

# UNS-1

## FMS Taskbook



## Use of Taskbook

The Simuflite Taskbook is both a practical tool for the cockpit and a training aid for the simulator .

Four sections comprise this Taskbook: Predeparture, Enroute/UNS-1, Arrival, and Planning. These sections are offered as a general guide to complete the associated tasks successfully.

The taskbook may be accessed in three ways: via a table of contents, by tabbed data, and by numbered reference.

- The table of contents lists all subjects included in this taskbook.
- If a procedure is known to be within a particular group, place thumb on the tab for that group and open.
- For rapid access, flip the taskbook over. Locate the desired procedure and its reference number. Next, locate the numbered tab; place thumb on the associated tab and open. The procedure is on one of the pages now visible.

**NOTICE:** This UNS-1 FMS Taskbook is to be used for aircraft familiarization and training purposes only. It is not to be used as, nor considered a substitute for, the manufacturer's Pilot or Maintenance Manuals.



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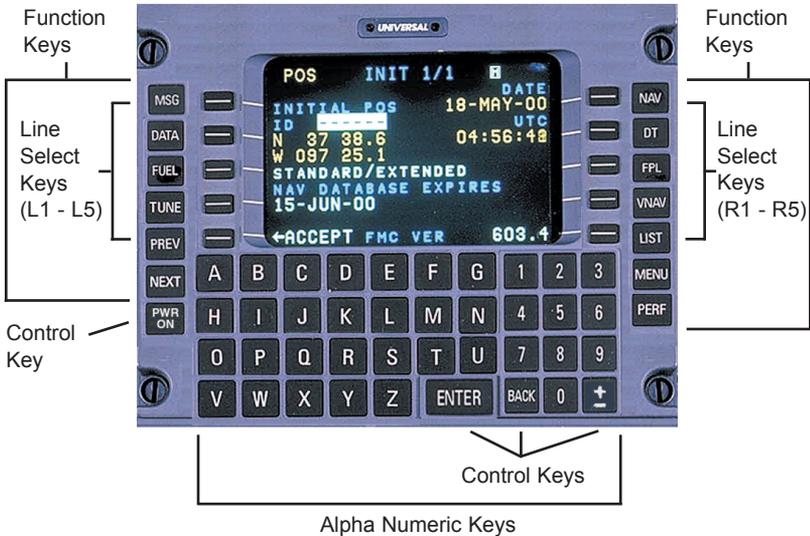
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UNS-1C



UNS-1K

ON/OFF DIM	Press and release to turn unit on (approximately 30 seconds warm up). Press and hold 3 seconds or more to turn OFF unit.
DISPLAY	The display adjustment window will be displayed.
OFF	Causes the CONFIRM OFF window to be displayed. This window has two options (CONFIRM OFF and CANCEL) selectable using the line select keys. Selecting CONFIRM OFF will turn the system off. Selecting CANCEL will return the display to the main (BRIGHT/DIM/CANCEL/OFFSET/OFF) window.
PREV Key	To cycle backward, one page at a time, through multiple pages of the same mode.
NEXT Key	To cycle forward, one page at a time, through multiple pages of the same mode.
BACK Key	When the cursor is over a data entry field, the BACK key serves as a delete or backspace key.
± Key	The State Change Key (±) is used in conjunction with the alpha numeric keys to enter data. It changes + to -, N to S, and L to R. It is also used in strictly alpha fields as a dash or period.
MSG Key	Causes the MESSAGE page to be displayed, showing active messages.
ENTER Key	To store input data.
LIST KEY	Provides a list of options appropriate to the data to be entered.
MENU Key	Presents a list of alternate formats or options for the FUEL, FPL, VNAV or TUNE mode being displayed.
DATA Key	To obtain information and status about the FMS, its NAV Data Base, and the attached sensors which operate with the FMS. Also used to make additions, deletions, or changes to pilot defined locations.
PERF	Accesses the DATA/PREF page. This page will contain parameters of the performance data base. If performance data base is missing or invalid, all fields will be dashed.
NAV	Accesses the navigation function display pages. There are normally two NAV pages; however, when another NAV mode such as APPROACH or HEADING is selected there will be two or more display pages which are cycled through by pressing the PREV or NEXT function keys.
DTO	The direct to key accesses the DTO function and is specifically dedicated to changing the flight plan in response to direct to clearances. If the direct to location is off the flight plan, provisions are made to link the location into the flight plan.
FUEL Key	Provides access to all fuel management functions.
FPL Key	The flight plan function key is used to access the Flight Plan page(s), or to access stored arrivals and routes. The Flight Plan pages may be accessed in order to construct a new flight plan, alter the current flight plan, or to insert a DP, STAR and approach into the flight plan.

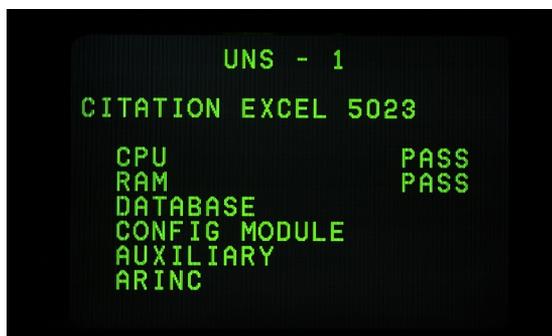
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## PRE-DEPARTURE

1

START UP

- ON to activate system and display self-test page

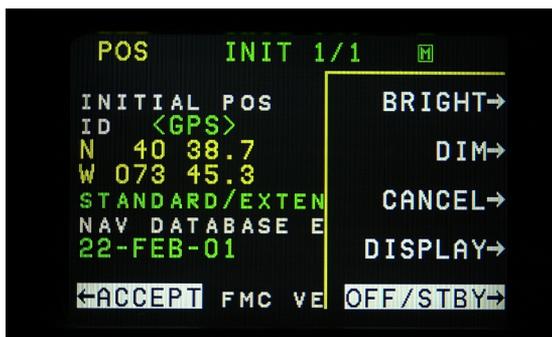


- ON (again) to access dimming control window

2

ADJUST BRIGHTNESS

- BRIGHT as needed

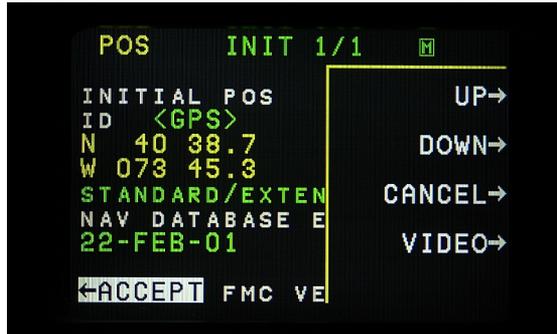


3

ADJUST DISPLAY/KEY ALIGNMENT

- DISPLAY to access display option window

2. UP or DOWN to align display arrows with line select keys.
3. CANCEL to return to previous page



**4**  
**INITIALIZATION**

Initialization page automatically appears at the end of the self-test if the self-test was passed without a fault, which would preclude use of the system. Typically the data (position, data and time) shown will be correct.

1. ACCEPT to accept GPS position, time and date



**Update INITIAL POS coordinates**

If data shown is not correct, use the line select keys to place the cursor over the fields to be corrected or changed and proceed as follows:



1. POS enter an ID (identifier) to update the INITIAL POS coordinates, or leave IDENT entry field empty, and press ENTER key to access DEFINE POS page.

**DEFINE POS page**

Reference WPT/Radial/Distance (cursor defaulted to REF WPT field)

1. REFERENCE ID
2. RADIAL
3. DISTANCE

**Latitude/Longitude**

1. — position cursor over latitude field
2. LATITUDE
3. LONGITUDE

**GPS Position**

1. — (3R) to indicate GPS POS

**DATE**

1. DATE enter date at zero meridian (DDMMYY)

**UTC**

1. UTC enter Universal Coordinated Time (hr:min)

**5****FLIGHT PLAN CONSTRUCTION AND EDITING**

1. FPL to access FPL 1/1 (Waypoint 1 will prefill with the airport from the initialization process)



- 2. LIST                    locate waypoint
- 4. ENTER
- 5. LIST                    access LIST page



- 6. AIRWAYS                list airways
- 7. Airway Ref. Nr.
- 8. Airway terminator

Continue entering waypoints.

**Fly-Over Waypoint**

- 1. FPL                    access FPL page

*NOTE: If the desired waypoints are not displayed, use the PREV and NEXT keys to page through the flight plan to find the desired waypoint.*

- 2. —                      position cursor over waypoint to be defined
- 3. OVFLY                line select key to cause an asterisk ( \* ) to appear after the waypoint identifier

*NOTE: To remove the asterisk, press the same line select key now labeled CNCL OVFLY*

**Add Waypoint**



1. FPL to access the first flight plan page
2. — position cursor over the waypoint
3. LIST to select waypoint

### Delete Waypoint(s)

1. FPL to access the first flight plan page
2. — position cursor over the waypoint to be deleted
3. DEL (twice) to delete waypoint

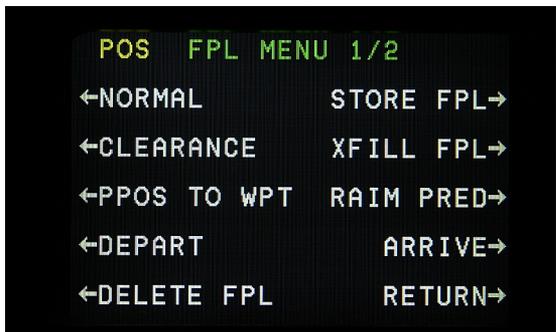


*NOTE: To delete remainder of flight plan, enter a reference number greater than the reference number of the last waypoint on the flight plan. Do NOT enter 99, or the entire flight plan will be deleted.*

### Change Waypoint

1. FPL access first flight plan page
2. — position cursor over first waypoint to be changed
3. DEL (twice) delete waypoint
4. LIST select new waypoint

### Delete Entire Flight Plan



1. FPL                      access first flight plan page
2. MENU
3. DELETE FPL (twice)

**Link a DP into a Flight Plan**

*NOTE: If a departure procedure has been issued as part of the ATC clearance, it may be linked into the flight plan.*

1. MENU                      from any flight plan page to get FPL MENU
2. DEPART                      on page 1/2 to access the DEPARTURE PAGE



*NOTE: DEPARTURE page will prefill with the departure airport.*

3. —                              at RUNWAY line, enter reference number of runway to be used



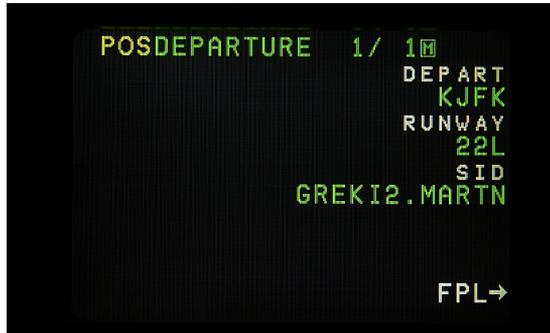
*NOTE: Cursor will advance to the DP field, and a list of DP's will appear.*

4. Select DP                      by entering reference number

*NOTE: A list of transitions will appear.*

5. Select transition by entering reference number

The final screen should appear as follows:



6. FPL return to active flight plan

*NOTE: The procedural legs of the DP will be a part of the flight plan (below).*



*NOTE: When a DP, STAR or approach is linked into a flight plan, the pilot should review the flight plan to verify that it is continuous with no gaps or duplicated waypoints, and that it conforms to the intended path of flight.*

### Enter an Altitude

1. — move cursor to ALT/FL field
2. FL enter three numerals (370 = FL370)
3. Altitude enter altitude as 16000



- Below 640 ft enter altitude with a lead zero (0137 = 137 ft.)

*NOTE: See VNAV section for entering offset altitudes.*

6

## FLIGHT PLAN SUMMARY



- FPL to access the flight plan mode
- PREV or NEXT to access the FPL SUMMARY page
- position cursor over each entry field and enter planned data as follows:

### UTC

- UTC enter estimated time of departure in universal coordinated time format, or
- ENTER to skip the EDT

### EDT

- time enter estimated time of departure in local time.
- difference enter local time zone difference from the zero meridian (up to  $\pm 13$  hours).

### ETD LCL

- time enter estimated time of departure according to local time zone

**TAS (MAN)**

1. true air speed      enter estimated true airspeed (in knots).

**FF (MAN)**

1. fuel flow            enter estimated fuel flow

**ETA UTC**

1. time                    enter estimated time of arrival. Manual entry will change the displayed ETD according to the ETE.
2. difference            enter local time zone difference from the zero meridian (up to  $\pm 13$  hours).

**ETA LCL**

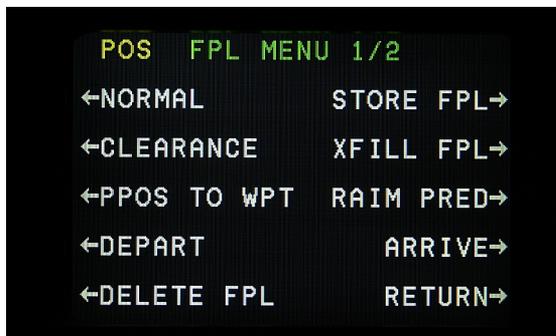
1. time                    enter estimated time of arrival may be made according to local time zone

**RESERVES**

1. fuel                    estimated reserve fuel, which is used to compute the MIN FUEL value

**7****FLIGHT PLAN OPTIONS****To Access FPL MENU Pages**

1. FPL                    to access FPL page
2. MENU                to access FPL MENU page



## Normal Flight Plan Display – NORMAL

1. NORMAL to return the display to the normal FPL display

```

POS  FPL  MENU  1/2
←NORMAL          STORE FPL→
←CLEARANCE      XFILL FPL→
←PPOS TO WPT    RAIM PRED→
←DEPART         ARRIVE→
←DELETE FPL     RETURN→

```

## Clearance Language Flight Plan Display – CLEARANCE

1. CLEARANCE clearance language, that is the DP, Airway sequence, STAR and Approach

```

POS  FPL  CLR  1/ 2  [M]
1  KJFK
   22L . GREKI2 . MARTN
5  MARTN
   208°      121NM
6  CRI
   042°      149NM
7  EEN
   070°      42.5NM
8  KCON

```

```

POS  FPL  CLR  2/ 2  [M]
   070°      42.5NM
8  KCON

```

**Present Position to Waypoint – PPOS TO WPT**

1. PPOS TO WPT to display distance and time from present position to each flight plan waypoint.

POS	FPL	1 / 2	
	PPOS	TO WPT	
		<u>DIST-NM</u>	<u>TIME</u>
1	KJFK		
2	JFK		
3	>GREKI	53.9	
4	JUDDS	67.1	
5	MARTN	124.4	
6	CRI	245.7	
7	EEN	395.1	

**Compressed Flight Plan Display – COMPRESSED**

1. COMPRESSED allows viewing of the maximum number of flight plan waypoints (up to 18) at one time. The current TO waypoint is shown on the first page with a caret (>).

POS	FPL	1 / 1	
1	KJFK		
2	JFK		
3	>GREKI		
4	JUDDS		
5	MARTN		
6	CRI		
7	EEN		
8	KCON		

**Waypoint to Destination – WPT TO DEST**

1. WP TO DEST to display distance and time from each waypoint to the destination.

POS	FPL	1 / 2	
	WPT	TO KCON	
		<u>DIST-NM</u>	<u>TIME</u>
1	KJFK	439.1	
2	JFK	438.6	
3	>GREKI	383.7	
4	JUDDS	370.5	
5	MARTN	313.2	
6	CRI	191.9	
7	EEN	42.5	

**Waypoint Definition – WPT DEFN**

1. WPT DEFN to display the coordinates of every flight plan waypoint, or FLOATING WPT in the case of procedural legs.

POS	FPL	1/ 2	☒
1	KJFK N 40 38.4	W 073 46.7	
2	JFK N 40 38.0	W 073 46.3	
3	>GREKI N 41 28.8	W 073 18.9	
4	JUDDS N 41 38.1	W 073 06.3	

**Delete Flight Plan – DELETE FPL**

1. DELETE FPL (twice) to delete all waypoints in the active flight plan

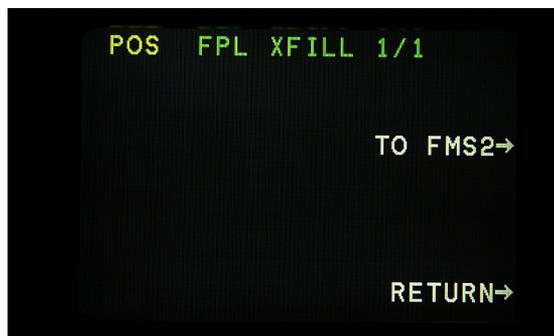
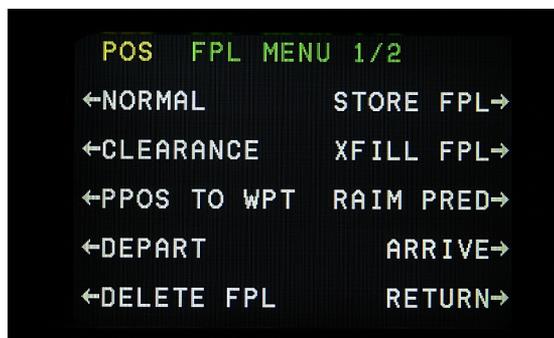
**Store Flight Plan – STORE FPL**

1. STORE FPL to display the PLT RTE screen with the cursor over the route name field. The current flight plan is now saved as a route in the Pilot Data Base. The destination can be changed to any eight character name to uniquely identify this particular route.

POSPLT	RTE	1/ 2	☒
1	KJFK		
--	JFK	@5000	
	036°	54.9NM	
--	GREKI	13.2NM	
	059°		
--	JUDDS	57.2NM	
	007°		
--	MARTN		

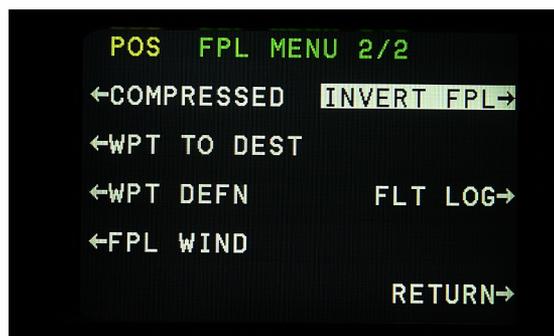
## Crossfill Flight Plan (Multiple System Installations) – XFIL

1. XFIL to crossfill a flight plan modified on one system to the other. Each system may be configured to PUSH or PULL flight plan data from one system to the other. Check with the Aircraft Flight Manual Supplement for the specific configuration.



## Invert Flight Plan – INVERT FPL

1. INVERT FPL (twice) to delete any DP, STAR or Approach from the current FPL, then invert it. The operator must perform a manual FR/TO leg change (or go DTO) to use the new FPL.



**Flight Plan Winds**

1. FPL WINDS
2. — to place cursor over waypoints
3. velocity enter wind as True, and magnitude in knots



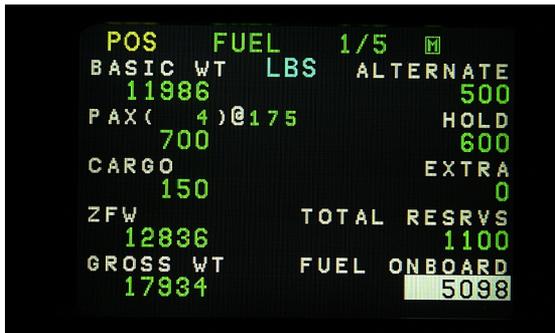
*NOTE: It is not necessary to enter a wind for each waypoint.*

**WEIGHT and FUEL Initialization**

1. FUEL to access FUEL page 1

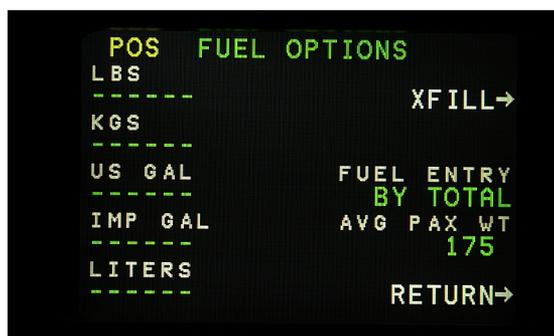
*NOTE: The BASIC OP WT and reserves plan values will be prefilled with the values last used.*

2. ZFW enter the aircraft's zero fuel weight in pounds or kilograms
3. TOTAL RESRVS enter the total fuel reserves for the planned flight in pounds.
4. FUEL ONBOARD total fuel is entered as a total, or is calculated from the individual tank entries (depending on the option selected on the FUEL OPTIONS page)



## FUEL MENU

1. MENU pressing this key while on any FUEL page will access the FUEL OPTIONS page



2. VALUE enter a known value. The other values will be calculated and displayed.
3. BY TANK to enter individual tank values
4. BY TOTAL to enter total fuel directly
5. XFIL to crossfill FMS with fuel data that has already been initialized in the cross-side FMS.

8

## FLIGHT INSTRUMENT INTERFACE

### HSI Course Deviation Scaling

Where analog data are utilized with electro-mechanical flight instruments, instrument display sensitivity is determined solely by the FMS. If EFIS equipment used the digital deviation data, the display sensitivities will be determined by the EFIS computer. Crosstrack instrument display sensitivity is selectable by the crew by using the NAV DISPLAY page which is accessed from the NAV MENU.

### Deviation Display Sensitivity Selection



The active mode is displayed in small font with IN USE next to it.

**CAUTION: SELECTING ENROUTE OR TERMINAL DURING APPROACH MODE WILL CANCEL THE APPROACH MODE.**

1. ENROUTE to create a display sensitivity of  $\pm 5.0$  nm.
2. TERMINAL to create a display sensitivity of  $\pm 1.0$  nm.
3. APPROACH to create a display sensitivity of  $\pm 0.3$  nm.

## ENROUTE

9

FLIGHT PLAN NAVIGATION

## NAV Page 1 (Normal NAV)

1. NAV to NAV Page 1

POS	NAV	1/2	M
FR	JFK		
	036° 53.9NM	+-	HDG→
TO	GREKI		
	059° 13.2NM	+-	MNVR→
NX	JUDDS		
XTK (T)	R0.42	GS	0
HEADWIND	---	BRG	035°
WIND	---T/---	TKE	L022°

2. FR the waypoint identifier and time overhead the FROM (FR) waypoint, or takeoff time for the first leg

*NOTE: Additional navigational data concerning the leg between the FR and the TO waypoints is displayed on the line below the FR waypoint.*

3. TO the TO waypoint identifier and the ETA for that waypoint.

*NOTE: The Great Circle Distance, course, and ETE between the TO and the NX waypoints is presented on the line below the TO waypoint.*

4. NX the next waypoint on the flight plan after the current leg, and the ETA for that waypoint.

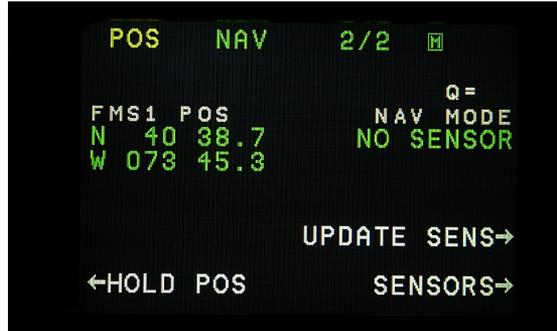
*NOTE: The ETA field will be dashes if the next waypoint is a GAP.*

5. XTK crosstrack.

*NOTE: This is the lateral distance in NM left (L) or right (R) of the extended course centerline between the FR and TO waypoints.*

## NAV Page 2 (Normal NAV)

*NOTE: When a normal NAV Leg is current, the following page will appear:*



1. FMS# POS            displays the current FMS position
2. —                to access the DEFINE POSITION page for entry of present position coordinates
3. HOLD POS        to access the HOLD POSITION page
4. UPDATE SENS    to send the current FMS BCP latitude/longitude to all sensors
5. SENSORS        to access DATA page 3 (FMS POSITION page)

## Manual Leg Change

1. NAV              to access NAV page 1



2. —              to choose FR or TO entry field

*NOTE: A listing of flight plan waypoints will be displayed on the right side of the page.*

3. IDENTIFIER      enter identifier of the desired waypoint

*NOTE: If the desired waypoint is on the flight plan, enter the associated reference number. If it is not on the flight plan, use the LIST function or type in the identifier.*

4. ENTER to accept the waypoint and clear the cursor



## Direct-TO Function



1. DTO to access the Direct To routing page

*NOTE: The turn direction will default to shortest turn, therefore no action is required. The turn direction can be overridden.*

2. LEFT or RIGHT to specify direction of turn
3. AUTO to cancel LEFT or RIGHT and return default to shortest direction
4. IDENTIFIER enter the identifier of the desired DIRECT TO waypoint

*NOTE: If the desired waypoint is on the flight plan, enter the associated reference number. If it is not, use the LIST function or type in the identifier.*

5. reference number to link the DTO leg into the flight plan

10

**NAV MANEUVER FUNCTIONS**

Begin on NAV Page 1

1. MNVR to display the MANEUVER Options page
2. — select HOLDING PATTERN, HDG, SXTK or PVOR mode of operation

**NAV Heading Page**

*NOTE: This page allows control of the aircraft heading from the FMS, while maintaining a display of information pertaining to the current navigation leg. The data on the left side of the page is identical to the data on NAV Page 1, and can be altered using the procedures for NAV Page 1. This data includes:*

**CMD HDG**

1. HEADING a new heading may be entered if desired
2. ENTER to confirm the current heading
3. ± or BACK to change from the automatic shortest turn to the long direction

**TURN R (or L) nnn°**

1. R, L, or ± when the cursor is over the CMD HDG field will cause a display of TURN R (or L)
2. DEGREES enter the number of degrees from current heading that is desired to turn. (Ex: TURN L 10°)

**INTERCEPT/HDG SEL**

1. HDG SEL or INTERCEPT to change the heading mode in use

**MNVR**

1. MNVR to access the MANEUVER definition page

**ARM APPR/ACT APPR**

1. ARM APPR change key to ACT APPR, and the reference navaid in the approach will be tuned

*NOTE: This key will indicate ARM APPR when 50 nm from destination if an approach is linked into the flight plan.*

2. ACT APPR flight plan will sequence to the INBOUND course of the approach, and the FMS will automatically enter FHDG mode (if so configured during installation)

**CNCL HDG/RETURN**

1. CNCL HDG to cancel the heading mode, and the FMS will provide steering to intercept the active navigation leg at a 45° angle.
2. RETURN to return the display to the page previously displayed (If the heading mode is not active, the line will read RETURN).

**Holding Patterns**

1. HA hold to an altitude terminator

*NOTE: Aircraft will stay in the holding pattern until the specified altitude is reached, then sequence to next leg the next time it crosses the holding fix.*

- 2. HF hold to fix terminator



*NOTE: Aircraft will sequence to the next leg after crossing the holding fix the second time. HF holding patterns are usually used as course reversals in lieu of procedure turns.*

- 3. HM hold to a manual terminator

*NOTE: Aircraft will remain in the holding pattern until an action is taken by the pilot to depart. HM holding patterns are most commonly found at missed approach holding fixes and are the only type of holding patterns the pilot can program manually.*

**Holding Pattern Depiction on FPL Pages**

- 1. Example of HF leg on flight plan page



**Holding Pattern Depiction on NAV Pages**

- 1. Example of HF leg on navigation page



*NOTE: An asterisk (\*) designates a fly-over waypoint. A subsequent waypoint designating an HX leg follows with a /H to indicate the hold.*

**Program A Holding Pattern**

(Begin on NAV Page 1/1)

1. MNVR to access the MANEUVER page
2. HOLDING DEFN to access the HOLD FIX page



*NOTE: If a holding pattern has been previously programmed, the HOLDING definition page for that fix will appear.*

3. FIX to access HOLD FIX page
4. TO to access the Holding Pattern Definition page (or enter the reference number for the desired waypoint)



5. ARM HOLD to accept the holding pattern with the default values.

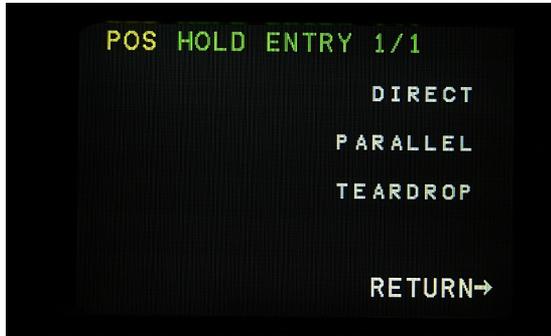
*NOTE: TURN will default to Right Hand. TIME will default to 1.0 minutes.*

6. — to place cursor on, and to modify, the INBD, DIR, TURN direction, TIME, or DIST fields

7. ENTER must be pressed to accept each data field

*NOTE: The ARM HOLD prompt changes to DTO HOLD after the line select key is pressed. Holding patterns cannot be armed on the ground.*

8. HOLD ENTRY to access the HOLD ENTRY page



### SXTK – Parallel Course (Selected Crosstrack)

Begin on MNVR page

1. SXTK NAV Page 1 will be displayed
2. ± (as required) to change the direction (left or right) of offset



3. OFFSET enter desired offset in nautical miles and tenths
4. ENTER

### Cancel Selected Crosstrack Mode

Begin on MNVR page

1. CNCL SXTK to cancel selected crosstrack mode

*NOTE: An alternate method is to enter a value of 0.0 nm in the SXTK data field on Nav Page 1.*

## Pseudo-VOR Function

Provides the capability to track TO or FROM any known waypoint on a programmed course or radial.

Begin on NAV Page 1 (Page 2 when in the Approach mode, or the DTO page)

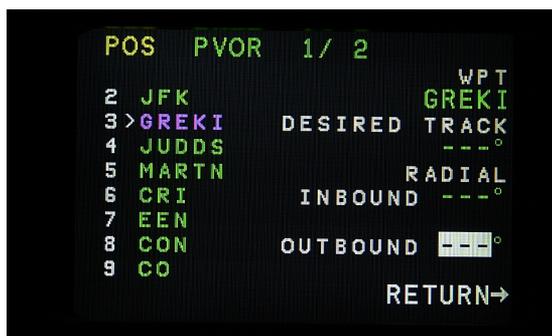
1. MNVR to access maneuver page



2. PVOR to access PVOR page



3. SELECT WAYPOINT by accepting the TO waypoint, or by entering the appropriate reference number of another waypoint in the WPT field



4. DESIRED TRK to follow a desired track outbound from a PVOR.

*NOTE: To follow a desired track outbound from a PVOR, a gap (\*GAP\*) must follow the PVOR waypoint on the flight plan.*

5. RADIAL INBND/ to identify the desired track to be flown to  
OUTBND or from the PVOR waypoint



6. ACCEPT to accept the PVOR

### Delete a PVOR

1. DTO conduct a DTO function or a manual leg change, or select the Approach mode.

### Gaps in the Flight Plan

A gap is a break in the flight plan designed to prevent the computer from making an automatic leg change as the TO waypoint is passed.

1. FPL to access the flight plan
2. PREV/NEXT to find the waypoint to follow the gap
3. — to place cursor over waypoint
4. LIST to access the LIST page
5. GAP to insert gap

**CAUTION: When a GAP is encountered, the flight plan will not autosequence to the next leg. It is the responsibility of the pilot to take appropriate action to continue accurate navigation of the aircraft.**

### Designate Fly-Over Waypoint(s)

A waypoint which will cause the navigation computer to delay making an automatic leg change until the aircraft is directly over the waypoint.

1. FPL to access Flight Plan page
2. NEXT/PREV to display additional flight plan waypoints

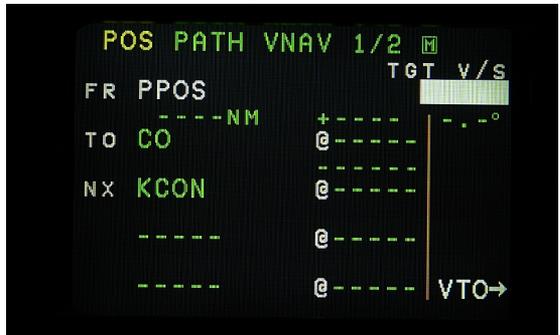
- 3. — to position cursor over the waypoint to be defined as an overfly waypoint
- 4. OVFLY to place an asterisk (\*) after the waypoint identifier indicating that it is an overfly waypoint



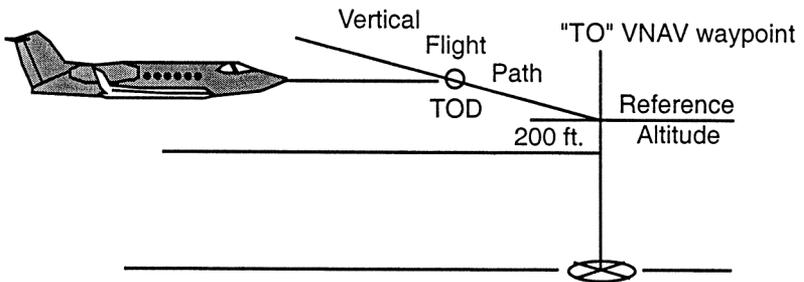
11

VERTICAL NAVIGATION (VNAV)

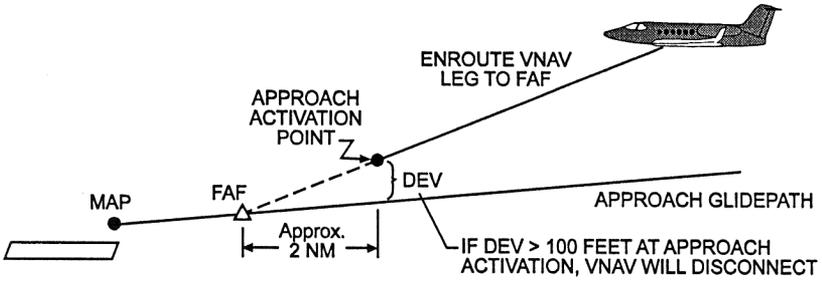
Used to define a vertical flight profile along the flight plan route, and then to compute the aircraft deviation from that profile for display.



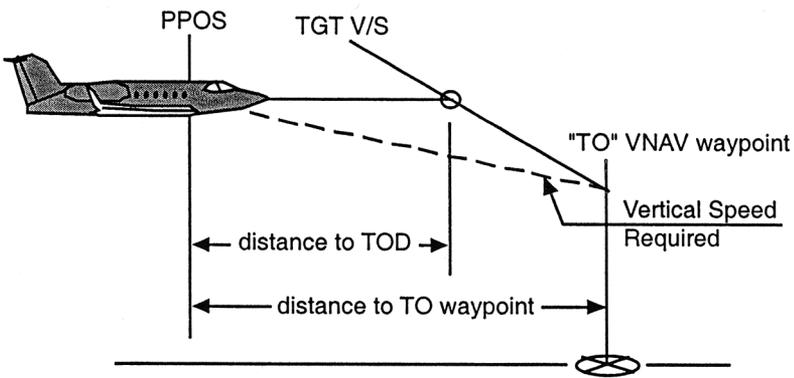
When VNAV is selected for display on the ADI, vertical deviation will be displayed prior to TOD capture point.



VNAV Transition from En Route to Approach.



The following figure is a representation of three scenarios for vertical speed entry and top of descent points.



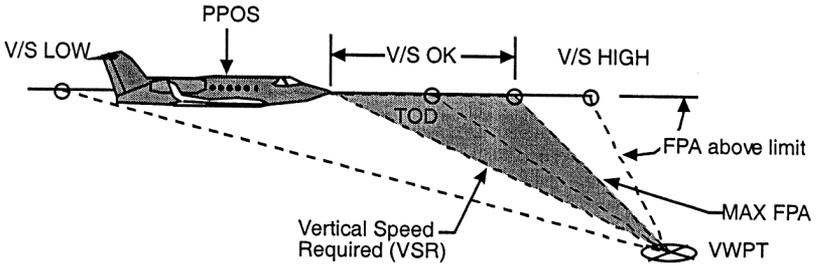
**VNAV Cruise**

The VNAV Cruise page will be accessed whenever the VNAV function key is pressed while in the Inactive or Cruise mode. It is used to define the vertical flight profile, and will be active prior to intercepting the vertical flight path. When the vertical flight path is intercepted the VNAV Descent page becomes active.

POS	PATH	VNAV	1/2	TGT	V/S
FR	PPOS				
	67.1NM	+----			----
TO	JUDDS	@14000			----
NX	EEN	@10000			0
	CO	@2000			----
	RW35	@383			0
					VTO→

**FR PPOS**

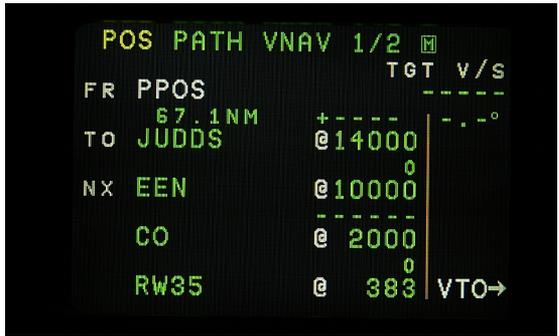
The FROM waypoint is always PPOS (present position), and is used for calculating the Vertical Speed Required to reach the TO VNAV waypoint at the specified altitude.



**VNAV Waypoint Select**

Begin on VNAV Cruise or Descent page.

1. VNAV to display the Path VNAV page



**VNAV Flight Path Definition Procedure**

*NOTE: A Flight Plan must already be active, as flight plan waypoints are used to define the VNAV waypoints.*

1. VNAV to display the VNAV Cruise page.
2. TO to define the TO VNAV waypoint.
3. WAYPOINT enter desired flight plan waypoint using the numeric selection process
4. ± to change the offset sign (- for offset prior to the flight plan waypoint, + for offset beyond the flight plan waypoint).
5. DISTANCE enter the offset distance
6. ALTITUDE enter the target altitude

*NOTE: 370 = FL370, while 0370 = 370 feet.*

7. — (3L, 4L, 5L) to access the NX entry fields.
8. additional waypoints repeat the above process to define succeeding VNAV waypoints
9. — (1R) to access the TGT V/S field and enter the desired vertical speed.

### **VNAV Error Messages**

The following error messages will appear on the VNAV page whenever an invalid entry is made in TGT V/S or altitude data fields:

V/S TOO HIGH	Value exceeds 6000 fpm or maximum flight path angle programmed in configuration module.
V/S TOO LOW	Entered value is less than minimum required value.
ADC ALT INV	(1) Aircraft altitude is > FL180 and only pressure altitude is available, or (2) ADC altitude is failed
CLR XFIL ALT	A VNAV plan is defined, but crossfilled altitude is being used by the system.
CLEAR MAN ALT	A manual entry for altitude was made on the ADC status page.
LEG RESTRICTION	The FMS is on a Procedure turn, VECTOR or other floating leg type.
XTK TOO HIGH	Current crosstrack is >12.5 nm.
CLR SXTK	Aircraft is flying a selected crosstrack distance prior to VNAV activation.
FPA TOO STEEP	Flight path is steeper than maximum FPA in configuration module.

## VNAV Descent Mode Procedure

The vertical navigation descent mode is activated by crossing the Top-Of-Descent point while in the cruise mode, or by selecting the Vertical TO (VTO) function.



## VNAV Direct-To Procedure

This procedure is designed to redefine an already established VNAV leg in the event ATC restrictions do not allow following the originally programmed vertical route.



1. VNAV to access the VNAV page
2. VTO to access the VERTICAL TO page
3. NUMBER enter the reference number of the desired VNAV Direct-TO waypoint

**NOTE:** If the computed flight path angle is greater than the configured maximum FPA, the reference number will flash, indicating that the path is too steep and cannot be engaged.

## VNAV Flight Profile Deletion

1. VNAV to access the VNAV page
2. TO or NX press any TO or NX line select key
3. 99 enter the number 99

**NOTE:** The vertical flight profile will be deleted and the VNAV pages will fill with the next 9 waypoints on the FPL.

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## ARRIVAL

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STARS AND APPROACHES

*NOTE: The following procedure for linking STARS and Approaches is shown in one continuous process, they may be programmed independently of each other.*

**Linking STARS and Approaches into a Flight Plan**

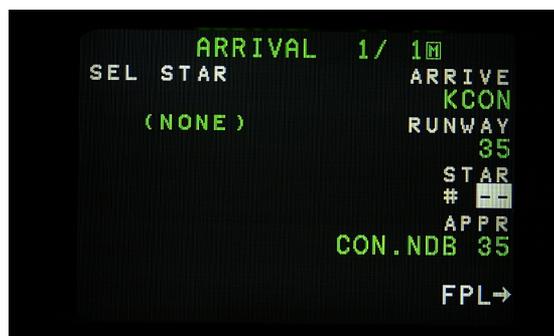
Begin on the FPL MENU page.

1. ARRIVE to access the ARRIVAL page. (The destination airport will prefill into the ARRIVE field.
2. NUMBER enter reference number for the landing runway from the list in the RUNWAY



*NOTE: After the runway is selected, the cursor will advance to the STAR field, and a list of STARS for that airport will appear.*

3. NUMBER select the STAR by entering the reference number from the list. (A list of transitions for the selected STAR will appear)



4. NUMBER select the transition by entering the reference number of the appropriate transition. (A list of approaches will appear).



5. NUMBER select the approach by entering the reference number of the approach in use. (A list of transitions, if any, will be displayed)
6. NUMBER select the desired transition by the reference number entry method

*NOTE: Selecting the approach and its transition may be delayed until later in the flight.*



7. FPL to return the display to the FPL pages. (The STAR legs and approach will now be a part of the flight plan, as shown below)

### Automatic Gaps in Flight Plans

NO LINK will be inserted at the transition points if the end waypoint of one procedure is not exactly the same as the beginning waypoint of the next procedure (SID-to-Enroute, Enroute-to-STAR, and/or STAR-to-Approach transitions).

It is the responsibility of the pilot to resolve these discontinuities and edit the flight plan to eliminate any NO LINKs by either:

1. edit                      manually eliminate the NO LINK using FPL editing techniques, or
2. DTO                      go direct to another waypoint after the NO LINK in order to maintain a continuous flight plan sequence.

### Duplication of Waypoints in a Flight Plan

1. —                         place cursor over duplicate waypoint
2. number                  enter the number of the initial approach fix
3. ENTER                  to close up the flight plan by deleting the duplicate waypoint

*NOTE: Anytime a SID, STAR or Approach is linked into the flight plan, the pilot should review the resulting flight plan to verify that it is continuous with no gaps or duplicated waypoints, and that it conforms to the intended path of flight.*

### Approach Armed Scaling

**(within 50nm of End-Of-Approach point)**

Begin on NAV Page 1

1. — (3R)                  select APPR ARM to increase CDI scale sensitivity to  $\pm 1.0$  nm.

### Approach Activated Scaling

Begin on NAV Page 1

1. — (3R)                  select ACT APPR to change CDI scale sensitivity to  $\pm 2.0$  nm.

### Missed Approach Scaling

1. MISSD APPR          select MISSD APPR to fly the missed approach procedure

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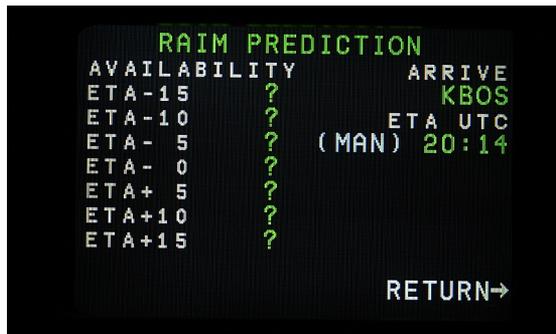
GPS Predictive RAIM – RAIM PRED

The RAIM PREDICTION page is only available if a RAIM capable GPS is configured. The flight plan destination identifier and ETA are displayed if they were defined in the flight plan, or they may be manually entered.

Begin on the FPL MENU, page 1/2



1. RAIM PRED (R3) to obtain the RAIM PREDICTION screen



**NOTE:** RAIM availability is displayed in terms of meeting ENR, TERM or APPR criteria (i.e., 2.0 nm, 1.0 nm, and 0.3 nm respectively) at the destination airport at the estimated arrival time shown.

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**APPROACH PROCEDURES**

**NAV Approach Page 1**

NAV APPR 1/3 is the first NAV page displayed when the FMS Approach mode is activated.



**Arm Approach Mode**

When the aircraft is within 50 nm of the runway (direct distance), the ARM APPR select key will become available, and the approach can be armed. If approach has not been manually armed, it will be automatically armed when the aircraft is 30 nm from destination.

1. ARM APPR to arm the Approach mode (the key will change to ACT APPR)

**Activate Approach Mode**

1. ACT APPR to activate Approach mode.

**Missed Approach Mode**

1. MISSD APPR to remove the EOA gap from the lateral guidance leg set.



2. =

```

NAV APPR 1/3 [M]
KCON GPS 17
FR INBOUND                                HDG→
171° 3.2NM -2.8°
TO INKOW 4307FT MNVR→
171° 6.0NM -2.8° CNCL
NX EHFAB 2500FT APPR→
-----
XTK(A) L0.15 VDEV -971
XWIND R 1 GS 157
WIND 265° / 1 VSR 6

```

3. =

```

NAV APPR 1/3 [M]
KCON GPS 17
FR INKOW 4307FT HDG→
171° 5.4NM -2.8°
TO EHFAB 2500FT MNVR→
171° 7.0NM -2.8° CNCL
NX RW17* 395FT APPR→
-----
XTK(A) L0.01 VDEV +56
XWIND R 1 GS 150
WIND 221° / 1 VSR -778

```

4. =

```

NAV APPR 1/3 [M]
KCON GPS 17
FR EHFAB 2500FT HDG→
171° 6.2NM -2.8°
TO RW17* 395FT MNVR→
NX *EOA* MISD APPR→
-----
XTK(A) R0.00 VDEV +207
XWIND R 1 GS 138
WIND 205° / 2 VSR -770

```

5. =

```

NAV APPR 1/3 [M]
KCON GPS 17
FR EHFAB 2500FT HDG→
171° 1.8NM -2.8°
TO RW17* 395FT MNVR→
NX *EOA* MISD APPR→
-----
XTK(A) R0.00 VDEV -240
XWIND R 1 GS 129
WIND 236° / 1 VSR -362

```

6. =



7. =



8. =



9. =



## Missed Approach Procedure

1. MSSD APPR      to cancel the current approach

*NOTE: The EAO gap will be removed from the approach, allowing normal leg sequencing after passing the missed approach waypoint.*

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**AFTER LANDING**

Upon touchdown the LANDING summary page will be displayed.

LANDING 1/2			
TIME	TAKEOFF	14:14	UTC
	LANDING	15:08	
	TOTAL	0+54	
FUEL	INITIAL	3716	
	ONBOARD	3176	
	USED	-----	LBS

### Compare Sensor's Derived Position Coordinates Against the FMS Best Computed Position

1. NEXT to access the HOLD POS page
2. — use line select keys to select other sensor's position coordinates

### Compare the Best Computed Position With The Actual Airport Coordinates

While on the HOLD POS page:

1. FMS # POS to access the DEFINE POSITION page
2. REF WPT to position cursor over reference waypoint identifier entry field
3. IDENTIFIER enter the airport identifier or the PILOT WPT identifier for the parking ramp coordinates. (distance and radial to the aircraft's present position will be computed and displayed)
4. RETURN to exit the page with no changes

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**SYSTEM SHUTDOWN**

1. ON/OFF key to display dimming control window
2. OFF to display CONFIRM OFF window
3. CONFIRM OFF to shut the system down

## Standby Mode

1. STANDBY to shut down and restart the system within a specified period of standby time, and still retain the pilot data, flight plan and fuel data.

*NOTE: This option does not work if the system is shut down in the air, or if the aircraft position is greater than 2 nm from the shutdown position.*

## Flight Log Entry

To record data to the FMS for later download to a disk. The FLIGHT LOG and FUEL mode configuration option must both be enabled.

Start from the FPL MENU, page 2/2

1. FLT LOG to access the flight log page



*NOTE: EMPTY WT, PAX, CARGO and FUEL ONBOARD entries on this page duplicate those on FUEL page 1, including the relationship to zero Fuel Weight. Values can be entered on either page.*

1. EMPTY WT the empty weight value in this field is programmed into the Configuration Module. Manual entries can be made by placing the cursor over the field and typing in the desired value.
2. PAX enter the number of passengers. The computer multiplies the number of passengers by the default weight per passenger (175 pounds). This weight may be changed on the FUEL MENU page.
3. CARGO enter cargo weight by placing cursor over the field and typing in the desired weight.

4. GROSS WT no entry required. This weight is the sum of Empty Weight, PAX, Cargo and Fuel Onboard.
5. FLT NBR enter flight number by placing cursor over this field and type in the desired number (maximum of 6 digits). This number is retained through touchdown and liftoff, and need not be entered unless a change is desired.
6. UPLOAD FUEL enter upload fuel by placing cursor over the field and typing in the desired amount. (+ = upload, - = download). A total of six digits may be used, including the + and - signs. Upload fuel values are reset after takeoff and do not need to be entered if no change is made.
7. FUEL ONBOARD total fuel onboard value is stored in memory until manually changed. Confirmation is required following initialization.

**17****POSITION CHECKS AND UPDATES****Inflight Accuracy Checks**

Begin on DATA page 1, or NAV page 2 while over a known ground reference.

1. HOLD POS press and hold this key
2. COMPARE compare the FMS best computed position with the known reference, or the position determined using other navigation equipment such as VOR, DME, TACAN, ADF, or radar fix to establish the aircraft position.

**Check Distance/Radial from a Known Position**

Used to automatically calculate the distance and radial from any waypoint in the database to the aircraft's held position.

1. DATA then HOLD POS to access the HOLD POS page
2. FMS # POS to access the DEFINE POSITION page
3. VERIFY verify the cursor is over the reference waypoint identifier entry field

4. IDENTIFIER      enter identifier of the known position.
5. POSITION         read the distance and radial to the aircraft's HOLD position
6. RETURN         to exit the page with no changes

### **Check or Change Distance/Radial of Pilot Waypoint from REF WPT**

1. DATA            to access the Data Base Menu page
2. PILOT-WAYPOINT to access the PLT WPTS directory
3. NEXT/PREV      use to locate the desired waypoint
4. NUMBER         enter the reference number associated with the desired waypoint (or type the identifier).
5. OBSERVE        observe the Waypoint Identification page for that identifier
6. MODIFY PLT     to display a DEFINE POSITION page for the waypoint

*NOTE: If the waypoint is being used in a route, flight plan, approach, etc., then MODIFY PLT will not appear. IN USE will indicate that waypoint cannot be edited. Disregard remainder of this procedure.*

7. VERIFY          verify the cursor is over the reference waypoint identifier entry field
8. IDENTIFIER      enter the desired identifier
9. ACCEPT         observe the distance and radial from the reference waypoint to the PILOT WPT.

*(NOTE: The radial or distance may be changed provided that the waypoint is not in use (a second reference waypoint and cross radial may be entered).*

10. ACCEPT WPT (twice)      to enter any change to the PILOT WAYPOINT position

### **Best Computed Position Update**

*NOTE: All Universal FMS systems are designed so that this procedure should never be necessary during normal operations.*

*NOTE: This procedure affects the system quality (Q) factor.*

An update can be accomplished on NAV page 2, DATA page 3, or HOLD POS page.

1. DATA                   to access the HOLD POS page when over a known geographic position
2. FMS # POS           to access the DEFINE POSITION page.
3. —                     press line select key to position cursor over the system's latitude coordinate
4. LATITUDE            enter the corrected latitude (the cursor will expand to cover the longitude entry field)
5. ± KEY (as reqd)   the ± key may be used to change the hemisphere (N, S, E, W)
6. LONGITUDE         enter the corrected longitude

*NOTE: If the manual input position differs from the frozen position by more than 10.0 arc minutes, a VERIFY POSITION message will be displayed below the coordinates. If the input coordinates are correct, perform step 7 below.*

7. ACCEPT               to accept the coordinate entries.

*NOTE: When the coordinates are accepted, the FMS best computed position, as well as all OSS computed positions, will be updated.*

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## PLANNING

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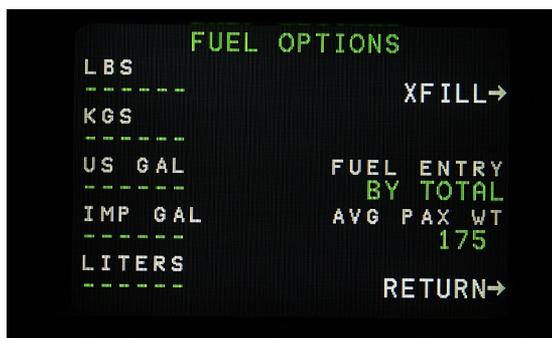
## FUEL MANAGEMENT

*NOTE: There is no direct connection between the aircraft's fuel quantity system and the FMS. Therefore the aircraft's system remains the primary reference for all fuel and range calculations. FMS fuel mode calculations are based on the pilot's initial entry of fuel on board, and subsequent automatic or manual fuel flow measurements subtracted over time.*

## Fuel Options Page

Begin on any FUEL page.

1. MENU to access the FUEL OPTIONS page.



*NOTE: The left side of the display is for viewing conversions. Pressing any of the left line select keys will place the cursor over that respective entry field. Entry of a value into one field will cause all other fields to display the same value converted per the entry field heading. The right side of the display is for selecting crossfill, tank or total for fuel on board entries, and to return to the prior display.*

2. XFILL causes the fuel onboard to be crossfilled (copied) to or from the other FMS
3. FUEL ENTRY
  - a. TANK fuel will be entered per tank.
  - b. FUEL ONBOARD a per tank format is presented allowing fuel onboard to be entered individually for up to 6 tanks.

- 4. AVE PAX WEIGHT to enter an average passenger weight value to be used for calculating total passenger weight on FUEL page 1/5.

*NOTE: Once entered, the default weight will be saved for subsequent use.*

- 5. TOTAL to enter the fuel on board directly into FUEL page 1 as a total amount
- 6. FUEL ENTRY to display a list page with options BY TANK or BY TOTAL
- 7. select select appropriate number
- 8. ENTER
- 9. RETURN to cause display to return to the last FUEL page viewed prior to pressing the MENU key

**FUEL Page 1 – Fuel and Wight**

FUEL Page 1 is the fuel and weight entry page. It is used to determine the gross weight of the airplane by entering the values to be used in calculating the weight and to plan the fuel reserves required.

- 1. — select line key to position cursor over the data entry fields.



- 2. BASIC WT to view the basic operating weight (BOW) of the aircraft, plus crew and provisions.

*NOTE: The BOW value shown is programmed into the Configuration Module. Entry of a new weight will override the Configuration Module weight, and will be retained in memory for future use.*

- 3. PAX to enter the total passenger weight

*NOTE: There are two methods of entering the total passenger weight. Enter the number of passengers (up to 999) in the PAX field. The computer will multiply the number of passengers by the default weight per passenger. This weight may be changed on the FUEL OPTIONS page. Total passenger weight may also be entered in the passenger weight field. This method will recalculate the displayed average passenger weight.*

4. CARGO           to input the cargo weight
5. ZFW             zero fuel weight is automatically calculated, based upon the three prior entries. If desired, this value may be directly entered.
6. GROSS WT       to give the sum of the ZFW and FUEL ONBOARD values.

*NOTE: Gross weight will not be calculated until FUEL ONBOARD entry is made or confirmed.*

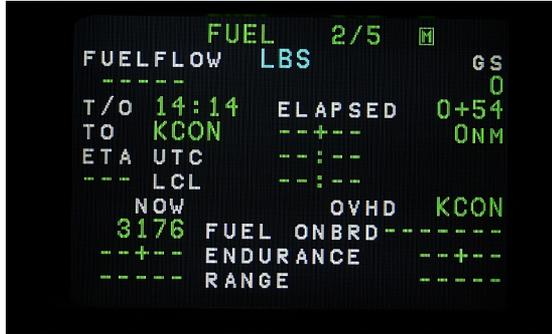
7. ALTERNATE      the fuel required to the alternate landing field.
8. HOLD           the fuel loaded for holding at the destination
9. EXTRA          additional reserve fuel loaded beyond that for alternate landing field and holding.

*NOTE: Extra fuel generally does not change from flight to flight.*

10. TOTAL RESRVS automatically calculated based upon the three prior reserve fuel entries. If desired, this value may be directly entered.
11. FUEL ONBOARD this value is stored in memory until manually changed. Confirmation is required following initialization.

Fuel Page 2 – Range and Endurance

Fuel Page 2 displays range and endurance estimates based upon departure time and current parameters. Manual FUEL FLOW and GS (groundspeed) entries may be made to evaluate their effect on the other parameters displayed. If all entries have been made on FUEL Page 1, then this will be the first page display when the FUEL key is pressed from another mode.



- 1. FUEL FLOW the cumulative fuel consumption in pounds or kilograms per hour. Placing the cursor over this field allows a manual fuel flow entry to be made.

*NOTE: When a manual entry is made, the performance displayed on this page will be referenced to that value.*

- 2. GS groundspeed expressed in knots. Placing the cursor over the GS entry field allows a manual groundspeed entry to be made.

*NOTE: When a manual entry is made, the performance displayed on this page will be referenced to that value. If Fuel Flow or GS are manually entered, these values will be lost when the fuel function is exited.*

- 3. T/O takeoff time
- 4. ELAPSED time elapsed since takeoff
- 5. TO time and distance to the final waypoint

*NOTE: The alternate landing field destination may be entered to show predictions for the great circle distance and bearing to the alternate.*

- a. TO place cursor over destination ident
- b. ident enter new ident as an alternate

*NOTE: The LIST function will present an airport list. An (A) will appear next to the new destination.*

- 6. ETA                      the estimated time of arrival at the TO waypoint location.
- 7. FUEL ONBRD          present fuel on board the aircraft in pounds.
- 8. OVHD                    the calculated fuel remaining over the destination
- 9. ENDURANCE          the amount of time, in hours and minutes
  - a. under NOW          time the flight can continue with the present fuel flow
  - b. under OVHD        time the flight could continue after the destination is reached

*NOTE: ENDURANCE is based on using all available fuel on board, including reserves.*

- 10. RANGE                distance in nautical miles
  - a. under NOW          distance that can be traversed with the present fuel flow, fuel on board, and groundspeed
  - b. under OVHD        the estimated distance which could be traversed after the destination is reached

### FUEL Page 3 – Summary of Fuel Requirements

Fuel Page 3 provides a summary of the fuel requirements for the flight plan. FUEL FLOW and GS entries may be made to evaluate their effect on the other parameters displayed.

FUEL		3/5	M
FUELFLOW	LBS		GS
---			0
FUEL			
AT DEPARTURE			3716
USED			-----
ONBOARD			3176
REQUIRED			-----
OVERHEAD	KCON		-----
RESERVES			1100
EXCESS			-----

- 1. FUEL FLOW            cumulative fuel consumption in pounds/kilograms.

*NOTE: Placing cursor over the FUEL FLOW entry field allows a manual fuel flow entry to be made. This value will be lost when the fuel mode is exited.*

2. GS                      groundspeed in knots

*NOTE: Placing cursor over the GS entry field allows a manual groundspeed entry to be made. This value will be lost when the fuel mode is exited.*

3. AT DEPARTURE   total fuel entered on FUEL Page 1 prior to departure.

*NOTE: This value will not change if a new entry is made while airborne.*

4. USED                   total fuel used

*NOTE: USED is set to zero whenever a FUEL ON BOARD entry is made on FUEL PAGE 1 while on the ground.*

5. ON BOARD         fuel on board the aircraft is equal to the total FUEL ON BOARD value last entered on FUEL Page 1, minus the fuel used since that entry was made

6. REQUIRED           estimated fuel required to the destination, based on the present fuel flow and ETE to destination

7. OVERHEAD         estimated fuel on board at the destination is equal to ONBOARD minus REQUIRED.

8. RESERVES         total reserves value as entered on FUEL Page 1

9. EXCESS             excess fuel at destination, is equal to OVERHEAD minus RESERVES.

## Fuel Page 4 – Projected Landing Weight

Fuel Page 4 displays projected landing weight based upon current fuel conditions. All fuel quantity and gross weight displays are computed values based upon the initial values input by the pilot and inputs from the engine fuel flow sensors. The values displayed on this page may not be changed, and the line select keys have no function.

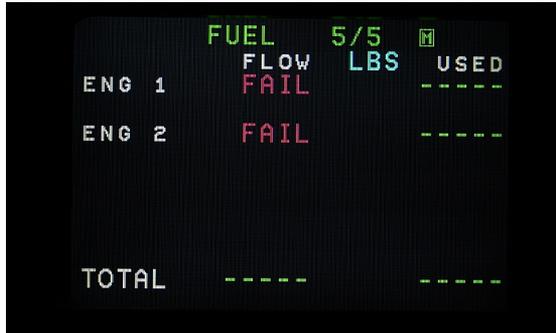
FUEL 4/5	
LBS	
GROSS WT	18176
FUEL ONBOARD	3176
LANDING WT	-----
OVERHEAD	KCON -----
GND NM/LB	-.----
AIR NM/LB	-.----
TAILWIND	---
ESAD	255
TEMP	ISA+00

1. GROSS WT current gross weight of the aircraft based on zero fuel weight plus present fuel on board
2. FUEL ONBOARD current fuel on board is calculated from the last fuel on board entry and fuel flow inputs subsequent to that entry
3. LANDING WT the landing weight is based on current gross weight minus fuel burn to destination (or the last waypoint prior to a gap). It is calculated using present ground speed and fuel flow.
4. OVERHEAD the calculated fuel remaining over the destination (or the last waypoint prior to a gap) based upon present fuel on board, present groundspeed and present fuel flow
5. GND NM/LB (KG) ground nautical miles per pound (kg) of fuel, based on the present groundspeed and fuel flow
6. AIR NM/LB air nautical miles per pound (kg) of fuel, based on TAS and fuel flow
7. HEADWIND/ TAILWIND wind component in knots
8. ESAD equivalent still air distance is the distance the aircraft would have flown since takeoff under zero wind conditions, or the air miles flown

9. TEMP temperature in terms of the difference between the actual static air temperature (SAT) and the ISA standard SAT based upon current altitude.

**Fuel Page 5 – Fuel Flow and Fuel Consumption**

Fuel Page 5 shows the fuel flow and fuel consumption in pounds/kilograms per hour for each engine & APU individually and cumulatively. The fuel flows shown are supplied by the aircraft’s fuel flow sensors.



1. FLOW fuel flow in pounds/kilogram per hour obtained from inputs from the engine fuel flow sensors
- a. FAIL displayed if fuel flow drops to zero for four minutes. To remove the fail and restore input:
- 1/cursor place cursor over FAIL
  - 2/BACK press BACK key
  - 3/ENTER press ENTER key
- b. Manual Entry manual FUEL FLOW entries are made as follows:
- 1/cursor use line select keys to position cursor
  - 2/fuel flow enter fuel flow (MAN will be displayed).
- c. Manual Entry Removal remove a manual entry as follows:
- 1/BACK press the BACK key
  - 2/ENTER press the ENTER key while the cursor is over the FF entry field

2. USED cumulative fuel used in pounds/kilograms for each engine, and the total for all engines.

a. Manual Entry manual entries may be made as follows:

- 1/— position cursor
- 2/quantity enter fuel used for the individual engine.
- 3/ENTER press the ENTER key

*CAUTION: APU Fuel Flow is a configurable option. With some digital fuel flow, it is displayed automatically. A manual entry is possible on all installations so configured. If fuel flow is not monitored by the FMS, fuel on board entries should be updated as required to compensate.*

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**PERFORMANCE**

**PERF Page 1**

The PERF page provides a synopsis of pertinent inflight performance information. This page is read-only; no entries can be made.



- 2** ADJUST BRIGHTNESS
- 3** ADJUST DISPLAY/KEY ALIGNMENT
- 15** AFTER LANDING
- 14** APPROACH PROCEDURES
- 8** FLIGHT INSTRUMENT INTERFACE
- 5** FLIGHT PLAN CONSTRUCTION AND EDITING
- 9** FLIGHT PLAN NAVIGATION
- 7** FLIGHT PLAN OPTIONS
- 6** FLIGHT PLAN SUMMARY
- 18** FUEL MANAGEMENT
- 13** GPS PREDICTIVE RAIM - RAIM PRED
- 4** INITIALIZATION
- 10** NAV MANEUVER FUNCTIONS
- 19** PERFORMANCE
- 17** POSITION CHECKS AND UPDATES
- 12** STARS AND APPROACHES
- 1** START UP
- 16** SYSTEM SHUTDOWN
- 11** VNAV NAVIGATION