

JB Panels 777 Sample Flight VTBD to VHHH for Microsoft Flight Simulator X SP2

This document provides a description of a sample flight using the JB777 panel and FMS. Our discussion will focus on the operation of the FMS assuming the user is familiar with FSX flight setup and the flight planner.

Our sample flight is 777-367 service from Bangkok Thailand (VTBD) to Hong Kong China (VHHH). This is a short two hour flight that will run our implementation of the 777 panel through it's paces.

We will cover preflight configuration which includes route planning, and performance configuration. Then follow the flight through takeoff, climb, cruise, descent, approach and landing phases. Pointing out the relevant FMS features for each phase of flight.

Reference is made to VTBD SID FRANK2, VHHH STAR SIKOU 3A/B and ILS 25L as part of our flight configuration.

Charts for this region can be downloaded from VATSIM Asia
<http://www.vatasia.net/download.php>

The following files are included with this document:

IFR Bangkok Intl to Hong Kong Intl.PLN – FSX generated flight plan
VTBD-VHHH-F2-SIK.PLN – Modified flight-plan to include SID and STAR waypoints.

Note: The software and information presented in this document is for entertainment purposes only for use with the Microsoft Flight Simulator X computer game.

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1. Aircraft Selection and Configuration

The aircraft used for this flight in reality is a 777-367 with Trent 892 engines. A POSKY model of this type can be loaded (as of this writing) from the www.projectopensky.com website.

Cathay Pacific Airways B-HNF 777-300 (RR) 777-367 RR Trent 892

<http://www.projectopensky.com/index.php?app=downloads&showfile=746>

Another option is the 777-300ER with GE90-115BL2 engines, which is a closer match to the performance data programmed into the FMS.

Cathay Pacific Airways B-KPA 777-300ER 777-367ER GE GE90-115BL2

<http://www.projectopensky.com/index.php?app=downloads&showfile=747>

Follow the instructions in the “readme.txt” file included in the JB777 panel package to update the aircraft.cfg file for your aircraft. We strongly recommend that you ensure your model is configured and working properly before attempting to use the FMS.

Select units of measure from 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.

Set the aircraft fuel and payload.

The initial state for the aircraft used in this sample flight, POSKY 777-300ER, is:

Parameter	Pounds	Kilograms
Empty weight	347800	157759
Payload	86150	39077
Fuel	71000	32192
Gross Weight	504950	229027

2. FMS Flight Phases

The FMS is capable of controlling the aircraft from the takeoff deceleration point shortly after takeoff through the climb, cruise, descent and approach phases of the flight delivering the aircraft to final approach lined up with the runway.

In order to accomplish this the FMS must be programmed with a flight plan specifying the route of flight, cruise altitude and speed, and performance data.

The minimum configuration required is to load a flight plan, specify cruise altitude, ensure sufficient fuel is loaded and begin the flight.

In this sample flight additional programming is performed to illustrate the features and limitations of the FMS.

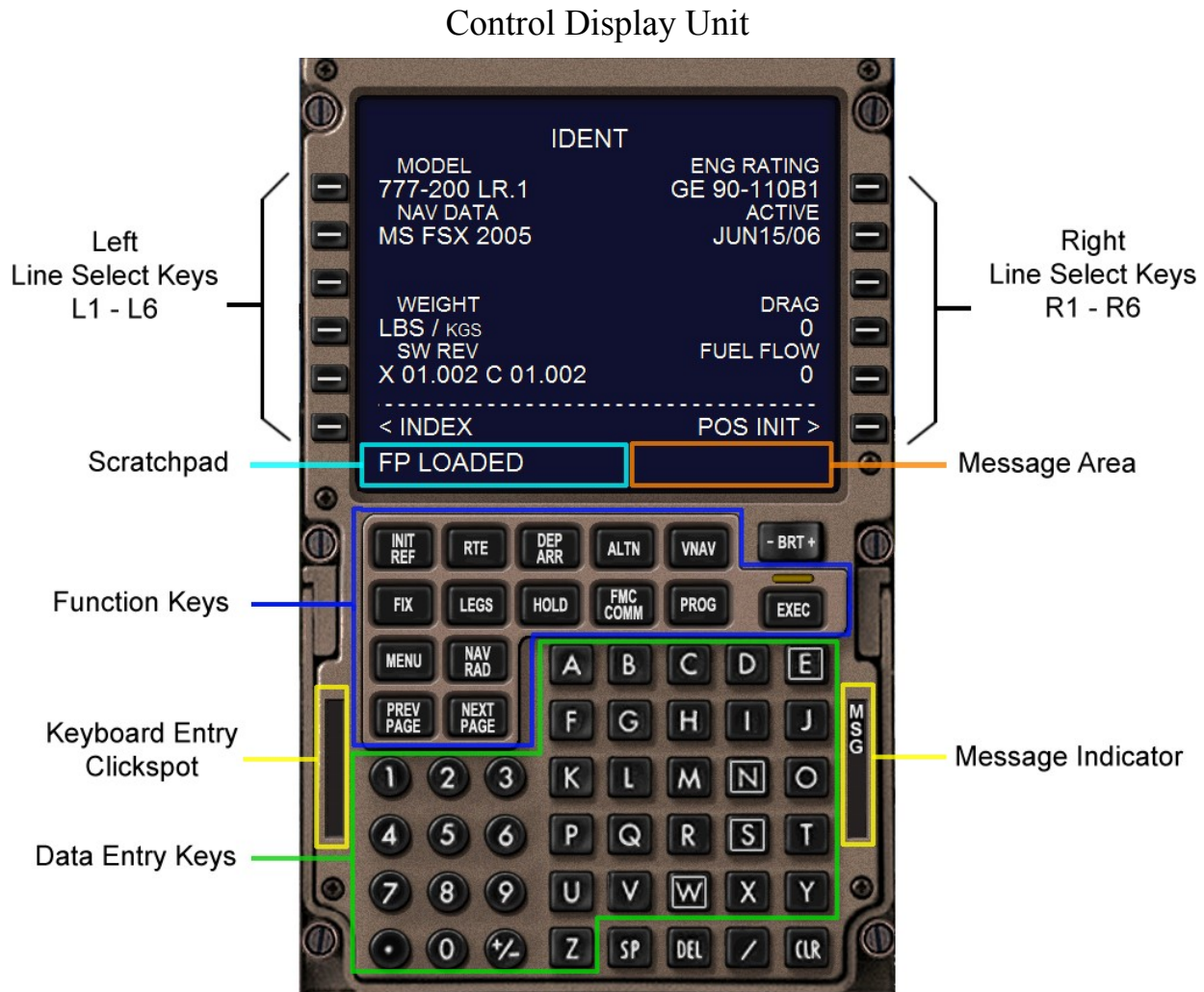
The flight operational phases covered are:

1. Preflight setup at the gate.
 - a) Load flight plan
 - b) Modify flight plan
 - Insert SID waypoints and speed and altitude restrictions
 - Insert STAR waypoints and speed and altitude restrictions
 - b) Performance Configuration
 - Weights, fuel, cost index, cruise altitude
 - c) Thrust Limit Settings
 - d) VNAV configuration
2. Takeoff and Climb
3. Cruise
 - a) Enroute route modification
 - b) Altitude change
 - c) Descent planning
 - Approach selection and configuration
4. Descent
5. Approach
6. Landing

3. Preflight

The bulk of the work required to setup the FMS is at the gate.

Starting with an FSX flight planner generated flight plan, modifications are made using the control display unit (CDU) to add SID and STAR waypoints with speed and altitude restrictions.



3.1. Flight Plan

A flight-plan is loaded using the FSX flight planner or via the ROUTE page on the FMS. The FMS cannot be used to create a flight-plan. It can only modify an existing plan one waypoint at a time. It does not populate the flightplan with intermediate waypoints between airway intersections.

Open the flight planner and either generate a flight-plan by entering departure (VTBD) and destination (VHHH) airports, or load *IFR Bangkok Intl to Hong Kong Intl.PLN* flight plan file included with the JB777 panel package.

If creating a flight plan, choose IFR flight plan type and high altitude airways.

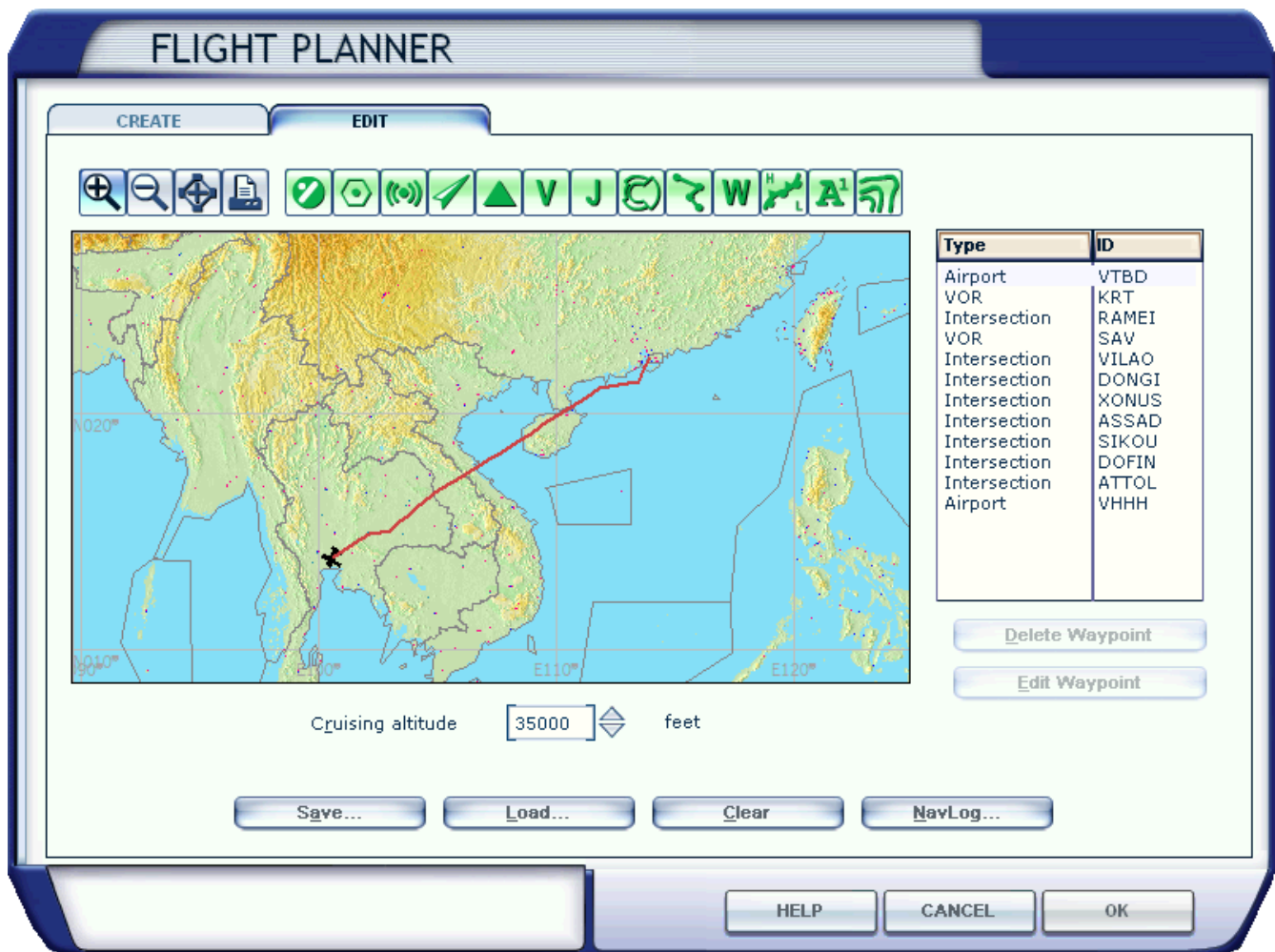
Create Flight Plan

The screenshot shows the 'FLIGHT PLANNER' window with the 'CREATE' tab selected. The interface includes the following elements:

- 1. Choose departure location**: A text box containing 'Bangkok Intl (VTBD) - GATE 26 -- GATE HEAVY' and a 'Select...' button.
- 2. Choose destination**: A text box containing 'Hong Kong Intl (VHHH)' and a 'Select...' button.
- 3. Choose flight plan type**: Two radio buttons. 'VFR (Visual Flight Rules)' is unselected, and 'IFR (Instrument Flight Rules)' is selected.
- 4. Choose routing**: Four radio buttons. 'Direct - GPS' is unselected, 'Low-altitude airways' is unselected, 'High-altitude airways' is selected, and 'VOR to VOR' is unselected.
- 5. Generate flight plan**: A text box with the instruction 'Click Find Route to calculate waypoints for your flight.' and a 'Find Route' button.
- Buttons at the bottom**: 'Save...', 'Load...', 'Clear', and 'NavLog...'.
- Bottom panel buttons**: 'HELP', 'CANCEL', and 'OK'.

The FSX generated flight-plan from VTBD to VHHH consists of 11 waypoints including the destination airport.

IFR Bangkok Intl to Hong Kong Intl.PLN



Review the plan (NAVLOG). Note the estimated fuel burn.

VTBD – VHHH Flight Plan NAVLOG

NAVIGATION LOG							
Microsoft Flight Simulator Flight Plan Bangkok Intl -> Hong Kong Intl Distance: 934.5 nm Estimated fuel burn: 7261.7 gal / 48653.3 lb Estimated time en route: 1:54							
Waypoints	Route	Alt (ft)	Hdg	Distance	GS (kts)	Fuel (gal/lb)	Time off
				Leg		9378.5	0:00
VTBD				Rem	Est	Est	ETE
				934.5	Act	Act	ATE
KRT (113.70) (VOR)	-D->	35000	056	106.8	489	830.5 / 5564.2	0:13
				827.6		/	
RAMEI (waypoint)	W1	35000	083	49.9	489	387.2 / 2594.3	0:06
				777.7		/	
SAV (113.50) (VOR)	A202	35000	048	137.9	489	1072.8 / 7187.4	0:16
				639.8		/	
Print HELP CANCEL OK							

Load the flight with the aircraft positioned at the gate at VTBD. The flight plan positions your aircraft at Gate 26.

VTBD Gate 26



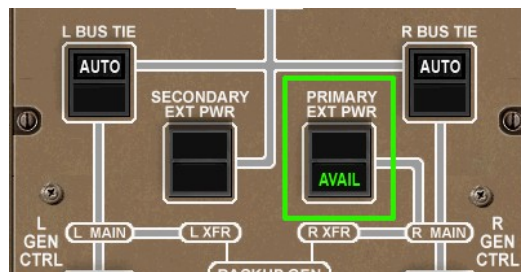
The FMS displays the IDENT page with confirmation that the flight plan is loaded.

Panel Load in 4:3 Format



Ensure the APU is running or external power is connected to avoid discharging the main battery during the preflight setup phase. If the main battery discharges, the panel will go dark. External power must be connected if the main battery is discharged.

To connect external power, verify the parking brake is set (trigger for external power availability), then press the illuminated primary external power connect switch on the overhead electrical panel.



Press the ROUTE (RTE) key on the CDU to display the loaded flight-plan

ACTIVE ROUTE



The FMS displays the route page containing the active waypoint. The active waypoint is the next waypoint on the flight path shown in magenta with a '<' character next to it. In this case page 2 contains the first waypoint on our route which is VOR BKK. The left column under the VIA heading indicates the path taken to the waypoint in the right column under the TO heading.

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. Cycle through the pages using the NEXT or PREV PAGE keys until you reach page 1. Note that most of our flight-plan will follow jet airway A202.

ROUTE page 1 contains information about the flight and can be used to load and save flightplans. The save option appears only after making changes to the flight-plan

ROUTE Page 1



Enter the departure runway 21R on the scratchpad then press left line select key 2 (L2). The FMS will search the database for the corresponding runway then display it on line 2.

Enter gate number 26 then press L3.

Enter flight number CPA713 then press right line select key 2 (R2).

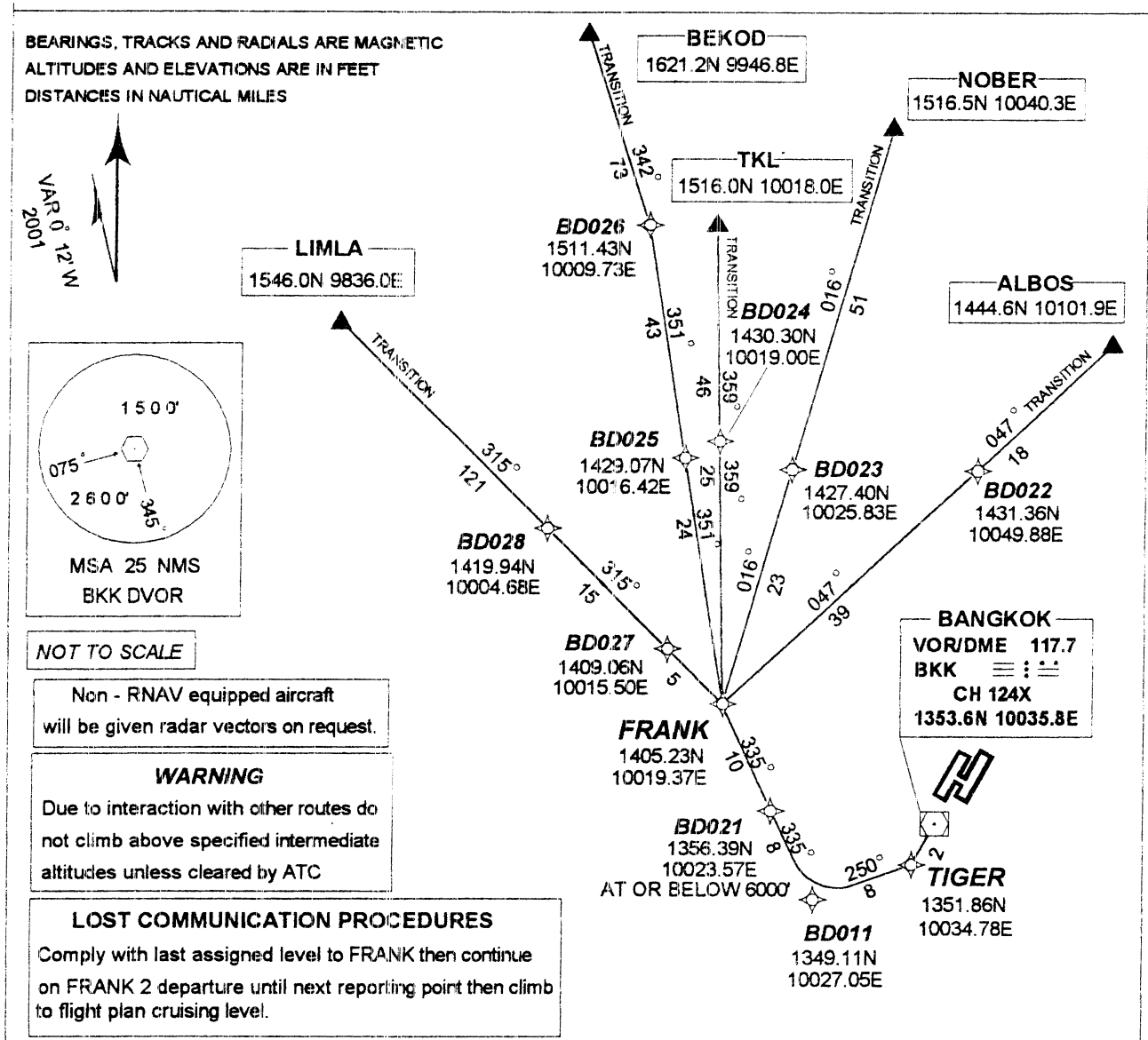
When data is entered the SAVE PLAN option appears on R4. Flightplans are saved to the users default flightplan directory *documents/Flight Simulator X*.

Route Page 1 Data Entered



3.2. Route Modification - SID

We will modify the flight-plan to follow the FRANK2 departure from VTBD to transition to ALBOS.



3.3. Delete Waypoint

Waypoints can be added and deleted from the ROUTE pages on the CDU.

Waypoint deletion is a three step process.

Press the DEL key. A DELETE prompt will appear on the scratchpad.

Press the right line select key next to the waypoint to be deleted.

Press the EXECute key to perform the deletion, or L6 to ERASE the proposed change.

Go to ROUTE page 2 and delete BKK.

Delete BKK



3.4. Add Waypoint

Waypoints are added by entering the waypoint IDENT in the scratch pad.

Then press the right line select key at the point where the new waypoint is to be inserted. When there are duplicates in the database, a list is presented from which the left line select key is pressed next to the desired waypoint.

The pending modification is highlighted on the ROUTE page.

Press the EXECute key to perform the insertion, or L6 to ERASE the proposed change.

Add waypoint TIGER to the flight-plan at waypoint KRT.

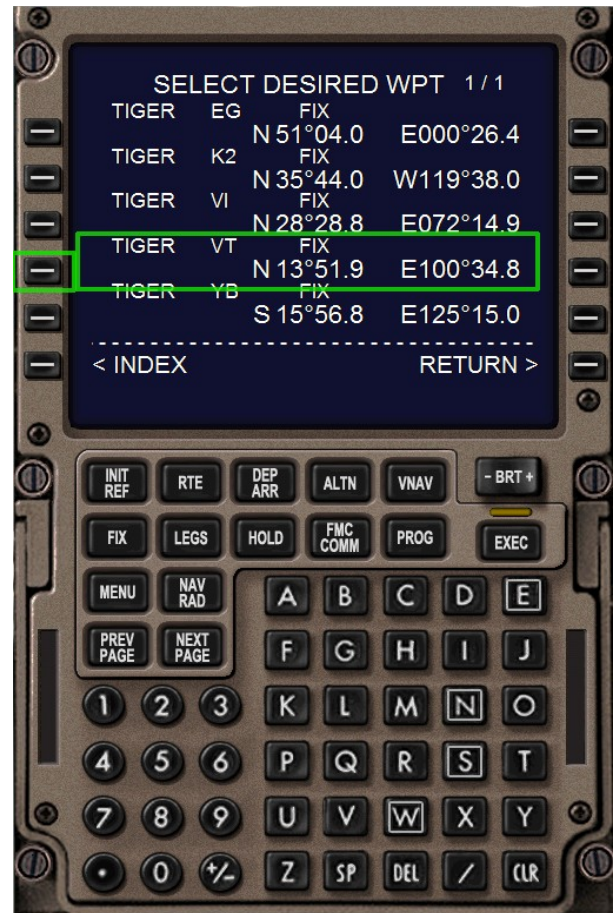
TIGER has duplicates in the database.

Select the waypoint at N 13 51.9 E 100 34.8 by pressing L4 from the duplicates page.

Add Waypoint TIGER



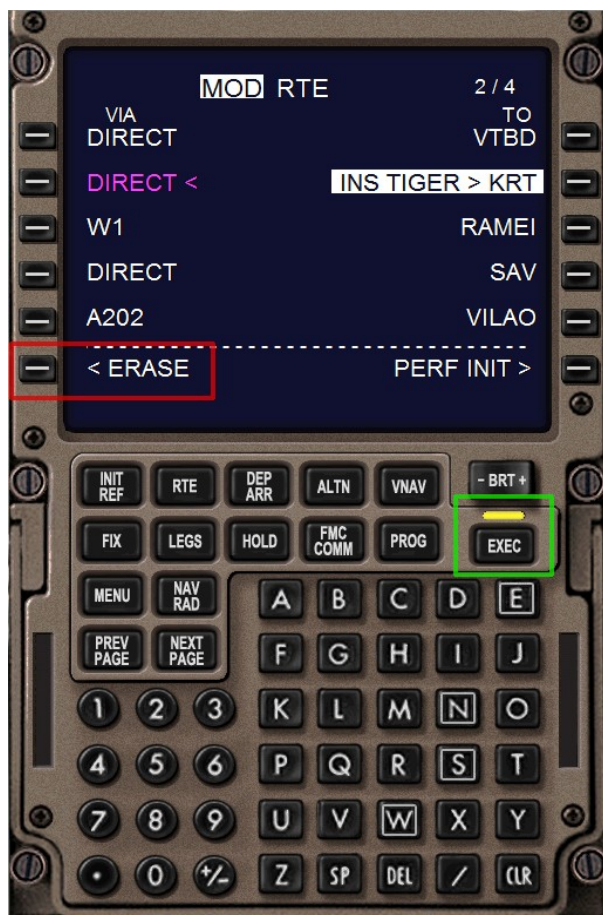
Select From Duplicate List



When the duplicate is selected, the ROUTE page appears with the modification highlighted.

Press EXEC to execute the change, or L6 to erase the proposed change.

EXECute Plan Change



TIGER Waypoint Inserted



Insert the remainder of the SID into the flight-plan

Add the following waypoints in the order listed, inserting each one successively at waypoint EKT. Note that FRANK has duplicates in the database. The desired waypoint is at the top of page 2 of the duplicate waypoint pages.

BD011

BD021

FRANK Region VT Coordinates N 14° 05.2 E 100° 19.4

BD022

ALBOS

Add SID Waypoints



3.5. LEGS Pages

Press the LEGS key on the CDU to display the flight-plan legs. The LEGS pages contain 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 a '<' character next to it.

Waypoints can be added and deleted from the LEGS pages as was done on the ROUTE pages except the *Left* line select keys are pressed to select the desired delete or insertion point.

Turn the mode switch on the EFIS panel to PLAN. The Navigation Display (ND) displays the flight-plan with the departure airport 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 Plan Mode



3.6. Speed and Altitude Restrictions

We will now enter the crossing restrictions into the FMS. Altitude and speed crossing restrictions are entered on the scratchpad, then the LSK next to the applicable waypoint is pressed to insert the restriction into the flight-plan. 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

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. We can determine from the FMS calculated predicted altitude whether a below or above restriction is required.

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

Enter the altitude restrictions for the waypoints as specified below.

Waypoint	Restriction	Description
BD011		No need to enter a restriction, the FMS will ensure the 6000 ft restriction at BD021 applies to previous waypoints.
BD021	6000B	At or below 6000 feet.
FRANK	7000B	At or below 7000 feet.
BD022		The specified restriction is between 7000 and 16000 ft. The 777 will be well above 7000 ft at this waypoint. The FMS will enforce the 16000B at ALBOS.
ALBOS	16000B	At or below 16000 feet.

LEGS Altitude Restriction Entry



The SID specifies a speed restriction of 250 kts below 10000 ft. This is the default speed restriction programmed into the VNAV climb page and therefore no further input is required.

VNAV Climb Page



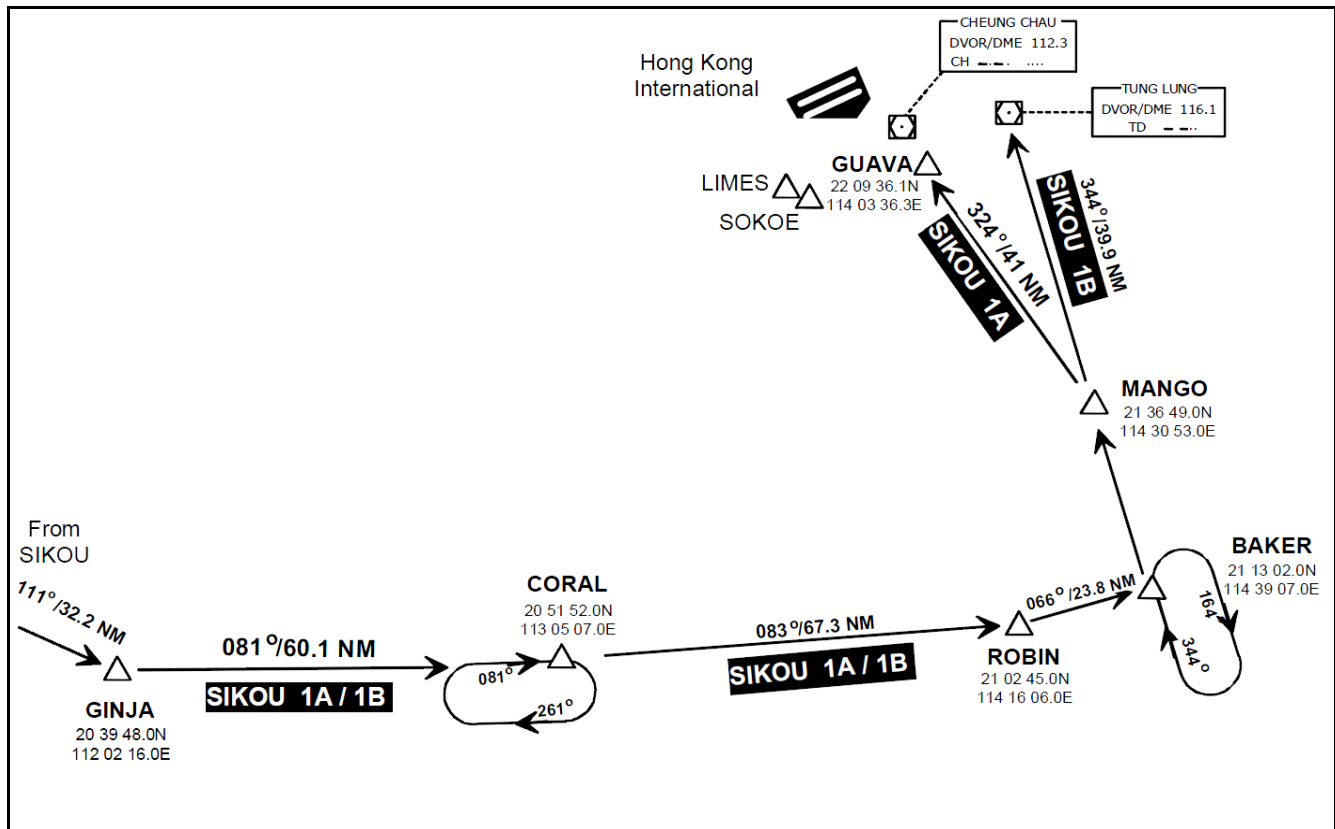
3.7. Route Modification - STAR

Plan for the SIKOU 1A/B arrival into VHHH.

Referring to the chart for the SIKOU STAR the routing is:

SIKOU GINJA CORAL ROBIN BAKER MANGO

VHHH SIKOU 1B STAR to Runway 25 L



Our FSX generated flight plan is:

SIKOU DOFIN ATTOL

Go to LEGS page 4.

Delete DOFIN and ATTOL.

3.8. Enter STAR Fixes

The STAR waypoint GINGA is not found by the GPS database search function. It can be entered as a fix by coordinate location.

The format for entering a fix is:

NXXXX.XXXXXX.XIDENT or

NXXXX.XXXXXX.XIDENT

The IDENT is optional, but recommended. Use leading zero's for degrees or minutes less than 10.

Place the CDU in keyboard input mode by clicking on the hotspot. Key presses are sent to the FMS rather than the simulation while in this mode. Remember to click out of keyboard input mode when finished entering data.

Add the following fixes and altitude and speed restrictions such that they appear in the flight-plan in the order listed:

IDENT	FIX Entry	Speed Restrict	Altitude Restrict
GINJA	N2039.8E11202.3GINJA		
CORAL	CORAL (Duplicate at VH)		
ROBIN	ROBIN (Duplicate at VH)		26000
BAKER	BAKER (Duplicate at VH)	270	
MANGO	MANGO (Duplicate at VH)	250	13000

Note that a speed restriction is likely needed at BAKER to begin slowing. The value depends on the aircraft model in use.

Use the segment distance in the LEGS page center column as a check that the correct coordinate was entered.

SIKOU to GINGA is 32 NM, to CORAL is 60 NM, to ROBIN is 67 NM, to BAKER is 24 NM, to MANGO is 25 NM, to VHHH is 54 NM.

LEGS Page Coordinate FIX Entry



Fix Data Entry Error



3.9. Review Plan

Review the route in ND PLAN mode. Note that waypoints entered as coordinate fixes (GINGA) do not display a label on the ND.

Review SIKOU STAR



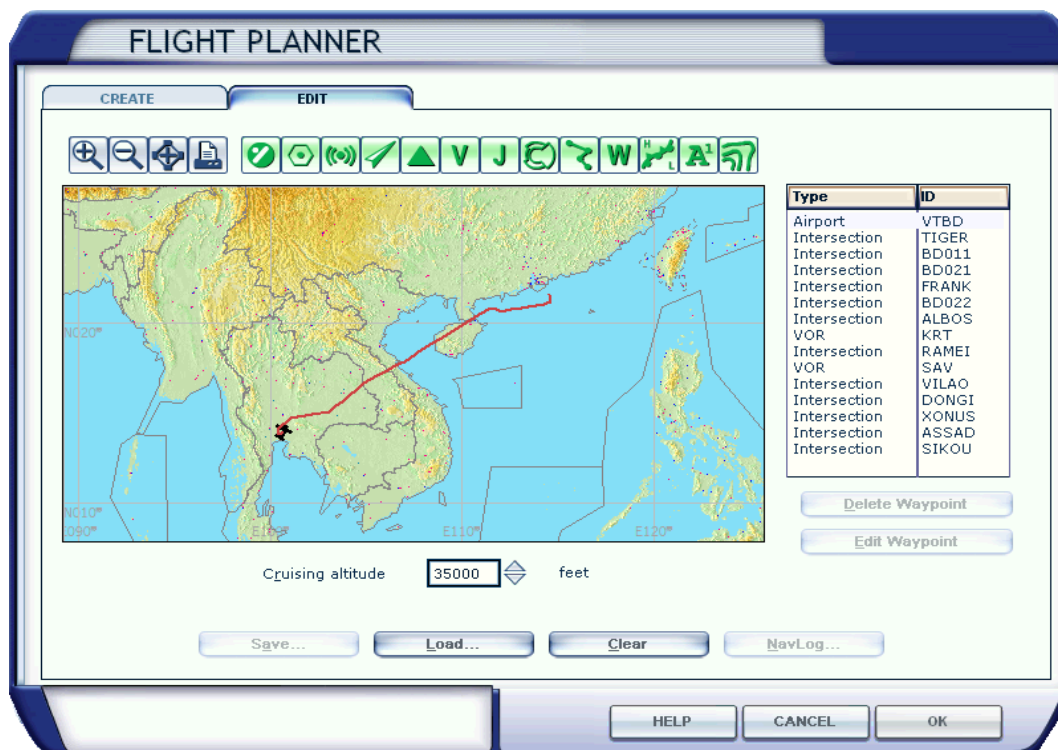
3.10. FlightPlan Save

Go to ROUTE page 1 and save the flight-plan Enter a file name and press R4 to save. The flight-plan is saved in FSX XML format in the *Documents\Flight Simulator X Files* directory. The saved plan does not contain speed and altitude restrictions.

Flightplan SAVE



The FSX flight planner does not dynamically recognize the changes made through the FMS. The flight-plan must be first saved by the FMS then loaded into the FSX flight planner to see the changes, if desired. Note that altitude restrictions are not saved.



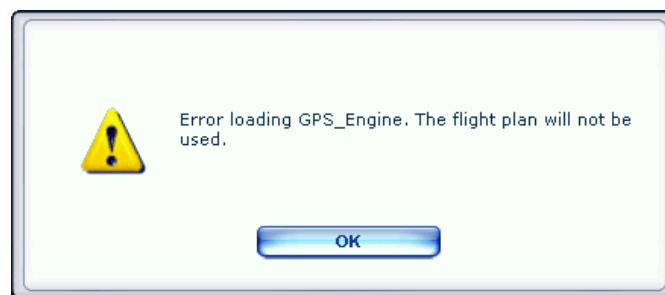
3.11. Flight Save

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. Use the FSX flight save function to save the flight.

We digress now for a few paragraphs to point out the issues involved with modifying flight plans and saving flights in FSX.

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.

End of digression ... back to the flight.

3.12. Performance Configuration

With the plan entered and saved, performance initialization is performed to allow the FMS to calculate the flight profile.

Press R6, PERF INIT, from the LEGS pages to go to the PERF INIT page, or press the INT/REF key.

Performance Initialization Page



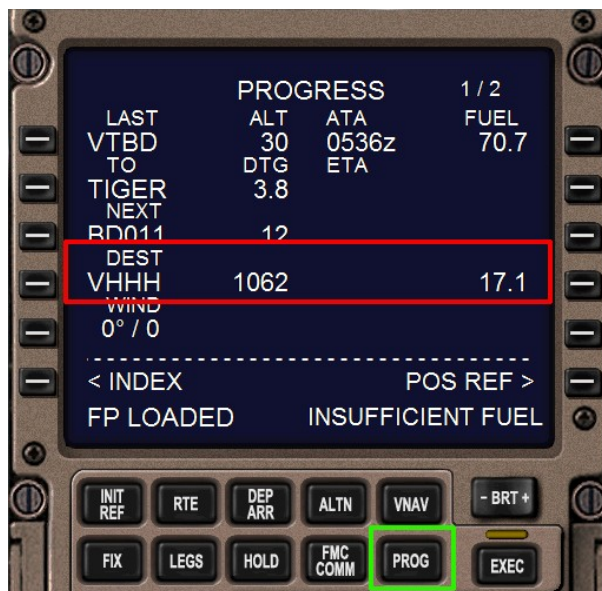
Setup the following parameters:

- RESERVES** Enter 20 (thousand lbs.) Fuel calculations do not take into account winds. Add additional reserves if expecting headwinds.
If FMS calculated fuel remaining at destination is less than RESERVES + 10000 lbs, an INSUFFICIENT FUEL message is displayed.
In the air, the trigger for INSUFFICIENT FUEL message is fuel remain less than 10000 lbs.
- PLAN ALT** Last loaded flight plan altitude reference.
- CRZ ALT** Enter 350 flight level.
- TRANS ALT** Enter 11000 ft transition altitude for VTBD. Above this altitude, use standard barometric pressure altitude reading.

Entry of a non zero cruise altitude triggers calculation of performance data, generates a vertical flight profile, and computes estimated fuel remaining at destination. In our case, with 71000 lbs of fuel on board, an INSUFFICIENT FUEL message is displayed.

Press the PROG key to go to the progress pages. The progress page displays waypoint distance, estimated time of arrival (ETA) and fuel levels. The destination VHHH fuel level remaining is estimated to be 17.1 thousand pounds.

Progress Page Fuel Remaining



Additional fuel needed to meet minimum fuel requirements is:

$$\begin{array}{rccccccccc} \text{RESERVES} & + & \text{CONTINGENCY} & - & \text{EST REMAINING} & = & \text{FUEL TO LOAD} \\ 20000 & + & 10000 & - & 17100 & = & 12900 \end{array}$$

We will load an additional 20000 lbs using the FSX aircraft fuel and payload menu. Estimated fuel at destination is now 36 thousand pounds.

Progress Page Sufficient Fuel Reserves



3.13. Thrust Limit Setting

Press R6, THRUST LIM, from the PERF INIT page to go to the THRUST LIM page, or select THRUST LIM from the INDEX page.

The thrust limit function of the FMS sets N1 limits for takeoff and climb. The autothrottle will not exceed N1 limits. Manual control of the throttles is unaffected. The thrust limit mode and limit setting appears on the EICAS display.

Thrust Limit and EICAS Display



Baseline takeoff and climb thrust limits are coded into the FMS and adjusted slightly for aircraft gross weight. Aircraft performance with these values will vary with different FSX flight models.

Thrust limits can be reduced by a fixed amount, TO-1, TO-2 and/or by a SElected assumed temperature derate.

Derate is used operationally to reduce engine wear when aircraft gross weight is below maximum takeoff weight. Using a derate thrust setting can improve realism in FSX where flight models are often overpowered at lower altitudes.

3.14. Derate Thrust Setting

Our lightly loaded flight has the potential for significant derate.

Press L4 to select TO-2 derate. Climb derate 2, CLB 2, is automatically armed.

The FMS will taper off the climb derate to normal climb thrust limit by approximately 15000 ft.

Enter 65 and press L1 for a 65°C assumed temperature derate.

Thrust Derate Setting and EICAS Display



3.15. Takeoff Speed Selection

Press R6, TAKEOFF, from the THRUST LIM page to go to the TAKEOFF pages, or select TAKEOFF from the INDEX page.

Takeoff Page



The FMS calculates reference takeoff speeds that are displayed as indicators on the PFD speed tape. Takeoff speeds vary with aircraft weight, thrust limits, and flap setting.

First load fuel and payload, and set thrust limits before setting takeoff speeds.

The pilot may enter specific takeoff speeds or accept the reference values. Specific speeds are entered on the scratchpad then up-selected by pressing R1, R2 or R3 for V1, VR, or V2 respectively.

If specific takeoff speeds are entered, ensure $V1 < VR < V2$.

Enter the takeoff flaps setting in L1. Enter 5, 15 or 20 degrees.

Optionally, enter the expected takeoff gross weight if significant fuel burn prior to takeoff is expected, and press R4.

Accept the reference speeds by pressing ACCEPT VSPEEDS, R6, or individually by pressing R1, R2 and R3.

Check the CG and trim setting. Set the trim.

When takeoff speeds have been entered or accepted, the prompt on R6 changes to ROUTE.

TAKEOFF REF		1 / 2
FLAPS	REF	V1
< 15° / 1000FT	140	140 KT
THRUST		VR
65°C D-TO 2	147	147 KT
ACCEL HT		V2
1000 FT	157	157 KT
CG	TRIM	GW WT
-9.3%	3.5	522.9
		520.0 >
		REF SPD
		OFF <- -> ON

< INDEX		ROUTE >

Obtain the 30 REF speed from Approach page R3, accessed from INDEX page L6.

INIT / REF INDEX 1 / 1

< IDENT NAV DATA >

< POS

< PERF

< THRUST LIM

< TAKEOFF

< APPROACH

FP LOADED

INIT REF RTE DEP ARR ALTN VNAB - BRT +

FIX LEGS HOLD FMC COMM PROG EXEC

MENU NAV RAD

A B C D E

PREV NEXT

APPROACH REF 1 / 1

Parameter	Value
GROSS WEIGHT	< 519.7
FLAPS	20°
VREF	159KT
	25°
	155KT
	30°
	151KT
-- / -- >	
WIND CORR	- . -KT

< INDEX ROUTE >

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3.17. Flight Plan Review

Review the flight path, speed and altitudes. Note that an approach has not yet been selected. In the absence of an approach, which specifies the landing runway, the vertical descent path is computed down to the center of the destination airport on a direct track from the last waypoint. Predicted waypoint speeds and altitudes are in small font.

Modified Flightplan with Restrictions



3.18. VNAV Review

Go to the VNAV pages by pressing the VNAV key.

There are 3 VNAV pages: climb, cruise and descent. The ACTIVE VNAV page is automatically displayed according to the current flight phase.

Speeds can be entered for the 3 flight phases. Waypoint speed and altitude restrictions entered on the LEGS page override these speeds where applicable.

We will use default values for this flight.



Note top of climb (TOC) on VNAV page 1, and top of descent (TOD) on page 2.

These are the points at which the FMS changes flight phase from climb to cruise and from cruise to descent respectively. The FMS is occasionally unable to correctly calculate the vertical path and incorrect TOC and/or TOD values appear. Check entered altitude restrictions if this occurs.

3.19. Approach Selection

Review the runway approach selection process. Normally the approach is selected when assigned a runway by the arrival controller on the descent to the destination.

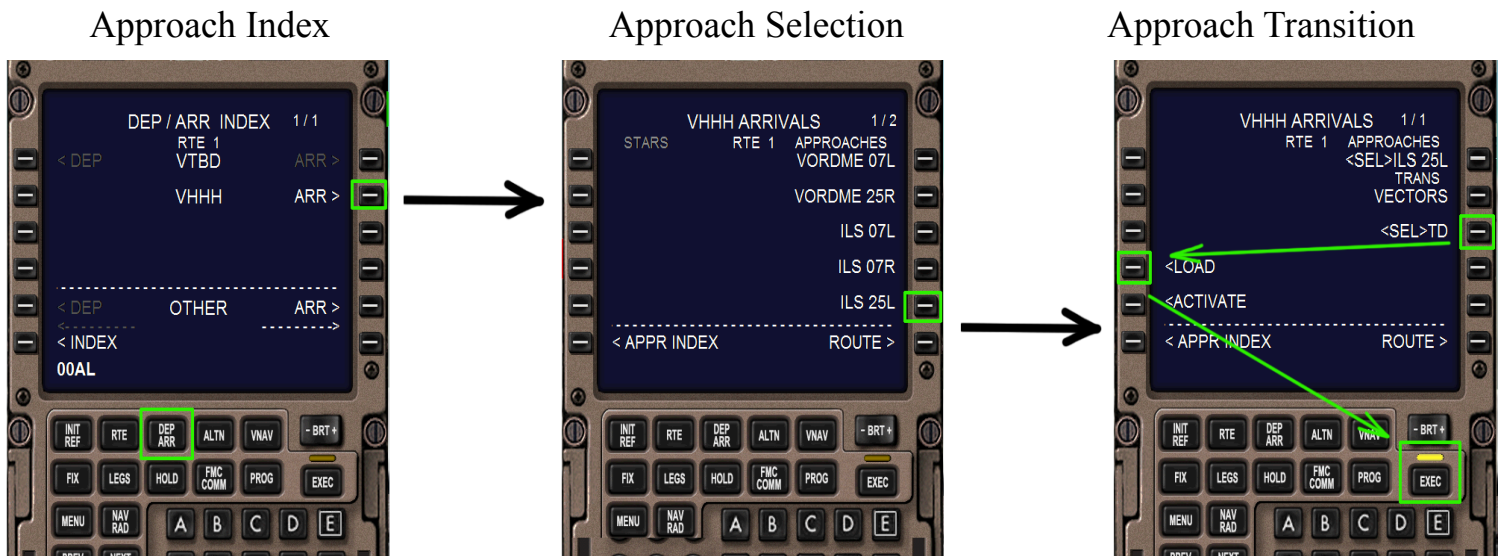
Press the DEP/ARR key to access the arrival pages.

The arrival pages consist of an index page, approach selection page, and transition selection page. FSX GPS approaches are selected from these pages. Note that vector approaches are not intended to be used with VNAV enabled.

Select VHHH ARRival, R2, ILS 25L approach, R5, and then TD transition, R3. Pressing the LSK keys again toggle the selection.

Approach Pages

Approach Selection



With TD transition selected, press L4 to load the approach. Press EXEC to execute the load.

The FMS will load the approach and display the ROUTE page for the approach. Note the route discontinuity that exists between the flight-plan and the approach.

Go to LEGS page 5, PLAN mode to view the discontinuity in the ND.

3.20. Route Discontinuity

The approach must be connected to the flight-plan to provide a continuous path for LNAV guidance. Press LEGS page 5 L2 to copy TD to the scratchpad. Then press L1 to connect the approach to the plan. Press EXEC to accept the modification.

Remove Route Discontinuity



Note that TD can be inserted anywhere in the plan at or after the active waypoint. All waypoints in the plan after the insertion point are deleted and replaced by the approach. To restore the waypoints, the plan must be reloaded.

Save the flight before experimenting so that the plan and FMS state can be restored.

Continuous Route



A few notes on approaches:

Approaches act as a string of waypoints that cannot be modified. Waypoints cannot be deleted from or inserted into an approach. Deleting or moving the transition waypoint (first waypoint in the approach string) applies the operation to the entire approach.

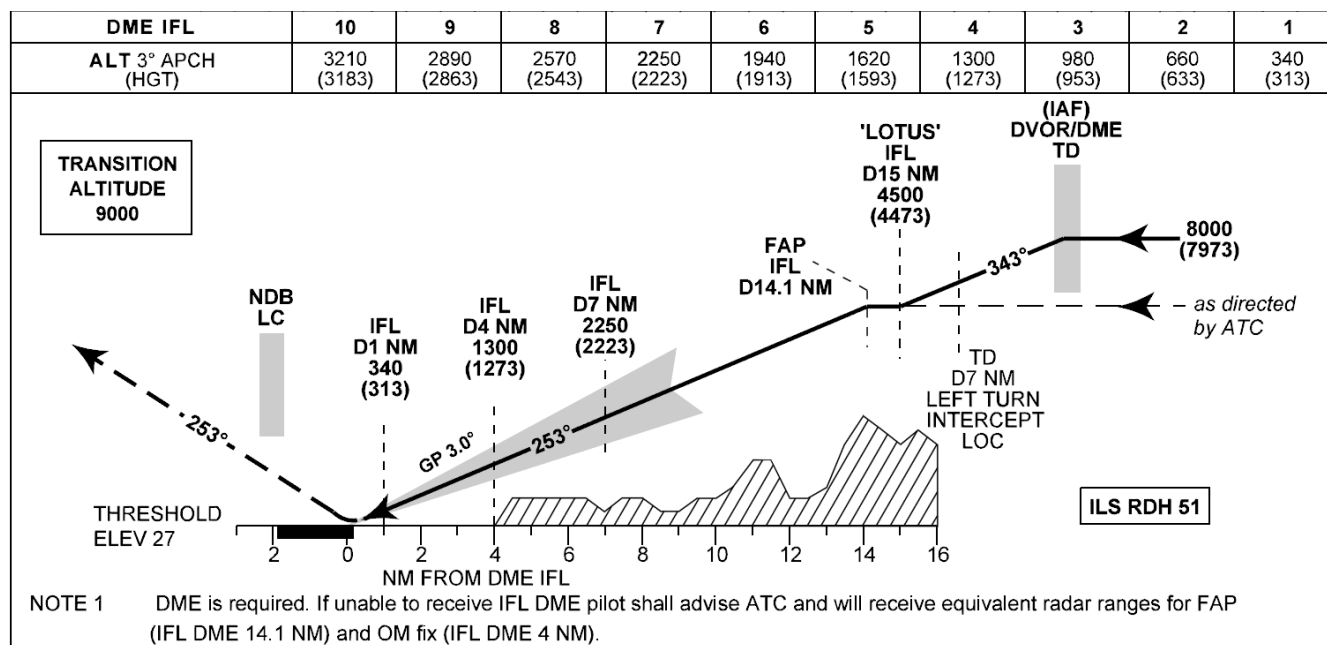
An approach is the termination of the flight plan, Waypoints cannot be added after the approach.

The approach waypoint altitudes displayed on the LEGS pages are read from the FSX GPS database and are often wrong.

The FMS will modify the database altitude values for waypoints within 10 nm of the runway if they exceed a 3.5° glidepath to result in a 3.0° glidepath. This is a generalization and should be checked.

Check approach altitudes. Enter altitude and speed restrictions if required to provide a smooth transition to the glide slope.

VHHH ILS Runway 25L Approach



3.21. Correct Approach Altitudes

Insert altitude restrictions to override the database altitudes. Refer to the DME and altitude readings on the chart to determine the correct altitudes, or use the formula:

Altitude = Distance from Threshold (nmiles) * 6076 * tan(3°) + Runway Alt

F125L Altitude = 6.8 * 6076 * 0.0524 + 28

F125L Altitude = 2193 (round to 2200)

LOTUS = 7.8 * 6076 * 0.0524 + 28

LOTUS = 2512 (round to 2500)

Enter the altitudes on the LEGS page. Note that the altitudes are deleted if the approach is unloaded.

Approach Speed and Altitude Restrictions



Preflight is complete. Save the flight.

4. Takeoff

Configure the MCP prior to takeoff.

1. Turn on the autothrottle arm switches.
2. Turn on the Flight Director (FD).
3. Set speed to 250 knots (greater of 250 or $30 \text{ REF} + 80$ from the Approach page).
4. Arm LNAV and VNAV from the MCP.
5. Set heading to runway heading.
6. Set Altitude to initial clearance altitude.

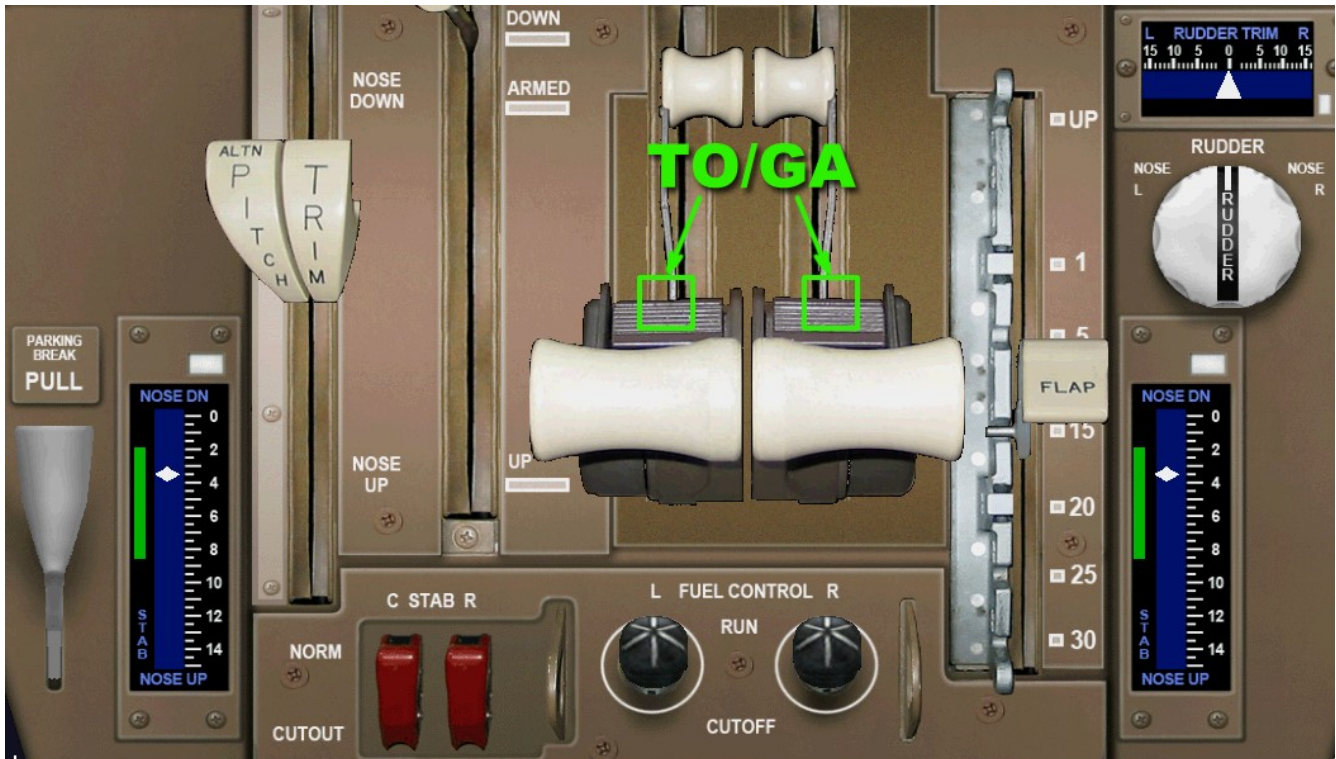
MCP Configured for Takeoff



4.1. Takeoff / Go-around Mode

We will use the TO/GA throttle mode to advance the throttles. Map the TO/GA function to a key using the FSX options-setting-controls menu, or press the click-spot on the throttle quadrant.

Throttle Sub-Panel TO/GA Click-spots



Activate TO/GA.

Throttles advance to D-TO 2 65°C N1 thrust limit.

At V1 speed begin pulling back on the yoke to initiate rotation when passing VR. Rotate smoothly to become airborne and continue pitch up to approximately 15° maintaining speed at V2 + 20-30. Retract the gear when confirmed positive rate of ascent.

LNAV is active at 50 ft AGL.

VNAV is active at 400 ft AGL.

The autopilot can be engaged above 50 ft AGL. For a smooth transition to autopilot plan to engage AP when VNAV becomes active. Prior to engaging the autopilot with VNAV active, align pitch with the FD pitch bar to avoid an abrupt pitch change.

Leave flaps at takeoff setting until on a 335° heading to FRANK. Then select flaps 5. The throttles will retard to stay below flap buffet speed.

5. Climb

With VNAV engaged, the FMS will close (blank out) the MCP speed window at 2000 ft AGL and control speed according the programmed schedule set in the LEGS and VNAV pages.

During climb flight phase, the FMS will not climb above the altitude set in the MCP window. Set the MCP altitude to clearance altitude.

Open the LEGS page on the CDU. Monitor the FMS is properly executing the programmed vertical path and observing speed and altitude restrictions.

Route LEGS Page



Progress Page



Speed control can be overridden by pressing the speed selector knob to open the speed window, and then dialing in the desired speed. Close the speed window by pressing the knob again and the FMS will revert speed back to the scheduled value.

Retract flaps when on a heading of 047° to BD022.

Check predicted top of climb (T/C) distance and ETA on the PROGRESS page or the VNAV CLIMB page. There is no T/C display on the ND.

At 10000 ft expect acceleration to climb speed of 310 knots, transitioning to Mach 0.84 near 32000 ft.

6. Cruise

The FMS transitions to cruise flight phase when the cruise altitude is reached. The VNAV CRZ page becomes active.

The VNAV CRZ page indicates time and distance to top of descent T/D. ETA and fuel remaining at the destination, and optimum, maximum and recommended altitudes based on aircraft weight.

VNAV Cruise Page



6.1. Enroute Plan Modification

Prior to reaching waypoint KRT, modify the flight-plan to fly to SAV.

Select SAV L5 to the scratchpad then press L3 KRT. SAV is staged to be the next waypoint in the flight-plan. Press EXEC to make the change.

Once the change is executed, the flight plan is modified and the aircraft will proceed to intercept the route to the SAV waypoint. The FMC does not have a modified route buffer. If you wish to review the modified route prior to the aircraft responding to the change, take the autopilot out of LNAV and VNAV by engaging ALT hold and track hold. When satisfied with the changes, re-engage LNAV and VNAV.

Next Waypoint Modification



Modified Route to Fly to SAV Waypoint



6.2. Cruise Climb

Cruise altitude can be changed from the VNAV CRZ page by entering the new altitude on the scratchpad and pressing L1 followed by EXEC. It can also be changed on the MCP altitude window by dialing in the desired altitude then press the altitude knob to make the change.

Change altitude to the recommended altitude of 38000 ft. Note that T/D advances with the higher altitude. Also note the estimated fuel remaining increase due to lower rate of fuel burn at the higher altitude.

Modify Cruise Altitude from MCP



6.3. Descent Notification

A tag appears on the ND at 20 nm from T/D. The FMC displays the RESET MCP ALT message if still set to cruise altitude. Set the MCP altitude lower. During the descent phase, the aircraft will not descend below the altitude set on the MCP altitude window.

Top of Descent in 10 Nmiles



7. Descent

The descent flight phase begins when the aircraft passes the T/D and begins descending.

The VNAV DES page is active.

The VNAV DES page shows flight path angle computed for the current descent leg and V/S required to follow or intercept the path.

The ND shows the vertical descent deviation scale with deviation indicator.

Enter the transition level for VHHH, 9000 ft on R2 of the VNAV DES page.

Descent Display



7.1. Check Approach Configuration

We are cleared for the approach to runway 25L.

Ensure the approach is loaded and waypoint MANGO is followed by approach transition waypoint TD with no discontinuity.

Check that the following altitude and speed restrictions are entered on LEGS page 5.

LEGS Approach Waypoint Restrictions



Select the final approach speed from the APPROACH page. Go to the INDEX page, select APPROACH L6.

The index page is accessed by pressing the MENU key.

Index Page



Enter 30 for the flaps setting and press R4, then EXEC.

Final Approach Speed



8. Approach

As the aircraft slows to 200 knots near waypoint TD, select flaps 5.

LNAV, VNAV, and the autothrottles are still engaged.

The radios will be auto-tuned to the runway ILS frequency if available.

Check the radio page, press NAV/RAD.

Radios can be tuned to the frequencies displayed by pressing the corresponding LSK.

Radio Tune Page



Prior to reaching LOTUS, open the speed window on the MCP and dial in 180 knots.

When the glide slope (G/S) comes alive, select flaps 20. Press the APProach key on the MCP to arm the autopilot to track ILS localizer and glide slope.

If the aircraft is above the G/S beam and not converging to intercept, the V/S wheel may be used to increase the descent rate. Reduce speed to 160 knots.

VNAV disengages when the G/S is captured.

When established on the localizer and glide slope, and prior to the final approach fix F125L, select flaps 30, lower the gear and dial in the landing ref speed on the MCP.

Autoland is active if the LOC and G/S deviation is within limits. LAND 3 displays on the PFD.

Set autobrakes and arm the speedbrakes.

Short Final 25L



9. Landing

Continue the autoland if properly configured, rudder input may help if there is a crosswind.

On touchdown take control of the throttles and apply reverse thrust to slow to 90 knots. Push the throttles forward momentarily to disengage reverse thrust.

Autobrakes disarm at 30 knots.

Take the assigned exit.

Welcome to Hong Kong.

