717

Flight Crew Operations Manual

Volume II – Operating Procedures - FMS Guide

The Boeing Company

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General

The airplanes listed in the table below are covered in the Flight Crew Operations Manual (FCOM). The table information is used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplanes.

Registry number is supplied by the national regulatory agency. Airplane, serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
0001	TBC01	00001	BC0001

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Preface	Chapter 0
Revision Record	Section 2

Revision Transmittal Letter

This revision reflects the most current information available to The Boeing Company through the subject revision date. The following revision highlights explain changes in this revision.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
Initial	January 15, 1999		1	May 15, 1999	
2	September 15, 1999		3	January 15, 2000	
4	May 15, 2000		5	September 15, 2000	
6	January 15, 2001		7	May 15, 2001	
8	September 15, 2001		9	January 15, 2002	
10	May 15, 2002		11	September 15, 2002	
12	January 15, 2003		13	May 15, 2003	
14	September 15, 2003		15	January 15, 2004	
16	July 15, 2004		17	January 15, 2005	
18	July 15, 2005		19	January 15, 2006	
20	July 15, 2006		21	January 15, 2007	
22	July 15, 2007		23	January 15, 2008	
24	July 15, 2008		25	January 15, 2009	
26	July 15, 2009		27	January 15, 2010	
28	October 15, 2010		29	April 15, 2011	
30	October 15, 2011		31	April 15, 2012	
32	October 15, 2012		33	April 15, 2013	
34	October 15, 2013		35	April 15, 2014	
36	October 15, 2014		37	April 15, 2015	
38	October 15, 2015		39	April 15, 2016	

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
40	October 15, 2016		41	April 15, 2017	

General

The Boeing Company issues Flight Crew Operations Manual revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued Temporary Revisions.

The revision date is the approximate date the manual is mailed to the customer.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages (LEP).

The Revision Record should be completed by the person incorporating the revision into the manual.

Filing Instructions

Keep applicable Temporary Revisions unless instructed to remove them by the highlights. This manual is revised by pages. To file a revision package, use the LEP to verify the correct content of the manual. On the LEP, pages identified with an asterisk (*) are replacement, new (original) issue or deleted pages. Use the pages provided in the package to add new pages or replace the corresponding pages in the manual. Remove pages that are marked Deleted on the LEP; there are no replacement pages for deleted pages.

Revision Highlights

Throughout the manual, airplane effectivity may be updated to reflect coverage as listed on the Preface - Manual Effectivity page. Registry or tabulation numbers are used as available at the time of printing. Highlights are not supplied.

Highlights and revision bars are provided for technical changes. In some sections, text may be rewritten or reformatted for clarity or other editorial purposes; these changes will have revision bars, but may not have highlights. Pages may also be republished without revision bars due to slight changes to the flow of the document generated by the publishing system.

No revision highlights.

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FMS.40.31	April 15, 2016	FMS.50.7	April 15, 2016
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		FMS.80.3	April 15, 2016

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FMS.120.27	April 15, 2016	FMS.120.74	April 15, 2016
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FMS.140.18	April 15, 2016

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FMS.TOC.150.1-2	April 15, 2016
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FMS.150.3	April 15, 2016
FMS.150.4	April 15, 2016
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PLEASE REFER TO THE TEMPORARY REVISION SUMMARY RECORD IN FLIGHT CREW OPERATING PROCEDURES MANUAL

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Preface	Chapter 0
Interim Procedure Summary Record	**Section 8**

All Interim Operating Procedures (IOP) have been integrated into the body of the Quick Reference Handbook, Operating Procedures, and FMS Guide.

IOPs will no longer be published and distributed separately.

In the list below, new numbers are issued for identification purposes. The overridden IOP number is also provided in smaller type. Descriptions have been expanded, with associated Service Bulletin numbers when applicable. Chapter and section location is provided in the final column.

FMS Guide Interim Procedures

717-FMS-0001 Previously issued as IOP 2-67. Please remove and discard IOP 2-67.	PEGASUS FMC – ALTITUDE CONSTRAINTS. Provides corrective action addressing a problem that may occur during the climb phase of flight on aircraft equipped with the Pegasus FMC.	Climb – Section 30
717-FMS-0002 Previously issued as IOP 2-61. Please remove and discard IOP 2-61.	DIR TO WITH ABEAM POINTS. ETAs and associated en route predictions were reported to be incorrect when selecting a DIR TO with ABEAM POINTS.	Cruise – Section 40
717-FMS-0003 Previously issued as IOP 2-63. Please remove and discard IOP 2-63.	FIX INFO PAGE WITH RUNWAY ENTRY. When entering a runway as a fix on the FIX INFO page, and preceded by an alphanumeric fix entry containing six or seven characters, two additional characters may be appended to runway entries only.	Cruise – Section 40
717-FMS-0004 Previously issued as IOP 2-65. Please remove and discard IOP 2-65.	PEGASUS "FROM" WAYPOINT ANOMALY – Erroneous TIME and ALTITUDE displayed.	Cruise – Section 40

717-FMS-0005 Previously issued as IOP 2-62. Please remove and discard IOP 2-62.	DOUBLE STRINGING OF STAR WAYPOINTS. STARs coded with runway transitions may cause the FMS to erroneously insert a duplicate string of STAR waypoints. The FMS logic incorrectly handles certain STAR and Runway combinations. A Nav Data Base change to correct this anomaly is scheduled to be released in the Fourth Quarter 2006.	Cruise – Section 40
717-FMS-0006 Previously issued as IOP 2-70. Please remove and discard IOP 2-70.	PROF - STAR ANOMALY. Addresses reported anomalies affecting PROF operation while in climb and cruise, resulting in loss of the entries on the CRZ LEVELS on the F-PLN INIT page and FMS mode switching into the descent mode.	Cruise – Section 40
717-FMS-0007 Previously issued as IOP 2-71. Please remove and discard IOP 2-71.	FMS/VIA – ATC LOG DATA (FANS ENABLED). Provides an interim procedure designed to prevent ATC LOG page from displaying previous flight leg messages.	ATS Datalink – Section 120
717-FMS-0008 Previously issued as IOP 2-72. Please remove and discard IOP 2-72.	FMS / VIA – ATC ROUTE CLEARANCE UPLINK ANOMALY (FANS ENABLED). Duplicate Waypoint Appears on Flight Plan After Loading ATC Route Clearance Uplink (FANS Enabled).	ATS Datalink – Section 120
717-FMS-0009 Previously issued as IOP 2-73. Please remove and discard IOP 2-73.	FMS/VIA – DUPLICATE WAYPOINT APPEARS ON FLIGHT PLAN AFTER LOADING ATC ROUTE CLEARANCE UPLINK (FANS ENABLED). A flight plan anomaly may occur on the ground or in flight loading an ATC clearance modification uplink message to modify an existing flight plan.	ATS Datalink – Section 120

PLEASE REFER TO THE FCOM ADVISORY BULLETIN SUMMARY RECORD IN FLIGHT CREW OPERATING PROCEDURES MANUAL

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General

The 717 Flight Crew Operations Manual provides descriptive information and operational procedures to be used as a guide for operation of the 717 airplane. The data in this manual are based upon engineering information and calculations. Operating instructions were derived from an in-depth study of the tasks which must be performed by the flight crew to properly complete a normal flight. The descriptive text has been prepared by experienced, publications-oriented pilots working in accord with the team that developed the operating instructions.

The 717 Flight Crew Operations Manual reflects the airplane description and operating recommendations approved by the Boeing Commercial Airplane Group. This does not mean that individual airlines may not publish manuals reflecting their own operating philosophies.

The style and format of this manual were developed by the Boeing Commercial Airplane Group after a review of the requirements of a cross section of domestic and international operators. Due to inherent delays in research, compilation, preparation, and printing of technical manuals, this publication may not include the most recent changes to the airplane. Every effort has been made to ensure the currency of the data contained herein. However, all data is subject to change without notice.

In the event of conflict between the limitations and performance data of this manual and the FAA Approved Airplane Flight Manual, the FAA Approved Airplane Flight Manual shall govern.

Please submit all correspondence regarding Flight Crew Operations Manual Bulletin status through the Service Requests Application (SR App) on the MyBoeingFleet home page.

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Preface	Chapter 0
Introduction	Section 11

General Overview

This section provides the pilot with a guide to the operation of the 717 FMS. The FMS is used by pilots for flight planning, navigation, performance management, airplane guidance, and flight progress monitoring.

The FMS consists of the flight management function (called Flight Management Computer or FMC, throughout the remainder of the guide) of two Versatile Integrated Avionics (VIA) computers and two Multifunction Control and Display Unit (MCDU) installed in the left and right sides of the forward pedestal. See Vol. III, Systems Description, Instrumentation & Navigation chapter, for additional FMS description.

The FMS provides a means via the Flight Control Panel (FCP) on the glareshield and the MCDU for the pilot to enter a flight plan, select various flight control modes, and enter other necessary flight data. Flight progress is monitored through the MCDU and the Electronic Instrument System (EIS).

After data entry, the FMCs generate a flight plan from the origin to the destination airport. The FMCs will then guide the airplane along that plan by providing roll, pitch, speed and thrust commands to the Flight Control Computers (FCC).

> NOTE: This document includes information of program options that may not be selected by all airlines.

Flight Phases

The following illustration depicts a typical FMS profile from the preflight phase at the origin airport to the rollout phase at the destination airport. In addition to the vertical profile (PROF) and speed mode (SPD), the FMS will supply lateral navigation (NAV) guidance to follow waypoints along the predefined route.

The predefined route may be divided into a number of FMS flight phases that include PREFLIGHT, TAKEOFF, CLIMB, CRUISE, DESCENT, APPROACH, and DONE.

In the PREFLIGHT phase, the FMC is initialized and the flight plan either recalled from the navigation database by company route designator, strung (entered waypoint by waypoint) from the origin to the destination airport, or uplinked through a datalink.

Typical FMS Profile
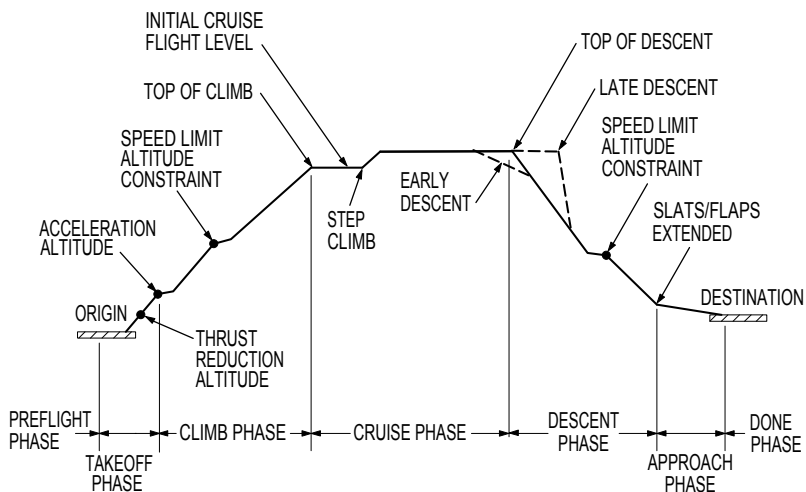
KB1-3-0296A

The PREFLIGHT phase also includes the following:

- Review airplane configuration and FMC database effective dates.
- Enter/select origin, destination, cruise altitude(s), flight number and cost index.
- Enter weight and fuel data.
- Align the IRS.
- Enter flight plan, runway, SID and transition points, and revise waypoints to include speed, altitude and time constraints.
- Confirm or enter takeoff Vspeeds.
- Select economy or pilot-defined flight phase speed.
- Tune navigation radios for departure.

The TAKEOFF phase extends up to the acceleration altitude. PROF, FMS SPD, and NAV modes are normally engaged above 400 ft. Thrust reduction is automatic at the thrust reduction altitude if PROF is engaged. PROF may be armed on the ground with automatic engagement at 400 feet (option).

The CLIMB phase extends from the acceleration altitude to the Top-of- Climb (T/C) for the first cruise flight level entered on the F-PLN INIT page. During CLIMB, the FMS SPD/PROF climb mode (if engaged) does the following:

- Supplies guidance for accelerating the airplane when above the terminal area speed restriction altitude
- Observes speed/altitude constraints that have been stored in the FMC database or inserted by the pilot.
- Supplies speed and altitude targets to the AFS.

The CRUISE phase extends from the top-of-climb point to the top-of-descent (T/D). CRUISE can include step climbs as well as enroute descents. A step climb requires setting a new altitude target on the FCP. The FMS calculates the optimum step climb point, and the altitude change is initiated automatically. Enroute descents are initiated by flight level change or vertical speed (V/S) mode, and then entering a new cruise flight level (CRZ FL) into the MCDU.

The DESCENT and APPROACH phases start from the top-of-descent or at a point where the pilot initiates a descent with the flight level change or V/S mode. The FMS calculates the appropriate point for the start of descent and initiates the descent automatically if the FCP altitude has been lowered and the airplane is in the PROF and FMS SPD modes. NAV and PROF guidance during an approach are terminated when the ILS localizer and glideslope are intercepted. If a missed approach is executed, NAV and PROF modes can be re-engaged to automatically fly the Missed Approach Procedure (MAP).

After landing and engine shutdown, the FMS goes through a DONE phase, clearing the active flight plan to prepare for reinitializing. Also, some of the data entry fields are reset to default values.

Operation

The FMS supplies airplane guidance and control commands through the following modes:

- NAV - Lateral navigation guidance
- PROF - Vertical profile control
- FMS SPD - Optimum speed control.

The FMS data is coupled to the autopilot/flight director (FD) through targets and/or steering commands.

The FMS also supplies the following: autopilot and flight director takeoff (T/O) and go-around (GA) references, variable bank angle limit control (in AUTO position), Vmin bank angle limiting data, ILS LOC ONLY mode selection, VOR mode selection (option), and Vmin speed and thrust limiting data.

FMS-generated data, command entries, and performance data are displayed on the MCDU. Each flight mode has its own page or pages.

Other FMS functions are airplane type and flight number identification, initialization, position reference, radio tuning, navigation reference, performance, thrust limiting, takeoff, approach, go-around, maintenance, sensor data, route data, route legs, route progress, and standby operation.

The FMS can be operated whenever electrical power is applied to the airplane. The FMS monitors power supply levels to detect supply transients. Short or long duration power transients may interrupt FMS operation, but the FMS retrieves enough previously stored data to recover completely without affecting FMS operations.

Dual Mode

The FMS operates in DUAL, INDEPENDENT, and STANDBY modes. INDEPENDENT and STANDBY modes are covered in the FMS DEGRADED PERFORMANCE chapter.

DUAL mode is the normal operating mode of the FMS. When operating in DUAL mode, there is cross talk between the FMCs to ensure the following:

- MCDU entries made on one side are entered simultaneously into the other FMC. The respective MCDU can display different pages, however, if the same page is displayed on each MCDU, the display is similar, but the predicted values may be slightly different.
- Leg sequencing is initiated simultaneously in both FMCs.
- Airplane position is calculated independently.

In the DUAL mode of operation, each FCC is coupled to the on-side FMC. The FMC in use is the master. This selection process ensures that both flight directors are controlled with the same steering commands.

> *NOTE: Recalculation of data by the FMS may cause momentary anomalies in displayed information.*

During normal operation, advisory messages may be displayed on one, or both, MCDU's. Both MCDU's should be monitored during flight.

Functions

Navigation

The airplane position and groundspeed (GS) are derived from the position and velocity information from the GNS.

If GNS is inhibited, the position and velocity information from the IRUs is combined with range and bearing information from VOR/DME stations to calculate the airplane position and groundspeed. In this case, the FMS combines range from two DME stations, and position and groundspeed information from a weighted average of the three IRUs. If two available navaids do not form an angle between 30 degrees and 150 degrees, range and bearing from a single VOR/DME are used with the IRU data. As the airplane progresses along the route, the FMS uses present airplane position and the stored navaids in the database to tune the VOR/DME receivers to the stations that yield the most accurate position estimate.

The database contains information on the class and figure of merit of the available navaids. The class of a navaid is defined as VOR, DME, VOR/DME, VORTAC, or LOC. The figure of merit (or reception quality) is primarily based on usable range of the station relative to the airplane.

The exact airplane position at power-up is determined by the system and displayed as the start coordinates. Navigation reverts to IRS with VOR/DME radio update only when the GNS is not available or has been inhibited.

Performance

The FMS performance or speed modes optimize the airplane vertical profile. These modes are as follows:

- ECON (Economy) - The ECON CLIMB, CRUISE, and DESCENT phase airspeed/Mach targets are calculated to obtain the minimum operating cost per mile traveled enroute based on the entered cost index. Some factors considered in these calculations include cruise flight level, gross weight, temperature, and current or predicted winds.
- POLICY - The POLICY mode is the same as the ECON speed mode, except with a crew-selected calibrated airspeed (CAS). This is done to satisfy a specific airline descent policy.

- EDIT - The pilot enters CAS/Mach for CLIMB, CRUISE, and DESCENT phases of flight, subject to flight envelope limits.
- MAX CLB - The MAX CLIMB speed is a table look-up speed for best angle of climb.
- MAX END (Endurance) - The MAX END and best holding speed targets are calculated for obtaining the least drag for maximum time aloft.
- MAX DES (Descent) - The MAX DES speed is based on operation at maximum flight speeds.

The performance mode computes optimum speeds, estimates fuel consumption and gross weight, predicts time, fuel, and distances at all flight plan waypoints, computes reference parameters such as optimum altitude, maximum altitude, and approach speed, searches and retrieves database information, and calculates the operational speed envelope.

Flight path predictions are computed by the FMS using an origin-to-destination trajectory that is based on gross weight, cost index, predicted cruise winds, speed/altitude/time constraints at specific waypoints, and specified modes for climb, cruise, descent, and approach. Allowances are made for takeoff and acceleration requirements between the legs of the vertical profile. The predictions are updated periodically as the flight progresses to incorporate airplane performance and groundspeed.

Descent path synthesis predicts the descent path by assuming flight idle thrust above the descent speed limit altitude and slightly above idle below this altitude. The synthesis starts at the destination and computes the point where slats/flaps are expected to be extended. It then intersects the cruise altitude creating a top-of-descent point. This results in a predicted path that takes into account speed targets, waypoint altitude constraints, and the impact of wind forecasts.

The optimum step climb (S/C) computes the best point along the route to initiate a step climb to a pilot-defined altitude that results in minimum trip cost. The "step to" altitude is preselected by the pilot on the FCP. The system then begins the climb at the programmed step climb point.

Approach speed targets are computed based on calculated gross weight and deceleration segments between configuration changes to arrive at the final approach speed 1000 ft. above the destination airport. The final approach speed (VAPP) includes a 5 knot bias above 1.23 x VSO or VREF. VAPP can be altered by the pilot for landing conditions.

The FMS fuel/weight/center of gravity (CG) calculation is a prerequisite for all performance computations.

After engine start, the fuel/weight calculation is updated based on fuel tank readings and a time integration of the fuel flow to each engine (/FF+FQ).

The route of flight is displayed on the EIS Navigation Display (ND) map display, and when the descent phase is active, a vertical deviation indicator is displayed to show airplane deviation from the computed flight path. The appropriate PROF Flight Mode Annunciator (FMA) is displayed on the EIS Primary Flight Display (PFD) to indicate that the airplane is tracking the descent path.

Guidance

The FMS supplies guidance commands for controlling airplane roll, pitch, speed, and engine thrust. Fully automatic flight path guidance that optimizes airplane performance is available in two or three dimensions. The NAV mode is for lateral guidance, and the PROF and FMS SPD modes are for vertical guidance and speed/thrust control. These modes are selected on the FCP and can be engaged separately or together.

Lateral Guidance – Lateral guidance is derived from a primary flight plan with automatic route leg sequencing. The FMS compares the airplane present position with the desired flight path and generates steering commands to the autopilot and flight director. The autopilot directs the airplane to fly along the desired path. Direct navigation from the airplane present position to any waypoint is also available.

Vertical Guidance – Vertical guidance includes the TAKEOFF, CLIMB, CRUISE, DESCENT, and APPROACH phases of the flight plan. Published departure, arrival, and approach segments, and individual waypoints that include speed and altitude constraints can be entered into the FMS for flight planning. These constraints, as well as the entered cruise altitude and cost index, define the FMS vertical profile.

In the climb part of the vertical profile, the AFS controls thrust based on FMS thrust limits and speed targets that are sent through the FCCs. The airplane climbs at climb limit thrust to a given altitude constraint. It then flies level at an appropriate speed target until past the constraining waypoint, and resumes the climb at climb limit thrust. Automatic level--off occurs at the altitude selected on the FCP.

The climb speed schedule is based on the speed limit and speed constraints at lateral waypoints. If not restricted by either of these conditions, the selected performance mode speed is used. After reaching the cruise altitude, the SPD mode maintains the selected performance mode speed until the descent phase is reached.

For the descent part of the vertical profile, the FMS calculates a vertical path that satisfies waypoint altitude and speed constraints. This calculation also considers the selected descent performance mode. The path to the first altitude constraint is constructed assuming idle thrust and a calculated descent gradient that maintains the mode speed schedule or the limit speed (considering the predicted wind conditions). PROF guidance controls airplane pitch similar to tracking an ILS beam. While flying the descent path, PROF pitch commands the FCC to hold the path while the pilot uses speed brakes to maintain speed if a significant, unanticipated acceleration occurs. The throttles are automatically advanced if speed falls below the target speed by 10 knots.

Software and Database

The FMS software includes the principal FMS operating program, performance database, Airline Modification Information (AMI) database, Operational Program Configuration (OPC) database, and navigation database for the 717 airplane.

The operating program executes the following FMS functions:

- Navigation – Determines radio autotuning, position, velocity, and wind data.
- Performance – Determines trajectory, defines guidance and control targets, and predicts flight path.
- Guidance – Determines flight path deviation, and generates lateral steering and control commands.
- EIS – Computes map and situation data for display.
- MCDU – Processes keystrokes and constructs flight plans.
- I/O – Processes received and transmitted data.
- BITE (Built-In Test Equipment) – Monitors the system, performs self-testing, and keeps records.
- Operating System – Controls the operating program, memory management, and stored routines.

The performance database in the FMS reduces the need for the pilot to refer to a performance manual during flight and gives the FMS the data required to compute pitch and thrust commands for the FCC. The performance database is also used by the FMS to compute detailed predictions along the entire airplane trajectory. The data stored in the database includes accurate airplane drag and engine model data, optimum speed data, maximum altitudes, and maximum and minimum speeds.

The Airline Modifiable Information (AMI) database contains default data for certain parameters that can be modified by the operator. This data includes taxi fuel, route reserve information, final time, and datalink options (lookup tables).

The Operational Program Configuration (OPC) database contains data that is read by the FMS to establish the operating configuration. This data includes GNS enable, 702 AOC datalink enable, 1.3g buffet limit enable, RNP message set, maximum takeoff gross weight, maximum landing weight, etc.

The navigation database in the FMS includes most of the information the pilot would normally get from navigation charts. This information can be displayed on the MCDU or EIS map. The geographic area covered includes all areas where the airplane is normally flown. The database is tailored to specific airline customers and can contain over 65,000 navigation points and airway route structure data. The stored data includes the location of VHF navaids, airports, runways, geographical reference points, and other airline-selected information such as SIDs, STARs, approaches, and company routes. Up to 40 additional waypoints can be entered by the pilot into a temporary database.

The FMS contains two sets of navigation data updated by maintenance procedures about every month to correspond to the normal revision cycle for navigation charts. When the navigation chart revision date arrives, the new data should have been loaded into the FMS and should be ready for the pilot to activate during preflight.

MCDU Page Formats

PAGE TITLE

NEXT PAGE PROMPT

VERTICAL SLEW PROMPT

LARGE FONT PILOT ENTRY

LABEL LINE

SMALL FONT

DATA LINE

SCRATCH PAD LINE

```
             F-PLN INIT    1/3 →
 1L   CO ROUTE              FROM/TO
                      KJFK/KATL   1R
 2L   ALTN ROUTE             ALTN
      LAT ↑↓   GNS POS     KMCN     2R
 3L   N4038.0          LONG
                        W07346.4   3R
 4L   FLT NO
      XXX1234          POS REF>   4R
 5L   CRZ LEVELS
      310/[ ]/[ ]/[ ]/[ ]/[ ]   5R
 6L   TEMP/WIND  OPT/MAXFL  CI
      -45°/TL030  280/328  200   6R
```

AIRWAY

WAYPOINT

```
        AIRWAYS FROM CYN
      VIA               TO
 1L   J37              GVE    1R
      VIA               TO
 2L   J42              MOL    2R
      VIA
 3L   [   ]                   3R
 4L                           4R
 5L                           5R
 6L  *INSERT    RETURN TO
                 LAT REV>    6R
```

ASTERISK

PAGE PROMPT

FLYING FROM THE WAYPOINT

PAGE NUMBER

```
         ACT F-PLN    1/2 →
      FROM    ETO  SPD   ALT
 1L   CRI    1342 237/5000   1R
 2L   CYN     50  320 / FL250   2R
      J37
 3L   VILLS    56  .80 / FL304   3R
      J37
 4L   (T/C)    58   " /FL310   4R
      J37
 5L   NALES   1401  .77 / FL310   5R
      J37
 6L   CLASY    03   "  /  "   6R
                         ↑↓
```

VERTICAL SLEW PROMPT

KB1-3-0297A

MCDU Data Labels

Page Title (large font) - Identifies selected page and type of data displayed below the title.

Scratchpad (SP) Line (bottom line of display) - Displays FMC-generated messages and keyboard entries. When a message is received, the MSG annunciator on the right side of the MCDU illuminates. The EIS also displays MCDU MSGs on the ND.

Large Font Entry - Represents data base of pilot entries that define the operation of the FMS.

Small Font Entry - Represents predicted, default, or FMC-calculated values. When adjacent to LSK, the data can be changed by pilot entry. If changed by the pilot, the font changes to large.

Label Line (small font) - identifies the data displayed directly under the label line.

Data Line - Contains box prompts, dashes, brackets, computer generated data (small font), or pilot entered data (large font).

Box Prompts (empty boxes) - Usually indicate that data entry is required for minimum FMS operation. This data entry is performed through the use of the scratchpad and the corresponding LSK. Entry into a box prompt line is displayed in large font. Dashes in a data field indicate that data entry into that field is not allowed or that data is being calculated by the FMC. Bracket prompts indicate optional entry is possible in the applicable field.

Next Page Prompt (arrow pointing right) - Indicates that there is more related data on another page.

Vertical Slew Prompts (up or down arrows) - Indicate that the latitude or longitude value below the prompts can be increased or decreased. The slew prompt can also appear to the extreme right of the scratchpad line. This indicates that the lines of the display can be scrolled to move up or down one line at a time.

Page Number (small font) - Indicates the page number of a data set and the number of pages in the set. Example: 1/3 indicates page 1 of 3 pages.

Waypoint (large font) - Waypoint is on the selected route. A triangle beside a waypoint identifier on the F-PLN page indicates that the airplane must overfly the waypoint. A right or left arrow beside a waypoint identifier shows the direction of turn at that waypoint.

Pseudo Waypoint - A pseudo waypoint is an FMC-generated waypoint inserted into the flight plan to indicate a vertical (PROF) event. Pseudo waypoints are step climb (S/C), top-of-climb (T/C), and top-of-descent (T/D).

Airway (large font) - Identifies the published airway between two waypoints.

Asterisk (*) - Appears adjacent to an LSK if the actuation of the key will affect the active situation.

Page Prompts (< or >) - Pushing the associated LSK accesses another MCDU page but no function is performed. A triangle beside a waypoint identifier on the F-PLN page indicates that the airplane must overfly the waypoint. A left or right arrow beside a waypoint identifier shows the required turn direction at that waypoint.
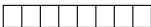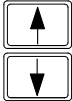
FMS-MCDU
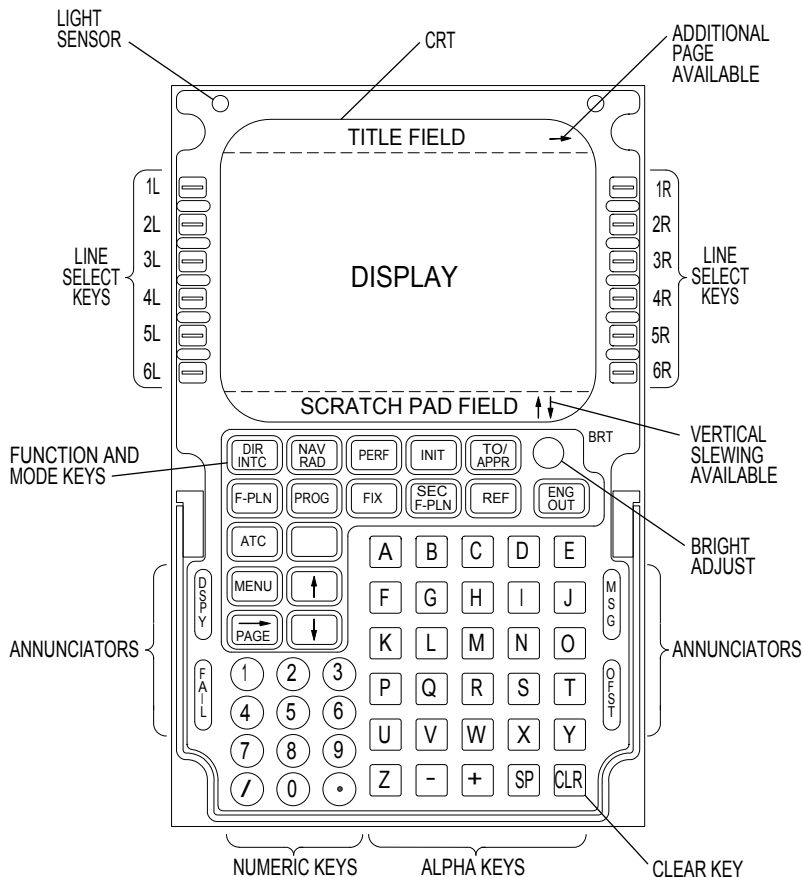
KB1-3-0295

MCDU Page Symbol Summary

☐☐☐☐☐☐☐☐	BOX PROMPTS	DATA ENTRY REQUIRED FOR MINIMUM FMS OPERATION.
– – – – – – – – – –	DASHES IN DATA FIELD	DATA ENTRY NOT ALLOWED OR DATA IS BEING COMPUTED FOR DISPLAY BY FMC.
[ ]	BRACKET PROMPTS	OPTIONAL DATA ENTRY POSSIBLE.
↑↓	VERTICAL SLEW PROMPTS	SCROLL PAGE UP/DOWN OR INCREMENT LARGER/SMALLER LATITUDE LONGITUDE VALUES.
⬆⬇	VERTICAL SLEW KEYS	PUSH TO SCROLL DATA LINES UP OR DOWN.
△	TRIANGLE	MUST OVERFLY WAYPOINT.
→	NEXT PAGE PROMPT	RIGHT TITLE LINE. ANOTHER PAGE AVAILABLE.
PAGE	FUNCTION KEY	PUSH TO SCROLL NEXT PAGE.
→ ←	ARROW WITH WAYPOINT	TURN DIRECTION AT WAYPOINT.
*	ASTERISK	ACTUATION OF LSK THAT HAS AN ASTERISK DISPLAYED, AFFECTS THE ACTIVE SITUATION.
( )	PSEUDO WAYPOINT	COMPUTER GENERATED PERFORMANCE (VERTICAL) EVENT (I.E., TOP OF DESCENT, ETC.)
< >	PAGE PROMPT	PUSHING ASSOCIATED LSK ACCESSES ANOTHER MCDU PAGE.

LB1-3-0059

MCDU Data Entry

Data must be entered into the scratchpad (SP) from left to right with the alphanumeric keys. Usually, the display field or data field acts as an example format that when followed will result in successful data entry. After SP entry and confirmation of correct data, an LSK push will transfer data from the SP to the data field.

The two FMCs of the dual system communicate with each other. Each FMC receives button pushes directly from the same side MCDU and button pushes from the off-side MCDU. The master FMC sequences button pushes in the order received, and transmits button push messages to the other FMC. Thus, both FMCs process the same data simultaneously.

In case of simultaneous button pushes on the MCDU, the master FMC assumes that its own MCDU's button push came first. This allows both pilots to operate simultaneously on the same or different MCDU pages and to enter data on different pages or on different lines of the same page, however, only one flight plan modification at a time will be processed.

Data entry notes are as follows:

- Lateral Flight Plan Revision - Accomplished on the F-PLN page by entering data into the SP and pushing the appropriate left LSK.
- Vertical Flight Plan Revision - Accomplished on F-PLN page by entering data into the SP and pushing the appropriate right LSK.
- Altitude/Flight Level Entry - Altitude related data can be entered as either altitude or flight level. Data is assumed to be a flight level if it is prefixed with FL or if it is entered as 1, 2, or 3 digits without an FL prefix.
- Runway Waypoint Entry - A runway may be used as a waypoint and must be typed as KJFK22L where KJFK is an ICAO airport, 22 is the runway, and the last space is blank or L, R, or C. The waypoint will be named RW and inserted into the MCDU data line. Example: RW22L.
- RETURN TO > 6R - When pushed, usually returns the MCDU to the previous or annotated page.
- BUTTON PUSH IGNORED - This MCDU message is displayed if an LSK is pushed during or just after a predicted profile point data appears.
- Delay in Accessing Pages - Access to MCDU pages may take up to 10 seconds or more when the FMC is performing other computations.

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FMS Guide   Chapter FMS
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FMS Guide	Chapter FMS
Table of Contents	**Section 00**

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FMS Guide	Chapter FMS
Introduction	**Section 00**

General

This section contains a description of FMS operations used on a typical flight, beginning with power up to engine shutdown at destination. All FMS flight phases including preflight, takeoff, climb, cruise, descent, and approach are covered in detail. Not all system functions are described. Those frequently utilized as part of normal operation are included.

> *CAUTION: All data entered into the FMS is advisory only and must be confirmed to be accurate and current by comparison to published and approved flight navigation charts and approach plates.*
>
> *The flight crew is responsible for assuring the accuracy of the FMS flight plan. All entries and edits to the FMS flight plan must be confirmed to be in compliance with ATC clearances, both laterally and vertically. If FMS NAV or FMS PROF guidance does not appear to be complying with the desired flight profile, the crew must intervene and ensure that the aircraft flight profile conforms to clearance requirements.*

Flight Data

The typical flight depicted in this section originates from New York International Airport (KJFK) and terminates in Atlanta (KATL). The flight data in the table below was utilized for this guide:

Company Route	NONE
Flight Number	XXX1234
Departure Airport	New York (KJFK)
Destination Airport	Atlanta (KATL)
Alternate Airport	Macon (KMCN)
TOGW (planned)	111,800 lbs
TOGW (actual)	111,800 lbs
ZFW w/o Ballast	90,000 lbs
ZFWCG	25.0
Fuel Load (Total Fuel On Board)	22,300 lbs
Anticipated Taxi Fuel	500 lbs
Blst Fuel	2000 lbs
Blst Tank	Center
CRZ LEVEL	310
TOCG	27.5

ROUTE: KJFK, JFK7, CYN, J37 (VILLS, NALES, CLASY, BRV, GVE) J42 (MOL), MACEY 2, KATL.

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Preflight	**Section 10**

Aircraft Status

1. Power On Aircraft . . . . APPLY

The A/C STATUS page appears on the MCDU automatically after power is applied or when the FMS transitions to preflight phase at the end of a flight.

2. MCDU Display Data . . . . CHECK

All data on the A/C STATUS page should be reviewed for applicability and currency.

```
            A/C STATUS      1/2 →
       MODEL               ENGINE
  1L   717-200             BR-715   1R
       OP PROGRAM
  2L   PS4081570-901                2R
       ACTIVE DATA BASE
  3L   23MAY-20JUNE   MD19905001    3R
       SECOND DATA BASE
  4L   21 JUN-19 JUL                4R

  5L                                5R
       PERF FACTOR
  6L   +0.4          F-PLN INIT>    6R
```

KB1-3-0145A

3. Active Data Base . . . . CHANGE/VERIFY

The second data base may be activated during preflight by pushing LSK 4L. A CONFIRM * prompt appears in 4R for pilot confirmation. The active data base cannot be changed after engine start.

Access the A/C STATUS page 2/2 by using the PAGE key.

STEP: Push **PAGE**

```
          A/C STATUS   2/2 →
       PERF DATABASE
   1L  316E-HNP-04L-0B              1R
        OPC P/N
   2L  PS200L-02063                 2R
        AMI P/N        DATA LINK
   3L  PS200L-02064    003FF780     3R

   4L                               4R

   5L                               5R

   6L            F-PLN INIT>        6R
```

LB1-2-0334

Alternate access to the A/C STATUS page 1/2 can be made through the REF function key and pushing LSK 5L.

STEPS: 1.   Push **REF**

            2.   Push **5L**

```
                    REF INDEX

            DEFINED
   1L     <WAYPOINT     ATC COMM>   1R

   2L     <WAYPOINT     AOC COMM>   2R
            CLOSEST
   3L     <AIRPORTS        NAVAID>  3R

   4L     <POS REF       DOC DATA>  4R

   5L     <A/C STATUS       MAINT>  5R

   6L     <SENSOR STATUS            6R
```

KB1-3-0189

IRS Initialization

1. IRU Mode Selectors . . . . NAV

Rotating the IRU selectors from OFF to NAV initiates IRU power-up and full alignment cycle (approximately 10 minutes). If the IRU selectors are in NAV and aligned, rotating to OFF and back to NAV within 5 seconds initiates a 3-minute quick alignment cycle. Both methods require the IRS position to be entered in the MCDU. If the GNS position is valid, the IRU position entry is not required.

2. F-PLN INIT Page. . . . . .ENTER

STEP: Push **INIT**

```
          F-PLN INIT   1/3 →
     CO ROUTE      FROM/    TO
1L   ☐☐☐☐☐☐☐☐  ☐☐☐☐☐/☐☐☐☐  1R
     ALTN ROUTE            ALTN
2L   – – – – – – – – –     – – – – –   2R
     LAT↑↓   GNS POS        LONG
3L   N4038.1          WO7346.2   3R
     FLT NO
4L   ☐☐☐☐☐☐☐☐     POS REF⟩   4R
     CRZ LEVELS
5L   ☐☐☐/[ ]/[ ]/[ ]/[ ]/[ ]   5R
     T E M P / W I N D  O P T  /  M A X F L  C I
6L   – – –°/– – – – –   – – – / – – –   ☐☐☐   6R
```

KB1-3-0146A

3. CO ROUTE or FROM/TO . . . . ENTER

IRS position can be inserted by entering a CO ROUTE in 1L, FROM/TO (ICAO identifier) in 1R, or latitude in 3L and longitude in 3R. Entering the position with the FROM/TO option will automatically display the route selection pages. If route selection is correct, push the LSK adjacent to the *INSERT prompt. If not, push LSK 6R to return to the F-PLN INIT page.

4. LAT and LONG . . . . CHECK OR CHANGE

Verify the accuracy of the LAT and LONG entered in line 3 of the MCDU. Minor changes can be made to the LAT and LONG with the up and down slew keys on the MCDU. If the GNS position is valid, then the GNS position may be used for IRS alignment.

5. IRU Align/Position . . . . ENTER

Push the LSK adjacent to the INITIALIZE IRS* prompt to transmit position to the IRUs and begin alignment. When IRUs are in the align mode, the INITIALIZE IRS* prompt changes to POS REF. If the GNS position is valid, the IRU position entry is not required and selecting INITIALIZE IRS* prompt will transfer GNS position to the IRS for use in alignment.

A CHECK POSITION message will be displayed on the ND when either of the following MCDU scratchpad (SP) messages are displayed:

a. FMC POSITION MISMATCH. This message will be displayed if the FMCs show a position difference of 5 NM or greater or twice the RNP distance (NM); the message will be removed if the position difference becomes less than 3 NM or twice the RNP distance (NM), respectively. Compare the position on the POS REF page and use the FMC considered to be the most accurate. The above is generally a result of poor DME position computation.

b. VERIFY AIRCRAFT POSITION. This message will be displayed if a single FMC radio position varies from the IRS position. Usually it shows on only one MCDU. Check the IRS POS page on that MCDU. If the condition persists, it is advisable to use the other FMC as primary for navigation.

NOTE: It is possible to have the message VERIFY AIRCRAFT POSITION on both MCDUs if a single IRS has drifted more than 12 NM. Comparison of both IRS POS pages should verify this. Use the FMC considered to be the most accurate.

6. POS REF. . . . . CHECK

Pushing LSK 4R again will access the POS REF page. The POS REF page is the first of three position information pages and displays the calculated FMC position and the navigation update status in line 1L, the IRS AVG position (an average of the three IRS positions) on line 2L is an average of IRU-1 and IRU-2 positions, and RNP and ANP values on line 4. If the GNS position is valid, GNS NAV INHIBIT* prompt is displayed on line 5R that allows the GNS position to be dropped from the FMC position calculation.

```
              POS REF      1/3 →
    FMC LAT/LONG (G/I)
1L  N4038.0/W07346.1                  1R
    IRS (AVG)
2L  N4038.0/W07346.1                  2R

3L                                    3R
    RNP/ACTUAL
4L  1.00/0.05 NM                      4R
                         GNS NAV
5L                      INHIBIT*      5R
                       RETURN TO
6L                    F-PLN INIT>     6R
```

KB1-3-0147

Access the IRS/GNS POS page by using the PAGE key. The IRS/GNS POS page displays each IRU position and mode status on lines 1 and 2. Each GNSSU position and mode status as well as the number of satellite vehicles tracked are displayed on lines 4 and 5. Note the countdown time on each IRU indicating normal alignment. A 10-minute or more alignment is normal depending on latitude. A 3-minute time indicates a quick alignment has been selected by turning the IRU selectors to OFF and back to NAV within 5 seconds.

STEP: Push **PAGE**

```
            IRS/GNS POS  2/3→
      IRU 1 - NAV
1L  N4038.0/W07346.0 000° / 00  1R
      IRU 2 - NAV
2L  N4038.0/W07346.0 000° / 00  2R
      IRU 3 - NAV
3L  N4038.0/W07346.0 000° / 00  3R
    GNS 1 - NAV           8 SV
4L  N4038.0/W07346.0 000° / 00  4R
    GNS 2 - NAV           8 SV
5L  N4038.0/W07346.0 000° / 00  5R
                      RETURN TO
6L                  F-PLN INIT>  6R
```

KB1-3-0148A

From the IRS/GNS POS page, pushing the PAGE key will access the IRS STATUS page which will display individual IRU drift rate and ground speed on lines 1L, and 2L. In addition, the IRS status codes will be displayed on lines 5L and 6L. A check of Drift Rate and residual ground speed is accomplished at the completion of flight.

 STEP: Push **PAGE**

```
                 IRS STATUS    3/3→
                DRIFT RATE        GS
 1L    IRU1         ---          ---    1R

 2L    IRU2         ---          ---    2R

 3L    IRU3         ---          ---    3R

 4L                                     4R

        STATUS CODE
 5L    IRU1      OO                     5R
       IRU2      OO       RETURN TO
 6L    IRU3      OO    F-PLN INIT>       6R
```

KB1-3-0149

After completing this step, push LSK 6R to return to the F-PLAN INIT page
and continue with cockpit preparation. Flight plan data, if not stored,
should be inserted prior to beginning the Final Cockpit Preparation
procedure.

7. ALTN ROUTE or ALTN. . . . . ENTER

When the alternate route number (ALTN ROUTE, 2L) or alternate ICAO
identifier (2R) has been entered, the alternate flight plan data page will be
displayed. If a stored flight plan is available, it can be selected by pushing
the LSK adjacent to the *INSERT prompt. If the stored flight plan is not
available or not desired, pushing LSK 6R will return the MCDU to the
F-PLN INIT page. Alternate route data can be strung or checked on the
ACT F-PLN page below the primary flight plan. If no alternate is desired,
the boxes on the F-PLN INIT page can be cleared by entering 0 in the
ALTN ROUTE prompt.

8. FLT NO . . . . ENTER

Flight number may be entered in the form of three alpha, four numeric and
then an optional alpha character. A four-digit number without alpha
characters may also be entered. In this example the flight number
XXX1234 was used. After entering the FLT NO in the SP, push LSK 4L to
enter.

9. CRZ LEVEL. . . . . .ENTER

At least one FL must be entered for initialization. Five additional cruise levels are optional and may be pilot-entered if separated by slashes. One CRZ LEVEL may be automatically loaded with a stored flight plan selection. In-flight cruise altitude changes should be made on this page.

> NOTE: If a cruise altitude is entered below the thrust reduction altitude, the thrust reduction altitude will be terminated and PERF predictions will not be available. Additionally, for low cruise altitudes (e.g., pattern work) cruise speeds may be displayed in Mach on the FMA and on the performance cruise pages, even though the airplane is in the normal IAS region.

10. TEMP/WIND . . . . .ENTER

The forecast temperature and wind may be manually entered here. If not entered, temperature will default to ISA temperature for FL entered. Wind entry is the average cruise wind component (trip wind). It may be entered as a tailwind (+, T, TL, or TAIL) or a headwind (-, H, HD, or HEAD). The wind entry must be preceded by a slash (/). If not entered, wind will default to 0 knots HD. Wind bearing is always along the airplane track.

> NOTE: TEMP/WIND entry is not mandatory but is used in performance computations and should be entered if available.

11. Cost Index (CI) . . . . .ENTER

Cost index reflects time cost relative to fuel cost. The numbers entered will govern the airplane speed and thereby the economy mode of operation. The CO ROUTE data may include the cost index and is entered when the company route is selected. If a CO ROUTE is not used, the CI should be entered after the flight plan data has been entered. Entry of the CI initiates performance computations.

```
          F-PLN INIT    1/3 →

  CO ROUTE          FROM/TO
1L                KJFK/KATL  1R
  ALTN ROUTE           ALTN
2L                    KMCN   2R
  LAT ↑↓   GNS POS      LONG
3L N4038.0        W07346.4  3R
  FLT NO
4L XXX1234        POS REF>  4R
  CRZ LEVELS
5L 310/[  ]/[  ]/[  ]/[  ]  5R
  TEMP/WIND  OPT/MAXFL  CI
6L -45°/TL030  280/328  200 6R
```

KB1-3-0150A

Flight Planning

The F-PLN key allows the pilot to review and revise the lateral and vertical elements of the flight plan in the sequence in which they occur. There are two major portions of the Active (ACT) flight plan, a Primary Flight Plan which describes the intended route for the remainder of flight and an Alternate (ALTN) Flight Plan from destination to the alternate airport. The legs of the alternate flight plan may be incorporated into the primary flight plan through a special lateral revise function (ENABLE ALTN). Minimum elements in the primary flight plan include origin and destination airports.

The active F-PLN is used for active guidance and all performance planning functions while the secondary flight plan is used for planning changes and predictive purposes. The secondary F-PLN can be entirely different from the active flight plan or it can be a modified version of the active F-PLN. The secondary F-PLN may be activated during flight.

In this section, a flight plan will be built (strung) from the initialized origin airport to the destination airport. The entry of a stored CO ROUTE will enable immediate entry of the entire flight plan appreciably reducing pilot workload.

CAUTION: Extreme care should be exercised to compare the waypoint lat/long taken from the electronic database against the waypoint lat/long depicted on the navigation charts, and that the proposed routing shown on the ND appears reasonable.

NOTE: While the airplane is on the ground, sensed temperature deviations of +20 degrees from ISA or greater will produce significant drops in the computed Maximum Altitude. However, the Maximum Altitude will correct itself inflight.

1. F-PLN Page Access

The F-PLN INIT page entered KJFK as the origin airport (A/P), KATL as the destination and KMCN as the alternate A/P. Pushing the F-PLN key with this initialization shows the following.

 STEP: Push **F-PLN**

Initialized ACT F-PLN

```
               ACT F-PLN    1/2→
        FROM      ETE   SPD    ALT
 1L   KJFK     0000---/     10   1R  ⎤
                                      ⎥
 2L   ---F-PLN DISCONTINUITY--   2R  ⎥  PRIMARY
                                      ⎬  PLAN
 3L   KATL       ---- ---/ 1030  3R  ⎥
                                      ⎥
 4L   ------END OF F-PLN------   4R  ⎦

 5L   KATL                       5R

 6L   ---F-PLN DISCONTINUITY--   6R
                             ↑↓
```

KB1-3-0311A

There are two methods of entering the flight plan data:

 • If there is a stored flight plan, confirm the flight plan data and insert with the LSK adjacent to the *INSERT prompt. If a CO ROUTE or stored flight plan was used, start with step 2.

• If there is no stored flight plan, or if the stored flight plan is not desired, push LSK 6R to return to the F-PLN page. Flight plan data will now have to be entered (strung) starting with step 3.

2. SID & RWY . . . . ENTER

The SID page is accessed by a LAT REV from the origin airport or runway.

 STEP: Push **1L**

LAT REV Page From KJFK

```
          LAT REV  FROM  KJFK
             N4038.0/W07346.4
  1L    <SID                              1R

  2L                          HOLD>       2R

  3L                                      3R
          NEXT WPT       NEW CO RTE
  4L    *[     ]         [        ]*      4R
                            NEW DEST
  5L                         [     ]*     5R
         ENABLE ALTN       RETURN TO
  6L    *TO KMCN          ACT F-PLN>      6R
```

KB1-3-0151

 STEP: Push **1L**

Initial SID Page

```
          SID FROM KJFK
       STD SID              RWY
1L   BETTE2               04L    1R
2L   GREKI2               04R    2R
3L   HAPIE2               13L    3R
4L   JFK7                 13R    4R
        CUSTOM
5L   <SIDS                22L    5R
6L                     RETURN TO      6R
                       LAT REV>
                          ↑
```

KB1-3-0169

The SID page lists and allows selection of SIDs and runways from the point of origin as well as a selection of a departure transition.

The SID page also lists either Standard or Custom SIDs and their associated transitions and runways from the origin airport allowing the crew to select the runway/SID/transition combination associated with their clearance.

For airplane equipped with the custom procedures option, line 5L provides a CUSTOM SIDS* prompt for selection. If pushed, all the custom SIDs for that airport will be displayed.

Select the takeoff runway from the right LSK. Scroll to select runway 22R. It will move to line 1R with <SEL> next to it. Select the SID from the left LSK. It will move to line 1L with <SEL> next to it.

If an operator's Nav DataBase has an Engine Out SID (EOSID) available for a particular runway, it will be indicated on the SID page line 2R after the runway and the appropriate SID have been selected. It will be presented in the format: "EOXX", where "XX" is the selected runway.

If an EOSID is available for the selected departure runway, and if the ENG OUT mode key on the MCDU is pushed, the EOSID routing will be displayed as a dashed magenta line on the ND MAP or PLAN pages. Additionally, the *CONFIRM EOSID CLEAR" prompt will appear on the ACT F-PLN page of the MCDU on the data line prior to the common diversion point. The engine out condition must be confirmed by pushing the LSK adjacent to the *CONFIRM prompt in order to activate the EOSID.

After Runway Selection

```
                 SID FROM KJFK
       STD SID                    RWY
 1L   BETTE2        <SEL>   22R   1R
                         ADDL RWYS
 2L   GREKI2                 04L  2R

 3L   HAPIE2                 04R  3R

 4L   JFK7                   13L  4R
         CUSTOM
 5L   <SIDS                  13R  5R
                       RETURN TO
 6L   *INSERT          LAT REV>   6R
                            ↑
```

KB1-3-0167

After Runway and SID Selection

```
            SID FROM KJFK
      STD SID              RWY
1L   JFK7    <SEL><SEL>   22R   1R
      TRANS              EOSID
2L   NONE                NONE   2R
      ADDL SIDS    ADDL RWYS
3L   BETTE2                04L   3R

4L   GREKI2                04R   4R
      CUSTOM
5L   <SIDS                 13L   5R
                    RETURN TO
6L   *INSERT         LAT REV>   6R
                         ↑
```

KB1-3-0168

STEP: Push **6L**

```
         ACT F-PLN     1/2→
      FROM    ETE   SPD   ALT
1L   RW22R   0000---/     10    1R

2L   ---F-PLN DISCONTINUITY--   2R

3L   CRI       ---- ---/   ---   3R

4L   ---F-PLN DISCONTINUITY--   4R

5L   KATL      ---- ---/  1030  5R

6L   ------END OF F-PLN-----    6R
                         ↑↓
```

KB1-3-0303A

If enroute transitions are available, they will be listed below the selected SID. After transition selection, remaining transitions are listed following the ADDL SIDs.

After the applicable runway and SID are inserted into the active flight plan, if the ENG OUT mode key on the MCDU is pushed, the EOSID routing will be displayed as a dashed magenta line on the ND MAP or PLAN pages, and the *CONFIRM EOSID CLEAR* prompt will appear on the ACT F-PLN page of the MCDU on the data line prior to the common diversion point for the Standard and Engine Out SID. This permits the crew to review the EOSID profile. Pushing the CLEAR* prompt will delete the EOSID dashed magenta line from the ND MAP or PLAN pages.

The selected combination may be inserted in the flight plan by pushing LSK 6L *INSERT for the active primary flight plan whereupon the display will return to the accessing F-PLN page. The accessing LAT REV page may be recalled by pushing the LSK 6R (RETURN TO) on the SID page, thus canceling any selections.

Custom SIDs and their transitions (program options), are customer-defined and customer unique. Page operation using Customer SIDs/Transitions is the same as that previously described for Standard SIDs.

If a CO ROUTE or stored route was selected, go to F-PLN INIT. If manually inserting (stringing) a route, continue with step 3.

3. No CO ROUTE Data . . . . STRING F-PLN

Waypoints may be entered (strung) into the flight plan by any one of several methods. Each of these methods is briefly described as follows:

Direct Waypoint Entry to the F-PLN

Type the waypoint description in the SP and enter in sequence on the ACT F-PLN page in the F-PLN DISCONTINUITY line. F-PLN discontinuity is defined as a break in the flight plan where there is no connection between two successive path/terminations. The FMC does not automatically insert route legs into the flight plan to bridge discontinuities. Therefore, the pilot should utilize the EIS or refer to the F-PLN routing to identify subsequent deletion or additions to construct the desired routing. Whenever the airplane is within 30 seconds of a leg sequence into a discontinuity, the message DISCONTINUITY AHEAD is displayed in the MCDU SP.

Direct entry into the F-PLN of the waypoint Coyle (CYN) is accomplished by typing CYN into the SP and pushing LSK 4L. The new waypoint CYN is inserted at line 4L causing the F-PLN DISCONTINUITY, as well as the remainder of the F-PLN, to be pushed down.

STEP: Type **CYN in SP**

```
            ACT F-PLN      1/2→
      FROM       ETE   SPD    ALT
1L   RW22R     OOOO---/      10    1R

2L   ---F-PLN DISCONTINUITY--   2R

3L   CRI          ---- ---/ -----   3R

4L   ---F-PLN DISCONTINUITY--   4R

5L   KATL         ---- ---/   1030   5R

6L   ------END OF F-PLN------   6R
     CYN                    ↑↓
```

KB1-3-0304A

STEP: Push **4L**

```
            ACT F-PLN      1/2→
      FROM       ETE   SPD    ALT
1L   RW22R     OOOO---/      10    1R

2L   ---F-PLN DISCONTINUITY--   2R

3L   CRI          ---- ---/ -----   3R

4L   CYN          ---- ---/ -----   4R

5L   ---F-PLN DISCONTINUITY--   5R

6L   KATL       ---- ---/   1030   6R
                          ↑↓
```

KB1-3-0305A

Other flight plan waypoint entries are similarly inserted into the flight plan.

Airway String

Select the LAT REV page from the start waypoint (CYN) and push LSK 2L adjacent to the <AIRWAYS prompt. Enter the airway in line 1L below VIA label. Then enter the end of the airway below the TO prompt in line 1R followed by the next airway in line 2L. Continue to string airways or push LSK 6L next to the *INSERT prompt to enter to the ACT F-PLN page. All airway waypoints will be strung onto the flight plan.

 STEP: Push **4L (CYN)**

```
          LAT REV FROM CYN
             N3705.3/W08042.0
1L                          STAR>    1R

2L    <AIRWAYS             HOLD>     2R
                        PROCEDURE
3L                         TURN>     3R
          NEXT WPT     NEW CO RTE
4L      *[      ]      [        ]*   4R
                         NEW DEST
5L                       [      ]*   5R
          ENABLE ALTN   RETURN TO
6L      *TO KMCN        ACT F-PLN>   6R
```

KB1-3-0330

STEP: Push **2L**

```
        AIRWAYS FROM CYN
      VIA                TO
1L    J37                GVE    1R
      VIA                TO
2L    J42                MOL    2R
      VIA
3L    [    ]                    3R

4L                              4R

5L                              5R
                     RETURN TO
6L    *INSERT        LAT REV>   6R
```

KB1-3-0171

4. ROUTE DATA . . . . CONFIRM

Step through the flight plan on page 1 or 2 of the ACT F-PLN. Page 1 displays Origin, Waypoint/Navaids, and Destination. Page 2 displays Origin, Waypoint/Navaids, Distances/Courses, CRZ WINDs and Destination. Step through the flight plan with the up/down slew keys, clear the F-PLN DISCONTINUITY as required, and verify flight plan data on the MCDU and NAV mode PLAN display.

STEP: Push **6L**

```
              ACT F-PLN     1/2→
        FROM       ETE  SPD    ALT
1L   RW22R       OOOO---/    1O      1R

2L   --- F-PLN DISCONTINUITY--      2R
     JFK7
3L   CRI          ---- ---/ -----   3R

4L   CYN          ---- ---/ -----   4R
     J37
5L   VILLS        ---- ---/ -----   5R
     J37
6L   NALES        ---- ---/ -----   6R
                            ↑↓
```

KB1-3-0496

STEPS: 1. Push **CLR**

2. Push **2L**

```
            ACT  F-PLN   1/2→
       FROM    ETE    SPD    ALT
 1L  RW22R   0000 ---/     10   1R
       JFK7
 2L  CRI        ---- ---/ -----   2R

 3L  CYN        ---- ---/ -----   3R
       J37
 4L  VILLS      ---- ---/ -----   4R
       J37
 5L  NALES      ---- ---/ -----   5R
       J37
 6L  CLASY      ---- ---/ -----   6R

                          ↑↓
```

KB1-3-0165A

STEP: Push **PAGE**

```
                 ACT F-PLN   2/2→
          FROM     DIST  °C      WIND
  1L    RW22R           15   ---°/---   1R
          JFK7       6
  2L    CRI                     ---/---   2R
                   54/221°
  3L    CYN                     ---/---   3R
          J37       44
  4L    VILLS                   ---/---   4R
          J37       35
  5L    NALES                   ---/---   5R
          J37       14
  6L    CLASY                   ---/---   6R

                                    ↑↓
```

KB1-3-0166A

Weight INIT

The WEIGHT INIT page is the second of three initialization pages and is accessed by the PAGE key from the F-PLN INIT page.

STEPS: 1. Push **INIT**

2. Push **PAGE**

```
          WEIGHT INIT    2/3→

     TAXI          UFOB    BLOCK
1L   0.5           22.5   ☐☐☐.☐   1R
     TRIP/TIME              TOGW
2L   ---.-/----          ☐☐☐.☐   2R
     RTE RSV/%      BLST  IN  ZFW
3L   --.-/05.0      --.- ☐☐☐.☐   3R
     ALTN                    LW
4L   ---.-                - - - . -   4R
     FINAL/TIME            TOCG
5L   ---.-/0030          ☐☐.☐    5R
     EXTRA/TIME           ZFWCG
6L   ---.-/----          ☐☐.☐    6R
```

KB1-3-0152A

Before Engine Start

BEFORE ENGINE START - All lines containing boxes require manual pilot entry. BLOCK, TOGW, or ZFW will be calculated based on which two of these three parameters are entered by the pilot. The calculated value will be displayed in small font and pilot entered values will be displayed in large font. If the pilot entry made for BLOCK, TOGW, or ZFW is cleared, then both the cleared value and the computed value (small font) will revert to boxes. All other line entries are optional, pilot alterable, or FMC calculated.

TAXI - Taxi fuel default value from data base or pilot-entered. Pilot alterable.

TRIP/TIME - The calculated trip fuel and time to the primary destination. Not pilot alterable.

RTE RSV/% - RTE reserves expressed as actual fuel and percentage of TRIP fuel. Either actual fuel or a percentage may be pilot entered, but not both. If there are no pilot entries, then a default percentage from the Navigation Data Base (NDB) will be displayed and the actual fuel will be computed based on this percentage of TRIP fuel. However, the RTE RSV fuel has an upper and lower limit. Therefore, if the RTE RSV fuel is large or small enough to exceed the respective limit, then that limit will be displayed in large font for actual fuel and the percentage will be back-calculated based on the limited RTE RSV fuel.

ALTN - When an alternate has been specified, predicted fuel to the alternate is displayed and is not pilot-alterable. If no alternate is entered, then the pilot may insert a fuel quantity.

FINAL/TIME - Displays navigation database holding fuel 1500 feet above the destination airport and is pilot alterable. Only one FINAL FUEL or TIME value may be entered. The value not entered will be calculated by the FMC. This entry field may be used for any contingency fuel needed (i.e., added holding fuel or added divert fuel for weather, etc.).

EXTRA/TIME - This fuel value is calculated by adding all required fuel (above) and subtracting that total from the BLOCK fuel. Should negative values be displayed, it indicates the flight may be into reserve or holding fuel. An INSUFFICIENT FUEL message will be displayed in the SP if extra fuel is zero or less.

BLOCK - BLOCK fuel weight is pilot-entered or calculated from the TOGW, ZFW, and TAXI entries. If the UFOB value to the left of the field is acceptable and with SP blank, pushing the adjacent LSK will enter the UFOB value into the BLOCK field in LARGE font. Pilot entry in this field allows trial entries for fuel planning purposes. After engine start, BLOCK fuel will be replaced by usable fuel on board (UFOB).

UFOB - Current fuel on board as sensed by the fuel quantity sensor, less any ballast fuel from the FUEL INIT page.

> NOTE: Before engine start none of the calculations of weight data (ZFW=TOGW+TAXI-BLOCK) account for ballast fuel. Therefore, pilot entries of weight data must already account for ballast fuel. Upon edit of ballast fuel, the pilot will be responsible for correcting the weight data.

TOGW - Takeoff gross weight is either pilot-entered or calculated from the BLOCK, TAXI, and ZFW entries.

ZFW - The zero fuel weight is either pilot-entered or calculated from the BLOCK, TOGW, and TAXI entries. It is recommended that the zero fuel weight (ZFW) always be pilot-entered in line 3R. This will permit the system to compute Takeoff Gross Weight (TOGW) in line 2R by adding the fuel weight measured from the fuel quantity gaging system (FQGS).

> NOTES: Where TOGW or ZFW or LW are exceeded, the SP message MAX TOGW (ZFW or LW) XXX.X is displayed, where XXX.X is the maximum value.
>
> If values of ZFW, TOGW or (after engine start) GW are out of range, a SP message to that affect will be displayed.
>
> ZFW must contain the ballast fuel weight if ballast fuel is to be carried on the flight.

LW - The landing weight is a calculated value computed from the ZFW and the EFOB at the destination. It is not pilot-alterable.

TOCG - The takeoff center of gravity is a required pilot entry. The value is obtained from the flight's weight manifest. The TOCG determines the stabilizer trim for departure.

ZFWCG - The ZFW center of gravity is displayed in % MAC. Pilot entry is required.

> NOTES: After the initial pilot entries have been made before engine start, edits of weight data will result in another computation according to the following rules:
>
> • When ZFW is edited, TOGW is recalculated.
>
> • When TOGW is edited, ZFW is recalculated.
>
> • When BLOCK is edited, TOGW is recalculated.
>
> • When TAXI is edited, value displayed in small font (either ZFW, BLOCK, or TOGW) is recalculated.
>
> • When BALLAST is edited, UFOB is recalculated.
>
> A cost index entry is required to make FMC performance computations. Calculated entries will contain dashed line fields until a CI is entered into the F-PLN INIT page.

At Engine Start

TAXI - This field is no longer displayed.

BLOCK - The BLOCK fuel field changes to show the sensors used for UFOB calculation (FF+FQ) in the data line and the label line is blank. FF represents the fuel flow sensor and FQ represents the fuel quantity sensor. A sensor can be eliminated from the calculation by entering the desired sensor (/FF or /FQ) in the scratchpad and pushing LSK 1R.

ZFW - The ZFW is the same value it was before engine start. Regardless of whether ZFW was entered (LARGE font) or calculated (small font) before engine start, ZFW is always displayed in LARGE font. CHECK ZFW is displayed in the SP if the difference of UFOB and BLOCK is greater than 500 pounds or 250 kilograms.

GW/TOGW - The TOGW changes to GW and will no longer be the same as the TOGW on the TAKEOFF page. GW and TOGW differ by the amount of TAXI fuel.

TOCG field is displayed until airborne, at which time the field disappears.

After Engine Start

UFOB - The fuel is decreased by time integration of fuel flow sensors and/or fuel quantity readings to determine the accurate weight of the airplane during the flight. Attempted pilot entry of UFOB with invalid FF or FQ data results in the display of SENSOR IS INVALID in the SP. The flight crew may deselect either sensor used for calculating UFOB, or may reinitialize UFOB by entering a new value (thereby deselecting the fuel quantity sensor). After deselecting either sensor, the flight crew may reselect it by clearing the 1R field.

> NOTE: After the initial pilot entries have been made edits of weight data will result in another computation according to the following rules:
>
> • When UFOB is edited, GW is recalculated.
>
> • When GW is edited, ZFW is recalculated.
>
> • When ZFW is edited, GW is recalculated.
>
> • When BALLAST is edited, GW is recalculated and ZFW is not recalculated.

CHECK ZFW will be displayed in the SP upon BALLAST entry or edit.

INSUFFICIENT FUEL will be displayed in the SP if the EXTRA fuel is zero or less.

GW OUT OF RANGE will be displayed in the SP for those values of GW that are out of range.

```
              WEIGHT INIT    2/3→
                    UFOB
1L                  22.4/FF+FQ          1R
        TRIP/TIME                  GW
2L      8.5/0141                  111.8   2R
        RTE RSV/%       BLST  IN  ZFW
3L      1.0/11.7         2.0   90.0   3R
        ALTN                     LW
4L        1.1                  103.3   4R
        FINAL/TIME               TOCG
5L        2.1/0030              27.5   5R
        EXTRA/TIME              ZFWCG
6L      9.1/0208               25.0   6R
```

KB1-3-0153A

The FUEL INIT page is accessed by pushing the PAGE key from the WEIGHT INIT page.

 STEP: Push **PAGE**
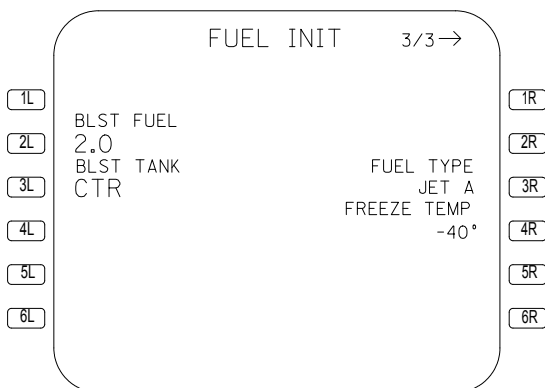
```
              FUEL INIT    3/3→

1L                                    1R
        BLST FUEL
2L      2.0                            2R
        BLST TANK          FUEL TYPE
3L        □                    JET A   3R
                          FREEZE TEMP
4L                            -40°     4R

5L                                    5R

6L                                    6R
```

KB1-3-0154

The pilot may enter fuel-related parameters specific to a flight and/or after FMC-computed default entries.

BLST FUEL - Ballast fuel identifies a certain quantity of fuel on board identified as nonusable fuel. When a quantity is entered as ballast fuel, the prompt BLST TANK appears in line 3L. The line entry is boxed, requiring a pilot entry. If BLST fuel is entered or edited after engine start, CHECK ZFW will be displayed in the SP.

> *NOTE: BLST FUEL entry without BLST TANK entry will result in a ballast disagree on the EIS Secondary Engine Display.*

```
                    FUEL INIT    3/3→

1L                                               1R
    BLST FUEL
2L  2.0                                          2R
    BLST TANK              FUEL TYPE
3L  CTR                       JET A              3R
                          FREEZE TEMP
4L                            -40°               4R

5L                                               5R

6L                                               6R
```

KB1-3-0155

Ballast fuel may be carried in center tank, or the forward auxiliary (AUX) tank (if installed). Enter C or A.

Attempted entry of any other tank results in the MCDU message FORMAT ERROR. Attempted entry of a BLST FUEL or BLST TANK number that exceeds the tank quantity limit results in the MCDU message TANK LIMIT EXCEEDED. If the BLST FUEL entry is greater than the largest tank limit the message ENTRY OUT OF RANGE will be displayed, and the entry rejected.

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NOTE: Ballast fuel will be retained after every flight until manually cleared by the flight or maintenance crew. The message CHECK BALLAST FUEL will be displayed when FMS transitions to DONE at the end of each flight where ballast is identified.

FUEL TYPE - Default to Jet A, but may be pilot altered. Fuels which may be entered include Jet A, A1, Jet B, JP4, JP5 and JP8. Enter A, A1, B, 4, 5, or 8.

FREEZE TEMP - Defaults to the specified fuel freeze temperature of the entered fuel. FREEZE TEMP is pilot-alterable, but will cause the FUEL TYPE field to become dashed.

FMS Predictions and Calculations

FMS predictions and calculations are displayed only after cost index, gross weight, and cruise flight level have been entered.

STEP: Push **F-PLN**

```
                ACT F-PLN      1/2→
         FROM      ETE    SPD    ALT
 1L   RW22R     0000   ---/     10   1R
         JFK7
 2L   CRI         02     170 / 2230   2R
 3L   CYN         11     304 / FL230   3R
         J37
 4L   VILLS       17     .76 / FL278   4R
         J37
 5L   (T/C)       17      " / FL310   5R
         J37
 6L   NALES       22      " /    "    6R
                                  ↑↓
```

KB1-3-0451

Push the PAGE key to display ACT F-PLN page 2/2. This page displays great circle distance to the next waypoint, the flight plan outbound course for the next leg, and temperature and wind information for the same waypoints displayed on page 1.

STEP: Push **PAGE**

```
              ACT F-PLN      2/2→
        FROM    DIST   °C        WIND
  1L   RW22R            15    ---°/---   1R
        JFK7      4
  2L   CRI              11   HEAD/000    2R
                54/221°
  3L   CYN             -31     "  /  "   3R
        J37      39
  4L   VILLS           -46     "  /  "   4R
        J37       5
  5L   (T/C)            "      "  /  "   5R
        J37      35
  6L   NALES            "      "  /  "   6R
                               ↑↓
```

KB1-3-0452

Distance Between Waypoints (Center) - The distance between the flight plan waypoints is displayed in the center field between the lines for the corresponding waypoints.

Departure Runway Surface Temperature (1C) - The departure runway surface temperature is displayed in the center of line 1. This temperature is calculated based on the temperature entered on the F-PLN INIT page, and can be changed on the CLIMB FORECAST page. After it is changed, it is displayed in large font on this page.

Magnetic Course (Center) - If the magnetic course between two waypoints is different than the previous leg, the course is displayed next to the distance in the center field.

Temperature and Winds (1C/R through 6C/R) - The temperature and winds for the waypoints are displayed on the same line as the waypoint identifier (or event name) on the right side of the MCDU. The temperature defaults to ISA temperature unless there is a value entered on the F-PLN INIT page. Then it is a calculated value for that altitude. Winds default to HD/000 unless there is a value entered on the F-PLN INIT page.

The temperature and winds for climb are from the CLIMB FORECAST page. If parameters do not change on successive legs of the flight plan, ditto marks (") are displayed.

Flight Plan Temp and Wind Entry

The wind profile used for prediction calculations is constructed as follows:

Initial F-PLN - The trip wind from the F-PLN INIT page is applied from takeoff at the origin airport to landing at the destination airport.

Climb - Entries on the CLIMB FORECAST wind page are used to compute the climb portion of the flight plan by linear interpolation. Winds must be entered manually on the CLIMB FORECAST page. If no climb wind data is entered, the system uses trip wind from the F-PLN INIT page. If no trip wind is entered, the system uses zero wind for the climb.

Cruise Wind Propagation - Propagation is copying entered or uplinked wind data from the waypoint where the entry is made to other waypoints that do not have entries.

Descent - If no entries are made on the DESCENT FORECAST page, the system uses trip wind from the F-PLN INIT page. If trip wind has not been entered, zero wind is used. Descent forecast wind is also used in alternate flight planning.

Winds entered on the F-PLN INIT page are inserted into the flight plan between the origin airport and destination airport and used for predictions. Cruise waypoint wind entries or changes can be made by a vertical revision to F-PLN page 2.

Push the right LSK adjacent to the cruise waypoint NALES with the scratchpad empty. The VERT REV AT NALES page 1/2 is displayed. Push the PAGE key to display the VERT REV AT NALES page 2/2. Wind data is entered on this page. Enter 310/280/100 in the scratchpad.

STEPS: 1. Push **6R**

2. Push **PAGE**

3. Type **310/280/100**

```
 VERT REV AT NALES  2/2→
                    ALT/TEMP
1L                 [    ]/[  ]°   1R
        ALT/ WIND     TRIP WIND
2L    [    ]/[  ]%[  ]    TL030   2R

3L    [    ]/[  ]%[  ]    PREV>   3R

4L    [    ]/[  ]%[  ]    NEXT>   4R

5L    [    ]/[  ]%[  ]            5R
                      RETURN TO
6L    310/280/100    ACT F-PLN>   6R
```

KB1-3-0453

STEP: Push **2L**

```
┌─────────────────────────────────┐
│  VERT REV ᴀᴛ NALES    2/2→      │
│                    ALT/TEMP     │
│                   [   ]/[   ]°   │
│     ALT / WIND                  │
│  FL310/280°/100                 │
│                                 │
│  [    ]/[   ]°/[   ]    PREV>    │
│                                 │
│  [    ]/[   ]°/[   ]    NEXT>    │
│                                 │
│  [    ]/[   ]°/[   ]            │
│                    RETURN TO    │
│  *INSERT          ACT F-PLN>    │
│                                 │
└─────────────────────────────────┘
```

1L 1R
2L 2R
3L 3R
4L 4R
5L 5R
6L 6R

KB1-3-0454

Pushing LSK 6L to insert the FL310 NALES wind into the flight plan.

ALT/WIND - Up to four altitudes of cruise winds can be entered. They are automatically arranged in descending order from top to bottom. The same four altitudes apply to all cruise waypoint winds. If no entry is made at a particular altitude, only brackets are displayed. On the VERT REV page pilot-entered or uplinked winds are displayed in large font, and propagated winds are displayed in small font. All winds displayed on F-PLN page 2 are in small font.

If the pilot clears the wind entry for any altitude on the wind entry page, all entries for that altitude along the route are also cleared.

*INSERT - The *INSERT prompt is displayed when a wind entry is made. Pushing the adjacent LSK inserts the wind value into the active flight plan and propagates the wind to all other waypoints that do not already have winds entered.

ALT/TEMP - If the temperature is known at a specific altitude, it is entered in degrees C in 1R.

TRIP WIND - Trip wind is displayed as entered on the F-PLN INIT page. The trip wind value is displayed only until an entry is made in 2L, 3L, 4L, or 5L.

PREV> and NEXT> - Pushing the LSK next to these prompts displays the wind entry page for the previous or next

waypoint along the route.

RETURN TO ACT F-PLN - Pushing 6R returns to the active F-PLN page without inserting any data.

Performance Mode Entry

The performance (PERF) page displays FMS speed mode data and time and distance predictions for planned altitude transitions in the active flight phase. The PERF page also lets the pilot preview and preselect FMS speed modes for the CRUISE and DESCENT portions of the flight.

There are two different PERF pages, the active page and the PRESELECT page. The active speed mode is used to determine the proper speed targets for the current portion of the flight, either CLIMB, CRUISE, or DESCENT. The PRESELECT speed modes are used to define the speed profile for future portions of the flight.

Pushing the PERF key on the ground displays the performance climb page. The other two pages of the set (2/3 and 3/3) are the PRESELECT CRZ page and the PRESELECT DES page.

STEP: Push **PERF**

```
                    ECON CLB      1/3→
                              PRED TO
 1L                              10000    1R
     ECON        TIME          DIST
 2L 305/.760    0005             19      2R
     MAX CLB
 3L *205        0003             17      3R
     EDIT
 4L [   ]                               4R
                              CLIMB
 5L                         FORECAST>    5R
    TRANS   OPT/MAXFL        TRUST
 6L 18000  325/328         LIMITS>      6R
```

KB1-3-0455

ECON - This is the selected speed mode (large font). It changes to small font with an asterisk when another speed mode is selected. The FMS power-up default speed mode is ECON.

MAX CLB - The small font with an asterisk indicates maximum angle-of-climb speed can be selected. When it is selected, the font size changes to large.

EDIT -This is a pilot-entered CAS and/or Mach. If only one value is entered, a constant CAS or Mach is flown. If the CAS and Mach entries are separated by a slash (270/.78), a constant CAS climb is flown until the crossover altitude where a constant Mach is maintained. If a CAS is entered without a specified Mach, Mmo is the associated Mach. If a Mach is entered without a specified CAS, Vmo is the associated CAS. When the pilot enters a speed, it is displayed in small font with an asterisk. Pushing 4L again activates the speed target and changes displayed speed to large font.

The EDIT field can also be activated by preselecting a speed on the FCP and pushing the FMS SPD button within 10 seconds. Pushing the button at any other time resets the speed mode to ECON. Pushing or pulling the FCP speed knob exits FMS SPD mode.

TRANS - This is the transition altitude of the origin airport from the database. If no value is available from the database, 18,000 ft. is the default value.

OPT/MAXFL - This is the FMS-computed optimum and maximum flight levels. Optimum altitude is calculated using ECON, EDIT or MAX endurance speed. Maximum flight level is from a table but is always equal to or less than max certified altitude.

PRED TO - These are time and distance predictions to the displayed altitudes using corresponding speed modes. The displayed altitude is large font if entered by the pilot, otherwise, FCP altitude is displayed in small font.

STEP: Push **PAGE**

```
        PRESELECT CRZ      2/3→

  1L                                    1R

       ECON
  2L  .760                              2R

  3L                                    3R

       EDIT
  4L  [   ]                             4R

  5L                                    5R

         OPT  MAXFL
  6L       345/348                      6R
```

KB1-3-0456

STEP: Push **PAGE**

```
        PRESELECT DES      3/3→

  1L                                    1R

      ECON
  2L  .754/280                          2R

  3L                                    3R

      EDIT
  4L  [ ]                               4R

                           DESCENT
  5L                      FORECAST>     5R

      TRANS   OPT  MAXFL
  6L  18000   345/348                   6R
```

KB1-3-0457

Climb Forecast Wind Entry

Pushing LSK 5R on the ECON CLB page displays the CLIMB FORECAST page.

On the CLIMB FORECAST page, ALT/WIND entries are done the same as waypoint wind entries. The origin airport wind and temperature are entered in 5L. A minimum of two wind entries are recommended, one for the origin airport and the other in 2L, 3L, or 4L.

The wind entry for KJFK does not require a preceding slash. Enter 300/15 in the scratchpad and push LSK 5L.

STEPS: 1. Push **PERF**

2. Push **5R**

3. Type **300/15**

4. Push **5L**

```
              CLIMB FORECAST

1L                                              1R
        ALT /  WIND
2L      [     ] /[ ]°/[ ]                        2R

3L      [     ] /[ ]°/[ ]                        3R

4L      [     ] /[ ]°/[ ]                        4R
                               TEMP
5L      KJFK /[ ]°/[ ]         [   ]°            5R
                           RETURN TO
6L      300/15             PERF MODE>            6R
```

KB1-3-0458

The rest of the data on the CLIMB FORECAST page is entered by typing wind altitude/direction/velocity and pushing LSK 4L. The altitude/wind data is displayed in order from the highest altitude to the lowest, no matter what order it was entered. Departure runway surface temperature is entered by typing temperature in the SP and pushing LSK 5R

```
                    CLIMB FORECAST

  1L                                                    1R
             ALT        WIND
  2L     FL290/260°/085                                 2R

  3L     FL200/265°/065                                 3R

  4L     FL100/280°/045                                 4R
                                       TEMP
  5L     KJFK /300°/015                  15°            5R
                                    RETURN TO
  6L     *INSERT               PERF MODE>               6R
```

KB1-3-0459

Push LSK 6L to insert the climb forecast data into the flight plan.

Takeoff Data Entry

After receiving airplane papers and before leaving the gate, the last page to access for preflight is the TAKEOFF page. Pushing the TO/APPR key will display the TAKEOFF page. After takeoff, when takeoff mode is exited, the page will default to APPROACH which cannot be restored to TAKEOFF for the remainder of the flight.

STEP: Push **TO/APPR**

```
        TAKEOFF KJFK RW22R
    FLEX     TOCG/TOGW      THRUST
1L  * [ ]    27.5/111.8     LIMITS>     1R
    PACKS    EPR          SLOPE/WIND
2L  ON       1.53         ▢▢▢.▢/▢▢▢     2R
    FLAP     STAB              OAT
3L  ▢▢.▢     2.3               ▢▢▢       3R
    V1       VFR          CLB THRUST
4L  ---      ---                1510     4R
    VR       VSR/V3          ACCEL
5L  ---      217/217            3010     5R
    V2       VCL          EO ACCEL
6L  ---      250                810      6R
```

KB1-3-0156A

FLEX - Allows pilot entry of an assumed temperature for a FLEX TO thrust rating. Range is from the present total air temperature (TAT) indication to 99°C. FLEX entries on this page are also entered on the THRUST LIMITS page. To regain full thrust, the assumed temperature may be cleared. TOCG and TOGW will be displayed to the right of FLEX.

TOCG/TOGW - These values are the same numbers as on the WEIGHT INIT page. After engine start, the TOGW on the WEIGHT INIT page will change to GW. As fuel is used, both pages will reflect the change.

PACKS - Displays the expected air conditioning packs setting for takeoff. Defaults to airline selection option of ON or OFF, but is pilot alterable to ON or OFF. To the right of the PACKS field, the EPR is computed and displayed. It is not pilot alterable.

FLAP - The flap setting is boxed, indicating a pilot entry. Range is from 5° to 20°. To the right, the computed stabilizer position is displayed. It is not pilot alterable.

V-speeds - V1, VR, and V2 will be computed for pilot confirmation. Before they are computed, dashes are displayed, but the pilot may enter and clear speeds. Computed speeds are displayed in small font with an asterisk prompting the pilot to confirm the speeds by pushing the associated LSK. The MCDU SP message CHECK/CONFIRM VSPDS is displayed until V-speed confirmation or clearing of the message. Confirmed and pilot-entered values are displayed in LARGE font, but if cleared return to computed small font values. FMS-computed and pilot-confirmed V-speeds are compared to computed values and if a ±2 knot or less difference is present, pilot-entered V-speeds remain unchanged. CHECK/CONFIRM VSPDS message will then be displayed.

> NOTES: Any manually entered V1, VR, and V2 speeds must be verified with AFM-derived data before takeoff. The flight crew must recalculate and reenter V-speeds before takeoff for any changes made that affect V-speeds already entered by the flight crew. If the automatic V-speeds option is enabled, the following applies: If the FMS-computed V-speeds cannot be confirmed for display on the PFD speed tape (as in the case of single FMS operation, for example), the flight crew must verify any displayed V-speeds on the MCDU comply with AFM-derived data obtained from a source other than the FMS before entering the speeds manually.
>
> The FMS will lock the TAKEOFF page and V-speeds display when the throttles are advanced above a high thrust setting (approximately 70%) and then airplane is within 15 degrees of the selected runway heading. Pulling the throttles back below this thrust level position will unlock the TAKEOFF page.

VFR - The flap retract speed will be displayed when V1, VR, and V2 are entered by the pilot.

VSR/V3 - The slat retract speed and V3 will be computed and displayed based on airplane gross weight.

VCL - The operational climb speed is displayed after a TOGW is entered. VCL will be computed and displayed based on airplane gross weight. This field is not pilot alterable. VCL will become the active FMS speed target above the all engine acceleration altitude and until 10,000 feet.

THRUST LIMITS - Pushing LSK 1R will display the THRUST LIMITS page.

SLOPE/WIND - Runway slope and wind components are mandatory pilot entries. U or + designates an uphill slope, while D or – designates a downhill slope. H or +, and T or – designate a headwind or tailwind respectively. Omission of the prefixes with the slope and/or wind will be assumed to be an uphill slope and/or a headwind component, respectively.

OAT - Outside air temperature is boxed indicating a mandatory entry for V-speed computations. Entries may be preceded by a + or – for temperature, otherwise + will be the default. Entries may be made in either degrees Centigrade of Fahrenheit. C for Centigrade or F for Fahrenheit must follow the temperature entered. After the temperature is entered, pushing LSK 3R with no data in the scratchpad shall cause the OAT entry to be converted between Centigrade and Fahrenheit values.

> NOTE: Temperature for the FMS OAT must not be taken from the TAT display on the EAD. Another source, such as ATIS, ATC, weather dispatch, etc., must be used.

CLB THRUST - Altitude at which takeoff thrust can be reduced to climb thrust. Defaults to 1500 feet above airport elevation. Pilot-alterable, minimum 1000 feet above airport elevation.

> NOTE: With FCP altitude set lower than ACCEL or CLB THRUST altitude, the ACCEL and/or CLB altitude values will be edited to the FCP altitude when the FCC transitions into altitude capture. Upon altitude capture, the FMS speed target will become the climb speed target VCL. Thrust reduction will occur when the FCC enters ALT hold mode.

ACCEL - Default 3000 feet above origin elevation (small font) where acceleration above V2 + 10 can begin. Pilot alterable, minimum 1000 feet above airport elevation.

> **CAUTION: If it is planned that the airplane will remain in the traffic pattern after the first takeoff and will not climb above the default ACCEL altitude, the ACCEL altitude should be edited below the airplane's initial level off. This will ensure the FMS Vmin speed properly transitions to 1.23 Vs and does not continue to be computed as 1.13 Vs (takeoff or go-around mode).**

EO ACCEL - Default 800 feet or 1500 feet (program option) above origin elevation (small font) where engine out acceleration is initiated. Pilot alterable, minimum 400 feet above airport elevation.

Appropriate values for the flight from New York to Atlanta are entered in the following screen.

```
        TAKEOFF KJFK RW22R
   FLEX      TOCG/TOGW      THRUST
1L *[ ]      27.5/111.8    LIMITS>        1R
   PACKS     EPR           SLOPE/WIND
2L ON        1.53          UP 0.0/HD0     2R
   FLAP      STAB              OAT
3L 18.0°     2.3             25°C         3R
   V1        VFR           CLB THRUST
4L *124      158               1510       4R
   VR        VSR/V3          ACCEL
5L *130      217/217           3010       5R
   V2        VCL           EO ACCEL
6L *138      250               810        6R
   CHECK/CONFIRM VSPDS
```

KB1-3-0157A

```
  137  PITCH      TAKEOFF      T/O CLAMP
                 — AP OFF —    —ATS OFF—

  250>                            -4-
                                  -3-
  138  V2                         -2-
  130  VR                          -
  124  V1                         -1-
                                   -
   0                              ——
  TAXI                             -
                                  -1-
                                   -
                             -3   -2-
   20——20        RA 200           -3-
                                  -4-
```
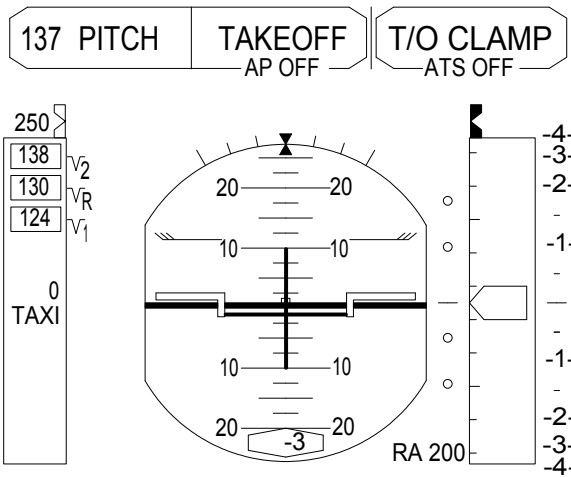
KB1-3-0158A

NOTE: V-speed boxes are dashed on the PFD, until V-speeds are confirmed/entered into the MCDU.

Thrust Limits Page

Access to the THRUST LIMITS page is from the TAKEOFF, REF, GO-AROUND, or active PERF page. The THRUST LIMITS page provides selection of various thrust limit modes. AUTO is the normal thrust page mode; however, MANUAL thrust selection is allowed at pilot's discretion.

 STEP: Push **TO/APPR**

```
        TAKEOFF KJFK RW22R
     FLEX      TOCG/TOGW      THRUST
1L   *[ ]      27.5/111.8     LIMITS>      1R
     PACKS     EPR         SLOPE/WIND
2L   ON        1.53        UP 0.0/HD 0     2R
     FLAP      STAB              OAT
3L   18.0°     2.3               25°C      3R
     V1        VFR         CLB THRUST
4L   124       158               1510      4R
     VR        VSR/V3            ACCEL
5L   130       217/217           3010      5R
     V2        VCL         EO ACCEL
6L   138       250                810      6R
```

KB1-3-0460

STEP: Push **1R**

```
          AUTO THRUST LIMITS
             EPR      TAT     FLEX
  1L    →T/O 1.55      15°     [  ]*    1R
         10%  DERATE   20%  DERATE
  2L    *T/O1                    T/O2*   2R
  3L     MCT                             3R
  4L     CLB                             4R
         10% DERATE      20% DERATE
  5L     CLB1                   CLB2     5R
                         RETURN TO
  6L     CRZ          PERF MODE>         6R
```

KB1-3-0159

During a flight one thrust limit is always active while others are either available for activation, armed, or available for arming. The present active limit is displayed on the left side of the page in LARGE font preceded by an arrow. The only thrust rating value displayed in LARGE font is adjacent to the active thrust limit.

Additional limits are available for activation and are indicated by an adjacent asterisk (*).

Armed thrust limits are those which either become active automatically or become active manually when selected by the pilot. These limits are distinguished by LARGE font (MCT, CLB, or CRZ) but have the thrust rating value displayed in small font.

```
          AUTO  THRUST  LIMITS
              EPR      TAT
 1L   *T/O               15°
      10%  DERATE    20%  DERATE
 2L   →T/O1 1.56              T/O2*
 3L   MCT
 4L   CLB
      10% DERATE        20% DERATE
 5L   CLB1                     CLB2
                         RETURN TO
 6L   CRZ                 TAKEOFF>
```

KB1-3-0160

Up to two takeoff derates (T/O1 and T/O2) and two climb derates (CLB1 and CLB2) are available as airline options via programming option and via maintenance options.

Line 1R allows entry of a FLEX temperature. If Flex thrust is used, line 2L, 2R will be replaced by the computed Flex thrust rating. Flex thrust can be deactivated prior to takeoff by clearing the Flex temperature entry in 1R or by activating an available Takeoff thrust selection. The 1R flex temperature field will be blank if T/O1 or T/O2 have currently been selected.

After the thrust reduction altitude is attained and the FMS transitions to the climb thrust limit, takeoff thrust limits, T/O1 and T/O2 are replaced by G/A. Line 1L displays G/A based on the thrust limit used for takeoff. The ARMED thrust limit will always be displayed on the left-hand side.

LSK 3L through 6L, 5R, and 6R work identically as in the preflight/takeoff portions of flight with the exception that the ARMED climb thrust limit is now ACTIVE (preceded by an arrow) and the other climb limits are AVAILABLE FOR ACTIVATION (preceded or succeeded by asterisks).

```
        AUTO THRUST LIMITS
              EPR      TAT
1L   G/A                15°          1R
     10%    DERATE   20%    DERATE
2L                                   2R

3L    MCT                            3R

4L   →CLB     1.41                   4R
     10%    DERATE   20%    DERATE
5L   *CLB1                   CLB2*   5R
                         RETURN TO
6L    CRZ            PERF  MODE>      6R
```
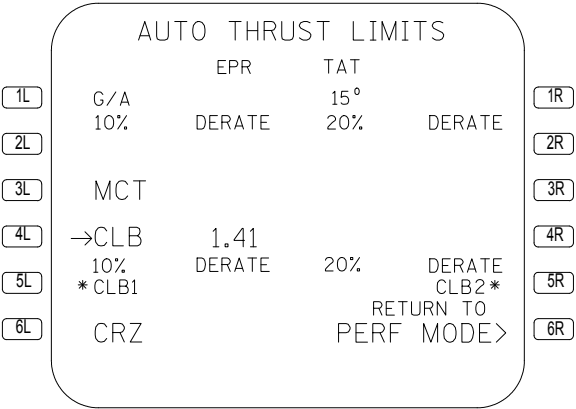
KB1-3-0161

MCT automatically becomes ACTIVE if an engine out situation is encountered or in the event of low speed protection.

Once the engine-out or low-speed condition has been cleared, the thrust limit will automatically transition from MCT to CLB or CRZ as appropriate for current flight phase.

The Thrust page will change to MANUAL THRUST LIMITS any time a pilot selection of an armed or active thrust limit is made.

```
       ┌─────────────────────────────────┐
       │     AUTO  THRUST  LIMITS        │
       │         EPR      TAT            │
  [1L] │ →G/A   1.55     14°            │ [1R]
       │                                 │
  [2L] │                                 │ [2R]
       │                                 │
  [3L] │    MCT    -.--                  │ [3R]
       │                                 │
  [4L] │    CLB                          │ [4R]
       │    10% DERATE      20% DERATE   │
  [5L] │    CLB1                 CLB2    │ [5R]
       │                    RETURN TO    │
  [6L] │    CRZ             PERFMODE     │ [6R]
       └─────────────────────────────────┘
```

KB1-3-0162

On the MANUAL THRUST LIMITS page, all of the thrust limits are AVAILABLE FOR ACTIVATION and displayed in LARGE font. The ACTIVE thrust limit is preceded by a right arrow with the corresponding thrust rating displayed in LARGE font. Line 4R displays the SELECT AUTO* prompt; selection of this prompt changes the thrust limit mode to AUTO.

In MANUAL mode, only crew action can change the ACTIVE limit, except in the event of an engine out, windshear, or low-speed protection.

During the takeoff, a windshear situation activates the maximum available Takeoff thrust limit. In a go-around windshear, the maximum go-around thrust is activated. An engine out in other than takeoff or go-around automatically activates the MCT thrust limit. A Low-Speed Protect situation activates the next higher thrust limit. (CRZ- CLB - MCT).

NAV Radio Tuning

The NAV RADIO page provides tuning status display and tuning control capability for the VOR, ADF (option), ILS and MLS receivers. It also provides for selection of VOR TRACK and LOC ONLY modes.

 STEP: Push **NAV RAD**

On this page small font values in the data line (lower line) are FMC auto tuned frequencies, identifiers or courses. LARGE font values in the data line are pilot-entered data. Label lines remain in small font.

```
                    N A V   R A D I O
          CRI/CRS                    CRI/CRS
  [1L]    112.30/[ ]°          112.30/[ ]°    [1R]

  [2L]                                         [2R]

  [3L]    ADF1                         ADF2    [3R]
          [   ]                        [   ]
  [4L]    ILS/CRS                              [4R]
          [   ]/[ ]°
  [5L]                                         [5R]
                    PRESELECT
  [6L]    [     ]/[     ]      [     ]/[     ]  [6R]
```

KB1-3-0163A

1L   1R   The selected navaid ident, frequency and course of VOR 1 and VOR 2, respectively

Label Line - Either the selected ident or frequency is displayed followed by /CRS. This line is always shown in small font.

Data Line - Either the selected frequency or ident is displayed, followed by the course if entered. A course may not be entered without a frequency or ident.

Lines 1L and 1R display autotuned or manually tuned station for VOR 1 and 2, respectively. If autotuned, the course data (/[ ]) will be blank.

VOR 1 and 2 may be manually tuned by inserting the station three-letter identifier or by entering the station frequency in line 1L or 1R. If tuning was accomplished with the identifier, the frequency will be shown above the identifier in small font. If the frequency was used, the identifier will appear in small font above the selected frequency. If any identifier entered on this page is not found in the data base, MCDU message NOT IN DATA BASE is displayed in the scratchpad. If the identifier for the entered frequency is not found, the label line remains VOR/CRS. If more than one selected ident exists, the DUPLICATE NAMES page is displayed for pilot selection of the correct navaid.

When entering the course in line 1R and 1L, the respective CDI on the VOR ND will be set to the selected course. If the station was tuned by entering the identifier in line 1R or 1L, the course line will also be displayed on the ND MAP page from the respective VOR.

> NOTE: The preferred method of tuning VOR navaid is to use the station identifier. Proper VOR tracking and navigation is provided with either method of tuning.

2L   2R   If the VOR mode is available (program option), a small font VOR ARM prompt with asterisk appears on the same side of the MCDU as the selected VOR/CRS. Two VOR ARM prompts may be displayed at a time. Pushing LSK 2L or 2R prepares the FMC for the VOR mode and replaces VOR ARM with VOR ARMED in LARGE font. Once the VOR mode conditions for VOR tracking are satisfied, VOR TRACK (LARGE font) replaces the VOR ARMED display and the aircraft will track that course. VOR mode is only available below 18,000 feet.

Any VOR prompt or display may be cleared by use of CLR key.

3L   3R   If the ADF option is enabled, the pilot must enter an ADF frequency or ident. The unentered item (frequency or ident) will be displayed in the label line.

4L   ILS ident or frequency and course are pilot-enterable and will be displayed in LARGE font. If autotuned, the ident is placed in the label line with frequency placed in the data line (small font). The course field displays final approach course derived from the selected ILS approach. This course is used by the AP for the ALIGN maneuver when in automatic LAND mode.

NOTE: ILS frequency may be retuned after LOC and G/S capture if in FD only approach mode (AP off). After retuning, APPR/LAND may be rearmed and AP reengaged.

5L		With the course entered in 4L, the LOC ONLY prompt with asterisk is displayed in small font if the option was selected. Pushing this key provides ILS localizer guidance with disabled glideslope guidance. Upon receiving the LOC ONLY mode request, the AFS is armed to capture the localizer. LOC ARMED is annunciated on the FMA. When the FCC localizer capture criteria are satisfied, the AFS captures and controls to the ILS localizer using the same FCC controls laws as when APPR/LAND is selected. Engaging another lateral control mode cancels the LOC ONLY mode. Descent to the MDA must be accomplished by use of the FCP V/S and altitude set functions or FMS FINAL APPR* prompt. Selecting NAV, APPR/LAND, VOR ARM or pushing the HDG/TRK select knob will reset the LOC ONLY approach mode. The LOC ONLY mode may also be disengaged by the FMS or may be deselected on the MCDU by selecting another ILS frequency.
6L	**6R**	PRESELECT provides the pilot with storage capabilities for future entries. Frequency or ident and course are entered by SP and LSK or may be cleared by the CLR key and SP. The navaid/course data may be transferred to a different data field by pushing the desired PRESELECT key which drops it to the SP, then pushing the LSK corresponding to the field where the preselect information is desired.

NOTE: Once a radio has been manually tuned, it will not autotune again until that radio frequency is cleared.

Departure Runway Change

The situation may arise requiring the pilot to change runways and/or departure during taxi. Upon throttle advance for takeoff, FMS position will be updated to the runway threshold. A change of the departure runway (also SID and transition) may be accomplished by accessing the fight plan and completing a LAT REV to the present takeoff runway. A discontinuity will be created between the new runway and the first waypoint on the flight plan.

Clearing the F-PLN DISCONTINUITY will connect the new runway with the first route waypoint and enable new FMC computation of F-PLN predictions.

> NOTE: A DISCONTINUITY will not be generated and inserted into the F-PLN if the SID termination waypoint is a common waypoint with the original F-PLN route. In this case, F-PLN waypoints between the origin runway and common termination waypoint will be deleted.

Because the runway has been changed, the message CHECK/CONFIRM VSPDS is displayed in the SP and the V-speeds must be reentered prior to departure. Also, the FLEX T/O thrust settings will be reset to maximum T/O thrust and will require reselection.

> NOTE: Prior to takeoff, FMS-computed and pilot-confirmed takeoff V-speeds are invalidated and recomputed with entry, changes, or deletions to the following parameters:
>
> • Weights (BLOCK, UFOB, ZFW, TOGW, and GW)
> • Flap entry
> • TOCG
> • OAT
> • Runway SLOPE/WIND
> • Selected runway
> • Selected thrust limit (including FLEX temperature)

GW Update

The GW may be updated during taxi on the WEIGHT INIT page. Access to this page is gained by pushing the INIT and PAGE keys.

Changing the GW after engine start changes the ZFW and could affect ZFWCG and the TOCG. Check these values and the V-speeds.

> NOTE: If the UFOB is invalid (dashed) and GW is invalid (dashed), the pilot must first enter UFOB before entering a GW. When UFOB is pilot-updated, the fuel quantity (FQ) is removed from the UFOB computation and only fuel flow (FF) is used to update UFOB.

Intentionally
Blank

Intentionally
Blank

During takeoff, the pilot flying should select the MCDU T/O page and the pilot not flying should select the DIR INTC page.

The FMC will update its reference position to the programmed runway threshold coordinates when throttles are advanced to takeoff thrust.

FMS NAV

FMS NAV may be armed before T/O at pilot's discretion. If NAV is armed prior to T/O, F/D NAV guidance will be available at 100 feet AGL. The AP may not be connected below 400 feet AGL if NAV is armed/engaged. (CAWS AP disconnect will sound if attempted.)

NAV mode can be armed / engaged if:

1. Aircraft on the ground with at least one engine operating.
2. LAND or AP GA modes are not active.
3. Aircraft is at least 100 feet above the destination altitude (on arrival).

NAV armed/track may be cancelled by the following:

1. Pushing FCP HDG/TRK select knob to select existing heading.
2. Selecting APPR/LAND (when LOC capture occurs).
3. Selecting LOC ONLY (when capture occurs).

   NOTE: The NAV mode will automatically disengage when the FMC enters a F-PLN DISCONTINUITY.

FMS SPD may be engaged above 400 feet AGL.

   NOTES: If AP is engaged below 400 feet AGL, NAV button pushes will be ignored until above 400 feet AGL.

   Parallel rudder is not available with NAV engaged. NAV mode may be disengaged by pushing the heading select knob or pushing the GA button. Pushing the GA button will reinstate parallel rudder.

FMS PROF

FMS PROF mode (program option) may be armed before takeoff at pilot's discretion and will be available at 400 feet AGL.

The PROF/FMS SPD mode will not engage if any of the following conditions are present:

1. A/C STATUS page displays NO FMS SPD/PROF message on the scratchpad.

2. SENSOR STATUS page indicates any of the following computers have failed:

    • Both ADIRUs.

    • Both FCCs.

3. The following information is not entered or is not valid on the MCDU:

    • Valid gross weight or ZFWCG airborne.

    • Cost Index (CI).

    • CRZ level input for takeoff, climb, and cruise phase.

    • V2 speed

4. Both MCDUs have failed to the master FMC.

NAV armed/track may be cancelled by the following:

1. Pushing FCP HDG/TRK select knob to select existing heading.

2. Selecting APPR/LAND (when LOC capture occurs).

3. Selecting VOR ARMED or LOC ONLY (when capture occurs).

    *NOTE: The NAV mode will automatically disengage when the
    FMC enters a F-PLN DISCONTINUITY.*

PROF mode will disengage with any of the following:

1. Rotating the vertical speed wheel.

2. Pushing or pulling the altitude preselect knob to engage the FCP altitude hold or altitude select mode (level change).

3. Engaging the AP/FD GA or glideslope mode.

4. FMS disengagement of PROF.

If the autothrottles are not engaged when PROF is selected, they will engage when the PROF switch is pushed and above 400 ft. AGL.

The absolute altitude floor or ceiling in all AFS modes, including FMS PROF, is the altitude displayed in the FCP altitude window except in LAND mode.

The FMS SPD mode may be selected independently from the PROF mode if desired. When the FMS SPD mode is active, the FMA speed target and speed control legend changes from white to magenta in color. The FMS SPD mode is canceled when:

1. FCP speed is selected by pushing or pulling the IAS/MACH select knob (hold or select mode).

2. GA mode selection.

Pushing the FMS SPD button within 10 seconds after preselecting an FCP speed results in editing the speed on the active PERF page in the EDIT field. A solid magenta circle will immediately be displayed on the PFD airspeed tape. The IAS/MACH select window on the FCP will display dashes. Pushing the FMS SPD switch a second time will cause the FMS to return to the ECON speed profile. If the FMS SPD switch is not pushed within 10 seconds of an FCP speed preselection, the magenta circle will turn to a shadow bug. Pulling the speed knob with a shadow bug displayed will manually edit aircraft speed but not FMS speeds.

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BEGIN INTERIM PROCEDURE 717-FMS-0001

PEGASUS FMC – ALTITUDE CONSTRAINTS.

REASON FOR INTERIM PROCEDURE: Boeing has identified a problem that may occur only during the climb phase of flight on aircraft equipped with the Pegasus FMC.

When the airplane sequences the first of two consecutive waypoints that have altitude constraints within 500 feet of one another, both altitude constraints will be cleared. Consequently, altitude clearance restrictions associated with the second waypoint will not be protected by an FMS Altitude Constraint

CORRECTIVE ACTION: Crews must select altitude clearance limits on the FCP and continue to monitor flight path compliance with all ATC or procedural altitude restrictions.

END INTERIM PROCEDURE 717-FMS-0001

FMS CLIMB

The FMS CLIMB (CLB) phase begins when the airplane climbs above the all engine acceleration altitude with all engines operating and ends when the top of climb (T/C) is attained. Speed is controlled to V2 + 10 until the acceleration altitude where it begins to increase to the speed limit of VCL knots below 10,000 feet. Above 10,000 feet, the FMS target speed for the active performance mode is selected for the remainder of the climb. Altitude and speed constraints are observed during the climb if they exist.

During the climb to altitude it may be desirable to modify the flight plan or climb schedule. These modifications could alter climb performance, entered altitude, speed, or time constraints and/or routing. FMS operation to accommodate these changes will be discussed in this section.

Climb Performance Change

The climb performance may be changed on the active PERF page by selecting an alternate performance mode. To climb at 320 KIAS, the speed may be entered via the IAS/MACH preselect and FMS SPD switch or from the PERF page as shown in the following example. Pushing the PERF key displays the MCDU page shown in the following screen.

 STEP: Push **PERF**

```
              ECON CLIMB    1/3→
                            PRED TO
 1L                            FL310    1R
      ECON        UTC           DIST
 2L  304/.758   1355            93      2R
      MAX CLB
 3L  *203        1354            89      3R
      EDIT
 4L  [   ]                               4R
                            CLIMB
 5L              FORECAST>               5R
      TRANS    OPT/MAXFL   THRUST
 6L  18000     350/352    LIMITS>        6R
```

KB1-3-0164A

Entering 320 in the SP and pushing LSK 4L enters the speed in the EDIT
brackets. Pushing LSK 4L again selects it (LARGE font) to control airplane
speed as shown in the following screen.

STEPS: 1.   Type **320 in SP**

2.   Push **4L**

3.   Push **4L**

```
           EDIT CLB      1/3→
                      PRED TO
1L           UTC          FL310   1R
   ECON                   DIST
2L *304/.758                      2R
   *MAX CLB
3L  203       1355          63    3R
   EDIT
4L 320/Mmo   1357          99     4R
                      CLIMB
5L            FORECAST>           5R
   TRANS   OPT/MAXFL  THRUST
6L 18000   350/352   LIMITS>      6R
```

KB1-3-0172A

Reselecting ECON speed or MAX CLB (best angle of climb) speed changes the pilot-selected climb performance mode, but the edit value will be retained in small font with an asterisk for possible future reselection. Clearing the EDIT speed is not allowed.

In the middle fields, time is displayed on the ground and UTC is displayed in flight. Distances are displayed in the far right fields.

MAX CLB gives the recommended speed for best angle of climb. This speed schedule is slightly above VMIN and is approximately 1.4 Vstall. Selecting MAX CLB, when at high speed in ECON or EDIT, provides the opportunity to exchange that high speed for altitude.

> NOTE: When FMS SPD mode is disengaged, the ACTIVE mode will not automatically revert to ECON. When FMS speeds are reengaged, the ACTIVE mode will be the last engaged FMS SPD mode (ECON, EDIT, MAX). If ECON was not the last engaged mode, EDIT or MAX will become active and a second FMS SPD button push will engage ECON.

Vertical Climb Revisions

When vertical altitude restrictions or deletions of restrictions occur during climb, the FMC can be modified to provide updated vertical guidance and performance. Changes to waypoint altitude and airspeed constraints, altitude speed limits and CRZ FL may be accomplished. When F-PLN changes are made, performance predictions will become invalid (dashed data fields, ---) for display purposes until they are recalculated. There can only be one altitude/speed limit for the CLB phase or one in the DES phase of flight. The initially selected CRZ FL must be eventually attained or changed or the FMS will not transition to the CRZ phase of flight.

Altitude Restrictions

Altitude restrictions may be inserted and cleared by direct entry into the F-PLN or through a VERT REV to the revise waypoint. For example, ATC instructs XXX1234 to cross CYN AT OR BELOW FL250. AT OR BELOW FL250 is inserted into the F-PLN by typing /-250 in the SP and pushing LSK 2R. An AT OR BELOW uses a minus (-) sign, an AT altitude is accomplished by no sign, and AT OR ABOVE uses a plus (+) sign.

STEPS: 1.   Type **/-250 in SP**

2.   Push **2R**

```
                  ACT F-PLN      1/2→
        FROM       ETO     SPD    ALT
  1L    CRI       1342    237/5000    1R
  2L    CYN         50    320 /-FL250 2R
          J37
  3L    VILLS       56    .80 / FL304 3R
          J37
  4L    (T/C)       58     " / FL310  4R
          J37
  5L    NALES     1401    .77 / FL310 5R
          J37
  6L    CLASY       03     " /   "    6R
                                  ↑↓
```

KB1-3-0176A

To enter an airspeed constraint at a waypoint, enter the constraint airspeed with or without the trailing slash (/) and push the revise waypoint right LSK. To clear both airspeed and altitude the CLR key and SP may be used.

The altitude or airspeed constraint entry may also be accomplished by a VERT REV to the constraint waypoint. Pushing CYN's right LSK results in the VERT REV AT CYN. Entry of 250 in the SP and pushing LSK 5L results in FL250. The FMC is not certain of the constraint being a *CLB or a DES* constraint and requires pilot's clarification. Pushing LSK 6L *CLB enters the altitude as a climb in the F-PLN.

STEPS: 1.   Push right **LSK abeam CYN with SP empty**

2.   Type **250 in SP**

```
╭────────────────────────────────────╮
│  VERT REV AT CYN          1/1      │
│   EFOB=19.6     EXTRA=9.1          │
│                                    │
│  SPD :AT/BELOW         RTA         │
│  *[ ]             PROGRESS>        │
│  ALT :AT/ABOVE                     │
│  *[ ]                              │
│  ALT :AT                           │
│  *[ ]                              │
│  ALT :AT/BELOW    DES SPD LIM      │
│  *[ ]              250/10000       │
│                   RETURN TO        │
│                 ACT F-PLN>         │
│  250                               │
╰────────────────────────────────────╯
```

KB1-3-0174A

STEP: Push **5L**

```
VERT REV AT CYN              1/1
EFOB=19.6   EXTRA=9.1


SPD :AT/BELOW           RTA
*[ ]          PROGRESS>
ALT :AT/ABOVE
*[ ]
ALT :AT
*[ ]
ALT :AT/BELOW   DES SPD LIM
FL250             250/10000

*CLB        OR        DES*
```

KB1-3-0175A

STEP: Push **6L**

```
         ACT F-PLN     1/2→
   FROM    ETO    SPD    ALT
CRI      1342  237/ 5000
CYN       50   320/-FL250
  J37
VILLS     56   .80 / FL304
  J37
(T/C)     58     " / FL310
  J37
NALES    1401  .77 /  FL310
  J37
CLASY     03     " /    "
                     ↑↓
```

KB1-3-0461

Only altitude constraints that are defined by the flight crew as AT or AT OR BELOW are restrictive in the takeoff/climb phase of flight. If conflicting altitude constraints (consecutive altitude constraints which would require a descent in the takeoff/climb phase) are encountered, then they are resolved as follows:

- The restrictive altitude of each lower (conflicting) constraint is made equal to that of the higher constraint.

- Each lower (conflicting) altitude is displayed in the flight plan at its associated waypoint.

- MCDU message CHECK ALT CSTR - XXXXX is displayed if conflict exists. XXXXX is the name of the waypoint.

Altitude constraints that exist above the CRZ ALT will be automatically deleted when the FMS transitions from CLB. In this case the MCDU message CLB ALT CSTRS DELETED will be displayed.

Speed Constraint

A speed (SPD) constraint may be inserted at waypoint CYN by entering a value into the data field associated with 2L of VERT REV page. Simply type the speed into the SP and enter by pushing LSK 2L.

> *NOTE: Speed constraints entered in a cruise leg will affect the speed targets for legs subsequent to the constraint waypoint. In order to regain use of FMS ECON SPEED while still in cruise, the crew may clear the speed constraint by accessing the VERT REV page of the FROM waypoint and pushing the LSK next to the CLEAR SPD prompt.*

```
 VERT REV AT CYN              1/1
   EOFB=19.6    EXTRA=9.1


 CLEAR SPD                  R T A
 *320           PROGRESS>




                   CLB SPD LIM
                    250/10000
                   RETURN TO
                   ACT F-PLN>
```

KB1-3-0177A

A climb speed limit is computed and displayed into the flight plan as VCL knots at or below 10,000 feet. The limit may be found on any climb waypoint VERT REV page and may be cleared by use of the CLR key or altered by pilot entry into data field 5R.

> NOTE: If it is desired to level and cruise at an altitude below the initial CRZ ALT found on the F-PLN INIT page, it will be necessary to change the F-PLN INIT initial CRZ FL or the FMS will not transition to CRZ flight.

If an altitude conflict exists between the FMS target altitude and the FCP selected altitude such that the airplane is between the two, ???? message is displayed on the left side of the title line (replacing TIME) to indicate the conflict. This condition can occur when the FCP altitude is set below airplane altitude in CLB or above airplane altitude in descent.

The pilot may select a speed higher than 250 knots by preselecting it on the FCP and pulling the speed knob. This action will override the FMS speed and fly the selected speed. However, this selection does not affect the NAV or PROF selections.

Above the speed limit and after all entered climb speed constraints, the FMS will command speed targets as selected on the active CLB PERF page. These speed targets appear on the speed tape as an open magenta circle. Pushing the FMS SPD button commands the airplane to fly the FMS speed target (magenta circle becomes solid).

Holding Patterns in Climb

With a holding pattern in the climb portion of the flight plan, 3 minutes prior to the waypoint at which a hold exists, the airplane will begin to target the holding speed. The default holding speeds are limited by the ICAO upper speed limit. The holding speed, like any other speed, is bound by the upper and lower speed envelopes (VMAX - 10 and VMIN + 5). Above the acceleration altitude, the holding speed and ICAO limit will override the operational climb speed VCL (below 10,000 feet) and override the FMS ECON speed above 10,000 feet. The holding speeds should be edited on the FLIGHT PLAN page to VCL.

Direct To a Waypoint

During climb it is common to be either cleared DIR TO a waypoint to intercept a course to a waypoint either on or off the flight plan. The DIR INTC function key allows the pilot to select, review, and insert a direct path from the airplane's present position to a selected fixed waypoint or to intercept a pilot-defined inbound course to any waypoint. When the DIR TO waypoint is identical to any fixed waypoint in the flight plan, then a direct leg is strung to that waypoint with intervening waypoints being deleted or retained as abeam waypoints. If the DIR TO waypoint is not in the F-PLN, a direct leg is created to the waypoint followed by a DISCONTINUITY.

Pushing the DIR INTC key displays the DIR TO and INTC FIX/CRS prompts on the F-PLN page.

STEP: Push **DIR INTC**

```
                    ACT F-PLN

        DIR TO          INTC  FIX/CRS
1L      [       ]       [       ]/[    ]*   1R

2L      CYN      1350    320/-FL250         2R
          J37
3L      VILLS    1356    .80 /  FL304       3R
          J37
4L      (T/C)    1358     " /  FL310        4R
          J37
5L      NALES    1401    .77/   FL310       5R
          J37
6L      CLASY      03     " /    "          6R

                                   ↑↓
```

KB1-3-0178A

1L   DIR TO - Replaces the FROM field of the active F-PLN page 1. The field allows entry of the desired waypoint which can be selected from the active flight plan by pushing its left LSK with the SP empty or by manual entry of a waypoint not in the F-PLN. In either case, the entered waypoint is asterisked with the ND displaying the proposed route change as a dotted magenta line. When asterisked, the *ABEAM POINTS prompt appears in line 2L.

1R   INTC FIX/CRS - The waypoint entered in line 1L is also entered in line 1R followed by a trailing asterisk. A unique and separate waypoint and inbound course entry may be made via the SP using a slash (/) to separate waypoint and course. Waypoint and course may be entered separately. After the inbound course is entered, a trailing asterisk is displayed and insertion into the F-PLN is possible by again pushing the LSK next to the asterisk.

> *CAUTION: If for any reason the crew enters the "FROM" waypoint in the INTC FIX/CRS box at LSK 1R, the master FMC will be lost. Refer to Abnormal Procedures, Single FMC Failure.*

The F-PLN waypoints can be scrolled. When a left LSK is pushed adjacent to a fixed waypoint with the SP empty, the waypoint is entered into lines 1L and 1R. Waypoint entry can also be entered as either an IDENT, LAT/LONG, or PBD via the scratchpad.

To execute a maneuver direct to VILLS, push LSK 3L to enter VILLS into line 1L. The asterisk appears and the proposed routing may be viewed on the ND (soft DIRECT TO, dotted magenta line). Pushing LSK 1L inserts a turn-point (T-P) into the F-PLN at the present position FROM point. A maneuver is immediately initiated to proceed directly to the entered waypoint.

 STEPS: 1.   Push **3L**

          2.   Push **1L**

```
              ACT F-PLN

        DIR  TO      INTC  FIX/CRS
 1L   *VILLS          VILLS/[   ]°   1R
        WITH
 2L   *ABEAM POINTS                  2R

 3L    VILLS     1356   .80 /   FL304   3R
        J37
 4L    (T/C)       58    " /  FL310   4R
        J37
 5L    NALES     1401   .77 /   FL310   5R
        J37
 6L    CLASY       03    " /    "      6R
                                 ↑↓
```

KB1-3-0179A

After inserting an INTC FIX into the F-PLN, if the existing heading intercepts the inbound course short of the chosen waypoint, the airplane will continue flying directly to an FMC-created intercept waypoint. If the SP message NOT ON INTC HEADING is displayed, the airplane is not on an intercept heading to the selected course. The intercept waypoint must be within 1000 NM of both the airplane and selected fixed waypoint. Otherwise, the F-PLN is unchanged and the SP message NOT ON INTC HEADING is displayed.

Required Time of Arrival (RTA)

> *NOTE: RTAs are used to adjust flight speeds in order to cross over a specified waypoint before, after, or at a given time. RTAs are intended for use with waypoints 1 hour or more downtrack. While controlling to an RTA, FMS cruise speed mode must be ECON. The FMS assumes ECON speed mode beyond the RTA fix. The FMS does not provide for an independent selection of a different cruise speed mode beyond the RTA fix.*

The FMC provides the capability for AT, AT OR BEFORE, and AT OR AFTER RTA entries. On the RTA PROGRESS page 2/2, the RTA entry in line 1R must be followed by a minus (-) for an AT OR BEFORE or followed by a plus (+) for an AT OR AFTER. Absence of a - or + sign will signify AT RTA. One RTA may be specified for each of the primary and secondary flight plans. The RTA fix entry must specify an existing flight plan waypoint. Pushing LSK 1R prior to descent flight phase will enable the RTA function.

Activation of RTA mode is allowed while on the ground. However, no RTA cruise speed adjustment will be calculated. Instead, a departure time will be calculated based on the entered RTA and FMS ECON predictions. After takeoff, an RTA entered in preflight is automatically deleted from the flight plan as UTC is substituted for estimated time enroute. Therefore, in order to meet a desired RTA at a waypoint, it is necessary to reinsert into the F-PLN. RTAs modify cruise flight speed prior to the associated waypoint and then only if the FMS ECON mode is active for that part of cruise. However, RTAs may be entered at any waypoint. The restrictive speed will be that speed necessary to reach the associated waypoint at the desired time (±30 seconds).

> *NOTE: Arrival time control performance will be ±30 seconds when accurate forecast winds have been entered and the airplane is not thrust or speed limited.*

New MCDU pages, RTA PROGRESS, and the SEC RTA PROGRESS page are created for entering RTA. Access to the RTA PROGRESS page is via the VERT REV page or from the next page key from the PROGRESS page. Access to the SEC RTA PROGRESS page is via the SEC VERT REV page or from the next page key from the SEC PROGRESS page.

If the FMS cannot meet the RTA, RTA ERROR AT XXXXX is displayed in the scratchpad. This also causes an MCDU MSG alert on the ND. This message is triggered by an error of 30 seconds or greater.

The computed ETO is displayed on the ACT F-PLN page in large font at the RTA waypoint.

If the RTA function is used prior to departure for predictions, it is removed automatically at takeoff, and must be re-entered enroute. If this occurs, RTA REMOVED is displayed in the scratchpad.

As in the example, it was requested that XXX1234 arrive at NALES at 1400 UTC. To enter the RTA constraint, perform a VERT REV at VILLS waypoint.

 STEP: Push **3R**

```
        VERT REV AT VILLS      1/2→
         EFOB=18.8        EXTRA=9.0

1L                                                1R
        SPD:AT/BELOW            RTA
2L      *[  ]            PROGRESS>                 2R
        ALT:AT/ABOVE
3L      *[  ]                                      3R
        ALT:AT
4L      *[  ]                                      4R
        ALT:AT/BELOW     DES SPD LIM
5L      *[  ]              250/FL100               5R
                         RETURN TO
6L                       ACT F-PLN>                6R
```

KB1-3-0462

STEP: Push **2R**

```
           RTA  PROGRESS  2/2→
     FIX                      RTA
1L  [          ]            - - - - -   1R
     RTA SPD              ALT/ETO
2L  - - - -            - - - - - / - - - -   2R

3L                                    3R

4L                                    4R
     MAX SPD
5L  - - - -                           5R
                        RETURN TO
6L                      VERT REV>     6R
```

KB1-3-0463

Enter NALES in 1L and the 1400 in 1R.

STEPS: 1. Type **NALES**

2. Push **1L**

3. Type **1400**

4. Push **1R**

```
          R T A   P R O G R E S S   2/2 →
      FIX                           RTA
1L│ NALES                        1400    │1R
      RTA SPD                   ALT/ETO
2L│ .785                    FL310/1400   │2R

3L│                                      │3R

4L│                                      │4R

5L│    MAX SPD                           │5R
     .800                 RETURN TO
6L│                      VERT REV>       │6R
```

KB1-3-0464

Transition to Cruise

The FMS transitions from a climb to cruise mode of operation when the airplane altitude equals cruise flight level ±50 feet and the cruise flight level equals clearance altitude ±50 feet.

> *NOTES: Cruise flight level is the altitude originally entered on the F-PLN INIT page as the first cruise altitude.*
>
> *Clearance altitude is the altitude set in the FCP altitude window.*

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CRUISE

FMS cruise is the phase of flight between T/C and T/D. During cruise the pilot may be required to make navigation changes, position updates, position reports, monitor flight progress, and change cruise altitudes. Preparing for descent can include STAR selection, descent forecast wind entry and review of approach and go around data. These are the subjects that will be covered in the CRUISE section.

Intercept Waypoint Inbound Course

If cleared to intercept an inbound course to a fix or waypoint either on or off the planned route of flight, the DIR INTC function key will allow the pilot to define a waypoint and inbound course from which the airplane's course will create an intercept waypoint enroute to the selected waypoint. Just like the DIR TO, when the selected waypoint is identical to any waypoint in the F-PLN, a direct leg is strung to that waypoint with the intervening waypoints deleted. If the INTC FIX/CRS waypoint is not on the F-PLN, a direct leg is created to the waypoint followed by a DISCONTINUITY.

Pushing the DIR INTC function key displays the INTC FIX/CRS brackets found in line 1R.

As an example of INTC FIX, enroute to CLASY, it is desired to intercept the 245° inbound course.

STEPS: 1.   Push **DIR INTC**

2.   Type **CLASY/245 in SP**

Intercept Inbound Course

```
                    ACT F-PLN
            DIR TO      INTC   FIX/CRS
  1L        [       ]      [     ]/[   ]*    1R
            J37
  2L        NALES   1401     .77/ FL310      2R
            J37
  3L        CLASY    03      " /    "        3R
            J37
  4L        BRV      12      " /    "        4R
            J37
  5L        GVE      17      " /    "        5R
            J42
  6L        MOL      23      " /    "        6R
            CLASY/245               ↑↓
```

KB1-3-0212B

1R   INTC FIX/CRS - The waypoint or LAT/LONG or PBD entered in 1L
is also entered in line 1R, followed by open brackets. A unique and
separate waypoint and inbound course entry may be made via the
SP using a slash (/) to separate waypoint and course. Waypoint
and course may be entered separately. After the inbound course
is entered, a trailing asterisk is displayed and insertion into the
F-PLN is possible by again pushing the LSK adjacent to the
asterisk 1R. The airplane must be on an intercept course or
pushing 1R will not create an intercept waypoint.

STEP: Push **1R**

Intercept Inbound Course

```
┌─────────────────────────────────┐
│          ACT F-PLN              │
│                                 │
│      DIR TO      INTC FIX/CRS   │
│  *CLASY        CLASY/245°*      │ 1R
│    WITH                         │
│  *ABEAM  POINTS                 │ 2R
│    J37                          │
│  NALES    1401    .77/  FL310   │ 3R
│    J37                          │
│  CLASY     03     "  /    "     │ 4R
│    J37                          │
│  BRV       12     "  /    "     │ 5R
│    J37                          │
│  GVE       17     "  /    "     │ 6R
│                          ↑↓     │
└─────────────────────────────────┘
```

1L, 2L, 3L, 4L, 5L, 6L labels on left; 1R, 2R, 3R, 4R, 5R, 6R on right.

KB1-3-0213B

If the existing airplane's course intercepts the inbound course short of the chosen waypoint, the airplane will create an intercept waypoint and continue flying directly to the intercept point. If the SP message NOT ON INTC HEADING is displayed, the airplane is not on an intercept heading to the selected course. The airplane heading must be altered to the desired intercept heading and LSK 1R must be reselected. Pushing the NAV button after the turn is complete will reengage FMS NAV and guide the airplane to intercept the course to the waypoint. That intercept waypoint is shown in the F-PLN as waypoint/course (CLASY/245). The intercept waypoint must be within 1000 NM of both the airplane and selected fix waypoint.

> NOTE: If assigned ATC heading, wait until wings level before inserting.

STEP: Push **1R**

Intercept Inbound Course

```
          ACT F-PLN      1/2 →

   FROM       ETO   SPD    ALT
1L T-P       1400  279 / FL310   1R

2L CLASY/245  01   .76 /    "     2R
     J37
3L CLASY      04   .77 /    "     3R
     J37
4L BRV        13    "  /    "     4R
     J37
5L GVE        18    "  /    "     5R
     J42
6L MOL        24    "  /    "     6R

                           ↑↓
```

KB1-3-0214

ND Map Display
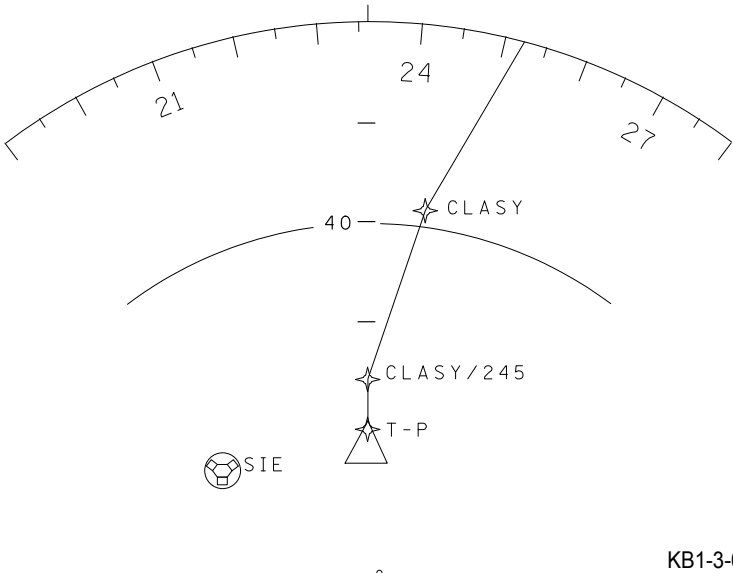
KB1-3-0215A

ABEAM Waypoints

INTERIM PROCEDURE 717-FMS-0002

DIR TO WITH ABEAM POINTS

REASON FOR INTERIM PROCEDURE: ETAs and associated en route predictions were reported to be incorrect when selecting a DIR TO with ABEAM POINTS. An arbitrary distance error occurs between the first and second ABxxx waypoints causing all subsequent waypoint ETAs and predictions to be in error. Predictions that may be in error are Time, Altitude, Speed, and Fuel On Board.

After selecting a DIR TO with ABEAM POINTS, the crew should immediately perform a DIR TO to the first "ABxxx" waypoint. If a leg distance/time error exists, this procedure will correct all ETAs and predictions.

END INTERIM PROCEDURE 717-FMS-0002

In a previous section the DIR TO function was described. When a waypoint is selected to proceed DIR TO and entered into line 1L, an insertion asterisk appears and line 2L is replaced with the asterisk option WITH ABEAM POINTS. Selecting this option performs the same DIR TO function as line 1L with the automatic insertion of up to 40 abeam points along the new path. Abeam waypoints are defined as the location where a perpendicular intersection is created by the DIR TO leg and a line that passes through an existing flight plan waypoint deleted by the DIR TO. If a deleted flight plan waypoint is more than 100 NM from the DIR TO leg, the respective abeam waypoint will be excluded from the function.

NOTE: Abeam points can only be made for waypoints on the flight plan.

When the FMS memory used to store pilot-defined waypoints or flight plan waypoints is full and creation of ABEAM waypoints cannot be accomplished, ABEAM WPTS INCOMPLETE message will be displayed in the SP.

As an example, DIR TO MOL has been selected and will be inserted with ABEAM POINTS (2L).

```
          ACT F-PLN

      DIR TO       INTC FIX/CRS
1L  *MOL              MOL/[  ]°*  1R
      WITH
2L  *ABEAM POINTS                 2R

3L   CLASY/245 1401 .76/  FL310   3R
       J37
4L   CLASY         04 .77/   "    4R
       J37
5L   BRV           13  " /    "    5R
       J37
6L   GVE           18  " /    "    6R

                          ↑↓
```

KB1-3-0329B

When the DIR TO with ABEAM POINTS is inserted into the flight plan, all waypoints are prefixed with AB. Wind data defined for deleted waypoints shall be copied to the respective abeam waypoints. ABCLA/245 is truncated to ABCLA.

```
          ACT F-PLN   1/2→

       FROM     ETO  SPD  ALT
1L   T-P       1400 279/ FL310   1R

2L   ABCLA      01   .76/   "     2R

3L   ABCLA      04   .77/   "     3R

4L   ABBRV      13    " /   "     4R

5L   ABGVE      18    " /   "     5R

6L   MOL        24    " /   "     6R

                          ↑↓
```

KB1-3-0216B

ND Map Display - Abeam CLASY/245
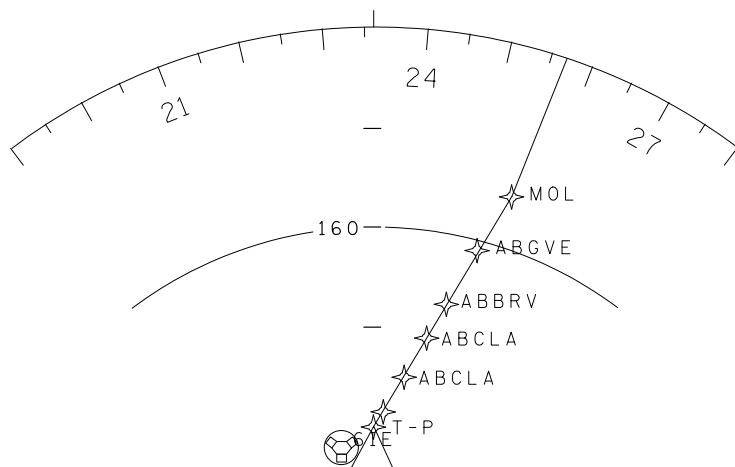
KB1-3-0217A

FIX INFO Page

INTERIM PROCEDURE 717-FMS-0003

FIX INFO PAGE WITH RUNWAY ENTRY.

REASON FOR INTERIM PROCEDURE: The following anomaly has been identified within the FMS:

When entering a runway as a fix on the FIX INFO page (1L), and preceded by an alphanumeric fix entry containing six (6) or seven (7) characters, two additional characters may be appended to runway entries only.

When viewing the MAP Display, the correct runway identification information will be displayed. The appended characters are only displayed on the associated FIX INFO page and do not degrade any FMS functions.

Clear FIX INFO Page Anomaly:

To clear the FIX INFO page anomaly, enter any legitimate waypoint having a total of five (5) or less alphanumeric characters into (1L) on the applicable FIX INFO page. The runway identification information when entered will now display correctly.

• *Example 1*

If alpha/numeric fix such as N30W120 (a total of 7 characters) is inserted into (1L) on the FIX INFO PAGE, it will be depicted as entered. If a new runway fix, such as KLAX24L is subsequently entered, the information in (1L) would be displayed as RW24L20. The appended numeric values represent the last two characters of the previous N30W120 fix entry information.

• *Example 2*

If alpha/numeric fix such as N30W120 (a total of 7 characters) is inserted into (1L) on the FIX INFO PAGE, it will be depicted as entered. If a new runway fix, such as KLGB30 is subsequently entered, the information in (1L) would be displayed as RW30_20. The appended "_" represents a blank and replaces a L/R runway identifier. The next two numeric values represent the last two characters of the previous N30W120 fix entry information.

• *Example 3*

If alpha/numeric fix such as CHIP01 (a total of 6 characters) is inserted into (1L) on the FIX INFO PAGE, it will be depicted as entered. If a new runway fix, such as KLAX24L is subsequently entered, the information in (1L) would be displayed as RW24L1. The appended numeric value of "1" represents the 6th character of the previous CHIP01 fix entry information.

• *Example 4*

If alpha/numeric fix such as CHIP01 (a total of 6 characters) is inserted into (1L) on the FIX INFO PAGE, it will be depicted as entered. If a new runway fix, such as KLGB30 is subsequently entered, the information in (1L) would be displayed as RW30_1. The appended "_" represents a blank and replaces the L/R runway identifier. The next numerical value represents the 6th character of the previous CHIP01 fix entry information.

Previous Fix	New RW Fix	Resultant RW Fix
N30W120 7 Characters	KLAX24L	RW24L205 (Five) + 6th & 7th
N30W120 7 Characters	KLGB30	RW30_204 (Four) + "_" + 6th & 7th
CHIP01 6 Characters	KLAX24L	RW24L15 (Five) +6th
CHIP01 6 Characters	KLGB30	RW30_1 4 (Four) + "_" + 6th

END INTERIM PROCEDURE 717-FMS-0003

The FIX mode key provides access to two FIX INFO pages which provide the pilot with the bearing and distance from a specified fix to the airplane and the capability to obtain predicted down path crossing times, distances, and altitudes from a user-defined radial off the reference fix. The specified fix may be a waypoint, a waypoint/course intercept point on the ACT F-PLN or an abeam point. The operation of each page is identical.

Pushing the FIX mode key displays the following screen.

STEP: Push **FIX**

```
              FIX INFO      1/2 →
        FIX
1L  [_____]                    1R
2L                                2R
3L                                3R
4L                                4R
5L                                5R
6L                                6R
```

LB1-2-0150

Choosing a fix of interest such as ESN and entering into line 1L via the SP results in the FIX INFO page

STEPS: 1. Type **ESN in SP**

2. Push **1L**

NOTE: In addition to an IDENT, the fix entry can also be in LAT/LONG or PBD formats.

```
                    FIX INFO        1/2 →
        FIX           RAD /DIST
 1L  ESN           066°/34                    1R

 2L                                            2R
      DNTKFX        ETO    DTG    ALT
 3L  [  ]°/---      ----   ----   -----        3R

 4L  [  ]°/---      ----   ----   -----        4R

 5L  [  ]°/---      ----   ----   -----        5R
      ABEAM
 6L  349°/8       1405     29    FL310        6R
```

KB1-3-0180A

1L FIX, RAD/DIST - FIX of interest entered into the FIX data field 1L. RADial and DISTance from that point to the airplane.

3L DNTKFX, ETO, DTG, ALT - Radial from that fix may be entered in lines 3L, 4L and/or 5L. Predictions are calculated for the radial distance or down track distance (DNTKFX) from the fix to over the F-PLN intercept point, the estimated time over (ETO) to the intercept point, the distance to go (DTG) to the intercept point, and the predicted altitude (ALT) over the intercept point. Course entries which do not intercept the active F-PLN or the intercept with a leg transition or any leg not terminating at a fix are displayed in LARGE font followed by the NO INTERCEPT message on the same line. Lines 3L, 4L, and 5L can be cleared by pushing the CLR key.

6L ABEAM - The abeam radial to the flight plan track with the same information as in line 3L above. If there is not an abeam course to the flight plan, then the abeam field is dashed with the NO INTERCEPT message.

The radial/distance and ABEAM points are automatically computed and displayed. The ND display shows the abeam course of 349 degrees.

ND Map Display
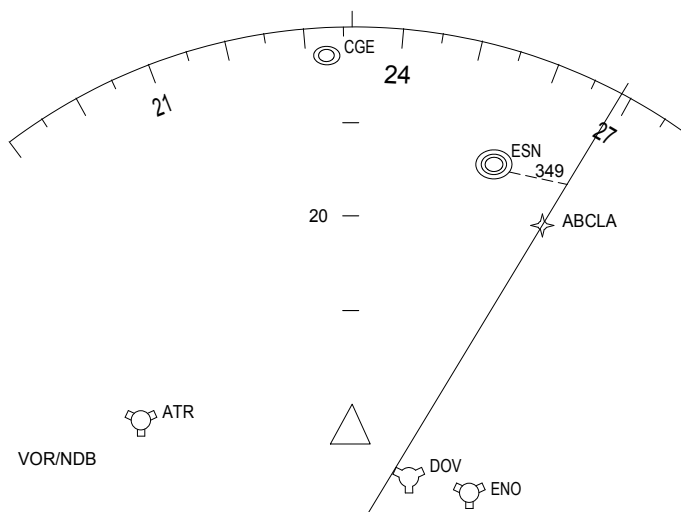
KB1-3-0182

As an example of fix radials and their display, the radials of 120 degrees, 333 degrees and 280 degrees are entered into lines 3L, 4L and 5L.

Fix Course Intercept

KB1-3-0181A

ND Map Display

KB1-3-0183A

If more than one intercept point exists for a given radial, the data is displayed for the one nearest the airplane along the flight plan. All intercept points must be within 999 NM of the reference fix for predicted data to be displayed. Radial resulting in intercept points outside this range are displayed, but the predicted data is dashed.

Off Route Navigation

It may be necessary to navigate off the F-PLN routing. The HDG/TRK select knob conveniently accomplishes this task when pulled but also disengages the FMS NAV function. When NAV is once again pushed to engage lateral NAV, the airplane will either turn to intercept the active F-PLN leg with up to a 45° intercept or continue straight ahead in a heading hold based on distances from the F-PLN route. If the airplane has remained within the 10 NM capture zone, it turns to intercept the ACT F-PLN leg. If the airplane is more than 10 NM on a diverging vector from the F-PLN routing, it would be necessary to turn to an intercept course and close the distance to 10 NM before the FMS NAV would reengage and provide intercept guidance.

ND Map Display

TRK 258 MAG

VOR/NDB

KB1-3-0184
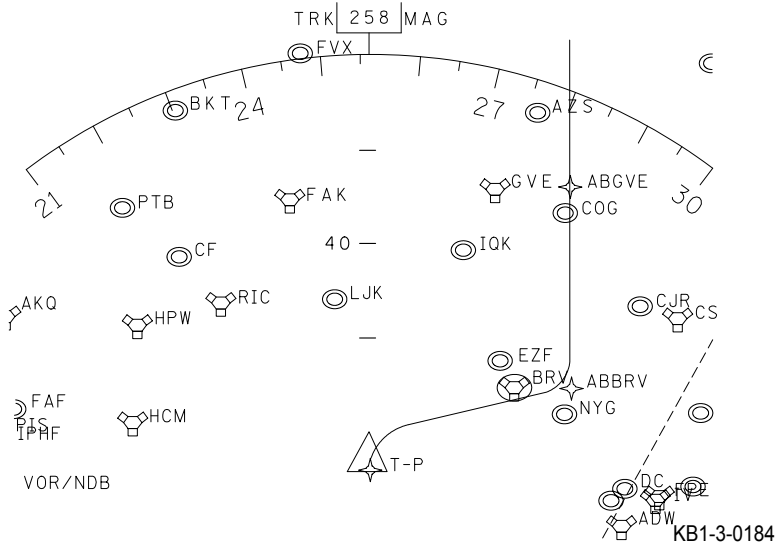
When the FCP NAV button is pushed to reengage lateral navigation, the FMC remembering the active leg DIR TO function, computes a new DIR TO ABBRV using a new T-P. This routing is shown in the following screen.


```
        ACT F-PLN      1/2→
      FROM    ETO     SPD      ALT
1L  T-P      1420    279/  FL310   1R
2L  ABBRV      40    .75 /    "     2R
3L  ABGVE      45     " /     "     3R
4L  MOL        53    .76 /    "     4R
5L  (T/D)    1527     " /     "     5R
6L  ---F-PLN DISCONTINUITY---      6R
                           ↑↓
```

KB1-3-0185A

```
            ACT F-PLN       2/2→
       FROM       DIST   °C    WIND
 1L   T-P                -46  077°/003   1R
                    54
 2L   ABBRV               "   280°/100   2R
 3L   ABGVE              "    " / "      3R
                    44
 4L   MOL              "    " / "       4R
        MOL         78
 5L   JOINN             "    " / "      5R
        MOL        105
 6L   AVERY            "    " / "       6R
                              ↑↓
```

KB1-3-0186A

When flying parallel to an active leg (such as in heading select mode) if greater than 7 miles abeam the TO waypoint, leg sequencing may not occur. The present active leg may now be in back of the airplane. To prevent the airplane from turning back when engaging NAV, first clear the FROM waypoint. The next leg will become the new active leg and NAV mode will conduct a proper capture.

Enroute Navaid Use

Radio information may be found on the NAV RAD page or through the REF page and NAVAID prompt. Those pages will be discussed in this section. Other supporting information may be found in NAV RADIO Tuning Section.

Autotuning

In flight, the pilots may access the NAV RADIO page to confirm automatic VOR radio tuning. The following illustrations show both FMCs have tuned BRV (114.5) for display on the ND. FMC 1 has tuned VOR 1 in line 1L and FMC 2 has tuned VOR 2 in line 1R.

STEP: Push **NAV RAD**

```
               NAV RADIO

       BRV/CRS              BRV/CRS
 1L   114.50/[ ]°        114.50/[ ]°   1R

 2L                                    2R
       ADF1                    ADF2
 3L    [    ]                  [    ]   3R
       ILS/CRS
 4L    [    ]/[    ]°                   4R

 5L                                    5R
                 PRESELECT
 6L   GVE/[    ]          CSN/[    ]    6R
```

KB1-3-0187A

Radio navaids for ND display are automatically selected according to the following priority:

1. Manually tuned navaid

2. Navaid specified for current F-PLN leg via nav database

3. Upcoming F-PLN waypoint (if navaid)

4. Preceding F-PLN waypoint (if navaid)

5. Closest navaid which is a F-PLN waypoint

6. Closest VOR/DME or VORTAC within 300 NM

7. Closest VOR within 300 NM

   NOTE: All navaids automatically selected will meet the figure of merit criteria following.

FIGURE OF MERIT CRITERIA

Fig of Merit	Aircraft Alt	Lateral Distance	Navaid Class Designator
0	12,000 ft or less MSL	40 NM or less	T (terminal)
1	18,000 ft or less MSL	70 NM or less	L (low altitude)
2	-	Lesser of 130 NM or LOS	U (unclassified)
3	-	Lesser of 130 NM or LOS	H (high altitude)
4	-	Lesser of 250 NM or LOS	H (high altitude)

When the active leg of the flight plan has a procedure specified navaid associated with it and a different manually tuned navaid is entered, the SP message (example) TUNE ATL 116.9 is displayed. Manual tuning of ORD or clearing the manual selection clears the message.

The ADF is tuned by the FMC using manually tuned nav data base navaid.

If no nav data base navaid can be selected, then an ADF station is not selected for tuning. A NAV database ADF is never used in radio position computations.

FMS Position

The FMC internal position is calculated using a combination of two IRUs for an IRS position. Radio DME/DME or DME/Bearing or Localizer data is used to calculate a radio position. Normally two of these sources of position and ground speed information are combined to reflect the FMC position displayed on the POS REF page. There are three modes available for updating the FMC position (in order of priority):

1. Radio/inertial
2. Inertial only
3. Radio only (advisory only)

GNS Position

If the GNS position is valid, then the FMC position is calculated using a combination of position data from two GNSSUs and two IRUs for an FMC position. The GNS position data is used as the primary sensor. There are four modes available for updating the FMC position and they are in order of priority:

1. GNS/Inertial.
2. Radio/Inertial.
3. Inertial only.

4. GNS only.

5. Radio only (advisory only).

RNP Navigation

Required navigation performance (RNP) is an accuracy requirement for a particular area, airspace, route, procedure, or operation, where accuracy is a 95% position certainty radius around the computed airplane position. The FMS continuously monitors input from the available navigation sensors (radios, IRUs, and GNS) to compute a position and actual navigation performance (ANP) value in units of nautical miles. The FMS RNP function is used as an integrity monitor for airplane position. The RNP/ANP values are displayed on the POS REF page.

```
              POS REF      1/3→
        FMC LAT/LONG (G/I)
   1L   N3757.3/W07718.8        1R
        IRS (MIX)
   2L   N3757.3/W07718.7        2R

   3L                           3R

        RNP/ACTUAL
   4L   1.00/0.38NM             4R
                     GNS NAV
   5L                INHIBIT*   5R
                   RETURN TO
   6L               REF INDEX>  6R
```

KB1-3-0188A

The 717 is certified to fly in RNP-10 airspace without GPS for a flight time not to exceed:

• 6.2 hours after placing IRU in navigation mode (pure inertial), or

• 5.9 hours after the last automatic DME/DME position update, or

• 5.7 hours after the last automatic VOR/DME position update.

The FMS navigation database contains a default RNP value for each of the various RNP flight phases (takeoff, terminal area, enroute domestic, oceanic remote, and approach). The default RNP values are based on existing operational requirements for existing airspace. RNP values in small font depict the normal default mode of operation for RNP. The defaults may be overridden via manual entry to support operational requirements for a particular area, airspace, route, procedure, or operation. Manual RNP entries are displayed in large font. The RNP entry range is from 0.01 to 99.9. If the manual RNP entry exceeds the default RNP value, then the FMS will display VERIFY RNP ENTRY in the SP.

RNP Flight Phase	Default RNP (NM)	Alert Time Delay (Seconds)
Takeoff	1.0	10 seconds
Terminal area	1.0	60 seconds
Enroute domestic	2.0	80 seconds
Oceanic remote	12.0	80 seconds
Approach	0.5	10 seconds

The FMS continuously compares the RNP with the ANP and will provide UNABLE RNP annunciations to the flight crew when the ANP has exceeded the RNP value. These annunciations alert the flight crew that the FMS is unable to maintain the integrity of position for the selected RNP. The flight crew may verify the ANP versus RNP value for both FMCs and select NAV mode on the lower ANP side. UNABLE RNP annunciations are defined as the following events:

1. MASTER CAUTION illumination.

2. Level 1 alert "UNABLE RNP" (amber on EAD).

3. UNABLE RNP (white on ND) flashes five times and then remains displayed steady.

If the ANP > RNP condition is present in transition to any RNP flight phase, then the annunciations will appear immediately. If the ANP > RNP condition occurs during an RNP flight phase, there is a specific time delay for each RNP flight phase before the annunciations occur. The MASTER CAUTION and Level 1 alert are resettable by pushing the MISC switch (cue light illuminated) on the EIS system display control panel (SDCP). However, the white UNABLE RNP on the ND will only reset if the condition clears for at least 10 seconds. This constant 10-second time delay is applicable regardless of the current RNP flight phase. Also, the UNABLE RNP annunciations are inhibited by the EIS during takeoff and approach.

If none of these modes are active, the airplane position will not be computed.

Radio Tuning

Each FMC shall use signals from the radio sensors that are tuned by that FMC. If FMC, MCDU or radio sensors become degraded, fail, or SISP configuration is changed, the FMC will only provide as much tuning capability and position accuracy as allowed by the radios it controls.

Radio position may be computed using the following prioritized methods:

1. DME/DME data.
2. DME/Bearing data.
3. Localizer update.

DME/DME - Slant range distance from two independent DMEs used to calculate a ground-referenced radio position. The first DME is selected as an existing procedure-specified navaid (must have DME) for the current flight segment or if none are specified the closest DME navaid. The second DME selected will be the closest DME which allows the angle to be nearest to 90 degrees.

DME/Bearing - This selection occurs only if DME/DME tuning cannot be accomplished. The known position of the navaid and the range and bearing are used by the FMC to calculate the radio position. Only collocated navaid facilities can be used. The following selection priority will be used:

1. Manually tuned VOR/DME or VORTAC.
2. Procedure specified for current leg.
3. Within 50.8 NM of the destination, a VOR/DME or VORTAC within 5 NM of the destination.
4. VOR/DME or VORTAC closest to the airplane.

The selected navaid (not specified for approach transition or final approach) will be excluded from selection if the airplane is flying away from it (inertial position available). If a procedure-specified navaid exists that is not the same as the manually tuned navaid, the message TUNE AAA-FFF.FF is displayed where AAA is the navaid ident and FFF.FF is the frequency.

Localizer - The localizer update uses the ILS localizer deviation signal, center beam bearing, physical LAT LONG, and a radio-corrected inertial position to determine the update position. This method is only used when controlling to the beam within 20 NM of the localizer facility and with a relative angle of less than 1.2 degrees. The localizer used must either be manually entered by the crew (takes priority) or automatically selected and tuned from the data base for the destination approach and runway in the F-PLN. If the airplane is within 20 NM of the destination and invalid data is continually received for 3 seconds, the MCDU message ILS UNTUNABLE is displayed.

Monitoring

To view the navaids automatically tuned by the FMC, the REF key and the NAVAID page (LSK 3R) must be selected.

 STEP: Push **REF**

```
                   REF INDEX

            DEFINED
   1L   <WAYPOINT      ATC COMM>    1R
   2L   <WAYPOINT      AOC COMM>    2R
            CLOSEST
   3L   <AIRPORTS         NAVAID>   3R
   4L   <POS REF        DOC DATA>   4R
   5L   <A/C STATUS        MAINT>   5R
   6L   <SENSOR STATUS              6R
```

KB1-3-0189A

STEP: Push **3R**

```
               NAVAID        1/3
      IDENT          STATION DEC
  1L  FAK                     06W   1R
          LAT/LONG
  2L  N3731.7/WO7749.7    NEXT>     2R
       FREQ
  3L  113.30              PREV>     3R
       ELEV           DESELECT
  4L  460                    [ ]    4R
       CLASS
  5L  VORTAC                        5R
       FIG OF MERIT
  6L  3 (130 NM)                    6R
```

KB1-3-0190

A maximum of four individual navaid pages automatically tuned by the FMC may be available at any one time. They are presented as follows:

Page 1   Navaids for EIS display

Page 2, 3   Navaids for radio position computation

Page 4   ILS/DME for display (within 25 NM of the destination)

If a navaid for EIS display (NAV RAD page) is also being used for positioning, then the navaid for ILS/DME display, if present, will move up to page 3.

Title   Right-hand corner displays the page number and total number of tuned navaid pages available. This line is blanked if a database navaid IDENT is entered in line 1L.

1L   IDENT - Navaid identifier. Navaids autotuned by the FMC. Pages are accessed by pushing LSK 2R (NEXT>) or LSK 3R (PREV>).

   However, any navaid in the data base may be referenced by typing in the navaid ident. Once an untuned ident is entered, tuned stations can no longer be observed by the pilot or accessed by pushing LSK 2R or 3R until the field is cleared. If there are no tuned navaids, four boxes will be displayed.

2L   LAT/LONG - Navaid LAT/LONG. If a noncollocated VOR/DME is displayed, the LAT/LONG is for the VOR.

5L   CLASS - The navaid class can include the following:

   VOR   ILS/DME

   DME   VORTAC

   LOC   VOR/DME

   ILS

   If the navaid is noncollocated, the word NONCOLLOCATED is displayed.

6L   FIG OF MERIT

1R   STATION DEC - Station declination (variation) of the navaid. Only displayed for VORs, VORTACs or VOR/DMEs.

4R   DESELECT - Ident of the deselected navaid is displayed. The pilot may enter a navaid ident into the field. Deselection results in that navaid not being autotuned or used for position update. However, manual tuning is still allowed. ONLY ONE STATION AT A TIME may be deselected. Deselection of a second station or clearing the first deselected navaid allows the FMC to again use that navaid.

It can be ascertained from the page numbers in the title field that three navaids are being FMC-autotuned. Since three pages are available and the airplane is not within 25 NM of the destination (no ILS/DME tuned), the three pages are the EIS displayed navaid and two DMEs for DME/DME position calculation. Navaid pages 2/3 and 3/3 are shown below.

STEP: Push **2R**

Autotuned NAVAID

```
               NAVAID        2/3
      IDENT          STATION DEC
1L    BRV                     09W   1R
             LAT/LONG
2L    N3820.2/WO7721.2    NEXT>     2R
         FREQ
3L    114.50              PREV>     3R
        ELEV            DESELECT
4L    120                    [ ]    4R
        CLASS
5L    VORTAC                        5R
        FIG OF MERIT
6L    1(70 NM)                      6R
```

KB1-3-0191

STEP: Push **2R**

Autotuned NAVAID

```
               NAVAID        3/3
      IDENT          STATION DEC
1L    GVE                     06W   1R
             LAT/LONG
2L    N3800.8/WO7809.2    NEXT>     2R
         FREQ
3L    115.60              PREV>     3R
         ELEV           DESELECT
4L    380                    [ ]    4R
         CLASS
5L    VORTAC                        5R
         FIG OF MERIT
6L    3(130 NM)                     6R
```

KB1-3-0192

Navaid Deselection

One navaid at a time may be deselected from automatic NAV radio tuning
by entering its ident into line 4R of the NAVAID page. The CLR key and SP
will clear the field or another ident may be entered to regain tuning access
to the deselected navaid.

As an example, MOL, 115.3 is deselected. This deselection forces the
FMC to tune another navaid for display in accordance with the tuning
priorities, which show that the FMC has automatically chosen the
preceding F-PLN navaid to tune for EIS display.

The following screen depicts the results of deselecting MOL and VBW
being autotuned in place of MOL.

STEPS: 1.   Type **MOL in SP**

2.   Push **4R**

```
                        NAVAID      1/3
          IDENT          STATION DEC
 1L   VBW                        06W    1R
             LAT/LONG
 2L   N3821.9/W07857.7    NEXT>         2R
          FREQ
 3L   241.0               PREV>         3R
          ELEV          DESELECT
 4L   400                   MOL         4R
          CLASS
 5L   VORTAC                            5R
          FIG OF MERIT
 6L   3(130 NM)                         6R
```

KB1-3-0194A

STEP: Push **NAV RAD**

Autotuned NAVAID Change

```
                    NAV RADIO
        VBW/CRS                  VBW/CRS
 1L     241.0/[  ]°              241.0/[  ]°     1R

 2L                                              2R

        ADF1                         ADF2
 3L     [  ]                         [  ]        3R
        ILS/CRS
 4L     [  ]/[  ]°                               4R

 5L                                              5R

                  PRESELECT
 6L     [   ]/[   ]           [   ]/CSN          6R
```

KB1-3-0195A

NAV Database information

Information for any navaid in the data base can be displayed by entering the navaid ident into the IDENT line 1L of the NAVAID page. Entering VBW in the IDENT field displays the NAVAID data.

STEPS: 1.   Push **REF**

2.   Push **3R**

3.   Type **VBW in SP**

4.   Push **1L**

```
                    NAVAID
       IDENT           STATION DEC
 1L    VBW                      06W    1R
            LAT/LONG
 2L    N3821.9/WO7857.7                2R
            FREQ
 3L    241.0                           3R
            ELEV          DESELECT
 4L    400                   [  ]      4R
            CLASS
 5L    VORTAC                          5R
            FIG OF MERIT
 6L    3(130 NM)                       6R
```

KB1-3-0196A

After VBW is entered, the title line page prompt and NEXT and PREV
prompts are removed and FMC-autotuned navaids can no longer be
displayed until the IDENT field is cleared. FMC automatic tuning is still
operable.

POS REF Page

Pushing the REF key or the INIT key provides access to the POS REF
page prompt. Pushing LSK 4L accesses the first of three POS REF pages.

STEP: Push **REF (or INT)**

```
               REF INDEX
         DEFINED
1L   <WAYPOINT      ATC COMM>   1R

2L   <WAYPOINT      AOC COMM>   2R
         CLOSEST
3L   <AIRPORTS         NAVAID>   3R

4L   <POS REF       DOC DATA>   4R

5L   <A/C STATUS       MAINT>   5R

6L   <SENSOR STATUS             6R
```

KB1-3-0189A

The POS REF page 1/3 displays the FMC Lat/Long and Inertial source in the label line. Line 2L is the coordinates from the IRS mix position (average IRU position). Line 4L is the RNP based on the phase of flight, and the Actual nav performance. The FMC position may be manually updated on this page. The IRS/GNS POS (page 2/3) displays all IRU and GNSSU positions. The third page, IRS STATUS 3/3, provides IRS drift at flight termination.

STEP: Push **4L (or 4R on INIT Page)**

```
          POS REF        1/3→
     FMC LAT/LONG (G/I)
1L   N3757.3/WO7718.8              1R
     IRS (MIX)
2L   N3757.3/WO7718.7              2R

3L                                3R
     RNP/ACTUAL
4L   1.00/0.38NM                  4R
                     GNS NAV
5L                   INHIBIT*     5R
                   RETURN TO
6L                 REF INDEX>     6R
```

KB1-3-0188A

1L   FMC LAT/LONG - Displays the current FMC position.
Pushing LSK 1L with the SP empty freezes the displayed
FMC LAT/LONG position. The displayed FMC LAT/LONG
title line is replaced by POS FROZEN label. Pushing LSK
1L a second time unfreezes the position which catches up
to where the airplane position is without update.

The FMC position may be updated by entry of a waypoint,
navaid, LAT/LONG, or place/bearing/distance at any time.
Entry in line 1L results in the POS FROZEN label and
appearance of an UPDATE prompt in line 1R. Pushing LSK
1R updates the airplane position and unfreezes the
LAT/LONG.

A CHECK POSITION message will be displayed on the ND when either of
the following SP messages are displayed:

1. FMC POSITION MISMATCH - This message will be displayed if the FMCs show a position difference of 5 NM or greater or twice the RNP distance (NM). The message is removed if the position difference becomes less than 3 NM or twice the RNP distance (NM), respectively. Compare the positions on the POS REF page, and use the FMC considered to be the most accurate. The above generally is a result of poor radio DME position computation.

2. VERIFY AIRCRAFT POSITION - This will be displayed if a single FMC radio position varies from the IRSs. Usually it shows on only one MCDU. Check the POS REF page on that MCDU. If the condition persists, it is advisable to use the other FMC as primary for navigation.

   NOTE: It is possible to have the message, VERIFY AIRCRAFT POSITION, on both MCDUs if a single IRS has drifted more than 12 NM. Comparison of all three POS REF pages should confirm this. Use the FMC considered to be the most accurate.

IRS/GNS POS Page

The IRS/GNS POS page is accessed by pushing the PAGE key from the POS REF page.

 STEP: Push **PAGE**

```
            IRS/GNS POS  2/3→
       IRU 1 - NAV
 1L  N4038.0/W07346.0 000° / 00   1R
       IRU 2 - NAV
 2L  N4038.0/W07346.0 000° / 00   2R
        IRU 3 - NAV
 3L   N4038.0/W07346.0 000° /  00  3R
     GNS 1 - NAV              8 SV
 4L   N4038.0/W07346.0 000° /  00  4R
     GNS 2 - NAV              8 SV
 5L  N4038.0/W07346.0 000° /  00   5R
                      RETURN TO
 6L               F-PLN INIT>      6R
```

KB1-3-0148A

1L	1R	IRU 1 - NAV
2L	2R	IRU 2 - NAV
3L	3R	IRU 3 - NAV (IF AVAILABLE)
4L	4R	GNS 1 - NAV
5L	5R	GNS 2 - NAV

Lines 1, 2 and 3 display the position of each IRU used to calculate the IRS position along with the relative bearing and distance from the FMC position to each IRU once the IRUs are aligned. The label lines display either NAV or ALIGN and, if ALIGN, the time remaining for IRU alignment. In the IRU ALIGN mode, dashes are displayed in data lines. In NAV, the IRU LAT/LONG position is displayed.

Lines 4 and 5 display the position of each GNS used to calculate the GNS position along with the relative bearing and distance from the FMC position to each GNSSU once the GNSSUs are in the NAV mode. The label lines display either NAV or ACQUIRE and the number of satellite vehicles tracked. If no position data is available from the GNSSUs, dashed lines are displayed. If a position is available the GNSSU LAT/LONG position is displayed.

IRS STATUS Page

The IRS STATUS page is accessed by pushing the PAGE key from the IRS POS page.

STEP: Push **PAGE**

```
          IRS STATUS   3/3→
            DRIFT RATE        GS
  1L  IRU1        ---        ---   1R

  2L  IRU2        ---        ---   2R

  3L  IRU3        ---        ---   3R

  4L                                4R

      STATUS CODE
  5L  IRU1     00                  5R
      IRU2     00      RETURN TO
  6L  IRU3     00    F-PLN INIT>   6R
```

KB1-3-0149

5L STATUS CODE - The action code of each IRU is displayed. Code definition is as follows:

01	IRU Critical Fault on GND (remove IRU).
02	IRU Non-Critical Fault (service IRU when convenient).
03	PPOS not entered yet, starting at beginning of align.
04	IRU Critical Fault in AIR (remove IRU).
05	Excess motion detected during align or rapid align.
06	ADR data fault or data outside limits.
07	Check circuit breakers. Input power test failed.
10	Alignment is prohibited due to IRU temperature below -15°C.

FMC Position Update

The FMC position may be updated both on the ground and in the air using the POS REF page. Access to that page is gained through the REF or INIT keys and POS REF prompt.

STEP: Push **REF**

```
              REF INDEX

       DEFINED
1L   <WAYPOINT      ATC COMM>   1R

2L   <WAYPOINT      AOC COMM>   2R
       CLOSEST
3L   <AIRPORTS        NAVAID>   3R

4L   <POS REF       DOC DATA>   4R

5L   <A/C STATUS       MAINT>   5R

6L   <SENSOR STATUS             6R
```

                                           KB1-3-0189A

STEP: Push **4L**

```
            POS REF     1/3→
      FMC LAT/LONG (G/I)
1L   N3757.3/WO7718.8             1R
      IRS (MIX)
2L   N3757.3/WO7718.7             2R

3L                                3R

      RNP/ACTUAL
4L   1.00/O.38NM                  4R
                     GNS NAV
5L                    INHIBIT*    5R
                    RETURN TO
6L                  REF INDEX>    6R
```

                                           KB1-3-0188A

A waypoint, navaid, LAT/LONG or place/bearing/distance can be typed in the SP and entered into line 1L. That entry causes a POS FROZEN title to be displayed, LAT/LONG entered between lines 1L and 1R and UPDATE* prompt to be displayed in line 1R. When the airplane is precisely at the update point, pushing LSK 1R will update the FMS position to the newly entered coordinates. The update may be cancelled by departing the MCDU page for another page prior to entering the update.

The FMC position is updated over the navaid MOL.

STEPS: 1. Type **MOL in SP**

2. Push **1L**

```
                 POS REF      1/3→
       POS FROZEN
1L   N3754.0/W07906.4  UPDATE*   1R
       IRS (AVG)
2L   N3808.9/W07905.5            2R

3L                               3R
       RNP/ACTUAL
4L   1.00/0.38 NM                4R
                        GNS NAV
5L                      INHIBIT* 5R
                       RETURN TO
6L                     REF INDEX>  6R
```

KB1-3-0200A

STEP: Push **1R (Over MOL)**

MOL Position Update

```
         POS REF      1/3→
      FMC LAT/LONG (G/I)
  1L  N3754.0/W07906.4          1R
      IRS (MIX)
  2L  N3754.0/W07906.4          2R

  3L                            3R
      RNP/ACTUAL
  4L  1.00 /0.39NM              4R
                      GNS NAV
  5L                 INHIBIT∗   5R
                   RETURN TO
  6L                REF INDEX>  6R
```

KB1-3-0197A

Cruise Performance Change

During the climb phase, the active PERF page was the CLB page (ECON or POLICY) and PERF pages 2/3 and 3/3 were PRESELECT CRZ and PRESELECT DES. When the FMS transitions to CRZ including any step climb (S/C), the active PERF page becomes the CRZ page and its preselected speed mode is engaged. In CRZ there is only one PRESELECT page and that is PRESELECT DES, page 2/2. Pushing the PERF key displays the performance CRZ page (ECON CRZ) shown below

> NOTE: When FMS SPD mode is disengaged, the ACTIVE mode
> will not automatically revert to ECON. When FMS speeds are
> reengaged, the ACTIVE mode will be the last engaged FMS
> SPD mode (ECON, EDIT, or MAX). If ECON was not the last
> engaged mode, EDIT or MAX will become active and a
> second FMS SPD button push will engage ECON.

STEP: Push **PERF**

```
          ECON CRZ      1/2→
                      TO T/D
  1L               0034/208NM   1R
       ECON
  2L   .748
       MAX END
  3L  * .639                    3R
       EDIT
  4L   [   ]
  5L                            5R
           OPT/MAXFL    THRUST
  6L       350/360      LIMITS>  6R
```

KB1-3-0201A

3L   MAX END - Mach calculated by the FMC which provides
minimum drag and hence maximizes endurance (time aloft).

1R   TO T/D - Time and distance to the T/D point which is displayed
in LARGE font but is not editable.

The airplane speed and, therefore, performance, may be changed by
selecting MAX END (LSK 3L) or an edited speed via LSK 4L or IAS/MACH
selector and the FMS SPD switch. The speed .78 is entered into line 4L via
the SP.

> NOTE: When using speed constraints in cruise, the speed
> constraint will become effective for the remainder of the flight,
> and will restrict the upper limit of FMS speeds (ECON or EDIT)
> to that value. In order to regain the use of FMS ECON speeds
> while still in cruise, the crew may clear the speed constraint by
> accessing the VERT REV page of the FROM waypoint and
> pushing the LSK next to the CLEAR SPD prompt.

STEPS: 1. Type **.780 in SP**

2. Push **4L**

3. Push **4L**

```
        EDIT CRZ       1/2→
                      TOT/D
                   0034/208NM
     ECON
    *.752
     MAX END
    *.662
     EDIT
    .780

        OPT/MAXFL      THRUST
        350/360       LIMITS>
```

KB1-3-0202A

Pushing LSK 6R provides access to the AUTO THRUST LIMITS page.

STEP: Push **6R**

```
      AUTO THRUST LIMITS

            EPR     TAT
 1L   G/A            -15°              1R

 2L                                   2R

 3L   MCT                             3R

 4L   CLB                             4R
      10% DERATE        20% DERATE
 5L   CLB1                    CLB2     5R
                       RETURN TO
 6L  →CRZ    1.47      PERF MODE>      6R
```

KB1-3-0203A

The MANUAL THRUST LIMITS title is displayed after pushing LSK 3L.

STEP: Push **3L**

```
            MANUAL THRUST LIMITS
                    EPR      TAT
[1L]        G/A              -13°              [1R]

[2L]                                           [2R]

[3L]      →MCT  1.55                           [3R]
                               SELECT
[4L]        CLB                   AUTO*        [4R]
            10% DERATE        20% DERATE
[5L]        CLB1                  CLB2         [5R]
                              RETURN TO
[6L]        CRZ             PERF MODE>         [6R]
```

KB1-3-0204

INTERIM PROCEDURE 717-FMS-0004

PEGASUS "FROM" WAYPOINT ANOMALY.

REASON FOR INTERIM PROCEDURE: STARs coded with runway transitions may cause the FMS to erroneously insert a duplicate string of STAR waypoints. The FMS logic incorrectly handles certain STAR and Runway combinations.

The Nav Data Base has new special coding to handle a STAR and Runway transition combination. This coding may cause the FMS to incorrectly insert a duplicate set of STAR waypoints when the STAR is inserted with only a runway (e.g., RW36) selected. Normal stringing will occur with the selection of an approach procedure to a specific runway (e.g., GPS36).

It is always the responsibility of the Flight Crew to verify the Flight Plan for accuracy and <u>manually clear all extra waypoints</u>.

END INTERIM PROCEDURE 717-FMS-0004

Flight PROGRESS Page

The PROG key provides access to the PROGRESS page which displays dynamic flight information pertinent to the present situation. Page layout is specifically tailored to facilitate oceanic position reporting. Starting with the flight number in the title line and including the position (FROM) with actual time over (ATO) and altitude, the next (TO) reporting point with ETO and the next succeeding reporting point along the route of flight. Pertinent remarks could include the current TEMP and WINDS found in line 4. See the following illustration of PROGRESS page at ABCLA (CLASY).

 STEP: Push **PROG**

Progress Page at ABCLA (CLASY)

```
        PROGRESS XXXX1234

      FROM              ATO   ALT
 1L   ABCLA            1426  FL310   1R
      TO                ETO
 2L   ABBRV            1440  FL310   2R
      NEXT
 3L   ABGVE            1445  FL310   3R
      TEMP      WIND           UFOB
 4L   -46°    077°/006         16.0  4R
      DEST      ETA    DTG     EFOB
 5L   RW26R    1549    476     11.2  5R
      ALTN
 6L   KMCN     1603    543     10.2  6R
```

KB1-3-0205A

UFOB in line 4R completes current situation information. Predictions at the destination and alternate airports include estimated time of arrival (ETA), distance to go (DTG), and estimated fuel on board (EFOB).

An existing flight plan waypoint can be entered in line 6L to obtain ETA, DTG, and EFOB prediction for that waypoint. The waypoint entry does not affect the existing flight plan and can be cleared via the CLR key. Attempted pilot entries into lines 1 through 5 are not allowed.

Closest Airports Page

The CLOSEST AIRPORTS page provides the four airports closest to the current airplane position. Pilot-defined runways are not included in this list. A fifth entry is reserved for pilot entry.

The CLOSEST AIRPORTS page is accessed by pushing LSK 3L from the REF INDEX page.

STEP: Push **REF**

```
           REF INDEX

       DEFINED
1L  <WAYPOINT      ATC COMM>  1R

2L  <WAYPOINT      AOC COMM>  2R
       CLOSEST
3L  <AIRPORTS        NAVAID>  3R

4L  <POS REF       DOC DATA>  4R

5L  <A/C STATUS       MAINT>  5R

6L  <SENSOR STATUS            6R
```

KB1-3-0189A

The following screen displays the closest airports from KJFK.

STEP: Push **3L**

```
           CLOSEST  AIRPORTS
                BRG/DIST
 1L    KLGA     353°/11          1R

 2L    KEWR     299°/18          2R

 3L    KISP     084°/33          3R

 4L    KSWF     359°/55          4R

 5L    [ ]      ---°/-----       5R

 6L                              6R
```

KB1-3-0465

Other methods of verifying the information in lines 1 through 4 include: (1) selecting the MAP and ARPT switches on the FCP for the ND if the airport is expected to be within 640 NM of the airplane, or, (2) utilizing the FIX INFO page which will provide radial/distance information to any entered waypoint or airport identifier.

Sensor Status Page

The SENSOR STATUS page of the REF INDEX page provides information on the status of sensors providing data input to the FMC. Only failed sensors are displayed. The failures are displayed under three columns where 1 = # 1 system, 3 = # 3 or aux system, and 2 = # 2 system. Where one sensor is fitted to the airplane, failures are recorded in column 1.

Failure of a sensor which is displayed on this page also causes the message SENSOR FAIL to be displayed in the SP.

STEP: Push **REF**

```
                REF INDEX
          DEFINED
1L  <WAYPOINT      ATC COMM>  1R

2L  <WAYPOINT      AOC COMM>  2R
          CLOSEST
3L  <AIRPORTS         NAVAID>  3R

4L  <POS REF        DOC DATA>  4R

5L  <A/C STATUS        MAINT>  5R

6L  <SENSOR STATUS            6R
```

KB1-3-0189A

STEP: Push **6L**

```
              SENSOR STATUS
                1    3/AUX    2
1L  IRU                       FAIL  1R
    EIS       FAIL            FAIL
2L  EEC       FAIL            FAIL  2R
    FCC                       FAIL
3L  FQGS      FAIL                  3R

4L                                  4R

5L                                  5R

6L                                  6R

          INDEPENDENT OPERATION
```

KB1-3-0206

Sensor types that may be displayed on the SENSOR STATUS page include:

IRU	VOR	ADC
DME	DEU	DIS-IN
FCC	FQGS	GCP
EIS	ILS	
ESC		
EEC		GNS

Cruise Flight Level Change

Cruise flight level changes can occur in the form of scheduled or unscheduled climbs or descents. Step climbs (S/C), unscheduled climbs, delayed climbs, unscheduled descents and decelerations will be discussed in this section

Climb

During cruise it may become necessary to climb to a higher altitude than the CRZ FL. Two cases exist, one where there is a planned S/C and the second where a S/C does not exist in the F-PLN.

Where a S/C exists, preselecting the FCP altitude prior to the S/C will allow the FMS PROF to automatically execute the S/C. The PERF page remains the CRZ page during climb.

Where a S/C exists, continued PROF cruise without changing the FCP preselected altitude will result in airplane level flight. Changing the CLR ALT by turning the attitude select knob to the S/C altitude will execute the climb. The PERF page will remain the selected speed CRZ titled page.

If the climb is not executed at the step climb point, the step distance on the PERF page will keep resetting and the S/C symbol will keep moving ahead of the airplane on the ND. This action reminds the crew that the airplane is ready to climb to the new flight level as soon as the FCP ALT is dialed up.

A temperature on the VERT REV page 2 will cause the FMC to recompute the step climb and other predictions. While it is recomputing, the toggling of the step climb will temporarily cease. After recomputation, depending on the temperature entry, it is possible that the newly predicted step climb is now really ahead of the airplane. In this case, the S/C symbol will no longer move until the airplane sequences the step climb point.

STEP: Push **PERF**

```
                ECON CRZ      1/2→
                      S/C TO FL350
                         0001/7NM
      ECON
     .764
      MAX END
     *.693
      EDIT
     [   ]



          OPT/MAXFL  THRUST
          355/358   LIMITS>
```

KB1-3-0466

Where a S/C exits and an immediate climb is required prior to the S/C point, the pilot must preselect the altitude on the altitude select knob and pull. This action disengages PROF, sets a new FMS CRZ ALT, and begins the climb. PROF may be pushed to reengage and to subsequently guide the airplane throughout the remainder of the climb and the S/C, if it still exists. If the S/C is canceled by the climb, an SP message CRZ FL(s) REMOVED is displayed. The PERF page will display the selected speed and CLB title.

The FMS has the capability to constrain the airplane to an altitude at a waypoint in cruise. The format is /SFLXXX which is entered on the right side of the ACT F-PLN page adjacent to the desired constraining waypoint with a flight level of XXX. The flight level must be equal to one of the flight levels on the F-PLN INIT page. This capability applies primarily in step climb operation between flight levels defined in the FMS. Once the airplane sequences the waypoint which has the constraining altitude and sequences the S/C point for that altitude, a vertical alert will be provided and the airplane will begin to climb, provided the FCP altitude has been raised to the new cruise flight level.

*NOTE: Altitude constraints should not be used to adjust a cruise
level downward. The FMS will transition to a descent flight
phase indefinitely.*

Entry of an altitude constraint during cruise flight will relocate the
associated S/C to that constrained waypoint For example, entering S330
(S is the operative prefix) as an altitude constraint (direct F-PLN or VERT
REV entry) will move the optimum FL330 S/C from the optimum position
in the F-PLN to the newly constrained waypoint. However, only F-PLN INIT
CRZ LEVELS may be constrained in this manner. The pilot, upon nearing
the altitude constrained waypoint and S/C, should preselect the S/C
altitude on the FCP and, if necessary (flashing VERT ALERT not observed
on the FMA or airplane does not begin to climb), pull the FCP altitude knob.
The airplane will climb to the S/C altitude. If the FCP altitude knob was
pulled, the PROF button must be pushed to reengage FMS PROF.

Where no S/C exists and an immediate climb is required, it may be
accomplished by preselecting the new altitude. PROF will remain engaged
and initiate an immediate climb to the new CRZ FL. CRZ ALT is reset on
the F-PLN INIT page. The PERF page will display the selected speed and
CLB title.

*NOTE: After FMC computations are completed and before final
MCDU/ND data display, momentary data line display changes
may occur. Up to 30 seconds may be required for extensive
computations. Events may also be displayed out of sequence
on the nav display.*

Descent

Where PROF is engaged and the FMS is guiding to the CRZ ALT, the CLR
ALT may be lowered for descent by preselecting the altitude with the
altitude select knob. PROF will guide the airplane in level flight until the T/D
is sequenced. At this point, the FMS will transition to the descent phase
and begin a descent along the descent path. The F-PLN INIT page CRZ
LEVELS data field will be automatically cleared and dashes will be
displayed. Dashes will be displayed for the CRZ LEVELS when descent
begins. The PERF page will be titled DES.

STEP: Push **INIT**

```
        F-PLN INIT    1/3 →
CO ROUTE              FROM/TO
                     KJFK/KATL
ALTN ROUTE               ALTN
                        KMCN

FLT NO
XXX1234           POS REF>
CRZ LEVELS
---/---/---/---/---/
              OPT/MAXFL   CI
---°/-----/  ---/328  200
```

KB1-3-0207A

Where PROF is engaged and an immediate descent is desired, the pilot must preselect the altitude with the altitude select knob and pull or set a V/S on the pitch wheel. Both these events disengage PROF and begin descent. Both of these actions transition the FMS to DES (PERF page DES) and clear the CRZ ALT on the F-PLN INIT page. Reengaging PROF mode at this point will cause the FMS to engage the same mode as selected. When the airplane levels at the new cruise altitude, the FMS may be transitioned back into the CRZ phase of flight by inserting the desired CRZ ALT in the F-PLN page. See screen below where FL 290 is entered as the new CRZ ALT. Otherwise, the FMS will remain in the descent mode until the vertical descent profile is reintercepted. A descent profile intercept point (I/P) will be displayed on the ND at this point. If PROF is pushed and reengaged prior to the I/P and the CLR ALT lowered, the FMS will continue the descent along the vertical descent profile.

STEPS: 1. Type **290 in SP**

2. Push **5L**

```
           F-PLN INIT    1/3 →
  CO ROUTE            FROM/TO
                    KJFK/KATL
  ALTN ROUTE             ALTN
                      KMCN

  FLT NO
  XXX1234            POS REF>
  CRZ LEVELS
  290/[  ]/[  ]/[  ]/[  ]/[  ]
  TEMP/WIND    OPT/MAXFL    CI
  --- °/ TL030   280/328   200
```

KB1-3-0208A

Deceleration

If the T/D is overflown before lowering the CLR ALT, the airplane will maintain level flight. On the F-PLN page the DECEL* prompt will appear in line 1R. Activating DECEL defines a speed target of VMIN + 5 while maintaining level flight. The deceleration should result in a situation that is more favorable to return to the descent path once clearance to descend is obtained. Once DECEL mode has been selected, either dialing the CLR ALT DOWN or selecting any other speed mode will cancel the DECEL mode. After the CLR ALT is reset by preselecting a lower altitude with the altitude select knob, the airplane will begin descent attempting to recapture the vertical profile. The descent target speed in this case will be either a casual return speed (ECON descent speed + 20 KIAS) or the FMS ECON speed.

For example, in the following screen the airplane is approaching the T/D but the FCP altitude has not been set lower.

STEP: Push **F-PLN**

```
                 ACT F-PLN    1/2→
          FROM     ETO   SPD    ALT
  1L    AVERY     1511   282/  FL350     1R
          MOL
  2L    BEBAD      28    285/  FL330     2R
          MOL
  3L    ODF        33     "  /   "       3R

  4L    (T/D)      35    .76/   "        4R
          MOL
  5L    MACEY      37    279/  FL267     5R
          MACEY2
  6L    WOMAC      40     "  / FL213     6R

                                  ↑↓
```

KB1-3-0467

Upon sequencing the T/D, the DECEL* prompt appears in line 1R. The PERF page, ECON DES, indicates the FMS has passed the T/D and has transitioned to DESCENT even though the airplane is maintaining the same altitude.

```
              ACT F-PLN      1/2→
        FROM
  1L  ODF      1533        DECEL∗   1R
        MOL      ETO   SPD
  2L  MACEY     38    279 /  FL265  2R
        MACEY2
  3L  WOMAC     40     "  /  FL212  3R
        MACEY2
  4L  LOGEN     42     "  /  17400  4R
        MACEY2
  5L  ATL       47    245 /   8680  5R
        ILS 26R
  6L  FREAL     49    228 /   5000  6R
                                ↑↓
```

KB1-3-0468

```
              ECON DES
      PATH ERROR         PRED TO
  1L  4920HI 16LONG        10000   1R
        ECON      UTC       DIST
  2L  .764/279   ----      ----    2R
        MAX DES
  3L  ∗330       ----      ----    3R
        EDIT
  4L  [   ]                        4R
                        DESCENT
  5L               FORECAST>       5R
      TRANS  OPT/MAXFL   THRUST
  6L  18000  355/358    LIMITS>    6R
```

KB1-3-0469

Path error is displayed in line 1. The number in 1L indicates how far (in feet) the airplane is above (HI) or below (LO) the calculated descent path. The number in 1C indicates how far (in NM) the airplane is laterally from the calculated descent path.

Descent Forecast Wind Entry

As soon as practicable in FMS operation, but not later than 40 NM before the T/D point, descent winds should be entered into the DESCENT FORECAST page and inserted into the F-PLN. These winds are used to build an accurate destination wind model used in fuel and descent predictions to include determining an accurate T/D point.

During cruise, the DESCENT FORECAST page may be accessed by pushing the PERF key, and then pushing PAGE to sequence to page 2/2, and finally pushing LSK 5R (DESCENT FORECAST>) to show the display.

STEPS: 1. Push **PERF**

2. Push **PAGE**

```
            PRESELECT DES    2/2→

  1L                                         1R
      ECON
  2L  .765/279                               2R

  3L                                         3R
      EDIT
  4L  [  ]                                   4R
                          DESCENT
  5L                      FORECAST>          5R
      TRANS    OPT/MAXFL
  6L  18000    355/358                       6R
```

KB1-3-0470

STEP: Push **5R**

```
        DESCENT FORECAST
                        ANTI-ICE
 1L                          OFF      1R

 2L    [     ]/[ ]°/[ ]               2R

 3L    [     ]/[ ]°/[ ]               3R

 4L    [     ]/[ ]°/[ ]               4R
                          TEMP
 5L    KATL/[ ]°/[ ]        [  ]°     5R
                       RETURN TO
 6L                    PERF MODE>      6R
```

KB1-3-0471

2L,3L **&4L**	ALT/WND - Wind data consists of bearing and magnitude which are considered a single entry (i.e. 255°/90 is considered a single undivided entry). When brackets for altitude are shown, altitude alone or an altitude/wind may be entered but not a wind alone. Once ALT/WINDs are entered, the FMS sorts them in descending order from top to bottom.
5L	Destination is always displayed and may not be changed or cleared. Destination winds should be entered.
1R	ANTI-ICE - Selects the anti-ice option for descent path computations <u>only</u>. This is done to anticipate the uses of anti-ice during some or all parts of descent.
5R	TEMP - Temperature at destination may be entered and/or cleared back to brackets if desired.

Whenever an altitude or wind entry or edit is performed, the *INSERT prompt in line 6L will reappear to enable insertion of new data into the FMC. The data entered or edited on this page has no effect on the system until the *INSERT prompt is pushed. If the page is exited without pushing *INSERT, then the entered or edited data is not retained. Winds for descent into Atlanta are entered into DESCENT FORECAST page.

STEPS: 1.   Type **290/255/90 in SP**

2.   Push **4L**

3.   Type **200/270/80 in SP**

4.   Push **4L**

5.   Type **100/285/45 in SP**

6.   Push **4L**

7.   Type **/090/018 in SP**

8.   Push **5L**

9.   Type **12 in SP**

10. Push **5R**

```
                  DESCENT FORECAST

                                    ANTI-ICE
  1L                                     OFF      1R
         ALT  /  WIND
  2L   FL290/255°/090                             2R

  3L   FL200/270° /080                            3R

  4L   FL100/285°/045                             4R
                                      TEMP
  5L   KATL /090°/018                   12°       5R
                                   RETURN TO
  6L   *INSERT               PERF MODE>           6R
```

KB1-3-0486

NOTES: Altitudes should be entered as a FL above the transition level.

If the destination is changed to other than the destination airport, all previous wind entries on this page are deleted.

INTERIM PROCEDURE 717-FMS-0005

DOUBLE STRINGING OF STAR WAYPOINTS.

REASON FOR INTERIM PROCEDURE: STARs coded with runway transitions may cause the FMS to erroneously insert a duplicate string of STAR waypoints. The FMS logic incorrectly handles certain STAR and Runway combinations.

The Nav Data Base has new special coding to handle a STAR and Runway transition combination. This coding may cause the FMS to incorrectly insert a duplicate set of STAR waypoints when the STAR is inserted with only a runway (e.g., RW36) selected. Normal stringing will occur with the selection of an approach procedure to a specific runway (e.g., GPS36).

It is always the responsibility of the Flight Crew to verify the Flight Plan for accuracy and <u>manually clear all extra waypoints</u>.

END INTERIM PROCEDURE 717-FMS-0005

STAR Selection

INTERIM PROCEDURE 717-FMS-0006

PROF – STAR ANOMALY.

REASON FOR INTERIM PROCEDURE: An operator reported encountering anomalies that affected PROF operation while in climb and cruise, resulting in loss of the entries on the CRZ LEVELS on the F-PLN INIT page and FMS mode switching into the descent mode. This results in PROF selecting an arbitrary level off altitude, or, if a lower altitude is in the FCP altitude window, initiating a descent to that lower altitude. This anomaly was the result of a combination of conditions requiring that the ACT F-PLN have a STAR with a manual track (FM) leg, and entry of that STAR-Transition- RWY combination into the ACT F-PLN anytime prior to leaving the final cruise altitude for descent into the destination.

Efforts to replace manual heading (VM) legs with manual track (FM) legs are underway. These legs are constructed primarily to accommodate approach segments which anticipate further ATC vectoring to the inbound IAP course.

Due to an FMS software error, an excess distance of approximately 350 NM is added to the ACT F-PLN when a STAR ending with an FM leg is inserted. In addition to affecting the PROF function during climb or cruise, it will also affect fuel burn calculations and destination ETAs on the PROGRESS page, possibly resulting in an INSUFFICIENT FUEL message on the MCDU.

RECOMMENDED ACTIONS – In all cases in which these anomalies appear, the immediate cause has been associated with the insertion of a STAR-Transition-RWY combination containing a "MANUAL" FM leg into the ACT F-PLN. These legs can be identified in the arrival portion of the flight plan as they will be displayed in the MCDU with font above the "MANUAL" line showing an abbreviation of the last waypoint in the STAR along with track reference in the format of e.g., KRA075° (see figure below). This line will be followed by an F-PLN DISCONTINUITY. Deleting "MANUAL" FM leg eliminates anomalies.
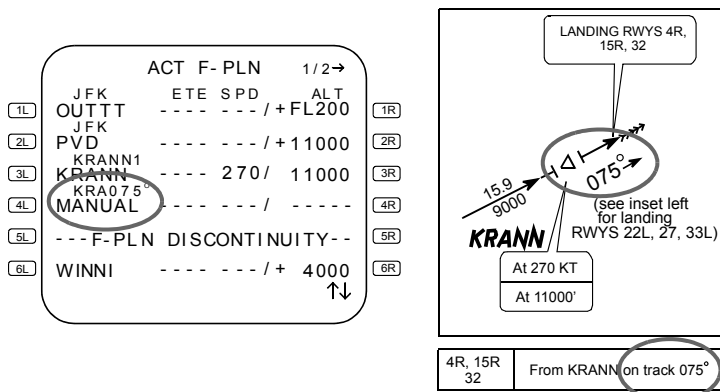
RECOVERY PROCEDURE

If a STAR-Transition-RWY combination containing an FM leg is entered into the ACT F-PLN while in climb or cruise, take the following steps to correct anomalies:

> *NOTE: If STAR-Transition-RWY combination is entered into the flight plan after descent has begun, there will be no PROF mode transition or F-PLN INIT anomalies, but erroneous time, fuel and distance calculations will be displayed.*

1. Disengage PROF by pulling the ALTITUDE SELECT knob to keep the aircraft climbing, or pushing it to maintain level flight.

2. Clear the "MANUAL" FM leg from the ACT F-PLN and replace it with a PBD on the required track at a distance of 25 NM, e.g. KRANN/075/25.

3. Re-INIT the planned cruise altitude on the F-PLN INIT page. It could take several seconds for the FMS to recalculate and return to the correct PERF mode (CLB or CRZ). If this does not happen within 30 seconds, assure that the FM leg has been removed from the ACT F-PLN and re-enter the CRZ LEVEL on the F-PLN INIT page.

4. Do not re-select PROF until the desired PERF mode is verified in the MCDU.

END INTERIM PROCEDURE 717-FMS-0006

The STAR page, called up from the LAT REV page, is similar to the SID page. It lists standard or custom arrivals as well as standard or custom runway approaches to the entered destination airport for selection by the pilot.

Access to the STAR selection page is normally made by a LAT REV from a point short of the destination. STAR cannot be selected from the FROM point. A LAT REV of the destination results in the destination becoming a waypoint in the flight plan in addition to being the destination. As the STAR, approach and any transitions are selected, they are inserted into the flight plan while deleting all waypoints in the flight plan beyond the revise point. When the approach is selected, the missed approach legs stored with that approach are automatically selected and strung into the revised flight plan.

For access to the STAR page, scroll to the end of the flight plan, choose a desired point short of the destination for the LAT REV (MOL), and push its associated LSK.

STEP: Push **F-PLN**

```
                ACT F-PLN     1/2→
         FROM     ETO     SPD      ALT
1L    T-P        1420    279/  FL310    1R
2L    ABBRV       40      .75 /   "     2R
3L    ABGVE       45       " /    "     3R
4L    MOL         53      .76 /   "     4R
5L    (T/D)      1527      " /    "     5R
6L    ---F-PLN DISCONTINUITY---         6R
                                   ↑↓
```

KB1-3-0185

STEP: Push **4L (MOL)**

```
        LAT REV FROM MOL
          N3756.9/W07836.7
1L                      STAR>         1R
2L   <AIRWAYS           HOLD>         2R
                      PROCEDURE
3L                       TURN>        3R
        NEXT WPT     NEW CO RTE
4L    *[      ]        [        ]*     4R
                      NEW DEST
5L                     [   ]*          5R
        ENABLE ALTN    RETURN TO
6L    *TO KMCN       ACT F-PLN>        6R
```

KB1-3-0209

For airplanes with the custom procedures option (program option), the STAR page will display a prompt for CUSTOM STARS in line 5L. Selecting this prompt allows direct access to the top of all the CUSTOM STARS available in the nav data base. A STD STARS* prompt will then appear in line 5L for possible selection.

The custom approaches list within the data base may also be selected by the CUSTOM APPRS* prompt in line 5R. Once the custom approaches prompt is selected, STD APPRS* prompt will move to line 5R for possible reselection.

From the LAT REV FROM MOL page, push LSK 1R to display the STAR page.

STEP: Push **1R**

```
         STAR ᴛᴏ KATL
   STD   STARS    STD   APPRS
[1L]  LGC8              ILSO8L  [1R]

[2L]  MACEY2            ILSO8R  [2R]

[3L]  RMG2              ILSO9L  [3R]

[4L]  SINCA3            ILSO9R  [4R]
       CUSTOM           CUSTOM
[5L]  <STARS            APPRS>  [5R]
                       RETURN TO
[6L]                   LAT REV>  [6R]
                          ↑
```

KB1-3-0210

Select the APPRS/runway first and then the appropriate STAR.

STEPS: 1.   Scroll To and Select **ILS26R**

2.   Push 2L **(MACEY2)**

3.   Push **2L**

```
              STAR to KATL

        STD  STARS      STD  APPR
 1L   MACEY2 <SEL><SEL> ILS26R    1R
          TRANS         ADDL APPRS
 2L   MOL      <SEL>         ILS08L  2R
        ADDL
 3L   LGC8                   ILS08R  3R

 4L   RMG2                   ILS09L  4R
          CUSTOM           CUSTOM
 5L   <STARS               APPRS>   5R
                         RETURN TO
 6L   INSERT              LAT REV>   6R
                            ↑
```

KB1-3-0211A

STEP: Push **6L**

```
      APPR  TRANS ᴛᴏ KATL
     STD STARS        STD  APPR
1L   MACEY2 <SEL> <SEL> ILS26R   1R
       TRANS               TRANS
2L   MOL  <SEL>            ATL *   2R

3L                                3R

4L                                4R

5L                  RETURN TO     5R
6L               ACT F-PLN>       6R
                         ↑
```

KB1-3-0324

If an approach transition is automatically selected, the display is returned to the originating F-PLN after *INSERT is selected. (The * is displayed to the left of the INSERT prompt for the ACT F-PLN, but is not displayed with the ALT F-PLN or SEC F-PLN.)

If an approach transition is not automatically selected, the APPROACH TRANSITION page is displayed after inserting to allow selection by pushing an LSK. The display is returned to the originating F-PLN page after selecting an approach transition or by selecting the RETURN prompt in line 6R if no transition is desired. (The * is only displayed next to the active primary F-PLN approach transitions.)

Custom arrivals, approaches, and their transitions are customer-defined and customer unique. Page operation using customer terminal procedures is the same as that previously described for standard terminal procedures.

Switching between standard and custom arrivals/transitions and approaches/transitions is accomplished by pushing LSK 5L and LSK 5R, respectively. This can be accomplished any time the prompts are displayed. The STAR page will allow selection of procedures, either custom or standard, as selected in lines 5L and 5R. Following a switch from custom or standard or vice versa, the selections already made by the pilot will be retained for display and insertion until another selection is made.

If a nonprecision approach has been selected, boxes will be displayed in line 2R for entry of a MIN PROF altitude (limited from 200 feet to 5000 feet above airport elevation). The *INSERT prompt shall be available after a MIN PROF altitude has been entered. Editing the MIN PROF altitude after the selected nonprecision approach has been inserted causes the entered MIN PROF value to be displayed in small font with an asterisk. Editing the MIN PROF value and confirming it by pushing LSK 2R will cause the MCDU to revert to the F-PLN page without restringing the STAR/APPR, and without initiating a descent path reconstruction. Selecting line 6L will restring the selected STAR/APPR and cause the MCDU to revert to the F-PLN page. See Approach Section for nonprecision approach description.

Approach and Go-Around Page Review

The APPROACH page may be selected (after takeoff) by pushing the TO/APPR key. A typical approach page is shown below.

STEP: Push **TO/APPR**

```
       APPROACH KATL RW26R
  CLEAN MIN                 L W
1L│191                  100.6   1R
  SLAT EXT MIN         LENGTH
2L│149                  9000    2R
  FLAP 18° MIN            ELEV
3L│138                    990   3R
                    TIMER MMSS
4L│40/EXIT               [   ]  4R
  VAPP     VREF
5L│138     133                  5R

6L│*25/EXIT      GO AROUND>      6R
```

KB1-3-0227A

The pilot may insert values into line 5L VAPP and 4R TIMER MMSS data fields. All other fields are FMC calculations that cannot be altered.

1L	**2L**	Minimum maneuvering speeds (1.23 Vstall) for a clean and slat extended configuration computed using destination predicted weight and altitude at the predicted slat extension point.
3L		Minimum maneuvering speed for flaps 18° using weight and altitude at the destination predicted 18° flap extension point.
4L	**6L**	Available slat/flap settings for landing with the chosen configuration in LARGE font without an *(asterisk). Pushing the *(asterisked) selection line 6L causes the settings to swap with the new setting in line 4L display in large font.
5L		VAPP and VREF - VAPP is computed as VREF + 5. VREF cannot be changed by the pilot but VAPP can be changed to allow for landing winds.
		VREF is 1.23 x Vso
1R		LW - FMC computed landing weight.
2R		LENGTH - Runway length from the data base.
3R		ELEV - Runway elevation from the database.
4R		TIMER MMSS - Timer value in minutes and seconds (MMSS) used to initialize the EIS displayed timer. May be cleared by the CLR key. The timer can be set to a max of 59 minutes 59 seconds.
6R		GO AROUND> - GO AROUND prompt is displayed only during cruise, descent or approach phases of flight. Pushing LSK 6R provides access to the GO AROUND page.

As an example of the selection and swapping when LSK 6L is pushed, the resulting display is shown in the following screen.

STEP: Push **6L**

```
         APPROACH KATL RW26R
    CLEAN MIN                    LW
1L  191                      100.6    1R
    SLAT EXT MIN            LENGTH
2L  149                      9000     2R
    FLAP 18° MIN             ELEV
3L  138                       990     3R
                        TIMER MMSS
4L  25/EXIT                  [   ]    4R
    VAPP      VREF
5L  141       136                     5R

6L  *40/EXIT          GO AROUND>      6R
```

KB1-3-0487

Pushing LSK 6R provides access to the GO AROUND page as shown in
the following screen.

STEP: Push **6R**

```
GO AROUND KATL RW26R
                     CLB THRUST
                         2490
         VFR             ACCEL
         139             3990
         VSR          EO ACCEL
         219             1790
         CLEAN MIN
         215
                       THRUST
                        LIMITS
                     RETURN TO
                     APPROACH>
```

KB1-3-0228A

This page is similar to the TAKEOFF page and is accessed either from the APPROACH page or automatically when either the GA button on the throttles is pushed. The climb thrust reduction and acceleration altitudes default to 1500 feet and 3000 feet above arrival waypoint elevation. They may be altered by the pilot.

- VFR is calculated as current configuration VREF + 50 (50 is from performance database.

- VSR is the higher of V3 or VFR and is lower bounded by stick-shaker speed.

- Clean minimum airspeed is computed the minimum speed with clean configuration using current weight and altitude.

   NOTES: VAPP edits performed on the APPROACH page will be retained until either the pilot clears the edit, performs another edit, or the FMS transitions through DONE phase of flight.

*During a go-around with the FCP altitude set lower than the
ACCEL or CLB thrust altitudes, the values will be
automatically edited to the FCP altitude when the FCC
transitions to ALT CAPTURE mode. Upon altitude capture, the
FMS speed target will become the climb speed target VCL.
Thrust reduction will occur when the FCC enters ALT HOLD
mode.*

Transition to Descent

The transition from cruise to descent occurs when the airplane sequences
the T/D in the vertical flight plan. The transition also occurs when the pilot
initiates an early descent by lowering the FCP CLR ALT and pulling or
turning the V/S wheel.

Intentionally
Blank

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Intentionally
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The descent phase normally occurs when the airplane departs the entered CRZ FL and extends until flaps are extended for landing. The descent vertical path is calculated by starting from the destination and computing in the reverse direction to satisfy decelerations, configuration changes, altitude and airspeed constraints, attitude speed limits, forecast winds, PRESELECTED DES speed, idle thrust and other constraining factors. This computation identifies the T/D.

When PROF and FMS speed modes are engaged and when cleared for descent, the pilot should set the lower altitude in the FCP altitude window without pulling the altitude knob. This removes the existing altitude constraint, and allows the airplane to descend.

> **CAUTION: During descent, if an altimeter BARO change of more than .20 IN (~6.8 HP) is made within 2000 feet of an FMS PROF mode constraint altitude, FMS PROF mode may be unreliable for vertical guidance and level-off, unless the altitude restriction is also selected in the FCP altitude window. Subsequent FMS PROF mode operation will be normal.**

In descent with FMS PROF and speed engaged, a speed on thrust mode will be used when on path. The FMA will display THRUST in the speed window and PROF in the altitude window. Slight throttle movements may be seen in descent in order to maintain the FMS SPD target.

For discretionary descents, just prior to descent the airplane may decelerate or accelerate from cruise speed to the vertical profile descent speed target if it is different from the cruise speed. Normally, the cruise and descent speed is the same unless it was either pilot-edited in PRESELECT DES or the CRZ FL is less than approximately FL250.

> *NOTE: During descent, increasing the Captain's BAROSET may initially cause the airplane to slightly accelerate above the current speed target.*

The chosen descent speed is maintained until approximately 2000 feet above the speed limit altitude (default 10,000 feet) where it changes to speed limit (default 250 KIAS) - 5 knots.

When engaged in FMS PROF and AFS speeds, the airplane will continue to control to the FMS path and AFS speed.

NOTE: In descent between 10,000 and 12,000 feet FMS speed edits above 245 knots will not be targeted due to the 250/10K speed restriction. The pilot may perform FMS speed edits in this area by first transitioning into cruise by entering a cruise flight level on the INIT page.

As descent progresses, the FMC calculates the appropriate deceleration distance from destination to slow to the approach speeds. When the flaps are extended, the FMS transitions to the approach phase.

Thrust limit during descent is maintained at CRZ limit until the flaps and slats are lowered for landing. See the following illustration for a descent F-PLN

```
              ACT F-PLN     1/2 →
         FROM    ETO   SPD      ALT
 1L   ODF      1533  285   FL330    1R
         MOL
 2L   MACEY      38   279   /  FL265   2R
         MACEY2
 3L   WOMAC      40    "    /  FL212   3R
         MACEY2
 4L   LOGEN      42    "    /  17400   4R
         MACEY2
 5L   ATL        47   245   /   8680   5R
         H272°
 6L   --F-PLN DISCONTINUITY--         6R
                              ↑↓
```

KB1-3-0218A

Early Descents

Descent description is also included in the Cruise Section. Early descents are accomplished at the ECON or pilot-selected speed. When below path is initiated by pilot action, engaging PROF will result in the FMS maintaining the same guidance mode as previously selected by the pilot. A below path situation could reintercept the descent path or result in leveling at the FCP altitude or an FMS constraint altitude, whichever occurs first, until path reinterception. The FMA mode will display PITCH in the speed window and IDLE in the altitude window.

A typical early descent in PROF mode would occur as follows. Prior to T/D, clearance to descend is received. The FCP altitude is preselected to the cleared altitude and the V/S wheel is used to select 1000 feet/minute descent. PROF mode is reengaged causing the FMS to fly -1000 feet/minute until the descent path is intercepted and flown.

If PROF mode is engaged in descent and a flight plan change occurs resulting in the FMS being below path the FMS will select a nominal rate of -750 feet/minute descent until intercepting the descent path or target altitude. The FMA mode will display THRUST in the speed window and V/S in the altitude window.

Late Descents

Late descents result in a more complex situation. The T/D is computed as an engine idle descent path and if the airplane attains a position above path, a speed change or ADD DRAG must be used to regain the descent vertical path. Above path conditions can be the result of late clearance to descend from ATC, altitude constraint entry during descent or strong tailwinds not entered in the FORECAST WIND page. If more than 300 feet above descent path, the FMS speed will only increase if the FMS speed mode is ECON or POLICY. The FMS speed target will not increase if EDIT FMS speed is being used. In the MACH range of descent, the ECON speed target will become ECON +0.02 Mach number, but will not exceed Mmo -0.02, or Mmo -10 knots KCAS, whichever is more restrictive. In the Calibrated Airspeed (CAS) range of descent, the FMS speed target will increase to ECON +20 knots but will not exceed VMO -10 knots KCAS. To aid in regaining the path, speed brakes may be needed. When the path can be made without speed brakes, the RMV DRAG message is displayed. If an altitude constraint cannot be met, the MCDU message ALTITUDE ERROR AT XXXXXXX is displayed. XXXXXXX is the constraint waypoint name. Late descents are accomplished in a SPD/IDLE mode. The FMA will display PITCH in the speed window and IDLE in the altitude window.

If on path and airplane speed is target speed + 10 knots fast, the ADD DRAG message is displayed on the ND and cleared when the speed is only 3 knots fast. As speed decays below target -5 knots, the RMV DRAG message is displayed. If on path and speed constraint cannot be met, the message SPD ERROR AT XXXXXXX is shown.

Descent speed limit - In PROF mode if airplane speed is above the limit speed at limit altitude plus 500 feet, the FMC target altitude will become the descent speed limit altitude and the airplane will level. The message SPEED LIMIT EXCEEDED will appear it the airplane must fly level. When airplane speed is 3 knots lower than the limit speed, the message is cleared and the airplane resumes descent.

If engaged in FMS PROF mode and AFS speeds, the airplane will not level off at the descent speed limit (10,000 feet default), if the airplane speed is above 250 knots.

> NOTES: *During descent, a potential overspeed condition can occur in AFS speed control. To avoid this overspeed condition, prior to the T/D, preselect the glareshield control panel (GCP) speed to 350 or 310 maximum respectively as follows:*
>
> • *If landing fuel is expected to be above 25,000 pounds edit to 350 KIAS.*
> • *If landing fuel is expected to be below 25,000 pounds, edit to 310 KIAS.*
>
> *ADD DRAG and RMV DRAG are advisory messages. The amount of drag added or reduced is at the discretion of the pilot.*
>
> *The ADD DRAG message is not displayed in cases of the FMS level flight segments when airspeed is higher than required.*
>
> *In approach phase, below path, the FMS will command altitude hold until on path is achieved.*
>
> *It is the pilot's responsibility to comply with the 250 KIAS constraint below 10,000 feet.*

Below Path

Early descents result in below path conditions. Speed control will be ECON speed or pilot-edited. If the early descent was initiated by pilot action, when PROF is engaged the FMS will maintain the same guidance mode as previously selected by the pilot. The airplane would then reintercept the profile from below or level at the FCP or FMS altitude constraint until the vertical path is acquired and the FCP altitude constraint is lowered.

If the below path condition occurred while the FMS PROF mode was engaged, the FMS will select a rate of -750 feet per minute until the profile is acquired.

During the approach phase (FLAPS extended), the FMS will command altitude hold until on path is achieved.

The intercept point to the vertical profile will be displayed on the ND as I/P.

To reenter the cruise phase of flight a new cruise altitude must be entered on the F-PLN INIT page of the MCDU. When this is done, a new descent profile and T/D will be displayed.

> NOTE: If above or below path, the intercept PROF point (I/P) as displayed on the ND can be expected to adjust as a result of vertical speed changes during air mass descents.

Descent Performance Change

The descent PERF page is listed to change airplane performance during descent. Time and distance to a pilot-selected altitude can be computed, and access to DESCENT FORECAST and THRUST LMITS pages can be made from this page. Transition altitude from the NAV database is displayed for information.

STEP: Push **PERF**

```
               ECON DES
     PATH ERROR          PRED TO
 1L    3860HI  12LONG       8000   1R
     ECON         UTC        DIST
 2L .764/279    1541          62   2R
     MAX DES
 3L *330        1536          43   3R
     EDIT
 4L  [    ]                         4R
                        DESCENT
 5L            FORECAST>            5R
     TRANS   OPT/MAXFL   THRUST
 6L 18000   ---/368    LIMITS>      6R
```

KB1-3-0219A

Descent performance modes of ECON (or POLICY), MAX DES, and EDIT are available in 2L, 3L, and 4L.

MAX DES is the speed that provides the maximum rate of descent. POLICY mode may be entered only during preflight but may be cleared to ECON mode with the CLR key. Predictions of distance and time to the pilot-entered altitude in 1R are calculated. Without a pilot-entered altitude, the FCP altitude is displayed in small font and used for computations.

If an altitude conflict exists between the FMS target altitude and the FCP selected such that the airplane is between the two, raising the FCP altitude above current airplane altitude, ??? is displayed on the left side of the title line and an immediate level off is performed.

> NOTES: *When FMS SPD mode is disengaged, the ACTIVE mode will not automatically revert to ECON. When FMS speeds are reengaged, the ACTIVE mode will be the last engaged FMS SPD mode (ECON, EDIT or MAX). If ECON was not the last engaged mode, EDIT or MAX will become active and a second FMS SPD button push will engage ECON.*
>
> *Any edits done to descent speeds must be cleared prior to approach in order for FMS approach speeds to function.*

1L displays the airplane deviation from the FMS descent path. The vertical deviation is first displayed in feet followed by the horizontal deviation in NMs. The values indicate the position of the airplane with the respect to the FMS descent path.

Vertical Descent Revisions

Altitude and speed restrictions may be entered at waypoints either directly into F-PLN or via a VERT REV in the same manner as Vertical Climb Revisions. Any vertical revisions, or for that matter, lateral revisions which disturb the vertical descent profile, will result in an above path or below path situation which resolved to an on path condition. While the performance computations are made, the airplane will fly the existing vertical descent profile.

Holding

There are three types of FMS holding patterns:

- Hold to a Manual Termination

- Hold to a Fix

- Hold to an Altitude

Hold to a Manual Termination (HM)

This holding function is used to insert a holding pattern with a pilot-controlled termination into the flight plan or to modify an existing holding pattern. The holding pattern may be inserted at any waypoint or the FROM waypoint for holding at the present position. A revision at an existing holding fix is permitted. Any inserted change becomes effective upon the next crossing of the holding fix. Changes are activated immediately if made on the active leg prior to entry of the holding pattern. A LAT REV (left LSK) provides access to the HOLD selection prompt and the holding page.

> **_WARNING:_** **When entering procedure turns or holding airspace, FMS NAV may not constrain the airplane from maneuvering beyond protected airspace. Pilots are responsible for procedural compliance, both in entry procedure and airspeed limits. The latter can be accomplished with an FMS speed constraint or FCP selected speed.**

An example of holding at MACEY are presented in the following illustrations.

 STEP: Push **F-PLN**

```
                  ACT F-PLN      1/2→
            FROM    ETO     SPD       ALT
  1L    ODF     1533    285 / FL330     1R
            MOL
  2L    MACEY    38     279  /   FL265   2R
            MACEY2
  3L    WOMAC    40      "   /   FL212   3R
            MACEY2
  4L    LOGEN    42      "   /   17400   4R
            MACEY2
  5L    ATL      47     245  /    8250   5R
            C078°
  6L    AJAAY    49     228  /   +5000   6R
                                  ↑↓
```

KB1-3-0472

STEP: Push **2L**

```
     LAT REV FROM MACEY
         N3420.0/W08341.3
 1L                        STAR>    1R

 2L  <AIRWAYS              HOLD>    2R
                        PROCEDURE
 3L                        TURN>    3R
       NEXT WPT      NEW CO RTE
 4L  *[       ]        [      ]*    4R
                        NEW DEST
 5L                       [   ]*    5R
       ENABLE ALTN     RETURN TO
 6L  *TO KMCN        ACT F-PLN>     6R
```

KB1-3-0209A

STEP: Push **2R**

```
     STANDARD HOLD AT MACEY
     INB CRS          TIME/DIST
 1L  221°              1.5/15.0     1R
     TURN
 2L  R                             2R
     TRIP          LIMIT UTC/FUEL
 3L   0.3           ----/---.-     3R
     RTE RSV/%        ALTN/FUEL
 4L  1.0/05.0         KMCN/1.0     4R
     FINAL/TIME
 5L  2.0/0030        CLR ALTN*     5R
                     RETURN TO
 6L  *INSERT         LAT REV>      6R
```

KB1-3-0221A

An explanation of holding page data lines follows:

Title Page

> HOLD AT - (Waypoint or PPOS). Previously modified holding pattern or pilot-defined holding pattern already defined for the waypoint PPOS is a special case FROM waypoint holding page.

> DATABASE HOLD AT - (Waypoint). Enroute holding pattern defined from the nav database.

> STANDARD HOLD AT - (Waypoint). Holding pattern parameters were defaulted by the FMS.

1L   INB CRS - Holding inbound course defaults to:

1. Database or pilot-defined holding pattern inbound course.

2. Inbound course from the flight plan.

3. Current track (when page accessed) for PPOS or discontinuity holding.

2L   TURN - Default is right (R) but pilot may enter left (L) or (R).

3L   TRIP - FMC calculated trip fuel from the holding fix to the destination.

4L   RTE   RSV/% - Route reserve fuel from the holding fix to the destination.

5L   FINAL/TIME - Fuel and time allowance for holding at the alternate.

6L   *INSERT - Inserts hold into F-PLN.

1R   TIME/DIST - Time (in minutes) and leg distance of holding pattern. Default time is 1.0 minute at or below 14,000 feet and 1.5 minutes above 14,000 feet. The altitude used to determine this is the predicted altitude at the revise point when HOLD page was accessed. For a PPOS HOLD, the airplane altitude at the time the FROM point was accessed is used. Either time or distance may be entered as the leg defining parameter but not both.

2R   REVERT TO STANDARD - Return to default hold parameters in existence before alteration by the crew. REVERT TO DATABASE is displayed when the hold parameters from the nav database are modified and inserted by the crew. Selecting 2R causes previously displayed data to return.

Three minutes prior to MACEY, the airplane will begin a deceleration to the holding speed. The holding speed, like any other speed, is bounded by upper and lower speed envelopes (VMAX - 10 and VMIN + 5).

> *NOTES: FMS holding speeds default to the performance database holding speed, limited by the ICAO speed limits and can be edited as necessary.*
>
> *If using FMS ECON SPD, once flaps are extended the FMS speed target will be VMIN + 5. If in an FMS EDIT, the speed target will remain at the EDIT speed during a hold, even when flaps are extended.*

If descent in holding is required, the PROF descent rate defaults to 750 ft./min descent

As MACEY is approaching, the ACT F-PLN page and ND display will look similar to the following displays.

```
                ACT F-PLN      1/2 →
       FROM                   EXIT AT
 1L   MACEY      1538             FIX*   1R
                LIMIT      HOLD
 2L   HOLD R    0028    SPEED   230      2R
      C221°     ETO   SPD
 3L   MACEY     1542      230/FL265      3R
      MACEY2
 4L   WOMAC       44      330/  FL212    4R
      MACEY2
 5L   LOGEN       46       " / 14770     5R
      MACEY2
 6L   ATL         51      227/  6790     6R
                               ↑↓
```

KB1-3-0223A

> *NOTES: Hold speed edits must be entered by the pilot via the SP into appropriate LSK.*
>
> *Lateral revisions from holding fix must be entered at LSK 3L. Revisions from LSK 1L will result in loss of holding pattern in FLT PLN and on ND.*

ND Display
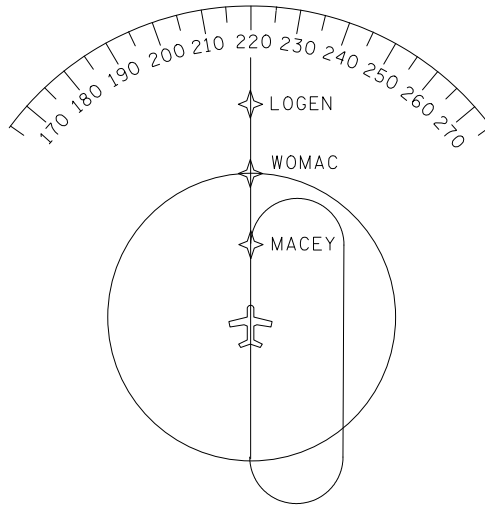
KB1-3-0224A

As an example, ATC has instructed the pilot to hold on the 240-degree inbound course to MACEY left turns. As shown on following page, 240 is typed in the SP and entered in 1L causing the REVERT TO STANDARD prompt to appear in 2R.

STEPS: 1.   Type **240 in SP**

2.   Push **1L**

3.   Type **L in SP**

4.   Push **2L**

```
              HOLD at MACEY
       INB CRS           TIME/DIST
 1L    240°               1.5/15.0    1R
       TURN             REVERT TO
 2L    L                 STANDARD     2R
       TRIP            LIMIT UTC/FUEL
 3L     0.3              ----/4.3     3R
       RTE RSV/%         ALTN/FUEL
 4L    1.0/05.0          KMCN/ 1.0    4R
       FINAL/TIME
 5L    2.0/0030         CLR ALTN*     5R
                         RETURN TO
 6L    *INSERT           LAT REV>     6R
```

KB1-3-0488

3R LIMIT UTC/FUEL Calculated values in LARGE font are shown
and pilot entry is not allowed. Dashes displayed if value not
available.

LIMIT UTC - Predicted time at which FOB is equal to LIMIT
FUEL.

LIMIT FUEL - Fuel necessary to complete the flight plan with no
changes to fuel reserves.

(LIMIT FUEL = TRIP + RTE RSV + ALTN + FINAL)

The entry in 3R is not displayed until the holding pattern is
inserted into the F-PLN. Then it is displayed on both F-PLN and
the holding page.

4R ALTN/FUEL - Alternate airport and to fuel to fly from the
destination airport to the alternate airport. If there is no
alternate, then NONE is displayed but a fuel entry may be
entered.

5R CLR ALTN - Displayed if an ALTN destination exists and the
revise point is in the primary portion of the F-PLN. Pushing 5R
when the prompt is displayed, deletes the alternate destination
and route legs setting ALTN fuel to zero.

It is conveniently placed on this page so the pilot can cancel the
requirement for altitude fuel should the flight crew deem it
feasible, thereby displaying additional holding fuel and time.

Pushing LSK **6L** *INSERT inserts the holding pattern into the flight plan.

STEP: Push **6L**

```
                    ACT F-PLN      1/2 →
          FROM                  EXIT AT
  1L    MACEY    1538              FIX*   1R
                 LIMIT     HOLD
  2L    HOLD L   0028    SPEED   230      2R
          C240°    ETO    SPD
  3L    MACEY    1542      230/FL265      3R
          MACEY2
  4L    WOMAC      44     330/  FL212     4R
          MACEY2
  5L    LOGEN      46      " /  14770     5R
          MACEY2
  6L    ATL        51     227/  6790      6R
                                   ↑↓
```

KB1-3-0489

After computations are completed, the LIMIT time and holding ICAO speed are displayed as shown.

The EXIT AT FIX* prompt in 1R is displayed three minutes prior to holding entry for a manually terminated holding pattern (Pilot selects exit). For a navigation database holding pattern which requires one turn in holding, the EXIT AT FIX prompt is displayed at initial holding fix passage. Pushing this prompt selects exit of the holding pattern and displays the prompt RESUME HOLD*. Pressing RESUME HOLD*, reinserts holding and displays EXIT AT FIX. Upon selecting EXIT AT FIX, the airplane turns immediately to the holding fix and departs holding after arrival at the fix.

For an HF or HM hold when localizer or VOR mode is captured, an AUTOMATIC * EXIT at FIX will occur.

```
           ACT F-PLN      1/2→
      FROM
1L    MACEY    1538 RESUME HOLD*    1R
             LIMIT        HOLD
2L    HOLD L   0028     SPEED   230    2R
       C240°    ETO    SPD
3L    MACEY    1542        230/FL265    3R
       MACEY2
4L    WOMAC     44       330/  FL212    4R
       MACEY2
5L    LOGEN     46        " /  14770    5R
       MACEY2
6L    ATL       51       227/  6790    6R
                              ↑↓
```

KB1-3-0490

Hold to a Fix (HF)

A holding pattern associated with approach procedures will require a selection of EXIT AT FIX (LSK 1R) in order to exit the holding pattern. This holding in lieu of a procedure turn is used to align the airplane with the final approach course and is part of a published approach procedure. This holding pattern is selected when an approach is selected from the STAR page and may not be revised by the crew. This holding pattern may be identified on the F-PLN page as 'HOLD L' (small font) being annunciated above the waypoint. (The EXIT AT FIX prompt will be displayed in 1R with this holding pattern.) This holding pattern will be further discussed in the approach portion of this section as it is associated with the approach phase of flight.

Entry to the HF pattern will be direct, parallel or teardrop as in a manual hold.

The vertical profile will also be flown as depicted in the published pattern when the fix waypoint is sequenced.

Hold to an Altitude (HA)

An additional type holding pattern, which is automatically terminated upon reaching an altitude, can be placed in the flight plan from the navigation database. In the F-PLN it will appear as HOLD L. Upon entering this holding pattern, the airplane will climb to altitude HHHHH where the pattern is terminated and the airplane sequences the waypoint and hold. The EXIT AT FIX prompt is not displayed and holding speed targets are not ensured to conform to ICAO maximum speeds.

If descent in holding is required, to PROF descent rate defaults to 750 ft./min descent.

This type of holding pattern is designed for unusual departures where a hold in climb is needed for terrain avoidance and is not pilot entered.

Speeds in the HA pattern are not controlled to standard holding speeds as is the case with the manual hold. Therefore, it may be necessary for the pilot to manually edit speed.

> NOTE: The FCP altitude window should always be set to the currently assigned altitude to prevent clearance deviations.

Alternate Diversion

Early alternate divert decisions are supported by the FMS with the ENABLE ALTN TO XXXX function of the LAT REV page. Pushing 6L, the ENABLE ALTN TO function, inserts the alternate portion of the active F-PLN into the primary portion of the flight plan, thus activating it. The function is available for any fixed waypoint in the primary F-PLN. When used, the active flight plan including speed, altitude and time constraints will be beyond the point from which the lateral revision is made. Routing becomes the revise point, F-PLN DISCONTINUITY, original destination as a flight plan waypoint and alternate routing to the new destination. The new cruise altitude will be the ALTN cruise altitude, which may be on the F-PLN INIT page. Normal F-PLN modifications may be made after the alternate flight plan has been incorporated into the primary F-PLN.

If alternate diversion via the ENABLE ALTN TO function is desired, it may be accomplished during the missed approach but the routing will be from the revise point to the destination as a waypoint and then to the alternate airport. The pilot may desire to accomplish a DIR TO or NEW DEST revision to accomplish the divert.

> NOTE: If ENABLE ALTN is not used, selected LAT REV and inserting a NEW DEST airport is required in order to tell the FMC to do a search for the airport runways and STARS associated with the alternate airport.

Transition to Approach

Transition to approach occurs when the flaps are extended.

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Intentionally
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In this section the approach speed targets and thrust modes, different approaches, and post approach options will be detailed. The FMS vertical speed and thrust profile will be discussed first.

The FMS speed target passing the descent speed limit will be 5 knots less than the speed limit, normally 245 KIAS. Speed targets will then reflect any speed restrictions as entered into the F-PLN at subsequent waypoints.

Approach Speeds

While in ECON speed, FMS approach speeds will decelerate from 245 KIAS to VAPP speed in discrete steps. The first deceleration will be from 245 to "clean min" + 20. The solid magenta circle FMS speed target will drop to that speed. At the next deceleration point, the FMS speed target will drop to "slat extend min" + 20. If the slats have not yet been extended, this next available speed target will be displayed as an open magenta circle limited by the current configuration VMIN amber "foot." This will prompt the pilot to extend the slats. Upon slat extension, VMIN reduces accordingly for the new configuration, thus allowing display of "slat extend min" + 20 as a solid magenta circle FMS speed target. The next deceleration displayed will be "flap 18° min" + 5. Again if flaps have not yet been extended, an open magenta circle will be displayed limited by the current configuration VMIN amber "foot". This indicates that the pilot should extend flaps. A final target of VAPP will be displayed at the last deceleration point. VAPP = VREF + 5 for the selected landing configuration (25° or 40° flaps entered on the APPROACH page).

> NOTE: Once flaps are extended. The FMS target will become VMIN + 20 for the current configuration for flaps less that 18°and VMIN +5 for flaps greater than or equal to 18°.

While in EDIT mode, the ECON approach speeds will be displayed as open magenta circle FMS available speed targets at each deceleration point ("clean min" + 20, "slat ext min" + 20, "flap 18° min" + 5 and VAPP), limited by the current configuration VMIN amber "foot" as described in ECON mode above. An FMS speed edit may be done at any time.

> NOTES: Once established on the low altitude speed limit (10,000 feet/245 KIAS), FMS speed edits are absolute. That is, when engaged in FMS edit speed, the speed target will remain fixed at 245 or lower, depending on the edit throughout the approach until one of the following occurs:
>
> • Another speed edit is performed.

- *ECON is selected.*
- *A speed constraint exists in the flight plan.*

VAPP edits performed via the MCDU on the APPROACH page will be retained until the pilot clears the edit, performs a new edit, or the FMS transitions through the DONE phase of fight.

Ideally the descent and approach speed targets should define an idle thrust smooth deceleration to VAPP where power is used to maintain VAPP for the remaining approach path. In reality, altitude restrictions, computed versus actual drag, and other variables can affect the timing and location of the above speed changes.

The active thrust limit changes to CLB thrust limit when the slats are lowered for landing. When GA is selected below the GA thrust reduction altitude, the thrust limit mode will change to GA mode. When the airplane altitude is equal to or greater than the GA thrust reduction altitude, the thrust limit mode changes back to CLB.

Approach Page Review

The APPROACH page may be selected (after takeoff) by pushing the TO/APPR key. A typical approach page is shown below.

 STEP: Push **TO/APPR**

```
        APPROACH KATL RW26R
     CLEAN MIN            LW
1L   191              100.6     1R
     SLAT EXT MIN     LENGTH
2L   149               9000     2R
     FLAP 18° MIN       ELEV
3L   138                990     3R
                   TIMER MMSS
4L   40/EXIT          [   ]     4R
     VAPP      VREF
5L   138       133              5R

6L   *25/EXIT      GO AROUND>   6R
```

KB1-3-0227A

The pilot may insert values into line 5L VAPP and 4R TIMER MMSS data fields. All other fields are FMC calculations that cannot be altered.

ILS Approach

During cruise or early descent, a LAT REV to a revised waypoint short of the destination and STAR selection can include selecting the ILS approach to the active runway at the destination. The associated ILS approach contains waypoints located to position the airplane at a point where the ILS can be captured.

FMS NAV sends steering guidance to the AP/FD to intercept the localizer with a 20-degree intercept. Vertical altitude targets are sent to the AP/FD that meet altitude constraints along the approach path and position the airplane to intercept the glideslope. Pushing the APPR/LAND button with a valid localizer signal arms the AP/FD to capture the localizer and glideslope and if AUTO FLIGHT is engaged, controls the airplane to autoland touchdown and rollout.

FMS SPD, if engaged, will provide speed targets during the approach.

The FMC tunes the ILS Localizer (and DME if available) when the airplane is within 25 NM of the destination. If the airplane is within 20 NM of the destination and invalid data is continually received for 3 seconds, the MCDU SP message ILS UNTUNABLE is displayed. The frequency should be confirmed by the crew and if necessary manually tuned.

If the ILS is tuned by entering a frequency, the FMS will not look up the identifier from the NAV data base for MCDU display. The identifier will, however, be decoded and displayed on the PFDs and NDs.

The flight plan for ILS 26R approach to Atlanta is shown as follows:

```
              ACT F-PLN      1/2 →
        FROM      ETO   SPD      ALT
 1L    ATL      1551  227  /   6790    1R
 2L    --F-PLN  DISCONTINUITY--        2R
 3L    FREAL    1553  179  /   5000    3R
         C272°                  -3.0°
 4L    AJAAY      55  136  /   2640    4R
         C272°                  -3.0°
 5L    RW26R      57   "   /    990    5R
         H272°
 6L    1600     ----  ---- /   -----   6R
                                ↑↓
```

KB1-3-0491

Nonprecision Approaches

The following nonprecision approaches are available for selection from the NAV data base: GPS, IGS, LDA, LOC (front CRS only), NDB, RNAV, and VOR.

If a nonprecision approach has been selected, boxes shall be displayed in LSK 2R for entry of a MIN PROF altitude (limited from 200 feet to 5,000 feet above airport elevation). The *INSERT prompt shall be available after a MIN PROF altitude has been entered. Editing the MIN PROF altitude after the selected nonprecision approach has been inserted causes the entered MIN PROF altitude value to be displayed in small font with an asterisk. Editing the MIN PROF altitude value and confirming it by pushing LSK 2R will cause the MCDU to revert to the F-PLN page without restringing the STAR/APPR and without initiating a descent path reconstruction. Selecting LSK 6L shall restring the selected STAR/APPR and cause the MCDU to revert to the F-PLN page.

> NOTE: The FMS PROF mode will automatically disengage at the pilot-entered MIN PROF altitude and the airplane will revert to AFS basic modes. AFS basic modes are ALT HOLD or VERT SPEED depending on the GCP altitude setting and AFS pitch mode reversion criteria.

```
                  STAR to KATL
         STD    STARS  STD      APPR
  1L   MACEY2 <SEL><SEL>  VOR27L   1R
         TRANS             MIN PROF
  2L   NONE                 1480FT   2R
         ADDL  STARS  ADDL   APPRS
  3L   LGC8                ILSO8L   3R

  4L   RMG2                ILSO8R   4R
         CUSTOM            CUSTOM
  5L   <STARS              APPRS>   5R
                         RETURN TO
  6L   *INSERT            LAT REV>   6R
                              ↑
```

KB1-3-0473

LOC Only Approach (Program Option)

For purposes of the FMS, a LOC ONLY Approach means that a full ILS approach was selected from the STAR page and that the glideslope portion is either temporarily unavailable or not desired to be used. In this case, a MIN PROF field is not presented when inserting the approach, therefore, descent in PROF MODE is not possible below the FAF altitude. The vertical path deviation indication on the ND should not be used for vertical path guidance beyond the FAF as it does not represent the correct descent path for the approach.

The NAV RAD page includes the option of selecting LOC ONLY when a runway heading is entered into the localizer course field (4L). Selecting this option by pushing LSK 5L provides ILS localizer guidance with disabled glideslope guidance. Upon receiving the LOC ONLY mode request the AFS is armed to capture the localizer and LOC ARMED is annunciated on the FMA. When the FCC localizer capture criteria are satisfied, the AFS captures and controls the airplane to the ILS localizer using the same FCC control laws as when APPR/LAND is selected, but any glideslope signals are ignored. Descend to MDA in vertical speed or FPA modes. Engaging any other lateral control mode (NAV, APPR/LAND, or VOR ARM), or pushing HDG/TRK cancels the LOC ONLY mode.

LOC Approach

For purposes of the FMS, a LOC approach means that a localizer approach was selected from the NAV data base and no glideslope exists. In this instance, vertical path guidance is programmed by the FMS down to the MDA.

VOR Approach (Using VOR Tracking)

VOR approaches may be flown in the NAV and PROF modes by selecting the appropriate VOR database approach and engaging NAV for lateral guidance and PROF for vertical guidance down to the MDA or by following raw data with the use of appropriate FCP controls. VOR approaches may be flown in NAV, TRACK, HEADING or VOR.

The NAV RADIO page, discussed in the Preflight section, has the option to select VOR ARM (2L and/or 2R) when a VOR frequency is tuned with a course entered into 1L or 1R. Pushing 2L or 2R displays a VOR ARMED prompt, and the FMS sends steering commands to the AFS to capture the VOR course. VOR ARMED should be displayed on the flight mode annunciator. If it is not, verify that the MCDU NAV RADIO page displays a VOR ARMED prompt.

```
                    NAV RADIO
        ATL/CRS               116.60/CRS
  1L    116.90/270°            PDK/180°      1R

  2L    VOR ARMED          VOR TRACK        2R
        ADF1                      ADF2
  3L    [   ]                     [   ]      3R
        ILS/CRS
  4L    [   ]/[   ]°                         4R

  5L                                         5R
              PRESELECT
  6L    [   ]/[   ]           [   ]/[   ]    6R
```

KB1-3-0474

When the VOR capture criteria are satisfied, the roll control window on the flight mode annunciator changes to VOR1 or VOR2 to indicate which VHF NAV receiver is selected by the FMS. Both can be armed but only one can be selected and control the airplane. The AFS then captures and controls the airplane to the selected VOR course as directed by steering commands from the FMS. When the airplane is over the VOR station, the AFS follows the selected VOR heading (VOR1 or VOR2 CRS displayed in the flight mode annunciator). The NAV RADIO page displays VOR TRACK in 2L or 2R when the AFS has captured the selected VOR signal.

The armed mode can be reset by clearing the course, tuning another VOR, selecting NAV, selecting LOC ONLY, selecting APPR/LAND, or pushing the HDG/TRK select knob. Pulling the HDG/TRK select knob to select a heading also cancels the VOR ARMED mode.

Automatic VOR course tracking as described above is only possible below 18,000 feet and is certified for use up to 40 nm from the navaid. However, the mode can be armed above 18,000 ft.

Tracking a VOR course TO or FROM a VOR on one side can be maintained while the other side is armed to track another course outbound from the same VOR or inbound to a different intersecting VOR.
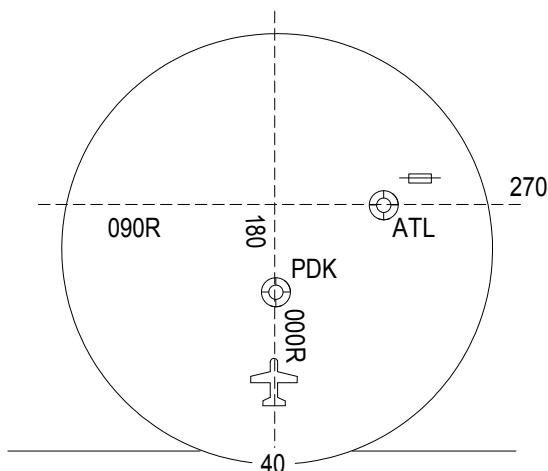
KB1-3-0475

VFR Approach

A VFR approach may be into the F-PLN as an approach during the STAR and RWY selection process. If the approach is entered, a final approach waypoint is added to the flight plan just prior to a 3-degree final approach path.

The approach waypoint precedes the destination runway by 8 NM and has an associated altitude constraint equal to the runway elevation plus 1500 feet. The identifier for this waypoint is FAnnn. where nnn is the destination runway number.

The final approach waypoint may be cleared manually or by entering a waypoint into the flight plan following the final approach waypoint. Clearing the waypoint by either of these two methods will cancel the VFR approach.

The above function is provided to assist the crew in positioning the airplane 8 miles from the airport on an extended center-line position. It is not intended for nor should it be used as an IFR procedure.

VFR approach procedures may be entered into the NAV data base.

As an example, the VFR approach to runway 21L at Yuma would be selected and loaded on the STAR page, as follows:

```
                  STAR TO KYUM
          STARS                    APPR
  1L    LG06                <SEL>VFR21L    1R

  2L    LG05                 REMAINING     2R
                               APPRS
  3L    LG05A                 ILS21R       3R

  4L     REMAINING            RNV21R       4R
           STARS
  5L    NONE                   VOR17       5R
                             RETURN TO
  6L    *INSERT              LAT REV>      6R
                                  ↑↓
```

KB1-3-0476

The approach waypoints and constraints are displayed on the following ACT F-PLN page.

```
                ACT F-PLN      1/2 →
        FROM     ETO    SPD     ALT
1L      PBD07  0424    245    2600       1R
2L      FA21L    0428    245/    1710     2R
                              -3.0°
3L      RW21L      31    182/     210     3R
4L          END  OF  F-PLAN              4R
5L      KYUM                             5R
6L      --F-PLN DISCONTINUITY--          6R
                                ↑↓
```

KB1-3-0477

The approach is displayed on the ND. Notice that the constraint altitude is maintained until 3 degrees descent path to the runway is intercepted.

ND Display
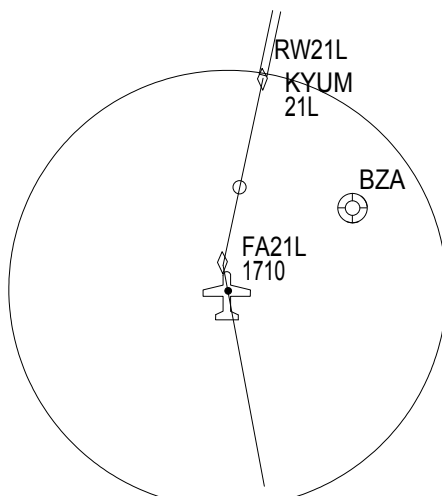
KB1-3-0478

Landing Runway Change

Runway changes just prior to landing are a common occurrence whether it is to a parallel runway or a completely different runway. The FMC may be prepared ahead of time to aid the pilot in handling the workload associated with this change. However, planning and tailoring the F-PLN must be completed well before the final approach phases of flight.

The FMS Secondary (SEC) F-PLN provides the pilot with the capability to develop an altered F-PLN which incorporates a new approach and landing runway at the destination. General instructions to accomplish this task are to access the SEC F-PLN by pushing SEC-F-PLN key, copy the Active F-PLN into the SEC F-PLN, after the STAR to include a new approach and landing runway, clear any DISCONs, and review the SEC F-PLN routing for intended backup plan routing, approach and landing runway. If the SEC F-PLN represents the plan you want, exit back to the ACT F-PLN and continue with the flight.

If a change in runway does occur simply push the SEC F-PLN key, ACTIVATE SEC by pushing LSK4R, and, if necessary, perform a DIR TO the waypoint where ATC has instructed you to join the new approach. The airplane could be hand flown there also.

> NOTE: The above procedure may be used effectively when employing the FMS and its functions to their full extent. An alternate method of simply tuning another ILS frequency on the NAV RAD page and selecting APPR on the FCP will also provide the needed information to change to another runway without using FMS flight planning capabilities.

STEP: Push **SEC F-PLN**

```
         SEC F-PLN INIT      1/2→
   CO ROUTE          FROM/ TO
1L│                 KJFK/KATL         │1R
   ALTN ROUTE                  ALTN
2L│                          KMCN     │2R

3L│ COPY ACTIVE    SEC F-PLN>         │3R

4L│ CLEAR SEC   ACTIVATE SEC*         │4R
   CRZ LEVELS
5L│ 310/[ ]/[ ]/[ ]/[ ]/[ ]          │5R
   TEMP / WIND    OPT/MAXFL      CI
6L│ -45°/TL030   280/328    200       │6R
```

KB1-3-0233A

STEP: Push **3L**

SEC F-PLN Access

```
          SEC F-PLN     1/2 →
    FROM       ETO  SPD    ALT
1L│ MACEY    1538 279/FL265           │1R
     MACEY2
2L│ WOMAC     40    "  /   FL212       │2R
     MACEY2
3L│ LOGEN     42    "  /   17400       │3R
     MACEY2
4L│ ATL       47   245 /   8250        │4R
     C078°
5L│ AJAAY     49   228/+5000           │5R
     PROCT
6L│ INTERCEPT 51   174/  +5000         │6R
                             ↑↓
```

KB1-3-0230A

STEP: Push **4L**

```
             LAT REV FROM ATL
              N3338.4/W08425.6
1L                           STAR>      1R

2L     <AIRWAYS            HOLD>        2R
                         PROCEDURE
3L                          TURN>       3R
         NEXT WPT     NEW CO RTE
4L       *[      ]     [       ]*       4R
                         NEW DEST
5L                       [    ]*        5R
         ENABLE ALTN    RETURN TO
6L       *TO KMCN       ACT F-PLN>      6R
```

KB1-3-0328

Changing the landing runway is accomplished through a LAT REV from
ATL, STAR selection and changing the selected runway.

STEP: Push **1R**

```
            STAR to KATL

      STD  STARS    STD   APPR
1L   MACEY2 <SEL><SEL>  ILS26R   1R
       TRANS          ADDL APPRS
2L   MOL                  ILS08L   2R

3L   ODF                  ILS08R   3R

4L   SPA                  ILS09L   4R
      CUSTOM             CUSTOM
5L   <STARS              APPRS>    5R
                        RETURN TO
6L   INSERT             LAT REV>   6R
                            ↑
```

KB1-3-0211

STEP: Push **2R**

```
             STAR to KATL

       STD STARS       STD APPR
1L   MACEY2<SEL>  <SEL> ILS08L   1R
       TRANS          ADDL APPRS
2L   MOL                  ILS08R   2R

3L   ODF                  ILS09L   3R

4L   SPA                  ILS09R   4R
      CUSTOM             CUSTOM
5L   <STARS              APPRS>    5R
                        RETURN TO
6L   INSERT             LAT REV>   6R
                            ↑
```

KB1-3-0231A

STEP: Push **6L**

Second Approach Selection

```
  APPR  TRANS ᴛᴏ KATL
 STD STARS          STD APPR
MACEY2 <SEL><SEL> ILS08L
   TRANS              TRANS
NONE                  ATL*


              RETURN TO
              SEC F-PLN>
```

1L 2L 3L 4L 5L 6L 1R 2R 3R 4R 5R 6R

KB1-3-0232A

The pilot can now continue to use the FMS until the runway change is announced by ATC. The runway changed SEC F-PLN may be activated by accessing the SEC F-PLN INIT page and pushing LSK 4R, ACTIVATE SEC, as shown in the following screen.

STEPS: 1. Push **SEC F-PLN**

2. Push **4R**

```
  SEC F-PLN INIT      1/2→
 CO ROUTE        FROM/ TO
                 KJFK/KATL
 ALTN ROUTE            ALTN
                  KMCN

 COPY ACTIVE    SEC F-PLN>

 CLEAR SEC   ACTIVATE SEC*
 CRZ LEVELS
 310/[  ]/[  ]/[  ]/[  ]
 TEMP / WIND   OPT/MAXFL   CI
 -45°/TL030  280/328   200
```

1L 2L 3L 4L 5L 6L
1R 2R 3R 4R 5R 6R

KB1-3-0233A

Go Around

Go around causes changes to thrust limits, FMS phases of flight, PROF and NAV guidance. Those items will be discussed as well as to set up another ILS approach.

Missed Approach

Pushing the GA switch below 2500 feet with 5 degrees or more flaps will initiate automatic go-around. If airplane altitude is below the go-around thrust reduction altitude, the thrust limit selected is go-around mode. If the altitude is above the go-around thrust reduction altitude, the thrust limit mode will be CLB.

NOTE: Pushing the GA button below 2500 ft. without 5 degrees of flaps or more only changes the thrust limit to GA.

During go around, the FMS transitions to TAKEOFF or CLB phases depending on use of the GA switch, sequencing the destination runway, valid CRZ FL or CLR ALT. If the go around is initiated via the GA switch before sequencing the destination and the pilot enters a valid CRZ FL the FMS transitions to TAKEOFF. As the airplane sequences the destination, the FMS transitions to CLB. With a manual increase in engine power, the FMS transitions to CLB after sequencing the destination.

> NOTE: Commanded airspeed during climb will be VMIN + 5 for configuration or indicated airspeed when the GA switch was pushed, whichever was higher. The commanded speed is displayed in the speed window on the PFD but will not be displayed on the MCDU GO AROUND page.

```
        GO AROUND KATL RW26R

  1L                   CLB THRUST    1R
                              2490
  2L     VFR                   ACCEL  2R
         139                  3990
  3L     VSR            EO ACCEL      3R
         219                  1790
  4L     CLEAN MIN                    4R

  5L                      THRUST      5R
                         LIMITS
  6L                   RETURN TO      6R
                       APPROACH>
```

KB1-3-0228A

Laterally, as the destination is sequenced, the missed approach is activated. Predictions are calculated for each waypoint in the missed approach and the CRZ ALT is established as the highest of CRZ ALT, CLR ALT, or 10,000 feet above the destination elevation. With PROF and NAV engaged, the airplane automatically flies the missed approach.

```
            ACT F-PLN
      FROM       ETO  SPD    ALT
1L   RW26R      1555  141 /   990    1R
      H272°
2L   1600        ---  --- / -----    2R
      C000°
3L   TROYS       ---  --- /+3500     3R
            LIMIT  HOLD
4L   HOLD R      --- SPEED/ -----    4R
      C180°
5L   TROYS       ---  --- / -----    5R
6L   ---END  OF  F-PLAN---           6R
                                ↑↓
```

KB1-3-0320

NOTES: *Once that final waypoint is passed, PPOS becomes the FROM waypoint followed by an active leg F-PLN DISCON and then the END OF F-PLN marker.*

After a missed approach or go-around, if the pilot clears the "TO" waypoint or the "TO" waypoint sequences to a DISCONTINUITY, it is possible that one or several waypoints may sequence if they are within 10 NM of airplane position. If this occurs, it may be necessary to enter a DIR TO or new waypoint, then the subsequent approach.

After executing an FMS missed approach, it will be necessary to string a new approach before sequencing through the loaded flight plan. If the flight plan is sequenced and destination is lost, it will be necessary to string a new flight plan with a new destination.

Second ILS Approach

Planning for a second approach (ILS, VOR, VFR etc.) could be accomplished in the secondary flight plan just like the landing runway change. It may also be accomplished in the following manner.

 KATL remains the destination and by performing a LAT REV and STAR
RWY selection from a missed approach waypoint (TROYS), a new
approach can be inserted into the active flight plan. That selection process
is displayed in the following screens.

 STEP: Push **3L**

```
        LAT REV FROM TROYS
           N3352.8/W08426.1
1L                          STAR>    1R

2L    <AIRWAYS             HOLD>    2R
                         PROCEDURE
3L                          TURN>    3R
      NEXT WPT         NEW CO RTE
4L    *[     ]            [     ]*   4R
                         NEW DEST
5L                          [   ]*   5R
      ENABLE ALTN        RETURN TO
6L    *TO KMCN        ACT F-PLN>    6R
```

KB1-3-0317

STEP: Push **1R**

Second Approach Selection

```
                STAR TO KATL
          STD STARS         STD APPR
 1L   MACEY2<SEL>  <SEL>ILSO8L   1R
          TRANS          ADDL APPRS
 2L   MOL                   ILSO8R   2R

 3L   ODF                   ILSO9L   3R

 4L   SPA                   ILSO9R   4R
          CUSTOM            CUSTOM
 5L   <STARS               APPRS>   5R
                          RETURN TO
 6L   INSERT              LAT REV>   6R
                              ↑
```

KB1-3-0231A

The *INSERT prompt is available from the previous selection or will be
available after changing the approach selection. Pushing LSK 6L
automatically displays the APPROACH TRANSITION page where the
transition is chosen and STAR APPR waypoints are inserted into the
F-PLN.

STEP: Push **6L**

Second Approach Selection

```
           APPR  TRANS TO KATL
     STD STARS            STD APPR
1L   MACEY2<SEL><SEL> ILS08L      1R
       TRANS                TRANS
2L   NONE                    ATL*  2R

3L                                 3R

4L                                 4R

5L                                 5R
                     RETURN TO
6L                 SEC F-PLN>      6R
```

KB1-3-0232A

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FMS Guide	Chapter FMS
Alternate Diversion	**Section 70**

After overflying the destination and during missed approach, alternate diversion may be accomplished by ENABLE ALTN TO, NEW DEST, or performing a DIR TO the alternate airport. New Destination is covered in Section 80.

Enable Altn To

From a revise waypoint LAT REV page, pushing 6L deletes all waypoints from the revise point to the destination and enters the alternate F-PLN into the primary F-PLN. The alternate F-PLN includes the old destination as a F-PLN waypoint

During missed approach a LAT REV to KATL is accomplished in the screen below. Selecting ENABLE ALTN TO KMCN 6L results in the flight plan shown in the following screens.

STEPS: 1. Push **LSK (abeam KATL)**

2. Push **6L**

```
        LAT REV FROM KATL
          N3338.4/W08425.6
  1L                         STAR>    1R

  2L   <AIRWAYS              HOLD>    2R
                        PROCEDURE
  3L                        TURN>     3R
        NEXT WPT       NEW CO RTE
  4L  *[      ]        [        ]*    4R
                         NEW DEST
  5L                       [    ]*    5R
        ENABLE ALTN      RETURN TO
  6L  *TO KMCN         ACT F-PLN>     6R
```

KB1-3-0226

```
        ACT F-PLN    1/2→
    FROM      ETO  SPD   ALT
1L  PPOS      1555 164 / 2800   1R
2L  ---F-PLN DISCONTINUITY--   2R
3L  KMCN      ---- ---/  350   3R
4L  ------END OF F-PLN------   4R
5L                             5R
6L                             6R
                         ↑↓
```

KB1-3-0235A

STEPS: 1. Push **CLR**

2. Push **2L**

Clearing the DISCONTINUITY provides continuous routing to KMCN.

Direct-To

Pushing the DIR INTC function key displays the modified F-PLN page as shown in the following screen.

By either ATC instructions or pilot choice, SCARR is chosen as an enroute point to perform a DIR TO. Enter SCARR in the SP and push LSK 1L for entry. Push LSK 1L again to create SCARR as a waypoint.

STEP: Type **SCARR in SP**

```
          ACT F-PLN
   DIR TO    INTC    FIC/CRS
   [      ]      [      ]/[    ]*
 ---F-PLN DISCONTINUITY--
 KMCN         ----  ---/-----
 ------END OF F-PLN------
 KMCN

 SCARR              ↑↓
```

1L 2L 3L 4L 5L 6L
1R 2R 3R 4R 5R 6R

KB1-3-0236A

STEPS: 1. Push **1L**

2. Push **1L**

```
            ACT F-PLN    1/2→
      FROM        ETO  SPD    ALT
1L  T-P          1558 250/  5000   1R

2L  SCARR        1601   " /    "    2R

3L  ---F-PLN DISCONTINUITY--      3R

4L  KMCN         ---- ---/   350   4R

5L  ------END OF F-PLN------      5R

6L  KMCN                          6R

                          ↑↓
```

KB1-3-0237A

Clearing the discontinuity creates the desired routing. From SCARR a STAR and approach to Macon can be selected.

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New Destination

The purpose of the new destination function is to reroute the F-PLN from the selected waypoint to a new destination. The function is available from any selected fixed waypoint in the flight plan including the FROM waypoints and PPOS. The new destination may be any airport in the database or a pilot-defined runway. When a new destination is entered, the following F-PLN events occur:

1. All waypoints beyond the selected fixed waypoint in the original F-PLN (including ALTN if it exists) are deleted.

2. A DISCONTINUITY is created between the selected waypoint and the new destination

3. A new destination is entered into the F-PLN.

To access the NEW DEST function, a LAT REV is performed. See screens below for a LAT REV at PPOS and KMCN entry.

```
            ACT F-PLN    1/2→
        FROM      ETO  SPD    ALT
 1L   PPOS        1555 164 / 2800    1R

 2L   ---F-PLN DISCONTINUITY--       2R

 3L   KMCN        ---- ---/   350    3R

 4L   ------END OF F-PLN------       4R

 5L                                  5R

 6L                                  6R

                              ↑↓
```

KB1-3-0235A

STEPS: 1. Push **1L**

2. Type **KMCN in SP**

3. Push **5R**

```
         LAT REV FROM PPOS
           N3338.4/W08425.6

1L                          STAR>      1R

2L    <AIRWAYS             HOLD>      2R
                     PROCEDURE
3L                        TURN>      3R
      NEXT WPT      NEW CO RTE
4L    *[     ]      [     ]*      4R
                      NEW DEST
5L                        [   ]*      5R
                     RETURN TO
6L    ENABLE ALTA
      *TO  KMCN      ACT F-PLN>      6R
```

KB1-3-0234A

STEP: Push **6R**

```
                 ACT F-PLN      1/2→
         FROM        ETO  SPD   ALT
  1L  │ PPOS         1555 164 / 2800 │ 1R

  2L  │ ---F-PLN DISCONTINUITY-- │ 2R

  3L  │ KMCN         ---- ---/   350 │ 3R

  4L  │ ------END OF F-PLN------ │ 4R

  5L  │                          │ 5R

  6L  │                          │ 6R

                              ↑↓
```

KB1-3-0235A

Clearing the F-PLN DISCONTINUITY establishes a T-P and direct routing to KMCN. A STAR selection cannot be selected from a T-P, and if selected at KMCN, it creates a routing from T-P to KMCN and then back to the STAR start waypoint.

To keep the alternate diversion simple, a DIR TO can be accomplished to an enroute waypoint short of the destination where the STAR may be efficiently selected.

> *NOTE: The NEW DEST function can also be used to CLR a large string of waypoints at one time. By LAT REV at the last desired waypoint to be flown, followed by a NEW DEST entry (i.e. same destination) all intervening waypoints would be cleared.*

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The FMS transitions to a flight complete mode (DONE mode) when the airplane has landed (<80 KIAS) and either the INIT key on either MCDU is pushed or the engines have been shut down. When a flight complete is declared, the A/C STATUS page is displayed on the MCDU and all route and flight specific data relevant to the last flight is cleared and default values are recalled for later display and access. Pushing of any MCDU button after the flight complete phase, transitions the FMS to PREFLIGHT.

To retain a flight plan for immediate or future use after landing, the ACT F-PLN may be copied into the SEC F-PLN and the active leg altered to prevent SEC F-PLN leg sequencing. After landing, the SEC F-PLN is preserved and may be copied into the ACT F-PLN for immediate use.

After landing and before the next takeoff, the IRU performance may be inspected on the IRS STATUS page.

IRS STATUS Page

The IRS STATUS page provides IRU error rates and terminal GS reading at the end of a flight. The page may be accessed by pushing the REF key, LSK 4L < POS REF and the PAGE key twice, as shown in the following sequence.

STEP: Push **REF**

```
              REF INDEX

     DEFINED
1L  <WAYPOINT    ATC COMM>   1R

2L  <WAYPOINT    AOC COMM>   2R
     CLOSEST
3L  <AIRPORTS      NAVAID>   3R

4L  <POS REF     DOC DATA>   4R

5L  <A/C STATUS     MAINT>   5R

6L  <SENSOR STATUS           6R
```

KB1-3-0189A

STEP: Push **4L**

```
            POS REF    1/3 →

     FMC LAT/LONG (G/I)
1L  N3754.0/W07906.4         1R
     IRS (MIX)
2L  N3754.0/W07906.4         2R

3L                           3R

     RNP/ACTUAL
4L  1.00 /0.39NM             4R
                   GNS NAV
5L                 INHIBIT*  5R
                  RETURN TO
6L                REF INDEX> 6R
```

KB1-3-0197A

STEP: Push **PAGE**

```
            IRS/GNS POS    2/3→
       IRU 1 - NAV
1L│  N3754.0/W07906.4  000°/  00  │1R
       IRU 2 - NAV
2L│  N3754.0/W07906.4  000°/  00  │2R
       IRU 3 - NAV
3L│  N3754.0/W07906.4  000°/  00  │3R
        GNS 1 - NAV          8 SV
4L│  N3754.0/W07906.4  000°/  00  │4R
        GNS 2 - NAV          8 SV
5L│  N3754.0/W07906.4  000°/  00  │5R
                        RETURN TO
6L│                    REF INDEX>  │6R
```

KB1-3-0198

STEP: Push **PAGE**

```
           IRS STATUS    3/3→
           DRIFT RATE        GS
1L│  IRU1      3.2          3   │1R

2L│  IRU2      4.7          5   │2R

3L│  IRU3      2.1          1   │3R

4L│                             │4R

     STATUS CODE
5L│  IRU1     00                │5R
    IRU2     00      RETURN TO
6L│  IRU3     00    REF INDEX>   │6R
```

KB1-3-0199A

When the pilot advances the throttles for takeoff and the FMS transitions to takeoff (FMC position update occurs), the FMC stores the IRU position difference between itself and the update FMC position. Upon touchdown, the FMC is updated once again and the IRU difference is again stored. The change in these two different readings represent IRU drift during the flight from takeoff to landing. Total drift divided by trip time provides the DRIFT RATE value displayed on the page. The GS column displays the IRU residual GS and is valid when the airplane is stationary after landing and engines are shut down.

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Advanced Flight Planning	**Section 100**

The Advanced Flight Planning section covers the creation of additional database waypoints, their insertion in the flight plan, secondary flight plan creation and differences, and the insertion of procedure turns in the flight plan.

Waypoint Creation and F-PLN Entry

Waypoints may be created for the data base in a variety of ways. They may be entered into the F-PLN either directly or through the use of a LAT REV. Pilot-defined runways may be created and used in the F-PLN. Waypoint creation and pilot defined runway entry are the topics of this section.

Along Track Offset (ATO) Waypoint

The along track offset waypoint, also known as the Place/Distance (PD) waypoint, is a pilot-defined point a given distance before or after an existing flight plan waypoint, and on the existing flight plan course. A new PD is located before the waypoint if a minus (-) is used and after the point if a (+) is used. The PD waypoint is given a flight plan name consisting of a waypoint three-letter identifier/three-digit distance and becomes one of the 40 pilot definable waypoints.

The referenced waypoint may not be the FROM waypoint. A discontinuity is never inserted since the point is along an established route. The PD point cannot be created closer than 1 NM to a point or less than 5 NM from the airplane position.

Place/Bearing/Distance (PBD) Waypoint

A Place/Bearing/Distance (PBD) waypoint may be pilot defined by specifying a waypoint three-letter ident/bearing/distance. The PBD becomes one of the 40 pilot definable waypoints and is labeled PBDXX where XX is the sequential number of the point the pilot creates. For example, a waypoint from SCARR 120° radial 20 NM is created and entered into the F-PLN by typing SCARR/120/20 in the SP and pushing LSK 2L.

STEP: Type **SCARR/120/20 in SP**

```
            ACT F-PLN     1/2→
       FROM       ETO  SPD    ALT
 1L  T-P          1558 250/  5000   1R

 2L  SCARR         1601   " /    "  2R

 3L  ---F-PLN DISCONTINUITY--      3R

 4L  KMCN          ---- ---/   350  4R

 5L  ------END OF F-PLN------      5R

 6L  KMCN                          6R
     SCARR/120/20           ↑↓
```

KB1-3-0238A

STEP: Push **2L**

```
            ACT F-PLN     1/2→
       FROM       ETO  SPD    ALT
 1L  T-P          1558 250/  5000   1R

 2L  PBD01         1602  " /    "   2R

 3L  ---F-PLN DISCONTINUITY--      3R

 4L  SCARR         ---- ---/  ----- 4R

 5L  ---F-PLN DISCONTINUITY--      5R

 6L  KMCN          ---- ---/   350  6R
                            ↑↓
```

KB1-3-0239A

Notice that PBDO1 was created indicating that this waypoint is numbered 1 of the possible 40 pilot defined waypoints. The next pilot defined waypoint that is created will be numbered 2 of 40 but may be differently labeled in the F-PLN. The PBD waypoint entry by definition causes a break in the F-PLN and results in the entry of F-PLN DISCONTINUITY. A PBD waypoint can be inserted as a DIR-TO waypoint.

Lat/Long Waypoint

A lat/long waypoint may be generated by inserting latitude and longitude coordinates directly into the F-PLN. The entered waypoint is named with the cardinal directions and degrees portion of the coordinate such as N33W083. As an example, N3335.9 W08308.4 is typed into the SP and entered by pushing 3L. Again, another DISCON is inserted into the F-PLN. A lat/long waypoint can be inserted as a DIR-TO waypoint.

STEP: Type **N3335.9W08308.4 in SP**

```
            ACT F-PLN    1/2→
       FROM        ETO  SPD    ALT
  1L  T-P         1558 250/   5000   1R

  2L  PBDO1        1602  " /     "    2R

  3L  ---F-PLN DISCONTINUITY--       3R

  4L  SCARR        ---- ---/ -----    4R

  5L  ---F-PLN DISCONTINUITY--        5R

  6L  KMCN             ---/    350    6R
      N3335.9W08308.4         ↑↓
```

KB1-3-0240A

STEP: Push **3L**

```
              ACT F-PLN    1/2→
        FROM        ETO  SPD    ALT
  1L   T-P        1558 250/  5000    1R
  2L   PBD01       1602   "  /    "   2R
  3L   N33W083      03    "  /    "   3R
  4L   ---F-PLN DISCONTINUITY--      4R
  5L   SCARR       ---- ---/ -----   5R
  6L   ---F-PLN DISCONTINUITY--      6R
                              ↑↓
```

KB1-3-0241A

Lateral Revision Waypoint Entry

Waypoints may be entered into a F-PLN or the routing revised using the LAT REV to an existing waypoint. The new waypoint is inserted immediately following the revise point with a direct leg. If the new waypoint does not exist in the F-PLN, a F-PLN DISCONTINUITY is inserted after the new waypoint. If the new waypoint is a waypoint already in the existing F-PLN, a single direct route is inserted with no discontinuity, and all the intervening waypoints are deleted.

STEP: Push **2L**

```
        LAT REV FROM PBD01
           N3335.9/W08030.9
1L                              STAR>    1R

2L   <AIRWAYS                   HOLD>    2R
                          PROCEDURE
3L                              TURN>    3R
       NEXT WPT         NEW CO RTE
4L   *[       ]         [        ]*      4R
                          NEW DEST
5L                          [    ]*      5R
       ENABLE ALTN        RETURN TO
6L   *TO KMCN            ACT F-PLN>      6R
```

KB1-3-0242A

STEPS: 1. Type **SCARR in SP**

2. Push **4L**

3. Push **4L**

```
        ACT F-PLN    1/2→
     FROM     ETO  SPD    ALT
1L  T-P      1558  250/  5000  1R

2L  PBD01    1602   " /    "   2R

3L  SCARR      05   " /    "   3R

4L  ---F-PLN DISCONTINUITY--   4R

5L  KMCN     ---- ---/ -----   5R

6L  --- END OF F-PLN ---       6R
                         ↑↓
```

KB1-3-0243A

Defined Waypoint Page

Pushing the REF key displays the REF INDEX page. From the REF INDEX page, pushing LSK 1L provides access to the DEFINED WAYPOINT page where pilot-defined waypoints are displayed and may be deleted or created.

STEP: Push **REF**

```
                REF INDEX

         DEFINED
  1L   <WAYPOINT      ATC COMM>   1R

  2L   <WAYPOINT      AOC COMM>   2R
         CLOSEST
  3L   <AIRPORTS        NAVAID>   3R

  4L   <POS REF       DOC DATA>   4R

  5L   <A/C STATUS       MAINT>   5R

  6L   <SENSOR STATUS              6R
```

KB1-3-0189A

STEP: Push **1L**

```
     DEFINED WAYPOINT   1/2
       IDENT
  1L   PBD01           NEXT>    1R
         LAT/LONG
  2L   N3327.0/W08246.9  PREV>  2R
       PLACE/BRG/DIST
  3L   SCARR/120.0°/20.0          3R
                          NEW
  4L             WAYPOINT>        4R

  5L             DELETE ALL       5R

  6L                              6R
```

KB1-3-0244A

From the DEFINED WAYPOINT page, pushing LSK 5R (DELETE ALL) deletes all pilot-defined waypoints that are not either in the Active, Secondary Flight Plan, or Fix page. Waypoints may be deleted singularly by use of the CLR key, SP, and individual DEFINED WAYPOINT pages as accessed by the NEXT (1R) or PREV (2R) keys. Defined waypoints presently being used in the Active, Secondary Flight Plan, or Fix page cannot be deleted. When deletion of a pilot-defined waypoint in the flight plan is attempted, the MCDU SP message F-PLN WPT/NAV RETAINED is displayed. All DEFINED WAYPOINTS are deleted when the FMS transitions through flight complete (DONE) phase. When the last waypoint is deleted, the WAYPOINT page is displayed. On this page, data on any NAV database waypoint may be reviewed by ident entry into 1L.

In the DEFINED WAYPOINT page, the DEFINED WAYPOINT is number 1/2 indicating that this is the first of two defined waypoints. The following screen shows data on page 2/2.

 STEP: Push **1R**

```
        DEFINED  WAYPOINT    2/2
        IDENT
 1L     N33W083              NEXT>    1R
              LAT/LONG
 2L     N3336.5/W08309.5     PREV>    2R

 3L                                   3R
                             NEW
 4L                     WAYPOINT>     4R

 5L                  DELETE ALL       5R

 6L                                   6R
```

KB1-3-0245

When 40 pilot-defined waypoints are created, the MCDU message LIST OF FORTY IN USE is displayed in the SP.

New Waypoint

The NEW WAYPOINT page, accessed through LSK 4R, enables entry of a new waypoint into the pilot-defined waypoint list.

STEP: Push **4R**

```
                    NEW  WAYPOINT

         IDENT
 1L      ▢▢▢▢▢▢▢                                    1R
         LAT/LONG
 2L      ▢▢▢▢.▢/▢▢▢▢▢▢.▢                            2R
         PLACE/BRG/DIST
 3L      ▢▢▢▢▢▢▢/▢▢▢.▢°/▢▢▢.▢                        3R

 4L                                                 4R

 5L                                                 5R

 6L                                                 6R
```

LB1-2-0250

On this page, the pilot may name his defined waypoint with any combination of alphanumerics in data field 1L. For example, the waypoint DOUGLAS is created in the following screen. Entry of the point into the pilot-defined waypoint list is via the ENTER prompt in 6R.

STEPS: 1.   Type **DOUGLAS in SP**

2.   Push **1L**

3.   Type **N3349.1W11809.0 in SP**

```
                 NEW  WAYPOINT

           IDENT
  1L     DOUGLAS                              1R
           LAT/LONG
  2L     □□□□□.□/□□□□□□.□                     2R
           PLACE/BRG/DIST
  3L     □□□□□□/□□□.□°/□□□.□                  3R

  4L                                          4R

  5L                                          5R

  6L                                          6R

          N3349.1 W11809.0
```

KB1-3-0492

STEPS: 1. Push **2L**

2. Push **6R To Enter Database**

```
          ╭─────────────────────────╮
          │        NEW  WAYPOINT     │
   ┌──┐   │                          │   ┌──┐
   │1L│   │ DOUGLAS                  │   │1R│
   └──┘   │    LAT/LONG              │   └──┘
   ┌──┐   │ N3349.1/W11809.0         │   ┌──┐
   │2L│   │                          │   │2R│
   └──┘   │                          │   └──┘
   ┌──┐   │                          │   ┌──┐
   │3L│   │                          │   │3R│
   └──┘   │                          │   └──┘
   ┌──┐   │                          │   ┌──┐
   │4L│   │                          │   │4R│
   └──┘   │                          │   └──┘
   ┌──┐   │                          │   ┌──┐
   │5L│   │                          │   │5R│
   └──┘   │                          │   └──┘
   ┌──┐   │                   ENTER  │   ┌──┐
   │6L│   │                          │   │6R│
   └──┘   │                          │   └──┘
          ╰─────────────────────────╯
```

KB1-3-0493

If a PBD is entered into 3L, then the LAT/LONG is calculated and displayed in 2L above. If a duplicate name is generated, the DUPLICATE NAMES page will be displayed when the point is next accessed.

Pilot-Defined Runway

On the NEW WAYPOINT page, a runway can be entered in 1L in the form of RW01 or RW14L. When entered, boxes associated with 4L (ELEV), 5L (LENGTH), and 6L (CRS) are displayed on the page. RW01 is entered into 1L. In the next screen, the remaining runway data is entered. Entry into the pilot-defined waypoint list is accomplished by pushing LSK 6R (ENTER).

STEPS: 1. Type **RW01 in SP**

  2. Push **1L**

```
                  NEW  WAYPOINT
        IDENT
  1L    RWO1                                    1R
                  LAT/LONG
  2L      ⬚⬚⬚⬚.⬚/⬚⬚⬚⬚⬚⬚.⬚                    2R
           PLACE/BRG/DIST
  3L      ⬚⬚⬚⬚⬚⬚⬚/⬚⬚⬚.⬚°/⬚⬚⬚.⬚               3R
           ELEV
  4L      ⬚⬚⬚⬚                                  4R
           LENGTH
  5L      ⬚⬚⬚⬚                                  5R
           CRS
  6L      ⬚⬚⬚                                   6R
```

KB1-3-0494

Enter remaining data.

STEP: Push **6R To Enter into Database**

```
                    WAYPOINT
          IDENT
  1L      RW01                               1R
          LAT/LONG
  2L      N4951.7/E00607.8                   2R

  3L                                         3R

          ELEV
  4L      100                                4R
          LENGTH
  5L      8000                               5R
          CRS
  6L      150°                    ENTER      6R
```

KB1-3-0495

The defined runway may be used as an origin or destination, but there will not be any SIDs or STARs available for the runway. The associated LAT/LONG of the runway is assumed to be the runway threshold point. Defining a runway in this manner may be used to establish an airport not in the NAV database for arrival and departure operations.

Duplicate Waypoints

If a nonunique identifier is entered through the MCDU, the DUPLICATE NAMES page will be automatically displayed for pilot review and waypoint selection. The LAT/LONG of the waypoint is displayed in whole degrees and, if a navaid, the frequency is also displayed. Pilot selection of the desired waypoint is made through the associated LSK whereupon the display reverts to the previously displayed page.

Duplicate waypoints will be displayed top to bottom in order of closest distance to the revised waypoint (for F-PLN entry) and/or airplane position for other DUPLICATE NAMES pages.

> NOTE: When a navaid is entered into the NAV RAD page, DUPLICATE NAMES page is not displayed (navaid automatically selected) when only one navaid with the selected IDENT exists within 100 NM of the airplane position.

Entering BR in the ACT F-PLN page results in the display of the DUPLICATE NAMES page.

```
            DUPLICATE NAMES
     656NM     LAT/LONG      FREQ
1L  *BR       N33/W084     266.0   1R
     1236NM
2L  *BR       N49/W100     233.0   2R
     2476NM
3L  *BR       N65/W014     382.0   3R
     3034NM
4L  *BR       N60/E005     109.90  4R
     3331NM
5L  *BR       N45/E005     388.0   5R
                       RETURN TO
6L                   ACT F-PLN>    6R
                              ↑
```

KB1-3-0246A

Choosing the correct BR waypoint by comparing LAT/LONGs and FREQ to the flight plan route yields BR at N33/W084 with a frequency of 266.0. To enter this navaid waypoint into the F-PLN, push LSK 1L.

STEP: Push **1L**

```
            ACT F-PLN    1/2 →
      FROM      ETO   SPD    ALT
 1L  T-P       1558  250/   5000   1R

 2L  BR          59   " /    "     2R

 3L  ---F-PLN DISCONTINUITY--      3R

 4L  N33W083   ---- ---/ -----     4R

 5L  SCARR     ---- ---/ -----     5R

 6L  ---F-PLN DISCONTINUITY--      6R
                              ↑↓
```

KB1-3-0247A

Waypoint Deletion

Waypoint deletions from the flight plan including F-PLN DISCONTINUITY are made using the SP and CLR key. The F-PLN DISCONTINUITY and waypoint routing are shown above. Actuation of the CLR key with the SP empty places the message CLR in the SP.

Actuation of the left LSK 2L abeam the waypoint to delete removes the waypoint from the flight plan and inserts another F-PLN DISCONTINUITY.

STEPS: 1.   Push **CLR**

2.   Push **2L**

```
            ACT F-PLN      1/2 →
      FROM        ETO  SPD      ALT
 1L  PPOS        1558 250/  5000    1R

 2L  ---F-PLN DISCONTINUITY--      2R

 3L  N33W083   ---- ---/ -----     3R

 4L  SCARR     ---- ---/ -----     4R

 5L  ---F-PLN DISCONTINUITY--      5R

 6L  KMCN      ---- ---/   350     6R
                             ↑↓
```

KB1-3-0248A

Continuing the process of waypoint and airway entries and clearing of any F-PLN DISCONTINUITY completes the flight plan stringing process to the destination airport.

ICAO Phonetic Waypoints

There are many waypoint identifiers that use an ICAO phonetic alpha character for their names. When an ICAO phonetic alpha character is used as a waypoint name (Alpha, Bravo, Charlie, etc.), the equivalent letter (A, B, C, etc.) is used. Entering an alpha character into 1L of the REF WAYPOINT page normally results in display of the DUPLICATE NAMES page.

Displayed duplicate names are sorted by proximity to current airplane position or revised waypoints.

The REF INDEX page may be used to search for duplicate waypoints and their associated data by pushing LSK 2L (WAYPOINT) for access to the WAYPOINT page. To search for B waypoints, enter B in the SP, and push LSK 1L. The NAV database search then produces a list of B points.

NOTE: Detailed information may be displayed about a specific waypoint by entry of its entire identifier in the IDENT box.

STEP: Type **B (Bravo) in SP**

```
              WAYPOINT
      IDENT
1L   ▯▯▯▯▯▯                              1R

2L                                       2R

3L                                       3R

4L                                       4R

5L                                       5R

6L                                       6R
      B
```

KB1-3-0300

STEP: Push **1L**

```
            DUPLICATE NAMES
      656NM    LAT/LONG     FREQ
1L   *B       N33/W084    266.0      1R
     1236NM
2L   *B       N49/W100    233.0      2R
     2476NM
3L   *B       N65/W014    382.0      3R
     3034NM
4L   *B       N60/E005    109.90     4R
     3331NM
5L   *B       N45/E005    388.0      5R
                        RETURN TO
6L                      ACT F-PLN>   6R
                            ↑
```

KB1-3-0302

Secondary Flight Plan

The active F-PLN is used for active guidance and all performance planning functions while the secondary flight plan is used for planning changes and predictive purposes. The secondary F-PLN can be entirely different from the active flight plan or it can be a modified version of the active F-PLN. The secondary F-PLN may be activated during flight.

SEC F-PLN INIT Page

Pushing the SEC F-PLN key provides access to the SEC F-PLN INIT page and its related functions.

 STEP: Push **SEC F-PLN**

```
        ┌──────────────────────────────┐
        │    SEC F-PLN INIT    1/2→     │
   1L   │ CO ROUTE        FROM/ TO      │  1R
        │ [         ]     [    ]/[    ] │
   2L   │ ALTN ROUTE            ALTN    │  2R
        │ [           ]        [    ]   │
   3L   │ COPY ACTIVE    SEC F-PLN>     │  3R
        │                              │
   4L   │ CLEAR SEC   ACTIVATE SEC*     │  4R
        │ CRZ LEVELS                   │
   5L   │ [  ]/[  ]/[  ]/[  ]/[  ]      │  5R
        │ TEMP/WIND   OPT/MAXFL    CI   │
   6L   │ -15°/TL030  ---/355    [  ]   │  6R
        └──────────────────────────────┘
```

KB1-3-0249A

1L   CO ROUTE - Field defaults to entry prompts (   ) when no CO RTE number or FROM/TO is defined. If any modification to the CO ROUTE is made, this field is blanked. If the active flight plan is copied into the SEC F-PLN, then the CO ROUTE number is reflected here if it exists in the active F-PLN.

1R   FROM/TO - Defined by copying active flight plan, entering origin/destination or defaults to entry prompts with no entry.

2L   ALTN ROUTE - Alternate route designator entry automatically chooses routing to the alternate. The field is blanked if 2R is entered.

2R   ALTN - Enables entry of the alternate airport ICAO identifier.

3L   COPY ACTIVE - Copies the remaining portion of the active flight plan into the secondary flight plan.

3R   SEC F-PLN - Accesses SEC F-PLN page.

4L   CLEAR SEC - Displayed only if there is at least one waypoint in the SEC F-PLN. Clears the secondary flight plan and defaults to PPOS - END OF F-PLN —.

4R   ACTIVATE SEC - Pushing LSK 4R with the ACTIVATE SEC prompt displayed immediately activates the SEC F-PLN and the previously active flight plan becomes the new secondary flight plan.

   If NAV is engaged, the first leg of the SEC must be laterally identical to the active leg for the ACTIVATE SEC prompt to be displayed. If you wish to activate the SEC F-PLN and the ACTIVATE SEC prompt is not displayed, disengage NAV momentarily by going to heading hold - the prompt will now be displayed. Push LSK 4R and, when the transfer is complete, reengage NAV. This feature prevents course changes due to accidental secondary activation.

5L   CRZ LEVELS - Proposed SEC F-PLN CRZ FLs. If a SEC F-PLN CRZ FL lower than current airplane CRZ ALT is entered, the lower CRZ FL will not transcribe to the active F-PLN. If the altitude is higher, it will become the new active cruise flight level, but the airplane will not climb until the FCP CLR ALT is raised.

6L   TEMP/WIND - Same as F-PLN INIT page. Pilot alterable.

6R   CI - Cost Index. Same as F-PLN INIT page. Pilot alterable.

Pushing LSK 3L copies the ACT F-PLN to the secondary.

Pushing 3L copies the ACT F-PLN to the secondary.

STEP: Push **3L**

```
   ┌─────────────────────────────────┐
   │    SEC F-PLN INIT      1/2→      │
   │ CO ROUTE        FROM/ TO         │
1L │                 KJFK/KATL        │ 1R
   │ ALTN ROUTE             ALTN      │
2L │                        KMCN      │ 2R
   │                                  │
3L │ COPY ACTIVE    SEC F-PLN>        │ 3R
   │                                  │
4L │ CLEAR SEC   ACTIVATE SEC*        │ 4R
   │ CRZ LEVELS                       │
5L │ 310/[  ]/[  ]/[  ]/[  ]/[  ]     │ 5R
   │ TEMP / WIND   OPT/MAXFL    CI    │
6L │ -45°/TL030  280/328   200        │ 6R
   └─────────────────────────────────┘
```

KB1-3-0233A

SEC F-PLN Pages 1 and 2

These pages serve the same purpose as the ACT F-PLN pages and their format and data are identical with two exceptions. SEC replaces ACT in the title line and predictions are displayed only if the SEC was created by copying the ACTIVE and the first legs are identical. An example of SEC F-PLN page with runway selection 08L at Atlanta is presented below.

STEP: Push **3R**

```
                SEC F-PLN    1/2→
         FROM      ETO    SPD     ALT
 1L   CATTA    1600    132/ 5000      1R
         PROCT
 2L   INTCP       03   ---/+5000      2R
         C092°                  -3.0°
 3L   FFO8L       04   ---/ 2740      3R
         C092°                  -3.0°
 4L   RWO8L       07   ---/ 1020      4R
         H092°
 5L   ---END  OF  F-PLAN---           5R

 6L                                   6R

                              ↑↓
```

KB1-3-0251A

All LSKs function identically to the ACT F-PLN LSKs except EOSID is not available for selection and the asterisks (*) are not displayed. Some data items such as GW, UFOB, CG and PERF SPEED modes used in performance calculations are shared by both F-PLNS.

SEC F-PLN Sequencing

SEC F-PLN sequencing of the SEC F-PLN occurs at the same time as the ACT F-PLN if the active leg of the ACT FPLN is identical to the first leg of SEC F-PLN. If at any time after the copy is made, a flight plan revision occurs so that the active leg and the SEC F-PLN first leg are no longer the same, all SEC F-PLN leg sequencing ceases. If conditions for secondary flight plan sequencing exists at engine shutdown, the SEC F-PLN reverts to its initial default state of PPOS followed by a DISCONTINUITY.

Flight Plan Memory Space

Flight plan memory space in the FMC is shared between the ACT F-PLN (includes primary and alternate) and the SEC F-PLN.

TOTAL FMC MEMORY SPACE

Active F-PLN

Primary	ALTN

Secondary F-PLN
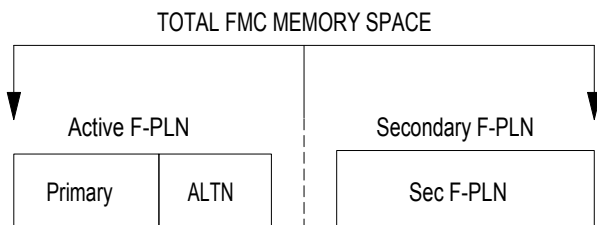
Sec F-PLN

KB1-3-0298

The ACT primary F-PLN has priority in occupying memory with the ACT ALTN next and the SEC F-PLN having lowest priority. When a revision is attempted and an overflow is encountered, the secondary F-PLN is cleared and the revision reattempted. The FMC memory space has space for up to 150 waypoints. MCDU SP messages that may be displayed include, F-PLN FULL, SEC F-PLN CLEARED, and ALTN F-PLN CLEARED.

SEC PROGRESS Page

The SEC PROGRESS page is accessed from the SEC F-PLN INIT page by pushing the PAGE key.

STEPS: 1. Push **SEC F-PLN**

2. Push **PAGE**

```
        SEC PROGRESS  2/2→
  RTE RSV/%
  ---.-/05.0
  FINAL TIME          DESCENT
  ---.-/0030    FORECAST>
  EXTRA TIME
  ---.-/----


   DEST      ETA    DTG    EFOB
  RWO8L     ----    90    ---.-
    ALTN
  KMCN      ----   159    ---.-
```

KB1-3-0252A

The information and data fields in 1L, 2L, and 3L are the same as the WEIGHT INIT page. Providing conditions for SEC F-PLN predictions are valid, lines 5 and 6 show the estimated time of arrival, distance to go and EFOB at the SEC destination and SEC alternate. Any SEC enroute waypoint may be entered in 6L. Note the page number 2/2 in the title line.

SEC RTA PROGRESS Page

The SEC RTA PROGRESS page is accessed from the SEC PROGRESS page by pushing the PAGE key. The data fields on this page are similar to the RTA PROGRESS page for the primary flight plan.

STEP: Push **PAGE**

```
    SEC RTA PROGRESS 3/3→
 FIX                         RTA
 _ _ _ _ _ _ _             _ _ _ _
 RTA SPD                  ALT/ETO
 _ _ _ _              _ _ _ _ _ / _ _ _ _




 MAX SPD
 _ _ _ _
```

1L 1R
2L 2R
3L 3R
4L 4R
5L 5R
6L 6R

KB1-3-0479

SEC DESCENT FORECAST Page

The SEC DESCENT FORECAST page is accessed by pushing LSK 2R from the SEC PROGRESS page. This page is identical to the ACT F-PLN DESCENT FORECAST page.

STEPS: 1.   Access **SEC PROGRESS PAGE**

2.   Push **2R**

```
           SEC DESCENT FORECAST
                          ANTI-ICE
  1L                         OFF      1R
        ALT / WIND
  2L   [    ]/[ ]°/[ ]               2R
  3L   [    ]/[ ]°/[ ]               3R
  4L   [    ]/[ ]°/[ ]               4R
                          TEMP
  5L   KATL /[ ]°/[ ]       [  ]°    5R
                       RETURN TO
  6L                   SEC PROGRESS>  6R
```

KB1-3-0480

NOTES: If the primary destination waypoint is cleared or changed
to other than a runway at the destination airport, all previous
wind entries on this page are deleted.

Secondary F-PLN data is cleared during the DONE phase
with the exception of a route strung using a CO ROUTE,
FROM/TO entry, or nonsequencing SEC F-PLN. Those
entries will be retained.

Procedure Turn

A procedure turn is a maneuver which is used to accomplish a course
reversal. It may either be selected from the LAT REV page off a transition
waypoint if it is contained within the Navigation Data Base (NDB), or it may
be manually entered into the F-PLN.

A procedure turn selected from the NDB will be automatically inserted into
the F-PLN if the auto-string feature is activated.

It will normally have a short outbound leg followed by a turn to reverse
course. If the auto-string feature is not activated, an approach transition
must be selected for the procedure turn to be inserted into the F-PLN.

A data base procedure turn (PROC T) is shown in AJAAY. In this example, the procedure turn is included in the flight plan when the Atlanta/Hartsfield ILS 26R transition from ATL VOR to AJAAY is selected.

```
                 ACT F-PLN    1/2 →
         FROM      ETO    SPD     ALT
  1L   WOMAC     1544   330/FL222        1R
         MACEY2
  2L   LOGEN       46      ▪ /   14770   2R
         MACEY2
  3L   ATL         51    227 /    6790   3R
         C078°
  4L   AJAAY       53    206 /+5000      4R
         PROC T
  5L   INTCPT      55    165 /+5000      5R
         317°                     -3.0°
  6L   AJAAY       57    134 /   2640    6R
                                   ↑↓
```

KB1-3-0521

Shown below is an example of a database procedure turn as depicted on the ND prior to the procedure turn waypoint becoming the "TO" waypoint.
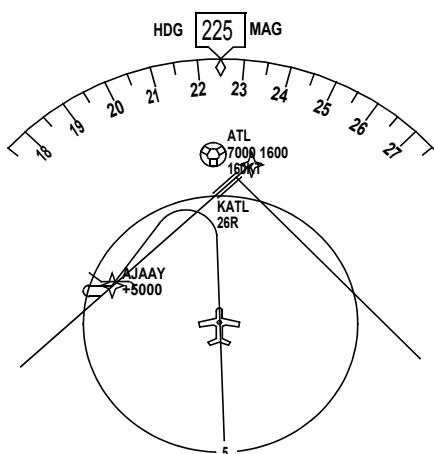
KB1-3-0519

Shown below is an example of a database procedure turn as depicted on the ND after the procedure turn waypoint becomes the "TO" waypoint.
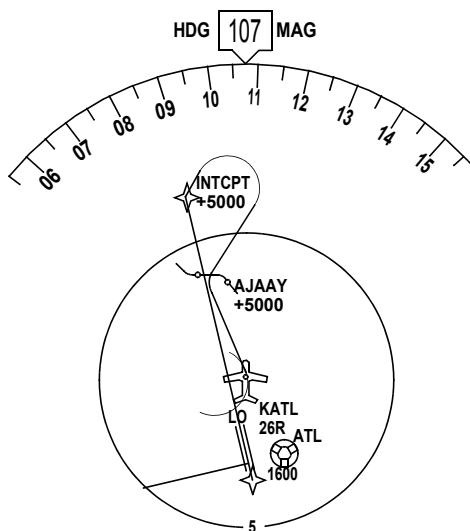
KB1-3-0518

Another method to accomplish a course reversal is to manually construct and insert a procedure turn into the F-PLN. The manual procedure turn is a teardrop maneuver. Access to the PROC TURN page is accomplished with a lateral revision (LAT REV) of the desired waypoint.

STEP: Push **4L**

```
        LAT REV FROM AJAAY
         N3339.0/W08418.7
1L                            STAR>    1R

2L   <AIRWAYS              HOLD>       2R
                          PROCEDURE
3L                           TURN>     3R
       NEXT WPT     NEW CO RTE
4L   *[     ]       [        ]*        4R
                           NEW DEST
5L                          [   ]*     5R
       ENABLE ALTN    RETURN TO
6L   *TO KMCN        ACT F-PLN>        6R
```

KB1-3-0253A

STEP: Push **3R**

```
         PROC TURN AT AJAAY
1L                                     1R
     OUTB CRS
2L   ☐☐☐                               2R
     INB DIST
3L   ☐☐.☐                              3R
     INB CRS
4L   ☐☐☐                               4R

5L                                     5R
                       RETURN TO
6L                     LAT REV>        6R
```

KB1-3-0254A

On the ND, verity the entry to and the procedure turn are correct. If the FMS and airplane are not capable of making a turn, the track line on the ND will be broken or inappropriate for a proper entry procedures. It is preferable to align the airplane for procedure turn entry to best fly the procedure turn track.

A manual procedure turn requires three entries to define the maneuver: An outbound course (OUTB CRS); inbound distance (INB DIST); and an inbound course (INB CRS). The OUTB CRS is the desired course to be flown on the outbound leg. The INB DIST is the distance to be flown on the inbound leg. The INB CRS is the desired course to the procedure fix on the inbound leg.

The procedure turn outbound course of 137 degrees with inbound course 272 degrees and 5 NM inbound distance is entered into the PROC TURN page and inserted into the F-PLN.

STEPS:
1. Type **137 in SP**
2. Push **2L**
3. Type **5 in SP**
4. Push **3L**
5. Type **272 in SP**
6. Push **4L**

```
          PROC TURN AT AJAAY

1L                                        1R
        OUTB   CRS
2L    137°                                2R
        INB   DIST
3L    5.0                                 3R
        INB CRS
4L    272°                                4R

5L                                        5R
                       RETURN TO
6L    *INSERT            LAT REV>         6R
```

KB1-3-0255B

Before the *INSERT prompt is displayed, the FMC checks the data for reasonable entries.

> **_WARNING:_** **When utilizing FMS flight guidance, it remains pilot responsibility to ensure the airplane flight profiles and path conform to the issued clearance. In some cases, FMS NAV may not constrain the airplane to safe maneuvering airspace.**

STEP: Push **6L**

```
                ACT F-PLN    1/2 →

         FROM       ETO    SPD    ALT
  1L   WOMAC    1544  330/ FL222       1R
         MACEY2
  2L   LOGEN      46     ▪  /   14770   2R
         MACEY2
  3L   ATL        51   227 /    6790    3R
           C078°
  4L   AJAAY      53   206 /+5000       4R
         PROCT
  5L   INTCPT     55   165 /+5000       5R
          272°                   -3.0°
  6L   AJAAY      57   134 /   2640     6R
                                  ↑↓
```

KB1-3-0321B

Shown below is an example of a pilot defined procedure turn as depicted on the ND prior to the procedure turn waypoint becoming the "TO" waypoint.
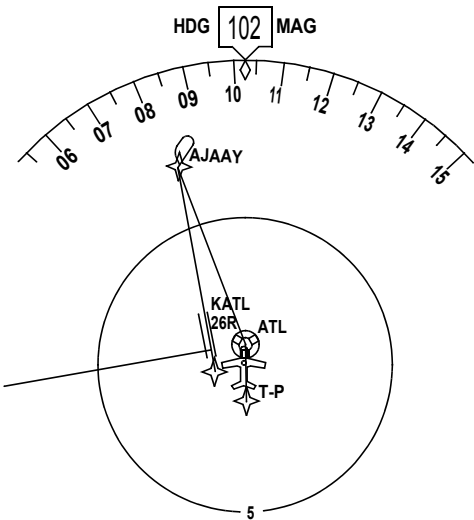
KB1-3-0520

Shown below is an example of a procedure turn as depicted on the ND after the procedure turn waypoint becomes the "TO" waypoint.
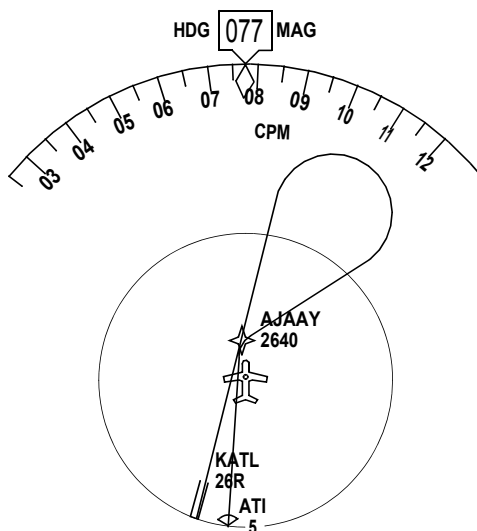
KB1-3-0517

If the FMS and airplane are not capable of making a turn, the track line on the ND will be broken.

Also, for Procedure Turns to Intercept Course legs which do not have a Navigation Data Base specified overfly, the FMS procedure turn track will not always overfly the Fix. The FMS will only compute an overfly if the required course change (between the airplane inbound course and the procedure turn outbound course) exceeds 175 degrees. For course changes less than 175 degrees, the FMS may perform a curved path transition.

Parallel Offset Nav

The parallel offset function enables the airplane to fly parallel to the original flight plan, laterally offset by a pilot-entered distance. This F-PLN alternation can be accomplished by performing a LAT REV at the FROM waypoint and entering the offset distance measured in NMs into the OFFSET brackets of 5L.

The parallel offset entry accepted by the FMC becomes active immediately after the offset distance is entered and the airplane turns to intercept the parallel course using up to a 45-degree intercept.

Exit the offset mode by clearing the OFFSET on the LAT REV page or entering the DIR TO on the DIR INTC page of the MCDU.

If the FMS cannot accept the offset, an ENTRY OUT OF RANGE message will be displayed. The parallel offset is cancelled when the active leg is changed due to a lateral revision, clearing the offset data, or the next leg is not applicable for an offset. In the latter case, the FMS automatically initiates cancellation of the offset and displays CANCELLING OFFSET in the SP. Cancellation will occur when the along track distance to go referenced to the original path is 1.3 NM greater than the calculated return path distance. Return to the F-PLN is accomplished again with up to a 45-degree intercept.

Polar Navigation

> NOTE: When the airplane is below 73° north latitude, and the VOR receivers are tuned to a true-referenced VOR, only the bearing pointers on the EIS NDs will show an offset from the actual radial position by the amount of the magnetic variation. All navigation in FMS NAV or in VOR, as well as the digital bearing information at the bottom of the ND, will be accurate.

When the airplane is above 73° latitude, it is defined to be in the polar region. Above this latitude the IRU transitions to a true heading mode of operation. In this region, it is likely that radio navigation update will not be available and the FMS position calculation will be determined from the IRS and the GPS.

Above 85° latitude the FMS transitions to a calculated FMS true track mode which is displayed in magenta color on the ND as FMS TRACK.

Within 2 NM prior to and 10 NM after the pole, the FMS transitions to a wings level mode of flight while it transitions the immediate polar region.

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This section provides a description of the Airline Operations Communication (AOC) function. The AOC is used to request flight plans, takeoff data, performance data, and wind data; generate position reports, and display uplink messages to the flight crew.

The Airline Modifiable Information (AMI) file enables many different AOC functions. The functions described here may or may not be available depending upon the options enabled in the AMI.

The AOC datalink is controlled with the FMS MCDU. The display pages for the AOC datalink are accessed from the AOC COMM MENU page.

> *NOTE: In order for the AOC or ATC datalink to operate, the flight crew must verify on CRP-3 that VHF-3 is in DATA mode.*

AOC COMM MENU Page

The AOC COMM MENU page is accessed by pushing LSK 2R on the REF INDEX page.

STEPS: 1.   Push **REF** Key

2.   Push **2R**

```
                AOC COMM MENU
           FPLN REQUEST     REVIEW
   1L     [            ]    AOC ROUTE>    1R
           T/O REQUEST       REVIEW
   2L     [ ]/[ ]            T/O DATA>    2R
           REQUEST          REVIEW
   3L     *PERF DATA       PERF DATA>     3R
           REQUEST          REVIEW
   4L     <WIND DATA       WIND DATA>     4R

   5L     <POS REPORT                     5R
           SEND                 STATUS
   6L     *FPLN REPORT         READY      6R
```

KB1-3-0428

1L   FPLN REQUEST - Flight plan request downlinks are initiated via 1L. To initiate a downlink request, the pilot must first enter the company route identifier in 1L via the scratchpad. A valid company route identifier shall consist of one to ten alphanumeric characters. The data line at 1L shall then display the entered identifier in large font, left justified, preceded by an asterisk. The title line at 1L shall display SEND REQUEST in small font. Pushing 1L when a company route name is displayed and the scratchpad is empty shall send a downlink request. Pushing 1L after pushing the CLR key shall clear the company route name. Upon either sending the downlink or clearing the company route name, the display at 1L shall revert to large font empty brackets in the data line preceded by an asterisk, and FPLN REQUEST in small font in the title line.

2L   T/O REQUEST - This field is used to request a takeoff procedure. A takeoff request downlink is initiated by entering a runway identifier in the data field in 2L. Valid entries are two numbers (01 to 36), followed optionally by L, R, or C, and a slash followed by up to three numbers, letters, or dashes to indicate runway intersection (optional). After this is done, the title line in 2L changes to SEND REQUEST and pushing 2L sends the takeoff request. After the request is sent, the title line reverts to T/O REQUEST. The runway identifier can be cleared from the data field before the request is sent by pushing the CLR key with the scratchpad empty, and then pushing 2L.

3L   REQUEST PERF DATA - Performance data request downlinks are initiated via 3L. Selection of this prompt results in a downlink request for performance initialization data, and causes the asterisk to disappear. The asterisk will reappear 20 seconds later, after which another perf data request downlink can be sent.

       NOTE: The system redisplays the asterisk to indicate that another request can be sent. The asterisk is not an indication that the request has been received by the ground station.

4L   REQUEST WIND DATA - This prompt shall be available only if a flight plan with a destination exists (either active or secondary), and the FMS has not transitioned to descent or approach flight phase. Selection of this prompt results in display of the AOC WIND REQUEST page.

5L   POS REPORT - Selection of this prompt results in display of the POS REPORT page.

6L   SEND FPLN REPORT - Selection of this prompt results in a downlink of the active flight plan. When 6L is pushed, the asterisk is removed from the data field for about 20 seconds. When the asterisk is redisplayed, another flight plan report can be sent.

> *NOTE: The system redisplays the asterisk to indicate that another request can be sent. The asterisk is not an indication that the request has been received by the ground station.*

1R   REVIEW AOC ROUTE - This prompt shall be available only if a flight plan uplink has been received. Selection of this prompt results in display of the AOC ROUTE REVIEW page.

2R   REVIEW T/O DATA - This prompt shall be available only if takeoff data has been received and the airplane is on the ground. Selection of the prompt results in display of the AOC TAKEOFF REVIEW MENU page.

3R   REVIEW PERF DATA - This prompt shall be available only if performance initialization data has been received and the airplane is on the ground. Selection of the prompt results in display of the AOC PERF REVIEW page.

4R   REVIEW WIND DATA - This prompt shall be available only if wind data has been received. Selection of this prompt results in display of the AOC WIND DATA REVIEW page.

6R   STATUS - This field provides the flight crew with an indication of the datalink status (i.e., READY, NO COMM, VOICE, or FAIL).

AOC ROUTE REVIEW Page

The AOC ROUTE REVIEW page is accessed by pushing LSK 1R on the AOC COMM MENU page.

STEPS: 1. Access **AOC COMM MENU** Page

2. Push **1R**

```
╭─────────────────────────────────────╮
│                                     │
│       AOC ROUTE REVIEW   1/1 →      │
│      NEW ROUTE                      │
│ ⊏1L⊐ KJFK/KATL          XXX1234  ⊏1R⊐ │
│      RWY    RW22R                   │
│ ⊏2L⊐ DISCON CRI      DIR    CYN  ⊏2R⊐ │
│      J37    GVE      J42    MOL      │
│ ⊏3L⊐ DIR    MACEY2   DIR    KATL ⊏3R⊐ │
│                                     │
│ ⊏4L⊐                             ⊏4R⊐ │
│      ─────────────────────────      │
│ ⊏5L⊐ *INSERT ACT         REJECT* ⊏5R⊐ │
│                      RETURN TO      │
│ ⊏6L⊐                 AOC MENU>   ⊏6R⊐ │
│                                     │
│                  .                  │
╰─────────────────────────────────────╯
```

KB1-3-0483A

LSK 1L-LSK 4L and LSK 1R-LSK 4R Flight Plan Review Data

The lateral flight plan elements are displayed in approximate ATC language below the route name and flight number. Any hold or constraints are displayed after the flight plan elements. If there is more than one page of flight plan data, ----CONTINUED---- is displayed below the flight plan data on each page except for the last one.

5L INSERT ACT/SEC (Final Page Only) - If the uplinked flight plan data is targeted for the active flight plan, the data line shall display *INSERT ACT. If the uplinked flight plan data is targeted for the secondary flight plan, the data line shall display *INSERT SEC. Selection of the prompt shall insert the uplinked flight plan data into the specified flight plan, clear the uplinked data from the uplinked buffer, and revert the display to the AOC COMM MENU PAGE. This prompt shall be displayed only on the last AOC ROUTE REVIEW page.

6L PREV or MIN PROF - If the flight plan review data extends beyond one page, then each page except the final page shall display large font <PREV at 6L. Selection of this prompt shall display the previous page of route review data. If the flight plan data contains a non-precision approach procedure, MIN PROF is displayed in 6L (instead of PREV) on the last page. Selecting MIN PROF prompt displays five data entry boxes in 6L. Before the flight plan data is inserted into the specified flight plan, the minimum profile altitude for the non-precision approach must be entered in 6L.

5R REJECT (Final Page Only) - The data line shall display large font REJECT*. Selection of this prompt shall clear the uplinked data from the uplink buffer and revert the display to the AOC COMM MENU page.

AOC T/O REVIEW MENU Page

The AOC T/O REVIEW MENU page is accessed by pushing LSK 2R on the AOC COMM MENU page. The AOC T/O REVIEW MENU page displays the AOC uplink takeoff data selections for up to four runways. AOC takeoff data can only be received by the FMS while the airplane is on the ground until the throttles are set to takeoff thrust.

STEPS: 1.   Access **AOC COMM MENU** Page

2.   Push **2R**

```
        AOC T/O REVIEW MENU
                      FPLN RWY
  1L                     22R>      1R

  2L                     04L>      2R
                       INVALID
  3L                     04R       3R

  4L                     13L>      4R

  5L                                5R
                      RETURN TO
  6L                  AOC MENU>     6R
```

AOC T/O REVIEW Pages

The AOC T/O REVIEW page 1/2 is accessed by selecting a runway from the AOC T/O REVIEW MENU page. This page displays the AOC uplink takeoff data for the selected runway. If certain data is not included in the takeoff data uplink, that field displays dashes.

STEP: Push **1R**

```
         AOC T/O RW22R      1/2 →
     FLEX
1L   21°              STD← →ALTN*    1R
     FLAP              THR RATING
2L   18.0°               - - -       2R
     V1                TOCG/TOGW
3L   120             27.5/108.8      3R
     VR                RWY COND
4L   130                   DRY       4R
     V2
5L   137                             5R
                       RETURN TO
6L                    T/O MENU>      6R
```

KB1-3-0430

LSK 1L - LSK 5L and LSK 2R - LSK 4R Uplinked Data Fields

These fields display uplinked data in large font as depicted in the previous screen. The title line for each field displays the name of the data item in small font, regardless of whether the data item is included in the uplink. If any particular data item is not included in the uplink, then dashes are displayed in the data line. The display of assumed temperature (flex) at line 1L and thrust rating at line 2R is mutually exclusive; if an assumed temperature is included in the uplink then the thrust rating shall display dashes. If alternate takeoff data for the given runway is uplinked, then pushing LSK 1R will toggle the display to the alternate data.

1R   RWY DATA STD/ALTN - If the takeoff data uplink included alternate data for the selected runway, pushing 1R toggles the display between standard data and alternate data for that runway. If the takeoff data uplink did not include alternate data, this selection is not displayed.

6R   RETURN TO T/O MENU - Selection of this prompt displays the AOC T/O REVIEW MENU page.

If a new takeoff data uplink is received while either AOC T/O review page is displayed, the AOC T/O REVIEW MENU page will automatically be displayed with the new runway list.

 STEP: Push **PAGE**

```
    AOC T/O RW22R      2/2 →
                         OAT
  1L                    20°C         1R
                     SLOPE/WIND
  2L              DN 1.0/HD15         2R
                    CLB THRUST
  3L                      1510        3R
                        ACCEL
  4L                      3010        4R
         ALL RWYS       EO ACCEL
  5L    *REJECT           810         5R
                      RETURN TO
  6L    *INSERT STD   T/O MENU>       6R
```
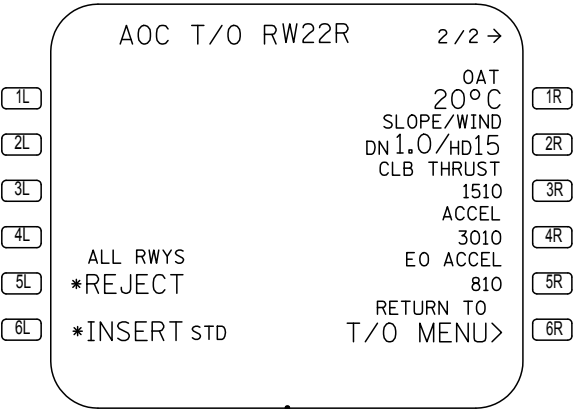
KB1-3-0431A

5L ALL RWYS *REJECT - Selection of this prompt clears the uplinked takeoff data from the memory buffer and displays the AOC COMM MENU page.

6L *INSERT STD or *INSERT ALTN or *INSERT - This prompt shall only be available if the runway to which this T/O REVIEW page applies is in active flight plan. Selection of this prompt, shall insert the uplinked data (displayed on pages 1 and 2) into the TAKEOFF, WEIGHT INIT and THRUST LIMITS pages, and shall downlink a response acceptance message, if enabled. Upon selection of this prompt, the page display shall revert to the AOC COMM MENU page. After selecting *INSERT, the takeoff uplink will remain pending. The pilot will still be able to access the AOC T/O REVIEW MENU page and select a new runway if a runway change is required.

1R-5R Uplinked Data Fields - These fields display uplinked data in large font as depicted in the previous screen. The title line of each field displays the name of the data item in a small font, regardless of whether that data item is included in the uplink. If any particular data item is not included in the uplink, then dashes are displayed in the data line.

6R RETURN TO T/O MENU - Selection of this prompt shall display the AOC T/O REVIEW MENU page.

AOC WIND REQUEST Page

The AOC WIND REQUEST page is accessed by pushing 4L on the AOC COMM MENU page.

STEPS: 1. Access **AOC COMM MENU** Page

2. Push **4L**

```
           AOC WIND REQUEST

  1L                                    1R
       ALT                    F-PLN
  2L  FL310              ACT← →SEC*      2R

  3L  FL290                              3R

  4L  [   ]                              4R

  5L  [   ]                              5R
                        RETURN TO
  6L  *REQUEST SEND    AOC MENU>         6R
```

KB1-3-0432

LSK 2L-LSK 5L Wind Altitude Request Entry

If there are wind altitudes present on the VERT REV page 2, those altitudes shall be displayed in these data fields. If there are less than four altitudes present on the VERT REV page 2, the remaining data fields have brackets so the pilot can enter an altitude for a wind request.

6L   *REQUEST SEND - Selection of this prompt downlinks a request for wind data (both cruise and descent). The request is for the flight plan displayed in field 2R, and contains the altitudes displayed in large font in fields 2L-5L and the top of descent altitude. If there are no altitudes displayed in 2L-5L, then the cruise altitudes displayed on the F-PLN INIT page (either ACT or SEC, according to which flight plan the request applies) shall be included; if there are no cruise altitudes for that flight plan then the downlink shall be sent without cruise wind altitudes. If the top of descent altitude is not available, then the downlink shall be sent without a top of descent altitude.

2R   F-PLN ACT/SEC - Selection of this prompt will toggle the selected flight plan (for which the wind request is made) between ACT and SEC.

> *NOTE: The FMS does not check to see if both flight plans exist before this prompt is displayed. If a wind request is made for a flight plan that does not exist, the system sends the request for the entered altitudes, but without any flight plan data (waypoint, etc.). If neither an active or secondary flight plan exist, this page is not accessible.*

6R   RETURN TO AOC MENU - Selection of this prompt shall display the AOC COMM MENU page.

AOC Wind Data Review Pages

There can be multiple CRUISE WINDS data review pages, one for each uplinked waypoint. If descent wind data is included in the uplink, then there shall be a DESCENT WINDS data review page. The DESCENT WINDS data review page shall be displayed as the last page in the series of wind data review pages. The following screens depict typical wind data review pages.

The AOC WIND DATA REVIEW page is accessed from the AOC COMM MENU page.

STEPS: 1.   Access **AOC COMM MENU** Page

2.   Push **4R**

```
┌─────────────────────────────────────┐
│   CRUISE WINDS          1/3          │
│   AT CLASY                           │
│                                      │
│   ALT    WIND          ALT/TEMP      │
│  FL310/280°/100    300/-15°          │
│                                      │
│  FL290/240°/080         PREV>        │
│                                      │
│                         NEXT>        │
│                                      │
│                                      │
│    ALL WINDS         ALL WINDS       │
│  *INSERT ACT          REJECT*        │
│                                      │
└─────────────────────────────────────┘
```

KB1-3-0433

```
┌─────────────────────────────────────┐
│   DESCENT WINDS         3/3          │
│                                      │
│    ALT    WIND                       │
│  FL290/255°/090                      │
│                                      │
│  FL200/270°/080         PREV>        │
│                                      │
│  FL100/285°/045         NEXT>        │
│                                      │
│  KATL/250°/018                       │
│    ALL WINDS         ALL WINDS       │
│  *INSERT ACT          REJECT*        │
│                                      │
└─────────────────────────────────────┘
```

KB1-3-0434

1L   Waypoint Identifier - If this page is displaying en route wind data, then the title line shall display AT WAYPOINT in small font, where WAYPOINT is the FMS identifier for which that wind data is associated. If this page is displaying descent wind data, then this field is blank.

2L-5L Uplinked Wind Data - If this page is displaying en route wind data, these fields shall display the uplinked altitude/bearing/magnitude wind data for the waypoint displayed in the title line at 1L. If this page is displaying descent wind data, these fields shall display altitude/bearing/magnitude wind data for the descent profile. If less than four altitudes of wind data are included in the uplink, the remaining fields will be blank.

6L   *INSERT ACT/SEC - The title line shall display small font ALL WINDS. If the uplinked wind data is targeted for the active flight plan, the data line shall display *INSERT ACT. If the uplinked wind data is targeted for the secondary flight plan, the data line shall display *INSERT SEC. Selection of the prompt shall insert the uplinked wind data into the specified flight plan, clear the uplinked data from the uplink buffer, and revert the display to the AOC COMM MENU page. For any uplink wind altitudes that match existing VERT REV page 2/2 altitudes, the uplinked wind data shall replace the existing wind data. If there are more than four wind altitudes (existing wind altitudes plus uplinked altitudes that don't match existing altitudes), all of the existing wind altitudes are deleted, and the uplinked wind altitudes are inserted into the flight plan.

2R   ALT/TEMP - If this page is displaying en route wind data, and the uplinked wind data contains an altitude/temperature for the waypoint displayed in 1L, then the title line shall display small font ALT/TEMP and the data line shall display the uplinked data in large font. Otherwise this field shall be blank.

3R   PREV - Selection of this prompt shall display the previous page of wind review data. If the current page is 1, then pressing 3R will result in wrapping around to display the last page of data.

4R   NEXT - Selection of this prompt shall display the next page of wind review data. If the current page is the final page of data, then pressing 3R will result in wrapping around to display the first page of data.

6R   *ALL WINDS REJECT - Selection of this prompt shall clear the uplink data from the uplink buffer and revert the display to the AOC COMM MENU page.

POS REPORT Page

The POS REPORT page provides the capability for the crew to review and send position report data to the company and/or ATC. If the ATS datalink functions are enabled, fields 2L, 3L, 2R, 3R and 4R are enterable and to be sent to ATC. If a position report is sent to the company, the default data for fields 2L, 3L, 2R, 3R, and 4R is sent, not the pilot entered data.

The POS REPORT page is accessed from the AOC COMM MENU page or the ATC INDEX page.

STEPS: 1. Access **AOC COMM MENU** Page

2. Push **5L**

```
           XXX1234 POS REPORT
        POS           ATA      ALT
 1L   VILLS         1422z FL270     1R
        EST                   ETA
 2L   NALES               1426z     2R
        NEXT             DEST ETA
 3L   CLASY               1428z     3R
        TEMP      WIND       SPD
 4L   -52°C  055°/ 70KT      .83    4R
                        POS FUEL
 5L                        19.5     5R
      COMPANY ------------------- ATC
 6L   *SEND               SEND*     6R
```

KB1-3-0435

1L   POS - This field displays the waypoint identifier for the leg that was last sequenced.

2L   EST - This is the active TO waypoint. The pilot can enter a different waypoint in this field. Deleting a pilot entry, sequencing the active TO waypoint, or changing the displayed page returns this field to the TO waypoint.

3L   NEXT - This field displays the waypoint for the leg following the active TO waypoint. The pilot can enter a different waypoint in this field. Deleting a pilot entry, sequencing the active TO waypoint, or changing the displayed page returns this field to the TO waypoint.

4L   TEMP/WIND - The temperature field displays the current outside air temperature. The wind field displays the current wind direction and magnitude.

6L   *COMPANY SEND - Selection of the COMPANY SEND prompt results in manually initiating a position report downlink message to the company. Upon selection, the asterisk will disappear for 20 seconds. Upon its return, another company position report may be sent.

        If the AOC datalink status is not READY and the ATS Datalink OPC option is not selected, then 6L will display the AOC datalink status as appropriate: NO COMM, VOICE, or FAIL.

        NOTE: The system redisplays the asterisk to indicate that another request can be sent. The asterisk is not an indication that the request has been received by the ground station.

1R   ATA/ALT - The actual time of arrival field displays the actual time of arrival at sequenced waypoints displayed in field 1L. The altitude field displays the current airplane altitude.

2R   ETA - This field defaults to display of the estimated time of arrival at the established (TO) leg waypoint displayed in field 2L. Pilot entry overrides the default and deletion of page change results in return to the default.

3R   DEST ETA - This field defaults to display the estimated time of arrival at DEST ETA destination. Pilot entry overrides the default and deletion, sequencing the active TO waypoint page change results in return to the default.

4R   SPD - This field defaults to display the current airplane Mach speed target, rounded to the nearest hundredths digit. Pilot entry overrides the default and deletion results in return to the default SPD value. Speed values are only displayed between Mach .61 and Mach .91. Otherwise, dashes are displayed.

5R   POS FUEL - This field displays the current amount of fuel remaining on the airplane.

6R   *ATC SEND - Selection of the ATC SEND prompt initiates transmission of the POS REPORT to ATC and results in creation of an ATC log entry associated with the transmitted message. If the ATC SEND prompt is not displayed, then the following statuses will be displayed depending on the condition of the ATS datalink: NO COMM, VOICE, FAIL, SENDING, and SENT. If the ATS Datalink OPC option is not selected, then 6R will be blank.

AOC PERF REVIEW Page

The AOC PERF REVIEW page is accessed from the AOC COMM MENU page.

STEPS: 1.   Access **AOC COMM MENU** Page

2.   Push **3R**

```
           AOC PERF REVIEW

        CRZ FL                BLOCK
  1L    310                    22.3    1R
        TEMP/WIND               TAXI
  2L    -48°/TL030              1.5    2R
        COST INDEX           RTE RSV
  3L    200                   10.0    3R
        PERF FACTOR             ZFW
  4L     0.0                   92.0    4R
                              ZFWCG
  5L    *REJECT                25.0    5R
                            RETURN TO
  6L    *INSERT             AOC MENU>  6R
```

KB1-3-0436A

**1L-4L
and
1R-5R** Uplinked Data Fields - These fields display uplinked data in large font, as shown in the above screen. The title line for each field displays the name of the data item in small font, regardless of whether the data item is included in the uplink. If any particular data item is not included in the uplink. If any particular data item is not included in the uplink, then large font dashes are displayed in the data line.

5L *REJECT - Selection of this prompt shall downlink a response rejection message, if enabled. Upon selection of this prompt, the page display shall revert to the AOC COMM MENU page.

6L *INSERT - Selection of this prompt shall insert the uplink data into the F-PLN INIT, A/C STATUS 1/2, and WEIGHT INIT pages, and shall downlink a response acceptance message, if enabled. Upon selection of this prompt, the page shall revert to the AOC COMM MENU page.

6R RETURN TO AOC MENU - Selection of this prompt shall display the AOC COMM MENU page.

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ATS DATALINK

> *NOTE: In order to be consistent with previous FMS sections, the same Kennedy to Atlanta flight plan has been used for the examples/artwork provided to describe the operation of the ATS Datalink function. However, it should be noted that the ATS facilities which currently support FANS-1 functionality are limited essentially to the Asia/Pacific region, so the ATS operations shown in this section cannot actually be performed with this flight plan.*

This section describes the Automatic Dependent Surveillance (ADS) and Air Traffic Services (ATS) functions of the FMS. The ADS section describes turning the ADS function on and off, and working with the ADS emergency functions. The ATS section describes logging on to an ATC center, displaying uplink messages, responding to uplink messages, requesting vertical clearances, speed clearances, lateral offsets, or route modifications, generating downlink reports, and declaring or cancelling emergencies.

Pilot interface to the ADS and ATC datalink functions is through datalink pages on the MCDU. These pages are accessed by selecting ATC COMM (1R) on the REF INDEX page or by pushing the ATC key (if installed).

Automatic Dependent Surveillance (ADS)

The ADS function can be turned on and off using the ATC LOGON/STATUS page. The state ADS function is displayed in the header line of field 5L. Three possible states for the ADS function are:

- OFF - ADS is displayed in the label line. OFF (large font) and ARM (small font) are displayed in the data line.

- Armed/Not Active - The ADS function is armed and ready to use but no connection has been established with an ATC or airline facility. ADS is displayed in the label line. OFF (small font) and ARM (large font) are displayed in the data line.

- Armed/Active - The ADS function is armed and one or more connections have been established with an ATC or airline facility. ADS (ACT) is displayed in the label line. OFF (small font) and ARM (large font) are displayed in the data line.

The FMS begins transmitting ADS reports once the ADS function is armed and ADS reporting has been requested by one or more ATC or airline facilities.

Once a connection is established, the ADS state changes to active. When the ADS function is armed or active, it can be turned off. This stops all ADS reporting and prevents the ADS function from responding to requests for ADS reporting.

Turning ADS Off

ADS reporting can be turned off using the ATC LOGON/STATUS page. The two following screens illustrate turning ADS reporting off. Access the ATC LOGON/STATUS page by selecting LSK 5L (LOGON/STATUS) on the ATC INDEX page. The first screen shows the ADS function armed and active. To terminate ADS reporting, push LSK 5L *OFF–ARM. The second screen shows the ATC LOGON/STATUS ADS turned off.

 STEPS: 1. Access **ATC INDEX** Page

2. Push **5L**

```
           ATC LOGON/STATUS
        LOGON TO
 1L    ▯▯▯▯                              1R
        FLT NO
 2L    ▯▯▯▯▯▯▯▯                          2R
        TAIL NO
 3L    XXXXXX                            3R

 4L                                      4R

        ADS (ACT)           ADS EMERG
 5L    *OFF← →ARM          OFF← →ON*     5R
       – – – – – – – – – – – – –DATA LINK
 6L    <ATC INDEX             READY      6R
```

KB1-3-0427A

Push LSK 5L turns ADS reporting off and stops all ADS reporting.

STEP: Push **5L**

```
          ATC LOGON/STATUS
        LOGON TO
1L      ▢▢▢                              1R
        FLT NO
2L      ▢▢▢▢▢▢▢                          2R
        TAIL NO
3L      XXXXXX                           3R

4L                                       4R

        ADS
5L      *OFF←  →ARM                      5R
        ----------------- DATA LINK
6L      <ATC INDEX          READY        6R
```

KB1-3-0426

Turning ADS On

ADS reporting can be turned on using the ATC LOGON/STATUS page. To turn the ADS function on, push LSK 5L while the ADS function is off. The ADS function arms. When a connection is established with an ATC or airline facility, ADS reporting becomes active and (ACT) is displayed above ARM in 5L. The FMS begins transmitting ADS report to the requesting facility.

STEP: Push **5L**

```
             ATC LOGON/STATUS
          LOGON TO
  1L      ▯▯▯▯                          1R
          FLT NO
  2L      ▯▯▯▯▯▯▯▯                      2R
          TAIL NO
  3L      XXXXXX                        3R

  4L                                    4R

          ADS                ADS EMERG
  5L     *OFF← →ARM         OFF← →ON*   5R
         ------------------DATA LINK
  6L     <ATC INDEX            READY    6R
```

KB1-3-0425A

Initiating ADS Emergency Mode

When ADS reporting is enabled, there are two methods to initiate the ADS emergency mode.

• Push LSK 5R on the ATC LOGON/STATUS page.

• Send an ATC downlink transmission with the MAYDAY MAYDAY MAYDAY message element.

If an ATC connection has been established, either method can be used to initiate the ADS emergency mode. If an ATC connection does not exist, the ADS emergency mode can only be initiated on the ATC LOGON/STATUS page.

To initiate the ADS emergency mode from the ATC LOGON/STATUS page, push the REF button to display the REF INDEX page and push LSK 1R (ATC COMM) on the REF INDEX page to display the ATC LOGON/STATUS page. If the ATC mode button is installed, pushing this button displays the ATC LOGON/STATUS page.

STEPS: 1. Push **REF**

2. Push **1R**

OR (IF INSTALLED)

STEP: Push **ATC**

```
           ATC LOGON/STATUS
        LOGON TO
1L      ☐☐☐☐                        1R
        FLT NO
2L      ☐☐☐☐☐☐☐                     2R
        TAIL NO
3L      XXXXXX                       3R

4L                                   4R
        ADS (ACT)        ADS EMERG
5L      *OFF← →ARM       OFF← →ON*   5R
        ------------------DATA LINK
6L      <ATC INDEX          READY    6R
```

KB1-3-0424

*NOTE: If an ATC connection has been established and there are
no new or pending uplink messages, pushing LSK 1R on the
REF INDEX page, or pushing ATC mode button (if installed)
displays the ATC INDEX page. Push LSK 5L on the ATC
INDEX page to display the ATC LOGON/STATUS page.*

STEP: Push **5R**

```
          ATC LOGON/STATUS
     LOGON TO
 1L  ▯▯▯▯                          1R
     FLT NO
 2L  ▯▯▯▯▯▯▯                       2R
     TAIL NO
 3L  XXXXXX                        3R

 4L                                4R

     ADS (ACT)         ADS EMERG
 5L  *OFF← →ARM     OFF← →ON*      5R
     ----------------DATA LINK
 6L  <ATC INDEX          READY     6R
```

KB1-3-0423

To initiate the ADS emergency mode by sending MAYDAY message
(when an ATC connection exists), push and hold the REF or ATC mode
button until the EMERGENCY REPORT page is displayed.

STEP: 1.   Push and Hold **REF** or

2.   Push and Hold **ATC**

```
           EMERGENCY  REPORT

1L    *MAYDAY                    PAN*    1R
       DIVERT TO                  SOB
2L    *KATL                       1OO    2R
       OFFSET          FUEL REMAINING
3L    [   ]            14.5 LBS 01+14    3R
       DESCEND TO
4L    *1OOOOFT(3O48M)                    4R

5L    *ERASE  EMERGENCY                  5R
       _____
6L    <ATC  INDEX            VERIFY>     6R
```

KB1-3-0437

The EMERGENCY REPORT page can also be accessed by pushing LSK
1L on the ATC INDEX page.

When the EMERGENCY REPORT page is displayed, push LSK 1L
(MAYDAY) to display the VERIFY EMERGENCY page. Push LSK 5R on
the VERIFY EMERGENCY page to send the emergency message and
initiate the ADS emergency mode.

STEPS: 1.   Push **1L**

2.   Push **5R**

```
            VERIFY EMERGENCY 1/1

       MAYDAY MAYDAY MAYDAY
  1L   O1+14 OF FUEL REMAINING         1R
         AND 100 SOULS ONBOARD.
  2L                                    2R

       FREE TEXT
  3L   [                    ]           3R

  4L   [                    ]           4R
                            REPORT
  5L                        SEND*       5R
       ------------------------------
  6L   <EMERGENCY                       6R
```

KB1-3-0400

Cancelling ADS Emergency Mode

There are two methods of cancelling the ADS emergency mode when it is active.

A. Cancelling Emergency Mode When an ATC Connection Does Not Exist

If no ATC or airline facility is active (a connection has not been established), the ADS emergency mode can be cancelled only on the ATC LOGON/STATUS page, as follows:

• Push the REF key to display the REF INDEX page and then push LSK 1R to display the ATC LOGON/STATUS page, or

• Push the ATC mode button (if installed) to display the ATC LOGON/STATUS page.

When the ATC LOGON/STATUS page is displayed, push LSK 5R. The ADS emergency mode is cancelled. OFF changes to large font, and ON changes to small font.

STEP: Push **5R**

```
           ATC LOGON/STATUS
       LOGON TO
 1L   ▢▢▢▢                              1R
       FLT NO
 2L   ▢▢▢▢▢▢▢▢                          2R
       TAIL NO
 3L   XXXXXX                            3R

 4L                                     4R
       ADS              ADS EMERG
 5L   *OFF← →ARM        OFF← →ON*       5R
      -------------------DATA LINK
 6L   <ATC INDEX             READY      6R
```

KB1-3-0422

B. Cancelling Emergency Mode When an ATC Connection Exists

If an ATC connection exists, the ADS emergency mode can be cancelled
on the EMERGENCYREPORT page or on the ATC LOGON/STATUS
page.

1. To cancel the ADS emergency mode from the EMERGENCY REPORT
page:

Push and hold the REF key or ATC mode button (if installed) until the
EMERGENCY REPORT page is displayed.

The EMERGENCY REPORT page can also be accessed by pushing LSK
1L on the ATC INDEX page.

STEP: 1.   Push and Hold **REF** or

2.   Push and Hold **ATC**

```
          EMERGENCY REPORT

1L    *MAYDAY                    PAN*    1R
      DIVERT TO                   SOB
2L    *KATL                       100    2R
      OFFSET           FUEL REMAINING
3L    [   ]              14.5 LBS 01+14  3R

4L    DESCEND TO                          4R
      *10000FT(3048M)

5L    *CANCEL EMERGENCY                   5R
      _____
6L    <ATC INDEX           VERIFY>        6R
```

KB1-3-0438

The CANCEL EMERGENCY prompt is displayed in 5L if an emergency message has been sent. Push LSK 5L to select the CANCEL EMERGENCY message. Push LSK 6R to display the VERIFY EMERGENCY page and then push LSK 6R on the VERIFY EMERGENCY page to send the CANCEL EMERGENCY message.

2. To cancel the ADS emergency mode from the ATC/LOGON STATUS page:

• Push the REF key to display the REF INDEX page and then push LSK 1R to display the ATC INDEX page, or push the ATC mode button (if installed)

• When the ATC INDEX page is displayed, push LSK 5L to display the LOGON/STATUS page. Push LSK 5R to cancel the ADS emergency mode. OFF changes to large font, and ON changes to small font.

STEPS: 1. Push **REF** Key

2. Push **1R**

3. Push **5L**

4. Push **5R**

```
          ┌─────────────────────────────────┐
          │        ATC LOGON/STATUS         │
          │    LOGON TO                      │
  ┌──┐    │    ────                          │   ┌──┐
  │1L│    │    FLT NO                        │   │1R│
  └──┘    │                                  │   └──┘
  ┌──┐    │    XXX1234                       │   ┌──┐
  │2L│    │    TAIL NO            ACT CTR     │   │2R│
  └──┘    │    XXXXXX                KJFK     │   └──┘
  ┌──┐    │    ATC COM            NEXT CTR    │   ┌──┐
  │3L│    │   *SELECT OFF                     │   │3R│
  └──┘    │    ADS (ACT)          ADS EMERG   │   └──┘
  ┌──┐    │   *OFF←→ARM           OFF←→ON*    │   ┌──┐
  │4L│    │   ───────────────────            │   │4R│
  └──┘    │                       DATA LINK  │   └──┘
  ┌──┐    │   <ATC INDEX            READY    │   ┌──┐
  │5L│    │                                  │   │5R│
  └──┘    └─────────────────────────────────┘   └──┘
  ┌──┐                                           ┌──┐
  │6L│                                           │6R│
  └──┘                                           └──┘
```

KB1-3-0439A

Air Traffic Services

INTERIM PROCEDURE 717-FMS-0007

FMS/VIA – ATC LOG DATA (FANS ENABLED).

REASON FOR INTERIM PROCEDURE: An operator conducting a flight utilizing ATC datalink communications (Controller Pilot / Data Link Communication – CPDLC) reported the following:

"While enroute and communicating normally via CPDLC with ATC, the flight crew down-linked a request to climb to FL340. A short time later, the uplink response "CLRD TO FL340" was received and the crew initiated a climb to the cleared FL. While climbing, the crew examined the ATC LOG page and noticed the message MAINTAIN FL330 in the log as the most recent message up-linked. The crew proceeded to resend the request for FL340. A short time later, ATC re-sent CLRD TO FL340 and the crew completed the level change.

"Subsequent research by the flight crew of the ATC LOG showed that none of the current flight's uplinks/downlinks were being logged and in fact, the ATC LOG was showing that each time an uplink/downlink was received/sent, the log would show a new "old" ATC message. The details of these "old" message showed them to be from a previous flight within a 24-hour period."

The intent of this Interim Procedure is to prevent the ATC LOG page from displaying previous flight leg messages.

FMS/VIA – ATC Log Data (FANS Enabled)

Subsequent further investigation by Boeing has revealed that the FMS input queue does not clear at flight completion. Power must be removed from the FMS/VIA LRUs for 10 seconds in order for the input queue to be cleared.

Boeing therefore recommends that the crew and maintenance interim procedures provided below be accomplished following flights in which CPDLC functions were used.

Boeing recommends the following for operators that are using CPDLC:

1. Flight crew makes a log book entry following CPDLC operations.

2. Maintenance should clear the log entry using one of the following methods:

    • Method A: Remove all aircraft power for more than 10 seconds.

    • Method B: Both Flight Management Computers must remain unpowered at the same time, for a minimum of 10 seconds. Accomplish this by opening the VIA-1 circuit breakers B1-1614 and B1-1615, and VIA-2 circuit breakers B-1616 and B-1617 located on the overhead panel (this method should be used when Method A above is not practical).

It is recommended that any ATC data link message log anomalies observed after implementing this interim procedure be communicated to Boeing as soon as practical.

<div style="border: 2px solid black; text-align: center;">

END INTERIM PROCEDURE 717-FMS-0007

</div>

The ATS function of the FMS lets the pilot communicate with an ATC facility to request vertical clearances, speed clearances, lateral offsets, and route modifications. The pilot can also display and respond to uplink messages, send downlink reports, and declare or cancel emergencies.

ATC Datalink Connection

The ATC datalink is controlled with the FMS MCDU. The display pages for the ATC datalink are accessed by pushing the ATC mode button (if installed) or by selecting ATC COMM (1R) from the REF INDEX page.

> *NOTE: In order for the AOC or ATC datalink to operate, the flight crew must verify on CRP-3 that VHF-3 is in DATA mode. In addition, if installed, the flight crew must verify that the HF radio is not in DATA mode prior to any use of the ATC datalink function (HF is not an approved medium for ATC FANS-1 communications).*

ATC LOGON/STATUS Page

The ATC LOGON/STATUS page is accessed by pushing the ATC COMM prompt on the REF INDEX page or by pushing the ATC key, if installed, when a logon to an ATC center has not been successfully completed. The page is also accessed by selection of LOGON/STATUS page prompt (5L) on the ATC INDEX page.

The ATC LOGON/STATUS page is used by the pilot to initiate the logon downlink to a specified ATC facility. This page also provides display of ADS status, ATC COMM status and Datalink status.

STEPS: 1. Access **ATC INDEX** Page

       2. Push **5L**

```
         ATC LOGON/STATUS
1L     LOGON TO                              1R
       □□□□
2L     FLT NO                                2R
       □□□□□□□□
3L     TAIL NO                               3R
       □□□□□□
4L                                           4R

       ADS               ADS EMERG
5L   *OFF←→ARM          OFF←→ON*            5R
     ------------------DATA LINK
6L   <ATC INDEX            READY>           6R
```

KB1-3-0421A

1. LOGON TO (LSK 1L)
   This field is used to enter the ATC facility identifier that the pilot wants
   to connect to. If the airplane position is invalid or the flight is
   completed, field 1L is blank. When no ATC COMM connection exists
   and no ATC center identifier has been entered, four box prompts are
   displayed. Valid ATC facility identifier entries are alpha characters.
   After entry of an ATC center identifier, and until both a positive
   acknowledgement (accepted) to the logon downlink message and a
   valid ATC COMM connection request uplink are received, the entered
   identifier will remain displayed in field 1L. After receipt of a valid ATC
   COMM connection request uplink and until a new ATC center identifier
   is entered or ATC COMM connection is terminated, dashes are
   displayed in field 1L. Clearing this field is allowed when an ATC facility
   identifier is displayed in field 1L.

2. FLT NO (LSK 2L)
   When the flight number is valid, it is displayed in field 2L. When the
   flight number is not valid, eight box prompts are displayed. The flight
   number can be entered on the F-PLAN INIT page or ATC
   LOGON/STATUS page, and will propagate from one page to another.
   The flight number consists of no more than eight alphanumeric
   characters. Clearing of the flight number is not allowed.

Flight crew must verify that the entered flight number matches the flight number on the filed flight plan.

If an ATC connection exists, entry of a different valid flight number terminates all ATC COMM and any logon process that is in progress at the time.

3. TAIL NO (LSK 3L)
   This field will normally display a tail number as received from the ACARS MU. If a tail number does not exist, seven box prompts will be displayed. The pilot may enter one to seven alphanumeric characters. The pilot entered tail number must match the tail number as received from the ACARS MU.

4. ATC COMM SELECT OFF (LSK 4L)
   This field is blank if a logon has not been successfully completed or the ATC COMM SELECT OFF prompt has been selected (terminating ATC COMM).

   Selection of the ATC COMM SELECT OFF prompt does not abort a logon process in progress at the time of selection, and has no effect on the display of fields 1L or 1R.

5. ADS *OFF<–>ARM (LSK 5L)
   When at least one ADS connection exists, "(ACT)" is displayed in the header line and *OFF<–>ARM is displayed in the data line. When an ADS connection does not exist, and the crew has not turned off ADS, ADS is displayed in the header line and *OFF<–>ARM is displayed in the data line. When the crew has turned off ADS, ADS is displayed in the header line and *OFF<–>ARM is displayed in the data line.

   Selection of *OFF<–>ARM terminates all ADS connections and ADS reporting.

6. ATC INDEX (LSK 6L)
   Selection of this prompt results in display of the ATC INDEX page.

7. Logon Status (LSK 1R)
   This field is blank until the required data has been entered in 1R, 2R, and 3R. When this data has been entered, LOGON SEND is displayed in 1R. Pushing 1R sends the logon request, and SENDING is displayed. When the message has been sent but a logon acknowledgement has not yet been received, SENT is displayed. When a logon acknowledgement has been received, ACCEPTED or REJECTED is displayed, depending on the content of the logon message. If the notification timer has expired, RESEND is displayed and the pilot must resend the logon request.

8. ACT CTR (LSK 3R)
When no ATC Datalink connection exists, this field is blank. After an ATC logon has been successfully completed and the airplane has received a connection request uplink from ATC, the header displays ACT CTR and the data line displays the four character identifier for the active ATC facility.

9. NEXT CTR (LSK 4R)
When an ATC Datalink connection does not exist, this field is blank. The next ATC center identifier is displayed in this field when ATC Datalink is available for communication and the next ATC center is known.

10. ADS EMERG OFF<–>ON* (LSK 5R)
This field is displayed if ADS is armed or active (as indicated in the 5L header). Selection of the ADS EMERG OFF<–>ON* (LSK 5R) prompt results in placing ADS in the emergency mode. Pushing 5R when the ADS is in emergency mode terminates the emergency mode.

ADS emergency mode is also initiated by transmission of an ATC emergency message containing the MAYDAY MAYDAY MAYDAY message element. The ADS emergency mode is also terminated by transmission of a CANCEL EMERGENCY message.

11. DATALINK Status (LSK 6R)
The Datalink status field displays the current datalink status: READY, NO COMM, VOICE or FAIL.

READY – Ready for datalink communication.

NO COMM – Airplane avionics are working, but no link is currently possible with the ground.

VOICE – ACARS MU/CMU is in voice mode.

FAIL – ACARS MU/CMU has a hardware failure, or is not powered up.

Logging Onto an ATC Facility

The flight crew can initiate communications with an ATC facility by means of a logon downlink message. The crew must perform this logon if ATC datalink is to be used during the flight. In addition, the crew may be required by particular ATC procedures to logon if ADS is to be used on the flight. The logon message is sent to a specified ATC facility, indicating that ADS and ATC datalink are ready and available for use on the airplane.

Enter the ATC facility in the SP, which is KJFK and push 1L.

STEPS: 1. TYPE **KJFK** in SP

2. Push **1L**

3. Type **XXX1234**

4. Push **2L**

```
         ATC LOGON/STATUS
     LOGON TO              LOGON
1L   KJFK                  SEND*   1R
     FLT NO
2L   XXX1234                       2R
     TAIL NO
3L   XXXXXX                        3R

4L                                 4R
     ADS              ADS EMERG
5L   *OFF←→ARM        OFF←→ON*     5R
     ------------------DATA LINK
6L   <ATC INDEX            READY   6R
```

KB1-3-0440

Push LSK 1R to send the logon request. SENDING is displayed in 1R

STEP: Push **1R**

```
        ATC LOGON/STATUS
     LOGON TO           LOGON
1L   KJFK             SENDING     1R
     FLT NO
2L   XXX1234                      2R
     TAIL NO
3L   XXXXXX                       3R

4L                                4R

     ADS           ADS EMERG
5L  *OFF←→ARM      OFF←→ON*       5R
    ------------------ DATA LINK
6L  <ATC INDEX            READY   6R
```

KB1-3-0441

After receipt of the logon request, the ATC facility either accepts or rejects the logon request and generates an acknowledgement. ACCEPTED or REJECTED is displayed in field 1R.

```
            ATC LOGON/STATUS
       LOGON TO              LOGON
1L     KJFK              ACCEPTED     1R
       FLT NO
2L     XXX1234                        2R
       TAIL NO
3L     XXXXXX                         3R

4L                                    4R

       ADS            ADS EMERG
5L    *OFF←→ARM       OFF←→ON*        5R
      ------------------DATA LINK
6L    <ATC INDEX          READY       6R
```

KB1-3-0442

After the first ATC connect message is received from the ATC facility, the facility identifier, KJFK is displayed in field 3R and the ATC COMM ESTABLISHED scratchpad message is displayed.

```
            ATC LOGON/STATUS
       LOGON TO
1L     ----                           1R
       FLT NO
2L     XXX1234              ATC CTR    2R
       TAIL NO                  KJFK
3L     XXXXXX            NEXT CTR      3R
       ATC COMM
4L    *SELECT OFF                     4R
       ADS            ADS EMERG
5L    *OFF←→ARM       OFF←→ON*        5R
      ------------------DATA LINK
6L    <ATC INDEX          READY       6R
      ATC COMM ESTABLISHED
```

KB1-3-0443

Terminating ATC Datalink Connection

The ATC datalink connection can be terminated by:

- Push the REF key to display the REF INDEX page and then push LSK 1R or push the ATC mode button (if installed) to display the ATC INDEX page.

- Push LSK 5L on the ATC INDEX page to display the ATC LOGON/STATUS page.

- Push LSK 4L on the ATC LOGON/STATUS page to terminate the datalink connection. ATC COMM TERMINATED is displayed in the SP. ATC NO COMM will also then be displayed on the NAV display.

  NOTE: The ATC NO COMM message on the ND will be continuously displayed until either the flight crew logs onto ATC again or until the FMS transitions to preflight.

STEPS: 1.   Access **ATC LOGON/STATUS** Page

2.   Push **4L**

```
          ATC LOGON/STATUS
       LOGON TO
1L    □□□□                          1R
       FLT NO
2L    XXX1234                       2R
       TAIL NO
3L    XXXXXX                        3R

4L                                  4R
       ADS              ADS EMERG
5L    *OFF← →ARM         OFF← →ON*  5R
      ---------------- DATA LINK
6L    <ATC INDEX            READY   6R
      ATC COMM TERMINATED
```

KB1-3-0420

ATC INDEX Page

When the logon to an ATC center has been successfully completed and no pending ATC uplinks exist, pushing LSK 1R (ATC COMM) on the REF INDEX page or pushing the ATC button (if installed) displays the ATC INDEX page.

STEPS: 1. Push **REF**

2. Push **1R** or

3. Push **ATC (If Installed)**

```
                  ATC INDEX
1L   <EMERGENCY    POS REPORT>   1R
2L   <REQUEST     WHEN CAN WE>   2R
3L   <REPORT       FREE TEXT>    3R
4L   <LOG          CLEARANCE>    4R
5L   <LOGON/STATUS     VOICE>    5R
     ----------------------------
6L   *PRINT LOG                  6R
```

KB1-3-0419

The ATC INDEX page is also accessible from the following pages: ATC LOGON/STATUS page, EMERGENCY REPORT page, ATC REQUEST page, ATC REPORT page, ATC LOG page, WHEN CAN WE EXPECT page, VERIFY REPORT, or VERIFY REQUEST page.

The ATC INDEX page is used by the pilot to access the ATC COMM functions and to print the contents of the ATC LOG.

1L   EMERGENCY - Selection of this prompt displays the EMERGENCY REPORT page.

2L   REQUEST - Selection of this prompt displays the ATC REQUEST page.

3L   REPORT - Selection of this prompt displays the ATC REPORT page.

4L   LOG - Selection of this prompt displays the ATC LOG page 1.

5L   LOGON/STATUS - Selection of this prompt displays the ATC LOGON/STATUS page.

6L   *PRINT LOG - If the ATC LOG is empty, this field will be blank. Selection of this prompt transmits the contents of the ATC LOG to the printer for a hard copy report.

1R   POS REPORT - Selection of this prompt displays the POS REPORT page.

2R   WHEN CAN WE - Selection of this prompt displays the WHEN CAN WE EXPECT page.

3R   FREE TEXT - Selection of this prompt displays the VERIFY REPORT page with only the free text message element.

4R   CLEARANCE - Selection of this prompt displays the VERIFY REQUEST page 1 for the CLEARANCE request.

5R   VOICE - Selection of this prompt displays the VERIFY REQUEST page 1 for the VOICE CONTACT request.

ATC Uplink Messages

ATC uplink messages are messages that ATC has sent to the airplane. When an uplink message is received, the ATC MSG annunciator is displayed on the ND and a chime sounds.

XXXXz ATC UPLINK Page

The XXXXz ATC UPLINK page is used to respond to an ATC uplink message, if required. This page is also used to print the uplink message, review loadable clearances, and arm the corresponding downlink report messages to be sent when the uplink message criteria are met.

> _NOTE: XXXXz is the time (UTC) that the uplink message was received._

When an uplink message is received and is ready for review, and if there is only one new or pending uplink message in the ATC LOG, pushing LSK 1R (ATC COMM) prompt on the REF INDEX page or pushing the ATC button (if installed) displays the time that the message was received from ATC.

STEPS: 1. Push **REF**

2. Push **1R** or

3. Push **ATC (If Installed)**

```
           1426z ATC UPLINK  1/1
                          STATUS
   1L                       OPEN    1R
      REPORT REACHING
   2L    FL290.                     2R

   3L                               3R
        STANDBY
   4L  *SEND                        4R
                          ACCEPT
   5L                       SEND*   5R
      --------------------------
   6L  *PRINT              LOG>     6R
```

KB1-3-0418A

An XXXXz ATC UPLINK page can also be accessed from the ATC LOG page via selection of the right LSK for the corresponding uplink message. XXXXz ATC UPLINK page is also accessed via selection of the UPLINK prompt on the VERIFY RESPONSE page, ATC LOAD REVIEW page, REJECT DUE TO page, XXXXz ATC REQUEST page, or selection of the INSERT ACT or INSERT SEC prompt on the ATC LOAD REVIEW page.

Page Title - The title of the page displays the time that the uplink message was received by the FMS.

1L   DISPLAY REQUEST - The DISPLAY REQUEST prompt is displayed on the first uplink page if the uplink message that is being displayed is in response to a WHEN CAN WE EXPECT or REQUEST downlink message that is currently contained in the ATC LOG. Pushing 1L displays the corresponding XXXXz ATC REQUEST page.

4L   *STANDBY SEND - If a response is required, the STANDBY SEND prompt is displayed on the last uplink page only. Pushing 4L immediately sends a STANDBY message and removes this prompt.

5L   REJECT - If UNABLE or NEGATIVE is a valid response to the uplink message, the REJECT prompt is displayed on the last uplink page only. Selection of the REJECT prompt results in the display of the REJECT DUE TO page, unless a REJECT message is already being sent for that uplink. If a REJECT message is being sent and 5L is pushed, the VERIFY RESPONSE page is displayed.

6L   *PRINT - Selection of the PRINT prompt results in the displayed uplink message being printed in its entirety.

1R   STATUS - STATUS displays the current status of the ATC uplink message on the first uplink page. This status is identical to the status displayed on the ATC LOG page.

4R   LOAD REVIEW - If the uplink message contains loadable data, the LOAD REVIEW prompt is displayed on the last uplink page only. Selection of the LOAD REVIEW prompt results in the display of the ATC LOAD REVIEW page. This prompt can be selected more than once.

> *NOTE: The LOAD REVIEW prompt will be blanked if the uplink is subsequently rejected.*

5R   ACCEPT SEND* - If WILCO, ROGER, or AFFIRM is a valid response, the ACCEPT prompt is displayed on the last uplink page only. Pushing 5R sends the ACCEPT response.

6R LOG/REPORT - The LOG prompt is displayed if the displayed uplink message does not include a request for a report, confirmation, or WHEN CAN YOU ACCEPT. Selection of the LOG prompt results in display of the ATC LOG page.

The REPORT prompt is displayed if the uplink message contains a report, confirmation, or WHEN YOU CAN ACCEPT type request. Selection of the REPORT prompt results in display of the ATC REPORT which includes the prompt for the REPORT downlink being generated in response to the XXXXz ATC UPLINK page. If the uplink message requires a response (ACCEPT or REJECT), the report list entry will not be displayed on the ATC REPORT page until the FMS has received acknowledgement from the network that the response downlink message was received. The corresponding report will not be displayed in the report list if the report has been sent or the corresponding report has been deleted from the report list.

Message Text - The uplink message text will be displayed starting in line 2 on the first page.

REPORT ARM (2R or 3R or 4R) - The REPORT ARM is displayed on the right side of the page, if the uplink message contains a report request that is armable and the uplink status is either OLD or ACCEPTED. Selection of the ARM prompt on this page or the VERIFY REPORT page results in the FMS being ARMED to automatically send the associated report downlink message when the reporting criteria is satisfied.

There are four reports that can be armed for automatic transmission. If the report is armed, the report will automatically be transmitted when the when the associated condition is satisfied.

1. An uplink message of REPORT LEVEL (altitude) can be armed and is sent when the condition is satisfied.

2. An uplink message of REPORT REACHING (altitude) can be armed and sends the REACHING (altitude) downlink message when the condition is satisfied.

3. An uplink message of REPORT PASSING (position), where (position) is in the active F-PLN, can be armed and sends the PASSING (position) downlink message when condition is satisfied.

4. An uplink message of REPORT LEAVING (altitude) can be armed and is sent when the condition is satisfied.
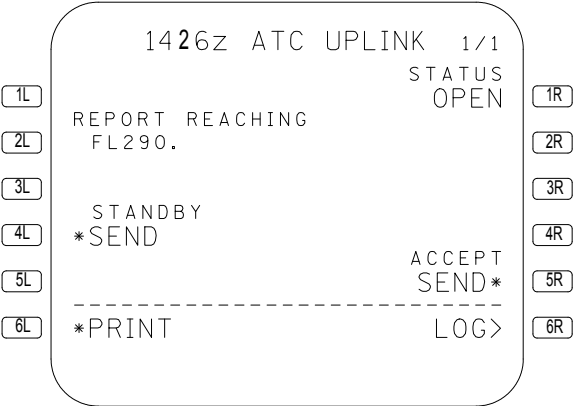
If the ARM prompt has been selected, ARMED will be indicated adjacent to the report request. Deletion of the prompt while ARMED is displayed disarms the trigger that would automatically initiate the downlink report.

RESPONSE - When an ACCEPT or REJECT downlink response message has been sent, the time that the response message was sent is indicated in the first header line following the end of the uplink message text. The response text is displayed in the subsequent lines.

ATC UPLINK Page - Uplink First Received

```
            1426z ATC UPLINK  1/1
                          STATUS
  1L                        OPEN        1R
     REPORT REACHING
  2L    FL290.                          2R

  3L                                    3R

        STANDBY
  4L   *SEND                            4R
                           ACCEPT
  5L                         SEND*      5R
       ──────────────────────────
  6L   *PRINT             LOG>          6R
```

KB1-3-0418

ATC UPLINK Page - Uplink Accepted

```
            1426z ATC UPLINK   1/1
                         STATUS
  1L                   ACCEPTED        1R
        REPORT REACHING     REPORT
  2L     FL290.              ARM*       2R
        ----  RESPONSE 1430Z    ----
  3L    ROGER.                          3R

  4L                                    4R

  5L                                    5R
        _____
  6L    *PRINT           REPORT>        6R
```

KB1-3-0417A

ATC UPLINK Page - Report Armed

```
            1426z ATC UPLINK   1/1
                         STATUS
  1L                   ACCEPTED        1R
        REPORT REACHING     REPORT
  2L     FL290              ARMED       2R
        ----  RESPONSE 1430Z    ----
  3L    ROGER.                          3R

  4L                                    4R

  5L                                    5R
        _____
  6L    *PRINT           REPORT>        6R
```

KB1-3-0416A

ATC UPLINK Page - Display Request Prompt

```
        1048z  ATC UPLINK     1/1
        DISPLAY              STATUS
1L  <REQUEST                    OLD   1R
    ROGER.
2L                                    2R

3L                                    3R

4L                                    4R

5L  _____     5R

6L  *PRINT                 LOG>       6R
```

KB1-3-0415A

ATC UPLINK Page - Reject Prompt

```
         1450z  ATC UPLINK  1/1
                          STATUS
1L                           OPEN     1R
    CAN YOU ACCEPT FL330 AT
2L  MOL.                              2R

3L                                    3R
      STANDBY
4L  *SEND                             4R
                          ACCEPT
5L  <REJECT               SEND*       5R
    _____
6L  *PRINT                 LOG>       6R
```

KB1-3-0444

ATC UPLINK PAGE - Message Continued

```
          1452z ATC UPLINK 1/2→
                         STATUS
1L                        OPEN         1R
    CAN YOU ACCEPT FL270 AT
2L    CLASY.                           2R
    CAN YOU ACCEPT FL330 AT
3L    MOL.                             3R
    WHEN CAN YOU ACCEPT
4L    FL310.                           4R
    WHEN CAN YOU ACCEPT
5L    FL330.                           5R
    ------- CONTINUED  -------
6L                          LOG>       6R
```

KB1-3-0445

INTERIM PROCEDURE 717-FMS-0008

FMS/VIA – ATC ROUTE CLEARANCE UPLINK ANOMALY (FANS ENABLED).

REASON FOR INTERIM PROCEDURE: An operator conducting a flight utilizing ATC data link communications (Controller Pilot / Data Link Communication – CPDLC) and tests conducted by Boeing have confirmed a flight plan anomaly may occur on the ground or in flight loading an ATC clearance modification uplink message to modify an existing flight plan. The anomaly will cause the course displayed on the ND MAP page to change from ATC uplink clearance. If not corrected by the flight crew, the aircraft will deviate from the ATC assigned route of flight.

FMS / VIA – ATC ROUTE CLEARANCE UPLINK ANOMALY (FANS ENABLED)

There is an anomaly associated with some CPDLC Route Revision Clearances, which can be recognized by CLEARED TO XXX VIA ROUTE CLEARANCE displayed on the ATC UPLINK and ATC LOAD REVIEW pages. The anomaly will occur after sequencing the last waypoint in the revised flight plan, which will result in a navigation error and will result in the disappearance of the magenta course line between the last point of the revised routing and the TO waypoint.

Example:

NOTE: Figure 1 shows original F-PLN prior to loading uplinked route clearance message.

Figure 1

```
          ACT F-PLN      1/2→
      FROM    ETE   SPD      ALT
 1L  KMEM   0000   ---/     340   1R
      AZONE2
 2L  AZONE  ----   ---/    -----  2R

 3L  GQO    ----   ---/    -----  3R

 4L  ATL    ----   ---/    -----  4R

 5L  OTK    ----   ---/    -----  5R

 6L  TRV    ----   ---/    -----  6R
                            ↑ ↓
```

1. This procedure applies only to clearances TO a waypoint VIA a revised routing.

Cleared to OTK via direct BBKING direct KERMI direct VUZ.

In Figure 2 below, note the boxed text in the CPDLC revised clearance: CLEARED TO OTK VIA ROUTE CLEARANCE.

Figure 2

```
    2031Z ATC UPLINK   1/1
                      STATUS
 1L                     OPEN   1R
   CLEARED TO OTK VIA ROUTE
 2L  CLEARANCE.                 2R

 3L                             3R


     STANDBY
 4L *SEND        LOAD REVIEW>   4R
                        ACCEPT
 5L <REJECT             SEND*   5R
     PRINT ------------------
 6L FAIL                LOG>    6R
```

2. Select LOAD REVIEW> (LSK 4R) and print revised routing. If printing is not available, make a written copy with date and time received.

Figure 3

```
        ATC  LOAD  REVIEW    1/1
        CLEARED  TO  OTK  VIA  ROUTE
1L       CLEARANCE:                     1R

2L      DIR      BBKNG                   2R
        DIR      KERMI
3L      DIR      VUZ                     3R

4L      _____      4R

5L      *LOAD  ACT        LOAD  SEC*     5R
                           RETURN  TO
6L                         ATC  UPLINK>  6R
```

3. Accept and load revised routing into MCDU flight plan per normal procedures.

> *NOTE: Boeing recommends loading any revised routing into the*
> *secondary flight plan, LOAD SEC* (LSK 5R), in flight or on the*
> *ground. LOAD ACT* (LSK 5L) is only available on the ground.*

4. When there are no duplicate waypoints, apply the following procedure.

Figure 4

```
          ACT  F-PLN        1/2→
        FROM    ETE    SPD     ALT
1L      KMEM   0000   ---/     340    1R

2L      BBKNG  ----   ---/    -----   2R

3L      KERMI  ----   ---/    -----   3R

4L      VUZ    ----   ---/    -----   4R

5L      OTK    ----   ---/    -----   5R

6L      TRV    ----   ---/    -----   6R
                                ↑↓
```

- In the ACT F-PLN (or SEC F-PLN), manually clear (CLR) the last waypoint of the revised clearance (e.g., VUZ) and observe
  - - - F-PLN DISCONTINUITY - - - displays on the associated line.
  The ATC LOAD REVIEW page will not change.

- Manually reenter the last waypoint of the revised clearance (e.g., VUZ) on the - - - F-PLN DISCONTINUITY - - - line.

- Clear (CLR) the F-PLAN DISCONTINUITY.

- Both pilots confirm all waypoints and courses in the revised ACT F-PLN (or SEC F-PLN) pages 1 and 2.

- If required, ACTIVATE SEC* (LSK 4R, page 1, SEC F-PLN INIT).

    CAUTION: *If the above steps are not accomplished and the last waypoint of the revised clearance is sequenced in flight, the aircraft will deviate from the revised clearance. The autopilot will remain in NAV, but the magenta course line between the last waypoint of the revised routing (e.g., VUZ), and the cleared-to waypoint (e.g., OTK) will be removed. Should this happen, advise ATC and return to the assigned routing or obtain a new clearance.*

END INTERIM PROCEDURE 717-FMS-0008

INTERIM PROCEDURE 717-FMS-0009

REASON FOR INTERIM PROCEDURE: An operator conducting a flight utilizing ATC data link communications (Controller Pilot / Data Link Communication – CPDLC) and tests conducted by Boeing have confirmed a flight plan anomaly may occur on the ground or in flight loading an ATC clearance modification uplink message to modify an existing flight plan. If not corrected by the flight crew, the aircraft will deviate from the ATC assigned route of flight. This IOP allows the deletion of either the first or second duplicate waypoint.

Some ATC UPLINK messages that revise existing flight plans have been shown to insert (LOAD) duplicate waypoints; i.e., waypoints with the same name and same latitude/longitude. Normally, such waypoints "collapse" to a single waypoint, but some uplink messages may result in duplicate waypoints.

Example:

1. A route revision message is received.

Figure 1

```
       2211Z  ATC  UPLINK   1/1
                            STATUS
 1L                           OPEN    1R
       CLEARED  TO  SAC  VIA  ROUTE
 2L      CLEARANCE.                   2R

 3L                                   3R
         STANDBY
 4L    *SEND        LOAD  REVIEW>     4R
                            ACCEPT
 5L    <REJECT             SEND*      5R
         PRINT ----------------
 6L    FAIL                  LOG>     6R
```

2. Select LOAD REVIEW> (LSK 4R) and print the revised routing. If printing is not available, make a written copy with date and time received.

Figure 2

```
          ATC  LOAD  REVIEW    1/1
        CLEARED  TO  SAC  VIA  ROUTE
 1L       CLEARANCE:                  1R

 2L     DIR    RBL                    2R
        J126   SAC
 3L                                   3R

 4L                                   4R
        _____
 5L     *LOAD  ACT        LOAD  SEC*  5R
                          RETURN  TO
 6L                       ATC  UPLINK>  6R
```

3. Accept and load revised routing into the MCDU flight plan per normal procedures.

> *NOTE: Boeing recommends loading any revised routing into the secondary flight plan, LOAD SEC* (LSK 5R), in flight or on the ground. LOAD ACT* (LSK 5L) is only available on the ground.*

4. If a duplicate waypoint is presented in ACT F-PLN (or SEC F-PLN), delete either the first or second iteration of that duplicate waypoint and CLR any associated F-PLN DISCONTINUITY.

Figure 3

```
           ACT  F-PLN      1/2 →
        FROM     ETO    SPD    ALT
 1L     KBAB    0038    180/   1100    1R

 2L     RBL       53    245/  10000    2R
          J126
 3L     SAC     0115     "  /  9360    3R

 4L     SAC       15     "  /    "     4R

 5L     KSCK      24    147/     30    5R

 6L            END  OF  F-PLN          6R
```

A waypoint of the revised clearance may be listed twice (e.g. SAC, SAC in Figure 3) on the ACT F-PLN (or SEC F-PLN) page. Accomplish the following:

- Manually clear (CLR) either the first or second duplicate waypoint of the revised clearance (e.g., SAC) and observe - - -F-PLN DISCONTINUITY- - - on the associated line. The ATC LOAD REVIEW page will not change.

- Clear (CLR) the - - -F-PLN DISCONTINUITY- - -.

  NOTE: Duplicate waypoints may be associated with an airway or other FMS procedure such as an RNAV arrival or departure. When deleting a duplicate waypoint, use of the LAT REV function may be required to reenter the airway associated procedure between the remaining duplicate waypoint and the previous or following waypoint. Ensure revised F-PLN matches ATC clearance.

- Both pilots confirm all waypoints and courses in the revised ACT F-PLN pages 1 and 2.

- If required, ACTIVATE SEC* (LSK 4R, page 1 SEC F-PLN INIT).

  CAUTION: If the above steps are not accomplished and the duplicate waypoint of the revised clearance is sequenced in flight, the aircraft will deviate from the revised clearance. Should this happen, advise ATC and return to the assigned routing or obtain a new clearance.

END INTERIM PROCEDURE 717-FMS-0009

Loading an Uplink Message

If an uplink message is loadable, the LOAD REVIEW prompt 4R is displayed on the last XXXXz ATC UPLINK page required to display the message.

If the FMS determines that only a portion of the data contained in an uplink message is loadable, the PARTIAL F-PLN LOADED message will be displayed when the LOAD ACT or LOAD SEC prompt is selected. An example of this is if the departure procedure is not compatible with the departure runway.

The pilot may load the uplink message in either the active or secondary flight plan via the ATC LOAD REVIEW page. Selecting the LOAD ACT prompt will then load the uplink into the active flight plan. Selecting the LOAD SEC will erase the existing secondary flight plan, copy the active flight plan to the secondary, and then modify the new secondary with the uplink. The standard operating procedure is to load the uplink into the secondary flight plan for pilot review of the map display and performance predictions. Then the secondary flight plan may be either cleared or activated. Note the LOAD ACT prompt is only available during the preflight phase. The LOAD ACT prompt is provided in case the pilot chooses to update the active flight plan without changing the secondary flight plan. The LOAD ACT or LOAD SEC prompts are only available if the uplink contains loadable data.

The ATC LOAD REVIEW page is accessed by selecting the LOAD REVIEW prompt on the XXXXz ATC UPLINK page. The ATC LOAD REVIEW page displays the loadable uplinked message text and allows the pilot to load the uplink message into either the active (if in preflight) or secondary flight plan.

```
        ATC LOAD REVIEW        1/1
1L  │ PROCEED DIRECT TO CLASY.             │ 1R
    │ AT CLASY CLEARED ROUTE               │
2L  │   CLEARANCE:                         │ 2R
    │ J37     BRV                          │
3L  │ J37     GVE                          │ 3R
    │ J42     MOL                          │
4L  │                                      │ 4R
    │ _____         │
5L  │ *LOAD ACT       LOAD SEC*            │ 5R
    │                 RETURN TO            │
6L  │                 ATC UPLINK>          │ 6R
```

KB1-3-0485

Message Text - The uplink message text will be displayed starting in line 2 on the first page.

5L   *LOAD ACT - If the uplink contains loadable data which will replace or modify the existing active flight plan, and the airplane is in preflight phase, then the LOAD ACT prompt is displayed on the last review page. Selecting the LOAD ACT prompt results in loading of the displayed data into the active flight plan and display of the accessing XXXXz ATC UPLINK page.

6L   PREV or MIN PROF (Not Shown) - Selection of the PREV prompt results in display of the previous ATC LOAD REVIEW page. If the flight plan data in the uplink message contains a non-precision approach procedure, MIN PROF is displayed in 6L (instead of PREV) on the last page of flight plan data. Selecting the MIN PROF prompt displays five data entry boxes in 6L. Before the flight plan data can be inserted into the specified flight plan, the minimum profile altitude for the non-precision approach must be entered in 6L.

5R   LOAD SEC* - If the uplink contains loadable data that will go into the secondary flight plan, then the LOAD SEC prompt is displayed on the last review page. Pushing 5R erases the existing secondary flight plan, copies the active flight plan to the secondary, and then modifies the new secondary with the uplink. The XXXXz ATC UPLINK page is then displayed.

6R   ATC UPLINK - Selecting the UPLINK prompt results in display of the XXXXz ATC UPLINK page.

REJECT DUE TO Page

The REJECT DUE TO page is accessed by selecting the REJECT prompt on the last page of the XXXXz ATC UPLINK page. This page is also accessible from the REJECT DUE TO prompt on the VERIFY RESPONSE page.

The REJECT DUE TO page allows the pilot to give up to five reasons why an ATC uplink message is being rejected.

```
            REJECT DUE TO
    DUE TO              DUE TO
1L  *PERFORMANCE       WEATHER   1R

2L  *UNLOADABLE CLEARANCE        2R

3L  *NOT CONSISTENT, RESEND      3R
     FREE TEXT
4L  [                    ]       4R

5L                               5R
    _____
6L  <UPLINK           VERIFY>    6R
```

KB1-3-0414

1L   *DUE TO PERFORMANCE - Selection of this prompt results in the reason of DUE TO AIRCRAFT PERFORMANCE being included in the rejection response. The reason can be deselected via pushing the CLR key and pushing LSK 1L.

2L   *UNLOADABLE CLEARANCE - Selection of the unloadable clearance prompt will select the UNLOADABLE CLEARANCE text for inclusion with the response downlink message. The reason can be deselected via pushing the CLR key and pushing 2L

3L   *NOT CONSISTENT.RESEND - Selection of the NOT CONSISTENT.RESEND prompt will select the NOT CONSISTENT.RESEND text for inclusion with the response downlink message. The reason can be deselected via pushing the CLR key and pushing 3L

4L   FREE TEXT - The pilot can also create free text rejection reasons. These are created via entering data into the SP and pushing LSK 4L. Text that is entered is included with the response message. The free text reason can be deselected via pushing the CLR key and pushing LSK 4L.

6L   UPLINK - Selection of the UPLINK prompt displays the corresponding XXXXz ATC UPLINK page.

1R   DUE TO WEATHER* - Selection of this prompt results in the reason of DUE TO WEATHER being included in the rejection response. The reason can be deselected via pushing the CLR key and pushing 1R.

6R   VERIFY - Selection of the VERIFY prompt results in display of the VERIFY RESPONSE page for rejection response with all of the reasons from the REJECT DUE TO page displayed.

To send ATC a message that an uplink was rejected because of airplane performance related to strong headwinds:

STEPS: 1.   Access Last Page of XXXXz ATC
                 UPLINK Page

         2.   Push **5L** (REJECT)

         3.   Push **1R**

         4.   Push **1L**

         5.   TYPE **STRONG HEADWIND**

         6.   Push **4L**

```
┌─────────────────────────────────────┐
│         REJECT DUE TO               │
│      DUE TO            DUE TO        │
│  [1L] PERFORMANCE      WEATHER [1R]  │
│  [2L] *UNLOADABLE CLEARANCE    [2R]  │
│  [3L] *NOT CONSISTENT. RESEND  [3R]  │
│        FREE TEXT                     │
│  [4L] STRONG HEADWIND          [4R]  │
│  [5L]                          [5R]  │
│       _____ │
│  [6L] <UPLINK          VERIFY> [6R]  │
└─────────────────────────────────────┘
```

KB1-3-0413

VERIFY RESPONSE Page

VERIFY RESPONSE - The verify response page is accessed by selecting VERIFY prompt (LSK 6R) on the REJECT DUE TO page.

 STEP: Push **6R**

```
              VERIFY RESPONSE
      UNABLE.
      DUE TO WEATHER.
      DUE TO AIRCRAFT
       PERFORMANCE.
      STRONG HEADWIND.



                      RESPONSE
                        SEND*
      - - - - - - - - - - - - - - - - - - - - - - - - - - -
      <REJECT DUE TO
```

KB1-3-0412

The VERIFY RESPONSE page allows the pilot the opportunity to review the response message that has been built prior to sending the response to ATC.

MESSAGE TEXT - The message text is displayed starting at line 1.

6L   REJECT DUE TO - The REJECT DUE TO prompt is displayed when the response being verified is a reject response.

Selection of the REJECT DUE TO prompt results in the corresponding REJECT DUE TO page being redisplayed. This prompt is only displayed prior to selection of the SEND/RESEND prompt.

5R   RESPONSE SEND* - If more than one page is required to display the message text, the SEND/RESEND prompt is displayed on the last VERIFY RESPONSE page only. Selection of the RESPONSE SEND prompt results in the response message being sent to ATC.

Upon receiving acknowledgement from the network that the response message has been received, the CDU page display changes from the VERIFY RESPONSE page to the XXXXz ATC UPLINK page associated with the original uplink, with the uplink status as REJECTED.

ATC Request Downlink Messages

The ATC REQUEST pages are used to create request downlink messages for vertical and speed clearances, lateral offsets, and route changes. A maximum of five elements can be included in a request downlink. Selection of a LSK or entry into a field on any of the ATC REQUEST pages that would cause more than five downlink message elements to be selected, results in the MESSAGE LIMIT EXCEEDED scratchpad message being displayed and the message element is not selected or the entry is not accepted. VOICE or CLEARANCE request downlink message can be created via the ATC INDEX page. The WHEN CAN WE EXPECT page is used to create negotiation downlink messages.

Clearance Request

A request clearance downlink message is created by displaying the ATC INDEX page and pushing the CLEARANCE prompt LSK 4R.

STEPS: 1. Access **ATC INDEX** Page

2. Push **4R**

```
         VERIFY REQUEST    1/1

   REQUEST
1L                                    1R
    FREE TEXT
2L  [                      ]          2R

3L  [                      ]          3R

4L  [                      ]          4R
                         REQUEST
5L                        SEND*       5R
    _____
6L  <ATC INDEX                        6R
```

KB1-3-0411

Voice Request

A request voice contact downlink message is created by pushing 5R (VOICE) on the ATC INDEX page. The VERIFY REQUEST page is displayed with the REQUEST VOICE CONTACT message and a field to enter free text (if desired).

STEPS: 1. Access **ATC INDEX** Page
2. Push **5R**

```
        VERIFY REQUEST    1/1

   REQUEST VOICE CONTACT
1L                                    1R
     FREE TEXT
2L   [                    ]            2R

3L   [                    ]            3R

4L   [                    ]            4R
                          REQUEST
5L                        SEND*       5R
     _____
6L   <ATC INDEX                       6R
```

KB1-3-0410

ATC REQUEST Page

The ATC REQUEST page is accessed by pushing LSK 2L on the ATC INDEX page. This page is also accessed by pushing the REQUEST prompt on the ATC ALT REQUEST, ATC SPEED REQUEST, ATC OFFSET REQUEST, ATC ROUTE REQUEST, or VERIFY REQUEST page.

Fields 1L, 2L, 3L, and 5L are non-operational while the request downlink message is being sent (SENDING).

```
                ATC REQUEST
        ALTITUDE
1L    *[   ]                              1R
        SPEED
2L    *[   ]                              2R
        OFFSET
3L    *[   ]                              3R

4L    <ROUTE REQUEST                      4R

5L    _____    5R

6L    <ATC INDEX           VERIFY>        6R
```

KB1-3-0409

1L   *ALTITUDE - Selection of 1L results in display of the ATC ALT REQUEST page. Entry of a valid altitude into field 1L results in display of the ATC ALT REQUEST page with the entered altitude displayed in field 1L on that page.

Entry of a block altitude in terms of feet, meters, or as a flight level, or a single altitude in feet, meters, or as a flight level results in selection of a message element requesting a block altitude, a level altitude, or a climb or descent clearance. This selection is based on the type of entry and the relative airplane altitude and the entered altitude (e.g., if a single altitude is entered and it is more than 150 feet above the airplane altitude, the REQUEST CLIMB TO [altitude] message is selected).

The valid entry range for an altitude in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude value in terms of flight level is FL030 through FL430, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by an M.

Clearing of this field is allowed. Clearing of this field results in deselection of the selected altitude request downlink element, as well as any reasons that were also selected on the ATC ALT REQUEST page: DUE TO WEATHER, DUE TO PERFORMANCE, MAINTAIN OWN SEPARATION/VMC, and AT PILOT DISCRETION.

2L   *SPEED - Selection of 2L results in display of the ATC SPEED REQUEST page. Valid speed entries consist of an IAS or Mach number. Entry of a valid speed into field 2L results in display of the ATC SPEED REQUEST page with the entered speed displayed in field 1L on that page.

A valid IAS speed value is entered in the format of three numerics, ranging from 100-380, inclusive. IAS speed values are rounded to the nearest 10kts. A valid Mach number is entered in the format of one to three digits, preceded by a decimal point, .XXX, ranging from .610 - .910, inclusive. Mach values are rounded to the nearest .01 mach. Mach speeds can be entered as .610-.910, 7-9, 61-91, or 610-910. Clearing of this field is allowed. Clearing of this field results in deselection of selected speed request downlink element, as well as any reasons that were also selected: DUE TO WEATHER or DUE TO PERFORMANCE.

3L   *OFFSET - Selection of 3L results in display of the ATC OFFSET REQUEST page. Valid offset entries consist of a direction followed DNN or NND, where D is either L or R and NN ranges from 1-99NM, inclusive. If L or R is not included, then the offset request is made for either direction. DNN will be displayed even if NND is entered. Clearing of this field is allowed. Clearing of this field results in deselection of the selected offset request downlink element.

4L   ROUTE REQUEST - Selection of this prompt results in display of the ATC ROUTE REQUEST page.

5L   *ERASE REQUEST - This prompt is displayed if data has been selected or entered for inclusion in a downlink request message on the ATC REQUEST, ATC ALT REQUEST, ATC SPEED REQUEST, ATC OFFSET REQUEST, or ATC ROUTE REQUEST page. Selection of this prompt results in the currently selected request being erased.

6L   ATC INDEX - Selection of this prompt results in display of the ATC INDEX page.

6R   VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing all of the selected request downlink elements.

ATC ALT REQUEST Page

The ATC ALT REQUEST page is accessed by pushing 1L on the ATC REQUEST page. This page may also be accessed via selection of the right arrow PAGE key from the ATC ROUTE REQUEST page. The ATC ALT REQUEST page is used to create vertical clearance request downlink messages. Fields 1L, 2L, 4L, 1R, 2R, 3R, and 4R are non-operational while the request downlink message is in the "SENDING" state.

```
        ATC  ALT  REQUEST 1/4→
    ALTITUDE            REQUEST
1L  FL330            CRZ  CLB*    1R
      STEP  AT       MAINTAIN  OWN
2L  [   ]         SEPARATION/VMC*  2R
                          DUE  TO
3L                  PERFORMANCE*   3R
                          DUE  TO
4L  *AT  PILOT  DISC    WEATHER   4R

5L                               5R
    _____
6L  <REQUEST            VERIFY>  6R
```

KB1-3-0446

1L   ALTITUDE - Entry of a block altitude in terms of feet or flight level, or a single altitude in terms of feet, flight level, or meters, results in selection of a message element requesting a block altitude, a level altitude, or a climb or descent clearance. This is based on the type of entry and the relative positions of the airplane altitude and the entered altitude (e.g. if a single altitude is entered and the entered altitude is more than 150 feet above the airplane altitude, the REQUEST CLIMB TO [altitude] message is selected). The valid entry range for an altitude value in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude in terms of flight level is FL030 through FL430, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by M. Clearing of this field is allowed. Clearing of this field results in deselection of the message element requesting a block, climb, descent, or level altitude clearance and returns this field and field 1L on the ATC REQUEST page to the default display. Any of the reasons that were also selected, such as DUE TO WEATHER, DUE TO PERFORMANCE, MAINTAIN OWN SEPARATION/VMC, or AT PILOTS DISCRETION are also deselected.

2L   STEP AT - A step at position or time value is enterable in this field only after entry of a single altitude value in field 1L that is greater than 150 feet above or below the current airplane altitude, and prior to selection of field 1R. A valid position identifier is defined as a fix name, navaid, airport, latitude/longitude, or a place bearing distance. If the associated fix is a waypoint in the active route, then the active route waypoint is selected for inclusion in the corresponding downlink message element. If the position entry is not included in the active route, or if it is a Place Bearing/Distance (PBD) of which the associated fix is not a waypoint in the active route, and the entered fix name, navaid, or fix portion of the PBD has duplicates in the Nav Data Base, then the DUPLICATE NAMES page is displayed. A valid time value is allowed and results in deselection of the request at a time or position and reselects the REQUEST [altitude], REQUEST CLIMB TO [altitude] or REQUEST DESCENT TO [altitude] message element, as appropriate. Time is entered as hhmm, where hh is 00-23 and mm is 00-59.

This field can be cleared by pushing the CLR key with the SP empty and then pushing 2L. Clearing this field deselects the STEP AT [position or time] message element.

4L   *AT PILOT DISC - This field is blank until an altitude value is displayed in field 1L. Selection of this prompt results in inclusion of AT PILOTS DISCRETION in the downlink request. Deletion of this field is allowed and results in deselection of the AT PILOTS DISCRETION downlink element.

6L   REQUEST - Selection of this prompt results in display of the ATC REQUEST page.

1R   REQUEST CRZ CLB* - Selection of this prompt results in creating the downlink request message text of REQUEST CRUISE CLIMB TO [altitude], using the altitude value displayed in field 1L. This message can only be created when field 2L displays dashes and field 1L displays a single altitude value that is greater than 150 feet above the current airplane altitude. Deletion of this field is allowed and results in deselection of the REQUEST CRUISE CLIMB TO [altitude] request downlink message element and reselects the REQUEST CLIMB TO [altitude] message element.

2R MAINTAIN OWN SEPARATION/VMC* - This field is blank until an altitude value is displayed in field 1L. Selection of this prompt results in inclusion of the message text, MAINTAIN OWN SEPARATION AND VMC in the downlink request. Deletion of this field is allowed and results in deselection of the MAINTIAN OWN SEPARATION AND VMC in the downlink element.

3R DUE TO PERFORMANCE* - This field is blank until an altitude value is displayed in field 1L Selection of this prompt results in inclusion of the message text, DUE TO AIRCRAFT PERFORMANCE in the downlink request. Deletion of this field is allowed and results in deselection of the results in deselection of the DUE TO AIRCRAFT PERFORMANCE downlink element.

4R DUE TO WEATHER* - This field is blank until an altitude value is displayed in field 1L. Selection of this prompt results in inclusion of the message text, DUE TO WEATHER in the downlink request message. Clearing of this field is allowed and results in deselection of the DUE TO WEATHER downlink element.

6R VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing all of the selected request downlink elements.

The following table describes the format of the altitude request downlink message elements that are created by entering data on the ATC ALT REQUEST page.

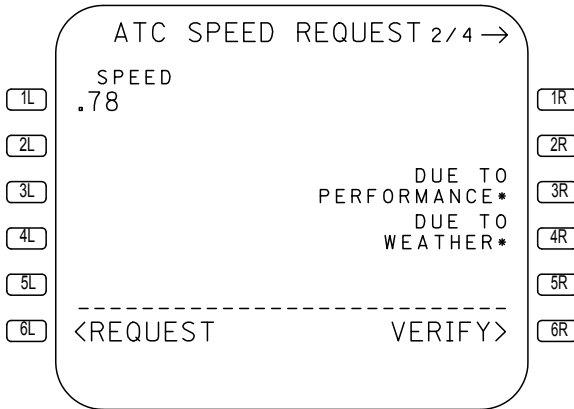| MESSAGE TEXT	HOW TO CREATE MESSAGE
REQUEST [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude into 1L that is within 150FT of current airplane altitude. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST BLOCK [altitude] TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter a block altitude into 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST CLIMB TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude that is more than 150FT above current airplane altitude into 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST CRUISE CLIMB TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude that is more than 150FT above current airplane altitude into 1L. Push LSK 1R on the ATC ALT REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST DESCENT TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude that is more than 150FT below current airplane altitude into 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
AT [position] REQUEST CLIMB TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude that is more than 150FT above current airplane altitude into 1L. Enter a valid position into 2L on ATC ALT REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
AT [position] REQUEST DESCENT TO [altitude]	Display ATC REQUEST page or the ATC ALT REQUEST page. Enter an altitude that is more than 150FT below current airplane altitude into 1L. Enter a valid position into 2L on ATC ALT REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
AT [time] REQUEST CLIMB TO [altitude]	Display ATC REQUEST page of the ATC ALT REQUEST page. Enter an altitude that is more than 150FT above current airplane altitude into 1L. Enter a valid time into 2L on ATC ALT REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
AT [time] REQUEST DESCENT TO [altitude]	Display ATC REQUEST page of the ATC ALT REQUEST page. Enter an altitude that is more than 150FT below current airplane altitude into 1L. Enter a valid time into 2L on ATC ALT REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

ATC SPEED REQUEST Page

Speed request downlink messages can be created using the ATC REQUEST page and the ATC SPEED REQUEST page.

ATC SPEED REQUEST page is accessed by selection of 2L or entry into field 2L on the ATC REQUEST page. This page may also be accessed via the selection of the right arrow PAGE key From the ATC ALT REQUEST page. The ATC SPEED REQUEST page is used to create speed request downlink messages. Fields 1L, 3R, and 4R are non-operational while the request downlink message is in the sending state.

Speed Request Downlink Message

```
 ┌─────────────────────────────────────┐
 │    ATC SPEED REQUEST 2/4 →           │
 │   SPEED                              │
1L│   .78                               │1R
 │                                     │
2L│                                     │2R
 │                           DUE TO    │
3L│                     PERFORMANCE*    │3R
 │                           DUE TO    │
4L│                       WEATHER*      │4R
 │                                     │
5L│  ─────────────────────────────     │5R
 │                                     │
6L│  <REQUEST            VERIFY>        │6R
 └─────────────────────────────────────┘
```

KB1-3-0408A

1L   SPEED - Valid speed entries consist of an IAS or Mach number. A valid IAS speed value is entered in the format of three numerics, ranging from 100-380, inclusive. A valid IAS speed value is rounded to the nearest 10 kts. A valid Mach number is entered in the format of one to three digits, preceded by a decimal point, .XXX, ranging from .61-.91 inclusive. A valid Mach number is rounded to the nearest .01 mach. Entry into this field results in inclusion of the message text, Request [speed], in the downlink request. Clearing of this field is allowed. Clearing of this field results in deselection of the selected speed request downlink element, as well as any reasons that were also selected: DUE TO WEATHER or DUE TO AIRCRAFT PERFORMANCE.

6L   REQUEST - Selection of this prompt results in display of ATC REQUEST page.

3R   DUE TO PERFORMANCE - This field is blank until a speed value is displayed in field 1L. Selection of this prompt results in inclusion of the message text. DUE TO AIRCRAFT PERFORMANCE in the downlink request. Deletion of the field is allowed and results in deselection of the DUE TO AIRCRAFT PERFORMANCE request downlink message element.

4R   DUE TO WEATHER - This field is blank until a speed value is displayed in field 1L. Selection of this prompt results in inclusion of the message text, DUE TO WEATHER in the downlink request. Selection of this field is allowed and results in deselection of the DUE TO WEATHER request downlink message element.

6R   VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing all of the selected request downlink elements.

The following table describes the format of the speed request downlink message element that is created by entering data on the ATC SPEED REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
REQUEST [speed]	Display ATC REQUEST page and enter a valid speed into field 2L or display the ATC SPEED REQUEST page and enter a valid speed into field 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

ATC OFFSET REQUEST Page

The ATC OFFSET REQUEST page is used to create lateral offset request downlink messages. This ATC OFFSET REQUEST page is accessed by pushing 3L on the ATC REQUEST page, or by pushing the PAGE key while the ATC SPEED REQUEST page is displayed.

```
         ATC OFFSET REQUEST 3/4→
          OFFSET
 1L│    L10NM                            │1R
          OFFSET AT
 2L│    [    ]                           │2R

 3L│                                     │3R
                              DUE TO
 4L│                         WEATHER*    │4R

 5L│                                     │5R
     ────────────────────────────────
 6L│    <REQUEST          VERIFY>        │6R
```

KB1-3-0407

Fields 1L, 2L, and 4R are non-operational while the request downlink message is in the sending state.

1L   OFFSET - Valid offset entries consist of an optional direction followed by a distance, in the format DNN or NND, where D is either L or R and NN ranges from 1-99 NM, inclusive. If the L or D is omitted, then the pilot will request an offset either side. Deletion of this field is allowed. Deletion of this field results in deselection of the selected offset request downlink element.

2L   OFFSET AT - An offset at position or time of value is enterable in this field only after entry of an offset value in field 1L when 4R is not selected. A valid position identifier is defined as a fix name, navaid, airport, latitude/longitude, or a place bearing distance. If the associated fix is a waypoint in the active route, then the active route waypoint is selected for inclusion in the corresponding downlink message element.

If the position entry is not included in the active route, or if it is a PBD of which the associated fix is not a waypoint in the active route, and the entered fix name, navaid, or fix portion of the PBD has duplicates in the Nav Data Base, then the DUPLICATE NAMES page is displayed. A valid time value is entered in hhmm format, where hh ranges from 00-23, inclusive and mm ranges from 00-59, inclusive.

Clearing of a step at value is allowed and results in deselection of the request offset at a time or position and reselects the REQUEST [offset] message element.

6L   REQUEST - Selection of this prompt results in display of the ATC REQUEST page.

4R   DUE TO WEATHER - This field is blank until an offset value is displayed in field 1L and if a position or time value is entered into field 2L. Selection of this prompt results in inclusion of the message text, REQUEST WEATHER DEVIATION UP TO [offset] in the downlink request message. Deletion of this field is allowed. Deletion of this field results in deselection of the REQUEST WEATHER DEVIATION UP TO [offset] in the downlink request message and reverts back to REQUEST OFFSET [offset].

6R   VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing all of the selected request downlink elements.

The following table describes the format of the offset request downlink message element that is created by entering data on the ATC OFFSET REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
REQUEST OFFSET [offset]	Display the ATC REQUEST page and enter an offset into field 3L or display the ATC OFFSET REQUEST page and enter an offset into field 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
AT [position] REQUEST OFFSET [offset]	Display the ATC REQUEST page and enter an offset into field 3L or display the ATC OFFSET REQUEST page and enter an offset into field 1L. Enter a valid position into field 2L on the ATC OFFSET REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
AT [time] REQUEST OFFSET [offset]	Display the ATC REQUEST page and enter an offset into field 3L or display the ATC OFFSET REQUEST page and enter an offset into field 1L. Enter a valid time into field 2L on the ATC OFFSET REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST WEATHER DEVIATION UP TO [offset]	Display the ATC REQUEST page and enter an offset into field 3L or display the ATC OFFSET REQUEST page and enter an offset into field 1L. Push LSK 4R on the ATC OFFSET REQUEST page. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

ATC ROUTE REQUEST Page

The ATC ROUTE REQUEST page is accessed by pushing 4L on the ATC REQUEST page. This page may also be accessed via selection of the "NEXT" key from the ATC OFFSET REQUEST page. The ATC ROUTE REQUEST page is used to create request direct to clearances, full routes, departure, approach, and arrival procedures and transitions, and heading and ground track clearances. Fields 1L, 2L, 5L, 2R, and 3R are non-operational while the request downlink message is in the SENDING state.

```
┌─────────────────────────────────────┐
│                                      │
│   ATC  ROUTE  REQUEST   4/4→         │
│      DIRECT  TO        HEADING       │
│ 1L│  [     ]              [   ]  │1R │
│ 2L│               GROUND  TRACK  │2R │
│                          [   ]       │
│      REQUEST          REQUEST        │
│ 3L│ *ACT  F-PLN      SEC  F-PLN* │3R │
│ 4L│                              │4R │
│                                      │
│      REQUEST  SID/STAR               │
│ 5L│ *[     ].[     ]             │5R │
│    ─────────────────────────────────│
│ 6L│ <REQUEST          VERIFY>    │6R │
│                                      │
└─────────────────────────────────────┘
```

KB1-3-0406

1L   DIRECT TO - A valid position identifier is defined as a fix name, navaid, airport, latitude/longitude, or a place bearing distance. If the associated fix is a waypoint in the active route, then the active route waypoint is selected for inclusion in the corresponding downlink message element. If the position entry is not included in the active route, or if it is a PBD of which the associated fix is not a waypoint in the active route, and the entered fix name, navaid, or fix portion of the PBD has duplicates in the Nav Data Base, then the DUPLICATE NAMES page is displayed. Clearing of this field is allowed and results in the selected downlink message element being deselected.

3L   REQUEST ACT F-PLN - Selection of this prompt results in inclusion of the downlink request message element REQUEST ROUTE CLEARANCE containing the flight plan data from the ACT F-PLN. This field is blank if SEC F-PLN is selected. Clearing of this field is allowed and results in deselection of the REQUEST ROUTE CLEARANCE downlink message element.

5L   REQUEST SID/STAR - If the airplane is on the ground and a departure procedure, or departure procedure and transition have been selected on the SID page, then that selected departure, or departure procedure and transition are displayed with a prompt. If the airplane is in the air and an approach or arrival procedure, or an approach or arrival procedure and transition have been selected on the STAR page, then that selected arrival or approach procedure or procedure and transition is displayed with a prompt. Selection of the default or entry of a procedure and transition (entry format is 6-character procedure, a period (.), followed optionally by a 5-character transition) results in selection of the message element requesting the selected or entered procedure or procedure and transition. Clearing of this field is allowed and results in deselection of the REQUEST PROCEDURE downlink message element.

6L   REQUEST - Selection of this prompt results in display of the ATC REQUEST page.

1R   HEADING - A valid heading value is entered in the format XXX, where XXX ranges from 0-360, inclusive. Entry into this field results in inclusion of the message text REQUEST HEADING [degrees] in the request downlink message. Clearing of this field is allowed and results in deselection of the REQUEST HEADING [degrees] in the request downlink message element.

2R   GROUND TRACK - A valid ground track value is entered in the format XXX, where XXX ranges from 0-360, inclusive. Entry into this field results in inclusion of the message text REQUEST GROUND TRACK [degrees] in the request downlink message. Clearing of this field is allowed and results in deselection of the REQUEST GROUND TRACK [degrees] downlink message element.

3R   REQUEST SEC F-PLN* - Selection of this prompt results in inclusion of the REQUEST ROUTE CLEARANCE downlink request message element containing the flight plan data from SEC F-PLN. This field is blank if ACT F-PLN is selected.

6R   VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing all of the selected request downlink elements.

The following table describes the format of the route request downlink message element that is created by entering data on the ATC ROUTE REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
REQUEST [procedure name]	Display ATC REQUEST page. Push LSK 4L to display ATC ROUTE REQUEST page. Push LSK 5L if the desired procedure name (procedure.transition) is displayed. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
	Display ATC REQUEST page. Push LSK 4L to display ATC ROUTE REQUEST page. Enter the procedure name (or procedure.transition) into 5L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST [route clearance]	Display ATC REQUEST page. Push LSK 4L to display ATC ROUTE REQUEST page. Push LSK 3L if ACT F-PLN contains desired requested route. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
	Display ATC REQUEST page. Push LSK 4L to display ATC ROUTE REQUEST page. Push LSK 3R if SEC F-PLN contains desired requested route. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST DIRECT TO [position]	Display ATC REQUEST page, Push LSK 4L to display ATC ROUTE REQUEST page. Enter a valid position into field 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST GROUND TRACK [degrees]	Display the ATC ROUTE REQUEST page. Push LSK 4L to display the ATC ROUTE REQUEST page. Enter a valid ground track into field 2R. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
REQUEST HEADING [degrees]	Display the ATC ROUTE REQUEST page. Push LSK 4L to display the ATC ROUTE REQUEST page. Enter a valid heading into field 1R. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
REQUEST CLEARANCE	Display the ATC INDEX page. Push LSK 4R to display the VERIFY REQUEST page. Push the SEND prompt on the VERIFY REQUEST page.

Negotiation Requests

The WHEN CAN WE EXPECT page is used to create negotiation request downlink messages. This page is accessed by pushing LSK 2R on the ATC INDEX page or by pushing LSK 6L on the VERIFY REQUEST page (if the VERIFY REQUEST page was accessed from the WHEN CAN WE page).

A maximum of three downlink message elements is selectable via the WHEN CAN WE EXPECT page, corresponding to one altitude message element, one speed message element, and a back on route message element.

```
              WHEN CAN WE EXPECT

          CRZ CLIMB TO
   1L    [     ]                            1R
          CLIMB TO
   2L    [     ]           HIGHER ALT*      2R
          DESCENT TO
   3L    [     ]            LOWER ALT*      3R
          SPEED
   4L    [     ]          BACK ON RTE*      4R

   5L                                       5R
         _____
   6L    <ATC INDEX            VERIFY>      6R
```

KB1-3-0405

Fields 1L, 2L, 3L, 4L, 2R, 3R, and 4R are non-operational while a request downlink message is being sent (SENDING).

1L   CRZ CLB TO - This field is blank if a value has been entered into fields 2L or 3L or if 2R or 3R has been selected. Entries can be made into this field when brackets or data are displayed. Valid entry into this field results in inclusion of the message text WHEN CAN WE EXPECT CRUISE CLIMB TO [altitude] in the downlink message. The valid entry range for an altitude value in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude value in terms of flight level is FL030 through FL430, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by M. This field is clearable and results in deselection of the WHEN CAN WE EXPECT CRUISE CLIMB TO [altitude] downlink message element.

2L   CLIMB TO - This field is blank if a value has been entered into fields 1L or 3L, or if 2R or 3R has been selected. Entries can be made into this field when brackets or data are displayed. Valid entry into this field results in inclusion of the message text WHEN CAN WE EXPECT CLIMB TO [altitude] in the downlink message.

The valid entry range for an altitude in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude value in terms of flight level in FL030 through FL430, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by M. This field is clearable and results in deselection of the WHEN CAN WE EXPECT CLIMB TO [altitude] downlink message element.

3L   DESCENT TO - This field is blank if a value has been entered into fields 1L or 2L, or 2R or 3R has been selected. Entries can be made into this field when brackets or data are displayed. Valid entry into this field results in inclusion of the message text WHEN CAN WE EXPECT DESCENT TO [altitude] in the downlink message.

The valid entry range for an altitude value in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude in terms of flight level is FL030 through FL430, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by M. This field is clearable and results in deselection of WHEN CAN WE EXPECT DESCENT TO [altitude] downlink message element.

4L SPEED - Entry into this field results in inclusion of the message text WHEN CAN WE EXPECT [speed] in the downlink message. A valid IAS speed value is entered in the format of three numerics, ranging from 100 through 380, inclusive. IAS speed values are rounded to the nearest 10kts. A valid mach value is entered in the format of one to three digits, preceded by a decimal point, .XXX, ranging from .610 through .910. Mach speeds can be entered as .610-.910, 7-9, 61-91, or 610-910. Mach speed values are rounded to the nearest .01. Clearing of this field is allowed. Deletion of this field results in deselection of the WHEN CAN WE EXPECT [speed] downlink message element.

5L *ERASE WHEN CAN WE - This prompt is only displayed when entries have been made in fields 1L through 4L on this page or 2R through 4R are selected. Selection of this prompt results in erasing any previously entered or selected items on this page.

6L ATC INDEX - Selection of this prompt results in display of the ATC INDEX page.

2R HIGHER ALT* - This field is blank if a value has been entered into fields 1L through 3L or if 3R has been selected. Selection of this prompt results in inclusion of the message text WHEN CAN WE EXPECT HIGHER ALTITUDE in the downlink message. Clearing of this field is allowed and results in deselection of the WHEN CAN WE EXPECT HIGHER ALTITUDE downlink message element.

3R LOWER ALT* - This field is blank if a value has been entered into fields 1L through 3L or if 2R has been selected. Selection of this prompt results in inclusion of the message text WHEN CAN WE EXPECT LOWER ALTITUDE in the downlink message. Clearing of this field is allowed and results in deselection of the WHEN CAN WE EXPECT LOWER ALTITUDE downlink message element.

4R BACK ON RTE* - Selection of this prompt results in inclusion of the message text WHEN CAN WE EXPECT BACK ON ROUTE in the downlink message. Deletion of this field is allowed and results in deselection of the WHEN CAN WE EXPECT BACK ON ROUTE downlink message element.

6R VERIFY - Selection of this prompt results in display of the VERIFY REQUEST page containing the selected message elements.

The following table describes the formats of the route request downlink message elements that are created by entering data on the ATC ROUTE REQUEST page.

MESSAGE TEXT	HOW TO CREATE MESSAGE
WHEN CAN WE EXPECT BACK ON ROUTE	Display the WHEN CAN WE EXPECT page. Push LSK 4R. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
WHEN CAN WE EXPECT CLIMB TO [altitude]	Display the WHEN CAN WE EXPECT page. Enter a valid altitude into field 2L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
WHEN CAN WE EXPECT CRUISE CLIMB TO [altitude]	Display the WHEN CAN WE EXPECT page. Enter a valid altitude into field 1L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
WHEN CAN WE EXPECT DESCENT TO [altitude]	Display the WHEN CAN WE EXPECT page. Enter a valid altitude in to field 3L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
WHEN CAN WE EXPECT HIGHER ALTITUDE	Display the WHEN CAN WE EXPECT page. Push LSK 2R. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.
WHEN CAN WE EXPECT LOWER ALTITUDE	Display the WHEN CAN WE EXPECT page. Push LSK 3R. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUSET page.
WHEN CAN WE EXPECT [speed]	Display the WHEN CAN WE EXPECT page. Enter a valid speed into field 4L. Push the VERIFY prompt. Push the SEND prompt on the VERIFY REQUEST page.

VERIFY REQUEST Page

The VERIFY REQUEST page is used to review the message elements selected for a request or WHEN WE CAN EXPECT downlink message prior to sending the message to ATC. The VERIFY REQUEST page is accessed by selection of the VERIFY prompt on the ATC REQUEST, ATC ALT REQUEST, ATC SPEED REQUEST, ATC OFFSET REQUEST, ATC ROUTE REQUEST, and WHEN CAN WE EXPECT pages. The VERIFY REQUEST page is also accessed from the ATC INDEX page via selection of the VOICE prompt or the CLEARANCE prompt.

```
                VERIFY REQUEST    1/1

1L   REQUEST WEATHER                          1R
       DEVIATION UP TO L15NM.
2L   REQUEST CLIMB TO FL250.                   2R
     REQUEST 240 KT IAS.
3L     FREE TEXT                               3R
     [                        ]
4L                                             4R
     [                        ]
5L                             REQUEST         5R
                                 SEND*
6L   ---------------------------------         6R
     <REQUEST              LOG>
```

KB1-3-0404A

MESSAGE TEXT - The message text that has been selected for inclusion in the downlink message is displayed starting in line 1L. If this page is accessed via selection of the VERIFY prompt on the WHEN CAN WE EXPECT page, then only those messages elements associated with the WHEN CAN WE EXPECT query are displayed. If this page is accessed via selection of the VERIFY prompt on the ATC REQUEST, ATC ALT REQUEST, ATC SPEED REQUEST, ATC OFFSET REQUEST, or ATC ROUTE REQUEST page, then only those elements associated with requests formulated via these pages are displayed. If this page is accessed via selection of the VOICE prompt on the ATC INDEX page, then only the element associated with the voice request is displayed. If this page is accessed via selection of the CLEARANCE prompt on the ATC INDEX page, then only the message element associated with the clearance request is displayed.

FREE TEXT - Free text requests can also be created. If message text has been selected for inclusion in the downlink message, there will be at least one line of free text available. If no other message text has been selected for inclusion in the downlink request message, lines 1 through 4 are available for free text entry. Free text is entered into the SP and then line selected into the available free text fields. Any text entered in a free text field is selected for inclusion with the downlink request.

6L REQUEST/WHEN CAN WE/ATC INDEX - Selection of the REQUEST prompt accesses the ATC REQUEST page. Selection of the WHEN CAN WE prompt accesses the WHEN CAN WE EXPECT page. Selection of the INDEX prompt accesses the ATC INDEX page.

5R SEND - This prompt is displayed on the last page of the VERIFY REQUEST pages. Selection of the SEND or RESEND prompt results in the downlink request message being sent to ATC. When the FMS receives acknowledgement that the request message has been received, the MCDU page display changes from the VERIFY REQUEST page to the XXXXz ATC REQUEST page.

XXXXz ATC REQUEST Page

The XXXXz ATC REQUEST page is automatically displayed when an acknowledgement is received from the network while the VERIFY REQUEST page is displayed, or when no network acknowledgement is received for the corresponding downlink after a certain amount of time (normally 5 minutes). The XXXXz AC REQUEST page is also accessed via the ATC LOG page through selection of the right LSK that is adjacent to the corresponding request message or by selecting the REQUEST prompt on an XXXXz ATC UPLINK page that corresponds to the downlink message.

The XXXXz ATC REQUEST page displays the downlinked request in clearance language.

```
          1410z ATC REQUEST 1/1

       DISPLAY                STATUS
1L  <UPLINK     RESPONSE RCVD      1R
       REQUEST CLIMB TO FL235
2L     DUE TO WEATHER.                2R

3L                                    3R

4L                                    4R

5L                                    5R
       --------------------------------
6L    *PRINT                 LOG>     6R
```

KB1-3-0403A

Page Title - The title of the page displays the time that the request downlink message was sent from the FMS.

1L   DISPLAY UPLINK - The DISPLAY UPLINK prompt is displayed on page 1/1 if an uplink message has been received (and is contained in the log) in response to the WHEN CAN WE EXPECT or REQUEST downlink message that is currently displayed. Selection of the DISPLAY UPLINK prompt results in displaying the corresponding XXXXz ATC UPLINK page.

6L   PRINT - The PRINT prompt is displayed on the last request page only. Selection of the PRINT prompt sends the displayed request message to the printer.

1R   STATUS - The message status field displays the current status of the request downlink. This status is identical to the status displayed on the ATC LOG page.

6R   LOG - Selection of the LOG prompt results in display of the ATC LOG page.

Message Text - The request downlink message will be displayed starting on line 2 on the first page. If more than one page is necessary to display the request downlink message text, CONTINUED will be indicated in line 6.

ATC Report Downlink Messages

The FMS formats reports in response to requests from an ATC facility for reports or confirmations. These reports are accessible via the ATC REPORT page and are displayed for review or modification on the VERIFY REPORT page.

The ATC Datalink function creates and manages up to ten requested reports. ATC report list entries will not be added to the list until the associated uplink message is non-pending. When there are ten requested reports in the list, and attempt to add a new report request to the list will result in the ATC REPORT LIST FULL scratchpad.

The following table describes how to create a report in response to the uplink message.

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
CONFIRM ALTITUDE	PRESENT ALTITUDE [altitude]
	CLIMBING TO [altitude]
	DESCENDING TO [altitude]
	Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM ALTITUDE prompt. The altitude value displayed in the field 1L defaults to the current airplane altitude. This value can be overwritten with a valid altitude entry.
	If the GCP altitude is greater than 150 feet above or below the current airplane altitude, the CLIMBING TO [altitude] or DESCENDING TO [altitude] message element, respectively, will also be included. This value can be overwritten with a valid altitude entry.
	If the report is correct, push LSK 5R (SEND).
CONFIRM ASSIGNED ALTITUDE	ASSIGNED ALTITUDE [altitude]
	ASSIGNED BLOCK [altitude]
	TO [altitude]
	Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM ASSIGNED ALTITUED prompt. The altitude value displayed in field 1L defaults to the current GCP altitude, if it exists. This value can be overwritten with a valid altitude entry. If box prompts are displayed, entry is required to send the downlink.
	If an altitude value is displayed in field 1L, then dashes will be displayed in field 2L. Entry of a valid altitude into field 2L will result in creation of the ASSIGNED BLOCK [altitude] TO [altitude] downlink message.
	If the report is correct, push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
CONFIRM ASSIGNED ROUTE	ASSIGNED ROUTE [route clearance] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM ASSIGNED ROUTE prompt. The route data that is chosen is the active route. If no route is active, a downlink report with this data cannot be generated. If the FMS is currently active on an offset route, the DEVIATING [offset] OF ROUTE message will be appended to the downlink message. Attempted entry over the offset value results in the OUT OF RANGE scratch pad message. Push LSK 5R (SEND).
CONFIRM ASSIGNED SPEED	ASSIGNED SPEED [speed] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM ASSIGNED SPEED prompt. The speed value displayed in 1L defaults to the active FMS speed target. If the speed is invalid, box prompts are displayed in 1L. Enter a valid speed value into 1L. The downlink report cannot be sent prior to entry of a speed value. Push LSK 5R (SEND).
CONFIRM ATIS CODE	ATIS [atis code] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM ATIS CODE prompt. A box prompt is displayed in the field 1L. Enter a valid ATIS code into field 1L. The downlink report cannot be sent prior to entry of a valid ATIS code. Push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
CONFIRM ENSUING WAYPOINT	ENSUING WAYPOINT [position] Display the ATC REPORT page. Push the LSK adjacent to the CONFIRM ENSUING WAYPOINT prompt. The displayed next waypoint [position] value can be overwritten by a valid position entry. If the active f-plan does not exist, field 1L displays 5 blanks. If the FMS is currently active on an offset route, the DEVIATING [offset] OF ROUTE message is appended to the downlink message. Attempted entry over the offset value results in the INVALID ENTRY scratchpad message. Push LSK 5R (SEND).
CONFIRM GROUND TRACK	PRESENT GROUND TRACK [degrees] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM GROUND TRACK prompt. The [degrees] value defaults to the computed ground track. This value can be overwritten by a valid degrees entry. If box prompts are displayed, entry is required to send the downlink. Push LSK 5R(SEND).
CONFIRM HEADING	PRESENT HEADING [degrees] Display the ATC REPORT page. Push the LSK adjacent to the CONFIRM HEADING prompt. The [degrees] value defaults to the computed heading. This value can be overwritten by a valid degrees entry. If box prompts are displayed, entry is required to send the downlink. Push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
CONFIRM NEXT WAYPOINT	NEXT WAYPOINT [position] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM NEXT WAYPOINT prompt. The displayed active waypoint [position] value can be overwritten by a valid position entry. If an active route does not exist, field 1L displays blanks. If the FMS is currently active on an offset route, the DEVIATING [offset] OF ROUTE message is appended to the downlink message. Attempted entry over the offset value results in the INVALID ENTRY scratchpad message. Push LSK 5R (SEND).
CONFIRM NEXT WAYPOINT ETA	NEXT WAYPOINT ETA [time] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM NEXT WAYPOINT ETA prompt. The displayed active waypoint ETA [time] value can be overwritten with a valid time value. If box prompts are displayed in field 1L, entry is required to send the downlink report. Push LSK 5R (SEND).
CONFIRM POSITION	PRESENT POSITION [position] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM POSITION prompt. The displayed [position] value can be overwritten with a valid position entry. If box prompts are displayed, entry is required to send the downlink report. Push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
CONFIRM REPORTED WAYPOINT	REPORTED WAYPOINT [position] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM REPORTED WAYPOINT prompt. The displayed [position] value is the last sequenced waypoint, if it exists. Otherwise blanks are displayed. Push LSK 5R (SEND).
CONFIRM SPEED	PRESENT SPEED [speed] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM SPEED prompt. Default value is the current airplane speed. Entry of a valid speed value in field 1L is allowed. Push LSK 5R (SEND).
CONFIRM SQUAWK	SQUAWKING [transponder code] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM SQUAWK prompt. Four box prompts are displayed in field 1L. Entry of a valid transponder code is required in order to send the downlink report. Push LSK 5R (SEND).
CONFIRM TIME OVER REPORTED WAYPOINT	REPORTED WAYPOINT [time] Display the ATC REPORT page. Push the left LSK adjacent to the CONFIRM TIME OVER REPORTED WAYPOINT prompt. The displayed last waypoint ATA [time] value can be overwritten with a valid time value. If box prompts are displayed, entry is required in order to send downlink report. Push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
REPORT REMAINING FUEL AND SOULS ON BOARD	[remaining fuel] OF FUEL REMAINING AND [souls on board] SOULS ON BOARD Display the ATC REPORT page. Push the left LSK adjacent to the REPORT REMAINING FUEL AND SOULS ON BOARD prompt. The lesser of the FMS computed or totalizer remaining fuel is displayed in 1L and can be overwritten with a valid entry (in hh and mm format). If box prompts are displayed entry is required in order to send the downlink report. Entry of a souls on board value in field 2L is required. Push LSK 5R (SEND).
REPORT BACK ON ROUTE	BACK ON ROUTE Display the ATC REPORT page. Push the left LSK adjacent to the REPORT BACK ON ROUTE prompt. Push LSK 5R (SEND).
REPORT DISTANCE TO [position]	AT [time] [distance] TO or FROM [position] Display the ATC REPORT page. Push the left LSK adjacent to the REPORT DISTANCE TO/FROM [position] prompt. Entry of a time value in field 1L is allowed. Entry of a distance value in field 2L is allowed. If box prompts are displayed, entry is required in order to send the downlink report. Push LSK 5R (SEND).

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
REPORT LEAVING [altitude]	LEAVING [altitude] This report is armable on either the XXXXz ATC UPLINK or VERIFY REPORT page via selection of the ARM prompt. Display the ATC REPORT page. Push the left LSK adjacent to REPORT LEAVING [altitude] prompt. Push LSK 5R (SEND). If ARMED, this report will be automatically sent upon leaving the given altitude.
REPORT LEVEL [altitude]	LEVEL [altitude] This report is armable on either the XXXXz ATC UPLINK or VERIFY REPORT page via selection of the ARM prompt. Display the ATC REPORT page. Push the left LSK adjacent to the REPORT LEVEL [altitude] prompt. Push LSK 5R (SEND). If ARMED, this report will be automatically sent upon leveling off at the given altitude.
REPORT PASSING [position]	PASSING [position] This report is armable on either the XXXXz ATC UPLINK or VERIFY REPORT page via selection of the ARM prompt, if [position] is a waypoint in the active F-PLN. Display the ATC REPORT page. Push the left LSK adjacent to the REPORT PASSING [position] prompt. Push LSK 5R (SEND). If ARMED, this report will be automatically sent upon sequencing the given position.

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
REPORT REACHING BLOCK [altitude] TO [altitude]	REACHING BLOCK [altitude] TO [altitude] Display the ATC REPORT page. Push the left LSK adjacent to the REPORT REACHING BLOCK [altitude] TO [altitude] prompt. Push LSK 5R (SEND). Attempted entry into fields 1L or 2L results in display of the ENTRY OUT OF RANGE scratchpad message.
REPORT REACHING [altitude]	REACHING [altitude] This report is armable on either the XXXXz ATC UPLINK or VERIFY REPORT page via selection of the ARM prompt. Display the ATC REPORT page. Push the left LSK adjacent to the REPORT REACHING [altitude] prompt. Push LSK 5R (SEND).
REQUEST POSITION REPORT	POSITION REPORT Display the ATC REPORT page. Push the left LSK adjacent to the REQUEST POSITION REPORT prompt. Push LSK 6R (SEND) on the POS REPORT page. If the GCP altitude is more than 150 ft. above the airplane altitude, the CLIMBING TO [altitude] message will be appended to the downlink. If the GCP altitude is more than 150 ft. below the airplane altitude, the DESCENDING TO [altitude] message will be appended to the downlink. If the FMS is currently active on an offset route, the DEVIATING [offset] OF ROUTE message will be appended to the downlink message.

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
WHEN CAN YOU ACCEPT [altitude]	WE CAN ACCEPT [altitude]
	AT [time]
	Display the ATC REPORT page. Push the left LSK adjacent to the WHEN CAN YOU ACCEPT [altitude] prompt. Box prompts are displayed in field 2L. Enter a valid time into field 2L. Push LSK 5R (SEND).
	WE CANNOT ACCEPT [altitude]
	Display the ATC REPORT page. Push the LSK adjacent to the WHEN CAN YOU ACCEPT [altitude] prompt. Push LSK 3L (CANNOT ACCEPT). Push LSK 5R (SEND).
WHEN CAN YOU ACCEPT [offset]	WE CAN ACCEPT [offset]
	AT [time]
	Display the ATC REPORT page. Push the left LSK adjacent to the WHEN CAN YOU ACCEPT [offset] prompt. Box prompts are displayed in field 2L. Push LSK 5R (SEND).
	Attempted entry into field 1L results in display of the ENTRY OUT OF RANGE scratchpad message.
	WE CANNOT ACCEPT [offset]
	Display the ATC REPORT page. Push the left LSK adjacent to the WHEN CAN YOU ACCEPT [offset] prompt. Push LSK 3L (CANNOT ACCEPT). Push LSK 5R (SEND).
	Attempted entry into field 1L results in display of the ENTRY OUT OF RANGE scratchpad message.

UPLINK MESSAGE	HOW TO CREATE DOWNLINK RESPONSE MESSAGE
WHEN CAN YOU ACCEPT [speed]	WE CAN ACCEPT [speed]
	AT [time]
	Display the ATC REPORT page. Push the LSK adjacent to the WHEN CAN YOU ACCEPT [speed] prompt. Box prompts are displayed in field 2L. Enter a valid time into field 2L. Push LSK 5R (SEND).
	Attempted entry into field 1L results in display of the ENTRY OUT OF RANGE scratchpad message.
	WE CANNOT ACCEPT [speed]
	AT [time]
	Display the ATC REPORT page. Push the left LSK adjacent to the WHEN CAN YOU ACCEPT [speed] prompt. Push LSK 3L (CANNOT ACCEPT). Push LSK 5R (SEND).
	Attempted entry into field 1L results in display of the ENTRY OUT OF RANGE scratchpad message.

Valid Entry Formats and Ranges

DATA	ENTRY FORMAT AND RANGE
ALTITUDE	Valid entries consist of an entry in terms of feet, flight level, or meters. An altitude value in feet ranges from 0 through 25000, inclusive. An altitude value in flight level ranges from FL030 through FL431, inclusive. An altitude in meters ranges from 0 through 16000, inclusive, and must be followed by an M.
ATIS CODE	Valid entries consist of a single character other than a space.
BEACON CODE	Valid entries consist of a four-digit, where each digit ranges from 0 through 7, inclusive.
DEGREES	Valid entries consist of a three-digit, 000 to 360.
OFFSET	Valid entry of offset is a one or two digit integer in the range of 1 to 99, inclusive. It is optionally preceded or followed by 'L' or 'R'. If the direction is omitted, then EITHER SIDE is implied.
POSITION	Valid entry of a position consists of a fix name, navaid, LAT/LON, or airport contained in the active route or the fix portion of a PBD entry is contained in the active route, or a pilot-defined waypoint.
PROCEDURE NAME	Valid entry of a procedure name is in a format of one to eight character(s). Character procedure name optionally followed by a period (.) and a one to five character(s) transition name.
REMAINING FUEL	Valid entry of fuel remaining is in the format hh+mm, where hh ranges from 00 through 23, inclusive, and mm ranges from 00 through 59, inclusive.
REMAINING SOULS	Valid entry consists of a one to three-digit integer.

Valid Entry Formats and Ranges

DATA	ENTRY FORMAT AND RANGE
SPEED	Valid speed entered consists of a three-digit number (IAS) between 100 and 380, inclusive, or a one to three-digit Mach value ranging from .610 through .910, inclusive. An IAS entry is rounded to the nearest 10 knots. A Mach entry is rounded to the nearest Mach .01.
TIME	Valid entries consist of four-digits in the format hhmm, where hh ranges from 00 through 23, inclusive, and mm ranges from 00 through 59, inclusive.

ATC REPORT Page

The ATC REPORT page displays a list of all the uplinked report requests, confirmation requests, and WHEN CAN YOU ACCEPT requests transmitted from ATC. A report list entry is added to the ATC REPORT page when a closure response is not required for the corresponding XXXXz ATC UPLINK page, or a positive closure response has been sent and received by the network. When the network has received the ATC report downlink message, the corresponding report list entry is removed from the ATC report list. If the downlink was a POSITION REPORT downlink, the oldest position report list entry is removed.

The ATC REPORT page is accessed by selecting the REPORT prompt on the ATC INDEX page, VERIFY REPORT page, or XXXXz ATC UPLINK page. The ATC REPORT page is automatically accessed if the VERIFY REPORT page is displayed and the corresponding report list entry is deleted using the other MCDU.

```
┌─────────────────────────────────────┐
│                                       │
│          ATC REPORT    1/2→           │
│                                       │
│  1L  <CONFIRM NEXT WAYPOINT      1R   │
│        ARMED                          │
│  2L  <REPORT PASSING BVR         2R   │
│                                       │
│  3L  <WHEN CAN YOU ACCEPT F..    3R   │
│                                       │
│  4L  <REPORT REACHING FL330      4R   │
│                                       │
│  5L  <REPORT REACHING FL290      5R   │
│      ─────────────────────────        │
│  6L  <ATC INDEX                  6R   │
│                                       │
└─────────────────────────────────────┘
```

KB1-3-0447

REPORT LIST ENTRIES (Starting in Line 1) - The ATC REPORT page can list up to ten report entries. If more than one page is required to list the reports, the next page of reports can be displayed by pushing the PAGE key. The data line displays the text of the uplinked report or confirmation request from ATC.

If the message text has more than 23 characters, the first 21 characters of the message are followed by two periods. If a report list entry is for a position report, pushing the LSK next to the report prompt displays the POS REPORT page. If a report list entry is for any other requested report or confirmation, pushing the LSK next to a report prompt displays the VERIFY REPORT page corresponding to the requested report or confirmation.

If a report has been armed for transmission, ARMED is displayed in the label line above the corresponding report. Pushing the CLR key with the scratchpad empty and then pushing an LSK next to a report entry, deletes the report entry.

6L   ATC INDEX - Selection of this prompt results in display of the ATC INDEX page.

VERIFY REPORT Page

The VERIFY REPORT page displays the report in clearance language, and lets the pilot review and modify the data portion of the message and add free text to the downlink (if desired) before it is sent.

The VERIFY REPORT page is accessed by pushing the left LSK next to a corresponding ATC report list entry on the ATC REPORT page, or by selecting FREE TEXT (3R) on the ATC INDEX page. Clearing of a report list entry while the corresponding VERIFY REPORT page is displayed on the other MCDU results in display of the ATC REPORT page.

```
                    VERIFY  REPORT

       PASSING                   REPORT
1L     BRV                        ARMED     1R
         FREE  TEXT
2L     [                              ]     2R

3L     [                              ]     3R

4L     [                              ]     4R
                                 REPORT
5L                                SEND *    5R
       ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
6L     <REPORT                             6R
```

KB1-3-0448

REPORT DATA (Starting in Line 1) - If the VERIFY REPORT page was accessed by selecting a report prompt on the ATC REPORT page, the message element for the corresponding report is displayed starting in line 1. There is always at least one line available after the message element(s) for free text entry. Clearing entered data displays default data or box prompts.

3L   *CANNOT ACCEPT - This prompt is displayed when the report downlink is in response to a WHEN CAN YOU ACCEPT request. Selection of this prompt results in selection of the corresponding CANNOT ACCEPT message element. Clearing of this field is allowed and results in deselection of the corresponding CANNOT ACCEPT message element.

6L   REPORT - Selection of this prompt results in display of the ATC REPORT page 1.

1R   ARM* - This prompt is displayed if the displayed VERIFY REPORT page is for a report which can be armed. Selection of this prompt on this page, or the corresponding XXXXz ATC UPLINK page, arms the report for transmission when the trigger condition is satisfied.

There are four reports that can be armed for automatic transmission; (LEVEL [altitude], LEAVING [altitude], REACHING [altitude], and PASSING [position]). If the report is armed, the report will be automatically transmitted when the associated trigger condition is satisfied. FREE TEXT is not sent when an armed report is automatically transmitted. Clearing while ARMED is displayed results in disarming the automatic trigger of the report downlink.

5R   REPORT SEND* - Selection of this prompt sends downlink report message to ATC.

POS REPORT Page

The POS REPORT page is used to create and send downlink position report messages. The POS REPORT page is accessed via selection of the POS REPORT prompt on the ATC INDEX page, or from LSK 5L on the AOC COMM MENU page.

```
        ┌─────────────────────────────┐
        │    XXX1234  POS REPORT       │
        │   POS         ATA      ALT   │
  [1L]  │ CLASY       1405z   FL310    │ [1R]
        │   EST                  ETA   │
  [2L]  │ BRV                  1403z   │ [2R]
        │   NEXT            DEST ETA   │
  [3L]  │ GVE                  1547z   │ [3R]
        │   TEMP     WIND        SPD   │
  [4L]  │ -52°C   055°/70KT      .77   │ [4R]
        │                   POS FUEL   │
  [5L]  │                      14.5    │ [5R]
        │   COMPANY _____ ATC   │
  [6L]  │ *SEND              SEND*     │ [6R]
        │                              │
        └─────────────────────────────┘
```

KB1-3-0484A

1L POS - This field displays the identifier for the last sequenced waypoint. Entry to this field is not allowed.

2L EST - This field displays the identifier for the active TO waypoint. The pilot may override the default by entering any waypoint that is contained in the active flight plan. Clearing the pilot entry, sequencing the active TO waypoint, or selecting another page will return this field to the TO waypoint.

3L NEXT - This field displays the identifier for the next active TO waypoint. The pilot may override the default by entering any waypoint that is contained in the active flight plan. Clearing the pilot entry, sequencing the active TO waypoint, or selecting another page will return this field to the NEXT waypoint.

4L TEMPERATURE/WIND - This field displays the current outside air temperature and current wind direction and magnitude.

6L *COMPANY SEND - Selection of this prompt initiates a report downlink message to the company. Data that is entered into fields 2L, 3L, 2R, 3R, and 4R does not affect the data transmitted in a position report downlink to the company. The asterisk is removed for 20 seconds after LSK 6L is pushed. When the asterisk is redisplayed, another position report can be sent.

> *NOTE: The system redisplays the asterisk to indicate that another report can be sent. The asterisk is not an indication that the report has been received by the ground station.*

1R ATA/ALT - This field displays the actual time of arrival at the waypoint displayed in field 1L and the airplane altitude when the waypoint is sequenced.

2R ETA - This field displays the estimated time of arrival at the waypoint displayed in field 2L. The pilot can enter a value in this field.

3R DEST ETA - This field displays the estimated time of arrival at the destination. The pilot can change the time in this field. Deleting a pilot entry, sequencing the active TO waypoint, or changing the displayed page returns this field to the default DEST ETA.

4R   SPD - This field displays the current airplane Mach speed
target, rounded to the nearest hundredth. A pilot can change the
displayed Mach speed target. Deleting a pilot entry returns this
field to the default SPD value. Speed values are displayed only
between Mach .61 and Mach .91. Otherwise, dashes are
displayed.

5R   POS FUEL - This field displays the current amount of fuel
remaining on the airplane when the waypoint in 1L was
sequenced.

6R   ATC SEND - This prompt is displayed only if the airplane is
logged onto an ATS center. Pushing 6R initiates a position
report downlink message to the ATS center and creates an ATC
log entry for the transmitted message. Other prompts are
displayed in this field, depending on the status of the ATS
datalink. The prompts include NO COMM, VOICE, FAIL, NO
ATC COMM, SENDING, and SENT.

If an offset is active when the POSITION REPORT message is
transmitted, the message element DEVIATING [offset] OF ROUTE will be
included in the downlink message. If the GCP altitude is more than 150
feet above or below the current airplane altitude, the CLIMBING TO
[altitude] or DESCENDING TO [altitude] message, respectively, will also
be included in the downlink message.

XXXXz ATC REPORT Page

The XXXXz ATC REPORT page displays the message elements that were
sent in a report downlink message. The XXXXz ATC REPORT page is
accessed via the ATC LOG page, or by selecting the SEND prompt on the
VERIFY REPORT page and either a network acknowledgement is
received or the time-out has expired.

```
        1425z ATC REPORT
                        STATUS
1L   REACHING FL290.       SENT      1R

2L                                   2R

3L                                   3R

4L                                   4R

5L   _____      5R

6L   *PRINT              LOG>        6R
```

KB1-3-0402

Page Title - The title of the page displays the time that the report downlink message was sent.

Message Text - The report downlink message text will be displayed starting in line 2.

6L   *PRINT - Selection of the PRINT prompt sends the displayed report message to the printer.

1R   STATUS - The message status field displays the current status of the report downlink. This status is identical to the status displayed on the ATC LOG page.

6R   LOG - Selection of the LOG prompt results in display of the ATC LOG page 1.

ATC Emergency Downlink Messages

The airplane is considered to be in emergency mode from the time that the FMS receives an acknowledgement from the network that it has received the emergency downlink message, until the time that the FMS receives an acknowledgement from the network that it has received the CANCEL EMERGENCY downlink message, or until both ATC COMM connections are terminated. Selection of a LSK or entry into a field on the EMERGENCY REPORT page that would cause more than five downlink message elements to be selected, results in the MESSAGE LIMIT EXCEEDED scratchpad message being displayed and the message element is not selected. Emergency report downlink messages are created using the EMERGENCY REPORT page.

EMERGENCY REPORT Page

The EMERGENCY REPORT page lets the pilot create downlink messages to alert the ATC facility to an airplane emergency and to the lateral and vertical maneuvers that the flight crew intends to execute. The EMERGENCY REPORT page is accessible via selection of the EMERGENCY prompt on the ATC INDEX page, the VERIFY EMERGENCY page, or by pushing and holding the REF key, or the ATC key (if installed) when an ATC COMM connection exists. Fields 1L through 5L and fields 1R through 3R are non-operational while the emergency report downlink is being sent (SENDING).

```
                EMERGENCY REPORT

 1L    *MAYDAY                      PAN*    1R
       DIVERT TO                     SOB
 2L    *KATL                        100     2R
       OFFSET            FUEL REMAINING
 3L    [   ]              14.5 LBS 01+14    3R

 4L    DESCEND TO                           4R
       *10000FT(3048M)

 5L    *ERASE EMERGENCY                     5R
       --------------------------
 6L    <ATC INDEX              VERIFY>      6R
```

KB1-3-0437

Fields 1L through 5L and fields 1R through 3R are non-operational while the emergency report downlink is being sent (SENDING).

1L   *MAYDAY - This field is blank if 1R has been selected. Selection of the MAYDAY prompt results in selecting the MAYDAY MAYDAY MAYDAY message element, and an abbreviated POSITION REPORT message element, for inclusion in the emergency report downlink message and results in display of the VERIFY EMERGENCY page. If the current airplane altitude is more than 150 feet above the altitude displayed in field 4L when the MAYDAY prompt is selected, then the DESCENDING TO [altitude] message element is selected as well. This field is clearable and results in deselection of the MAYDAY MAYDAY MAYDAY message element, the abbreviated POSITION REPORT message element, and the DESCENDING TO message element.

2L   *DIVERT TO - This field defaults to the identifier of the destination airport for the active flight plan, if it exists. Selection of the default destination airport, results in inclusion of the message text DIVERTING to [destination airport] VIA ROUTE CLEARANCE in the emergency report downlink, where the active route is included in the route clearance data.

Entry of a fixname, navaid, airport, latitude longitude, PBD, or a pilot-defined waypoint that is not the active destination airport selects the message element indicating the intention to proceed direct to the entered position, and includes the message text DIVERTING TO [position] VIA ROUTE CLEARANCE. However, no route clearance data is included. If the entry in 2L is included in the active route, the active route waypoint is included in the downlink message element. If the entry is not included in the active route, and the identifier is non-unique in the Nav database, then the fix closest to the current airplane position is automatically selected. Clearing of this field is allowed and results in deselection of the DIVERTING TO [position] VIA ROUTE CLEARANCE downlink message element.

3L   OFFSET - An offset can be entered in 3L as one or two digits (1 through 99 nm), optionally preceded or followed by L or R. Entering an offset in this field includes the message text OFFSETTING [offset] in the emergency report downlink. Pushing the CLR key with the scratchpad empty and pushing 3L deselects the OFFSETTING [offset] message element.

4L   *DESCEND TO - This field defaults to the GCP window altitude. Selection of the default value, or entry of a valid altitude, results in inclusion of the message text DESCENDING TO [altitude] in the emergency report downlink. If the displayed altitude is below the current airplane altitude, then the message element is automatically selected when the emergency report message includes the MAYDAY MAYDAY MAYDAY message element.

The valid entry range for an altitude value in terms of feet is 0 through 25,000 feet, inclusive. The valid entry range for an altitude value in terms of flight level is FL030 through FL431, inclusive. The valid entry range for an altitude value in terms of meters is 0 through 16,000 meters, inclusive, and must be followed by M. Clearing of this field is allowed and results in deselection of the DESCENDING TO [altitude] message element.

5L   *ERASE EMERGENCY/CANCEL EMERGENCY - The ERASE EMERGENCY prompt is displayed when at least one item has been selected for inclusion in an emergency report downlink message. Selection of the ERASE EMERGENCY prompt results in erasing the downlink message text that was selected for inclusion in the emergency report downlink message.

The CANCEL EMERGENCY prompt is displayed when ATC COMM is in emergency mode and no message text has been selected for inclusion in an emergency report downlink message. Selection of the CANCEL EMERGENCY prompt results in inclusion of the message text CANCEL EMERGENCY in the emergency report downlink message.

Clearing of this field is allowed when the CANCEL EMERGENCY prompt has been selected. This results in deselection of the CANCEL EMERGENCY message element.

6L   ATC INDEX - Selection of this prompt results in display of the ATC INDEX page.

1R   PAN* - This field is blank if 1L has been selected. Selection of the PAN prompt results in inclusion of the message text, PAN PAN PAN in the emergency report downlink, and in display of the VERIFY EMERGENCY page.

2R   SOB - Entry of the number of passengers on board the airplane in conjunction with a fuel remaining value in field 3R results in inclusion of HH+MM REMAINING FUEL AND XXX SOULS ON BOARD downlink message element. Clearing of this field is allowed and results in deselection of the HH+MM REMAINING FUEL AND XXX SOULS ON BOARD downlink message element.

3R   FUEL REMAINING - This field displays blanks until a valid SOB value has been entered into field 2R. When a SOB value is displayed in field 2R, the field defaults to the FMS computed fuel remaining, displayed in HH+MM (hours+minutes) format. The remaining fuel expressed in terms of thousands of pounds or thousands of kilograms is displayed to the left of the hours+minutes fuel remaining display.

       If a SOB value is displayed in field 2R and both the totalizer and FMS computed remaining fuel are invalid, box prompt are displayed until a valid entry is made. Valid entry of fuel remaining is in the format HH+MM, where HH ranges from 00-23 inclusive, and MM ranges from 00-59, inclusive. Clearing of this field is allowed and results in deselection of the HH+MM REMAINING FUEL AND XXX SOULS ON BOARD downlink message element.

6R   VERIFY - Selection of this prompt results in display of the VERIFY EMERGENCY page containing all of the selected emergency report downlink message elements.

Emergency Report Downlink Messages

MESSAGE TEXT	HOW TO CREATE MESSAGE
MAYDAY MAYDAY MAYDAY	Display EMERGENCY REPORT page. Push LSK 1L. Push the SEND prompt.
DIVERTING TO [position]	Display the EMERGENCY REPORT page. Enter a valid fixname, navaid, airport, lat/long, or PBD into LSK 2L. Push the VERIFY prompt. Push the SEND prompt.
DIVERTING TO [position] VIA [route clearance]	Display the EMERGENCY REPORT page. Push LSK 2L. Push the VERIFY prompt. Push the SEND prompt.
OFFSETTING [offset]	Display the EMERGENCY REPORT page. Enter an offset value into field 3L. Push the VERIFY prompt. Push the SEND prompt.
DESCENDING TO [altitude]	Display the EMERGENCY REPORT page. Push LSK 4L or enter an altitude into LSK 4L. Push the VERIFY prompt. Push the SEND prompt.
	Display the EMERGENCY REPORT page. Push LSK 1L when the altitude displayed in field 4L is more than 150 feet below the current airplane altitude. Push the SEND prompt.
CANCEL EMERGENCY	If an emergency exists, display EMERGENCY REPORT page. Push LSK 5L (CANCEL EMERGENCY prompt). Push the VERIFY prompt. Push the SEND prompt.
PAN PAN PAN	Display EMERGENCY REPORT page. Push LSK 1R. Push the SEND prompt.
[remaining fuel] OF FUEL REMAINING AND [remaining souls] OF SOULS ON BOARD	Display the EMERGENCY REPORT page. Enter the number of souls on board into LSK 2R. Ensure that the remaining fuel value exists in HH+MM format in field 3R. Push the VERIFY prompt. Push the SEND prompt.
[free text]	Display the EMERGENCY REPORT page. Push the VERIFY prompt. Enter free text on the VERIFY EMERGENCY page. Push the SEND prompt.

MESSAGE TEXT	HOW TO CREATE MESSAGE
POSITION REPORT	An abbreviated position report is appended automatically to any emergency message, together with DEVIATING [offset] ROUTE, CLIMBING TO [altitude] or DESCENDING TO [altitude], as appropriate.

VERIFY EMERGENCY Page

The VERIFY EMERGENCY page lets the pilot review the emergency downlink before it is sent, and include free text in the downlink, if desired.

The VERIFY EMERGENCY page is accessed via the selection of the MAYDAY prompt, the PAN prompt, or the VERIFY prompt on the EMERGENCY REPORT page.

```
              VERIFY EMERGENCY 1/1

1L     MAYDAY MAYDAY MAYDAY                    1R
       01+14 OF FUEL REMAINING
2L       AND 100 SOULS ONBOARD.                2R

3L       FREE TEXT                             3R
       [                  ]
4L     [                  ]                     4R
                            REPORT
5L                            SEND*            5R
       --------------------------------
6L     <EMERGENCY                             6R
```

KB1-3-0400

MESSAGE TEXT - The message text that has been selected for inclusion in the downlink message is displayed starting in line 1.

FREE TEXT - At least one line will be available to enter a free text message in the emergency report downlink message. Free text only emergency reports are allowed. If no other message text has been selected for inclusion in the downlink message, lines 1 through 4 are available for free text entry. Free text is entered into the SP and then line selected into the available free text fields.

6L EMERGENCY - Selection of the EMERGENCY prompt displays the EMERGENCY REPORT page.

5R REPORT SEND* - This prompt is displayed on the last page of the VERIFY EMERGENCY pages. Selection of this prompt results in the downlink request message being sent to ATC.

XXXXz EMERGENCY Page

The XXXXz EMERGENCY page is accessed via the ATC LOG page through selection of the right LSK that is adjacent to the associated emergency report message or by selecting the SEND prompt on the VERIFY EMERGENCY page and either network acknowledgement is received or the time-out has expired.

```
         1510z EMERGENCY  1/1
                          STATUS
 1L                                      1R
         MAYDAY MAYDAY MAYDAY
 2L      01+14 OF FUEL REMAINING         2R
          AND 100 SOULS ONBOARD.
 3L                                      3R

 4L                                      4R

 5L                                      5R
         _____
 6L      *PRINT                    LOG>   6R
```

KB1-3-0401

Page Title - The title of the page displays the time (UTC) that the emergency report downlink message was sent.

Message Text - The emergency downlink message text will be displayed starting in line 2 on the first page. If more than one page is necessary to display the emergency downlink message text, "CONTINUED" will be displayed in line 6.

6L   *PRINT - The PRINT prompt is displayed on the last emergency page only. Selection of the PRINT prompt sends the displayed report to the printer.

1R   STATUS - The message status displays the current status of the emergency report downlink. This status is identical to the status displayed on the ATC LOG page.

6R   LOG - Selection of the LOG prompt results in display of the ATC LOG page.

Declaring an Emergency

To Declare an Emergency:

- Push and hold the REF key or the ATC button (if installed). (ATC COMM connection must exist.)

- Push LSK 1L (MAYDAY) on the EMERGENCY REPORT page results in display of the VERIFY EMERGENCY page, with MAYDAY MAYDAY MAYDAY message element displayed in line 1. If the current airplane is more than 150 feet higher than the current GCP altitude, the DESCENDING TO [altitude] message element will be included in the emergency report downlink message. An abbreviated position report will be transmitted with any emergency report downlink message that included MAYDAY MAYDAY MAYDAY.

- Free text can be entered into the SP and then line selected to any field containing a free text entry prompt. The entered text is appended to the emergency report when the message is sent.

- Push LSK 1R (SEND) transmits the emergency report downlink message.

```
                VERIFY EMERGENCY 1/1

         MAYDAY MAYDAY MAYDAY
   1L    01+14 OF FUEL REMAINING             1R
            AND 100 SOULS ONBOARD.
   2L                                        2R

            FREE TEXT
   3L    [                      ]            3R

   4L    [                      ]            4R
                             REPORT
   5L                        SEND *          5R
         ------------------------------
   6L    <EMERGENCY                          6R
```

KB1-3-0400

Cancelling an Emergency

To cancel the emergency mode:

- Push and hold the REF key or the ATC button (if installed). The EMERGENCY REPORT page is displayed.

- Push 5R (CANCEL EMERGENCY).

- Push 6R (VERIFY). The VERIFY EMERGENCY page is displayed.

- Enter any free text, if desired, on the VERIFY EMERGENCY page and push 5R (SEND).

  NOTE: After a MAYDAY downlink message is sent, it may be possible that the CANCEL EMERGENCY prompt will not become available on the EMERGENCY REPORT page. If that occurs, the flight crew will have to cancel the MAYDAY manually.

ATC Log

Whenever the FMS receives or sends a message on the ATC datalink, that message is stored in the ATC log.

ATC LOG Page

The ATC LOG page provides a listing of all uplinks and downlinks stored in the ATC LOG. The ATC LOG page is accessible via the ATC COMM prompt on the REF INDEX page, or by pushing the ATC button (if installed) when more than one pending uplink exists. This page is also accessible via selection of the LOG prompt on the ATC INDEX, XXXXz ATC REPORT, XXXXz ATC REQUEST, XXXXz ATC UPLINK and XXXXz EMERGENCY pages.

```
                 ATC LOG      1 /2 →
        1450Z                    NEW
 1L    ↑PROCEED DIRECT TO S   ..>    1R
        1435Z                   OPEN
 2L    ↑CLIMB TO AND MAINTA   ..>    2R
        1430Z           RESPONSE RCVD
 3L    ↓WHEN CAN WE EXPECT    ..>    3R
        1426Z              REJECTED
 4L    ↑CLIMB TO REACH FL29   ..>    4R
        1420Z                    OLD
 5L    ↑CONFIRM POSITION        >    5R
       ────────────────────────────
 6L    <ATC INDEX      ERASE LOG*    6R
```

KB1-3-0399

LOG ENTRIES - The ATC log entries are displayed in chronological order, based upon time of receipt of the uplink, or time of transmission of the downlink. The newest message is displayed in line 1 on page 1, and each successive log entry is displayed in the next available data line.

For each ATC log entry, the following data is provided:

- The time that the uplink was received or the downlink was transmitted is displayed in the left header line of each log entry.

- An up arrow indicates the message is an uplink message, and a down arrow indicates the message is a downlink message.

- The characters of message text are displayed in the data line of the log entry. If the message is more than 21 characters long, the first 19 characters are displayed followed by two periods.

• The message status is displayed in the right header line of each log entry.

Selection of a right LSK adjacent to a log entry displays the corresponding uplink or downlink page. Selection of a left LSK adjacent to a log entry while CLR is displayed in the SP removes that log entry from the ATC LOG.

> *NOTE: It may be possible that after sending a downlink message, it could be incorrectly placed at the end of the ATC LOG instead of at the beginning. The time stamp will be correct, however.*

6L ATC INDEX - Selection of this prompt results in display of the ATC INDEX page.

6R ERASE LOG*/CONFIRM* - Pushing 6R when there is at least one entry in the ATC log displays the CONFIRM prompt. Selecting the CONFIRM prompt deletes all the ATC log messages that are not pending. When there are no closed entries in the ATC log, or while the ATC log is being printed, this field is blank.

> *NOTE: Leaving the ATC LOG page without selecting the CONFIRM prompt returns the initial display. The CONFIRM prompt cannot be reset back to ERASE LOG by selecting CLR key.*

ATC Log Status

The ATC uplink status text is displayed on the ATC LOG and XXXXz ATC UPLINK pages.

STATUS TEXT	STATUS DESCRIPTION
ABORTED	Message was pending when both ATC COMM connections were terminated.
ACCEPTED	Message has been reviewed, the message requires a response, a positive closure response was sent and the FMS has received acknowledgement from the network that it has received the closure response.
NEW	Message has not been reviewed.
OLD	Message has been reviewed and does not require a response.
OPEN	Message has been reviewed, the message requires a response, and either a closure response has not been sent (STANDBY is not a closure response), or the closure response was sent, but the FMS has not received acknowledge from the network that the response message was received.
REJECTED	Message has been reviewed, the message requires a response, and a negative closure response was sent and the FMS has received acknowledgement from the network that it has received the closure response.

The ATC downlink message status is displayed on the ATC LOG, XXXXz ATC REQUEST, XXXXz ATC REPORT, and XXXXz EMERGENCY pages.

STATUS TEXT	STATUS DESCRIPTION
ABORTED	The message was pending when both ATC COMM connections were terminated, or when an ATC COMM transfer of control was performed.
DEFERRED	SEND prompt has been selected, network acknowledgement has been received, the message requires a response and a response of REQUEST DEFERRED was received.
OPEN	SEND prompt has been selected, network acknowledgement has been received, the message requires a response, and either the response has not been received or the response was STANDBY.
RESPONSE RCVD	SEND prompt has been selected, network acknowledgement has been received, the message requires a response, and a response other than STANDBY or REQUEST DEFERRED was received.
SENDING	SEND prompt has been selected, the network acknowledgement has not been received.
SENT	SEND prompt has been selected, the network acknowledgement has been received, and the message does not require a response.

ATC Log Management

The ATC log contains memory to store logged messages and the FMS will automatically delete old messages from the log when the log becomes full. When the portion of the ATC log that is dedicated to storing pending uplink messages becomes full, the FMS rejects any new uplink message. In order to avoid a log full condition, the log should be managed by manually deleting messages that are no longer needed.

The ATC log can retain a minimum of 75 messages which includes a combination of downlink and non-pending uplinks. This storage is capable of storing a minimum of 5 messages which contain one or more route clearances. Upon receipt of an uplink that causes the log to be full, the RESPOND TO ATC UPLINKS scratchpad message is displayed.

Crew Interaction Log Management

The ATC log can be managed by deleting individual messages from the log, or all of the non-pending messages contained in the log.

- To Delete Individual Message - While the ATC LOG page is displayed, push the CLR key with the scratchpad empty. Then push the left LSK next to the log entry to be deleted. The associated message is deleted from the ATC log.

- To Delete All Non-Pending Messages - While the ATC LOG page is displayed, push 6R (ERASE LOG). Then push 6R again (CONFIRM). All of the non-pending messages are deleted from the ATC log.

   NOTE: If a message is displayed on one MCDU and that message is deleted with other MCDU, the MCDU that was displaying the message reverts to the ATC LOG page.

Automatic Log Management

If the status of an uplink message change from pending to non-pending (i.e., the pilot responds to the uplink message), or a downlink message is transmitted and insufficient log storage capacity exists to store the message, the oldest message is deleted from the log.

Ten minutes after flight completion the Log memory is cleared of all log messages and prepared for future log messages.

   NOTE: The ATC LOG may automatically clear itself upon the FMS cycling through Flight Complete. It is advisable, if so desired, to print the ATC LOG prior to shutting down both engines at the end of the flight.

ATC Log Printing

The ATC log contents can be printed by pushing LSK 6L (PRINT LOG) on the ATC INDEX page.

```
                    ATC INDEX

1L    <EMERGENCY    POS REPORT>    1R

2L    <REQUEST      WHEN CAN WE>   2R

3L    <REPORT         FREE TEXT>   3R

4L    <LOG            CLEARANCE>   4R

5L    <LOGON/STATUS       VOICE>   5R
      --------------------------
6L    *PRINT LOG                   6R
```

KB1-3-0398

Miscellaneous

Datalink Status

The datalink status indicated in field 5R on the last page of the VERIFY RESPONSE, VERIFY REQUEST, VERIFY REPORT, and VERIFY EMERGENCY pages.

Datalink Status Definitions

DISPLAY	DEFINITION
BLANKS	The datalink status is READY, a connection with ATC COMM is established and no elements have been selected.
NO ATC COMM	The datalink status is READY, but a connection with ATC COMM is not established.
NO COMM	Airplane avionics are working but there are no datalink communications possible.
VOICE	The ACARS MU/CMU is in VOICE mode.
FAIL	The ACARS MU/CMU has experienced a hardware failure, or has no power.
SEND>	The datalink status is READY, a connection with ATC COMM is established, at least one element has been selected, and the prompt has not been selected.
SENDING	The datalink status is READY, a connection with ATC COMM is established, the SEND or RESEND prompt was selected, and the network acknowledgement timer has not expired.

Printer Status

The PRINT LOG prompt is displayed in 6L on the ATC INDEX page. The PRINT prompt is displayed in 6L on the last page of the XXXXz ATC UPLINK, XXXXz ATC REQUEST, XXXXz ATC REPORT, and XXXXz EMERGENCY pages.

DISPLAY	CAUSE
PRINT BUSY	The printer is busy printing data and the print was not initiated on the page that is displayed.
PRINTING	The printer is busy printing data and the print prompt was selected on the page that is displayed.
PRINT FAIL	The FMS has determined that the printer is failed. This could be an indication that the printer is out of paper or that the printer door is open.
<PRINT ERROR	The <PRINT LOG or <PRINT prompt has been selected and an error has occurred while attempting to print the data. Selecting <PRINT ERROR will attempt to print the data again.
<PRINT LOG or <PRINT	The printer is ready for printing data.

Intentionally
Blank

Intentionally
Blank

THIS SECTION INTENTIONALLY BLANK

Intentionally
Blank

Intentionally
Blank

FMS Guide	Chapter FMS
Abnormal Operations	Section 140

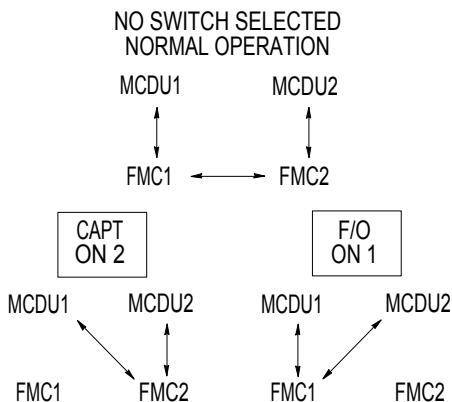### Dual and Independent Operation

The FMS is operable when electrical power is applied to the airplane. Built-In-Test (BIT) is performed at this time and after any short-term power transients. Pilot entered data is retained during power transients through battery-powered memory in the FMC. A latch failure is a complete halt of processing, recoverable only by cycling the circuit breaker.

When powered, the FMS supports DUAL, INDEPENDENT, and STANDBY operational modes. One MCDU must be available to operate any FMS mode. Dual mode is the normal operating mode of the FMS. In Dual mode the two FMCs communicate with each other (cross talk) and at least one MCDU communicates with one FMC dependent on pilot selections on the Source Input Select Panel (SISP). Refer to the following figure.

CAPT AUXILIARY PANEL   F/O AUXILIARY PANEL
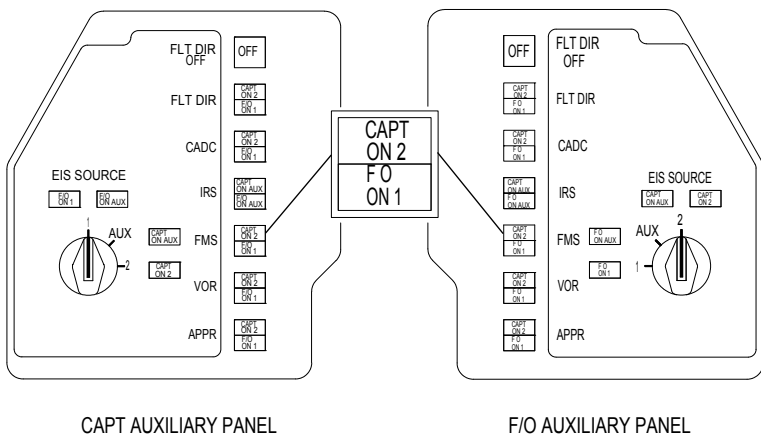
LB1-2-0041

With neither FMS SISP switch selected, FMC1 will transmit page displays to MCDU1 and FMC2 will transmit to MCDU2. This normal selection and other possible selections are shown in the following figure. When CAPT ON 2 or F/O ON 1 is selected, the Captain or First Officer MCDU will automatically display the MENU page. When FMC2 (CAPT ON 2) or FMC1 (F/O ON 1) is available, the <FMC-1 or <FMC-2 prompt is displayed in line 1L for pilot selection and operation.

NO SWITCH SELECTED
NORMAL OPERATION

MCDU1   MCDU2

FMC1 ⟷ FMC2

| CAPT | | F/O |
| ON 2 | | ON 1 |

MCDU1   MCDU2   MCDU1   MCDU2

FMC1   FMC2   FMC1   FMC2

KB1-3-0294

Dual mode operation involves both FMCs operating together with one of them picked to act as master FMC and the other Hot Spare FMC. Upon initial power-up within 0.5 seconds, FMC1 is designated the master and begins an initialization and cross talk (or synchronization) of FMC resident data to include items on the A/C STATUS page like the use of identical databases, operational programs, and airplane configuration data (airplane model, engine model, etc.). An FMC change could cause the FMS to operate in INDEPENDENT mode if the data in each installed FMC is not the same. Any discrepancy on the A/C STATUS page generates the MCDU message A/C STATUS MISMATCH.

After DUAL mode is established, both FCCs will select the FMC on the same side as the FCC/FMC in control. This FMC will then become the master. This selection process ensures that both flight directors (FD) are controlled with the same steering commands.

> NOTES: In the event of a FCC failure, the FMS will be affected as follows:
>
> • FMS SPD, NAV and PROF modes will disengage on the onside FMC with a master FCC failure.
>
> • There should be no effects to the FMS if the offside FCC fails. All FMS modes should remain engaged.

To correct the loss of FMS modes, the pilot should push the AUTOFLIGHT button on the GCP, then reselect FMS modes.

In DUAL mode operation, three parameters, airplane position, gross weight, and active thrust limit shall be computed independently by each FMC. Individually computed data is compared with any significant errors annunciated with an MCDU message.

- Present positions differ by more than 5 NM, or twice the RNP distance (NM), MCDU message FMC POSITION MISMATCH is displayed. The message is automatically cancelled when difference is less than 3 NM or twice the RNP distance (NM), respectively. The ND MAP display shows CHK POS message.

- Active thrust limit differs by more than 1% N1. MCDU message THRUST LIMIT MISMATCH is displayed.

    NOTE: In some dynamic conditions, vertical and lateral computations may temporarily disagree and may be evident on the ND. In this case, the flight director and autoflight system will use their respective FMC and autopilot for tracking

While data synchronizing is in progress, the MCDU message PLEASE WAIT is displayed. The same message is displayed for power interruption of longer than 4 seconds. In this case, the FMC question will become the Hot Spare and resynchronize itself to the master while establishing DUAL mode operation. While the PLEASE WAIT message is displayed, MCDU key inputs from either MCDU will not be accepted for processing. The message is automatically cleared when resynchronization is attained.

When cross talk or resynchronization is attempted and fails, each FMC will revert to a completely INDEPENDENT mode of operation without cross talk. The message INDEPENDENT OPERATION is displayed in the MCDU SP until it is cleared or the FMC reestablishes cross talk. The INDEPENDENT OPERATION message is re-displayed when the SENSOR STATUS page is accessed.

To display the SENSOR STATUS page, push LSK 6L on the REF INDEX page.

STEP: Push **REF**

```
              REF INDEX
         DEFINED
1L   <WAYPOINT      ATC COMM>   1R

2L   <WAYPOINT      AOC COMM>   2R
         CLOSEST
3L   <AIRPORTS         NAVAID>  3R

4L   <POS REF        DOC DATA>  4R

5L   <A/C STATUS        MAINT>  5R

6L   <SENSOR STATUS             6R
```

KB1-3-0189A

STEP: Push **6L**

```
             SENSOR STATUS
                 1    3/AUX    2
1L   IRU                      FAIL   1R
     EIS         FAIL         FAIL
2L   EEC         FAIL         FAIL   2R
     FCC                      FAIL
3L   FQGS        FAIL                3R

4L                                   4R

5L                                   5R

6L                                   6R


          INDEPENDENT OPERATION
```
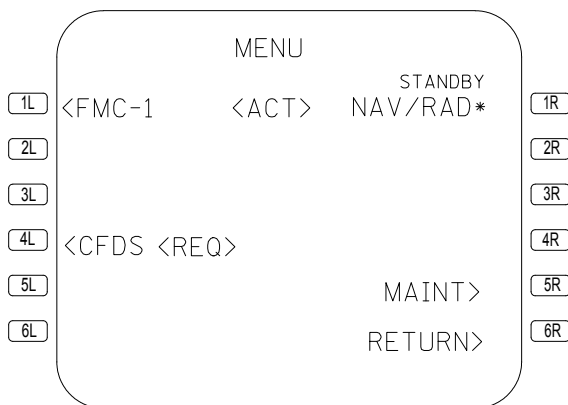
KB1-3-0206

> *NOTE: In the INDEPENDENT mode of operation, each FMC*
> *evolves its own flight plan; therefore, position errors could be*
> *encountered, and will be seen on the NAV display. Pilots*
> *should ensure the same data is entered in both MCDUs.*

Single Flight Management Computer

The FMS Built-In-Test is comprised of a combination of internal software and hardware monitors within the FMC and MCDU. Built-In-Test was designed to detect and isolate 95% of all failures in the FMS. When an error of failure is detected, the FMS will attempt to correct the situation through hardware/software resets. If the error cannot be corrected, the FMC is failed and the MENU page is displayed without an FMC-1 or FMC-2 selection prompt in line 1L.

STEP: Push **MENU**

```
                        MENU
                              STANDBY
  1L  <FMC-1     <ACT>   NAV/RAD*    1R
  2L                                 2R
  3L                                 3R
  4L  <CFDS <REQ>                    4R
  5L                        MAINT>   5R
  6L                       RETURN>   6R
```

LB1-2-0323

If the master FMC fails, the fact is detected by the Hot Spare FMC. The Hot Spare FMC will then function as the master FMC.

When an FMC fails, the pilot may select the Hot Spare FMC through the SISP.

Single FMC Failure

SISP . . . . Select Operable FMC

If an FMC failure occurs, the respective MCDU MENU page will be displayed without the FMC1 or FMC2 prompt in the 1L data field. Also, STANDBY NAV/RAD* prompt will be displayed in the 1R data field and MAP FAIL will be displayed on the respective navigation display (ND).

If this condition is detected, the pilot can select the functioning FMC by pushing the FMS button on his SISP. In this event, CAPT ON 2 or F/O ON 1 will be illuminated on both SISPs.

To display proper information on both NDs during a single FMC operation, the following mode and range selections must be made.

ACTIVE FMC SIDE	FAILED FMC SIDE
MAP	MAP (Same range selection as Active FMC)
PLAN	PLAN (Same range selection as Active FMC)
MAP	VOR (Any selected range)
MAP	APP (Any selected range)

Either side can always display the VOR/APP mode at any time.

MAP FAIL will appear, after 20 seconds, on the failed side when the active FMC is in the VOR, or APP, or PLAN mode and the failed FMC is in the MAP mode.

NO PLAN MODE will appear within 5 seconds on the failed side when the active FMC is in VOR, APP, or MAP mode and the failed FMC is in the PLAN mode.

Dual FMC Failure

MENU Page. . . . . ACCESS

If both FMCs fail, STANDBY operation must be selected on both MCDUs to gain access to navigation and NAV station tuning. To select STANDBY operation, push the LSK 1R on the MENU page when displayed. In the STANDBY mode only, the MCDU MENU, F-PLN, PROG, NAV RAD, and DIR INTC keys are functional to select the related STANDBY pages.

STEP: Push **MENU**

```
                  MENU
                         STANDBY
1L          <ACT>   NAV/RAD*        1R

2L                                  2R

3L                                  3R

4L  <CFDS <REQ>                     4R

5L                     MAINT>       5R

6L                     RETURN>      6R
```

KB1-3-0497

STEP: Push **1R**
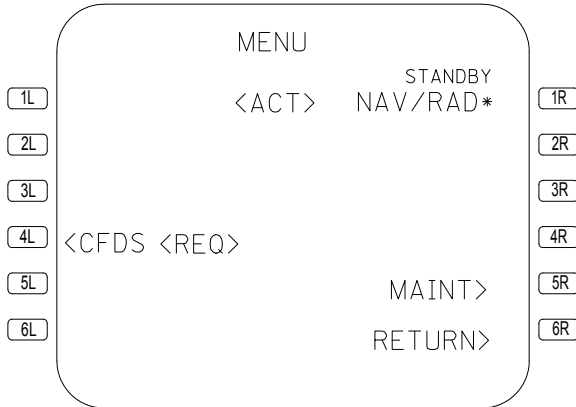
```
           STANDBY NAV RADIO
1L     ERD/CRS                      1R
       113.60/ [   ]°
2L                                  2R

3L    ADF1                          3R
      [   ]
4L    ILS / CRS                     4R
      [   ]/[   ]
5L                                  5R

6L            PRESELECT             6R
      [    ]/[    ]     [    ]/[    ]
```
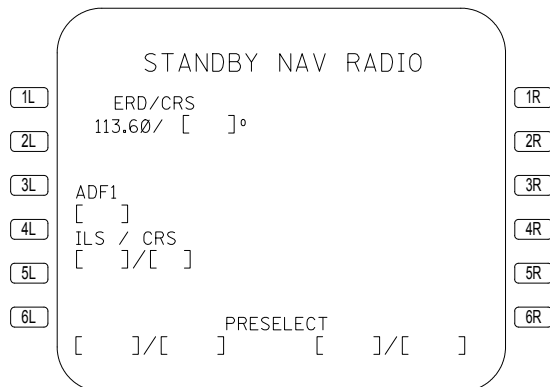
LB1-2-0292

During normal flight, the MCDU is continually updating the STANDBY NAV/RAD page to reflect the onside FMC radio tuning. Thus, on entering the STANDBY mode of operation, the MCDU is already initialized with the current tuning data. If STANDBY NAV/RAD is selected after the onside FMC has completed an automatic reset, then the pilot must retune the radios. With no database available, station identifiers will not be recognized and frequencies must be entered for tuning. Left side radios are tuned with the CAPT's MCDU and right side radios are tuned with the F/O's MCDU.

> NOTE: In normal operation the FMCs have the ability to tune and identify the navigational station corresponding to the flight plan. With no database, it is additionally important to properly tune and identify radios to ensure the appropriate facility has been tuned.

The message TIMEOUT RESELECT is displayed when the MCDU has lost communications with the FMC (or other active subsystem) and is cleared only by the CLR key or after re-establishing communications. Occasional FMC time-outs may occur during normal operation. Time-outs are evidenced by the onside Navigation Display (MAP or PLAN) showing MAP FAIL message, and the onside MCDU displaying the MENU page with the TIMEOUT RESELECT message in the scratchpad with the FMC prompt missing.

When TIMEOUT RESELECT is displayed for a fault or FMC resynchronization, the MENU page will automatically be displayed with the TIMEOUT RESELECT displayed in the scratchpad. If the FMC (SEL) prompt is displayed in data field 1L, push LSK 1L to reselect the FMC. If FMC (SEL) or FMC (REQ) is not displayed in 1L and time permits, wait up to 15 seconds for the message to be displayed. If time does not permit, or the FMC (SEL) or FMC (REQ) message is not displayed, push LSK 1R to select STANDBY operation or select the other FMS on the respective SISP.

Refer to DUAL FMC FAILURE for STANDBY operation or SINGLE FMC FAILURE for single operation.

As an example, the STANDBY PROGRESS and F-PLN pages are accessed at Coyle.

STEP: Push **PROG**

```
        STANDBY  PROGRESS
     FROM                    ALT
1L  CRI                    - - - - -    1R
     TO           TTG      DTG
2L  CYN          0005       27          2R
     NEXT
3L  VILLS        0005       27          3R
     DEST
4L  KATL         0137      599          4R
      PRESENT  POSITION       GS
5L  N4010.1/WO7412.2      374KT         5R

6L                                      6R
```

KB1-3-0323

The FROM, TO, NEXT and DEST (destination) waypoints are displayed along with distances to go (DTG) and time to go (TTG). Computed present position is displayed in the 5L data field with ground speed (GS). NO ENTRIES MAY BE MADE ON THIS PAGE.

STEP: Push **F-PLN**

```
            STANDBY F-PLN
        FROM
1L  CRI            N4036.7  W07353.7  1R
        C208°        54NM
2L  CYN            N3949.0  W07425.9  2R
        C226°        44NM
3L  VILLS          N3918.1  W07501.6  3R
        C225°        35NM
4L  NALES          N3853.6  W07538.2  4R
        C248°        14NM
5L  CLASY          N3848.2  W07555.3  5R
        C248°        73NM
6L  BRV            N3820.2  W07721.2  6R
                               ↑↓
```

KB1-3-0322

FCC Failure

In the event of an FCC failure, the FMS will be affected as follows:

- FMS SPD, NAV, and PROF modes will disengage on the onside FMS with a master FCC failure.

- There should be no effect to the FMS if the Hot Spare FCC fails. All FMS modes should remain engaged.

To correct the loss of FMS modes, the pilot should push the AUTO FLIGHT button on the GCP and then reselect FMS modes.

MCDU Failure

If an MCDU failure is detected, the display is blanked and the FAIL annunciator on the MCDU (lower left) illuminates.

Engine Out Takeoff/Initial Climb

The FMS ENGINE OUT (EO) mode predicts one-engine out performance and incorporates EOSID routing (if available for departure runway). When an Engine Out SID (EOSID) is available for a particular runway, it will be indicated on the SID page line 2R after the runway and the appropriate SID have been selected. It will be presented in the format: "EOXX", where "XX" is the particular runway selected.

If an EOSID is available for the departure runway, it will be available until the airplane has passed the common diversion point. Prior to the common diversion point, if an engine out condition is sensed or the ENG OUT mode key on the MCDU is pushed, the EOSID routing will be displayed as a dashed magenta line on the ND MAP or PLAN pages, and the *CONFIRM EOSID CLEAR* prompt will appear on the ACT F-PLN page of the MCDU on the data line prior to the common diversion point.

The engine out condition must be confirmed by pushing the *CONFIRM prompt in order to activate and display the EOSID routing.

If no EOSID is available or the airplane has passed the diversion point, the *CONFIRM ENG OUT CLEAR* prompt will appear on the PERF page when an EO condition is detected.

```
                    ECON CLB      1/3
                               PRED TO
  [1L]                          15500    [1R]
          ECON       UTC         DIST
  [2L]   299/.547  1345            10     [2R]
          MAX CLB
  [3L]  *194        1345          ----   [3R]
          EDIT
  [4L]  *VMO/.780                         [4R]
                                CLIMB
  [5L]                       FORECAST>    [5R]
  [6L]  *CONFIRM  ENG  OUT  CLEAR*        [6R]
```

KB1-3-0291A

Pushing the ENG OUT key on the MCDU will also cause the *CONFIRM ENG OUT CLEAR* prompt to appear on the appropriate page. Once displayed, pushing LSK 6L (*CONFIRM ENG OUT) activates computations that provide EO lateral guidance (with EOSID) and EO maximum altitude and new MAX CLB, MAX END, and ECON speed targets. The climb/descent paths and fuel consumption predictions are also recomputed and displayed.

> *CAUTION: If the ENG OUT key has been pressed, the pilot
> must select either *CONFIRM or CLEAR*. Failing to do so
> will leave EO armed and remove the ALT F-PLN from MAP
> and PLAN modes.*

During takeoff the FMS engine out speed target is obtained at the time of
engine out detection. Prior to reaching V2, the speed target will be V2. If
the airplane speed is between V2 and V2 + 10, the speed attained at
engine loss will be maintained. If above V2 + 10, the speed will be reduced
to V2 + 10 and maintained. In each of the three cases, the speed will be
maintained until EO ACCEL altitude has been reached (FMS SPD
engaged) or pulling the speed knob on the FCP to initiate acceleration
(FMS SPD not engaged). At EO ACCEL altitude, the FMS speed target will
be V3 until reaching all engine operating ACCEL altitude (if FMS SPD is
not engaged V3 should be selected in the FCP SPD window). T/O or GA
thrust will be maintained until all of the following conditions have been met:

1. Airplane is at or above V3.

2. Slats have been retracted.

3. Two engine ACCEL altitude has been reached.

If PROF is not engaged, it will be necessary to pull level change to reduce
thrust at all engine ACCEL altitude.

Engine Out in Climb

Confirming engine out results in the ENG OUT CLB page being displayed
on the MCDU as displayed below.

The message CRZ FL ABOVE MAXFL in the SP indicates the all engine
CRZ FL was above the recomputed single-engine MAXFL.

Single-engine MAXFL is that altitude maintained with one engine
operating at maximum continuous thrust with a 100 feet per minute climb
rate available.

```
                  ENG OUT CLB   1/3→
        D/D                  PRED TO
1L      253                    15500    1R
          ECON        UTC          DIST
2L      253/.472    1345         ----    2R
          MAX CLB
3L      *205        1345         ----    3R
          EDIT
4L      *VMO/.780                         4R
                              CLIMB
5L                        FORECAST>       5R
        TRANS       OPT/MAXFL THRUST
6L      18000       ---/222   LIMITS>     6R
```

KB1-3-0293A

Automatic FCC EO detection or pilot-confirmed EO request results in selecting the MCT limit for the remaining engine. The selection is a thrust limit and not engine out required thrust.

STEP: Push **6R**

```
        MANUAL  THRUST  LIMITS
                 EPR     TAT
  1L     G / A   -.--     -4°          1R

  2L                                   2R

  3L    →MCT   1.58                     3R

  4L     CLB                            4R
         10% DERATE      20% DERATE
  5L     CLB1                 CLB2      5R
                         RETURN TO
  6L     CRZ           PERFMODE>        6R
```

KB1-3-0162A

The engine out mode of operation cancels time constraints and the DECEL mode of operation.

To reselect all engine condition, the pilot must push the ENG OUT key to display the *CONFIRM ENG OUT CLEAR* prompt. Selecting CLEAR* will cause the ENG OUT function to deactivate and performance predictions to revert to the all engine condition.

FMS Engine Out Operation - Driftdown

The following procedure describes the FMS driftdown profile with PROF engaged. If PROF is not engaged, pilot should attempt to follow the described FMS profile.

If FCCs detect an engine failure, engine out confirmation must be made by the pilot through the MCDU.

> NOTE: EO confirmation will not clear previously selected edit or
> max speeds.

Engine Out in Climb

If an engine out condition occurs in climb above the single-engine maximum altitude the airplane will continue to climb with a speed target of driftdown and MCT power. When the airplane can no longer climb at the driftdown speed, a natural level off will occur. The airplane will remain in level flight until the driftdown speed is reached and the FCP altitude is lowered. The FMS transitions to the DESCENT mode and the PERF page title changes to D/D ENG OUT DES.

```
            D/D ENG OUT DES
      D/D                PRED TO
1L    254                   16000        1R
      ECON      UTC             DIST
2L    .552/229  1550             13       2R
      MAX DES
3L   *330       1548              5        3R
      EDIT
4L   *VMO/.780                            4R

                        DESCENT
5L                      FORECAST>         5R
      TRANS   OPT/MAXFL   THRUST
6L    18000   ---/174    LIMITS>          6R
```

KB1-3-0482

Engine Out in Cruise

When an engine out in cruise occurs and the pilot has confirmed the engine out, the current speed target will remain the active target. The thrust limit will transition to MCT; however, the engaged mode will remain in ALT-HOLD/SPD. When the speed target can no longer be maintained in ALT-HOLD/SPD, the mode will transition to ALT-HOLD/MAX thrust and the speed target will become the driftdown speed. The airplane will remain in level flight until the driftdown speed is reached and the FCP altitude is dialed down.

The FCP altitude may be lowered to the single-engine maximum altitude (rounded down to the nearest 500 feet) or a lower altitude if desired; however, the airplane will not descend until the airplane speed has reached D/D speed and the FCP altitude is dialed down. When this occurs, the airplane will enter a driftdown engine out descent mode and will descend to the FCP altitude with D/D speed as the target. Driftdown descent is accomplished with speed on pitch and throttles at MCT thrust. The D/D speed is displayed on all PERF pages adjacent to line 1L, as well as the Eng Out Econ speeds displayed in their appropriate positions.

```
                    ENG OUT DES
     PATH ERROR              PRED TO
 1L   999OLO 99SHORT      FL264     1R
       ECON        UTC        DIST
 2L  .552/229      1538         13   2R
      MAX DES
 3L  *330          1537          4   3R
      EDIT
 4L  *VMO/.780                       4R
                          DESCENT
 5L                    FORECASTS>     5R
     TRANS    OPT/MAXFL  THRUST
 6L  18000    ---/342   LIMITS>      6R
```

KB1-3-0290A

> **WARNING:** **The airplane will fly level in FMS PROF and FMS SPD and will not descend until the FCP altitude is lowered. The airplane will not depart the clearance altitude with FMS modes engaged until the FCP altitude is dialed down; however, AFS speed protection is available. If decays below VMIN, FMS PROF and SPD will disengage. AFS speed protection will engage at VMIN - 10. The airplane will depart the clearance altitude in order to maintain VMIN speed.**

When the descent rate reaches less than 100 fpm for 60 seconds, prior to reaching the single engine maximum altitude, the FMS mode will change from driftdown to a vertical speed mode of -100 fpm. The V/S rate may be edited via the GCP and PROF may then be reengaged. The MCDU D/D ENG OUT DES page changes to ENG OUT DES. If the FCP altitude is dialed below the single engine maximum altitude, the vertical speed will increase to -750 fpm. The FMS speed target shall remain VDD until one of the following occurs:

1. Airplane achieves cruise level operation.

2. Airplane captures the descent path.

3. Pilot performs any speed mode activity via the GCP or MCDU.

When the airplane reaches the FCP altitude, the airplane will level off. To transition from descent to cruise, it will be necessary to enter cruise flight on the INIT page. The speed target will then become the Eng Out Econ Cruise speed. Thrust limits will remain in auto MCT.

> NOTE: When the airplane transitions into ENG OUT CRZ, a top of descent may not be displayed on the MCDU flight plan page. The top of descent does not exist internally in the FMS, and once the FCP is dialed down and the top of descent is sequenced, the airplane will descend into a normal FMS descent.

```
            ENG OUT CRZ 1/2→
                       TO T/D
1L                     ----/----        1R
        ECON
2L     .552                             2R
        MAX END
3L     *.612                            3R
        EDIT
4L     [   ]                            4R

5L                                      5R
            OPT/MAXFL  THRUST
6L          ---/178    LIMITS>          6R
```

KB1-3-0481

PROF disengagement shall not cause a speed target change. If airmass descent operation is initiated above the single engine maximum altitude, the FMS speed target shall be VDD.

If an engine out is detected above single engine maximum altitude while the airplane is already in a descent, the thrust limit will go to MCT, but the airplane will be flown with idle thrust down to the single engine maximum altitude (or FCP altitude if higher). The airplane will maintain the current speed target which was active at engine out confirmation. This will effectively yield an all engine speed/profile. When the airplane reaches the single engine maximum altitude, it will then start flying with reference to the single engine descent path, or a single engine cruise if a new cruise flight level was entered on the INIT page with the EO speed as a target.

Intentionally
Blank

FMS Guide	Chapter FMS
Degraded Navigation	**Section 150**

No FMS SPD/PROF Message

In the event that the FMS transitions into the NO FMS SPD/PROF condition, the FMS is operating in a very limited mode of operation. All FMS functions involving performance and vertical guidance will be inoperative.

> **WARNING:** *If the NO FMS SPD/PROF mode has become activated, the flight crew is not permitted to perform a takeoff.*

The NO FMS SPD/PROF condition is triggered by the following event:

Upon power-up, the FMS internally checks its option for engine/airframe configuration and then compares it to the current software performance database. If a miscompare occurs, the mode is activated.

No FMS SPD/PROF condition can be identified by the following:

- NO FMS SPD/PROF on the MCDU A/C STATUS page.

- ATS OFF box remains amber at engine start.

- STAB T/O GREEN BAND will be removed.

- All thrust limit values will be dashed.

> NOTES: Navigation status is annunciated to the right of the boxed section in the lower left corner of the ND.
>
> The indications are:
>
> G/I NAV - Global and inertial NAV
>
> R/I NAV - Full radio and inertial NAV
>
> IRS/NAV - Inertial NAV only (no DME updates)
>
> R NAV - Radio NAV only
>
> NO NAV - No NAV data available
>
> The IRS NAV annunciation is normal for extended flight out of VOR/DME range. If IRS NAV remains displayed within VOR/DME range, primary reference for navigation must be radio navigation aids.

Due to inherent drift rates in the IRUs or noisy radio inputs, there are times when the IRS position and the FMC computed radio position are different. This condition may indicate faulty IRUs or radio inputs to the FMC position are different and FMC position computation. When the radio position is different from the IRS position by more than 12 NM, the following events occur:

1. If possible, different radios are selected and tuned and the new radio position compared to the IRS. If the difference is less than 12 NM, no further corrective actions occur.

2. If the position difference remains 12 NM or greater, the MCDU message VERIFY A/C POSITION is displayed.

NDs will display proper information as long as the same modes (NAV, VOR, APPR or PLN) and ranges are selected on both ECPs. Both MCDUs will function normally to make inputs to the functional FMC.

If an MCDU failure is detected, the display is blanked and the fail annunciator light on the MCDU keyboard (lower left) lights up.
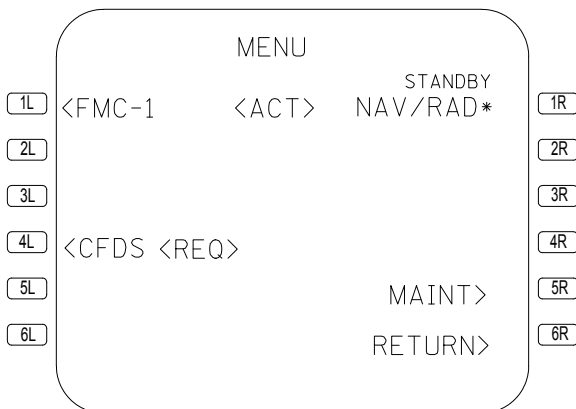
No Navigation - ENTRY INTO THIS CONDITION INDICATES A COMPLETE FAILURE TO ENGAGE ANY NAVIGATION MODE. While airborne, the airplane position is considered valid for the first 2 minutes and during this time a resumption of radio data and/or the return of IRU data would cause the engagement of a navigation mode consistent with sensor availability. After 2 minutes the airplane position is considered invalid and at least one valid IRU position is required to terminate the No Navigation condition, the FMC position on the IRS STATUS page becomes dashed and the MCDU SP message A/C POSITION INVALID is displayed.

Standby MCDU Operation

If at any time the flight crew does not believe its FMC is working, the MCDU can be used for standby operation. In this section, the MENU page, Standby MCDU Operation, STANDBY F-PLAN, Standby Progress and Standby Radio Tuning will be described.

MENU Page

The MENU page provides the means to access specific sub systems which use the MCDU for display. Pushing the MENU function key displays the MENU page.

STEP: Push **MENU**

```
                    MENU
                            STANDBY
  1L   <FMC-1    <ACT>  NAV/RAD*    1R
  2L                                2R

  3L                                3R

  4L   <CFDS <REQ>                  4R

  5L                     MAINT>     5R

  6L                     RETURN>    6R
```

LB1-2-0323

Pushing the LSK next to the subsystem name causes the subsystem menu or top level page to be displayed and activates the subsystem. Upon returning to the MCDU MENU page an ACT indicator is displayed next to the active subsystem. Should a nonactive system make a request to send a message to the MCDU, the prompt REQ will be displayed.

The NAV/RAD* prompt at 1R is continuously displayed. MCDU Standby operation is available at any time.

Pushing LSK 1R activates MCDU Standby operation and causes the display to change to the STANDBY NAV/RAD page. If the MENU page is accessed during standby operation, the NAV/RAD* prompt is replaced by an ACTIVE prompt in 1R. The pilot may return to the active subsystem, or by pushing the LSK adjacent to the active subsystem, or by pushing LSK 6R, the RETURN prompt. When returning to FMC1 or FMC2, the MCDU display last shown before going to the MENU page will be redisplayed. If both FMCs are inoperative and FMC1 or FMC2 become operable, the A/C status page is accessed when returning to normal FMS operation.

The message TIMEOUT-RESELECT is displayed when the MCDU has lost communications with the FMC and is cleared only by the CLR key or after reestablishing communications. Occasional FMC time-outs may occur during normal operation. Time-outs are evidenced by the onside navigation display (MAP or PLAN) showing a MAP FAIL or NO PLAN MODE message, and the onside MCDU displaying the MENU page with the TIMEOUT-RESELECT message in the scratchpad with the FMC prompt missing.

If an FMC time-out occurs, the FMCs will attempt to re-synch. During the re-synch the good FMC will display the PLEASE WAIT message in the scratchpad. The re-synch process should take no more than 40 seconds. If during this time it becomes imperative to access the navigation radios (VOR, ADF, ILS), the pilot may select the STANDBY/NAV RAD* prompt in the MENU page, realizing that this option will disable thrust limits and gross weight data. PLEASE WAIT message cannot be erased from the scratchpad with CLR key while FMCs are resynching.

Standby MCDU Operation

When the FMC fails to provide valid page data to the MCDU within 3 seconds of a request, the MCDU will deactivate that FMC and display the MENU page. Pushing LSK 1R (NAV/RAD* prompt) activates standby operation.

During the time between failure of an FMC and either subsequent recovery of the FMC or the pilot selecting standby operation, the MCDU operates in an INTERIM navigation mode. In this mode the MCDU supplies the last know valid radio frequencies received from the FMC. Vertical guidance data to the FCC will be provided.

In the full-up standby operational mode, the MCDU will provides navigation, radio frequencies, and lateral guidance data.

NAVIGATION - During standby navigation, the MCDU will provide airplane position and ground speed. The standby airplane position shall consist of the airplane's lateral position updated 5 times per second by using the present position inputs from the IRU. If Inertial Only position update is not active, then the airplane lateral position shall not be computed. Standby ground speed is the ground speed input from the IRU updated at the same rate.

RADIO FREQUENCIES - Radio frequencies that were tuned by the FMC prior to failure will remain tuned until the pilot enters new frequencies into the STANDBY NAV RADIO page. If the MCDU also fails, it will latch a request for the onside radio equipment to receive tuning frequencies from the offside FMC until the onside MCDU becomes operational again.

In standby operation the following data is available to other airplane systems:

- Airplane present position

- Current ground speed

- Navaid frequency (VOR, ADF, ILS) and course (VOR)

- ILS runway heading

- Distance to active waypoint

- Time to go (to the active waypoint)

- Active waypoint identifiers

- MAP display

LATERAL GUIDANCE - The MCDU lateral guidance provides for horizontal control of the airplane to the defined lateral flight plan. Roll rate and roll magnitude is limited appropriately for airplane speed. The lateral guidance performs the following tasks:

- Lateral path construction

- Current path leg sequencing

- Steering command to the AFS (horizontal only)

- Crosstrack deviation (display by EIS)

- Active leg progress computations (time, distance, direction)

Standby Radio Tuning

From MENU page, push LSK 1R to access to the STANDBY NAV RADIO page. The STANDBY NAV RADIO page can be accessed from another page while in the standby mode by pushing the NAV RAD key.

STEP: Push **1R**

```
              STANDBY NAV RADIO
  1L      ERD/CRS                          1R
         113.6Ø/ [    ]°
  2L                                        2R

  3L    ADF1                                3R
        [    ]
  4L    ILS / CRS                           4R
        [    ]/[   ]
  5L                                        5R

  6L                PRESELECT               6R
        [     ]/[      ]      [     ]/[      ]
```

LB1-2-0292

The STANDBY NAV RADIO page provides tuning status display and control capability for the onside VOR, ADF, and the ILS. The left MCDU in standby mode of operation will control only the left radios as shown in the above screen.

The pilot may tune the radios manually by entering the frequency (not ident) normally. The ILS runway heading is output to systems which use the information if entered. The capability to preselect navaid frequencies for later use is provided in line 6.

Standby Direct To Page

Pushing the DIR INTC key while the MCDU is in standby mode and the airplane position is valid causes display of the STANDBY DIRECT TO page. Selecting a latitude/longitude waypoint or a waypoint from the flight plan into data line LSK 1L will cause a Direct To maneuver to that waypoint when LSK 1L is pushed.

Standby F-PLN

Pushing the F-PLN key with Standby Active displays the STANDBY F-PLN page. The following screen shows a sample STANDBY F-PLN page at Coyle.

STEP: Push **F-PLN**

```
              STANDBY F-PLN

        FROM
 1L   CRI          N4036.7  WO7353.7   1R
        C208°         54NM
 2L   CYN           N3949.0  WO7425.9   2R
        C226°         44NM
 3L   VILLS         N3918.1  WO7501.6   3R
        C225°         35NM
 4L   NALES         N3853.6  WO7538.2   4R
        C248°         14NM
 5L   CLASY         N3848.2  WO7555.3   5R
        C248°         73NM
 6L   BRV           N3820.2  WO7721.2   6R
                              ↑↓
```

KB1-3-0322

The purpose of this page is to display each leg of the active route, provide position information for each waypoint, computed outbound true course, and great circle distance data for the connecting legs. The pilot can make waypoint entries using the left LSKs only. A valid waypoint entry should consist of an identifier/Lat/Long or a Lat/Long only. The NAV database is not available. Vertical scrolling is available to review and modify the F-PLN.

During normal flight, the MCDU is continually updating the STANDBY F-PLN to reflect the FMC flight plan. Consequently, on entering the standby mode of operation the MCDU is already initialized with the current F-PLN.

Basic F-PLN functions such as sequencing, waypoint entry and deletion, DISCONTINUITY insertion, DIR TO function, and PPOS and T-P generation are operable.

> NOTE: Since only waypoints tracks and distances are maintained in the MCDU, the STANDBY F-PLN should be reviewed upon entering the STANDBY mode. Discontinuities may appear where flight plan data has been lost such as holding patterns, heading legs, procedure turns, etc.

Standby Progress

The standby progress page is accessed by the PROG mode key and displays dynamic information for the current flight. The following screen shows STANDBY PROGRESS page at Coyle.

STEP: Push **PROG**

```
              STANDBY PROGRESS
        FROM                    ALT
 1L    CRI                     -----    1R
        TO            TTG      DTG
 2L    CYN          0005       27       2R
        NEXT
 3L    VILLS        0005       27       3R
        DEST
 4L    KATL         0137      599       4R
         PRESENT POSITION          GS
 5L    N4010.1/WO7412.2     374кт       5R

 6L                                     6R
```

KB1-3-0323

Line 1 displays the FROM waypoint identifier and altitude if available. Lines 2 thru 4 display the TO, NEXT, and DESTINATION waypoints along with the distance to go, and the distance to go to each waypoint. The computed airplane present position is displayed in 5L, with the current ground speed displayed in 5R. Entries cannot be made on this page.

Distance to go information on STANDBY PROGRESS page is IRU derived with no radio DME input. As such, it is to be considered only as accurate as the IRUs. It may not reflect accurate position.