

JB Panels 777 FMS for Microsoft Flight Simulator X SP2

The Flight Management System (FMS) provides flight planning and control functions as well as access to navigational data contained in the FSX GPS database.

The FMS operates on a FSX flight plan using the FSX GPS for lateral navigation and flight plan waypoint modifications. It also computes and controls a vertical flight path for the flight plan and provides speed control and throttle management.

The 777 FMS is an integrated component of the JB Panels 777 panel. It is designed to interact with the 777 panel components to provide flight management and control functions. It will not operate as a stand alone unit.

This document provides a description of the features and operation of the FMS. Refer to the JB777 Sample Flight document (JB777SampleFlight.pdf) for a working example of the FMS used to plan, control and monitor a flight.

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Appendix 1: Adding Fixes to the FSX Navigation Database

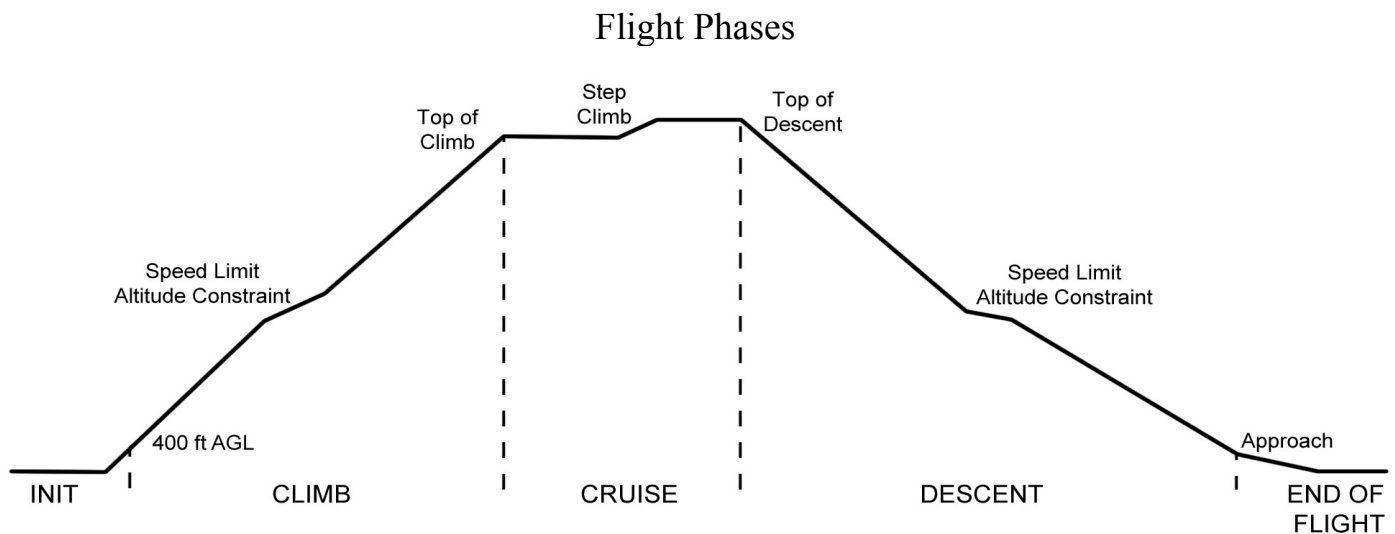
1. FMS Operation

The FMS is loaded with a flight plan and performance data. Once loaded with the necessary data, a vertical flight path is computed and the FMS is ready to provide lateral and vertical guidance along the flightpath from departure to destination.

Automated control is provided through the autopilot and engaged via the LNAV and VNAV controls on the mode control panel (MCP) located on the 777 glareshield. Engaging VNAV also engages the autothrottle to provide automated speed control according to speed data entered into the FMS.

2. Flight Phases

The FMS operates in four flight phases.



Preflight The FMS is loaded with a FSX flight plan. Waypoints may be added or deleted and speed and altitude constraints are entered.

Fuel reserves and cruise altitude are entered.

Thrust performance is selected.

A vertical flight path is computed.

Takeoff speeds are accepted or entered.

Climb Lateral navigation (LNAV) engages above 50 feet AGL.

Vertical navigation (VNAV) engages above 400 feet AGL.

Speed control engages above 2000 feet AGL.

The climb phase extends to the top-of-climb (T/C) when cruise altitude is reached.

Cruise The cruise phase extends to the computed top-of-descent (T/D) point.

Cruise climb/descent may be initiated by modifying the altitude on the MCP, or by entering a cruise altitude on the FMC VNAV or performance pages.

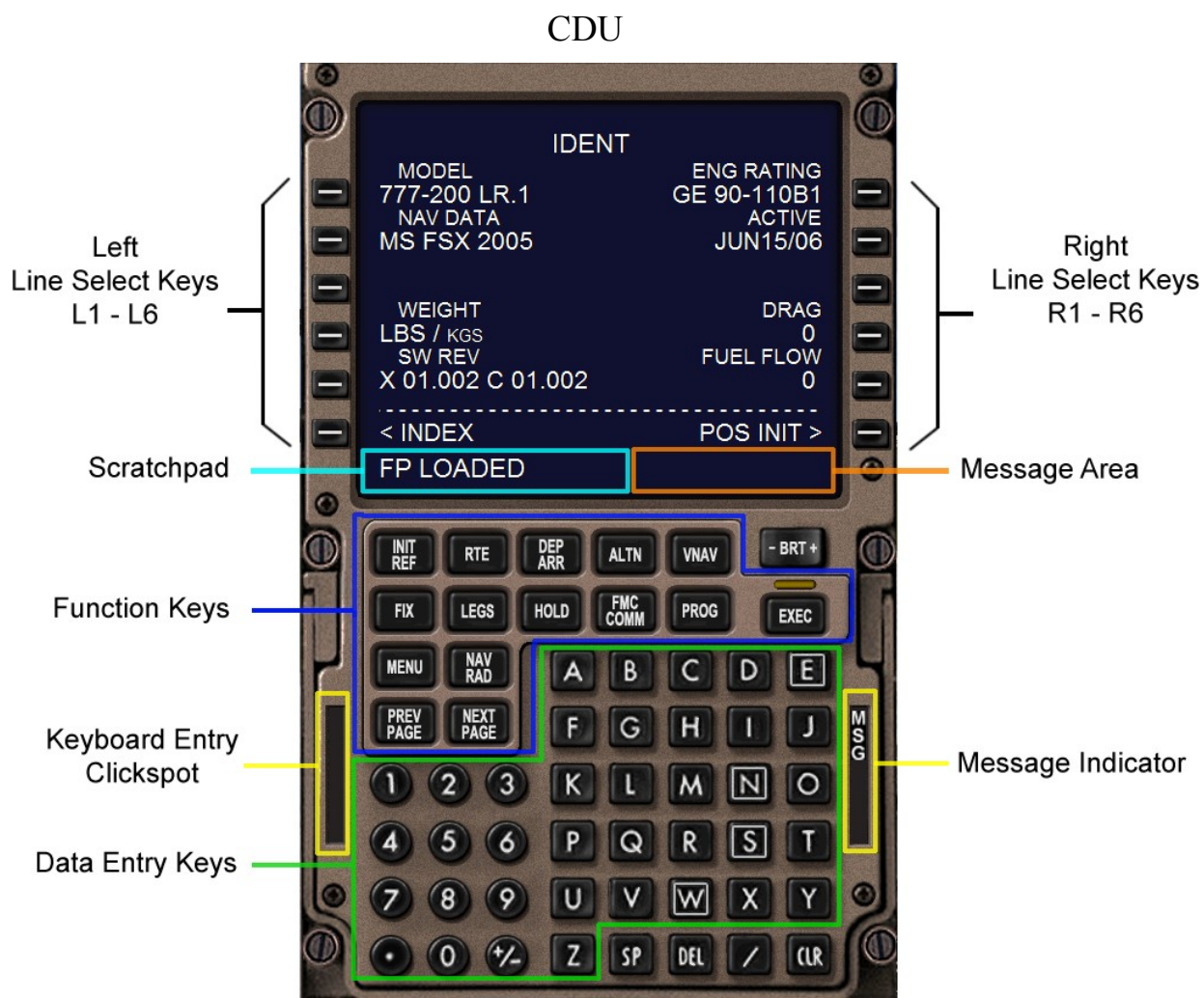
Step climbs are computed and predicted based on fuel burn rates.

Descent The descent phase begins at the T/D and extends until one of the following occurs:

- approach mode is engaged via the APP switch on the MCP and the ILS localiser and glideslope signals have been acquired, or
- the missed approach procedure is initiated, or
- VNAV and LNAV are disengaged via the switches on the MCP.

3. Control Display Unit

The Control Display Unit (CDU) is the terminal used to interface with the FMS. Data is entered via the CDU and status from the FMS is displayed on the CDU display.



4. IDENT Page

The IDENT page is the default page displayed on the CDU.

It displays database information and software revision level. The drag and fuel rate correction parameters can be modified from this page.

Ident Page



- Weight** Toggle weight display units between pounds (LBS) and kilograms (KGS) by pressing L4.
- The default value is set according to the FSX general settings units of measure. **US System** selects pounds, **hybrid** selects kilograms. Metric units of measure is not recommended for use with this panel.
- Drag** Can be used to modify the climb and descent curves to better match a specific aircraft model.
- Enter a positive value to reduce predicted climb performance, increase predicted descent rate.
- Enter a negative value to increase predicted climb performance, decrease predicted descent rate.
- Fuel Flow** Can be used to modify the predicted fuel consumption rate.

Enter a positive value to increase predicted fuel consumption rate. The FMC predicts more fuel is required to reach the destination.

Enter a negative value to decrease predicted fuel consumption rate. The FMC predicts less fuel is required to reach the destination.

To modify the Drag or Fuel Flow parameter:

1. Press R4 or R5 to highlight the parameter,
2. Enter the value,
3. Press R4 or R5 to modify the parameter,
4. Press EXEC to execute the change.

Enter Fuel Flow Factor

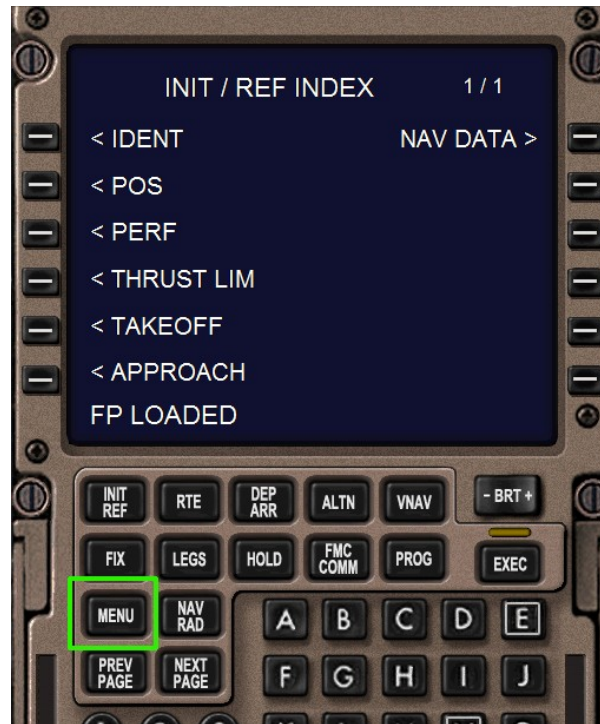


5. Index Page

The Index page allows access to the Ident, data entry, and NAV database pages.

Access the Index page by pressing the MENU key.

Index Page



6. Position Pages

Access the position pages by pressing L2 from the Index page.

Position Page



7. Performance Initialization Page

Access the Performance Initialization page by pressing the INT/REF key or L3 from the Index page.

Performance Initialization Page



Performance initialization fields:

- | | |
|------------|---|
| GR WT | The gross weight of the aircraft in thousands of pounds or kilograms. The sum of the zero fuel weight and fuel weight. |
| FUEL | Fuel weight in thousands of pounds or kilograms . |
| ZFW | Zero fuel weight. |
| RESERVES | Fuel reserve quantity in thousands of pounds or kilograms . Used to determine sufficient fuel quantity. If calculated fuel remaining at destination is less than RESERVES + 10000 lbs, an INSUFFICIENT FUEL message is displayed. |
| COST INDEX | Factor used to determine ECON speed values. Valid entry is 0 – 300. |
| PLAN ALT | Last loaded flight plan altitude in feet. Half-tone when CRZ ALT is set. |
| CRZ ALT | Cruise altitude in feet, or if a 3 digit number is entered, flight level. Set Cruise Alt to 0 to turn off FMC VNAV control. |

STEP SIZE Step size for the climb increment to calculate the optimum step climb profile. The default value is the ICAO value of 4000 ft . Valid range is 0 to 9000 ft. When a value of 0 is entered, no step climbs are planned.

CRZ WIND Current wind reading. TBD.

CRZ CG Current center of gravity.

TRANS ALT Transition altitude. Above this altitude, use standard barometric pressure altitude reading. Default value is 18000 ft.

8. Thrust Limit Page

Access the thrust limit page by pressing L4 from the Index page.

While on the ground, the thrust limit page allows selection of thrust limits for takeoff and climb flight phases. The thrust limit is the autothrottle limiting thrust setting for the applicable flight phase.

Baseline takeoff and climb thrust limits are computed based on aircraft gross weight. The limits can be derated (reduced) by fixed amounts, TO-1, TO-2 and/or by a SElected assumed temperature derate.

Thrust Limit Page (On Ground)



Press L2 – L4 to select takeoff thrust limits. The corresponding Climb thrust limit is selected. Press R2 – R4 to select climb thrust limits.

Select an assumed temperature derate by entering the temperature value on the scratchpad, then press L1 to input the value.

The selected thrust limit displays on the the EICAS.

Thrust Limit Temperature Derate



When airborne, the thrust limit page displays the selected thrust limit mode.

Thrust Limit Page (Airborne)



9. Takeoff Page

Access the takeoff reference page by pressing L5 from the Index page.

The Takeoff reference page allows entry of takeoff flaps setting and takeoff gross weight, then displays reference V-speeds for the settings.

Takeoff Reference Page

Reference V-speeds



V-speeds Accepted



Takeoff flaps setting is entered on L1.

Takeoff gross weight is entered on R4.

V speeds may be entered individually on the scratchpad then input by pressing R1 – R3 for V1 – V2 respectively. If manually entering V speeds, ensure V2 is greater than VR and VR is greater than V1.

Accept reference V-speeds by pressing R1 – R3, and/or R6 when the ACCPT VSPEED prompt is displayed. When V-speeds have been accepted, the R6 prompt changes to ROUTE.

Center of gravity and Trim setting is displayed in L4. Set trim to the indicated value prior to takeoff.

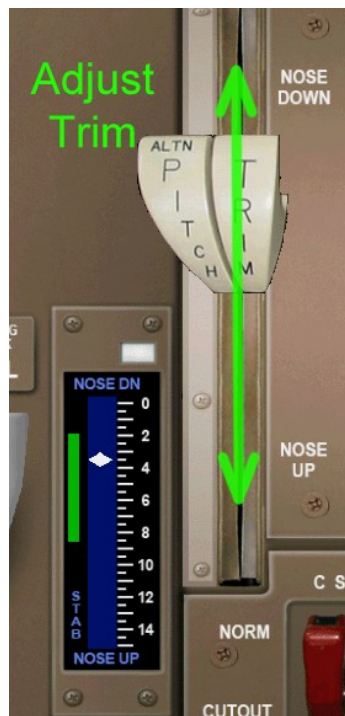
V-speeds are displayed as reference marks on the PFD speed tape.

Trim setting is displayed on the throttle quadrant.

PFD V-speed
Reference Marks



Throttle Trim



Additional takeoff data is displayed on takeoff page 2.

Takeoff Page 2



10. Approach Configuration Page

Access the approach configuration page by pressing L6 from the Index page.

The approach page allows selection of landing flaps setting and corresponding reference speed.

Approach Configuration Page



The weight used to calculate the landing reference speed setting is displayed and set in L1. Default weight is current weight. To modify the weight enter the weight on the scratchpad and then press L1.

To select a flaps setting, enter the flaps setting (20, 25 or 30) on the scratchpad then press R4. Press EXEC to process the flaps speed setting. The LEGS page will update to display the reference speed.

The flaps setting can be copied to the scratchpad by pressing R1, R2 or R3 for flaps setting 20, 25 or 30 respectively.

Flaps Selection

Select to Scratchpad



Modify if Desired, Input, and EXECute

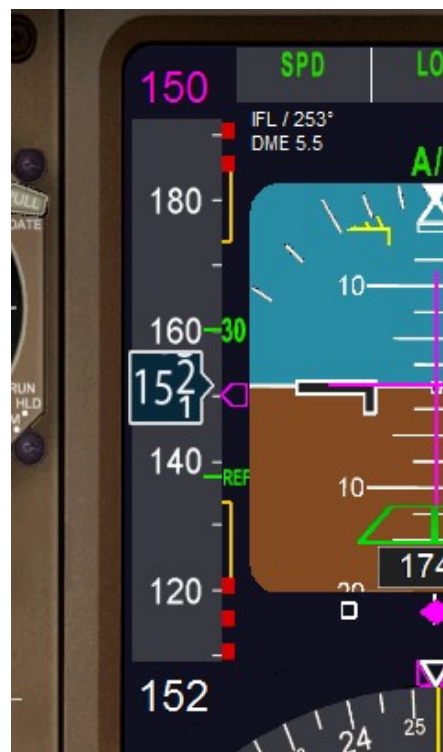


The PFD indicates the selected approach flaps setting and reference speed when descending.

PFD FLAPS/REF SPEED



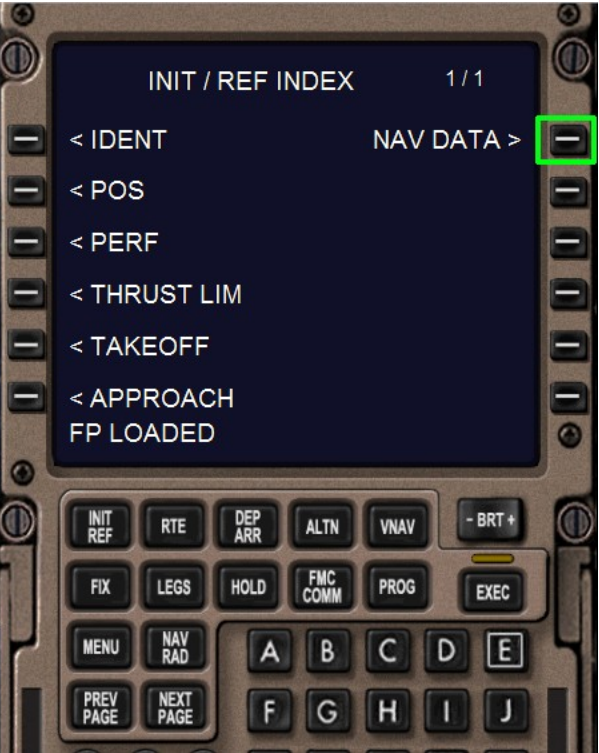
PFD REF SPEED Indicator



11.Navigation Database

The FSX GPS navigation database can be accessed from the INDEX page by pressing R1, NAV DATA.

NAV DATA Select from Index Page



Navigation Data Menu Page



A list of nearest Airports or NAV aides can be obtained by pressing the right select keys. Information for a database entry accessed by IDENT can be obtained by pressing the left select keys

Airport IDENT Info



12. Flightplan Load

A flightplan is loaded by using the FSX flight plan load menu, or from page 1 of the Route pages.

A route cannot be created using the FMC, although individual waypoints can be added to and deleted from an existing flightplan.

Flightplan Load From CDU



13. Route Pages

Access the Route pages by pressing the RTE key.

The ROUTE pages consist of a first page showing the origin and destination airport followed by a variable number of pages listing the waypoints on the route.

Route Page 1

Route page 1 is displayed when the RTE key is pressed if there is no flightplan loaded.

Route Page 1

No Flightplan Loaded



VHHH-VTBD Flightplan Loaded



To load a flightplan, enter the plan filename on the scratchpad (maximum 33 characters) then press L4. A PLAN LOADED message will confirm the plan is loaded.

To save a flightplan, enter the plan filename on the scratchpad (maximum 33 characters) then press R4. A PLAN SAVED message will confirm the plan is saved.

ORIGIN Departure airport ident. Not modifiable.

DEST Destination airport ident. Not modifiable.

RUNWAY Departure runway.

FLIGHT NO Flight number.

- GATE** Departure gate number, or parking identifier.
- Gate number 20, for example, may be entered as `GATE20`, or just `20`. Specify a terminal and gate number as `C20`.
- A parking location must be preceded by the word `PARKING`. For example `PARKING 20`.
- CO ROUTE** Flightplan name.
- LOAD PLAN** Load a flightplan file.
- SAVE PLAN** Save a flightplan file. The Save Plan option appears after modifications have been made to the plan.

Route Waypoint Pages

The route waypoint page with the active waypoint is displayed when the RTE key is pressed if a flightplan is loaded. The left column specifies the path to the adjacent waypoint in the right column.

The active waypoint, the next waypoint on the flight path, is shown in magenta with a '<' character next to it.

Use the PREV PAGE and NEXT PAGE keys to step through the route pages.

Route Waypoint Pages



Approach Waypoints



14. Legs Pages

Access the Legs pages by pressing the LEGS key.

The LEGS pages contain the flightplan waypoints, distance and bearing to the next waypoint, and set or predicted speed and altitude when crossing the waypoint.

The active waypoint, the next waypoint on the flight path, is shown in magenta with an indicator '<' character next to it.

LEGS Page



Approach Waypoints



15. Route Modifications

Waypoints can be added to and deleted from flightplan from the ROUTE and LEGS pages. Note that approach waypoints cannot be deleted and a waypoint cannot be inserted into an approach.

Delete a waypoint.

A waypoint can be deleted by pressing the DELeTe key, then selecting the waypoint to be deleted using R1 to R5 on the ROUTE pages or L1 to L5 on the LEGS pages. Or, a waypoint can be selected then moved to an earlier position in the flightplan, deleting all intermediate waypoints.

Delete Waypoint Using Delete Key



Delete Waypoints Using Select and DTO



Add (Insert) a waypoint.

A waypoint can be added by entering the waypoint ident on the scratchpad, then select the point at which to insert the waypoint using R1 to R5. Waypoints can be added to the end of the flightplan by selecting the dashed (-----) entry at the end of the flightplan.

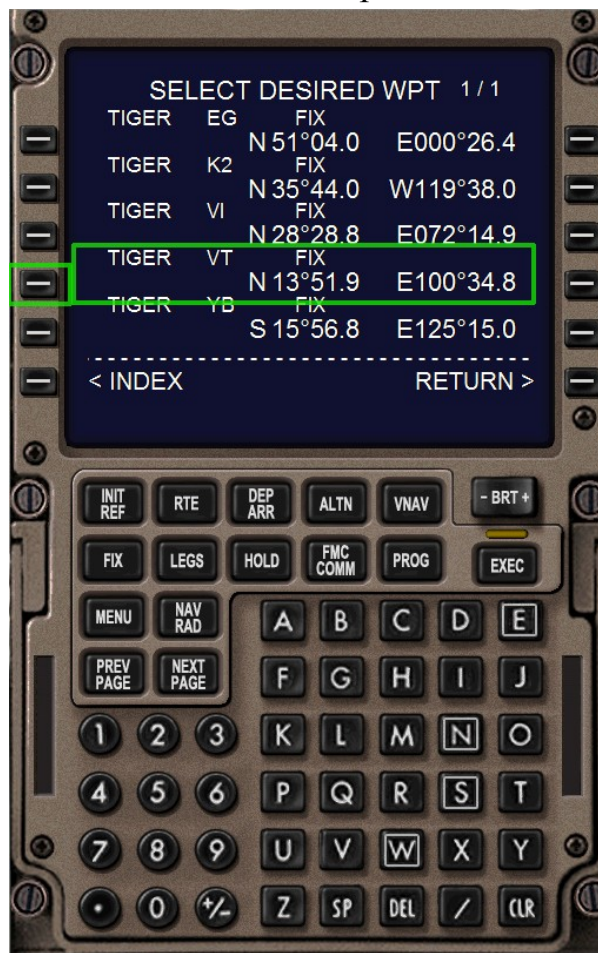
A Duplicate Waypoint selection page is presented when multiple fixes with the same ident exist.

The steps for adding a waypoint with duplicate entries in the navigational data base are illustrated in the following images.

Input Waypoint and Select Insert Point



Select From Duplicates



EXEC Change (or ERASE)



Waypoint TIGER Inserted Before KRT



Add Pilot-Defined Waypoints

A waypoint that is not based on an identifier in the navigational database can be defined in the following ways:

- Coordinate fix A waypoint at a latitudinal and longitudinal position.
- Bearing fix A waypoint at a bearing and distance from another waypoint in the flightplan.
- Along track fix A waypoint that is at a specified distance along the flightplan track from an existing waypoint.

Add a Coordinate Fix.

A coordinate fix can be added by entering the fix coordinates, then selecting the point at which to insert the waypoint using R1 to R5 from the ROUTE pages, or L1 to L5 from the LEGS pages.

Formats for entering a fix are:

NXXXX.XXXXXXX.XIDENT or

NXXXX.XXXXXXX.XIDENT

The IDENT is optional, but recommended. Use leading zero's for degrees or minutes less than 10. A fix label will not appear on the ND.

Fixes that specify full degree coordinates can be entered as a 5 character set with a single quadrant designator. N or E in the northern hemisphere or S or W in the southern hemisphere.

N is used for North latitude, west longitude.

E is used for north latitude, East longitude.

S is used for South latitude, east longitude.

W is used for south latitude, West longitude.

Latitude precedes longitude. Two characters represent longitude with the position of the designator indicating whether the longitude is above 100°. The designator is the last character if the longitude is less than 100°.

Examples of 5 character fix entries

Coordinate	5-character entry
N20° W030°	2030N
N50° W120°	50N20
N10° E009°	1009E
N08° E150°	08E50
S20° E030°	2030S
S30° E160°	30S60
S48° W034°	4834W
S51° W170°	51W70

Insert Fix (From the Legs Page Shown)



Add a Bearing Fix.

A bearing fix can be added from the LEGS pages only.

A bearing fix can be added by entering the flightplan waypoint identifier followed by the *true* bearing from the waypoint and the distance, then selecting the point at which to insert the waypoint using L1 to L5.

Format for entering a bearing fix is:

IDENT/BBB/DDDD

IDENT Waypoint identifier.

BBB Bearing from the IDENT in degrees.

DDDD Distance from the IDENT.

Add Bearing Waypoint 140° - 60 nmiles From SIKOU



The new waypoint is named IDENT01, for this example SIKOU01.

Note that the bearing for the waypoint is entered as a true heading. When displayed on the LEGS page, the heading includes the magnetic variation of 2° resulting in a bearing from SIKOU of 142°.

Add an Along Track Fix.

An along track fix can be added from the LEGS pages only.

An along track fix can be added by entering the flightplan waypoint identifier followed by the distance, then selecting the waypoint using L1 to L5.

Format for entering an along track fix is:

IDENT/DDDD

IDENT Waypoint identifier.

DDDD Distance from the IDENT. A negative value defines a point along the track before the waypoint. A positive value defines a point along the track after the waypoint.

Along track fixes are useful for defining altitude and speed restriction at a specific distance from a flightplan waypoint.

The following example adds an along track waypoint 40 nmiles from SIKOU. The new waypoint is named SIKOU02.

Scratchpad Entry: SIKOU/40

Along Track Waypoint 40 Nmiles from SIKOU



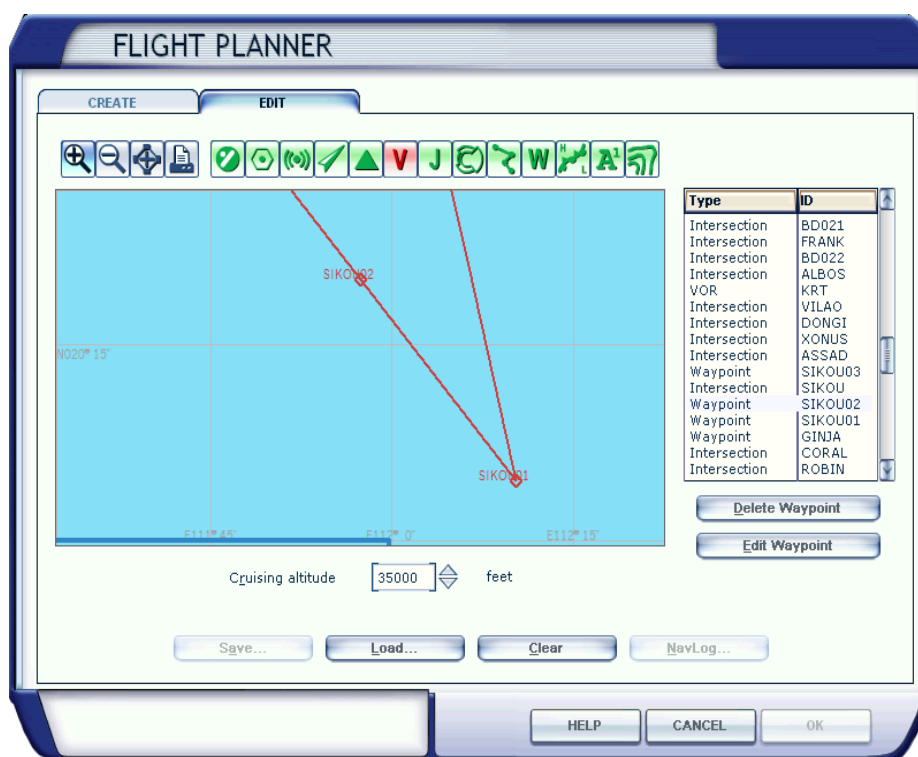
The following example adds an along track waypoint 85 nmiles before SIKOU, It is given the name SIKOU03.

Scratchpad Entry: SIKOU/-85

Along Track Waypoint 85 Nmiles before SIKOU



Pilot-defined waypoints are saved in the flightplan as “USER” waypoints. They can be edited and view with the FSX Flight Planner after the flightplan has been saved.



16. Speed and Altitude Restrictions

Speed and altitude constraints may be entered for a waypoint in order to meet climb or descent path restrictions.

On the LEGS pages, altitude and speed crossing restrictions are entered on the scratchpad, then the right LSK next to the applicable waypoint is pressed to insert the restriction into the flight-plan.

Format for entering a speed and altitude restriction is:

SSS/AAAAA – where SSS is indicated airspeed and AAAAA is altitude in feet.

A speed or altitude can also be entered individually. The FMS determines the type of data entry as follows:

Data Entered	Data Type
10 < Data <= 90	Speed Mach Number
100 <= Data <= 350	Speed IAS
350 < Data or Data length 4 characters or more (eg. 0060 = 60 ft)	Altitude

Speed Restriction



Speed/Altitude Restriction



Altitude restrictions can be specified as at or below (eg 7000B), at or above (eg 7000A), or at the specified altitude (eg 7000). Between altitudes is not currently supported.

Altitude Restriction Entry



Speed and Altitude Restriction



Restrictions can be deleted by pressing the DEL key then pressing the line select key (LSK) next to the applicable restriction to delete. If there are both a speed and altitude restriction, the first LSK press deletes the speed restriction, a second LSK press deletes the altitude restriction.

Delete Speed Restriction



Altitude Restriction



Plan Review

Turn the mode switch on the EFIS panel to PLAN.

The Navigation Display (ND) displays the flight-plan with the waypoint at the top of the current LEGS page centered.

R6 on the CDU changes to the STEP command.

Review the flight-plan by stepping through the waypoints.

Press R6 on the CDU to step through the waypoints while reviewing the displayed path on the ND.

Click on the center of the ND to expand the gauge.

Legs Page Waypoint Step



17. VNAV Pages

Access the VNAV pages by pressing the VNAV key.

There are 3 VNAV pages for climb, cruise and descent flight phases. When VNAV is pressed the page for the current flight phase is displayed.

VNAV Climb Page



CRZ ALT	Cruise altitude. Enter altitude in feet or flight level (100's of feet) on the scratchpad, then press L1 to change. Enter 0 to turn off FMC VNAV.
ECON SPD	FMC calculated climb speed. Change values by entering the speed (120 - 350) or mach number (40 – 90) on the scratchpad then press L2.
SPD TRANS	Speed limit below specified altitude. Default is 250 knots below 10000 feet. Change values by entering speed or altitude on the scratchpad and pressing L3. Two change operations are required to change both values.
SPD RESTR	Speed restriction below specified altitude. Change values by entering speed or altitude on the scratchpad and pressing L4. Two change operations are required to change both values.
ECON	Press L5 to revert back to economy climb speed.
INDEX	Press L6 to go to the Index page.

TO T/C ETA and distance to predicted top-of-climb.

TRANS ALT Altitude above which standard barometric pressure is used. Change value by entering the altitude in the scratchpad then press R3.

ROUTE Press R6 to go to the active Legs page.

VNAV Cruise Page



Navigation Display Step Climb Arc



CRZ ALT Cruise altitude. Enter altitude in feet or flight level (100's of feet) on the scratchpad, then press L1 to change. Enter 0 to turn off FMC VNAV.

ECON SPD FMC calculated cruise speed. Change values by entering the speed (120 - 350) or mach number (40 – 90) on the scratchpad then press L2.

ECON Press L5 to revert back to economy cruise speed.

INDEX Press L6 to go to the Index page.

STEP ETA and distance to predicted optimum step climb position. Appears only if cruise distance can accommodate a step climb, and step size is greater than zero. ND displays step climb (S/C) arc if within range.

TO T/D ETA and distance to predicted top-of-descent.

ETA FUEL ETA and predicted fuel remaining at destination.

OPTI ALTS Optimum, maximum and recommended cruise altitudes.

ROUTE Press R6 to go to the active Legs page.

VNAV Descent Page



DEST ALT	Destination airport altitude.
ECON SPD	FMC calculated descent speed. Can be changed by entering the speed (120 - 350) or mach number (40 – 90) on the scratchpad then press L2.
SPD TRANS	Speed limit below specified altitude. Default is 240 knots below 10000 feet. Change values by entering speed or altitude on the scratchpad and pressing L3. Two change operations are required to change both values.
SPD RESTR	Speed restriction below specified altitude. Change values by entering speed or altitude on the scratchpad and pressing L4. Two change operations are required to change both values.
ECON	Press L5 to revert back to economy descent speed.
INDEX	Press L6 to go to the Index page.
TRANS ALT	Descent transition altitude. Change value by entering the altitude in the scratchpad then press R2.
WPT ALT	Approach runway or destination airport ident and altitude.
FPA V/S	Flight path angle and vertical speed to next waypoint.
ROUTE	Press R6 to go to the active Legs page.

18. Runway Approach Pages

Access the Runway Approach pages by pressing the DEP/ARR key.

The Runway Approach pages allow selection and load of an approach from the FSX GPS database. A runway approach segment cannot be modified to add or delete waypoints.

Runway Approach Index Page



Access the approaches for the flightplan destination airport by pressing R2.

Access approaches for any airport, by first entering the airport ident in the scratchpad, then pressing R5.

The Runway Approach Selection pages are then displayed.

Runway Approach Selection Pages



The Runway Approach Selection pages list the approaches available for the selected airport.

Use PREV/NEXT page to go to the page containing the desired approach.

Press APPR INDEX, L6, to go back to the approach index page, or

Press the RSK next to the desired approach. In the image above VIDP ILS 10 approach is selected by pressing R4.

The approach transition selection pages are then displayed.

Approach Transition Select Pages



The approach transition selection pages list the transitions available for the selected approach.

Use PREV/NEXT page to go to the page containing the desired approach transition.

Press APPR INDEX, L6, to go back to the approach index page, or

Press the RSK next to the desired transition. In the image above VIDP ILS 10 approach transition IGINO is selected by pressing R4. Pressing R4 again toggles the selection status.

The approach transition is marked as SElected and the LOAD option appears.

Approach Transition Selected



The approach at transition IGINO is loaded by pressing L4, followed by EXEC.

The Route page with the loaded approach and route discontinuity is displayed.



Close the route discontinuity:

1. Select the approach transition waypoint.
2. Select the point to insert the transition in the flightplan.
3. EXEC the change.

Select Transition Waypoint



Select Insertion Point



Continuous Route



The first waypoint of the approach segment is identified as APPR TRANS on the route page. Waypoints cannot be added to the end of the approach segment.

19. NAV/RAD Pages

Access the NAV/RAD pages by pressing the NAV/RAD key.

The NAV/RAD pages display:

- two nearest VOR stations
- approach runway ILS frequency (if available)
- nearest ADF station

The nearest VORs radial and distance information is displayed on lines 2 and 3 respectively.

The NAV radios can be tuned to the VOR frequency by pressing L1 for NAV1 or R1 for NAV2.

If an approach is loaded, the destination airport, approach name and ILS frequency, if available, is displayed on line 4. If VNAV is active, the FMC will tune the NAV radios to the ILS frequency when the aircraft is within 30 nmiles of the airport. The NAV radios can be tuned to NAV 1 or NAV2 at any time by pressing L4 or R4 respectively.

The nearest ADF station is shown on L5. It can be tuned to ADF 1 by pressing L5.

ADF 2 tuned frequency is shown on R5.

NAV/RAD Page



The Communications radios tuned frequencies are displayed on the Comm Radio page. The Comm Radio page can be accessed as page 2 of the NAV/RAD pages or by pressing the FMC/COMM key.

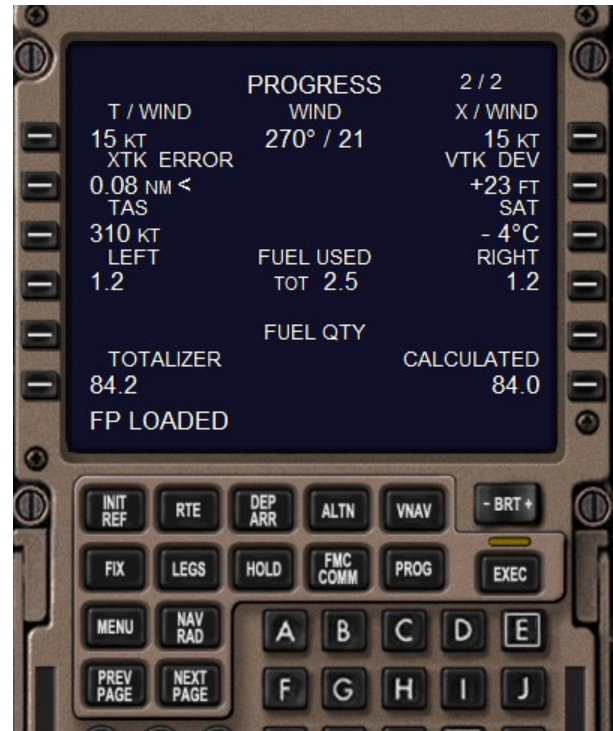
Comm Radio Page



20. Progress Pages

Access the Progress pages by pressing the PROG key.

Progress Pages



Progress pages display waypoint and destination distance, ETA, fuel, wind and tracking information.

Fuel used, displayed on page 2, line 4, can be reset by pressing R4.

21. Activate Flightplan Leg HOLD Page

Access the HOLD pages by pressing the HOLD key.

The HOLD pages are used to activate a leg in the flightplan. The format is similar to the route page.

Use the PREV/NEXT page to go to the page that contains the waypoint segment to activate.

Press the RSK next to the waypoint. The waypoint ident is copied to the scratchpad.

Press the EXEC key to make the waypoint segment active and begin turning to an intercept course with the flightplan segment.

Activate Flightplan Waypoint
Segment from HOLD Page



Progress Page



The progress page is then displayed with the next waypoint distance, ETA and fuel.

22. FIX Direct-To Page

Access the FIX pages by pressing the FIX key.

The FIX page is used to specify a navigation fix to fly direct to. The FSX GPS “direct-to” mode is activated. Direct-to mode consists of a path starting at the aircraft position where the mode was invoked and terminating at the target fix. This path directly to the specified fix overrides the flightplan.

VNAV is disabled when “direct-to” mode is active. Modifying the flightplan is the preferred method to proceed to a waypoint when using VNAV.

FIX Direct-To Mode



Enter a FIX ident in the scratchpad, then press R6 to activate.

Press EXEC to invoke “direct-to” mode.

The progress page is then displayed showing the fix position, distance and ETA.

Progress Direct-To



Cancel Direct-to Mode

Go to the Route or LEGS page to cancel DTO mode and revert back to the flightplan.

LEGS DTO Mode Cancel



Note that when the flightplan becomes active after cancelling direct-to mode, the first waypoint in the plan is the active waypoint. Avoid initiating a turn towards the first waypoint by disengaging LNAV prior to cancelling direct-to mode. Use the HOLD page to activate the desired flightplan waypoint. Then re-enable LNAV.

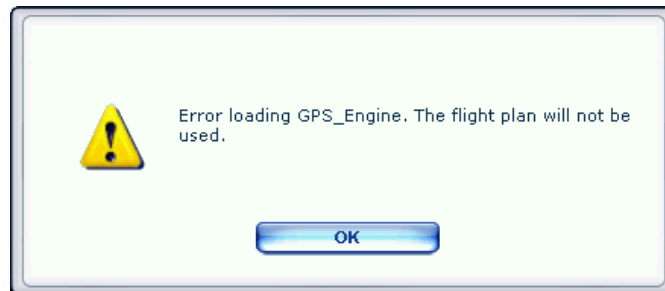
23. Flight Save

The FSX flight save option will save the state of the FMC and 777 panel. The state is reloaded when the flight is loaded.

Saving the flight (vs. *flight-plan*) will save all data entered into the FMS, including the flight-plan, as well as aircraft state, weather etc. Saving the *flight-plan* simply saves the waypoints and nothing else.

FSX saves the flight-plan file name and the flight-plan contents in the flight file. This can lead to synchronization errors if the contents of the flight-plan file don't match the flight-plan saved in the flight file. If they are out of sync a GPS load error is displayed when attempting to load the flight and the flight-plan will not load.

GPS Load Error



In order to reduce the likelihood of this problem occurring, the FMS will save the flight-plan when the flight is saved and add to the flight-plan file name the tag:

`_JB777FMC_<DEPART_IDENT>_<DEST_IDENT>_<FLIGHT_FILE_NAME>`

The intent behind this strategy is that a long-haul 777 flight may be saved several times throughout the duration of the flight with plan changes made along the way. Each saved instance must be in sync with the plan at the time the flight is saved.

The side effect is there will be a flight-plan file (with a long name) for every saved flight file.

Keep in mind that if a flight-plan is modified and saved with the same file name, any flight file that referenced the plan in its original state will encounter a GPS load error.

Appendix 1: Adding Fixes to the FSX Navigation Database

Navigational fixes can be added to FSX navigation database. An XML file contains the fix(es) to add to the database.

Waypoints are specified with the following fields:

Field	Description
lat	latitude in decimal notation. North is positive, south is negative.
lon	longitude in decimal notation. East is positive, west is negative.
waypointType	type of waypoint
magvar	magnetic variation. The difference between true north and magnetic north at the position of the waypoint. Magnetic variation can be obtained from the FMC NAV DATA for an existing nearby VOR.
waypointRegion	region code based on ICAO regions. Region code can be obtained from the FMC NAV DATA for an existing nearby fix.
waypointIdent	five character waypoint identifier.

The syntax is as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<FSData version="9.0" xmlns:xsi='http://www.w3.org/2001/XMLSchema-
instance' xsi:noNamespaceSchemaLocation="bglcomp.xsd" >
<Waypoint
  lat="20.663333333333"
  lon="112.038333333333"
  waypointType="NAMED"
  magvar="2.0"
  waypointRegion="VH"
  waypointIdent="GINGA">
</Waypoint>
</FSData>
```

The waypoint entry adds to the database the GINGA fix in the Hong Kong region (VH). Multiple waypoint entries can be included in the file.

Compile the xml file with the bgl compiler, BglComp.exe, included in the FSX SDK and located in the “Environment Kit” folder.

The file can be compiled from windows explorer by dragging it over the BglComp.exe.

The compilation result is a *.bgl file.

Place the bgl file in the Addon Scenery/scenery folder.

Once in place, the new waypoints can be accessed the same way as any existing fix in the database.