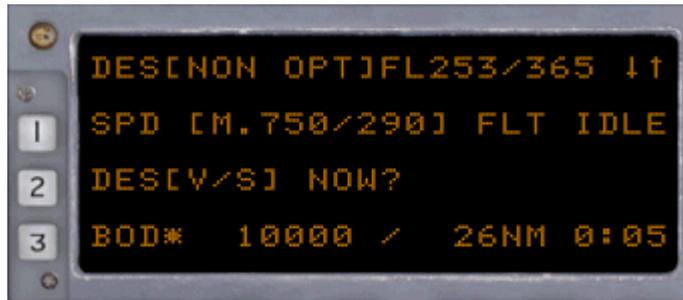
- 1) This page will be presented anytime a lower altitude is armed. However, line select key 1 will not come on and SPD, SEL will not flash until 5 min to TOD.
- 2) DES OPT page is auto-selected only if it was previously called up and armed; descent speed is always displayed in IAS.

Push ① (light off) to enable automatic descent at TOD for armed descent profile.

Notes

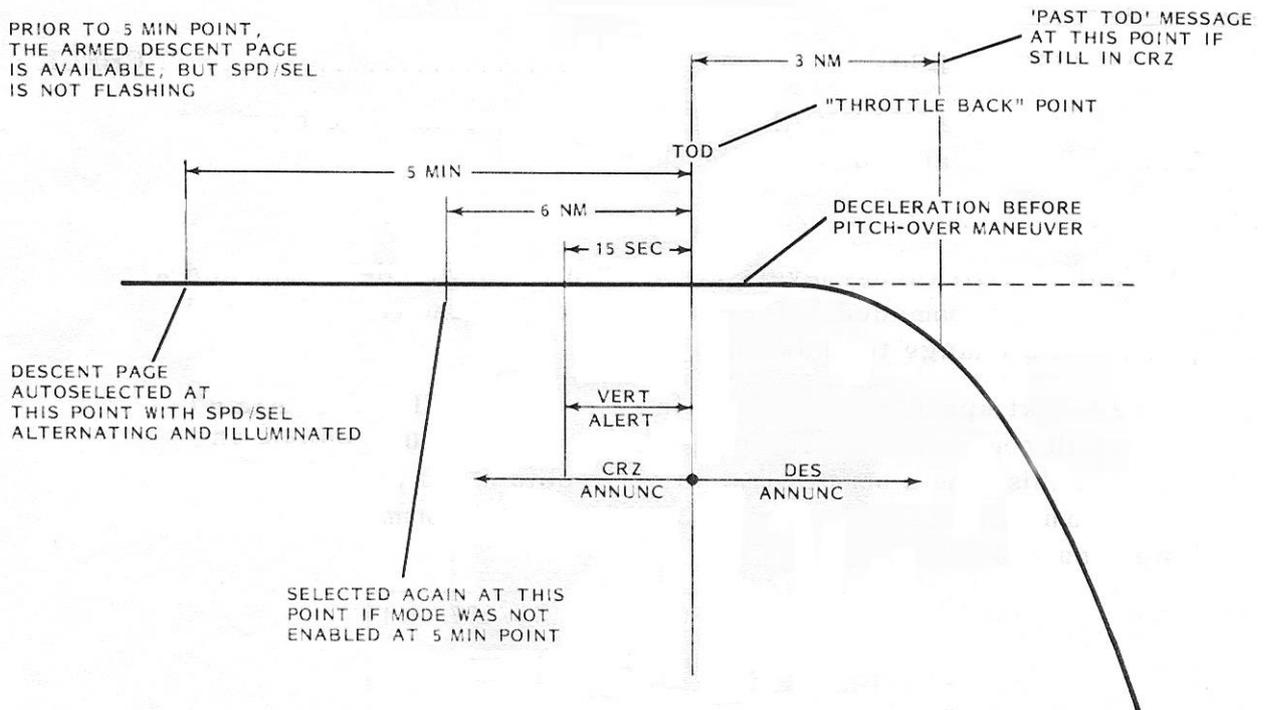
- 1) At 6nm to TOD the "SELECT DES?" message will be displayed on the DES [NON OPT] page if descent not enabled by pushing key 1.
- 2) A PAST TOD message will be displayed 3nm after TOD if system still in cruise.

At planned TOD thrust levers are driven to flight idle detent and a deceleration commanded before the pitch-over maneuver. ATS and pitch FMS's change to show PERF DES.



DES [NON OPT] Page at descent initiation

Basic Descent Parameter Definition/Annunciation at Transition to PERF Descent



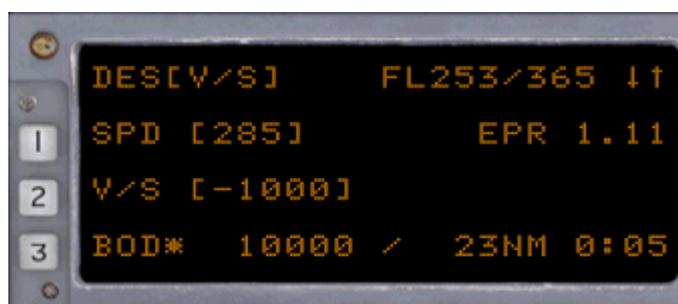
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If a mode other than the DES [NON OPT] (at M.750/k60 schedule) is desired move the slew switch as required to have DES OPT page displayed; observe SPD-SEL alternately flashing in line 1. Push ① to arm mode. The DES page and display will now be auto selected at 5 min prior to TOD.

The DES [V/S] mode can be entered from CRZ or DES and its use is intended for the intercept of a DES OPT or [NON OPT] profile (armed altitude below current altitude). With DES [V/S] NOW? displayed, pushing line select key ② calls up DES [V/S] page; observe SEL alternating with V/S in line 2.

Push again line ② to command DES [V/S] Mode Entry:

At entry to mode, PMS will hold current IAS and a vertical speed of 1000 fpm. EPR display in line 1 is thrust command required to hold IAS and V/S as displayed.



DES [V/S] Page – Mode engaged

Any IAS - V/S combination can be edited, provided drag (speedbrakes) is not required to maintain that combination.

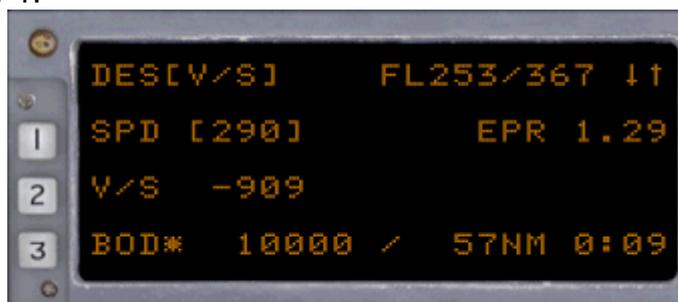
Notes

- 1) *The IAS edit must be within VMIN-/VMAX limits.*
- 2) *The V/S edit must be within -200 to -6000 fpm or a CHECK ENTRY message will appear.*
- 3) *If the V/S edit is greater than the max V/S obtainable with idle thrust and no drag at the descent speed, a MAX RATE XXXX message will appear.*

When both quantities (IAS -- V/S) are displayed in []:

– to hold displayed V/S at idle thrust and to allow IAS to vary, edit CLEAR into line 1 then push line select key 2;

– to hold displayed IAS at idle thrust and to allow V/S to vary, edit CLEAR into line 2 then push line select key 1.



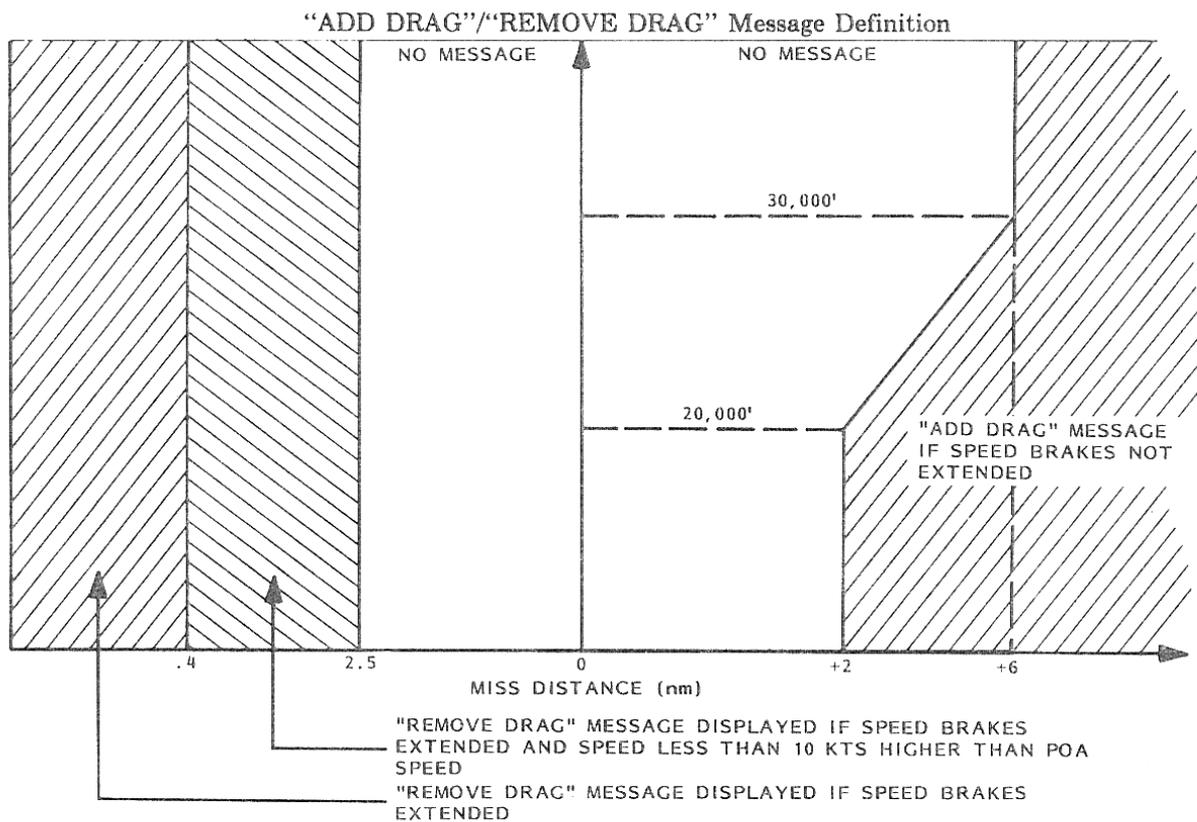
DES [V/S] Page with CLEAR edited into line 2.

ALTITUDE/DISTANCE INQUIRY

Altitude/Distance inquiries are enabled on any DES page according same procedural steps given under PMS CLB/FGS PERF MODE procedure.

ADJUSTMENT OF DESCENT PROFILE WITH SPEEDBRAKES

When unplanned tailwinds are present, the trajectory of the airplane will tend to go long, i.e., BOD miss distance (in line k of DES page) will be an increasing positive number. Speedbrakes may be extended to regain the profile. ADD or REMOVE DRAG message will be displayed for speedbrake operation according to the graph below:



NOTE: IF THRUST IS REQUIRED:

- "ADD DRAG" MESSAGE IS REMOVED
- "REMOVE DRAG" MESSAGE IS DISPLAYED IF SPEED BRAKES EXTENDED
- THRUST IS AUTOMATICALLY APPLIED WHEN MISS DISTANCE IS -6 NM

BOD INTERCEPT

The end of the flight profile defined to the PMS is the BOD. When the airplane is either at BOD altitude beyond BOD, or below BOD altitude, the PMS reverts to a [NON OPT] mode with POA inactive. PLAN page with the ENTER PLAN message in the scratchpad is auto selected.

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PMS OPERATIONAL ADVISORY SUMMARY TABLE

Note

CDU operational advisory messages appear in the scratchpad of the CDU. The "CDU MESSAGE" annunciator (located on the instrument panels) will illuminate when a CDU scratchpad message appears. Procedures for clearing these messages are listed in the following table.

MESSAGE	CONDITIONS	CLEARED BY	REMARKS, NOTES
ENTER PLAN	<ol style="list-style-type: none"> ENGINE start before plan data entered. At BOD Alt & past BOD. Below BOD alt. 	<ol style="list-style-type: none"> GWT entry. PLAN entry. 	Pitch and thrust valid not issued until PLAN is completed.
CHECK GWT	<ol style="list-style-type: none"> Entered GWT outside limits 40.0 - 68.4T 	<ol style="list-style-type: none"> Entry of GWT within limits. CLEAR key. Selection of different display page. 	Will not accept GWT outside limits.
CHECK FUEL	<ol style="list-style-type: none"> Engine start before fuel weight entered. Entered fuel outside limits 4.6-19.5T 	<ol style="list-style-type: none"> Fuel weight entry. CLEAR key. Selection of different display page if due to entry. 	Fuel displays blanked.
MAX LAND WT?	<ol style="list-style-type: none"> Predicted GWT at BOD greater than 61 kT 	<ol style="list-style-type: none"> Correction of previously entered planning data if in error. Entry of additional planning data; alt, wind. CLEAR key. 	Correction or entry of additional data for the POA may cause predicted BOD gross wt to fall below max.
BOD FUEL LOW?	<ol style="list-style-type: none"> Predicted FUEL at BOD less than 2.4T 	<ol style="list-style-type: none"> Correction of previously entered data if in error. Entry of additional planning data; alt, wind. CLEAR key. 	Correction or entry of additional data for the POA may cause predicted BOD fuel to increase above minimum.
BOD ALT?	<ol style="list-style-type: none"> In flight with distance to BOD less than k00 nm or less than j/k entered trip distance whichever is less & BOD ALT not entered. 	<ol style="list-style-type: none"> BOD ALT entry. CLEAR key. 	PERF DES mode inhibited until message is cleared.
V _{MAX} XXX KT OR V _{MIN} XXX KT	<ol style="list-style-type: none"> Airplane too fast/slow for configuration. Edited longitudinal speed outside of V_{MAX} V_{MIN} limits. 	<ol style="list-style-type: none"> Aircraft speed within MAX/MIN limits. CLEAR key or entry of acceptable speed or different page selection. 	<ol style="list-style-type: none"> This message is not clearable with the CLEAR key. PMS does not accept commands outside V_{MAX} / V_{MIN}

PMS OPERATIONAL ADVISORY SUMMARY TABLE (Continued)

MESSAGE	CONDITIONS	CLEARED BY	REMARKS, NOTES
ARM ALT?	<ol style="list-style-type: none"> In CLB or DES with clearance altitude not armed. Time to TOD 5 min or less and CONFIRM BOD message cleared but lower altitude not armed. 	<ol style="list-style-type: none"> ARM appropriate altitude. CLEAR key. 	Alert does not appear until clearance altitude input for 10 sec unchanged. Cannot initiate CLB or DES from CRZ without armed ALT.
CHECK ENTRY	<ol style="list-style-type: none"> Improper sequence of entries in scratchpad. 	<ol style="list-style-type: none"> Reload scratchpad data. CLEAR key. Selection of a different display page. 	
DIST TO BOD?	<ol style="list-style-type: none"> 5 minutes prior to TOD 	<ol style="list-style-type: none"> Edit BOD distance and/or altitudes on PLAN page. CLEAR key. 	Plan page autoselected when message appears.
STEP CLB?	<ol style="list-style-type: none"> 5 min or less to step climb point in cruise and higher altitude not armed. 	<ol style="list-style-type: none"> Higher altitude armed. CLEAR key. 	
CHECK ALT	<ol style="list-style-type: none"> Entered altitude negative or greater than operational ceiling. Illegal entry, i.e., single digit. LDG ELEV greater than 5000 ft. 	<ol style="list-style-type: none"> Enter altitude in range. CLEAR key. Selection of different display page. 	
CHECK TEMP	<ol style="list-style-type: none"> Entered temperature more than 25 °C from standard. 	<ol style="list-style-type: none"> Enter in range temperature. CLEAR key. Selection of different display page. 	
CHECK WIND	<ol style="list-style-type: none"> Wind magnitude greater than 250 kt or wind direction outside range 0 to 160°. 	<ol style="list-style-type: none"> Enter in range parameter. CLEAR key. Selection of different page. 	
CONFIRM PLAN	<ol style="list-style-type: none"> In cruise more than 1024 ft below current planned altitude for 10 minutes. 	<ol style="list-style-type: none"> Edit current planned altitude to current cruise altitude. CLEAR key. 	<p>If message is cleared with CLEAR key, the 10 minutes timer is restarted. Permanent clear is obtained if current planned altitude is edited to current cruise altitude. The PLN-CRZ page shall be autoselected unless data is being loaded on another page.</p>
CHECK DIS	<ol style="list-style-type: none"> Entered trip distance less than 50 nm (on ground only) or greater than 2600 nm. 	<ol style="list-style-type: none"> Entry of an in-tolerance distance. CLEAR key. Selection of a different page. 	

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PMS OPERATIONAL ADVISORY SUMMARY TABLE (Continued)

MESSAGE	CONDITIONS	CLEARED BY	REMARKS, NOTES
D/R	Invalid data from both VORs, both DMEs, or one VOR and one DME.	<ol style="list-style-type: none"> Valid data from both VOR and DME on either 1 or 2 side. Define BOD as FRQ/RDL/DIS. 	Message is not clearable by CLEAR key. Indicates PMS is dead reckoning due to inadequate nav data (DES mode only).
SELECT DES	<ol style="list-style-type: none"> In CRZ 6 nm to TOD, and DES not enabled. In DES V/S 6 nm from armed profile 	<ol style="list-style-type: none"> CLEAR, DES enabled/selected or 3 nm past TOD. CLEAR key, select another DES mode, or 3 nm beyond profile. 	Replaced by PAST TOD message if airplane remains in CRZ 1 nm past TOD.
PAST TOD	<ol style="list-style-type: none"> In CRZ, and 3 nm past TOD. 	<ol style="list-style-type: none"> CLEAR key, begin DES, or arm another DES mode. 	
MAX RATE XXXX	<ol style="list-style-type: none"> In DES V/S, and edited V/S - IAS combination cannot be held without drag. 	<ol style="list-style-type: none"> Edit new V/S or IAS. 	Not clearable with CLEAR key.
ADD DRAG	<ol style="list-style-type: none"> BOD miss distances per message definition graph 	Extending speedbrakes or REMOVE DRAG message conditions.	
REMOVE DRAG	<ol style="list-style-type: none"> BOD miss distance as per message definition graph 	Retracting speedbrakes or ADD DRAG message conditions.	

PMS QUICK REFERENCE CHECKLIST

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PREFLIGHT

- PUSH **STS TEST** CHECK LIGHTS AIRPLANE/ENGINE COST INDEX PROGRAM DESCENT
- PUSH **PLAN** ENTER GWT FUEL TRIP
- SLEW  ENTER ALTITUDE(S) WIND TEMP/DEV

BOD DEFINITION

ONGROUND OR INFLIGHT AS FREQ OR FREQ/RDL/DIST/ALT

- PUSH **PLAN** THEN
- PUSH **3** ENTER FREQ/RDL/DIST ALTITUDE SPD (OPTIONAL) WIND (OPTIONAL)

INFLIGHT TO UPDATE DISTANCE/ε OR ALTITUDE)

- PUSH **PLAN** REVISE BOD DISTANCE ALTITUDE

ENGAGEMENT

- SELECT ATTS ON AP ON OR FD ON CL THRUST
- PUSH **PERF** ENGAGES C C D L OR R OR E B Z S

MODE CHANGES

- CLB → CRZ AUTOMATIC AT SET ALT
- CRZ → CLB IMMEDIATE
- CRZ → DES AT TOD } ARM ALT PUSH ①
- CRZ → DES AFTER TOD }
- CRZ → DES [V/S] IMMEDIATE ARM ALT PUSH ② PUSH ②

OPTIONS

[NON OPT]

- **CLB** **CRZ** OR **DES** ENTER IAS OR M PUSH ① PUSH ①

CLB MAX (MAX ANGLE)

- **CLB** SLEW  PUSH ①

HOLD/ENDURANCE

- **CRZ** SLEW  PUSH ①

OPT (RETURN TO)

- **CLB** **CRZ** OR **DES** SLEW  PUSH ①

DES V/S (IN CRZ OR DES)

- **DES** ARM ALT PUSH ② PUSH ②

NOTE:
a. [SPEED] OR [V/S] MAY BE EDITED
b. FOR IDLE DES, [CLEAR] [SPEED] OR [V/S]

PRESENT POSITION

- **VERT WPTS** SLEW  PUSH ①

ALTITUDE/DISTANCE INQUIRY

- **CLB** **CRZ** OR **DES** ENTER ALTITUDE PUSH ③ or /DISTANCE PUSH ③
- TO CLEAR ENTER [CLEAR] PUSH ③

MESSAGES

- BOD ALT? ENTER ALTITUDE PUSH ③
- DIST TO BOD? ENTER PUSH ③
- " " " IF OK PUSH [CLEAR]
- SELECT DES..WHEN CLEARED..ARM ALT..PUSH ①
- PAST TODWHEN CLEARED..ARM ALT..PUSH ①
- ENTER PLANENTER DIST /ALT PUSH ③

CMA-900 FMS OVERVIEW



DISPLAY: The DISPLAY is divided into four areas. The first line is the title of the displayed page. The left/right fields display data of selected page. The last line (SCRATCHPAD) shows typed alphanumeric data and system generated messages.

LINE SELECT KEYS: the LSK are 12 keys that permit entry of data from the scratchpad to the desired line or, if the key is pressed with the scratchpad empty, it will enter the content of that line into the scratchpad, if applicable.

EXECUTE KEY: Before any modification can be effective, it must be executed through the EXEC key.

CLEAR KEY: The CLR key it is used to delete, character by character, the data in the SCRATCHPAD. If the scratchpad is empty inserts the word DELETE into the scratchpad. Then pressing a line select key deletes data in the corresponding field, where permitted.

BRIGHT ADJUST: To regulate brightness of DISPLAY.

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The display screen provides 14 lines of 24 characters. The color conventions used in the display are as follow:

AMBER: Alert scratch pad messages.
CYAN: Page titles and prompts.
GREEN: Fixed data fields, field titles and waypoint names.
MAGENTA: Identifies the active TO waypoint.
WHITE: Computed dynamic data.

Three different font size are used, as follows:

LARGE: Manual entries and waypoint information.
MEDIUM: Computed or system generated data.
SMALL: Data field units

Annunciator lights:

FAIL – illuminates upon detection of a major MCDU failure.

MSG – flashes when new caution or warning message appears in the scratchpad field of the MCDU display.

POS – illuminates when the aircraft’s navigation is in dead reckoning.

OFST – illuminates during offset (parallel track) navigation.

IND - illuminates when the FMS is operating in independent mode.

EXEC – illuminates when a modification to the active route is in process but has not been executed.

Dash Data Fields – a dash data field (-----) implies an optional data entry.

Box Data Fields – a box data fields (□□□□□) implies a mandatory data entry.

ACT, MOD Status - leg modifications to the active flight plan will display the MOD status (in reverse video) ahead of the page title.

Slash Rule [/] – the slash key “ / ” is used to separate two items of data entered in the same data field (such as wind direction and speed).

Cancellation of Slash Symbol Waypoint Legend (/H, /O) – any procedure attached to a waypoint and identified by a slash symbol followed by a letter, such as holding pattern (/H) or fly-over (/O) can be cancelled by using the slash key alone and the appropriate lsk.

Conditional waypoints - a conditional waypoint is used in the navigation database when a route leg does not terminate at a defined latitude and longitude.

(INTC) – Leg terminates at the interception of the next leg.

(3000) – Leg terminates at the altitude shown.

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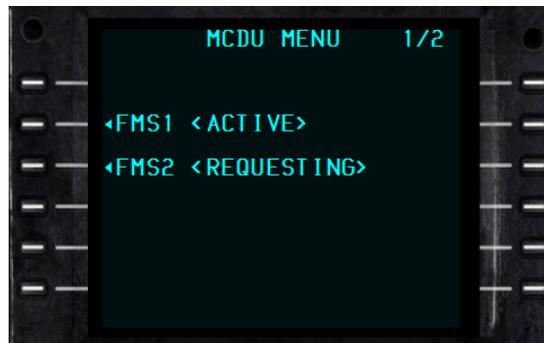
Course Legends

- CRS – Indicate a course leg inbound the next leg.
- FR FIX – Indicates a course outbound from the FIX.
- HDG – Indicates a heading leg
- HOLD AT – Replaces the TO WPT when navigating a holding pattern.

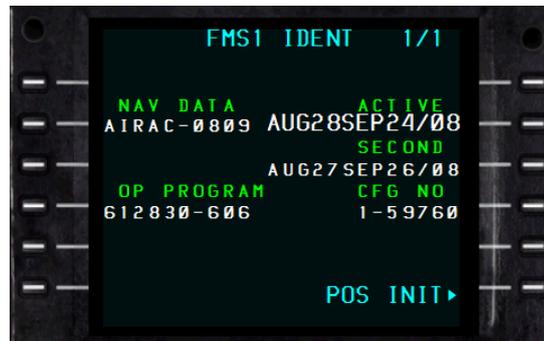
FLIGHT OPERATIONS

PREFLIGHT PROCEDURES

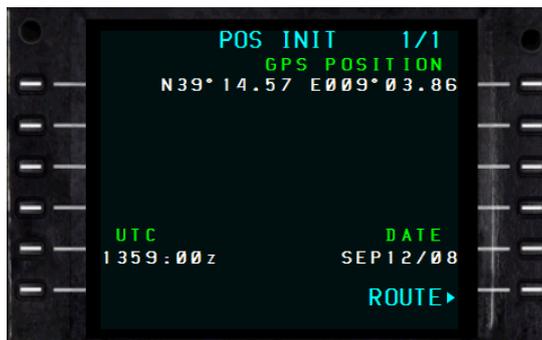
Upon power up the MCDU will show a white display while testing the annunciator lights. After these tests, it displays the MCDU MENU 1/2 page.



The IDENT 1/1 page is displayed by pressing the LSK 2L.



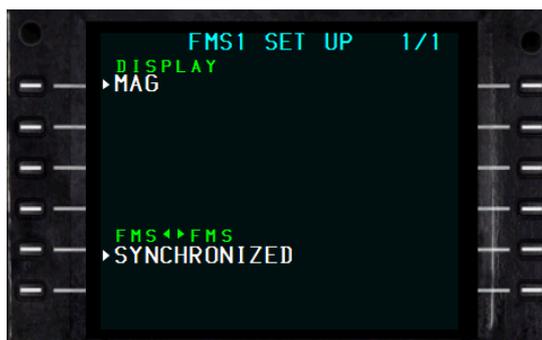
Verify the date of the active database cycle. Go to POS INIT 1/1 page by pressing POS INIT (LSK 6R).



Position/time/date cannot be updated if the primary sensor (GPS) is in the NAV mode.

ANGULAR REFERENCES FOR NAVIGATION

Display the INIT/REF INDEX 1/2 page by pressing INIT REF, and then SET UP 1/1 page by pressing LSK 3L.



The default angular reference for heading, course, actual track, and bearing is **MAGNETIC NORTH** (degree symbol), and that of wind direction is **TRUE NORTH** (T symbol). Change the navigation reference DISPLAY to TRUE or MAGNETIC by pressing LSK 1L.

ACTIVE ROUTE SELECTION

Display the ROUTE 1/1 page by pressing RTE, or by pressing LSK 6R if POS INIT 1/1 page is displayed.



Key in the company route identifier into the scratchpad (e.g.: CAGFCO1), then move it to the CO ROUTE field by pressing LSK 2L

or:

Display the company routes by pressing LSK 6R and select route identifier by pressing the appropriate LSK.

Verify the ORIGIN and DEST identifier and accept the new active route by pressing EXEC, or cancel modifications by pressing LSK 6L.

When no company route is available, a route can be created by first defining the origin and destination airports on the ROUTE page, followed by entry of the individual waypoints on the LEG page.

IN-FLIGHT PROCEDURES

Display the LEGS 1/X page and verify the course and distance of the route legs.



INSERTING TEMPORARY WAYPOINTS

A. PLACE/BEARING/DISTANCE. With the desired reference waypoint identifier in the scratch pad key the bearing and distance separated by slash, e.g.: LEDRO049/15; move the waypoint to the desired place in the route by pressing the appropriate LSK.

B. PLACE/BEARING – PLACE/BEARING. Key in the scratch pad the bearing of the waypoint from the first reference waypoint followed by a slash (/) and the bearing from the second reference, e.g.: LEDRO005/ALEDI305

C. ALONG-TRACK WAIPOINTS. An along track waypoint lies on the inbound (outbound) course to (from) the reference waypoint. The reference waypoint must be already in the route legs; e.g.: ALEDI/20, ALEDI/-20.

D. LATITUDE/LONGITUDE. Key the coordinates into the scratch pad, e.g. N39E009.

E. NAVIGATION DATABASE WAYPOINTS. Key the new identifier into the scratchpad then move the waypoint in the desired place in the route by pressing the appropriate LSK. If the identifier is not found in the database the message "NOT IN DATA BASE" will show in the scratch pad.

ROUTE DISCONTINUITIES



Under normal conditions, the active route will form a continuous path of linked waypoints (legs). However, a ROUTE DISCONTINUITY will be inserted into the flight plan if the end of a leg is indeterminate or when the entered waypoint is not part of the existing flight plan.

A ROUTE DISCONTINUITY can also be inserted into the flight plan by selecting RTE DISCON (LSK 1R) on the INIT/REF INDEX 2/2 page. The LEGS page will be displayed with 0000 in the scratch pad; insert the 0000 into the flight plan by pressing the appropriate LSK.

ROUTE DISCONTINUITY close-up can occur only upwards, by moving a downtrack waypoint to the THEN field by pressing the appropriate LSK.

WAYPOINT DELETION

A. BY CLOSE-UP METHOD.

Display the waypoint to be deleted by pressing LEGS and NEXT or PREV as required, then key in or copy the waypoint identifier after the one to be deleted into the scratchpad and move it to the location of the waypoint to be deleted by pressing the appropriate LSK. In this case a ROUTE DISCONTINUITY is not created.

B. BY CLEAR KEY.

Press the CLR key, "DELETE" message is displayed in the scratch pad; delete the selected waypoint by pressing the appropriate LSK. A ROUTE DISCONTINUITY is inserted in place of the deleted waypoint.

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FLY-OVER AND FLY-BY WAYPOINT

Waypoints are loaded into the route as fly-by (with turn anticipation) or fly-over (no turn anticipation) as coded in the navigation data base.

A. TO CONVERT TO FLY-OVER FROM FLY-BY

1. Display the INIT/REF INDEX 2/2 page, and select “FLY OVER” by pressing INIT REFT, NEXT and /o=OVER (LSK 1L).

The LEGS 1/X page is displayed with “/o” in the scratchpad.

or:

Key in “/o”

2. Move the “/o” to the desired location by pressing the appropriate LSK.

The legend “/o” is displayed to the right of the waypoint name.

3. Make this route modification active by pressing EXEC.

B. TO CONVERT TO FLY-BY FROM FLY-OVER

1. Display the selected waypoint by pressing LEGS and NEXT or PREV as required

2. Key in /, and move the / to the waypoint location by pressing the appropriate LSK.

3. Make this route modification active by pressing EXEC.

ETA AND CRUISE WIND



ACT	LEGS	ETA	1/2
	ETA	WIND	
LEDRO	1642.5z	000° /	0
ALEDI	1645.6z	000° /	0
QUENN	1650.8z	000° /	0
ROXAN	1657.1z	000° /	0
ESTNO	1702.4z	000° /	0
<LEGS			LAT-LONG>

Display the desired waypoint by pressing LEGS and NEXT or PREV as required, then display the LEGS ETA page by pressing LEGS ETA (LSK 6R).

WAYPOINT LATITUDE/LONGITUDE



From the LEGS ETA page, display the LAT-LONG page by pressing LAT-LONG (LSK 6R).

PROGRESS ALONG THE ROUTE

Display the PROGRESS 1/4 page by pressing PROG.

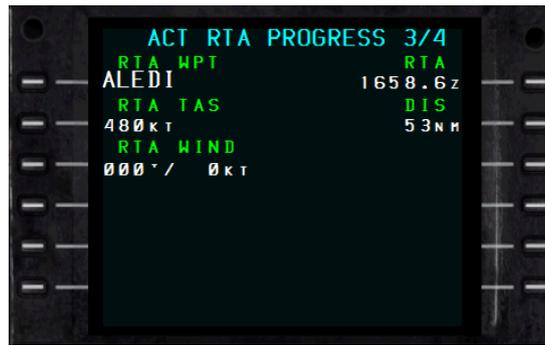


To change the display reference of WIND to either TRUE or MAGNETIC, press LSK 3L. Display the PROGRESS 2/4 page by pressing NEXT.



REQUIRED TIME OF ARRIVAL COMPUTATION

Display the PROGRESS 3/4 page.

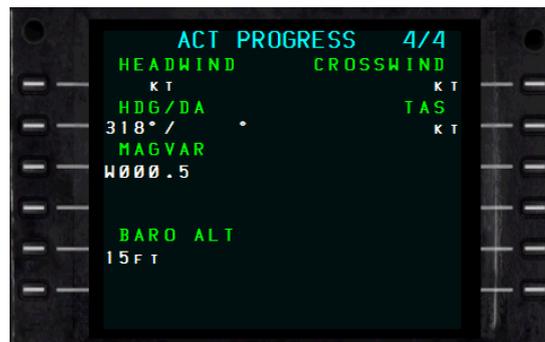


Key in the waypoint identifier and move it to the RTA WPT field by pressing LSK 1L.
Key in the required time of arrival and move the entry into the RTA field by pressing LSK 1R.

*The RTA TAS to reach the RTA waypoint at the RTA time is computed and displayed in field LSK 2L. Manual entry of RTA TAS will display computed RTA in field LSK 1R.
Manual entry of RTA WIND allows effect of estimated downtrack wind to be tested.*

ALTIMETER AND AIR DATA

Display the PROGRESS 4/4 page by pressing PROG and PREV.



OFFSET TRACK INITIATION

Display the ROUTE 1/1 page by pressing RTE.



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Enter the amount of track offset desired (e.g.: L10.0), and move the entry into the OFFSET field by pressing LSK 2R. Initiate the capture of the offset track by pressing EXEC.

OFFSET TRACK CANCELLATION

1. set the offset track to 0 by entering 0 (zero) into the scratch pad and moving it into the OFFSET field.

or:

2. Delete the offset value by pressing CLR and then LSK 2R.

3. Initiate the capture of the original track by pressing EXEC.

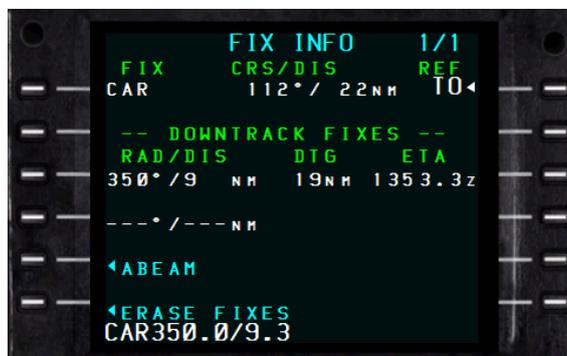
The advisory message END OF OFFSET is displayed in the scratchpad.

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POSITION FIX INFO AND DOWNTRACK FIX CREATION

With the desired reference waypoint identifier in the scratchpad:

Display the FIX INFO 1/1 page by pressing FIX



Move the waypoint identifier into the FIX field by pressing LSK 1L.

The bearing and distance from the FIX to the aircraft are displayed. Display the reciprocal by pressing REF (LSK 1R).

To create a downtrack fix along the flight plan where the radial from the entered FIX intersect, key in the radial (e.g.: 350) and press LSK 3L or LSK 4L.

or:

To create a downtrack fix along the flight plan where the distance from the entered FIX intersect, key in /, distance (e.g.: 20) and press LSK 3L or LSK 4L.

or:

To create a downtrack fix along the flight plan where the radial from the entered FIX intersect, key in the radial and press (e.g.: 350) and press LSK 3L or LSK 4L.

or:

To create a downtrack fix along the flight plan where the aircraft will be directly abeam the entered FIX, press ABEAM LSK 5L.

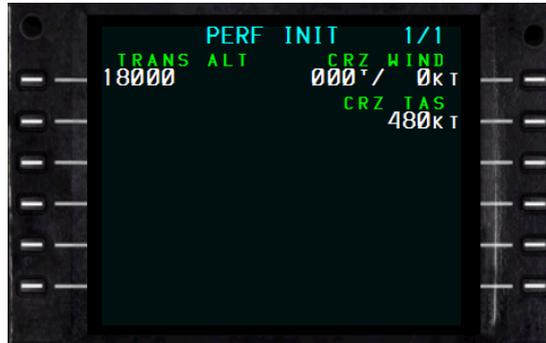
The distance to go (DTG) and estimated time of arrival (ETA) to the calculated waypoint are displayed in field LSK 3R.

The calculated waypoint can be moved into the scratchpad by pressing LSK 3L, 4L or 5L. Move the waypoint to the desired place in the route by pressing the appropriate LSK.

CRUISE PERFORMANCE PARAMETERS INITIALIZATION

These are not mandatory entries

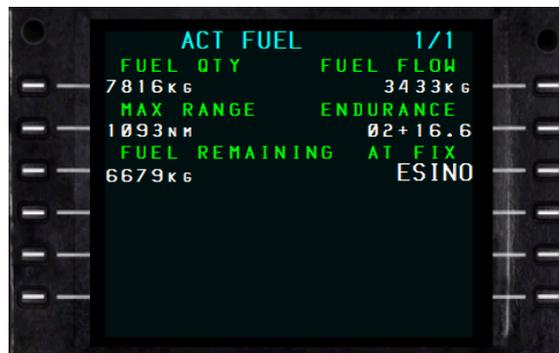
Display the INIT/REF INDEX 1/2 page by pressing INIT REF; display PERF INIT 1/1 page by pressing PERF INIT (LSK 4L).



Key in transition altitude (LSK 1L), cruise wind (LSK 1R) and planned cruise true airspeed (LSK 2R).

FUEL REMAINING AT ANY WAYPOINT

Display the INIT/REF INDEX 2/2 page by pressing INIT REF, PREV or NEXT; display FUEL 1/1 page by pressing FUEL (LSK 5L).

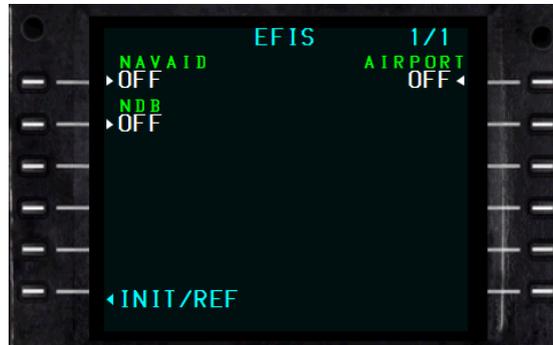


With the desired waypoint identifier in the scratchpad, move it into the AT FIX field by pressing LSK3R.

Fuel remaining at the selected waypoint is calculated based on displayed fuel quantity and fuel flow rate. By default, destination waypoint is displayed.

EFIS DISPLAY

Display the INIT/REF INDEX 2/2 page by pressing INIT REF, PREV or NEXT; display EFIS 1/1 page by pressing EFIS (LSK 5R).

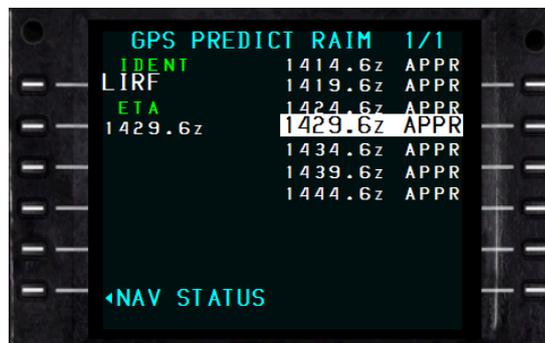


Add the desired element to the EFIS display by pressing the appropriate LSK until ON is displayed.

Remove the desired element from the EFIS display by pressing the appropriate LSK until OFF is displayed.

PREDICTIVE RAIM REQUEST

Display the NAV STATUS INDEX 1/1 page by pressing INIT REF, NAV STATUS (LSK 3R); display the GPS PREDICT RAIM 1/1 page by pressing PREDICT RAIM (LSK 1L).



The GPS PREDICT RAIM 1/1 page for the destination airport is displayed, with current ETA at the LSK2L location. The possible outcome are:

To determine the predicted HIL for any waypoint, key the waypoint identifier into the scratchpad and move it to the IDENT field.

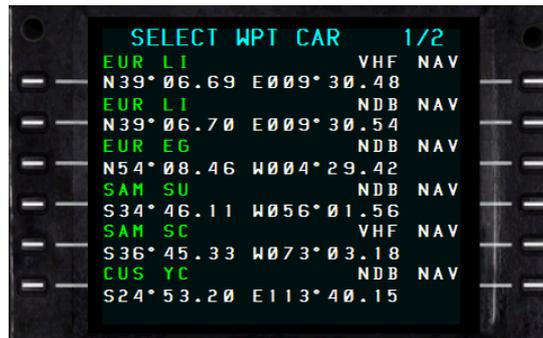
Key the ETA for the new waypoint into the scratchpad and move it to the ETA field.

If the predictive RAIM function indicated that GPS instrument approach integrity will not be available at the ETA, the operator should modify the ETA or conduct the approach with other equipment.

DUPLICATE IDENTIFIER SELECTION

The SELECT WPT 1/X page is automatically displayed when an entered identifier occurs more than once in the navigation data base.

Duplicated identifiers are listed on as many pages as necessary, in order of increasing distance from the previous waypoint.



Each waypoint is identified by its type, latitude and longitude position, and region/country code.

Select the correct waypoint by pressing the appropriate left LSK. The display reverts to the page last displayed with the selected identifier in the data field.

DEPARTURE AND ARRIVAL PROCEDURES

Display the DEP/ARR INDEX 1/1 page by pressing DEP/ARR.



STANDARD DEPARTURE SELECTION

Display the DEPARTURES page by pressing LSK 1L



Select the appropriate departure runway and procedure and make this route modification active by pressing EXEC.

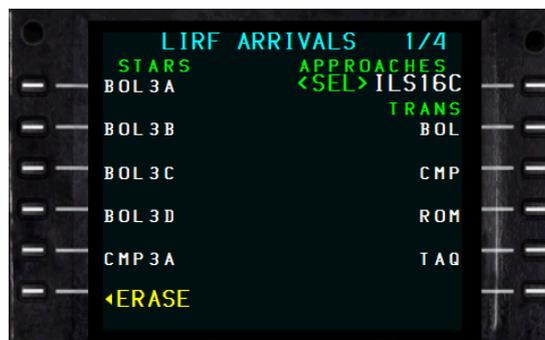
The waypoints for the selected procedure are added to the beginning of the route legs.



Verify the inserted waypoints in the LEGS page and close any ROUTE DISCONTINUITY.

STANDARD TERMINAL ARRIVAL ROUTE (STAR) AND APPROACH SELECTION

Display the DEP/ARR INDEX 1/1 page by pressing DEP/ARR; display the ARRIVALS page by pressing LSK 2R.



Select the required star, transition and approach procedure and make this route modification active by pressing EXEC.



Verify the inserted waypoints in the LEGS page and close any ROUTE DISCONTINUITY.

POST-FLIGHT PROCEDURES

TAKE-OFF AND LANDING TIMES

There are no data entries to be made on this page.

Display the INIT/REF INDEX 2/2 page by pressing INIT REF, NEXT; display the FLIGHT LOG 1/1 page by pressing FLIGHT LOG (LSK 6L).



DIRECT-TO/INTERCEPT

A. DIRECT-TO A WAYPOINT IN THE ACTIVE ROUTE:

1. Display ACT LEGS 1/X page by pressing LEGS.
2. Display the desired waypoint by pressing PREV or NEXT as required.
3. Key in or copy the waypoint identifier into the scratch pad.

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4. Return to the first ACT LEGS page by pressing LEGS or PREV as required.
5. Move the waypoint identifier to the TO WPT field by pressing LSK 1L.
ACT status on the title display is replaced by MOD.
6. Verify the inbound course and distance of the leg to the TO WPT.
7. Make the direct-to leg active by pressing EXEC.

B. DIRECT-TO AN OFF-ROUTE WAYPOINT:

1. Key in the off-route waypoint identifier.
2. Display ACT LEGS 1/X page by pressing LEGS.
3. Move the waypoint identifier to the TO WPT field by pressing LSK 1L.

ACT status on the title display is replaced by MOD, THEN any ROUTE DISCONTINUITY lines are inserted immediately after the new TO waypoint.
4. Verify the inbound course and distance of the leg to the TO WPT.
5. Make the direct-to leg active by pressing EXEC.

To intercept the leg on a manually entered inbound course, before pressing EXEC key in the inbound course and select the direct-to intercept mode by pressing INTC CRS (LSK 6R).

If the aircraft track/heading is incorrect, turn the aircraft to the correct track/heading prior to pressing EXEC key.

HOLDING PATTERN NAVIGATION

With any ACT LEGS page displayed press HOLD.

If a holding pattern has already been defined, the HOLD 1/1 page is displayed. Press NEW HOLD (LSK 6L) to display the ACT LEGS page.

or:

Press LEGS and key in /H

then:

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1. Display the desired HOLD FIX waypoint by pressing PREV or NEXT as required.
2. Move the /H prompt to the desired holding waypoint by pressing the appropriate LSK.
The MOD HOLD page is displayed with default values of hold parameters.
3. Change the hold parameters as required.
4. Arm the hold by pressing EXEC.



HOLDING PATTERN AT PRESENT POSITION

1. Display the ACT LEGS page with the /H prompt in the scratch pad by pressing HOLD.
2. Select the present position hold mode by pressing HOLD PPOS (LSK 6R).
- 3.

EXITING HOLDING PATTERN

A. EXIT OVER FIX (HOLD AT) WAYPOINT:

1. Display the ACT HOLD 1/X page by pressing HOLD.
2. Arm the exit hold procedure by pressing EXIT HOLD (LSK 6R).

The EXIT HOLD prompt changes to the EXIT ARM status indication in amber reverse video.

The hold exit can be cancelled at this point by pressing EXIT ARM (LSK 6R). The prompt reverts to EXIT HOLD.

3. Initiate exit from the hold by pressing EXEC

B. EXIT BY DIRECT-TO NAVIGATION TO ANY WAYPOINT:

Perform a standard direct-to procedure to any waypoint.

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HOLDING PATTERN DELETION

A. PRIOR TO ENTRY:

1. Display the desired holding waypoint by pressing LEGS, NEXT or PREV as required.
2. Key in /.
3. Cancel the hold by pressing the appropriate LSK.
4. Accept the modified route by pressing EXEC.

B. AFTER OLD ENTRY INITIATED:

Perform an exit hold procedure.

OTHER MCDU PAGES DESCRIPTION

- **MCDU MENU 2/2**

[MENU], [NEXT]

Select COLOR or MONOCHROME display by pressing LSK 5L.

- **PARALLAX 1/1**

[MENU], [NEXT], <PARALLAX>

Adjust display parallax by pressing LSK 2R or LSK 4R.

- **CTR LEGS 1/X**

[INIT REF], <CTR LEGS>



Change the waypoint centered on the navigation display map, by pressing the STEP prompt (LSK 6R).

- **REF NAV DATA 1/1**

[INIT REF], <NAV DATA>

Key in the desired identifier (waypoint, navaid, and airport) and move the entry to field ID by pressing LSK 1L.

Detailed information appropriate to the selected identifier type is displayed. If the identifier is not found in the data base the NOT IN DATABASE advisory message is displayed in the scratch pad.

- **MESSAGE RECALL 1/X**

[INIT REF], <MSG RECALL>

The MESSAGE RECALL page lists all the caution messages. A message is preceded by a “*” if not yet acknowledged.

- **GPS 1/2, 2/2**

[INIT REF], <NAV STATUS>, <GPS>

Displays GPS status data and GPS calculated position, track, altitude and speed.

