QualityWings SIMULATIONS

Ultimate 787

Tutorial & Basic FCOM

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Please visit our website at:
http://www.qwingssim.com
http://www.qualitywingssim.com

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Tutorial Overview

Welcome to the QualityWings 787. This tutorial is designed to get you familiar with the many different features of the 787 aircraft and the procedures involved in operating the aircraft in the Flight Simulator environment. It also serves as a basic version of a Flight Crew Operation Manual for the 787.

While there are many similarities in the behavior of this aircraft with its real-life counterpart, it is important to note that this product is not designed to provide real-life training. As such, this manual has been adapted to fit the procedures necessary for use in the simulator ONLY.

The tutorial is broken down into 5 different modules:

1. Tutorial 1 – Cold and Dark Start
2. Tutorial 2 – Flight Planning and Engine Start
3. Tutorial 3 – Ready to Go! Let's Fly (FMC Loaded)
4. Tutorial 4 – Let's Land
5. Tutorial 5 – Ready to Go! Autopilot 101 (We suggest this tutorial FIRST)

Tutorial 1 will not only teach you how to operate many of the switches and systems in the flightdeck, but it will also allow you to become familiar with many other elements of the product, such as the QualityWings Control Panel and the QualityWings Dispatcher.

Tutorial 2 will involve loading a Flight Plan into the Flight Management System. After the FMS is loaded, engines will be started.

Tutorial 3 is for those who are continuing on from Tutorials 1 and 2, or for experienced Simmers who are familiar with FMC Loading procedures.

Tutorial 4 is for those who are continuing on from Tutorials 2 and 3 and will discuss the approach and landing FCOM procedures.

Tutorial 5 is for those who are not interesting in loaded an FMC Route and just want to get up in the air to learn some autopilot operating modes.

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Tutorial Route Basics

The flight is a short hop from XXX to XXX.

Acft Type	DEP	ARR	Distance	Time	Flight Time	Weather
787-8GE	KSEA	KSFO	766 NM	Noon	1.5 hours	Clear Skies

QualityWings Dispatcher

Prior to launching the Simulator, we must setup Fuel and Payload via the QualityWings Dispatcher. Fuel changes can be made via the Dispatcher once the Sim is launched, but payload changes unfortunately cannot be saved to the Aircraft.cfg file once the simulator has been launched.

The Dispatcher can be launched via the Windows Start Menu. Look for the QualityWings Program Group and select the Dispatcher.
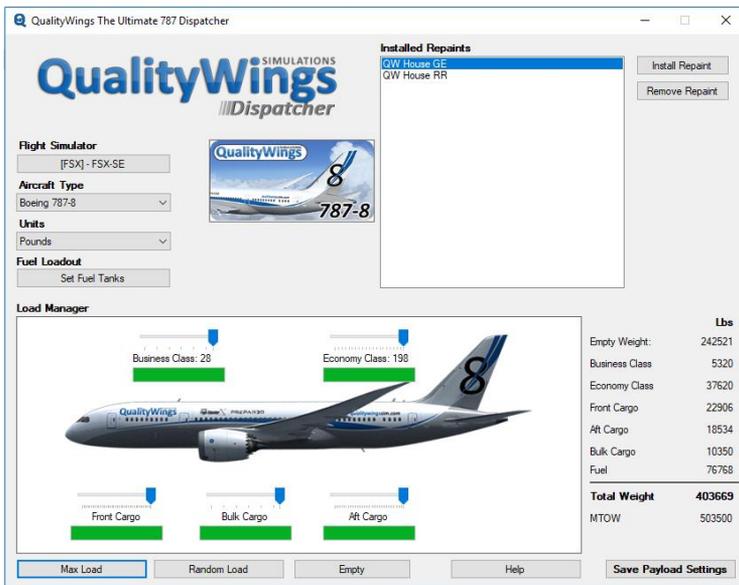
First make sure that you have the correct simulator selected, correct aircraft and pounds as the Units selected.

· **Note**: For this tutorial, we are using Pounds instead of Kilograms

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On this flight, we're taking a full load of passengers
- · Select Max Load
- · Click Save Payload Settings

Now we must set the Fuel Load.

Click on the 'Set Fuel Tanks button under Fuel Loadout.
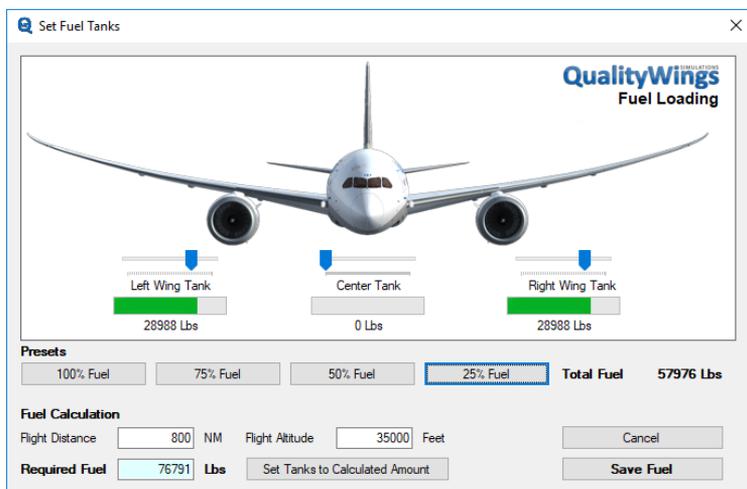
We are going to set fuel to 25% of the Fuel capacity. Click Save Fuel.

We are now done with the Dispatcher

QWTip: *For more information about the QualityWings Dispatcher, see the User's Manual*

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FSX Setup

Launch FSX.

If your FSX settings shows is set to show the Opening Screen, please proceed to Step 3. If not, please perform the following:

Step 1

Click on the FSX Menu and select End Flight

Step 2

Once on the Opening Screen, select Free Flight from the left side menu if it is not already selected.

Step 3

There is no need to load any FSX default aircraft prior to using the QualityWings 787. We recommend that you load the 787directly from Free Flight. It will load up with the engines running and ready to fly after a short self-configuration period. A message bar at the top of your screen will let you know when you are ready to start messing with switches.

Make sure that your current aircraft is a QualityWings 787-8 (GE version).

Note: Once you start installing other liveries, you will need to ensure that 'Show All Variations' is checked on the Select Aircraft screen. Otherwise, the livery may not show.

Once the aircraft is selected, make these following changes:

Current Location – KSEA (Seattle Tacoma) Gate C10

Current Weather – Clear Skies
Current Time and Season – 12 Noon
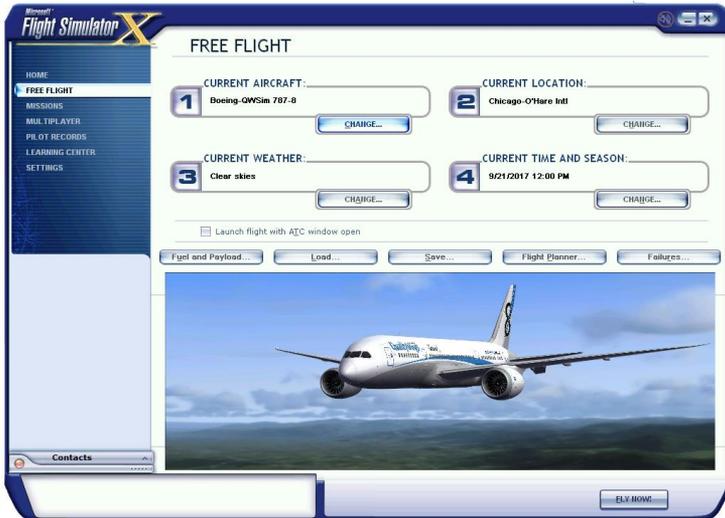
When you're to enter the flightdeck, click Fly Now

Welcome to the 787 Flightdeck

Tutorial 1 – Cold and Dark Start

Establishing the Cold and Dark Situation

Establishing the Cold and Dark Procedure as a default will require a manual edit to a Configuration file named the QW787.cfg file.
This file is located in the following directory:

It currently contains the following line regarding Cold and Dark:
//panelstate=coldanddark.pnl
Remove the // so it should only read:

<div align="center">panelstate=coldanddark.pnl</div>

Do not edit the remaining other options in that file.
We apologize for the inconvenience and are working on an easier solution for this in the future.
If you do not want to edit that file, you can establish Cold and Dark by going to the FMS CDU Page:

- Select INIT REK Mode Key
- Select INDEX at LSK 6L
- Select LOAD PNL
- Select COLDANDDARK.

The aircraft (if all systems are running) will shut down to Cold and Dark

Initial Preflight

Inspections and Establishing Power

General

Accomplish the Flight Deck Inspection procedures on the pilot's first flight of the day or aircraft change. Accomplish the Flight Deck Safety Inspection and Establish Electrical Power

Flight Deck Safety Inspection

- ▪ Battery Switch...On
  - · <u>Note</u>: The 787 battery drains fast. Establish external or APU electrical power as soon as practical after turning battery on.
- ▪ Hydraulic panel...Set
  - o C1 and C2 pump switches..Off
  - o Demand pump selectors...Off
- ▪ Wiper selectors..Off
- ▪ Nav lights switch..On
  To remain ON at all times.
- ▪ Logo lights switch (at night) …..On
- ▪ Landing gear lever...Down
  EICAS gear indication displays DOWN.
- ▪ Alternate flaps arm switch.. Off
- ▪ Alternate flaps selector..Off
- ▪ Parking Brake………………………………………………………………………………………Set

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Establishing External Power

Click the Compass card on the Center Post to display the QualityWings Control Panel.

- Select the External Power button.
  It will turn green to indicate that it is connected.
- Open the L1 and/or L2 Entry Door(s)
  The Door button will turn red to indicate that it is open

Apply External Power

- Forward external power (if available).……………………………………………On
Check EXT PWR AVAIL light illuminated. Push either FWD EXT PWR switch
(Both are interconnected on the QW787) and observe that ON illuminates
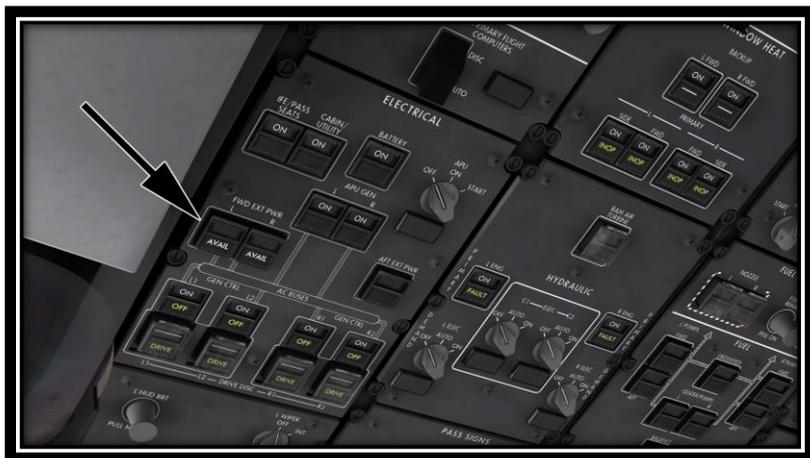
Establishing APU Electrical Power

It is recommended to operate the 787 using as much electrical power as
possible.

APU Electrical Power

- **Note**: If the APU will be started to be used as initial source of electrical
power, wait 90 seconds after turning on the battery to allow Core
Systems to power up. These core systems (called CCRs) will be powered
up after this time and this will be indicated by the Captain's inboard and
lower display unit showing the default formats).

- APU switch……………………………………………....……………………………Start, then on
Rotate APU selector to START, hold momentarily, then allow to smoothly
return to ON. Observe APU FAULT light illuminates momentarily and verify
FAULT light extinguished.

- **Note:** The **MAIN BATTERY LOW** message can display when power is
established. The main battery is charging, and when the battery charge
is sufficient for takeoff, the message blanks.

- Trim air switches……………………………………………………………………………Verify on
- Pack switches………………………………………………………………………………Verify auto
- Recirculation fans upper/lower switches…………………………………………Verify on

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Initial Preflight Procedure

The following procedures are accomplished in their entirety on every flight, and assumes that the Electrical Power Up procedure is complete.

- IRS selectors...Off 30 seconds, then on
  Verify that the ON BAT light is extinguished.
- Initial data .... Set
  o CDU IDENT page:
    Verify MODEL is correct.
    Verify ENG RATING is correct.
    Verify navigation database ACTIVE range is current.
  o CDU POS INIT page:
    Verify time is correct.
  · **Note**: It is not necessary to enter the present position on the SET INERTIAL POS line as the QW787 always gets the information from the FlightSim.
- Status display..Check
  Verify:
  o On any DSP, select SYS
  o Hydraulic quantities do not display RF or OF
  o Liquid cooling quantities do not display RF or OF
  o Oxygen pressure is sufficient for flight
- Circuit breaker status verify:
  o On any DSP select SYS, then CB
  o Check OPEN/TRP CB page for any open or tripped circuit breakers
- Engine display switch..Push
  o Primary and secondary engine indications display existing conditions.
  o Verify engine oil quantity 18 quarts minimum prior to engine start.

- EICAS display...Check

  Check indications are normal.

  Verify that the EICAS messages displayed are normal for this phase of ground operations. There will be numerous messages for doors, hydraulic pumps, etc., however, there should not be any message that will not be resolved by normal preflight and engine start procedures, such as a BOTTLE 1/2 DISCH ENG or a BRAKE TEMP message. When verified as normal, clear the EICAS messages.

Overhead Panel

- Flight control surfaces panel .... Set
- TAIL switch...NORM
- WINGS switch ....NORM
- Heading reference switch...NORM
- Primary flight computers disconnect switch .... Guard closed

  Verify the DISC light is extinguished.
- Electrical panel .... Set
  o BATTERY switch.. ON

  Verify the OFF light is extinguished.
  o IFE/PASS SEATS power switch... ON

  Verify the OFF light is extinguished.
  o CABIN/UTILITY power switch .... ON

  Verify the OFF light is extinguished.
  o APU GENERATOR switches... ON

  Verify the OFF lights are extinguished.
  o GENERATOR CONTROL switches... ON

  Verify the OFF lights are illuminated.

  Verify the DRIVE lights are illuminated.
- APU selector ....As required

  Verify the FAULT light is extinguished.
- L WIPER selector.. OFF
- TOWING POWER panel lights .... Off
- FLIGHT DECK DOOR POWER switch... ON
- CCR RESET switches ....Guards closed
- EMERGENCY LIGHTS switch... Guard closed
- SERVICE INTERPHONE switch .... OFF
- **Note**: Do not push the PASSENGER OXYGEN switch. The switch causes deployment of the passenger oxygen masks.

- PASSENGER OXYGEN ON light .... Guard closed
- WINDOW HEAT panel.. Set
- BACKUP WINDOW HEAT switches.. ON
- PRIMARY WINDOW HEAT switches.. ON
  Verify the INOP lights are extinguished.
- **Note**: Do not push the RAM AIR TURBINE switch. The switch causes deployment of the ram air turbine.
- RAM AIR TURBINE UNLOCKED light .... Verify extinguished
- HYDRAULIC panel .... Set
  o LEFT and RIGHT ENGINE PRIMARY pump switches .... ON
  Verify the FAULT lights are illuminated.
  o CENTER 1 and CENTER 2 ELECTRIC pump selectors...................... OFF
  Verify the FAULT lights are illuminated.
  o LEFT and RIGHT ELECTRIC DEMAND pump selectors .... OFF
  Verify the FAULT lights are illuminated.
- SEAT BELT SIGNS selector .... Set
- Lighting panel .... Set
  o Overhead panel light control .... Mid position
  o MASTER BRIGHTNESS switch .... On
  o MASTER BRIGHTNESS control .... As needed
  o GLARESHIELD PANEL light control .... Mid position
  o LANDING light switches .... OFF
- GROUND TEST selector... NORM
- APU fire panel.. Set
  Verify the APU BTL DISCH light is extinguished.
  o APU fire switch.. In
  Verify the APU fire warning light is extinguished.
- CARGO FIRE pane .... Set
- CARGO FIRE ARM switches.. Off
  Verify the FWD and AFT fire warning lights are extinguished.
  Verify the cargo fire DISCH light is extinguished.
- ENGINE panel .... Set
  o EEC MODE switches .... NORM
  o START selectors.. NORM

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- FUEL JETTISON panel .... Set
  - o FUEL JETTISON NOZZLE switches .... Off
    Verify the VALVE lights are extinguished.
- FUEL TO REMAIN selector……………………………………………………........ In
- FUEL JETTISON ARM switch…………………….... ....……Off
  Verify the FAULT light is extinguished.
- FUEL panel… ....……Set
  - o CROSSFEED switch……………………………… ....……………………………Off
    Verify the VALVE light is extinguished.
  - o FUEL PUMP switches……………………………………………………………Off
    Verify the left aft pump PRESS light is extinguished if the APU is on or is illuminated if the APU is off.
    Verify the other left and right pump PRESS lights are illuminated.
    Verify the center pump PRESS lights are extinguished.
  - o Fuel BALANCE switch……………………………………………………………………Off
    Verify the ON light and FAULT light are extinguished.
- · **Note**: During preflight and after fueling is complete, a fuel imbalance between the left and right main tanks may be indicated as a result of prolonged APU operation.

If fuel balancing is desired while the aircraft is on the ground, and both engines are shutdown
  - o One fuel pump in the higher quantity tank .... ON
  - o FUEL BALANCE switch .... ON
    The fuel balance system may take up to 30 seconds to activate.
    When fuel balance is complete:
  - o FUEL PUMPS AFT and FWD switches (all) .... Off
- ANTI-ICE panel………………………………. ....……. ……………………………Set
  - o WING anti-ice selector .... AUTO
  - o ENGINE anti-ice selectors .... AUTO

- Lighting panel…………………………………………………………………………Set
  - o BEACON light switch…………………………………………………………Off
  - o NAVIGATION light switch……………… …………………………As needed
  - o LOGO light switch……………………… . ………………As needed
  - o WING light switch…………………………… . ………………As needed
  - o INDICATOR LIGHTS switch……………………… ….. ………………………TEST
  - o RUNWAY TURNOFF light switches……………………………………OFF
  - o TAXI light switch…………………………………………………………… OFF
  - o STROBE light switch……………………… ………………………………………OFF
- ELT switch…………… ………… …………………………………………Guard closed
- HUMIDIFICATION switch………………… ………………………………………ON
- FWD/BULK CARGO TEMPERATURE switches .... As needed
  Verify the OFF light is extinguished.
- AIR CONDITIONING panel……………… …… ………………………………Set
  - o EQUIPMENT COOLING switches .... AUTO
    Verify the OVRD lights are extinguished.
  - o RECIRCULATION FANS switches .... ON
  - o FLIGHT DECK TEMPERATURE control..................... 10 o'clock position
  - o CABIN TEMPERATURE control .... 10 o'clock position
  - o PACK switches .... AUTO
    Verify the OFF lights are extinguished.
  - o TRIM AIR switches... ON
    Verify the FAULT lights are extinguished.
  - o VENTILATION switch ....NORM
    Verify the ALTN light is extinguished.
- PRESSURIZATION panel .... Set
  - o OUTFLOW VALVE switches .... AUTO
    Verify the MAN lights are extinguished.
- LANDING ALTITUDE selector .... In
- R WIPER selector……………………………………………………………OFF

Glareshield

- FLIGHT DIRECTOR switch... ON
- DISPLAY SELECT PANEL... Set

- ▪ EFIS control panel .... Set
  - o MINIMUMS reference selector .... RADIO or BARO
  - o MINIMUMS selector .... As needed
  - o FLIGHT PATH VECTOR switch .... As needed
  - o METERS switch .... As needed
  - o BAROMETRIC reference selector ....IN or HPA
  - o BAROMETRIC selector .... Set local altimeter setting
  - o ND mode selector ....MAP
  - o ND mode select switch ....Push
  - o MENU ....Select
  - o Map selections .... As needed
  - o ND CENTER switch .... As needed
- · CAUTION: Do not use the Airport Map as a primary navigation reference. This application is designed to aid in pilot awareness only.
- ▪ ND range selector .... 0.5, 1, 2, or 5
  Displays airport map.

QWTip: For more information about the Airport Map Display, see the User's Manual

- ▪ DISPLAY SELECT PANEL .... Set
  - o EICAS TRANSFER switch .... As needed
    Select EICAS to the desired side.
- ▪ ND WXR switch .... Off
  Verify the weather radar indications are not shown on the ND or PFD mini-map.
- ▪ ND TFC and TERR switches .... As needed
- ▪ Mode control panel .... Set
  - o FLIGHT DIRECTOR switch .... ON
  - o AUTOTHROTTLE ARM switches... Arm
  - o Autopilot DISENGAGE bar .... Up
  - o HEADING/TRACK reference switch .... As needed
  - o BANK LIMIT selector.. AUTO
  - o VERTICAL SPEED/FLIGHT PATH ANGLE
    reference switch .... As needed
  - o ALTITUDE increment selector .... As needed

Sidewalls

- Oxygen..
  - o Oxygen mask ....Stowed and doors closed
  - o RESET/TEST switch .... Push and release
    Verify that the yellow cross shows momentarily in the flow
    indicator.

FORWARD PANEL brightness control ....Right click to ON

Forward Panels

- AIR DATA/ATTITUDE source selector .... AUTO
- PFD/MFD selector..NORM
- Flight instruments..Check
  Verify the flight instrument indications are correct.
  Verify only the following two flags are shown:
  ➢ TCAS OFF
  ➢ NO VSPD until takeoff V-speeds are selected
  Verify the flight mode annunciations are correct:
  ➢ Autothrottle mode is blank
  ➢ Roll mode is TO/GA or HUD TO/GA
  ➢ Pitch mode is TO/GA
  ➢ AFDS status is FLT DIR
  Select the MAP mode.
- Landing gear panel ....NORM
  - o Landing gear lever.. DN
  - o ALTERNATE GEAR switch .... Guard closed
  - o AUTOBRAKE selector ....RTO
- Integrated standby flight display.. Set
  Verify the approach mode display is blank.
  Set local altimeter setting.
  Verify the flight instrument indications are correct.
  Verify no flags or messages are shown.

Aisle and Control Stand

- SPEEDBRAKE lever .... DOWN
- Reverse thrust levers...Down
- Forward thrust levers ....Closed
- Parking brake .... Set
  Verify the PARKING BRAKE SET message is shown.
- STABILIZER cutout switches...Guards closed

- FUEL CONTROL switches. ....CUTOFF
- FUEL CONTROL switch fire warning lights .... Verify extinguished
- ALTERNATE FLAPS panel... Set
  - ○ ALTERNATE FLAPS ARM switch .... Off
  - ○ ALTERNATE FLAPS selector .... OFF
- Captain's audio control panel .... As needed
- Left tuning and control panel .... Set
  Verify the OFF light is extinguished.
  - ○ VHF……………………………………….…………………….Select, set L VHF
  - ○ WEATHER RADAR………………………………………………………Select
    Set GAIN and MODE as needed.
  - ○ TRANSPONDER………………………………………………………Select
- Flap lever .... Set
  The flap position indicator does not show when the flaps are up.
  Set the flap lever to agree with the flap position.
- FLIGHT DECK DOOR ACCESS selector ....AUTO
- Engine fire panel.. Set
  Verify the ENG BTL 1 DISCH and ENG BTL 2 DISCH lights are
  extinguished.
  - ○ Engine fire switches .... In
    Verify the LEFT and RIGHT fire warning lights are extinguished.
- GLIDESLOPE INHIBIT switch........................ BELOW G/S light extinguished
- TRANSPONDER MODE selector ....STBY
- AURAL CANCEL light ....Extinguished
- FLOOR LIGHTS switch……………………………………………………As needed
- EVACUATION COMMAND switch .... Guard closed
- AISLE STAND PNL/FLOOD light control.................................. Mid position
- Seat.. Adjust
  Adjust seat for optimum eye reference.
- **CDU/EFB preflight .... Complete**

Now that the Flightdeck Preflight setup is just about complete, it's time to
perform the CDU and EFB preflight. We will load the route and enter
performance information that will be necessary for our flight to San Francisco.

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Tutorial 2 – Flight Planning

CDU/EFB Preflight

There are many ways to use the QualityWings 787 Flight Management System (FMS) for your flight.

- You can import a flightplan created by the FSX FlightPlanner.
- You can load flightplans generated from Third Party applications or sites such as PFPX - Professional Flight Planner X and SimBrief.
- Manual Entry of the FlightPlan

For this tutorial, we will perform a manual entry of the FlightPlan to get you familiar with the basics of the FMS. We strongly suggest that all users become comfortable with loading the FMS as it can greatly enhance your experience with the 787.

Procedures for loading the FMS using the FSX Default FlightPlanner and Third Party programs will be provided in a separate section.

Route Introduction

KSEA (Seattle-Tacoma International Airport) is the primary commercial airport serving the Seattle metropolitan area in the U.S. state of Washington. It is located in the city of SeaTac, approximately 13 miles (21 km) south of Downtown Seattle. The airport, the largest in the Pacific Northwest region of North America, is owned and operated by the Port of Seattle.

KSFO (San Francisco International Airport) is the largest airport in Northern California and the second busiest in California, after Los Angeles International Airport. It is 13 miles (21 km) south of downtown San Francisco, California, United States, near Millbrae and San Bruno in unincorporated San Mateo County. It has flights to points throughout North America and is a major gateway to Europe and Asia.

The flightplans lateral route that we will be flying from KSEA to KSFO is:

<div align="center">HAROB5 ERAVE Q1 ETCHY</div>

We will also need to provide some information that will help it calculate performance information for us, most notably how high we plan to fly. Today's flight is scheduled for a cruising altitude of 35,000 feet (Flight Level 350 | FL350).

Lateral Route Breakdown

HAROB5.ERAVE.Q1.ETCHY

Looks simple enough right? Well in some ways it is, but there really is a lot more going on behind those 6 codes. This is called an Aviation Route. This Aviation Route has several different waypoints, imaginary "highways in the sky" and procedures.

There first part of this route [HAROB5] is called a Standard Instrument Departure (SID). A SID defines a pathway out of an airport and onto the airway structure. A SID is sometimes called a Departure Procedure (DP). SIDs are unique to the associated airport.What we can't yet see is that this SID contains several other waypoints, but all we will do in the FMS is select the HAROB5 SID. The FMS will do the rest as it is smart enough to decode the different elements of what that particular SID means.

ERAVE, Q1 and ETCHY are part of the enroute structure of our route.

Standard Terminal Arrival Route (STAR) procedures are common parts of Aviation Routes are at the end of ATC Routes. Where the SID defines a pathway leaving an airport, a STAR defines a pathway into an airport from the airway structure. STARs can be associated with more than one arrival airport, which can occur when two or more airports are in proximity (e.g., San Francisco and San Jose). For our route, we will not use a STAR, but we will be using an Approach procedure for Run 19L in San Francisco.

QWTip: SID and STAR procedures get updated from time to time, and when the do the number at the end changes. In the event that you are reading this tutorial and you can't find HAROB5 in the FMS, look for HAROB with a different number at the end. This should still work for you. If not, we sincerely apologize.

There are many resources available that explain these procedures in detail. One recommended resource is the Virtual Air Traffic Simulation Network (VATSIM). They have a Pilot Resource Center that deals with IFR procedures amongst many topics. See this page:
https://www.vatsim.net/pilot-resource-centre/ifr-specific-lessons/sids-and-stars

FMC Preflight Pages

General
Completion of the FMC preflight requires data entry in all minimum required data locations. Entry of all required and optional preflight data optimizes FMC accuracy.

Preflight Page Sequence
The identification page usually displays when power is applied to the FMC. Preflight flow continues in this sequence:

- Identification (IDENT) page
- Position initialization (POS INIT) page
- Route (RTE) page
- DEPARTURES page (no prompt)
- Performance initialization (PERF INIT) page
- Thrust limit (THRUST LIM) page
- Takeoff reference (TAKEOFF REF 1/2) page
- Takeoff reference (TAKEOFF REF 2/2) page (no prompt)
- Takeoff reference (TAKEOFF REF 1/2) page

Some of these pages are also used inflight.

QWTip: For more detailed information about all FMC Pages, see the FMS Supplement Section at the end of this document

Minimum Preflight Sequence
During preflight, a prompt in the lower right directs the pilot through the minimum requirements for preflight completion. Selecting the prompt key displays the next page in the flow. If a required entry is missed, a prompt on the TAKEOFF page leads the pilot to the preflight page missing data.

Aircraft GPS position is always available for FMC preflight and flight instrument operation. Entry of inertial position is optional as the IRS has continuous access to Simulator GPS position.

A route must be entered and activated. The minimum route data is origin and destination airports, and a route leg.

Performance data requires entry of aircraft weights, fuel reserves, cost index, and cruise altitude.

Takeoff data requires a flap setting and center of gravity.

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Supplementary Pages

Supplementary pages are sometimes required. These pages have no prompts and interrupt the usual sequence. Discussions of each page include methods to display the page.

When the route includes SIDs and STARs, they can be entered using the DEPARTURES or ARRIVALS pages.

Route discontinuities are removed and the route is modified on the ROUTE and RTE LEGS pages. Speed/altitude restrictions are entered and removed on the RTE LEGS page. The RTE LEGS page is described in FMC Cruise.

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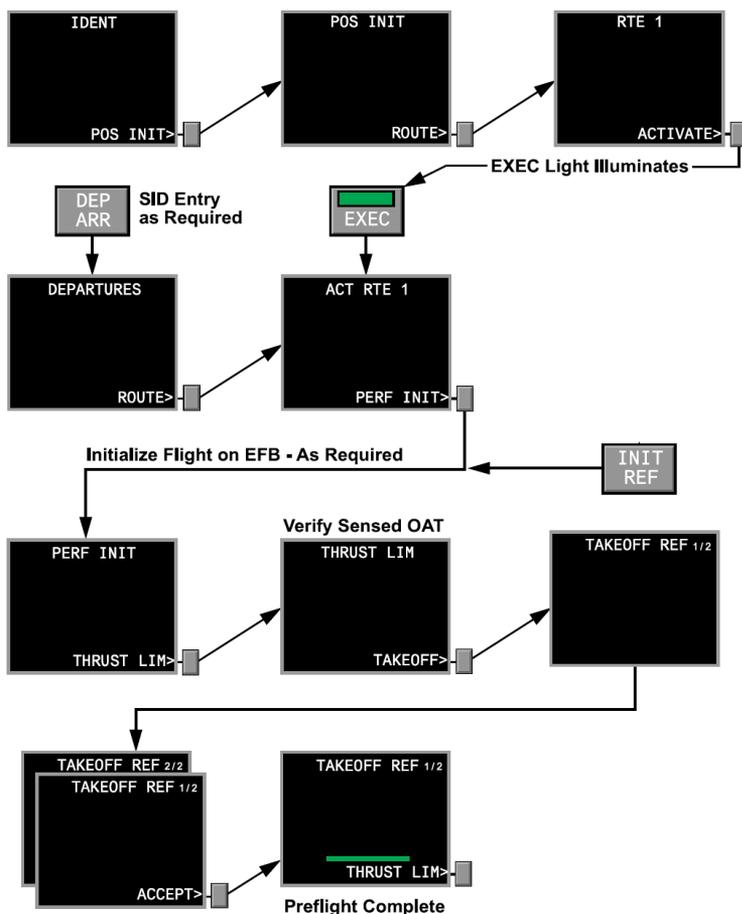
We are going to start programming the FMS now. You can type directly into the Multifunction Keypad (MFK) next to the FMS CDU or you can pop-out the Lower MFD for a better and more straight on viewpoint.

The aircraft powers up with both CDUs showing on the Lower MFD. If it is not showing, push the CDU button on the Captains Side MFK.

To open the Lower MFD Pop Out Display, click on the Light Sensor on the lower left side of the display. You can also use the LWR key on the Captains Cursor Control Device, since the light sensor may be blocked by the throttles when they are advanced.

IDENT Page

On aircraft power-up, the CDUs are available on the lower display unit. The IDENT page should be displayed. If not, click Line Select Key (LSK) 6L to display the INDEX page where the IDENT page can then be selected. The IDENT page doesn't contain any required entries (which are signified by open boxes) but it does provide you with some valuable information. On the IDENT Page:

- Verify that the MODEL is correct
- Verify that the ENG RATING is correct
- Verify that the navigation data base ACTIVE date range is correct

If the navigation database is out of date, an FMC Help Display Window shows on the lower part of the CDU. With the title 'NAV DATA OUT OF DATE'. This does not affect your ability to fly FMS routes, but if you are trying to fly the most up to data procedures you may find some differences since procedures change.

A subscription to a service such as Navigraph will ensure that you always have the most up to date Navigation Data Base for the QualityWings 787.
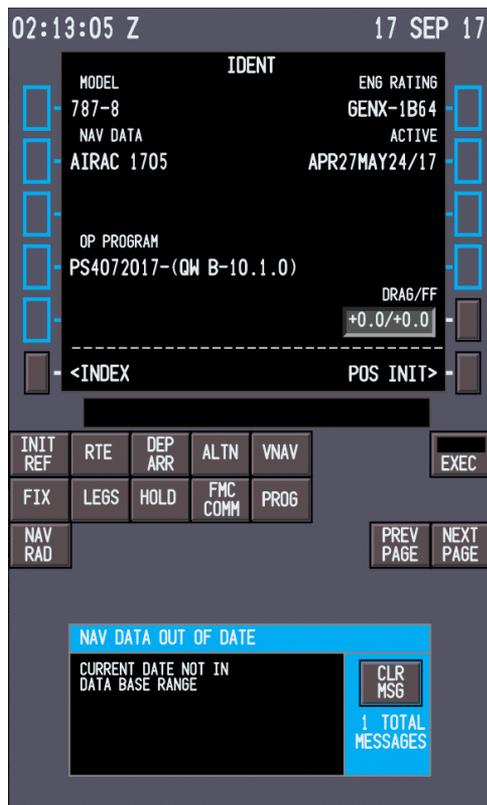
QWTip: For more information about the IDENT Page, see the FMS Pages Section in this document

Click LSK 6R to go to the POS INIT page, which is the next step in the preflight sequence.

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POS INIT Page

If you have experience with the FMC on similar types of airplanes, many of these FMC pages will have a familiar look and feel. The 787 has continuous access the GPS position, so it is not necessary to enter a Present Position during IRS alignment as it is required on most FMCs.

If you would have checked this page during IRS alignment earlier in the tutorial, you would've noticed Dashes right below in the SET INERTIAL POS. Where boxes signify required information, dashes are for optional information.

Speaking of dashes, notice the dashes in REF AIRPORT?

Let's enter KSEA as the reference airport, but first let's activate the Direct Keyboard Entry feature of the CDU. Click on the Scratchpad. It will change into a **Magenta** Color.

Go ahead and type KSEA into the scratchpad. Click LSK 2L to enter it to the REF AIRPORT Prompt.

Once you set the REF AIRPORT, the option for setting the gate for better position also becomes available. Just like REF AIRPORT before it, this step is also not necessary.

QWTip: You can use the arrow keys on your keyboard to move the Highlight cursor around to different editable LSKs. The Enter ket can be used to place scratchpad information into LSKs.

QWTip: For more information about the POS INIT Pages, see the FMS Pages Section in this document

Click LSK 6R to go to the ROUTE page, which is the next step in the preflight sequence.

QualityWings SIMULATIONS

ROUTE Page 1/2

The RTE pages are the primary location for entering the enroute portion of your flight plan.

- Type KSEA into the scratchpad and place it into LSK 1L (Origin)
- Type KSFO into the scratchpad and place it into LSK 1R (Destination)
- Type QW930 into the scratchpad and place it into LSK 3R (Flight Number)

We could enter the departure runway into the RUNWAY prompt, but we are going to do that on the DEP/ARR page.

As a reminder, prompts that have blue outlines in the LSK area are functions that are unavailable.

QWTip: For more information about the RTE Pages, see the FMS Pages Section in this document

```
02:13:05 Z                    17 SEP 17
                    RTE 1            1/2
      ORIGIN                          DEST
      KSEA                            KSFO
      RUNWAY                          FLT NO
      -----                           QW930
      ROUTE                          CO ROUTE
     <REQUEST                        ---------

      ROUTE ------------------------
     <PRINT                            ALTN>

     <RTE 2


 INIT   RTE    DEP   ALTN  VNAV              EXEC
 REF           ARR
 FIX    LEGS   HOLD  FMC   PROG
                     COMM
 NAV                              PREV  NEXT
 RAD                              PAGE  PAGE
```
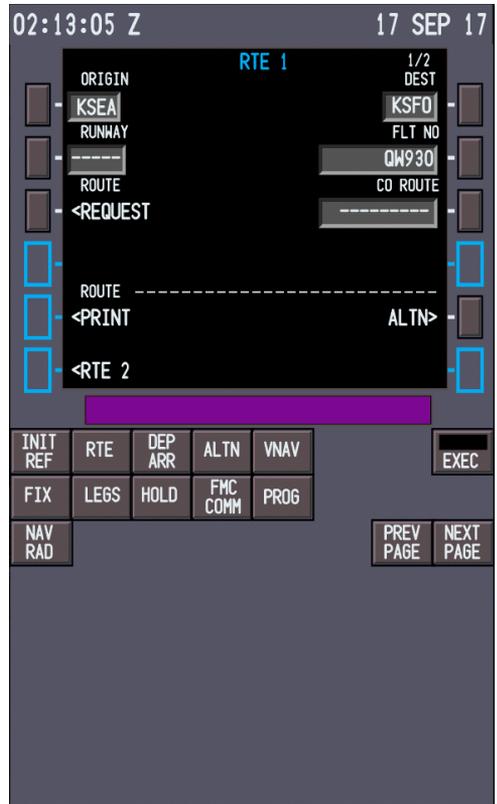
The next step does not involve clicking a line select key, as there is no prompt for our next move. Click the DEP/ARR button

QualityWings SIMULATIONS

DEP/ARR Page (Departure Setup)

The departure and arrival index page is used to select the departure or arrival page for the origin and destination airports for each route. Departure and arrival prompts are available for the origin airport. Destination airports have only arrival prompts. The reason you have both departure and arrival prompts for the origin airport is to account for a return to the airport after takeoff due to an emergency. An example of an emergency requiring a return to the airport can be seen here. ☺

- Select KSEA DEP at LSK 1L

A list of all SIDS and RUNWAYS available for KSEA shows on the KSEA Departures page.
On the right are available runways and on the left are available SIDS. In order to see all available RUNWAYS and SIDS, the NEXT PAGE key would need to be selected. But our runway is in view.

- Select Runway 16L at LSK 2R

Once Runway 16L is selected, all other available runways hide from the page for the moment and now only SIDS available for our selected runway show on the left side. This is why we didn't enter the runway on the RTE page before as this helps with planning the correct SID to use.

- Select the HAROB5 SID at LSK 3L

QualityWings SIMULATIONS

Now that the HAROB5 SID is selected, TRANSitions now show. Transition routes allow pilots to transition from the end of the basic SID to a location in the enroute structure.

- Select TRANS ERAVE at LSK 1L

```
              KSEA DEPARTURES        1/ 2
SIDS               RTE 1          RUNWAYS
HAROB5         <SEL>   <SEL>         16L
TRANS
ERAVE
FEPOT
HISKU
HQM
--------------------------------
<INDEX                          ROUTE>
```

With ERAVE selected as the TRANS, the Departure section of the Preflight is now complete.

- Select ROUTE at LSK 6R

```
              KSEA DEPARTURES        1/ 2
SIDS               RTE 1          RUNWAYS
HAROB5         <SEL>   <SEL>         16L
TRANS
ERAVE          <SEL>




--------------------------------
<INDEX                          ROUTE>
```

Initial Route Activation

This brings us back to the RTE Page, but now notice that the LSK at 6R has changed to say ACTIVATE. We can now start the process of making the Route Active.

- Select ACTIVATE at LSK 6R

```
                     RTE 1          1/2
ORIGIN                             DEST
KSEA                               KSFO
RUNWAY                            FLT NO
16L                              QW930
ROUTE                          CO ROUTE
<REQUEST                       ---------

ROUTE  -------------------------
<PRINT                            ALTN>
<RTE 2                        ACTIVATE>
```

Clicking the Activate button illuminates the EXECute light in the EXEC button on the CDU (and also the Multifunction Keypad).

- Select the EXEC button on the CDU or the EXEC button on the Multi-Function Keypad (MKF)
- The EXEC light extinguishes

QWTip: Activation of the route at this is simply to allow the QWPAS Preflight announcement to occur at this point. Typically, the route wouldn't be activated until later in the programming of the FMS.

02:13:05 Z   17 SEP 17
                    RTE 1   1/2
    ORIGIN   DEST
    KSEA   KSFO
    RUNWAY   FLT NO
    16L   QW930
    ROUTE   CO ROUTE
    <REQUEST   ---------

    ROUTE ------------------------------
    <PRINT   ALTN>
    <RTE 2   PERF INIT>

INIT   RTE   DEP   ALTN VNAV   EXEC
REF   ARR
FIX   LEGS HOLD FMC   PROG
                  COMM
NAV   PREV NEXT
RAD   PAGE PAGE

The Route is Now Active. The title of the page now shows ACT RTE 1, butt we still have some work to do with the Route.

- Click on the NEXT Page Button on the CDU to get to the 2nd page of the currently available 2 pages of RTE

                  ACT RTE 1   1/2
    ORIGIN   DEST
    KSEA   KSFO
    RUNWAY   FLT NO
    16L   QW930
    ROUTE   CO ROUTE
    <REQUEST   ---------

    ROUTE ------------------------------
    <PRINT   ALTN>
    <RTE 2   PERF INIT>

QualityWings SIMULATIONS
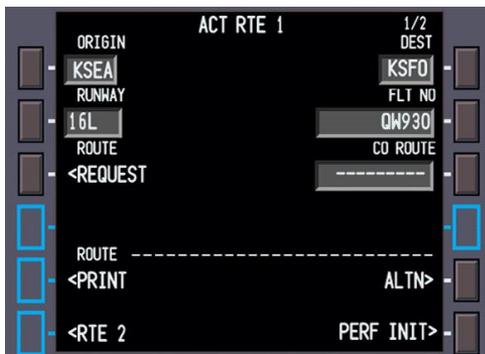
ROUTE Page 2/2

RTE page 2 and subsequent pages are where you actually enter route information. The right side TO column is where you're going (a waypoint as an example) and the left side VIA column is how you're getting there (an airways as an example). Two lines have automatically been added by our SID selection – we're going DIRECT to an elevation of 932 feet and then we're going to ERAVE VIA the HAROB5 SID and ERAVE transition.

- Type Q1 into the scratchpad and select LSK 3L to enter Q1 into the VIA column

Notice a few things happen. The dashes in the adjacent TO column now become boxes, since a required entry is needed to complete this row. **THEN** shows in between the VIA and TO columns. **MOD** shows in front of the Page Title (RTE 1). This means we're MODifying the active route **ERASE** shows at LSK 6L. This allows us to erase the modification if needed.

- Type ETCHY into the scratchpad and select LSK 3R to enter ETCHY into the TO column.
- Click the EXECute light to complete the Modification to the Route. The **MOD** will disappear.
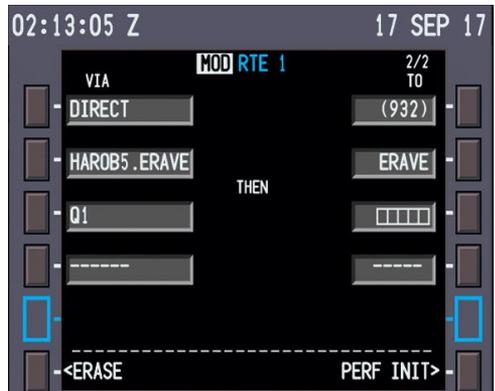
DEP/ARR Page (Departure Setup)

Click the DEP/ARR Mode key to go back to the Departure/Arrivals Page so that we can now setup the arrival portion of our route. Our approach for ILS19L should be on Page 1

- Select the ARR for KSFO at LSK2R.
- Select the ILS19L Approach at LSK 1R
- Select the BERKS Transition at LSK3R

LEGS Page (Departure Setup)

We are almost done with our setup of the information that allow for Lateral Guidance from the FMS. This will allow the LNAV Autoflight mode to get steering commands from the FMS. The LEGS page allows us to see deeper into the codes route procedures we just entered. This is important because you can check for "breaks" in the route called "Route Discontinuities"

- Select the LEGS Mode Key

This will bring you to page 1 of what should be 5 pages of route legs

- Select the NEXT PAGE key until you arrive at Page 3 of 5

On this page, you will notice empty Boxes In between ETCHY and BERKS. We need to clear this Discontinuity, otherwise the aircraft will just continue straight after ETCHY.

- Select BERKS which should be at LSK 5L to place it in the scratchpad
- Select LSK 4L to place BERKS in the boxes

This clears the Route Discontinuity. Your ACT RTE page should look like this now.
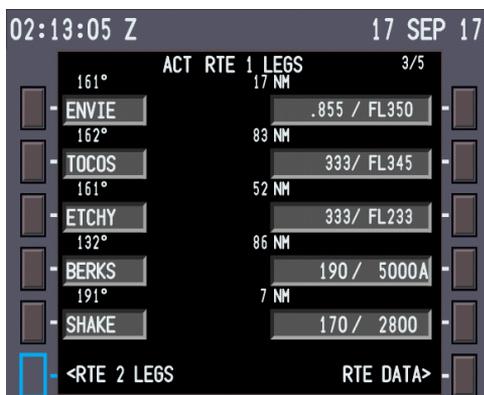
PERF INIT Page

Now that the information for the Lateral Navigation has been entered, we now need to set up information that will be used for the Vertical profile of the flight. This will allow for Vertical Navigation from the FMS to the Autoflight system, better known as VNAV mode.

We start entering this information on the Performance Initialization Page (PERF INIT).

- Select the INIT REF KEY

Since we have not entered any performance information here yet, INIT REF defaults to this page. PERF INIT can also be found on the INIT/REF Page at LSK 3L. We must fill in all requires entries on this page.

- Enter 350 into LSK 1R
- Enter a Cost Index of 200 into LSK 2R
- Enter a Reserves of 5 into LSK 4L
- Click EXEC key
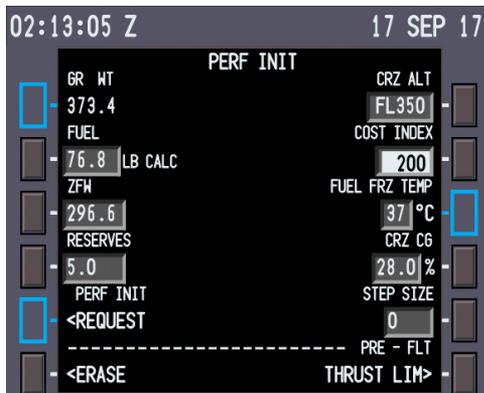
Cost Index

A quick word about Cost Index. This powerful value is where you make a decision where fuel or time of flight is more important to your operations. Values of 0-2000 are possible on the QW787 where the lower the number, the slower you go. But you will save fuel. The higher the number, the more fuel you'll consume because you will fly faster. We recommend a Cost Index between 200-250. This aircraft is extremely slippery and difficult to slow down.

Thrust Limit Page

After completing the entries on the Perf Init page, the next page in the Preflight sequence is the Thrust Limits Page.

- Select LSK 6R on the PERF INIT Page

The Thrust Limit page is used to select takeoff and climb thrust fixed derates. Derating of thrust via the assumed temperature method is also available by entering a temperature higher than the actual outside air temperature.

We are going to leave this page as is for a full thrust takeoff. After all,

engine wear is not a big deal in the QualityWings 787…at least not for now ;-)

Takeoff Ref Page

The last page in our Preflight is the Takeoff Reference Page. This page has the following data:

- Flaps Setting for Takeoff
- Center of Gravity Setting
- V-Speeds

But before we access the Takeoff Reference Page, let's perform some functions on the Electronic Flight Bag that will provide more accurate information for use on the Takeoff Reference Page.

EFB Onboard Performance Tool

We are going to use the Onboard Performance Tool (OPT) Application within the EFB to provide the data for the Takeoff Reference Page in the FMS.
Since we have already entered a route, the INITIALIZE FLIGHT soft key is available at the lower right. Similar to the CDU, we will reference Line Select Keys. SO the INITIALIZE FLIGHT is shown at LSK 8R.

- Click on LSK 8R to Initialize the flight, or just click on the INITIALIZE FLIGHT soft key on the display itself
    - Note: When you click on INITIALIZE FLIGHT, the soft key will change to say CLOSE FLIGHT

This will grab the ORIGIN and DESTINATION airports from the FMC Route Page. This will be useful for not only the EFB OPT App, but also for Terminal Charts that we will see later.

- Click on the Performance Soft Key
- Click on the Light Sensor on the lower left of the screen to popout the EFB display.

The performance Takeoff Page should now be displayed. Because we initialized the EFB, some information has been prepopulated from our FMS Data:

- Airport
- Runway
- Takeoff Flap Setting
- Wind

- Temperature
- QNH
- CG %

We will need to Copy over the Takeoff Weight Data from the FMC.

- Click the
- FMC Data soft key

QualityWings SIMULATIONS
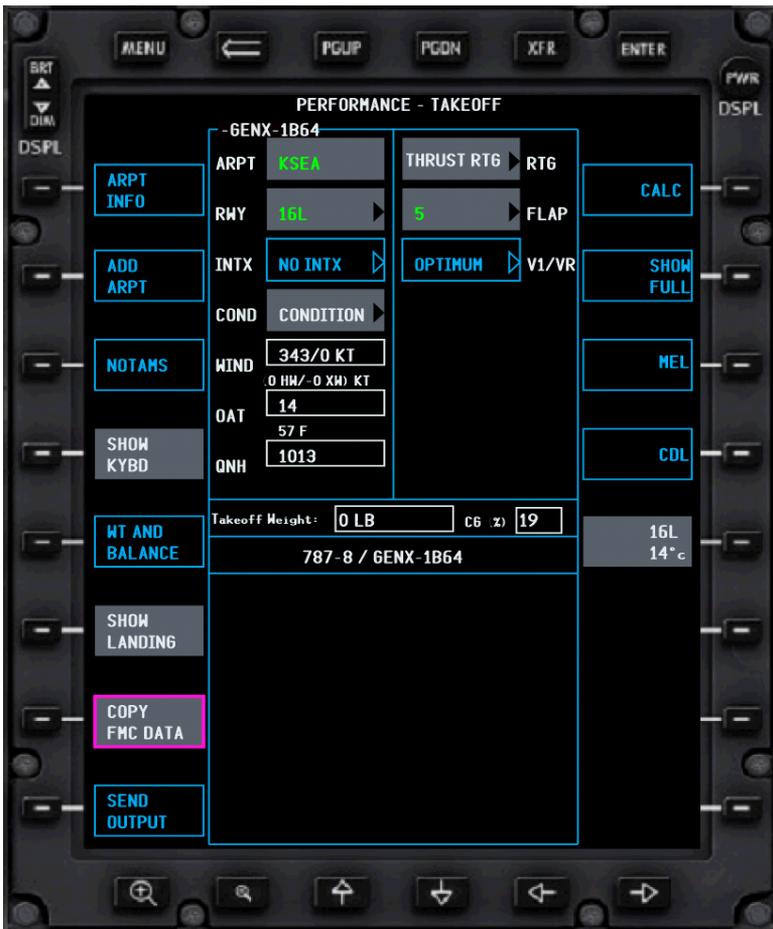
The takeoff Weight will now show
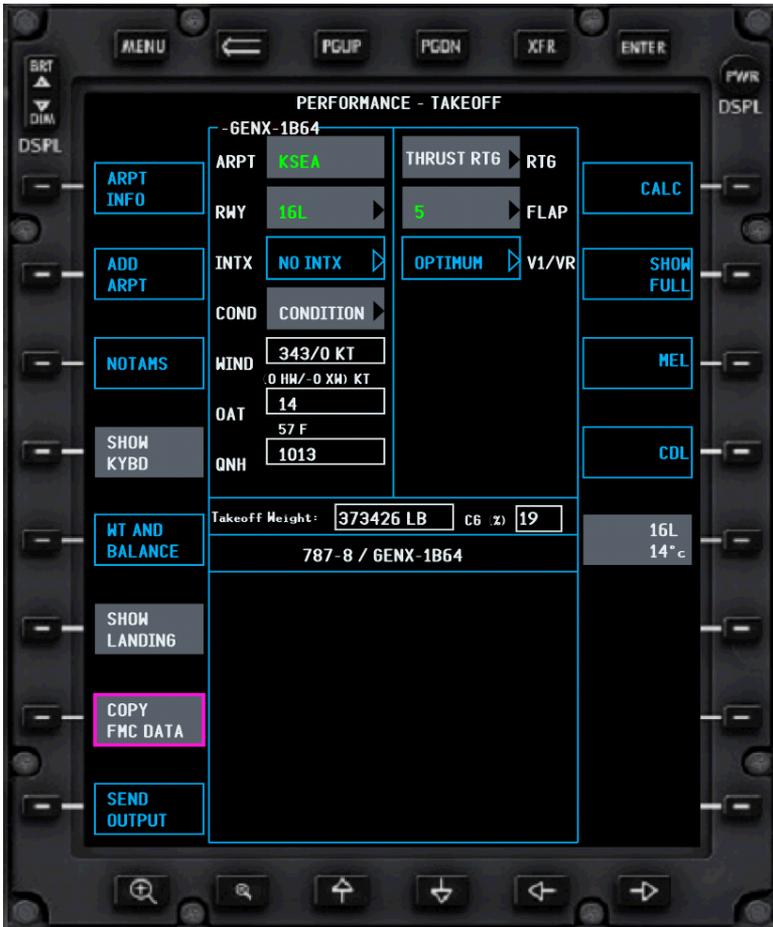
We still need to enter the following information for Runway CONDITION and Takeoff THRUST RATING

- Click the List Box for Condition
  - Select DRY
- Click the RTG List Box for THRUST RTG
  - Select TO

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The CALC Soft Key will now change from unavailable (Cyan Box) to available for selection. Your EFB should look fairly similar to what is below (Your Takeoff Weight may vary)
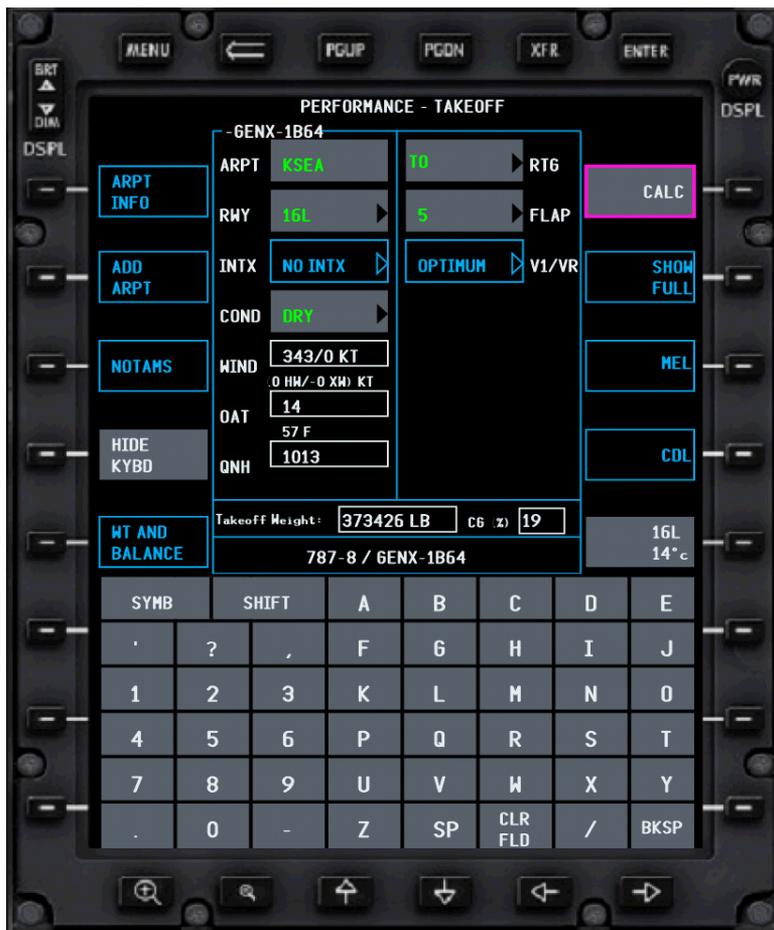
Upon selecting the CALC soft key, the EFB Onboard Performance Tool will provide data more accurate V-Speeds than we previously had available on the Takeoff Ref Page alone.

The Calculated V-Speeds are now available.
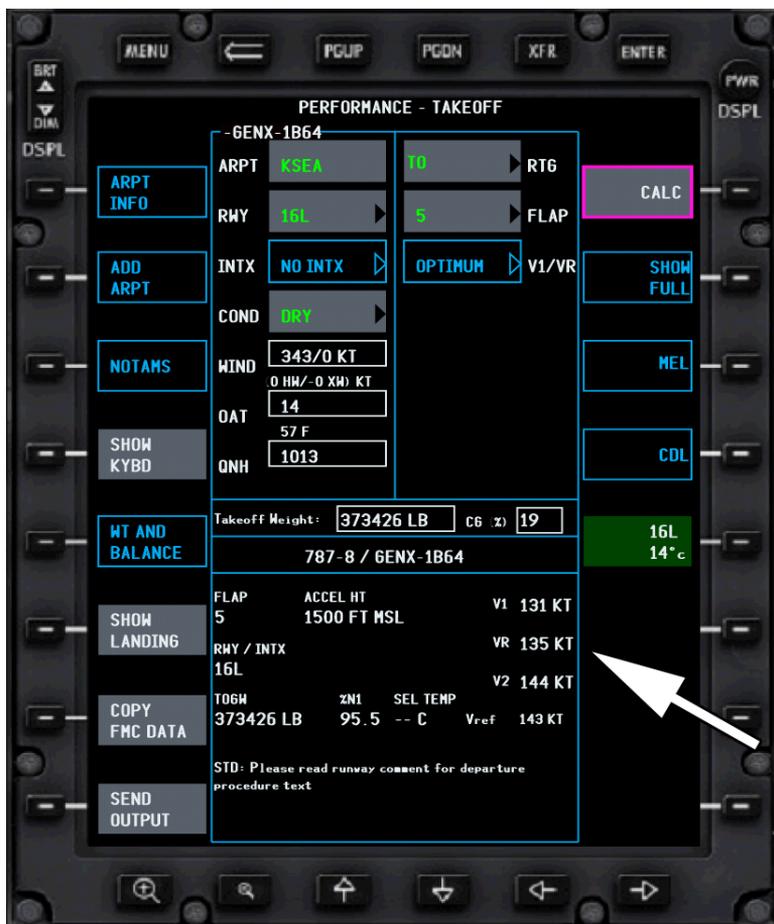
Now all that is left is to send this information to the Takeoff Reference page in the FMS.

- Select the Send Output Soft Key at LSK 8L

The Send Output Where Display shows.
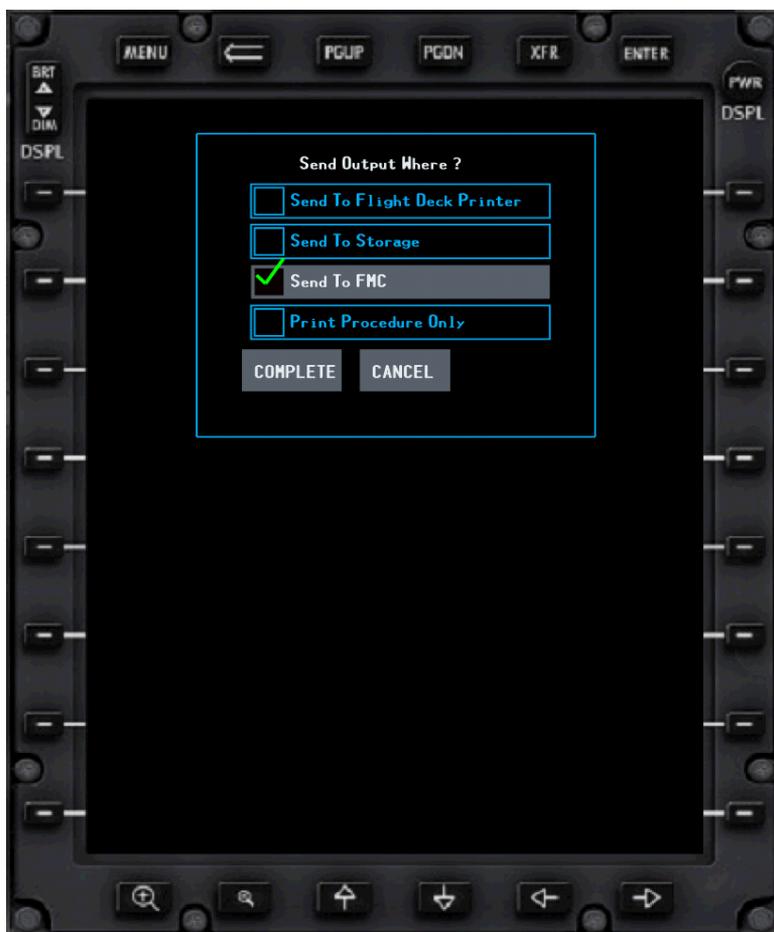
- Select "Send to FMC"
- Click the COMPLETE Soft Key

You should hear the Communications Chime in the flightdeck if your volume was turned up. Let's go back to the FMS CDU.

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Takeoff Ref Page Uplink

Sending the output from the EFB uplinked our Takeoff V-Speeds to the FMS. The Takeoff Reference Page automatically opens (even if the FMS CDU was on another page) to allow us to either ACCEPT or REJECT the uplink from the EFB.The Page header shows TAKEOFF REF UPLINK.

- Click LSK 5R to ACCEPT the Takeoff Ref Uplink from the EFB OPT

V-Speeds are now on the Primary Flight Display.

The Takeoff Ref Page is almost Complete. We need to enter the CG value.

- Select LSK 3L.A calculated value will be placed into the scratchpad
- Select LSK 3L again to place this value back into the CG Trim % box

Our Preflight is fully complete!

QualityWings SIMULATIONS

Preflight Completion

Preflight Completion Procedure

- Mode Control Panel .... Setup
    - LNAV ....Select to Arm
    - VNAV...Select to Arm
    - Altitude ....
- **Preflight Checklist .... Perform**
- Departure .... Completed [F, C]
  Normally the briefing is completed at the gate. The pilots should also
  brief any subsequent changes to the original briefing, such as runway,
  weather, departure procedures, selected automation modes, etc. Verify
  appropriate departure routing is attached to the runway without
  discontinuity.

Preflight Checklist

QualityWings SIMULATIONS
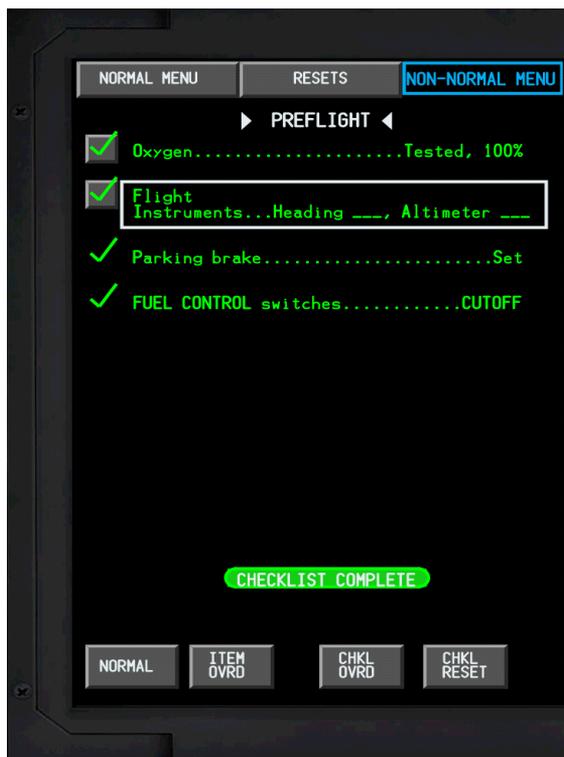
EFB Terminal Charts

The EFB can be used to review departure procedures. The Terminal Charts App allows you to view Departure and Arrival Procedures.

Go back to the EFB and select the MENU key at the top left.

- Select the Terminal Charts Soft Key to

The Origin and Destination Airports are already entered since you initialized the EFB earlier. Select the COMPLETE Soft Key.

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Upon selected COMPLETE, you are taken to the Charts Clip page where all the procedures for the Origin and Destination are available for viewing.

Chart Clips are only available for the Origin and Destination. Currently KSEA is selected. Click on the SID for HAROB5 (Our departure procedure) to see a neat feature.

The ability to have your actual route superimposed over the Terminal Chart is available by selecting the EFB – Flight Plan Overlay Option.

For more information about options, see the QualityWings User's Manual.
But this is the option on the INFO page that needs to be selected:
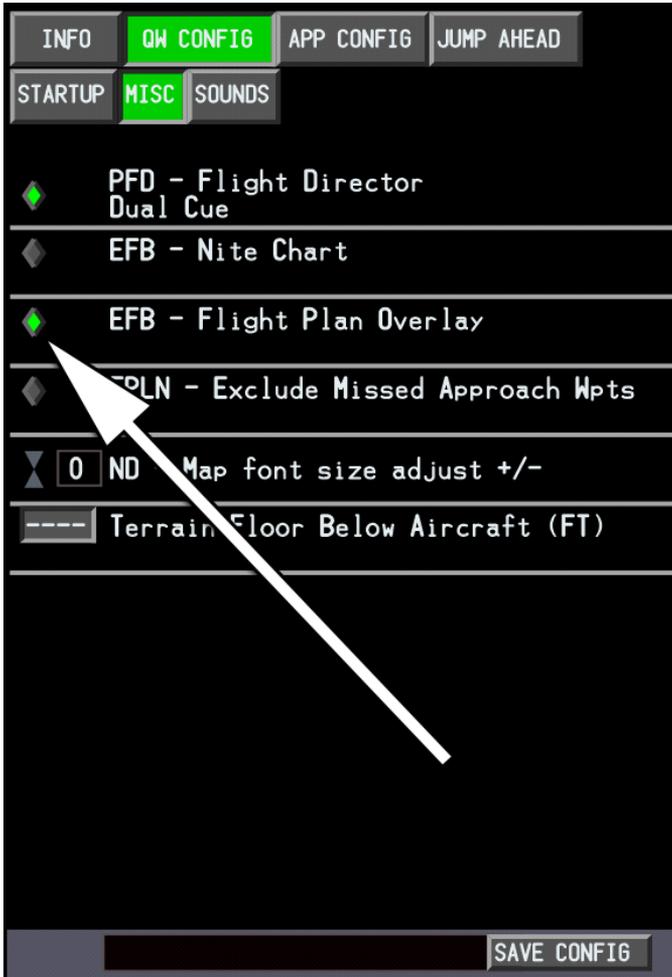
Before Push/Before Start

General

Approximately 5 minutes prior to anticipated departure time:

- Confirm the APU is running.

If it is not yet running:

- APU selector .... Rotate to START, release to ON
  Verify the FAULT light is extinguished.

You can check the progression of the APU start by selecting the SYS Status Page on any MFD.

When the APU RPM is greater than 99%, the **APU RUNNING** Memo Message will be displayed on the EICAS display.

- Note: It may be necessary to click the Cancel/Recall Switch on the Display Select Panel to show Memo Messages, as they should at the end of the EICAS message queue.

QualityWings SIMULATIONS

Ensure that all doors are closed by using the QualityWings Control panel.
You can confirm Door Status via the SYS Door Synoptic Page.
The Flight Attendants will automatically arm all entry doors. EICAS will display
the **DOORS AUTO** Memo Message showing that all entry doors armed Armed.
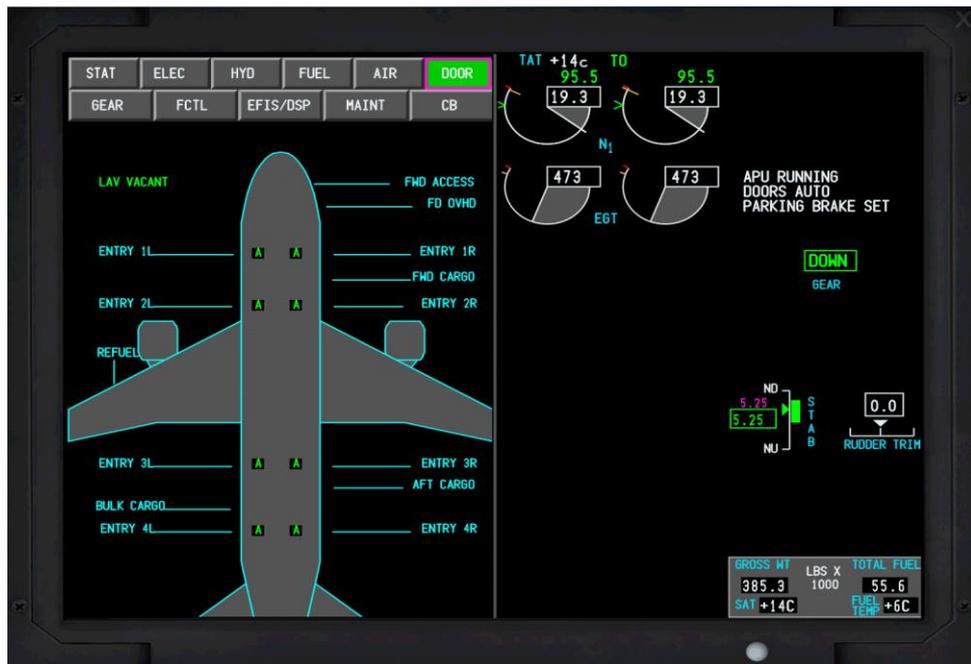
When all doors are closed and the flightplan is loaded (Preflight Complete
Message displayed), the QWCAS First Officer will then call for the "Before Start
Checklist".

Before Push Procedure

- Seat belts ....On [F, C]
  Each pilot shall keep their seat belt fastened when at their station and
  the aircraft is moving.
- Seat belt sign .... ON
- Hydraulic pumps... ON/AUTO
- Right demand pump selector .... AUTO
  Verify FAULT light extinguished.
- Left demand pump selector .... AUTO
  Verify FAULT light extinguished.

- C1/C2 electric pump selectors...AUTO
  Verify FAULT lights extinguished.
- Fuel ....___ Release, ___ on board
  Check the fuel on board as displayed on the forward EICAS display
  (sensed value) against the QualityWings Dispatcher release Fuel
- Fuel pumps .... ON
- Left and right fuel pump switches .... ON
  The PRESS lights are illuminated because of load shedding. If the APU is
  running, the left aft pump PRESS light is extinguished.
- Center fuel pump switches.. ON
  Select ON if center tank fuel quantity is displayed in amber.
  Both PRESS lights illuminate until after engine start because of load
  shedding.
- STAB/RUDDER TRIM ....SET
  Set and verify the stabilizer trim to agree with the magenta FMC
  stabilizer takeoff setting on the EICAS display. Verify rudder trim set at
  zero.

  - - - - - WHEN ALL DOORS ARE CLOSED - - - - -

- Doors ....
  Select the Doors synoptic on the First Officer's MFD. Use of the synoptic
  will assist the Captain in determining when aircraft movement is
  imminent. The pilots must confirm that all doors are closed and all
  passenger entry doors are in the auto mode prior to aircraft movement
  or engine start.
- Beacon ....On
  The beacon is used as a signal to personnel outside the aircraft that an
  engine start is imminent or that an engine is running.
- Transponder ....XPDR
- Before Start Checklist .... Perform

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Before Start Checklist
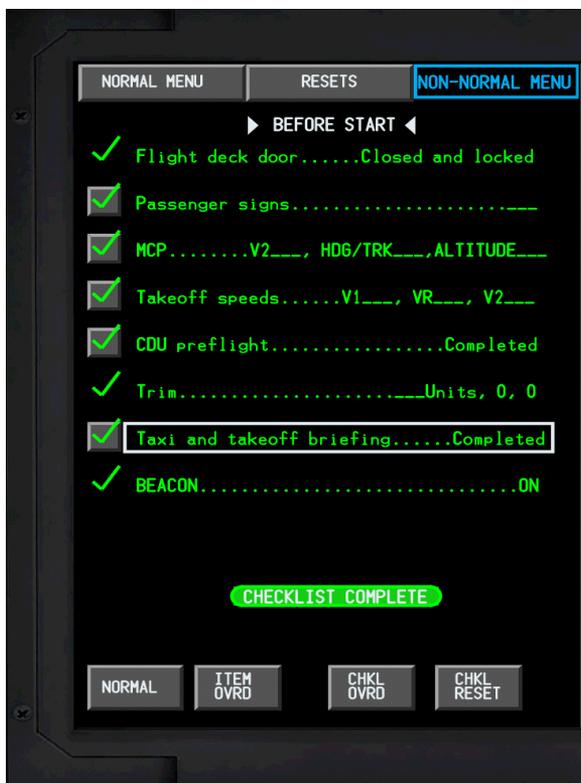
Engine Start

Engine Start Procedure

Normal starting sequence is both engines simultaneously.

- Display secondary engine indications on EICAS.
- Position left START/IGNITION selector to START.
- Position left fuel control switch to RUN
  Verify that **AUTOSTART** message shows on EICAS display above left engine N2 indication
- · Note: When doing simultaneous engine starts, delay selecting the second engine start switch by a minimum of 5 seconds.
- Position right START/IGNITION selector to START.
- Position right fuel control switch to RUN.
  Verify that **AUTOSTART** message shows on EICAS display above right engine N2 indication
- Monitor engine displays for normal indications.

When the engine has reached stable Idle, the **AUTOSTART** message is replaced with **RUNNING** for 30 seconds.
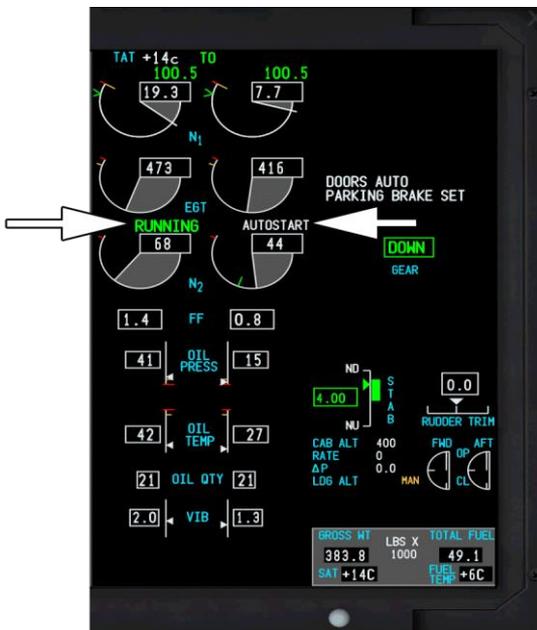
Tutorial 3 – Ready to Go! Lets Fly

Before Taxi

General (Flow)

The PM will call for the Before Taxi checklist when the engine(s) have reached a stabilized idle with a loaded flightplan. The Before Taxi flow will be initiated when the PM calls for the checklist. This checklist will be completed prior to releasing the brakes for taxi.
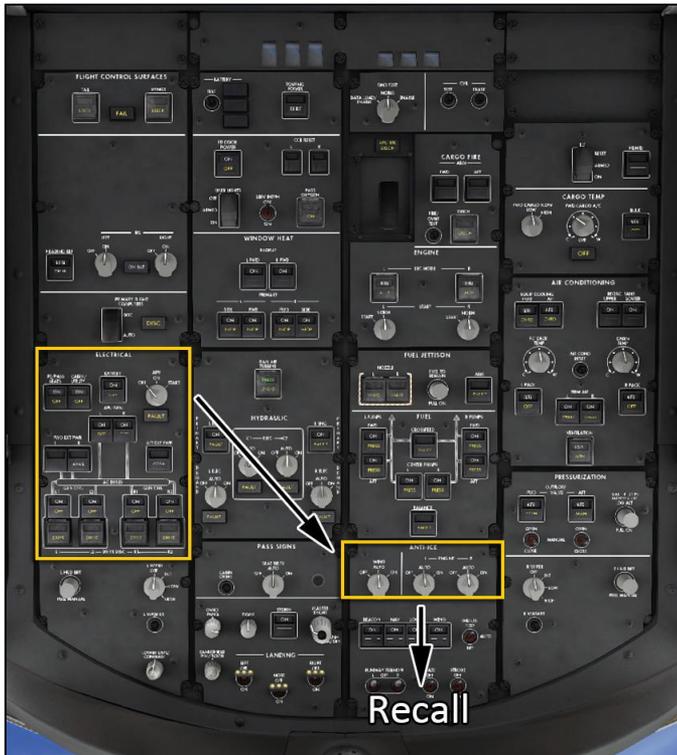
Before Taxi Flow	
APU	Off
Engine Anti-Ice (As Required)	AUTO/ON
Recall	Check
Flight Controls	Check
Radio Panel	ATC
Flightdeck Door	Closed & Locked

Before Taxi Procedure

- APU .... Off
- Engine anti-ice ....As required
  When icing conditions exist or are anticipated, as each engine is started
  position the respective engine anti-ice switch ON.
- Recall ....Checked
  Verify **STEERING LOCKED OUT** memo message is not displayed.
- Autobrake ....RTO
  The autobrake will be verified to be in the RTO selection for all takeoffs.
- Flight controls ....Checked
    - o Select the FCTL synoptic on the Captains MFD.
    - o Verify proper flight control movement on FCTL synoptic display
      as depicted in the graphic below.
      When the control check is complete, restore the NAV display on
      MFD.
    - o Move the control wheel, control column and rudder pedals to
      full travel in both directions and verify:
        - ➢ Freedom of movement
        - ➢ The controls return to center
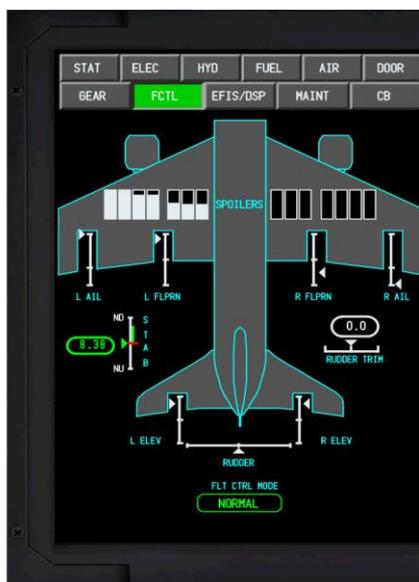
Shown with Control Wheel commanding left turn, control column commanding Nose Down and the Rudder Pedals Neutral

- Flaps.. Set ___
  This item of the checklist is a read and do item. (The pilots should not wait for the flaps to reach the commanded position prior to taxi. Actual flap position will be verified during the Before Takeoff checklist.)
- CDU/reference speeds .... Set [F, C]
  CDU (display setup)
  o PF - Display TAKEOFF REF pg 1/2
  o PM - Display ACT RTE 1 LEGS pg 1/x
  Reference Speeds Cross-check and verify the CDU TAKEOFF REF page, and MCP:
  o Flap setting
  o Thrust selection
  o Runway
  o V-speeds
  o V2 set in MCP IAS/MACH window

- Stab/rudder trim .... ____Units, zero
  Verify the stabilizer trim agrees with the magenta FMC stabilizer takeoff setting on the EICAS display. Verify rudder trim set at zero.
- Radio panel .... Set
  Captain select VHF L on the left audio control panel.
- Flight deck door .... Closed and locked
  Verify no EICAS messages FD DOOR LOCK FAIL or FD DOOR OPEN illuminate.
- Before Taxi Checklist .... Perform

Before Taxi Checklist

Taxi

General Taxi Notes

- To signal intent to other pilots, consider turning on the taxi light when the aircraft is moving or intending to move on the ground, and turning it off when stopped, yielding, or as a consideration to other pilots or ground personnel.
- If possible, accomplish paperwork and other activities when the aircraft is not moving and the parking brake is set.
- Pilots should familiarize themselves with the airport taxiways, intersecting runways and any obstructions which may be a hazard to safety. While taxiing, utilize the airport map on the ND in 5 NM scale or less. If confusion exists, consider the use of the Flight Simulator Progressive Taxi feature.

QWTip: We have included the Airport Map Data for over 140 default Flight Sim airports around the world. The hubs for all the airlines that we have provided a livery for is included in this data set, so the chances are high that your favorite airport is already available for display. Third Party Addon Airport Data may not be available. See the User's Manual for more information on the Airport Map Display, and the ability to create data for your favorite airport if it is not available.

- Pilots should not hesitate to discontinue taxiing if any doubt exists about the aircraft's location on the field.
- When cleared for takeoff, ensure that the correct runway is being used.

QWTip: If the departure runway has been selected during FMS Flight planning, the QWCAS Captain will callout "Runway Verified" for additional Situational Awareness". Keep in mind may only work correctly for the runways in default scenery

- **Thrust Use:** To initiate taxi and reduce possibility of jet blast damage:
  - o Smoothly advance power to a minimum required for the aircraft to roll forward; maximum of N1 35%RPM.
  - o Aircraft response to thrust change is slow, particularly at high gross weights. Idle thrust is adequate for taxiing under most conditions. A slightly higher thrust setting is required to start taxiing. Allow time for aircraft response to each thrust change.
  - o Retard the power as soon as possible after the aircraft starts to taxi.

- **Taxi Speed:** Due to the difficulty of visually determining actual groundspeed based on outside references, the tendency is to taxi faster than desired. This is especially true during runway turnoff after landing. Pilots should utilize digital displays for groundspeed determination.
- The normal straight-away taxi speed should not exceed approximately 30 knots. Speeds in excess of this, when combined with long taxi distances, cause heat buildup in the tires. When approaching a turn, speed should be slowed to the appropriate speed for the conditions. On a dry surface, use approximately 8 to 10 knots.
- Use of reverse thrust is not recommended during taxi. At low speeds, the reverse thrust can cause loose objects on the taxiway to be ingested causing FOD.
- **Brakes:**
  o Avoid prolonged brake application (riding the brakes) to control taxi speed. If taxi speed is too high, reduce speed with a steady brake application and then release the brakes to allow them to cool. Continuous braking should be avoided.
  o Avoid taxi speeds greater than 30 knots on long taxi routes. Braking to approximately 10 knots and subsequent release of the brakes will result in less wear of the brakes than when the brakes are constantly applied.

QualityWings SIMULATIONS

Before Takeoff

General (Flow)

The objective is to accomplish the Before Takeoff checklist at an appropriate time to avoid time compression of checklist accomplishment nearing departure. The QWCAS First Officer will call for the Before Takeoff Checklist if the Before Taxi Checklist is complete and the aircraft is within 1700 feet of the Departure Runway programmed into the FMS Route

Meteorological conditions permitting, turn on runway turnoff, strobe, logo (night only), and wing lights when taxiing onto the runway.

Turn on landing lights when takeoff clearance is received as an indication to other traffic that the aircraft is beginning the takeoff roll.

Meteorological conditions permitting, the use of the above lights is required inflight below 18,000 feet for all operations.

Transponder

Before Takeoff Flow	
Transponder	TA/RA
WXR/TERR/VSD	As Desired
Lights	*When cleared for Takeoff - ON

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Before Takeoff Procedure

- Departure briefing .... Completed [F, C]
  Normally the briefing is completed at the gate. The pilots should also brief any subsequent changes to the original briefing, such as runway, weather, departure procedures, selected automation modes, etc. Verify appropriate departure routing is attached to the runway without discontinuity.
- Departure announcement ....Completed

QWTip: The QWPAS automated Flight Attendant Departure Announcement will occur when the aircraft is within 1700 feet of the Departure Runway programmed into the FMS Route. If no Runway is entered into the Flightplan, there will be no announcement.

- Flaps... ⎯⎯
  - · Note: If the FMC flap selection and actual flap position are not in agreement, the ECL will not reflect a green checkmark. Never override the Flaps item on the Before takeoff Checklist
- Transponder .... TA/RA
  Rotate selector to TA/RA mode. Ensure TFC is displayed on MAP.
- Radar/terrain/VSD...As required
  WXR and TERR functions should be displayed as desired depending upon weather and surrounding terrain. The terrain function cannot be displayed on an ND with weather radar. However, if both displays are desired, one may be displayed on the ND and the other on the PFD mini-map.
  The Vertical Situation Display (VSD) should also be selected anytime the TERR display is selected.
- Before Takeoff Checklist... Perform

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Before Takeoff Checklist

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Takeoff

Up until this point, we've been operating the aircraft very slowly on the taxiways. Once we start to advance the throttles for takeoff, things will start to happen very, very quickly, so it's imperative that you always stay a step ahead of the aircraft. As such, we suggest that you review the notes in the following section BEFORE actually beginning the step-by-step Takeoff Procedure.

Takeoff Considerations

Setting Takeoff Thrust

While a rolling takeoff is normally recommended, we suggest that you start out with the aircraft static until you become more familiar with the aircraft.

Takeoff Roll

Keep the aircraft on the centerline with rudder pedal steering and rudder. Do not use the ailerons to steer the aircraft along the centerline during normal conditions.

Apply a small amount of downward pressure on the control column.

Rotation and Liftoff

Above 80 knots, relax the forward control column pressure to the neutral position.

For optimum takeoff and initial climb performance, initiate a smooth, constant rate rotation at VR toward 15 degrees of pitch attitude.

Rotate smoothly at an average pitch rate of 2 degree/second. A 10 degree body attitude will be achieved in approximately 5 seconds. Avoid any tendency to rapidly rotate to a 10 degree pitch attitude and hold it until lift-off. This technique can result in a tail strike.

·   Note: The flight director pitch command is not used for rotation. Proper rotation will result in an airspeed of approximately V2+15 knots at average gross weights. Initially, the F/D will command 15⯑ nose up. If the vertical speed is acceptable, adjust the pitch attitude smoothly to maintain an airspeed of V2+15 to 25 knots.

When a positive rate of climb has been verified on the IVSI and altimeter, the QWCAS Crew will announce "Positive Rate and call for "Gear Up". Stabilize airspeed at V2+15 to 25 knots, and transition to the F/D pitch command.

Autopilot Engagement

The autopilot may be engaged any time at or above 200 feet AGL. The PF normally engages the autopilot and announces the action with the PM confirming engagement

Takeoff Pitch Modes

For our tutorial, VNAV will be the go to pitch mode. Normally, TO/GA is engaged and VNAV is armed for takeoff and engages at 400 feet above the runway. The use of VNAV for takeoff, flap retraction, and climb out is the preferred method of managing the AFDS for takeoff. This provides the VNAV profile and acceleration schedule compatible with the planned departure and overspeed protection for flaps.

With VNAV engaged, the FMC commands AFDS pitch and A/T modes to fly the vertical profile selected on the FMC. Therefore, the MCP IAS display becomes blank, and the command airspeed bugs (cursors) are positioned at the FMC commanded airspeed on the airspeed indicator and speed tape. The AFDS controls pitch to maintain FMC speed. With VNAV engaged, pushing the IAS MACH selector enables speed intervention. Speed intervention allows the pilots to change aircraft speed with the IAS/MACH selector while remaining in VNAV. The FMC will normally command a default 250 knot climb speed once the flaps have been retracted. FMC initial climb speed can be altered by placing a speed restriction (with or without a corresponding altitude restriction) into the FMC on the CLB page.

Takeoff Roll Modes

For our tutorial, LNAV will be the go to Roll Mode. LNAV will be armed on the ground and will engage 400 feet above the runway.

Departure Flap Operation

Avoid airspeeds near the limit speed for the current or selected flap setting. Do not select a flap setting that either results in an over speed, or reduces maneuvering bank angle capability. You must be vigilant not to select flaps unless the speed is appropriate.

Flap movement to the next position should be initiated when within 20 knots of the maneuver speed (on the speed tape) for the next flap position, and accelerating.

Accelerate to the next maneuver speed while the flaps are retracting. Acceptable maneuver margin exists at speeds 20 knots below the recommended maneuver speed for each flap position.

Takeoff Configuration Warnings

The takeoff configuration warning system is armed when the aircraft is on the ground and the thrust is in the takeoff range on either engine.

The takeoff configuration warning will sound when one of the following conditions exist:

- Speed brake lever not in DOWN detent position
- Stabilizer position outside of takeoff range
- Trailing edge flaps not in takeoff position
- Leading edge slats not in takeoff position
- Parking brake set
- Door configuration warning
- Rudder configuration warning

If a takeoff configuration warning occurs when the thrust levers are advanced for takeoff prior to reaching V1, the takeoff will be rejected unless the Captain determines that continuing the takeoff is a safer course of action under the conditions.

Takeoff Procedure

Prior to crossing the runway hold short line:

[C, F/O] Runway verification..Check
Use all available resources to verify the runway and runway entry point.

QWTip: The QWCAS First Officer will announce "Runway Verified" when the aircraft is lined up with the Departure Runway programmed into the FMS Route. If no Runway is entered into the Flightplan, there will be no announcement.

When the aircraft is in any runway environment (crosses the hold line):

- [C] Strobe lights switch..On
- [C] Wing lights switch ....On
- [C] Logo light switch (night only)..On
- [C] Runway turnoff and taxi lights switches .... On
- [C, F] Runway alignment...Check

When lined up on the departure runway, both pilots will visually verify the aircraft symbol on the ND/MAP display is on the assigned runway and the aircraft and runway headings agree. Resolve any inconsistencies prior to takeoff.

When takeoff clearance is received:

- [C] Landing lights switches ....On
- [PF] Thrust levers..Advance smoothly

When the aircraft is aligned with the runway centerline, apply takeoff thrust by advancing the thrust levers to approximately 40% N1. Allow the engines to stabilize momentarily then select TO/GA.

Allowing the engines to stabilize provides uniform engine acceleration to takeoff thrust and minimizes directional control problems. This is particularly important if crosswinds exist or the runway surface is slippery. The exact initial setting is not as important as setting symmetrical thrust. If thrust is to be set manually, smoothly advance thrust levers toward takeoff thrust.

As the thrust levers reach the end of their forward movement, ensure that thrust stabilizes at takeoff N1 (referencing the EICAS N1 indication)

QWTip: As the thrust levers reach the end of their forward movement, the QWCAS PF will announce "Check Thrust". The PM ensures that thrust stabilizes at takeoff N1 and announces "Thrust Set"

- Thrust.. Ensure stabilized
  Check that THR REF appears on both FMAs and thrust levers advance to takeoff N1. Make any final adjustments to takeoff N1 by 80 knots.
  Do not readjust thrust settings after 80 knots.
  Observe A/T HOLD at 80 knots.
  Monitor instruments and warning lights.
- Note: If the autothrottles are not engaged by 50 KIAS, they cannot be engaged until above 400 feet RA

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- Airspeeds .... Call out
  - o At 80 KIAS call out, "80 knots".
  - o At V1-5 knots call out, "V1".
  - o At VR call out "Rotate".

QWTip: At 80 knots, the QWCAS Pilot will call out "80 knots". The QWPAS PM will respond "Checked". At V1, the 787 Synthesized Voice will announce "Vee One". At VR, the QWCAS PM will announce "Rotate"

- Initial Climb.. Initiate
  Though the Tail Strike Protection System will make it difficult, do not exceed normal rotation rate (2 degrees/sec), as tail contact with the runway is possible.
- "Positive rate" .... Call out
  Verify positive rate on both VSI and altimeter.

QWTip: When a Positive Rate of Climb is established after takeoff, the QWCAS PM will announce "Positive Rate" and the PM will announce "Gear Up". The gear will not come up automatically.

- Landing Gear Lever .... UP Position

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After Takeoff

General (Flow)

The PM calls for the After Takeoff Checklist at a time that does not interfere with vigilance while departing the terminal area. This generally occurs around 3,000 feet AGL.

After Takeoff Flow	
Gear	UP
Flaps	UP
Engine Anti-Ice	AUTO

After Takeoff Procedure

- Gear ....
UP (white) all landing gear are up and locked (indication blanks after 10 seconds).
- Flaps..
UP (white) the slats and flaps are retracted (indication blanks after 10 seconds).
- Engine anti-ice .... AUTO
Select ENGINE ANTI-ICE switches to AUTO if they were turned to the ON position during taxi and takeoff.
- After Takeoff Checklist .... Perform

After Takeoff Checklist

Climb

Climb Considerations

Passing through 10,000 feet MSL, push the cabin chime button once as an indication of aircraft altitude to the flight attendants.

QWTip: Passing through 5,000 AGL, QWPAS Flight Attendants greet the passengers with an After Takeoff Announcement.

QWTip: Passing through 11,000 AGL, QWPAS makes an automated announcement letting the Passengers know that the Use of Portable Electronic Devices is permitted.

Set barometric pressure on all altimeters as required.
STD will display on the Primary Flight Display below the Altimeter.

Thrust Management

Once climb thrust is set, the EEC automatically compensates for the various changes in environmental conditions during the climb and maintains climb thrust.

VNAV Operation – Climb

The VNAV climb phase is initiated when reaching the thrust reduction altitude entered on TAKEOFF page 2/2, and continues until reaching the entered cruise altitude at the top of climb (T/C) point.

Verify that thrust reduction occurs at the FMC-generated altitude of 800 feet by observing thrust lever movement, engine sound, and the proper EICAS indication of CLB.

Verify VNAV commands an acceleration (limited by flap/slats or gear configuration) at the FMC-generated altitude of 1500 feet RA, by observing that FMC airspeed has changed from the speed at VNAV engagement to one of the following:

190 knots for 20° flap takeoff	(flap limit speed is 210 knots)
210 knots for 15° flap takeoff	(flap limit speed is 215 knots)
225 knots for 5° flap takeoff	(flap limit speed is 230 knots)

When the flaps/slats are retracted, VNAV commands an acceleration to the VNAV climb speed of:

- 250 knots, or
- The speed transition associated with the origin airport, or
- The speed entered on the VNAV CLB page SPD RESTR line.

After the gear and flaps are retracted and all speed transitions or speed/altitude restrictions are met, the CLB page title becomes ACT 250KT CLB. At the speed transition altitude the CLB page title changes to ACT ECON CLB (or the pilot selected climb mode of ACT XXXKT CLB).

For VNAV to operate successfully, it must be understood that when the ATC departure clearance has a SID with altitude/speed constraints the PF must set the highest altitude for the SID in the MCP altitude window. This allows VNAV to fly the CDU altitude profile that matches the SID climb profile. The aircraft autopilot will not climb past an MCP Altitude. We will also see that during a descent that the aircraft autopilot will not initiate a descent below the MCP Altitude. We have set our MCP to 35,000 feet, so this will not be a concern of ours.

Climbing through Transition Altitude

- Altimeters ....Set standard" (STD)
  Select STD on the EFIS control panel and ISFD.

Climbing through 18,000 Feet

- Turn off the runway turnoff lights, the landing lights, and the wing lights.
- Logo lights are as desired.
- Verify the fuel panel is set up appropriately and the current fuel quantity is acceptable.

Cruise Announcement QWCAS

As you approach the Top of Climb (T/C indicated on the ND), turn the Seatbelt Sign OFF. The Captain will make an announcement to the Passengers about the flight.

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Cruise

You've done it! You got the aircraft to the Top of Climb. It's smooth sailing for a little while now. VNAV transitions to the cruise phase when reaching the top of climb (T/C) point, defined by the cruise altitude entered in the FMC during preflight, and continues until reaching the top of descent (T/D) point.

Cruise Procedure

Altimeter Verification

Upon reaching initial cruise flight level:

- Altimeters .... Verify altimeter set
  Verify:
  o All altimeters are set to 29.92/STD.

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Tutorial 4 – Lets Land

Descent

What goes up, must come down. It's time to get these passengers on the ground in San Francisco. But the descent phase is not to be underestimated. Careful planning ahead ensures that the aircraft will be slow enough for the approach phase.

Descent Procedure

Start the Descent Procedure before the airplane descends below the cruise altitude for arrival at destination.

Complete the Descent Procedure by 10,000 feet MSL.

- Recall and notes ....Checked
  Press RECALL to check EICAS for any displayed messages, then cancel.
- Reference speeds .... _____Set
- Enter VREF on the APPROACH REF page.
  - o Selecting the desired landing flap speed prompt causes the flap/speed to be selected to the scratchpad. Entering the flap/speed to line 4R transmits the computed VREF for the displayed gross weight to the speed tape. It is displayed as REF
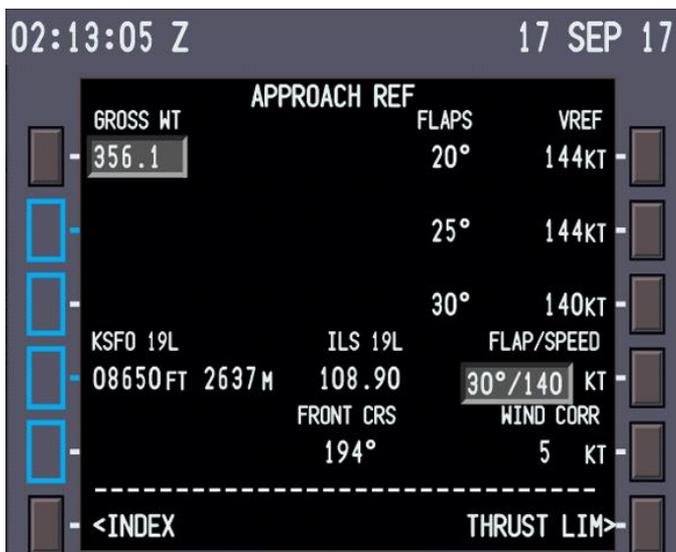
- Landing distance and autobrakes....................................Checked,____set
  Set the AUTOBRAKE selector to the needed brake setting.
  For normal landing conditions, autobrakes 2 or 3 used with idle reverse thrust optimizes brake wear. Normal autobrake/reverse thrust management is autobrakes 2 or 3 and idle reverse.
  Use the following as a guide to set the autobrakes:
  1 Not practical for carbon brakes.
  2 or 3 Provides adequate deceleration rates for most routine operations where the runway is dry or braking action is reported as good.
  4 Use when moderate deceleration rates are required or if the runway is reported wet, slippery, or braking action is reported poor.
  MAX AUTO Use when maximum deceleration rates are required or landing rollout distance is limited. This deceleration rate is less than that produced by maximum manual braking.
- Set the RADIO/BARO minimums as needed for the approach.
- Do the approach briefing.
- DESCENT Checklist...Perform

Approach

Approach Procedure

The Approach Procedure is normally started at transition level.

Complete the Approach Procedure before:

• The initial approach fix, or

• The start of radar vectors to the final approach course, or

• The start of a visual approach

- ▪ Altimeters ....___In/hPa, ___ baro/radio
  Set barometric pressure on all altimeters as appropriate. Set minimums for the planned approach.
- ▪ Seat belt sign ....On.

Below 18,000 feet:

- ▪ Runway turnoff, strobe, logo (night only), landing, and wing lights are required when below 18,000 feet, meteorological conditions permitting.
- ▪ At transition level, or as appropriate, set and crosscheck the altimeters.
- ▪ VSD .... Select as needed
- ▪ Approach checklist .... Perform

Flap Extension Schedule

Current Flap Position	At Speed Tape "Display"	Select Flaps
UP	UP	1
1	1	5
5	5	20
20	20	25 or 30

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Landing

General (Flow)

The Landing Checklist in is called for by the PM below 1500 feet RA and less than 10 NM from the destination. Typically, this checklist is done in conjunction with the placing the Landing Gear down on all normal landings.

Landing Flow	
Speedbrake	Armed
Gear	Down
Flaps	As Required

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Landing Procedure General

- Speed brake ....Armed
  Place the speed brake lever in the ARMED position; the EICAS message
  SPEEDBRAKE ARMED is displayed. If the EICAS advisory AUTO
  SPEEDBRAKE message is displayed, disarm the speed brake and use
  manual speed brake for landing.
- Gear .... Down
  Primary verification of gear position is by the EICAS GEAR DOWN (green)
  normal display.
- Flaps..___
  Verify the flap position indicator on the primary EICAS display
  corresponds to the flap handle position selected for landing.

Landing Checklist
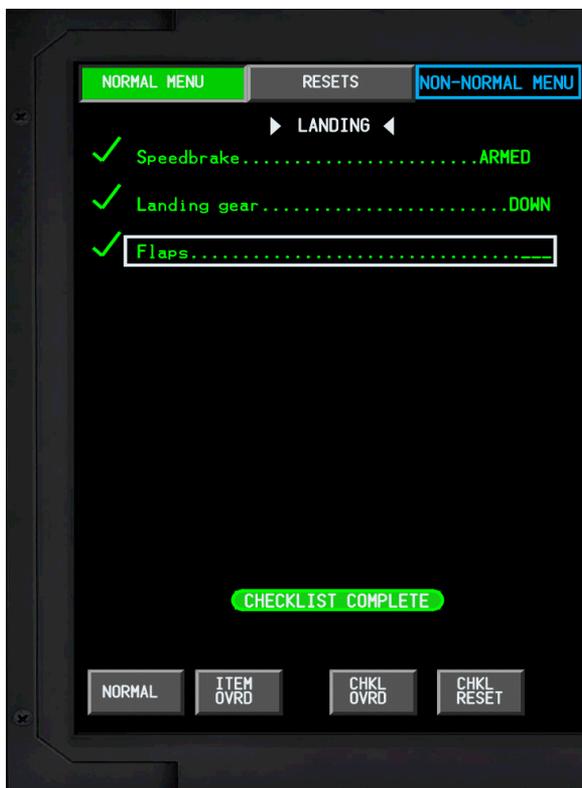
ILS Landing Procedure

Several types of approaches are available for the 787 but for this tutorial we are shooting an ILS approach.

Initially, our approach will be to a fix. LNAV will be the roll mode and VNAV will be the pitch mode

- Set appropriate flap maneuver speed in IAS window.
- When on localizer intercept heading:
  Verify that the navigation radios are tuned and identified
  Verify that the deviation pointers are shown
- Arm the APP mode.
- Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.
- Use LNAV HDG SEL/TRK SEL or HDG HOLD /TRK HOLD to intercept the final approach course, as needed.
- Verify that the localizer is captured.
- Verify final approach course heading.
- At glideslope alive, check speed below appropriate limit:
  o Set the landing gear lever to DN.
  o Set the flap lever to 20.
    Verify flaps are in transit to the required position.
- Set appropriate flap man oeuvre speed in IAS window.
- Set the speedbrake lever to ARMED.
- Set appropriate (VREF+5) speed in IAS window.
- Set the missed approach altitude on the MCP.
- LANDING checklist .... Perform
- Monitor the approach

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After Landing

General (Flow)

Initiate the landing flow when situational awareness and time permits and clear of all active runways.

Ultimate 787
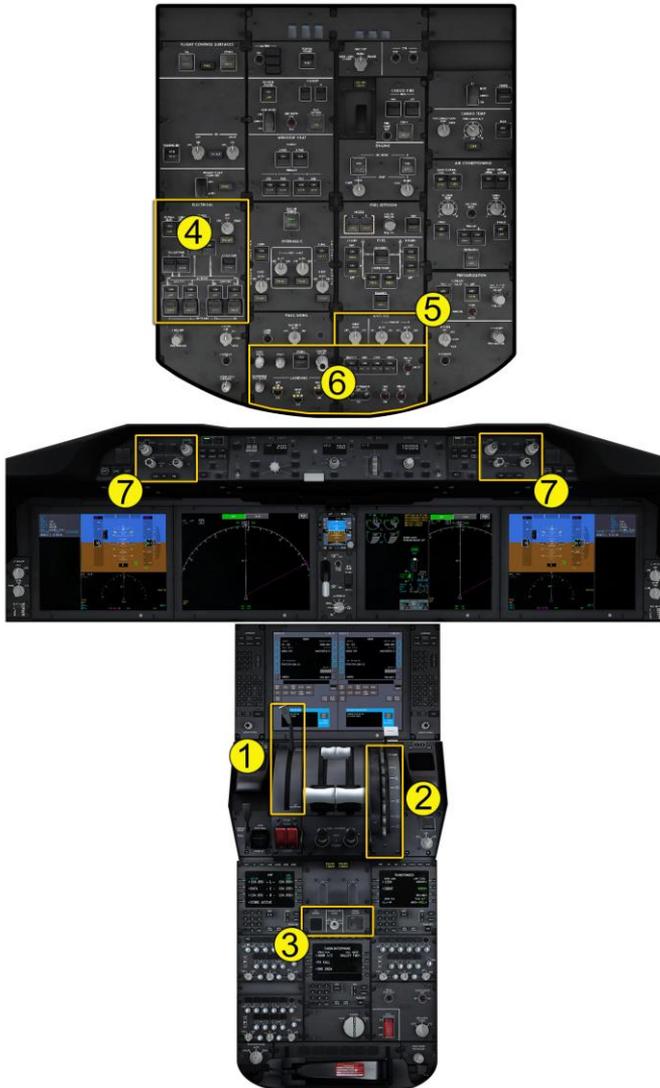
After Landing Flow	
Speedbrake	DOWN
Flaps	UP
Transponder	XPDR
APU	Start
Anti-Ice	As Required
Lights	OFF
Weather Radar (WXR)	OFF

After Landing Procedure

The After Landing procedure must be accomplished prior to engine shutdown.

- Speed brake lever .... Down
- Flaps ....Up
- Transponder ....XPDR
- APU ....Start
- Anti-ice ....As required
  Wing anti-ice is verified in the AUTO position. Engine anti-ice is turned ON if icing conditions exist. See the Supplementary Procedures chapter, Adverse Weather, for further considerations. Window heat is normally left on at through-flight stations.
- Exterior lights...As required
  - o Turn off landing, wing, and strobe lights exiting the runway.
  - o **Daylight** Leave NAV lights on. Use taxi light as required.
  - o **Darkness** Leave NAV and logo lights on. Turn off strobe lights. Use external lighting as necessary for taxi.
- Weather radar switches .... Off
  Switches are installed on the EFIS control panel.

Ultimate 787

Shutdown

General (Flow)

The Shutdown Flow will be initiated after the aircraft comes to a stop at the gate or parking spot and the engines are shut down.
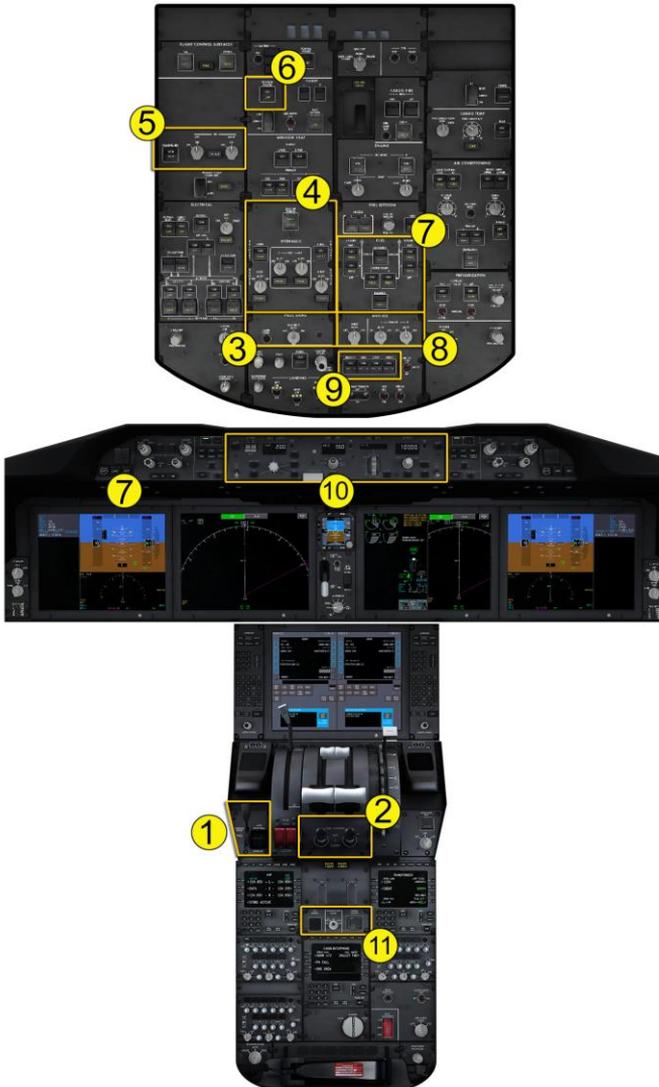
Shutdown Flow	
Parking Brake	Set
Fuel Cutoff Switches	OFF
Seat Belts	OFF
Hydraulic Pumps	OFF
IRS Selectors	OFF
FD Door Power	OFF
Fuel Pumps	OFF
Engine Anti-Ice	AUTO
Beacon	Off
Flight Directors	OFF
Transponder	Standby
External Power	AS Required

Parking Procedure

- Parking brake .... Set
  Set parking brake when at a full stop.
  Verify the PARKING BRAKE SET message is displayed.
  Leave the parking brake set provided the **BRAKE TEMP** EICAS message is not displayed.
- Fuel control switches .... Cutoff
  After APU or external power is ON, position the fuel control switches to CUTOFF.
- Seat belt sign .... Off
  Once the parking brake is observed set, turn off seat belt sign
- External power .... As required via the QualityWings Control Panel
  If available for electrical power, select L FWD and R FWD when AVAIL light illuminated and observe ON lights illuminate.
- Hydraulic system ....
  - Left electric demand pump selector .... Off
  - C2 and C1 electric primary pump switches.................................... Off
  - Right electric demand pump selector... Off
  All electric pump switches are turned off. Engine pump switches are left ON.
- Flight deck door power switch .... Off
- Fuel pumps .... Off

Place all fuel pumps switches OFF. If APU is running and AC busses are powered, left aft fuel pump will be on and PRESS light extinguished, regardless of pump switch position

- Engine anti-ice ....Auto
- Beacon .... Off
- HUD .... Stow
- EFB main menu...Close flight
- Transponder .... Standby
- IRS selectors.. Off

  Both A/C and D/C electrical systems should remain powered until the IRSs are shut down.

- Shutdown Checklist .... Perform

Shutdown Checklist

Secure

General

Normally, pilots will not depower the aircraft, but procedures for doing so are provided.

Secure Procedure

- Emergency lights .... Off
- Packs/lower recirc fan .... Off
- EFB PWR switch .... Off
- APU/EXT power ....As required
  Configure the electrical system as required. Normally leave the electrical system powered. Use of external power is preferable to operating the APU.
- Battery switch... OFF

Secure Checklist

QualityWings SIMULATIONS
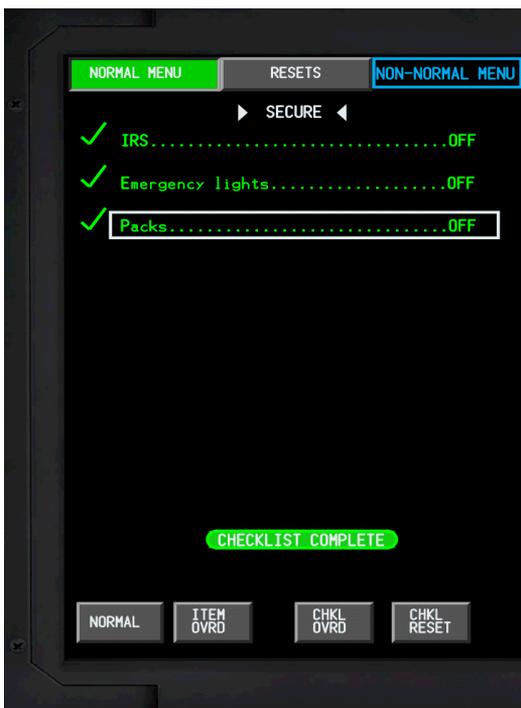
Tutorial 5 – Ready to Go! Autopilot 101

This standalone tutorial is for those who want a basic understanding of the 787 Autoflight System. It does not require any of the previous tutorials to be completed. If you have completed Tutorials 1 and 2, then you will be ready for this one. If you loaded the aircraft from the Free Flight menu, as long as you have engines running you should be ready to go with this tutorial.
The basic requirements:

- Engines Running
- IRS Aligned
- Hydraulics Available

This tutorial assumes the use of the virtual cockpit primarily. The 787 runs a 30 second initialization process when it first loads into the sim. This will be noted by a banner at the top of your display.

Welcome to the Quality Wings Ultimate 787 Collection. Please allow 30 seconds for initialization.

We suggest not touch anything during this 30 second period to ensure everything is set up correctly.
Once the process is complete, a message will show letting you know that it's ok to start interacting with the switches.

Quality Wings 787 initialization complete. Enjoy your flight!

FSX Setup

- Choose any 787 variant that you want.
- Load the aircraft in KSEA and choose Runway 16L.
- Choose your Current Weather to "Clear Skies"
- Choose 12 noon in Time and Season

Aircraft Setup

Runway 16L will align you to a heading of 163.

- Ensure your Heading Indication on the Navigation Display shows 163
- Ensure the Parking Brake is Set

Set up the Mode Control Panel as follows:

- Flight Director Switches ON
- Both Autothrottle Switches to ARM
- Ensure Speed is set at 200 knots

- Set Heading to 210
- Set the Altitude Window to 5000

You Mode Control Panel will look like this:
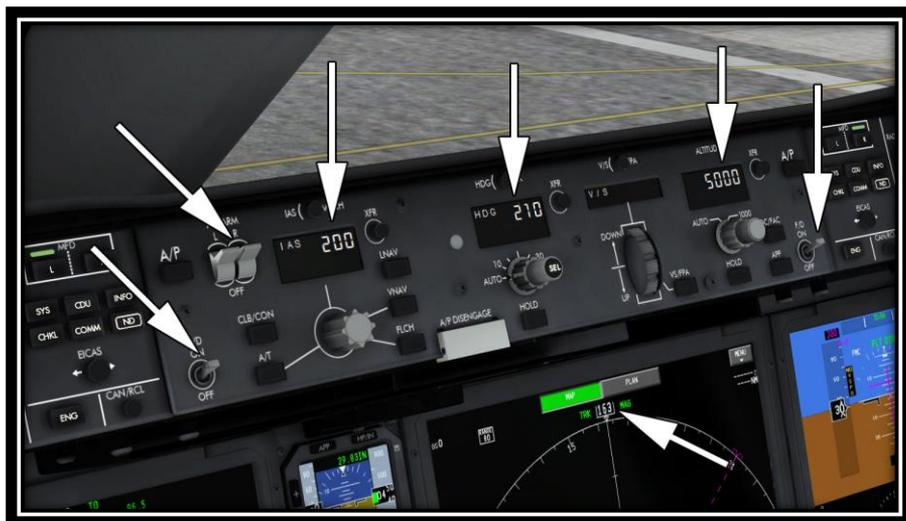
The Autoflight Mode Annunciator (FMA) at the top of the Primary Flight Display (PFD) will look like this:

The left column is for Autothrottle System status, the middle is for Autoflight Roll Modes and the right column is for Autoflight Pitch Modes.
TO/GA is the Roll and Pitch mode for Takeoff.
Below the FMA is the Autopilot System Status. With the Flight Director Switches ON, FLT DIR shows. Notice the box around FLT DIR. This box shows around a change in the status of all FMA and Autopilot modes for the first 10 seconds that a new mode is active and then it disappears.

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Set Flaps to 5 Units
Verify Flap Position on EICAS as shown below:

While we understand you might not want to load an FMS route, there are some basic steps that need to be taken in the CDU to ensure a safe takeoff.
On the Lower Display Unit should be showing the CDU on both halves:
On the Left CDU

- Select the RTE mode key
- Enter KSEA into the scratchpad
- Select LSK 1L to enter KSEA into ORIGIN
- Enter 16L into the scratchpad
- Select LSK 2L to enter 16L into Runway

On the Right CDU

- Select the INIT REF Mode Key
- Select LSK 6L to go to the INDEX Page
- Select LSK 4L to go to the TAKEOFF Page
- Enter 5 into the scratchpad
- Select LSK 1L to enter 5 into the FLAPS box

Once those values have been entered, Takeoff V Speeds become available and will be placed on your PFD Speedtape. You will also hear Aural callouts for these V-Speeds. This will help in determining rotation speeds.

Your completed CDU should look as follows:
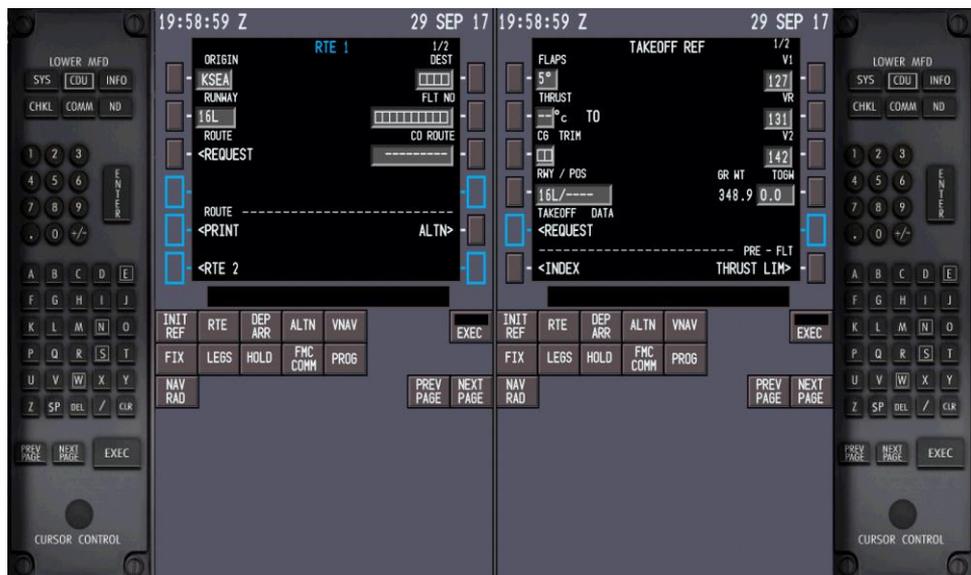
Takeoff Roll

Now that we're all setup, it's time to takeoff, but first let's get familiar with the Takeoff Warning System. Make sure that your Parking Brakes are still SET. Smoothly advance the throttles to approximately 60 % N1. An easy way to determine where 60% N1 is going to be is to imagine a line extending up from the upper left part of the arc of the EGT gauges below the N1 gauges.

At this point you should be hearing the Warning Siren blaring. You should also see the Red Warning Message "CONFIG PARKING BRAKE". The Takeoff Warning System alerts you to improper configuration that could make taking off unsafe. If this occurs, bring your throttles back to idle, correct the configuration problem and then try it again. In our case, we deliberately kept the parking brake set.

With your throttles at 60% N1, it's time to engage TO/GA Takeoff mode. This is a Flight Director Only Mode, but we are not going to sue Flight Director Guidance during the takeoff. WE will begin following the bars AFTER we lift-off.
TO activate the TO/GA mode, click the screw immediately above the Captains side Flight Director Switch. You could've used the TO/GA switches in the front of the Thrust levers as well.

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The Autothrottles will advance the throttles to meet the Green Thrust Reference Number above your N1 indicator (GE) or the TPR indicator (RR). When TO/GA is activated, the Autothrottle System Mode will change to **THR REF**. This is your indication that the autothrottles are driving the levers to that **THR**ust **REF**erence.

```
THR REF │ TO/GA │ TO/GA

         FLT DIR
```

Maintain slight forward pressure on your yoke or joystick until reaching 80 knots and use the rudder if necessary to keep the airplane aligned with the runway centerline.

Once the aircraft reaches 80 knots airspeed, the autothrottles will remove power from the thrust levers and engage into a mode called HOLD. It's not really holding the throttle there, but it is no longer moving them for them remainder of the takeoff roll and during climb until another Pitch Mode other than TO/GA is selected.

```
HOLD  │ TO/GA │ TO/GA

         FLT DIR
```

Upon reaching V1 speed we are committed to flying. At VR, smoothly rotate at around 2 to 2.5 degrees per second toward a goal of 15 degrees nose up after liftoff. Be careful not to rotate too quickly. The 787 has a Tail Strike Protection system that tries to inhibit tail strikes, but rotating too quickly runs the risk of a tail strike. Continue pitching above 15 degrees to keep the airspeed below the Flaps 5 bug and then follow the flight director bars but do not "chase" them. Smoothly maneuver to follow them.

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Climbout

Fly Runway Heading and Wings Level until approximately 1000 feet Radio Altitude and immediately engage the Autopilot by clicking the CMD switch on either side of the MCP. When you click the switch, a light in the switch will illuminate to let you know the Command mode is engaged.

The Autopilot Status will now show as A/P on the PFD. The Autothrottle, Roll & Pitch statuses remain as they were during the takeoff roll.
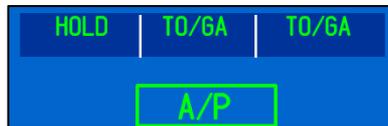
Since we engaged the Autopilot at around 1000 feet (radio height), it will continue to climb to the MCP Altitude of 5000 feet (barometric height). The Autothrottles are still commanding to the thrust Ref Limit.

Don't forget to retract Flaps before they get to the Flap Retract Speeds as indicated on the PFD.

Altitude Hold Mode

As the aircraft approaches 5000 feet, you will have the Altitude Alert aural sound. The Autopilot Pitch mode will change to ALT which is Altitude Hold. The Autothrottle will transition from commanding thrust to the limit to a SPD mode (Speed Mode). Now the throttles will adjust to ensure the aircraft speed is at 200 knots while we are at 5000 feet.

The FMA will look like this.

SPD	TO/GA	ALT
	A/P	

Autothrottle Speed Hold Mode

We are already in SPD Hold mode right now but to demonstrate the speed control while in this mode, rotate the IAS/MACH selector until the window reads 240.

QWTip: You can right to increase values and left click to decrease values on the window or the knobs on the MCP

Notice how the Autothrottles increase the thrust on the engines to get the airspeed moving towards 240 knots.
Once approaching 240 knots, they should start to reduce thrust to make sure the aircraft doesn't exceed 240 knots.

The FMA will look like this.

SPD	TO/GA	ALT
	A/P	
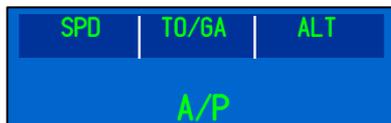
Heading Select Mode

We need to select another Roll Mode. Prior to departure, we set 210 in the MCP Heading Window. We should still be flying at or close to our runway heading.
We will now engage Heading SELECT mode which will initiate a right turn towards a heading of 210 degrees.
Select the center pushbutton on the Heading Selector labeled **SEL.**

The FMA will display as follows:

SPD	HDG SEL	ALT
	A/P	

Once the aircraft approaches 210 degrees, it will level the wings to maintain that heading. The Heading knob is continuously armed while HDG SEL is active. If you rotate the knob in any direction, the aircraft will roll to the new heading without clicking SEL.

Now you should have a heading on your ND that displays 210 if you did indeed follow the instructions which said to clear all Weather (Clear Skies weather profile). But in reality there will be winds out there, so let me show you something might see.

Notice in the above picture that even though the Heading Bug is at 210, the aircraft is not quite at that heading. In my example, I have slight winds. The ND shows the TRACK of the aircraft. We are indeed at a heading of 210, but we are tracking towards 205.

The small upside down triangle centered on the Heading Sel Bug on the ND shows out Heading of 210. In other words, we're "slipping" through the air just a bit which can be completely normal.

Track Select Mode

It is more realistic to operate in TRACK Roll Modes. To switch the autoflight system between Heading and Track Modes, use the button immediately above the HDG/TRK Windows labeled HDG/TRK. When you click the button, the HDG/TRK windows label inside changes from HDG to TRK.

And after a slight adjustment from the autopilot, you will now see that the bug symbol changes a bit to reflect Track instead of Heading. And now our value on the MCP matches what is in the ND TRK window.

2This is what the FMA should look like now.

Roll Hold Modes

We are currently in TRK SEL mode at 210 degrees.

Right click on the HDG/TRK window until it reads 300 degrees. The aircraft will immediately begin a right turn for a Track of 300 degrees.

While the aircraft is in this turn, at around 280 degrees while still turning click the HOLD button immediately below the HDG/TRK Selector. This will engage TRK Hold Mode.

The aircraft will stop turning towards 300 degrees and stop the turn. If you clicked it around 280, it should stop at a track of approximately 285-288. This is ok.

Had we been in a HDG SEL mode, when we clicked on the HOLD Switch we would've transitioned to HDG Hold instead of TRACK Hold.

The FMA should look like this now:

SPD	TRK HOLD	ALT
	A/P	

Pitch Mode Changes

Let's climb another 5000 feet up to 10,000 feet. First we need to set the Altitude Window to our Target Altitude of 10,000. Right click on the window of the Outer Knob until the window reads 10,000.

QWTip: By default, the aircraft loads with the Altitude Selectior increment in Auto mode. In this mode it may take longer to dial in Altitudes. You can right click on the INNER Altitude knob to change the Altitude selector increments from Auto to 1000s. In auto, you can select Altitudes in 100s. In Auto, altitudes are incremented by 1000s

Notice that the aircraft did not pitch up to try and get to 10,000 feet? That's normal since we have to pick a pitch mode to get us there.

QualityWings SIMULATIONS

Vertical Speed Mode

The first pitch mode we will operate is called Vertical Speed Mode. In this mode, the Autopilot will command a climb or descent to whichever Vertical Speed that you dial into the Vertical Speed/Flight Path Angle Window. In this mode, Vertical Speed is prioritized over speed.

QWTip: While the Autothrottle remains in Speed Mode, the Auto pilot will pitch the aircraft to whatever you dial in, regardless of whether an excessive vertical speed in climb will result in speed degradation or rising speeds during Vertical Speed descents. Use caution when in this mode.

First, click on the VS/FPA button below the Vertical Speed Window to open up the normally blank Vertical Speed Window.

The window will open to whatever Vertical Speed the aircraft is currently doing. Since we were already in Altitude Hold Mode at 5000 feet, when clicking on the V/S/FPA button, the window should open to "0000"

Use your Mouse scroll wheel on the Vertical Speed wheel to dial in a +2000 Vertical Speed.

The aircraft will pitch up to maintain a vertical speed of 2000 FPM until it we transition to 10,000 feet.

The FMA should look like this during Vertical Speed mode:

SPD	TRK HOLD	V/S
	A/P	

As we approach 10,000 feet, the Vertical Speed window will close and the pitch mode on the FMA will transition back to Altitude Hold Mode (ALT)

SPD	TRK HOLD	ALT
	A/P	

Flight Path Angle Mode

Where Vertical Speed Mode commands for a selected climb or descent based on vertical speed, Flight Path Angle (FPA) commands to a specific flight path angle in climb or descent.

Dial in 15,000 feet in the Altitude Windows. To switch from Vertical Speed Mode to FPA, click on the VS/FPA switch directly above the Vertical Speed window to change from VS to FPA. The display window will show FPA.

Now select the VA/FPA mode switch to open he VS/FPA window and activate the FPA mode. Dial in an approximate FPA command of +3.0.

QWTip: The flight path angle display is set in increments of one-tenth of a degree and a range of ±9.9 degrees. You may open the FPA window and a small FPA value will show indicating a slight FPA such as 0.06 as an example. Rotating the switch from this point with result in that additional hundredths value remaining with your selected value. In the example above when the FPA window was opened, there was a slight FPA of 0.03. Dialing to +3.00 will display as +3.03 as it includes this initial FPA.

The FMA will display as follows:

As we approach 10,000 feet, the FPA window will close and the pitch mode on the FMA will transition back to Altitude Hold Mode (ALT)

Flight Level Change Mode (Climb)

This next mode is one of the most effective and widely used pitch modes When FLCH engages, the autothrottle (if armed or engaged) automatically engages in the thrust mode (THR) to provide a constant thrust level. The thrust level is proportional to the altitude change requested. The target climb or descent rate is low for small altitude changes and is increased for large altitude changes. The autothrottle will command the appropriate thrust level between full climb thrust and idle. FLCH engages and maintains desired speed through pitch control even if the autothrottle is not armed, but manual throttle manipulation is required to achieve the desired climb or descent performance.

When FLCH is activated, it will grab the aircrafts CURRENT speed in the place it in the IAS/Mach Speed Window. This will be used as the reference speed for the FLCH climb (or descent).

To demonstrate this:

- Increase the Altitude Window to 30,000 feet
- Rotate the IAS/MACH selector until the window reads 300.

The autothrottle will begin to increase thrust to speed the aircraft up to 300 knots. When the speed gets to approximately 280 knots, immediately hit the FLCH mode switch. Notice that the Speed Window changes to approximately 280 (or the current speed that the aircraft is flying when FLCH is engaged). The Autothrottle will command for thrust as needed. In this case, it commands for thrust to the Climb Limit as displayed on EICAS as this is a large altitude change.

The FMA will display as follows:

```
┌THR REF┐│TRK HOLD│  FLCH
└───────┘│        │

           A/P
```

Once leveling off at 30,000 feet, FLCH will transition to Altitude Hold Mode once again and the autothrottles will transition to SPD Mode.

```
   SPD    │TRK HOLD│   ALT

           A/P
```

Autothrottle Mach Hold Mode

Now that we are at high altitudes, let's switch the Autothrottle from Speed Hold mode to Mach Hold Mode. Pressure the IAS/MACH switch immediately above the IAS/MACH window. The Mach Window will now display a Mach label and the current Mach number now shows.

The FMA will display as follows:

```
┌ MACH ┐│TRK HOLD│   ALT
└──────┘│        │

           A/P
```

If you had an airspeed of approximately 280, then when you switchover to Mach, it show be approximately .73.
Change the Mach speed to .80. The aircraft will speed up to Mach .80

Flight Level Change Mode (Descent)

We have already used Flight Level Change for a climb. We will now use it for a descent to 20,000 feet.

- Dial in 20,000 in the Altitude Window
- Select FLCH

The Autothrottle will start to reduce thrust and eventually enter a HOLD mode. The autopilot will pitch as required to maintain the Mach of approximately .80 during the descent. FLCH will not allow the aircraft to overspeed as Mach .80 becomes too fast at the lower Altitudes.

The FMA will display as follows:

Once we've leveled off at 20,000, the Pitch Mode will change back to ALT.

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Autopilot Disconnect

Now that we are stable at 20,000 feet, let's discuss disconnecting the Autopilot. The autopilot can be disconnected 3 different ways:

- Disconnect Switch on the Control Wheel (Normal Method)
- Disconnect Bar on the MCP (Alternate Method)
- Overriding the control wheel or control column
- · <u>Note</u>: An override is not a normal means of disconnect the autopilot

Disconnect the Autopilot now by pushing the disconnect button on the Control Wheel. You will see an **AUTOPILOT DISC** EICAS Message and you will hear the Autopilot Disconnect Aural Warning. The warning will remain on EICAS untilt he switch is pushed a second time OR the Autopilot is reengaged. Go ahead and click the disconnect switch one more time clear the EICAS message. Then engage the Autopilot again. Confirm it is engaged by looking at the Autopilot CMD Status on the PFD.

Now disconnect the Autopilot by clicking the Disengage Bar on the Mode Control Panel. . You will see the **AUTOPILOT DISC** EICAS Message and you will hear the Autopilot Disconnect Aural Warning just as you did when using the switch on the control wheel. When the Bar is down, an orange and black strip will be revealed.

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Reset the warning message and aural sound the same way that you did with the previous disconnect. Now while the bar is still down, try to re-engage the autopilot. Notice that the Autopilot did not engage. It will not engage until that bar is returned to normal.

Do that now:

- Return the Disconnect Bar to Normal (UP
- Engage the Autopilot
- Confirm it is engaged.

Let's continue with the next to last mode that will be discussed: Approach.

QualityWings SIMULATIONS

Feature: Approach Config

We will use the QualityWings ApproachConfig feature to line us up for an Approach back into Seattle.

On the Captains Display Select Panel, select the INFO Page to show on the left hand side of the Inboard MFD. Then click on the APPCONFIG Tab.

You should now be on the Approach Reposition Page.

Activate the Direct Key Entry Mode on the left CDU by clicking the scratchpad. It will turn magenta in color to indicate that this mode is active. This allows you to type instead of clicking on the MKF keys.

QWTip: Direct Key Entry mode allows you to use your keyboard to type into the scratchpad. You can also use your arrow keys to navigate within the CDU environment. To enter Direct Key entry mode, simply mouse click within the scratchpad. When the scratchpad changes from black to maroon in color, Direct Key Entry Mode is active. To exit this mode, simply click the scratchpad again and it will return to black.

Please note that any key commands used within the Flight Sim environment (such as clicking P for pause) will not work until you exit Direct Key Entry Mode.

Type KSEA into the scratchpad of the Approach Reposition Page.
You will see that it shows being typed on both the CDU and the APP Reposition Page. This is normal.

Click the SEND Button to send KSEA into the Airport box below Approach Reposition Title.

Once KSEA is sent to the Airport box, all available runways and approaches for Seattle International will display.

By default a Visual Approach is selected for Runway 16C.Our approach is not going to be on 16C, but instead 16L. And by setting up for an actual approach procedure for this runway, the ILS frequencies will also be tuned automatically for us.

Make the following selections:
Runway 16L
Approaches .... ILS 16L
Initial Approach Fix/Approach Fix .... GRIFY

The Approach Reposition page should like this now:

Another feature during Approach Config is that once an Approach procedure is selected, the Electronic Flight Automatically displays the procedure chart for the selected approach. This will give you a chance to review the approach procedures as necessary.

Before we click reposition, let's find out what our Approach Reference Speeds are for our Landing Flaps. We do this via the CDU APPROACH Page.
On the left CDU:

- Select INIT/REF
- Select INDEX at LSK 6L
- Select APPROACH at LSK 5L

Your approach reference numbers may look different than the graphic below:
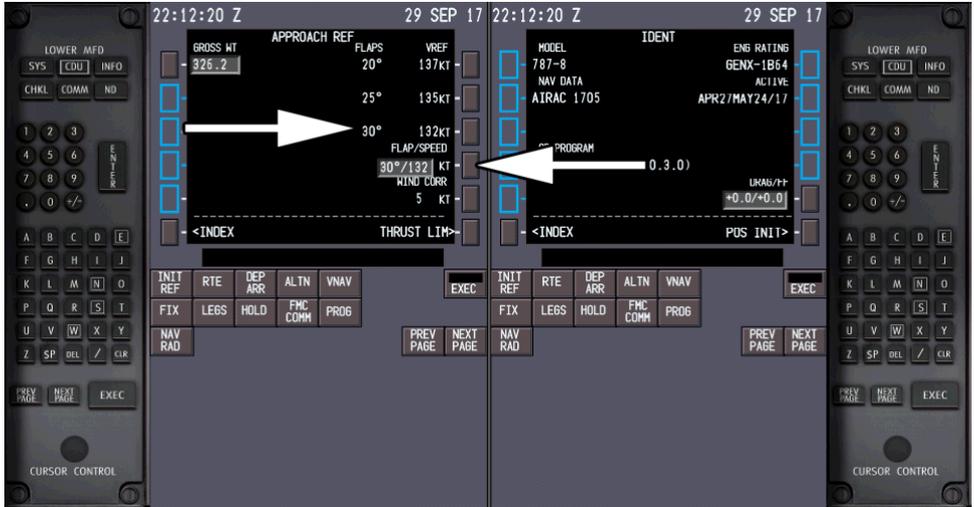
When you click reposition, the aircraft will be moved to the IAF of GRIFY at an Altitude of 6,000 feet.
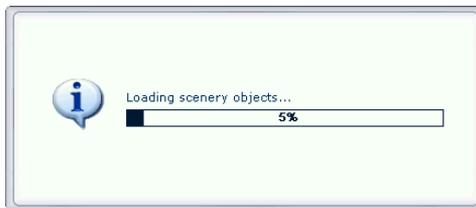
The aircraft will load Paused to allow you to check the aircrafts configuration for the approach. Approach Config will configure the aircraft at a speed of approximately 210 knots with the MCP set at 210 knots. But always confirm that the MCP is set to 210 knots.

QualityWings SIMULATIONS

The FMA should look like this before you un-pause the simulator:

SPD	TRK HOLD	ALT
A/P		

When you un-pause the simulator, it will take a few seconds for App Config to stabilize the aircraft.

Approach Mode

The Approach Mode provides Localizer and Glideslope signals to the Autopilot. We are going to shot an Automatic Approach Landing (Autoland).

- Dial in 2000 feet into the Altitude Window
- Select APP mode on the MCP.
  - o Verify the APP mode button lights up
  - o Verify that LOC (Localizer) shows below TRK HOLD on the FMA
  - o Verify that G/S shows below ALT on the FMA

LOC and G/S show in smaller text and white in color. This means that these modes aree armed for automatic engagement later on during the approach once they pick up their respective ILS signals. But we're still currently holding track and Altitude.

The FMA should look like this

We need to start descending.

- Dial in 2000 feet into the Altitude Window
- Select FLCH

- Set your Flaps to 5
- Select an Autobrakes Setting of 4
- Arm the Autospeedbrakes (Shift + / or whatever you have setup for this command)

The aircraft will start to make a right turn as the Localizer captures, it will automatically become the Active Mode:

QualityWings SIMULATIONS

- Set the MCP Speed to 180 knots
- Set the Flaps to 20

When the Glideslope captures, it will automatically become the Active Mode:

SPD	LOC	G/S

A/P

- Lower the Landing Gear
- Set MCP Speed to 150 knots
- Set the Flaps to 30

At 1500 Feet Radio Altitude the Autopilot will engage into Multi-Channel Autoland Approach and annunciate LAND 3 in the Autopilot Status on the PFD. Two modes arm:

- Flare for the Pitch mode
- Rollout for the Roll Mode

SPD	LOC ROLLOUT	G/S FLARE

LAND 3

At approximately 50 feet RA, the Pitch mode changes from G/S to FLARE

```
 SPD  |   LOC   |  FLARE
      | ROLLOUT |
              LAND 3
```
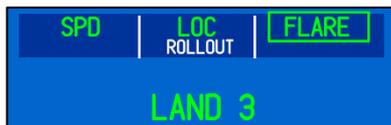
At approximately 30 feet RA, the Autothrottle mode changes from SPD to IDLE

```
 IDLE |   LOC   |  FLARE
      | ROLLOUT |
              LAND 3
```
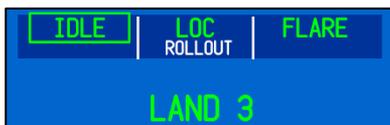
At touchdown, the Autothrottle disconnects and the Roll Mode changes to ROLLOUT

```
        | ROLLOUT |  FLARE
              LAND 3
```
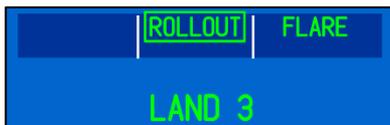
Great job on handling the 787 Autoflight System!
Last mode: Go-Around

Go Around Mode

The Final Autopilot Mode in this Tutorial to be discussed is G-Around Mode. Let's say that you're on an approach and you need to abort the landing, the Go-Around mode will provide thrust to the Go-Around limit and fly wings level to a Missed Approach Altitude that we will enter into the MCP Altitude Window.

Approach Config Setup

Make the following selections:

Runway 16L
Approaches... ILS 16L
Initial Approach Fix/Approach Fix .... KARFO

When we last interfaced with Approach Config during our flight, the setup prior to unpausing with fairly short. There are some limitations to this feature in that it can't anticipate all types of entries into an Approach. Entering App Config will require some additional steps after un-pausing:

Approach Config will load paused to allow you to set up some remaining options When you un-pause:

- Turn off BOTH Flight Director Switches
- Turn on Captains Flight Director Switch
  - Confirm the Autoflight Mode on PFD is FLT DIR
- Click Autopilot CMD Switch
  - Confirm the Autoflight Mode on PFD is A/P
- Arm both Autothrottle Switches (If they are not already armed)
- Click A/T Mode Switch
  - Confirm the A/T mode on FMA is SPD
- Click APP mode button on MCP
  - Confirm that LOC/GS is armed (or engaged) depending on approach type selected if you're doing an IFR approach
- Set Flaps to 15 Units
  - The Flaps will not move while paused, but you can see the magenta target for 15

Confirm that MCP Speed is approx. 210 knots. If not, set it to 210 knots. For this Approach, verify that the MCP Altitude is 3200 feet.

Go Around Mode

Manage the approach similarly to how it was done in the Approach Mode section of this tutorial (i.e managing speeds, flaps, arming speedbrakes, autobrakes).

But this time around, when you get to 200 feet RA, click the To/GA Clickspot to engage Go-Around Mode. You can also use the Actual To/GA Switches:

TO/GA Switches (Highlighted for clarity)
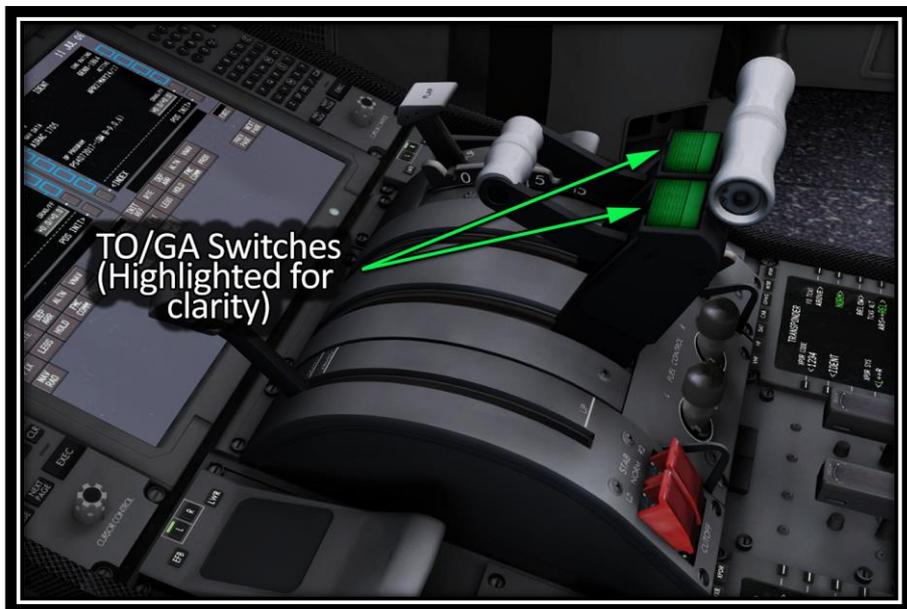
The Autothrottle System will command thrust to the Go Around Thrust Reference and the Pitch and Roll Modes will be TO/GA. Wings are level and the Autopilot will fly the aircraft to the MCP Altitude set of 3200 feet.

THR REF	TO/GA	TO/GA
	A/P	
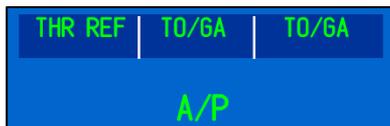
Once the aircraft levels off at the MCP Altitude, the FMA will show:

SPD	TO/GA	ALT
	A/P	

QualityWings SIMULATIONS
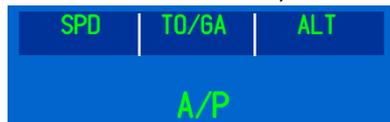
FMS Supplement

For more information about the FMS CDU, please reference the User's Manual.

FMC Preflight Pages

Initialization/Reference Index Page

The initialization/reference index page allows manual selection of FMC pages. It gives access to pages used during preflight and not usually used inflight. This page provides quick access to FMF display pages that do not have a mode key.

How to Access:

You can access this page from the INIT REF Mode Key or 6L LSK from any of the following pages:

IDENT page	TAKEOFF REF pages
POS INIT page	APPROACH REF page
POS REF pages	ANNOUNCEMENT STATUS page
PERF INIT page,	REF NAV DATA page
THRUST LIM page	ALTN page,

```
00:43:02 Z                    17 SEP 17

                  INIT/REF  INDEX

  1  <IDENT                   NAV DATA>    7

  2  <POS                  FLIGHT PLANS>   8

  3  <PERF                LOAD ATC RTE>    9

  4  <TAKEOFF                LOAD PNL>    10

  5  <APPROACH               SAVE PNL>    11

  6  <ANN STATUS             SAVE FPL>    12
```
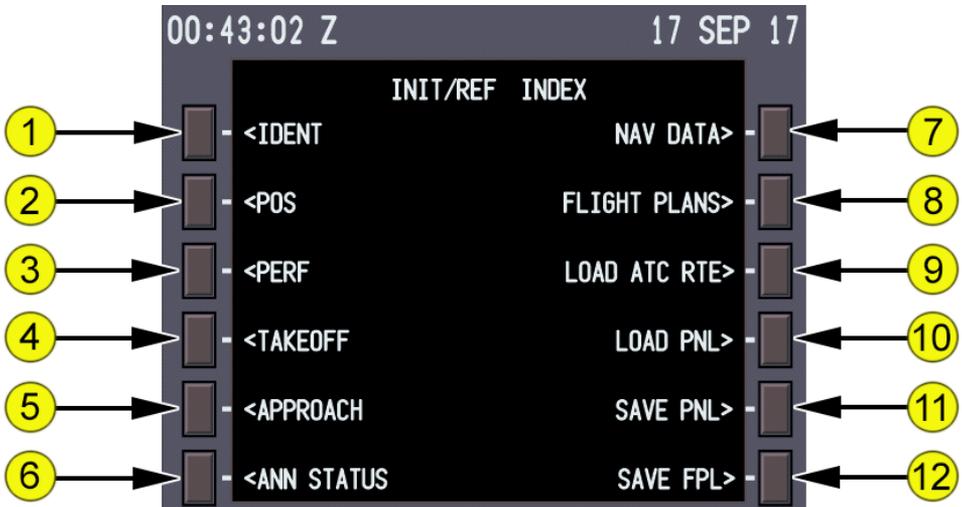
1. **Identification (IDENT)** The IDENT page is used to verify basic aircraft data and currency of the navigation database.
2. **Position (POS)** The POS INIT page is used for IRS initialization.
3. **Performance (PERF)** The PERF INIT page is used for initialization of data required for VNAV operations and performance predictions.

4. **TAKEOFF** The TAKEOFF REF page is used to enter takeoff reference data and V-speeds.
5. **APPROACH** The APPROACH REF page is used for entry of the approach VREF speed.
6. **ANN STATUS (QW Specific Page)** The ANNOUNCEMENT STATUS page is used to track and control the status of QWPAS and QWCAS announcements
7. **NAV DATA** The REF NAV DATA page is used for data on waypoints, navaids, airports, and runways. NAV DATA pages are accessible only from this page.
8. **FLIGHT PLANS (QW Specific Page)** The FLIGHT PLANS page allows selection of User Stored Flight Plans and automatically stored Flight Plans
9. **LOAD ATC RTE (QW Specific Page)** The LOAD ATC ROUTE prompt loads the any active default FSX Planner Generated Route
10. **LOAD PNL (QW Specific Page)** The STORED PANELS page allows selection of any user stored panel states
11. **SAVE PNL (QW Specific Page)** The SAVE PNL prompt saves the current panel state for retrieval in the LOAD PNL page
12. **SAVE FPL (QW Specific Page)** The SAVE FLIGHTPLAN prompt saves any currently Loaded Flightplan

Identification Page

Most of the data on this page is for pilot verification. Users can verify QW787 Version information, navigation database cycle version information.

How to Access:

You can access this page from the INIT REF Page. This page also displays on the ground when electrical power is first applied.
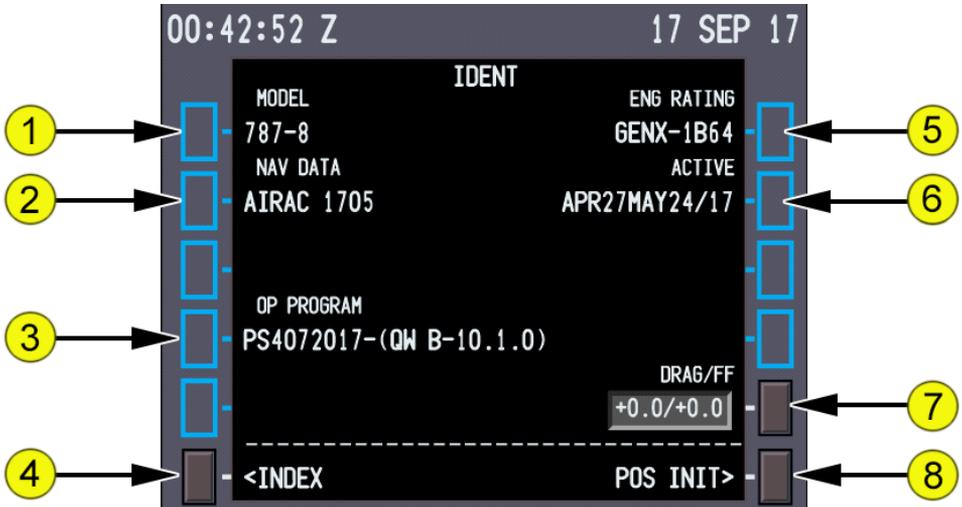
1. **MODEL** Displays aircraft model.
2. **NAV DATA** Displays the current AIRAC navigation database cycle.
   QW787 Release Version AIRAC Cycle:
3. **OP PROGRAM** Displays the QW787 Version Number in ().
4. **INDEX**
   Select Displays the INIT/REF INDEX page.
5. **ENG RATING** Displays engine model.
6. **ACTIVE**
   - Displays the effectivity date range for the active AIRAC navigation database cycle. If the active navigation database is out of date an FMC Help Window will display. Refer to the User's Manual for more information on updating Nav Database Cycle
7. **DRAG/FF** Displays the aircraft drag and fuel flow correction factors. Changes here DO NOT affect aircraft performance
8. **Position Initialization (POS INIT)** Select Displays the POS INIT page.

Position Initialization Page 1/3

The position initialization page allows entry of aircraft present position for IRS alignment in the event that automatic GPS updating is not available on the real aircraft. This is never an issue in the Flight Simulator.

How to Access:

You can access this page from the INIT REF Page or 6R LSK from the IDENT page.
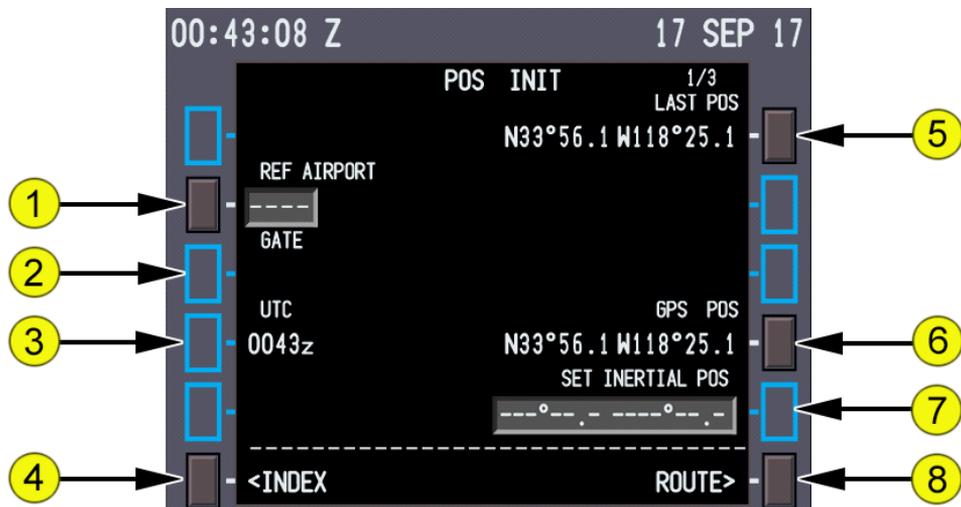
1. **Reference Airport (REF AIRPORT)**
- Entry of the reference airport displays the airport latitude/longitude.
- Optional entry.
- Valid entries are ICAO four-letter airport identifiers.
- Removes previous GATE entry.
2. **GATE**
- The gate entry allows further refinement of the latitude/longitude position.
- Optional entry after reference airport entered.
- Valid entry is a gate number at the reference airport.
- Displays the latitude and longitude of the reference airport gate.
3. **Coordinated Universal Time (UTC)**
- Displays UTC time as updated from the Simulator.
- The displayed value cannot be selected, modified, or overwritten.

4. INDEX
   Select Displays the INIT/REF INDEX page.
5. Last Position (LAST POS) Displays the Simulator present position.
6. GPS Position (GPS POS) Displays the Simulator present position.
7. Set Inertial Position (SET INERTIAL POS)
- The set inertial position entry is optional because the IRS has continuous access to the GPS position. Entry may be accomplished by selecting the most accurate latitude/longitude from LAST POS, REF AIRPORT, GATE, GPS POS, or make a manual entry.
- New inertial position entries can be made anytime dashes are displayed. New entries display for 2 seconds. After 2 seconds, dashes display to allow entry of another position.
- This box WILL NOT Override the position coming from the simulator. We left it in simply to satisfy those who might be used to doing this from other products. But on the **QW787** it is not required.
8. ROUTE
   Select Displays the ROUTE page.

Position Reference Page 2/3

Position reference page 2 displays positions calculated by the FMC, IRU, GPS, and radio navigation receivers.

This page displays latitude/longitude or bearing/distance. All position displays are in actual latitude and longitude, as calculated by the related system. The IRU, GPS, and radio position data can be changed to bearing/distance.

How to Access:

You can access this page from the POS INIT Page using the NEXT Page key or the POST REF Page 3/3 using the PREV Page Button page.
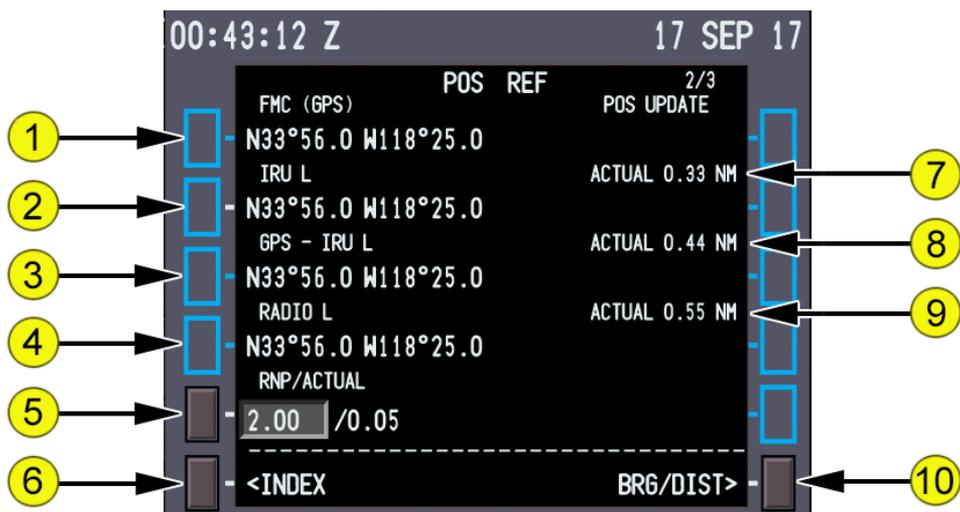
1. **FMC**
- The source used by the Master FMC for position data displays next to the FMC line title. On the QW787, the FMC always uses GPS as the source for position data.
- Displays the FMC-calculated latitude/longitude.
2. **INERTIAL**
- Displays latitude/longitude (or bearing/distance) position of the IRU sensor currently being used by the Master FMC.
- Blank if no valid IRU position exists.

3. GPS
- Displays latitude/longitude (or bearing/distance) position of the GPS sensor currently being used by the Master FMC.

4. RADIO
- Displays latitude/longitude (or bearing/distance) position of the navigation radios being used by the Master FMC.

5. Required Navigation Performance and Actual Navigation
- Displays RNP values stored in the navigation database for departure and arrival procedures; or, if there are none, displays the default values stored within the FMC by flight phase. Also displays FMC actual navigation performance (ACTUAL).
- Valid RNP entries are in the range 0.01 to 99.9. ACTUAL entry not allowed.

6. INDEX
Select Displays the INIT/REF INDEX page.

7. **ACTUAL - INERTIAL** Displays actual navigation performance of the IRU.
8. **ACTUAL - GPS** Displays actual navigation performance of the GPS.
9. **ACTUAL - RADIO** Displays actual navigation performance of radio updating.
10. Bearing/Distance (BRG/DIST) or Latitude/Longitude (LAT/LON)
Select Alternates position data format between bearing/distance or latitude/longitude.
   - o The page illustration is shown in the latitude/longitude display format.
   - o Latitude/longitude format displays are actual position. Bearing/distance format displays the bearing and distance of other position sources relative to the Master FMC position.

Position Reference Page 3/3

On position reference page 3, the pilot can observe the calculated positions of the left, right, and center FMCs. The header line indicates which FMC is being used as MASTER, SPARE, or BACKUP. This page also allows the pilot to enable or inhibit position updating modes used by the FMC.

This page can display the bearing/distance or latitude/longitude format.

How to Access:

You can access this page from the POS INIT Page using the PREV Page button or the POST REF Page 2/3 using the NEXT Page Button page.
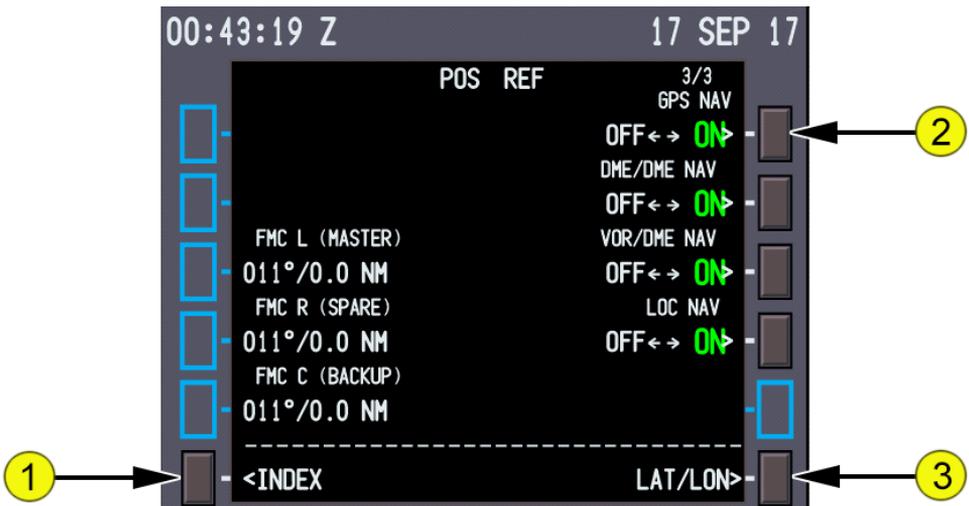
1. **INDEX**
   Select Displays the INIT/REF INDEX page.
2. **GPS NAV**
   Select Alternately selects GPS NAV ON (enabled) and OFF (disabled).
- Note: Setting to OFF does not cause any changes to the position updating on the QW787
3. **Latitude/Longitude (LAT/LON) or Bearing/Distance (BRG/DIST)**
   Select alternately changes the display of position data on POS REF 2/3 to latitude/longitude format or bearing/distance format. The page illustration is shown in the bearing/distance display format.

Route Page 1/X

One route (RTE 1) can be displayed in air traffic control format.
Routes can be:

- entered by the pilot
- uplinked via LOAD ATC RTE prompt if default FSX Flight Planner route is active
- Loaded from FLIGHT PLANS page

All routes have two or more pages. The first route page displays origin and destination data. Subsequent route pages display route segments between waypoints or fixes.

How to Access:

You can access this page by selectign the RTE mode key or from the POS INIT Page using the PREV Page button or the POST REF Page 2/3 using the NEXT Page key.
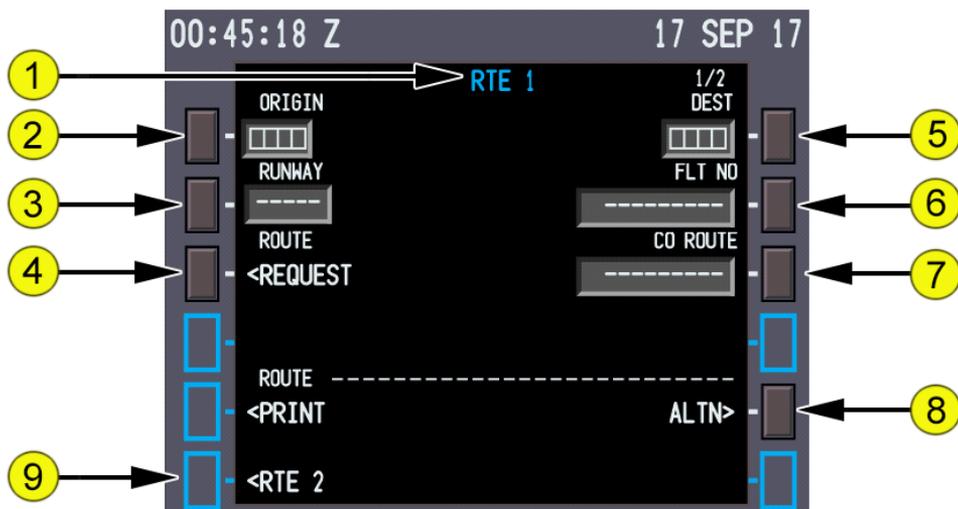
1. **Page Title**
   - White when the route is active.
   - Cyan when the route is inactive or pending activation.
   - The white shaded word MOD precedes the page title when the route is modified and the change is not executed.
   - Multiple route pages are indicated by the page sequence number to the right of the title. The minimum number of route pages is 2.

2. **ORIGIN Entry:**
   - Must be a valid ICAO identifier in the navigation database
   - Is made automatically when a company route is entered
   - Enables direct selection of departure and arrival procedures
   - Displays MOD in page title of an active route
   - Entry on the ground deletes route
3. **RUNWAY**
   - Enter the applicable runway for the origin airport. Runway must be in the navigation database. Entry is optional.
   - New entries on an active route cause MOD to display in the route title.
   - Automatically entered when part of a company route.
   - Can be selected on the DEPARTURES page.
4. **ROUTE REQUEST**
   - Select The Stored Flight Plans Page to allow you to load a stored Flight Plan
5. **Destination (DEST) Entry:**
   - Must be a valid ICAO identifier in the navigation database
   - Is made automatically when a company route is entered
   - Enables selection of departure and arrival procedures
6. **Flight Number (FLT NO)**
   - Enter the company flight number.
   - Transponder transmits flight number to Flight Simulator ATC
   - Entry is optional for activation of the route.
   - Limited to 10 characters.
   - Pilot-entered or uplinked.
   - Flight number is included in the PROGRESS page title.
7. **Company Route (CO ROUTE)**
   - A company route can be called from any flightplans stored in the following folder in your Flight Sim Directory: QualityWings\QW787\FlightPlans\
   - The Filename is the Company Route minus the extension. We suggest keeping filenames are short as possible
   - An entry is optional for activation of the route.
   - Valid entry is any pilot-entered or uplinked company route name. If the name is not contained in the NAV database, the entry is allowed

and the CDU help window message COMPANY ROUTE NOT IN DATA BASE displays.

- Entry of a new company route replaces the previous route.

8. Alternate (ALTN)
Select Displays the ALTN page.

9. RTE 2, ERASE
- RTE 2
  Not selectable
- ERASE
  Select Deletes all lateral and vertical mods to the displayed modified route.
  Selection of <ERASE while a pending activation route is displayed returns the inactive route.

10. ACTIVATE
- Select the ACTIVATE key to arm the route for execution as the active route. When the EXECUTE key is pushed, the route becomes the active route and the ACTIVATE prompt is replaced with the next required preflight page prompt.
- **Select** Prepares the selected route for execution as the active route.
- Activation of a route is required for completion of the preflight.
- Displayed on inactive route pages.
- After route activation, the ACTIVATE prompt is replaced by:
  o PERF INIT when the required performance data is incomplete, or
  o TAKEOFF when the required performance data is complete

Route Page 2/X

The subsequent route pages 2/X through X/X, display route segments in air traffic control format. Route segments are defined as direct routing, airways, or procedures with start and end points such as waypoints, fixes, navaids, airports, or runways. More waypoints for each route segment are shown on the RTE LEGS page.

How to Access:

You can access this page from the RTE Page using the NEXT Page and PREV Page keys.
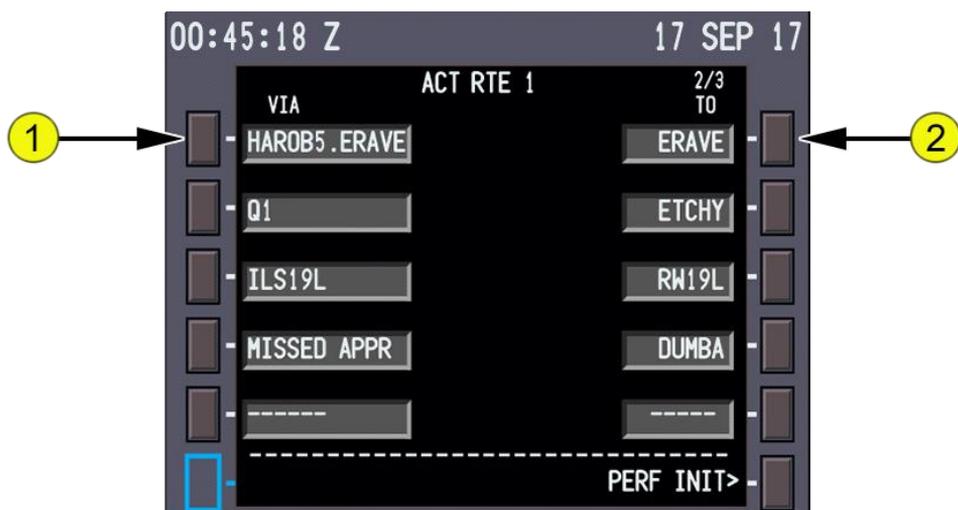
1. **VIA**
   - The VIA column displays the route segment to the waypoint or termination in the TO column. Enter the path which describes the route segment between the previous waypoint and the segment termination.
   - Enter an airway in the VIA column and boxes display in the TO column.
   - Valid entries can also include procedures or DIRECT. Procedures are usually entered through selections on DEPARTURES and ARRIVALS pages. DIRECT is usually entered as a result of entering a TO waypoint first.

- Valid airways must:
  - o Contain the fix entered in the TO waypoint, and
  - o Contain the previous TO waypoint, or
  - o Intersect the previous VIA route segment
- Dashes change to DIRECT if the TO waypoint is entered first.
- Dashes display for the first VIA beyond the end of the route.
- Invalid VIA entries display the CDU help window message NOT IN DATA BASE.
- Invalid VIA entries are:
  - o Airways and company routes which do not contain the TO waypoint of the previous line
  - o Airways that do not intersect the previous airway
  - o Airways or company routes that are not in the navigation database
- The start and end waypoints determine whether the entered airway is valid. The route segment must contain the waypoint entered in the TO position. The TO waypoint of the previous route segment must be the same as the start point of the next route segment or a route discontinuity is created between the segments.
- Entry of a SID or transition enters the VIA and TO data for the route segments of the SID. A SID links to the next route segment when the final SID waypoint is part of the route segment.
- A route can contain segments formed by the intersection of two airways. Entering two intersecting airways in successive VIA lines without a TO waypoint causes the FMC to create an airway intersection waypoint to change from one segment to the next. The FMC-created waypoint intersection (INTC) displays in the first airway segment TO waypoint.
- HAROB5.ERAVE is an example of a SID selection made on the DEPARTURES page.
- Q1 is an example of an airway entry.
- ILS19L is an example of an approach selection made on the APPROACH page.

2. TO

- Enter the end point of the route segment specified by the VIA entry.
- Entry of a waypoint in the TO column without first entering a VIA airway shows DIRECT in the VIA column.
  - o Data input is mandatory when boxes are displayed.
  - o Valid waypoint entries for a DIRECT route segment are any valid waypoint, fix, navaid, airport, or runway.
  - o Valid waypoint entries for airways are waypoints or fixes on the airway.
  - o Dashes display on the first TO waypoint after the end of the route.

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Departure/Arrival Index Page

The departure and arrival index page is used to select the departure or arrival page for the origin and destination airports for each route. The index also allows reference to departure or arrival data for any other airport in the navigation database.

Departure and arrival prompts are available for the origin airport. Destination airports have only arrival prompts.

How to Access:

You can access this page by selecting the DEP/ARR mode key.

1. **Departure (DEP) - Route 1**
   - Push Displays the departure page for route 1 origin airport.
2. **Arrival (ARR) - Route 1 Destination**
   - Select Displays the arrival page for route 1 destination airport.

Departures Page

The departures page is used to select the departure runway, SID, and transition for the route origin airport.

The departures page for the inactive route displays when the DEP ARR function key is selected with an inactive RTE or RTE LEGS page displayed.

How to Access:

You can access this page by selecting LSK 1L on the DEP/ARR Index Page
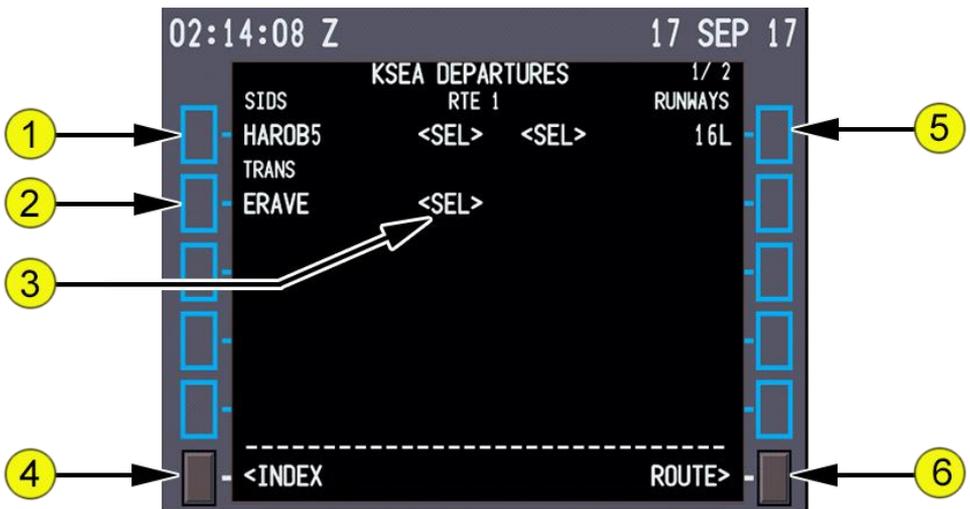
1. **Standard Instrument Departures (SIDS)**
   - Displays a list of SIDS for the airport.
   Select
   - Selects SID for use in the route
   - Other SIDs no longer display and transitions for the selected SID display
   - Runways for selected SID remain and others no longer display
2. **Transitions (TRANS)**
   - Displays transitions compatible with the selected SID.
   Select
   - Selects transition for entry in the route.
   - Other transitions no longer display.

3. **Selecting Options** Selecting an option displays <SEL> inboard of the option and creates a route modification. After executing the modification, <SEL> becomes <ACT>. Executing a modification or leaving the page and returning displays all options and the <SEL> or <ACT> prompts.

4. **ERASE or INDEX**
   - ERASE displays when a route modification is pending. INDEX displays when no route modification is pending.
   - ERASE selected - removes route modifications not executed and displays the original route.
   - INDEX selected - displays the DEP/ARR INDEX page.

5. **RUNWAYS**
   - Displays a list of runways for the selected airport.
   - The runway selected on the RTE 1/X page displays as <SEL> or <ACT>.

   Select
   - Selects runway for use in the route. All other runways no longer display
   - SIDs associated with selected runway remain, all others no longer display
   - Subsequent change of a runway deletes departure procedures previously selected

6. **ROUTE**
   Select Displays the related RTE page.

Navigation Radio Page

VOR, ILS and GLS navigation radios are normally autotuned by the FMC. ADF radios are manually tuned. The NAV RADIO page displays the VOR, ILS-GLS and ADF radio status and allows manual control of these radios. Entering data on this page tunes the selected navigation radio. VOR courses can also be entered.

How to Access:

You can access this page by selecting the NAV/RADIO mode key.
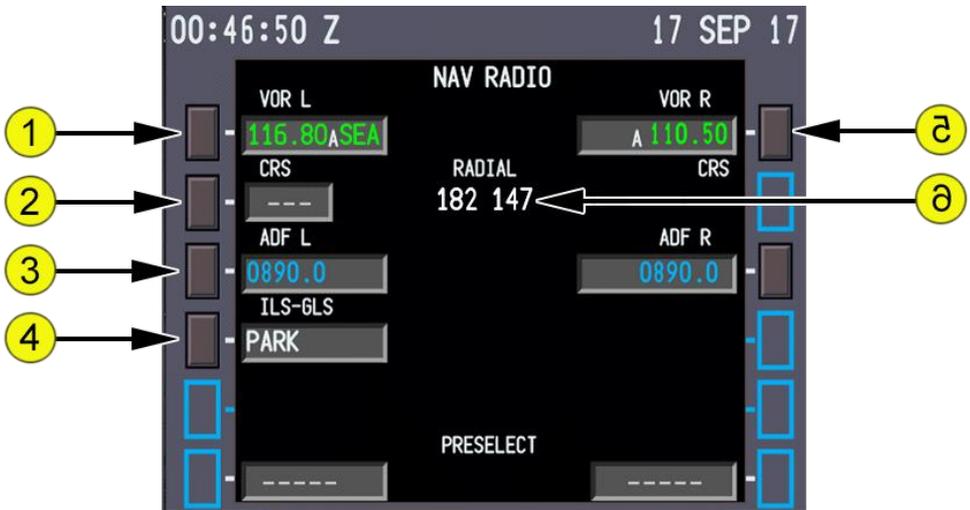
1. **VOR Frequency and Tune Status**
   - The tuning status displays adjacent to left and right VOR frequencies. Entry of a frequency manually tunes a VOR. FMC autotunes VORs for procedure flying and route operations. The FMC also tunes related DMEs.

   The tuning status displays are:
     - A (autotuning) - FMC selects a navaid for best position orientation
     - M (manual) - VOR is manually tuned. Manual-tuning takes priority over FMC autotuning. Deletion of a manually-tuned frequency returns system to autotuning
   - Valid entries:
     - VOR or non-ILS DME identifiers (XXX) or VOR or non-ILS DME frequencies (YYY.Y or YYY.YY)

- The identifier and frequencies are green and tuning status is white.
2. **CRS**
   - Blank when in autotune.
   - Valid entry is a three-digit course. Data can be entered when dashes or a course are displayed.
   - With a VOR approach selected, sequencing an IAF/FAF causes the FMC to procedure autotune the VOR frequency. When the approach has a runway waypoint, the FMC selects the inbound course.
3. **RADIAL** Displays radial from left and right VOR stations to the aircraft.
4. **ILS Tuning**
   - The tuning status displays adjacent to the ILS frequency/course. The ILS receivers operate in FMC autotune or manual tuning modes. The FMC autotunes the ILS frequency/course depending upon the approach selected in the flight plan. When the ILS is not necessary, the FMC sets the ILS-GLS status to PARK. This removes the displays from the PFD.
   - Valid entry is a three-digit course. Data can be entered when dashes or a course are displayed.
      - – ILS frequency and front course (XXX.XX/YYY)
      - – Front course, with a frequency already entered (/YYY)
   - Aircraft position on the route determines the ILS-GLS operating mode. The operating mode displays are:
      - PARK - the ILS or GLS is not being used and is not tuned.
      - XXX.XX/YYY PARK - the ILS is tuned for the selected approach but is not being used.
      - The letter A indicates autotuning under FMC control for approach guidance.
      - The letter M indicates the ILS or GLS is manually-tuned.

Performance Initialization Page

The performance initialization page allows the entry of aircraft and route data to initialize performance calculations. This data is required for VNAV calculations

How to Access:

You can access this page from the INIT REF Page or 6R LSK from the ACT RTE 1 page.
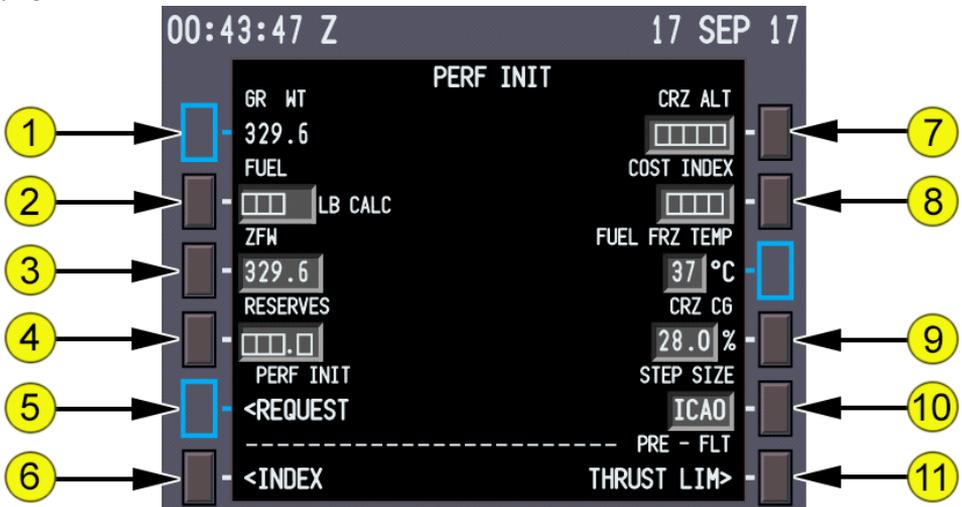
1. **Gross Weight (GR WT)**
   - Calculated gross weight is displayed after Zero Fuel Weight is entered.
   - Manual entry is not allowed.
2. **FUEL**
   - Fuel on board displays when the fuel totalizer calculations are valid. The source for the display is included in the line:
     - CALC (calculated) - fuel quantity is from FMC calculations. Manual entry is possible.
     - MANUAL - fuel quantity has been manually entered
   - Box prompts indicate invalid totalizer signals received from the fuel quantity system. Manual entry required.
   - Valid entry is XXX or XXX.X.
   - Only manual entries can be deleted.

3. **Zero Fuel Weight (ZFW)**
   - Normally, ZFW is entered from the aircraft dispatch papers and the FMC calculates the aircraft gross weight.
   - Valid entry is XXX or XXX.X.
4. **RESERVES**
   - Valid entry is XXX or XXX.X.
   - Can be manually
5. **Performance Initialization Request (PERF INIT REQUEST)**
   Reserved for Future Development
6. **INDEX**
   Select Displays the INIT/REF INDEX page.
7. **Cruise Altitude (CRZ ALT)**
   - Cruise altitude can be entered by the pilot or from a company route or uplink.
   - Valid entry is XXX, XXXX, XXXXX or FLXXX.
   - Entry displays this cruise altitude on the CLB and CRZ pages.
8. **COST INDEX**
   - Cost index is used to calculate ECON climb, cruise, and descent speeds. Larger values increase ECON speeds. Entering zero results in maximum range airspeed and minimum trip fuel. Cost index can be entered by the pilot or from a company route or uplink.
   - Valid entries are 0 to 2000.
9. **Cruise Center of Gravity (CRZ CG)**
   - Displays default value of 28.0% in small font.
   - Valid entry is 6.0 through 39.5.
   - Does not affect anything on the QW787
10. **STEP SIZE**
   - Displays the climb altitude increment used for planning the optimum climb profile.
   - Default value is ICAO.
   - Valid manual entries are 0 to 9000 in 1000-foot increments.
   - For a nonzero entry, performance predictions are based on step climbs at optimum points. For a zero entry, performance predictions are based on a constant CRZ ALT.
11. **Thrust Limit (THRUST LIM)**
   Select Shows the THRUST LIM page.

Thrust Limit Page

The thrust limit page allows selection and display of reference thrust for takeoff. Takeoff thrust derate by use of assumed temperature is also accomplished on this page.

Additional page data displays are:

- <SEL> - Identifies the selected takeoff thrust reference mode.
- <ARM> - Identifies the armed climb thrust reference mode.

The <ARM> prompt changes to <SEL> when the armed climb mode becomes active.

How to Access:

You can access this page from the 6R LSK on the TAKEOFF page.

1. **Assumed Temperature (SEL), Outside Air Temperature (OAT)**
- Entry of an assumed temperature warmer than the OAT reduces takeoff thrust and displays D as part of the thrust reference mode.
- Valid entries are 0° C to 99° C
- Pilot-entered or uplinked values replace previously displayed values.
- The assumed temperature thrust derate is not the same as TO 1 and TO 2 fixed thrust derates described below. If TO 1 or TO 2 is selected and an assumed temperature is then entered, thrust is further derated.

- If entry results in greater than a 25% reduction in thrust, the entered value is dialed back to a value that results in a 25% reduction.

2. **Takeoff (TO)**
   Select Selects full rated (TO) takeoff thrust limit.

3. **Takeoff 1 (TO 1)**
   Select Selects fixed percentage derate (TO 1) for takeoff thrust limit.
   - o Selecting TO 1 arms the appropriate climb thrust (CLB, CLB 1 or CLB 2).

4. **Takeoff 2 (TO 2)**
   Select Selects fixed percentage derate (TO 2) for takeoff thrust limit.
   - o Selecting TO 2 arms the appropriate climb thrust (CLB, CLB 1 or CLB 2).

5. **INDEX**
   Select Displays the INIT/REF INDEX page.

6. **Thrust Reference Mode** Displays selected takeoff thrust mode.

7. **Takeoff N1 Limit** Displays the takeoff N1 calculated by the thrust management function.

8. **Climb (CLB)**
   Select Selects the full rated (CLB) climb thrust limit.
   - o Pushing a climb line select key overrides an automatic selection.

9. **Climb 1 (CLB 1)**
   Select Selects a percentage derate (CLB 1) climb thrust limit.

10. **Climb 2 (CLB 2)**
    Select Selects a percentage derate (CLB 2) climb thrust limit.

11. **TAKEOFF**
    Select Displays the TAKEOFF REF page.

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Takeoff Reference Page 1/2

The takeoff reference page allows the pilot to manage takeoff performance. Takeoff flap setting and v-speeds are entered and verified. Thrust limits, takeoff position, and takeoff gross weight can be verified or changed. Preflight completion status is annunciated until complete.

Takeoff reference page entries finish the normal preflight. The takeoff flap setting must be entered and v-speeds should be set before completion.

How to Access:

You can access this page from the INIT REF Page or from the 4L LSK on the THRUST LIM page.
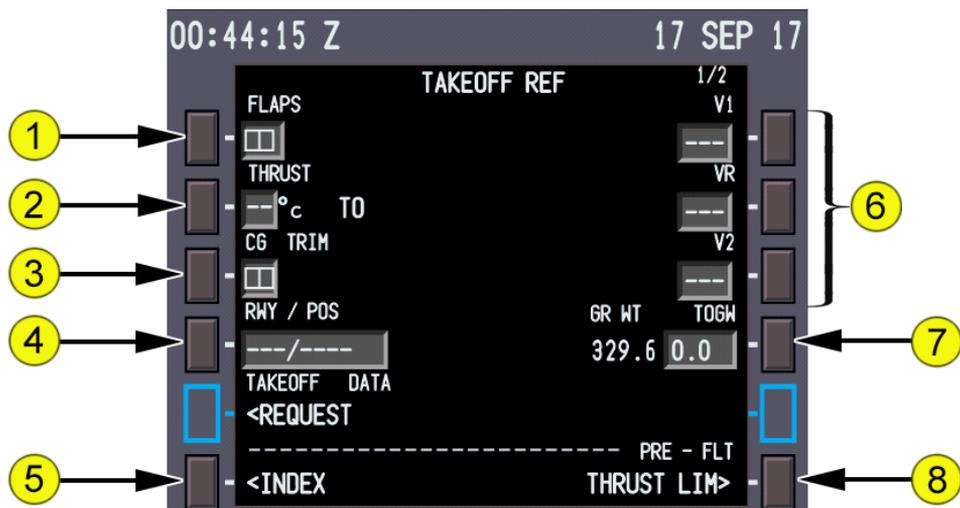
1. **FLAPS**
   - (787-8) Displays takeoff flap setting. Valid entries are 5, 15, or 20.
   - (787-9) Displays takeoff flap setting. Valid entries are 5, 10, 15, 17, 18, or 20.
   - Pilot entry or uplink from EFB OPT
2. **THRUST**

• Displays takeoff thrust selected on THRUST LIM page, or pilot or uplink entered assumed temperature for takeoff thrust derate calculations.

• Valid entries are 0° C to 99° C

3. **Center of Gravity (CG), TRIM**
   - Valid entry is CG within the valid range.
   - After CG entered, the FMC:
     - o Calculates and displays the stabilizer takeoff setting to the right of the CG entry (trim display is in 0.25 unit increments)
     - o Updates the takeoff green band displayed on stabilizer position indicator

4. **Runway/Position (RWY/POS)**
   - Displays the takeoff runway from the active RTE page if previously selected. Runway entry does not change runway entered on RTE or DEPARTURES page.

5. **INDEX**
   Push Displays the INIT/REF INDEX page.

6. **V Speeds (V1, VR, V2)**
   - Dashes display when required information not entered.
   - Pilot-entered speeds display in large font and replace uplinked speeds from EFB OPT.
   - Select Pilot-entered V speeds replace AOC uplinked speeds.

7. **Gross Weight (GR WT), Takeoff Gross Weight (TOGW)**
   - GR WT displays aircraft gross weight from the PERF INIT page.
   - Valid entry is any weight within the allowable aircraft takeoff gross weight range.

8. **Thrust Limit (THRUST LIM)**
   Select Displays the THRUST LIM page.

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Preflight Status

If the required preflight entries are not complete, the words PRE-FLT display on the right side of the dashed line. Preflight pages requiring entries display below the dashed line as prompts.

```
----------------------- PRE - FLT
<INDEX                THRUST LIM>
```

When preflight entries are complete, the line 6 header displays FMC PREFLIGHT COMPLETE in white letters on a green background. The THRUST LIM prompt displays at LSK 6R. The line 6 header FMC PREFLIGHT COMPLETE is also displayed on the PERF INIT and THRUST LIM pages.

```
------ FMC PREFLIGHT COMPLETE ------
<INDEX                THRUST LIM>
```

When preflight entries are complete, the line 6 header displays FMC PREFLIGHT COMPLETE in white letters on a green background. The THRUST LIM prompt displays at LSK 6R. The line 6 header FMC PREFLIGHT COMPLETE is also displayed on the PERF INIT and THRUST LIM pages.

Takeoff Reference Page 2/2

TAKEOFF REF 2/2 provides additional takeoff data and the ability to modify the climb profile. Data may be entered by the pilot.

How to Access:

You can access this page from the INIT REF Page or from the 4L LSK on the THRUST LIM page.
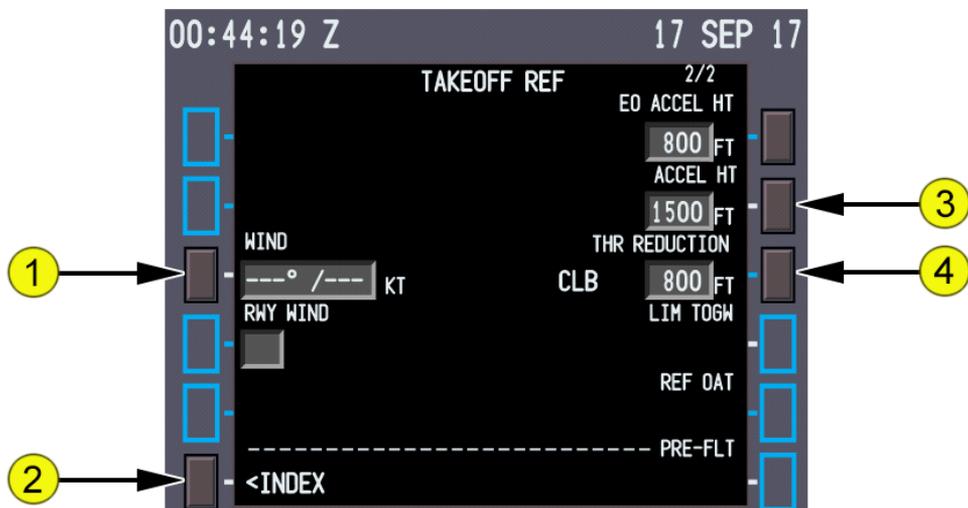
1. **WIND**
   - Wind direction and speed can be entered by the pilot
   - Valid directions are from 0° to 360° (0° and 360° are shown as 000°).
   - Valid speeds are from 0 to 250 knots.
   - Subsequent entries may be wind direction or speed only.
2. **INDEX**
   Select Displays the INIT/REF INDEX page.
3. **Acceleration Height (ACCEL HT)**
   - Displays the altitude above airport (height above airport, corrected for temperature and barometric setting), where acceleration will start for flap retraction.
   - Default value is 1500 feet AGL
   - Default value can be changed via QW Options
   - Entry is Optional

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4. Climb Thrust and Thrust Reduction (THR REDUCTION) Altitude

- Displays armed climb thrust rating and the altitude above airport (height above airport, corrected for temperature and barometric setting), or flap setting where reduction from takeoff thrust to climb thrust will begin.
- Default THR REDUCTION value is 800 feet AGL.
- Value can be entered manually
- Entry is optional. Valid entries is a height from 400 to 9999 feet.

FMC Takeoff and Climb Pages

VNAV Climb Page

The climb page is used to evaluate, monitor, and modify the climb path. The data on the climb page comes from preflight entries made on the route and performance pages, and from the airline policy file.

The climb page is the first of the three pages selected with the VNAV function key. When the FMC changes to the cruise mode, the climb page data is blanked. FMC climb can be economy or a fixed speed

How to Access

You can access this page by selecting the VNAV mode key.

1. **Cruise Altitude (CRZ ALT)**
   - Displays cruise altitude entered on PERF INIT page.
   - Valid entries are: XXX, XXXX, XXXXX, or FLXXX. Altitude displays in feet or flight level depending on transition altitude.
   - The altitude can be changed by two methods:
     - o A new cruise altitude can be manually entered from the CDU at any time. The modified cruise altitude displays in shaded white until executed.
     - o A new cruise altitude can be entered from the MCP, if intermediate altitude constraints do not exist between the aircraft altitude and the MCP altitude. Set cruise altitude in the

altitude window and push the altitude selector. The cruise altitude changes without modification or execution.

2. **Economy Speed (ECON SPD), Selected Speed (SEL SPD)**
   - **ECON SPD:**
     - o Speed based on cost index in CAS or Mach.
     - o Used by FMC at altitudes above all waypoint speed constraints, speed restrictions, and speed transition altitudes.
     - o Valid entries are CAS or Mach.
   - **SEL SPD:**
     - o Displays when pilot enters speed.
     - o Valid entries are CAS or Mach.

3. **Speed Transition (SPD TRANS)**
   - The speed transition line displays the transition speed/altitude from greater of the transition speed associated with the origin airport or VREF+80 knots (example 250/10000).
   - Valid entry is a CAS and altitude (example 240/8000).

4. **Speed Restriction (SPD RESTR)**
   - Speed restrictions for an altitude less than the cruise altitude are manually entered on this line.
   - Valid entry is a CAS and altitude (example 240/8000).

5. **Transition Altitude (TRANS ALT)**
   - Transition altitude for origin airport contained in navigation database. FMC uses 18,000 feet if transition altitude is not available.
   - Manually change transition altitude here
   - Valid entries are XXX, XXXX, XXXXX, or FLXXX.

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Tutorial/FCOM

RTE X Legs Page

The Route Legs Page provides a means of entering and displaying the details of each leg of the route

How to Access

You can access this page by selecting the LEGS mode key.
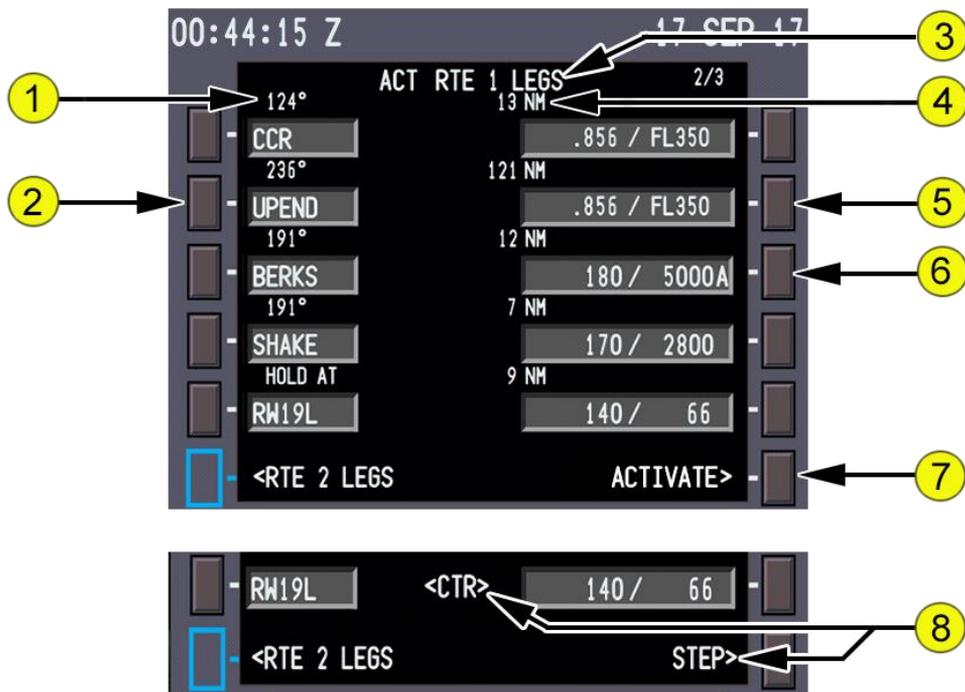
1. **Leg Direction**
   - Leg segment data in line title:
     - Courses - magnetic (XXX°) or true (XXX° T)
     - Arcs - arc radius in miles, ARC, turn direction (example: 24 ARC L)
     - Heading leg segments - XXX° HDG or XXX° THDG (when referenced to true north)
     - Track leg segments - XXX° TRK or XXX° TTRK (when referenced to true north)

- o Special procedural instructions from database - HOLD AT, PROC TURN, or PROC HOLD (FMC exits hold when crossing the fix after entry)
- Dashes display for an undefined course.

2. Waypoint Identifier
- Active leg is always the first line of the first active RTE X LEGS page.
- Active waypoint is on active leg and is magenta. Modified waypoints are shaded white until executed.
- All route waypoints display in flight sequence. Waypoints on an airway are included on the route legs page.
- Waypoints can be modified. Examples:
  - o Add waypoints
  - o Change waypoint sequence
  - o Delete waypoints
  - o Connect route discontinuities
- Displays the waypoint by name or condition.
- Boxes display for route discontinuities.
- Dashes display after the end of the route.

3. **Page Title** Title format displays route status:
- RTE X LEGS (cyan) - inactive route
- ACT RTE X LEGS (white) - active route
- MOD (shaded white) RTE X LEGS (white) - modified active route

4. **Distance to Waypoint Distance** (decreasing) from aircraft to active waypoint or from waypoint to waypoint. Blank for some leg types (e.g., HDG or VECTORS).

5. Waypoint Speed/Altitude Predictions
- Waypoint speed and altitude predictions display in small font.
- Dashes display in predicted descent region prior to descent path calculation. Descent path calculation requires an altitude constraint below cruise altitude.
- Manual entry allowed in climb or descent phase.

6. Waypoint Speed/Altitude Constraints
- Waypoint speed or altitude constraints display in large font.
- Manual entry allowed in climb or descent phase. Entered by FMC when constraints are part of a procedure.

- Magenta when it is an FMC-commanded speed/altitude. Airspeed constraint may be magenta in one line with magenta altitude in another line.
- Speed constraint is assumed to be at or below the displayed speed. Valid entries are:
  - o Speed entry can be airspeed or Mach
  - o Altitude entry can be thousands of feet or flight level (19000, FL190)
  - o XXX/XXXXX - airspeed/altitude entered simultaneously
  - o XXX, XXXX, XXXXX or /XXX, /XXXX, /XXXXX - altitude only
  - o Enter FL190 or 19,000 feet as 190 or 19000. Enter FL090 or 9,000 feet as 090 or 9000. Enter 900 feet as 009 or 0900. Enter 90 feet as 0090

  Altitude constraint suffixes:
  - o Blank - cross at altitude
  - o A - cross at or above altitude
  - o B - cross at or below altitude
  - o Both - altitude block. If constraint is to cross between two altitudes, enter lower altitude followed by the letter A and higher altitude followed by the letter B (e.g., 220A240B or 240B220A). Altitudes can be entered in any order.

7. **ACTIVATE**
   Select ACTIVATE
   - Activates inactive flight plan; displays RTE DATA prompt.
   - Prompt displays when RTE and RTE LEGS flight plan is inactive.
8. **MAP CTR STEP** (map center step)
   - Changes centered waypoint on ND. <CTR> is adjacent centered waypoint on the RTE LEGS page.
   - Prompt displays when the PLAN is selected on the map display.

LNAV Modifications

This section describes typical techniques to modify the route. The modifications include:

- Add and delete waypoints
- Change waypoint's sequence
- Remove discontinuities

When modifications are made to a RTE LEGS page, several prompt or identifying features help the pilot make the modifications, such as:

- ERASE

Modified entries display in shaded white

Add Waypoints

Waypoints can be added to the route at any point. Added waypoints are followed by route discontinuities.

First, enter the waypoint name in the scratchpad.

Second, locate the desired line in the flight plan and select the adjacent line select key. The scratchpad waypoint name is put into the selected line. The entered waypoint is connected to the waypoint above it via a direct route. A route discontinuity follows the waypoint.

For example, OED is typed into the scratchpad. Select line select key 2L to put OED into line 2. The FMC assumes BTG direct OED. RBL and the rest of the flight plan follow the route discontinuity.
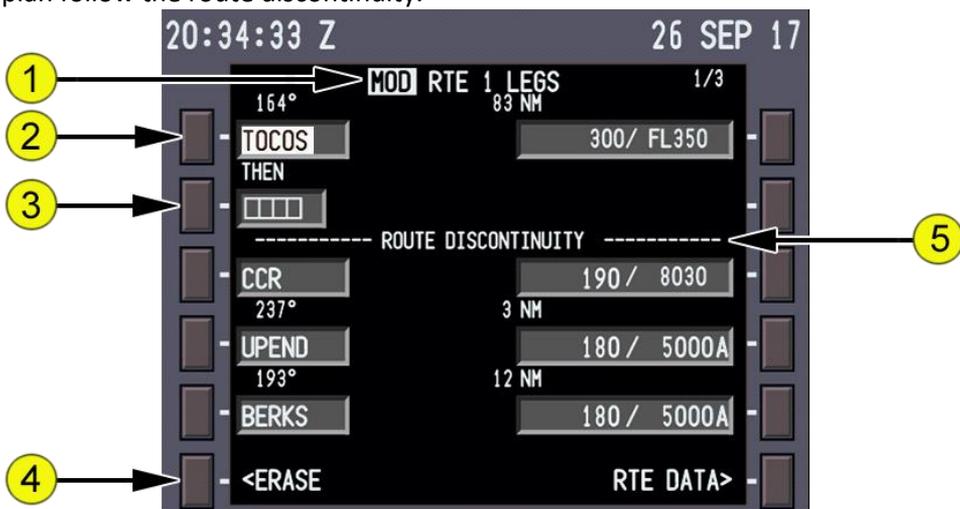
1. **Page Title**
   - MOD (shaded white) Replaces ACT when modification in progress.
   - ACT (white) Replaces MOD when ERASE selected or EXECUTE key selected.
2. **Modified Waypoint**
   - Waypoint name is shaded white until executed.
   - OED waypoint entered into the route after BTG. Modification creates a route discontinuity because OED was not in active route. The FMC now requires routing beyond OED.
3. **Discontinuity Waypoint** Discontinuity is removed when applicable waypoint is entered in boxes.
4. **ERASE**
   Select Removes all modifications and shows active data.
   - Displays when the FMC contains modified data. Removed when selected or modifications executed.
5. **ROUTE DISCONTINUITY** Line title separates route segments when there is a discontinuity.
- Note: Performance predictions to destination on the PROGRESS page are calculated assuming the route of flight is direct between waypoints on either side of a route discontinuity.

Delete Waypoints

Use the RTE LEGS page to remove waypoints from the route. The active waypoint cannot be deleted. Two methods to remove a waypoint are:

- Delete the waypoint with the DELETE function key.
- Change the waypoint's sequence.

The data in the route before and after the deleted waypoint does not change. A discontinuity is put in the route when the DELETE function key is used to remove a waypoint.
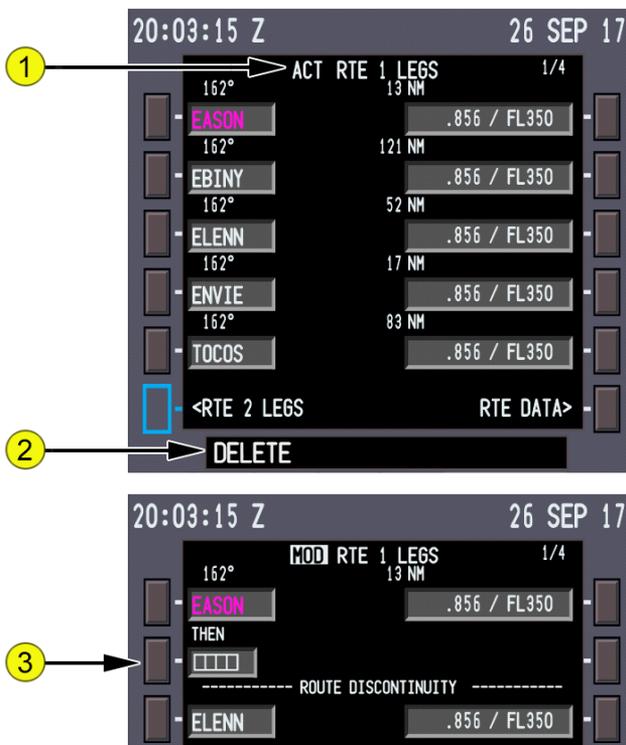
1. **Active Route** The active route shows EBINY followed by ELENN & ENVIE.
2. **DELETE Entry** Selecting the DEL function key arms the delete function and selects DELETE to the scratchpad.
3. **ROUTE DISCONTINUITY** With DELETE in the scratchpad, selecting the line select key for EBINY deletes the waypoint. Boxes replace EBINY and a route discontinuity displays.

Change Waypoint Sequence

Waypoints moved from one position in the flight plan to another do not cause route discontinuities.

The waypoint may be typed in the scratchpad or copied from the flight plan. To copy a waypoint from the flight plan, find the applicable waypoint on one of the RTE LEGS pages. Select the line select key adjacent to the waypoint.

The example below shows the flight plan being modified to fly from BTG direct OAK. Select the line select key adjacent to OAK to put OAK in the scratchpad. Select the line select key adjacent to RBL. RBL is removed from the flight plan and the routing is direct from BTG to OAK to AVE. The modification does not cause a route discontinuity. Several waypoints can be removed from the flight plan at a time with this method.
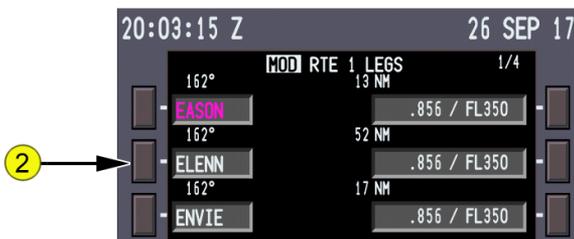
1. **Active Route** The active route shows EBINY followed by ELENN and ENVIE. The clearance is to fly from EASON direct ELENN. The ELENN waypoint is selected to the scratchpad.
2. **Change ELENN's Sequence** ELENN is selected to the waypoint after EASON. EBINY is removed with no discontinuity.

Remove Discontinuities

A discontinuity exists when two waypoints are not connected by a route segment. Connect a route segment after the discontinuity to the route segment before the discontinuity to remove the discontinuity.

Copy the subsequent waypoint from the route into the scratchpad and enter it into the discontinuity, just as when adding a waypoint.
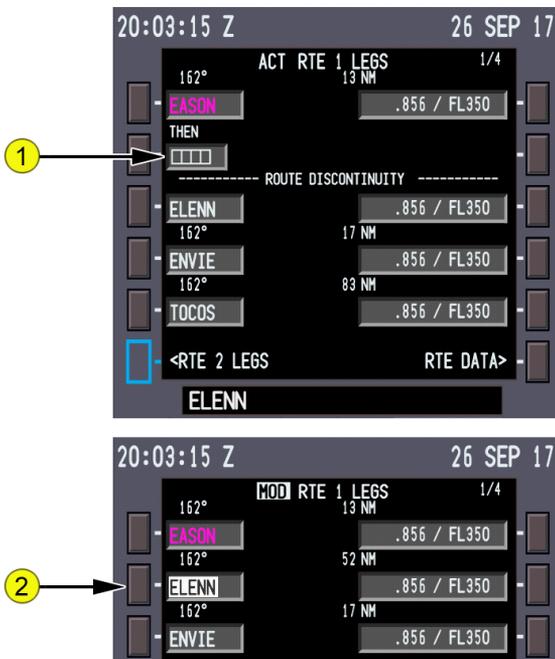
1. **Route Discontinuity** The active route has a discontinuity after EASON. The example shows how to fly direct from EASON to ELENN. Copy ELENN to the scratchpad. Any subsequent waypoint in the route can be selected to the scratchpad to remove the discontinuity.
2. **Continuous Route** Select ELENN to the boxes to remove the discontinuity. Entering a waypoint in the boxes which does not already exist on the route moves the discontinuity one waypoint further down the route.

Thrust Limit Page

Thrust limits are selected on the thrust limit page. Inflight, this display replaces the takeoff thrust limits with applicable thrust limits for climb. The selected limits display here and on the EICAS display.

Fixed thrust derates can be selected for climb. Go-around, continuous, and cruise thrust limits are available also.

How to Access

You can access this page from the 6R LSK on the APPROACH page.

1. **Go-Around (GA)**
   - Select Selects go-around thrust limit.
2. **Continuous (CON)**
   - Select Selects maximum continuous thrust limit.
3. **Cruise (CRZ)**
   - Select Selects cruise thrust limit.

FMC Cruise Pages

General

The cruise phase starts at the top of climb. During cruise, the primary FMC pages are:

- CRZ
- PROGRESS

The CRZ pages display VNAV related data. The PROGRESS pages display flight progress data. During cruise, the specific page listed below is used to:

- RTE DATA page Display progress data for each waypoint on the RTE.
- REF NAV DATA page Display data about waypoints, navaids, airports, or runways, and can be used to inhibit navaids.
- FIX INFO page Display data about waypoints. Page data can be transferred to other pages to create new waypoints and fixes.

VNAV Cruise Page

The cruise page is used to monitor and change cruise altitude and speed. Speed changes can be manually selected or automatically selected with the selection of other VNAV modes. Cruise climbs, cruise descents, and step climbs can be accomplished from the cruise page.

When using VNAV in economy mode, page data is based on operating at ECON SPD. Economy cruise speed is based on cost index. When the pilot enters a selected speed, page data changes.

How to Access

You can access this page by selecting the VNAV mode key.
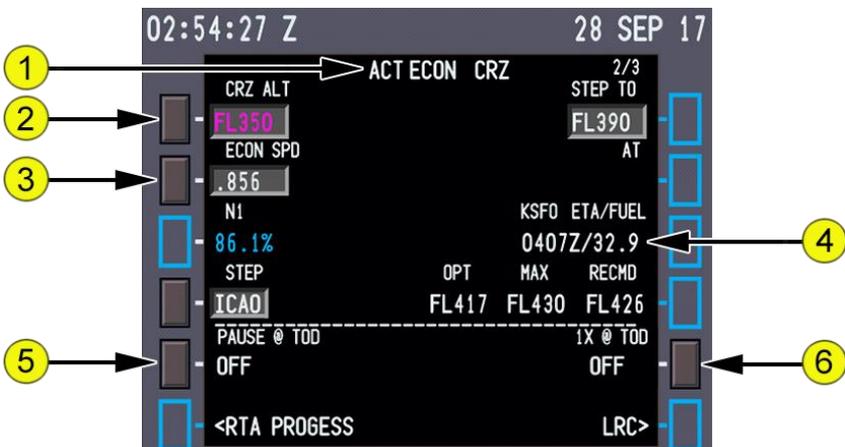
1. **Page Title**
   - The page title displays active (ACT) or modified (MOD) cruise. Usually, the title contains ECON for economy cruise. Selected speeds can modify the title.
     Page titles include:
     - o ECON CRZ Speed based on cost index.
     - o ECON CRZ CLB or CRZ DES Cruise climb or descent with ECON selected.
     - o MCP SPD CRZ Selected MCP cruise speed.

2. **Cruise Altitude (CRZ ALT)**
   - Displays cruise altitude entered on PERF INIT page.
   - Valid entries are: XXX, XXXX, XXXXX, OR FLXXX. Altitude displays in feet or flight level depending on the transition altitude.
   - Modified values display in shaded white.
   - Changing the MCP altitude and pushing the altitude selector enters the MCP altitude as the active cruise altitude, without creating a modification.

3. **Economy Speed (ECON SPD), Selected Speed (SEL SPD)**
   - Displays target speed or Mach in magenta.
   - MOD displays in the page title in shaded white until the modification is erased or executed.
   - SEL SPD displays when pilot enters speed.

4. **DESTINATION ETA/FUEL**
   - Displays estimated time of arrival and calculated fuel remaining at the destination.
   - Line title displays ETA/FUEL W/MOD when a route modification is pending.
   - Calculations are based on optimum step climbs and cruise altitudes.

5. **PAUSE AT TOD**
   - Select to enable Pausing at the Top of Descent
   - Must have a Flightplan with vertical profile executed in order for the FMS to compute TOD

6. **1X AT TOD**
   - Select to enable Slowing Sim Rate to 1X at the Top of Descent
   - Must have a Flightplan with vertical profile executed in order for the FMS to compute TOD

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VNAV Modifications

During the cruise phase, VNAV can calculate step climbs. Optimum step climbs are calculated by the FMC. In all cases, the new climb altitude must be selected in the MCP altitude window before VNAV commands the climb.

Calculated Step Climb

When a nonzero value is entered into the STEP SIZE line on the PERF INIT or CRZ page, the FMC calculates optimum points for step climbs as the aircraft performance permits. The climb altitude is determined by the value in STEP SIZE. Multiple step climbs are possible based on performance and route length.
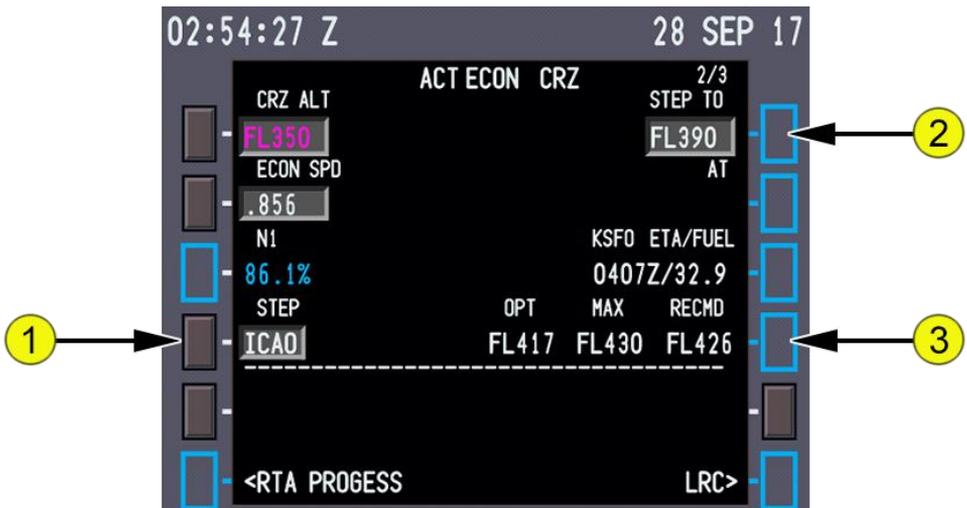
1. **STEP SIZE**
   - Used for calculation of optimum step point and step climb predictions.
   - Displays the default step climb size of ICAO.
   - Valid entries are altitudes from 0 to 9000 in 1000-foot increments.
2. **STEP TO**
   - An altitude can be entered for a step climb evaluation. The FMC calculates the predicted step climb data and displays the results on this page and the PROGRESS page.
   - Step climb altitudes entered on the RTE LEGS page can be higher or lower than the CRZ ALT. These step climb altitudes cannot be overwritten on the
   - CRZ page.

- When using the ICAO step size, the STEP TO altitude is the next higher altitude above the OPT altitude corresponding to the direction of flight, based on the CRZ ALT entered before takeoff. Changes to CRZ ALT while inflight do not affect calculation of STEP TO altitudes using ICAO step sizes.
- When using an altitude increment step size, the STEP TO altitude is the next higher altitude above OPT calculated by adding the STEP SIZE increment to the FMC CRZ ALT.
- When entering a cruise altitude above maximum altitude, the CDU help window message MAX ALT FLXXX displays.
- Entry of a new cruise altitude deletes all waypoint altitude constraints at or above the new cruise altitude.
- Displays:
  - The STEP TO altitude from the RTE LEGS page
  - A calculated step climb altitude based on the step size
- Manual entry is allowed.
- Blank when:
  - There is no active flight plan, or
- **3. Optimum Altitude, Maximum Altitude, and Recommended Altitude**
- **OPT**
  - With ECON speed selected, displays altitude which minimizes trip cost based on weight and cost index.
- **MAX** Displays maximum sustainable altitude based on:
  - Current gross weight
  - Temperature
  - Two engines operating
- **RECMD** Displays the most economical altitude to fly

Reference Nav Data

The reference navigation data page displays data about waypoints, navaids, airports, and runways

How to Access

You can access this page from LSK 1R on the INIT/REF Page
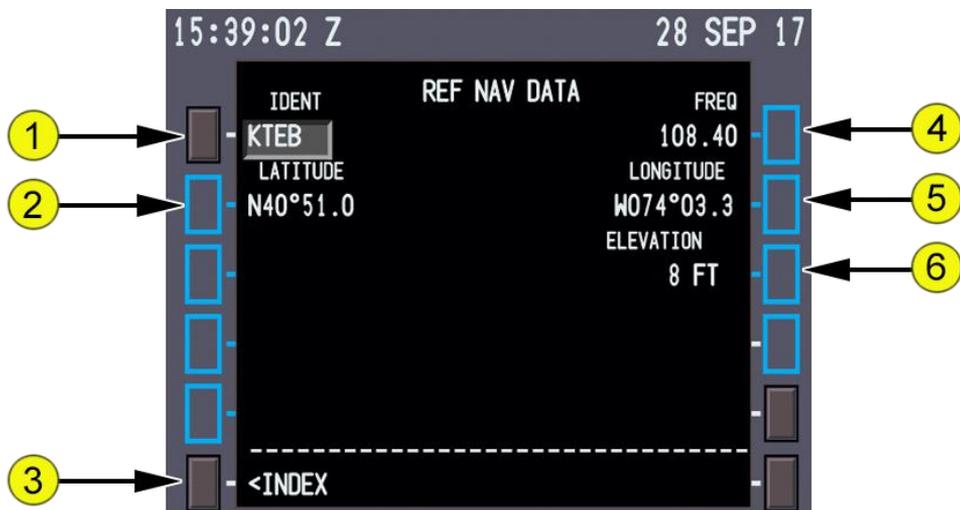
1. Identification (IDENT)
   - Valid entries are any waypoint, navaid or airport from the navigation database.
   - Entry changes to dashes when page is exited and then reselected.
2. LATITUDE Displays latitude of entered identifier.
3. INDEX
   Select Displays the INIT/REF INDEX page.
4. Frequency (FREQ) Displays frequency of entered identifier when it is a navaid.
5. LONGITUDE Displays longitude of entered identifier.
6. ELEVATION Displays elevation of entered identifier when it is a navaid or airport

Fix Information page

Four identical FIX INFORMATION pages are used to create waypoint fixes and waypoints for the ND. The page can be cleared by selecting the ERASE FIX prompt or by using the DEL key.

Magnetic or true fix bearings depend on aircraft location.

How to Access

You can access this page from LSK 1R on the INIT/REF Page

1. **FIX** Valid entries are airports, navaids, place bearing distance, place bearing/place bearing, along-track, latitude/longitude, and waypoints from the navigation database. The selected fix displays on the ND and is highlighted by a green circle.
2. **Bearing/Distance (BRG/DIS), ETA, DTG, ALT**
   - Valid entries are XXX/YYY.Y:
     - o Decimal values can be omitted.
     - o Leading zeros can be omitted for distance entries.
     - o Distance only entries (up to 5400 NM) must start with a slash (/)
   - Distances from the fix display on the ND as a circle around the fix.
   - Bearings from the fix display on the ND as radial lines from the fix.
3. **Bearing/Distance (BRG/DIS)** - Dashes Enter a bearing, distance, or both bearing and distance from the fix. A bearing and distance from the fix displays on the ND as a waypoint fix point.
4. **ERASE FIX** Select Removes all fix data from the page and the ND.

Route Data Page

The route data page displays data for each waypoint on the ACT RTE X LEGS page. This page is available only for the active route.

The ETA and calculated fuel remaining at the waypoint display for each waypoint.

Manual entry is not possible.

How to Access

You can access this page from LSK 6R on the LEGS Page

1. **ETA** Displays ETA for waypoint.
2. **WAYPOINT (WPT)** Displays identifier for waypoint.
3. **FUEL** Displays the FMC-calculated fuel remaining at the waypoint.
- Note: ETA and estimated fuel calculations assume a direct flight across route discontinuities.

Position Report Page

The position report page displays data for a position report. The page contains reference data only. Manual entries are inhibited.

How to Access

You can access this page from LSK 6L on the PROGRESS Page

1. **Position (POS)** Displays the last waypoint name or latitude/longitude used to report position. This is the previous active waypoint.
2. **Estimate (EST)** The active waypoint displays in magenta.
3. **NEXT** Waypoint after active waypoint.
   - Temperature and Wind (TEMP WIND)
   - TEMP displays the OAT in °C.
   - WIND displays the wind direction and speed
4. **Temperature and Wind (TEMP WIND)**
   - TEMP displays the OAT in °C.
   - WIND displays the wind direction and speed.
5. **Actual Time of Arrival and Altitude (ATA ALT)**
   - ATA displays the actual time of arrival for the POS waypoint.
   - ALT displays the aircraft altitude at last waypoint.
6. **ETA** Displays the estimated time of arrival for the active waypoint.
7. **Position Fuel (POS FUEL)** Displays the FMC calculated fuel remaining at the POS waypoint.

Progress Page 1/2

The progress page displays general flight progress data.
The page title displays the company flight number entered on the RTE page.
Page one of the progress pages displays general data about:

• Waypoints (active and next)
• Destination data
• FMC speed
• T/C, T/D, etc.

How to Access

You can access this page by selecting the PROG mode key.
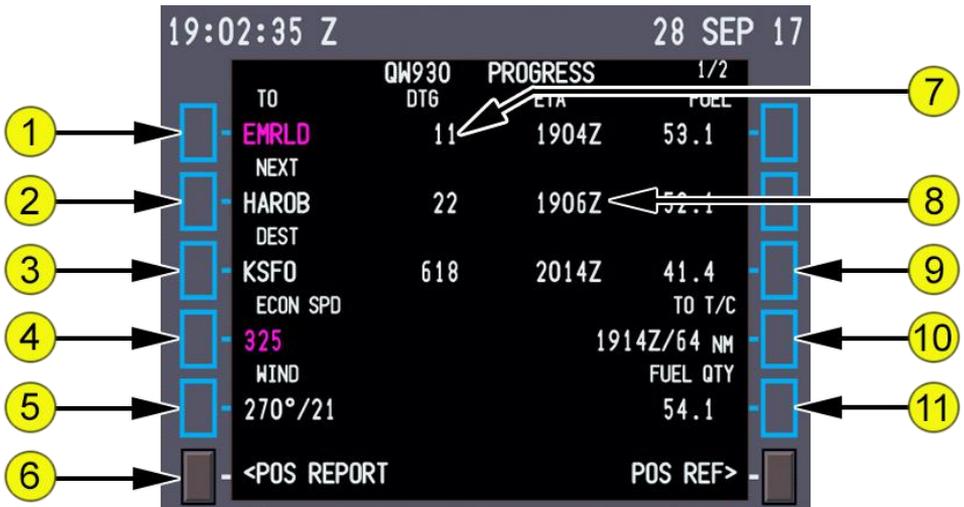
1. **TO**
   • Active waypoint displays in magenta.
   • Cannot be modified.
2. **NEXT**
   • Waypoint after TO waypoint displays in white.
   • Cannot be modified.
3. **Destination (DEST)** Shows destination airport
4. **Selected Speed (SEL SPD)**
   • The FMC active command speed displays in magenta.
   • The active speed mode is the same as on the performance page, unless changed by the MCP or a limit. The speed modes are:

- o ECON SPD - economy speed
- o MCP SPD - MCP speed entered on the MCP IAS/MACH indicator
- o SEL SPD - selected speed manually entered on the CDU

5. **Wind** Displays Current Winds
6. **Position Report (POS REPORT)** Select Displays the POS REPORT page.
7. **ETA** Estimated time of arrival at waypoint or destination.
8. **Distance To Go (DTG)** Distance to go to waypoint or destination.
9. **FUEL** Estimated fuel remaining at waypoint or destination.
10. **TO T/D**
    - Data line displays ETA and DTG to line title point.
    - Data line disappears when the aircraft is past the climb/descent point
    - Line titles are:
      - o T/C - top of climb
      - o T/D - top of descent data
11. **FUEL QTY** Displays Total Fuel Quantity

Progress Page 2

Progress page two contains:

- Wind data
- Fuel data
- Static air temperature
- True airspeed
- Track error data

How to Access

You can access this page by selecting the PROG mode key and then selecting the NEXT PAGE key
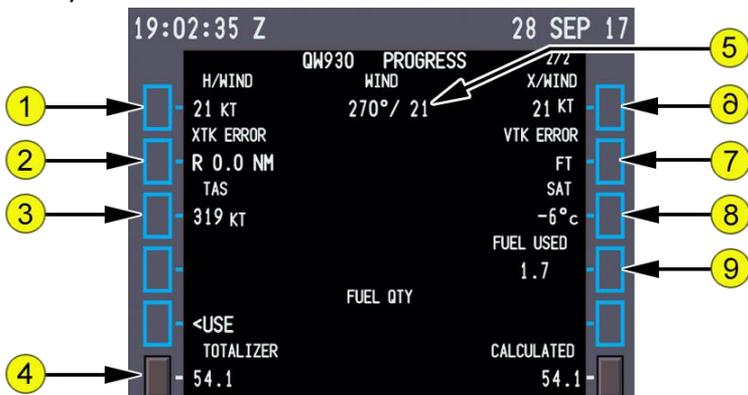
1. **Headwind (H/WIND), Tailwind (T/WIND)**
   - Displays headwind (H/WIND) or tailwind (T/WIND) component.
   - Wind component data is relative to the aircraft.
2. **Crosstrack Error (XTK ERROR)** Displays crosstrack (XTK) error in nautical miles left or right of the active route.
3. **TAS** Displays aircraft true airspeed.
4. **TOTALIZER** Displays Total Fuel Quantity
   Fuel Quantity TOTALIZER, CALCULATED
5. **WIND** Displays current wind direction and
6. **Crosswind (X/WIND)** Displays left (L) or right (R) crosswind component relative to aircraft heading.
7. **Vertical Track (VTK) ERROR** Displays error above (+) or below (-) the vertical path.
8. **Static Air Temperature (SAT)** Displays outside static air temperature.
9. **Total Fuel Used (FUEL USED TOT)** Displays sum of the LEFT, RIGHT and APU fuel used values.

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FMC Descent Pages

VNAV Descent Page

The descent page is used to monitor and revise the descent path. Descent speeds are economy (ECON) and fixed speed (SEL). The default VNAV descent mode is ECON. A fixed speed descent is flown when speed intervention is used or a speed is entered on the DES page. The descent page is blank with DES as the title until an altitude constraint below the cruise altitude is entered. This page title includes the VNAV speed mode. The ECON mode controls descent speed at the economy speed until reaching a lower speed restriction. The fixed speed mode controls descent speed at the fixed speed until a lower speed restriction is reached

How to Access

You can access this page by selecting the VNAV mode key
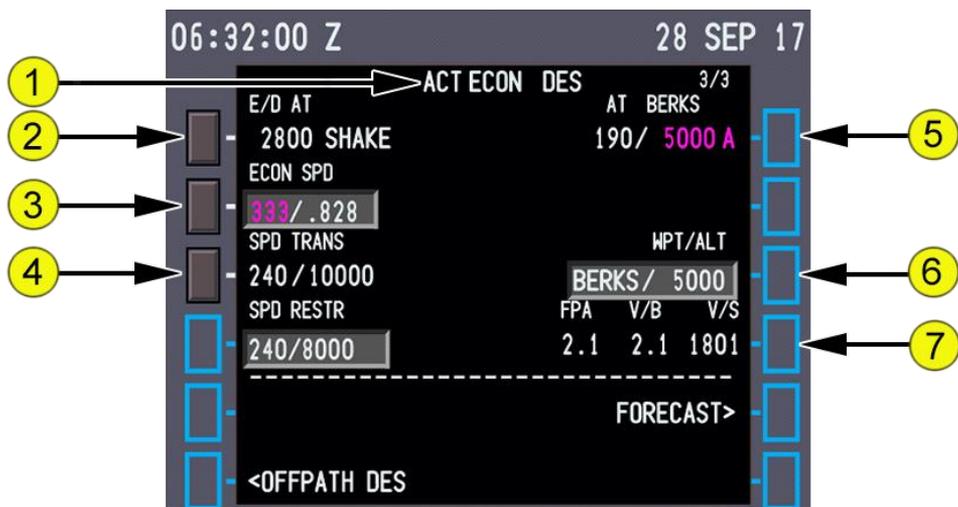
1. **Page Title**
   - The page title displays active (ACT) or modified (MOD) descent. Usually, the title displays ECON for economy descent. Fixed speed descents modify the title.
   - The page title displays the type of descent:
     - ○ ECON - speed based on a cost index
     - ○ MCP SPD - MCP speed intervention is selected
     - ○ XXXKT - fixed CAS descent speed profile

- o M.XXX - fixed Mach descent speed profile
- Fixed descent speeds are for
  - o A pilot entered selected speed (SEL SPD).
  - o A speed transition.
  - o A speed restriction associated with an altitude constraint.
  - o Waypoint speed constraints.

2. **End of Descent AT (E/D AT)**
   - Displays the end of descent altitude and waypoint.
   - The end of descent point is a waypoint in the descent phase with the lowest altitude constraint.
   - The altitude displays in magenta when altitude becomes the FMC altitude target.
   - blank if no E/D point exists.

3. **Economy Speed (ECON SPD), Selected Speed (SEL SPD)**
   - Both CAS and Mach values display.
   ECON SPD
   - o Economy speed based on cost index.
   - o Displays CAS and Mach values.
   SEL SPD
   - o Displays when pilot enters speed
   - o Displays constraint speed on transitioning into a selected speed segment (waypoint speed constraint, SPD RESTR, or SPD TRANS).
   - o Valid entries are CAS or Mach.
   - o The FMC commanded speed is magenta. Initially, Mach is magenta and CAS is white. Below CAS/Mach transition altitude, CAS is magenta and Mach is white.

4. **Speed Transition (SPD TRANS)**
   - The transition speed is usually 10 knots less than the destination airport limiting speed from the navigation database. When no airport limit speed exists, the default speed of 240 knots displays. The transition altitude is the point the transition speed is active for the destination airport. When no altitude exists in the navigation database, the default of 10,000 feet displays.
   - Speed displays in magenta when it is the FMC speed target.

5. **AT XXXXX**
   - Displays the next waypoint constraint from the RTE LEGS page

- The constraint is speed/altitude. Blank when no constraint exists.
- Speed and/or altitude display in magenta when they are the FMC target values.

6. **Waypoint/Altitude (WPT/ALT)**
   - Defaults to the next descent waypoint constraint (displayed in 1R) if no pilot entry.
   - Displays dashes if no constraint exists in the descent portion of the flight plan.
   - Valid entry is any waypoint/altitude combination where the waypoint exists in the Nav Database, or in the flight plan (including lat/lon waypoints and reporting points) and the altitude is below the current aircraft altitude.

7. **Flight Path Angle (FPA), Vertical Bearing (V/B), Vertical Speed (V/S)**
   - **FPA**
     - Displays the current flight path angle of the aircraft.
     - Display is blank if no waypoint/altitude combination is displayed at line select key 3R or if the aircraft is below the altitude displayed at line select key 3R.
     - V/B displays the calculated vertical bearing required to achieve the waypoint altitude displayed at line select key 3R.
     - V/S displays the vertical speed required to achieve the waypoint altitude displayed at line select key 3R.

FMC Approach Pages

During approach, roll and pitch modes usually change to the approach guidance supplied by navigation radios. The FMC continues to calculate and show present position and can supply LNAV and VNAV approach guidance for certain types of approaches when radio navigation is not used.

The RTE LEGS and PROGRESS pages are used to manage the aircraft until other approach guidance becomes active. Other pages which support approaches are:

- **ARRIVALS page** To select arrival and approach procedures.
- **APPROACH REF page** To specify approach flap settings and set the approach VREF.
- **HOLD page** To manage holding patterns. Holding is described in this section but it can be used during any phase of flight.

Arrivals Page

The arrivals page allows selection of a runway, approach, approach transition, standard terminal arrival route (STAR) or profile descent, and an arrival transition to the destination airport. The INDEX key accesses the DEP/ARR INDEX and provides arrival/departure data for any other airport in the navigation database.

Selecting Options

Selecting a runway, approach, approach transition, STAR/profile descent, or arrival transition displays <SEL> inboard of the selection and displays MOD in the page title. The other options within the same category are removed from the list. When the modification is executed, <SEL> changes to <ACT>. Selecting another page and returning to ARRIVALS displays all options; the applicable <SEL> or <ACT> prompts display.

When a STAR is selected followed by selection of an approach or runway and a transition exists in the navigation database, the transition waypoints with associated speed/altitude constraints are inserted into the flight plan linking the STAR to the approach or runway. If more than one transition exists, selection of the applicable transition is made under TRANS on the left side of the page.

Some STARs serve more than one runway. If a STAR and runway are selected and subsequently a different runway is selected, and if the STAR is compatible with the new runway, the transition waypoints are inserted into the flight plan linking the STAR to the runway.

If a different STAR, runway, or STAR-runway combination is desired, selecting another page and returning to the ARRIVALS displays all options.

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How to Access

You can access this page by the DEP/ARR mode key

```
23:46:03 Z                        28 SEP 17
              ➤KSFO ARRIVALS         1/2
   STARS                          APPROACHES
   BDEGA2      <ACT>   <ACT>       ILS 19L
   TRANS                            TRANS
   AMAKR                            CCR
   
   LEGGS                           BERKS
   
   MLBEC
   
   MRRLO
   -------------------------------------
   <INDEX                          ROUTE>
```

1. **Page Title**
   - The destination airport identifier displays in the title.
   - Airports with more than 5 runways or STARs produce multiple arrivals pages.
2. **Standard Terminal Arrivals (STARS)**
   - STARs display in a list under the STARS line title.
   - NONE displays when there are no STARS in the database.
   Select
   - Selects STAR for entry into the route; <SEL> displays.
   - All other arrival procedures no longer display and transitions for the selected procedure display.
   - Deletes a previously selected procedure.
   - Displays ERASE prompt.
3. **STAR Transitions (TRANS)**
   - Displays list of transitions for the selected arrival procedure.
   Select
     o Selects transition for entry into the route.
     o All other transitions no longer display.

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4. **INDEX**
   - Select Displays the DEP/ARR INDEX page.
5. **APPROACHES**
   - Displays the destination airport approaches.
   - ICAO eight-character approach names are supported. Example: RNVZ 08R.
   - Selection and execution of an ILS approach autotunes the ILS receivers and displays the course. Selection and execution of a back course (B/CRS) approach autotunes the ILS and displays the front course.
   Select: Selects approach for entry into the route; <SEL> displays; TRANS replaces
6. **Approach Transitions (TRANS)**
   - Displays a list of transitions to the selected approach.
   - Approach transitions include IAFs, feeder fixes, and fixes providing routing to the FAF.
   Select
     - Selects transition for entry into the route.
     - Deletes all other transitions.

Approach Ref Page

The approach reference page displays approach planning data and approach reference speed (VREF) selection.

How to Access

You can access this page from the INIT REF Page or by selecting INIT REF Mode key when airborne
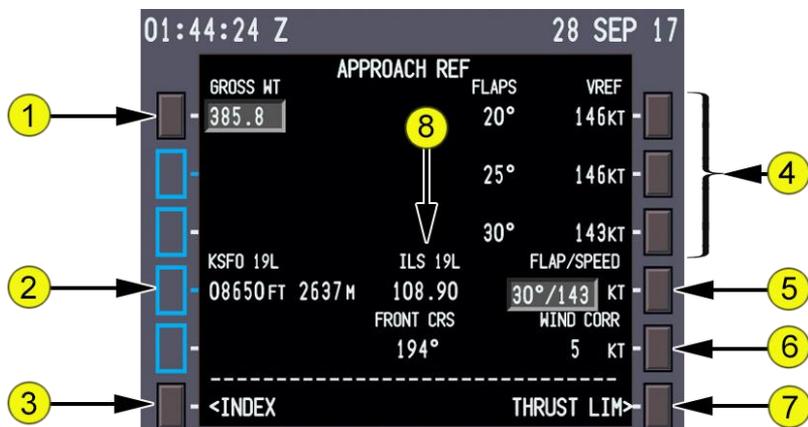
1. **Gross Weight (GROSS WT)**
   - FMC-calculated aircraft gross weight displays.
2. **Runway Length**
   - Displays the length in feet and meters of the destination runway.
3. **INDEX** Select Displays the INT/REF INDEX page.
4. **FLAPS VREF**
   - Displays the calculated reference speed for flaps 20°, 25°, and 30°.
   - The V-Speeds automatically calculate and display as soon as the Approach Ref Page is accessed
   - Can Accept UPLINKed V-Speeds from the EFB OPT
5. **FLAP/SPEED**
   - The flap position and VREF speed is entered for landing.
   - The VREF speed displays on the PFD.
6. **Wind Correction (WIND CORR)**
   - Displays wind correction to be applied to approach speed.
   - Defaults to 5 KTs. Valid entry is a speed from 0 to 20 KTs.
7. **Thrust Limit (THRUST LIM)** Select Displays the THRUST LIM page.
8. **ILS Information**: Displays ILS Frequency & Course of Destination Runway

Alternates Page 1/2

ALTN page 1/2 data aids the pilot in finding a suitable alternate airport. The page displays four airports in an ETA sequence.

- Note: Alternates Page 2/2 is a static display and not discusses in this manual
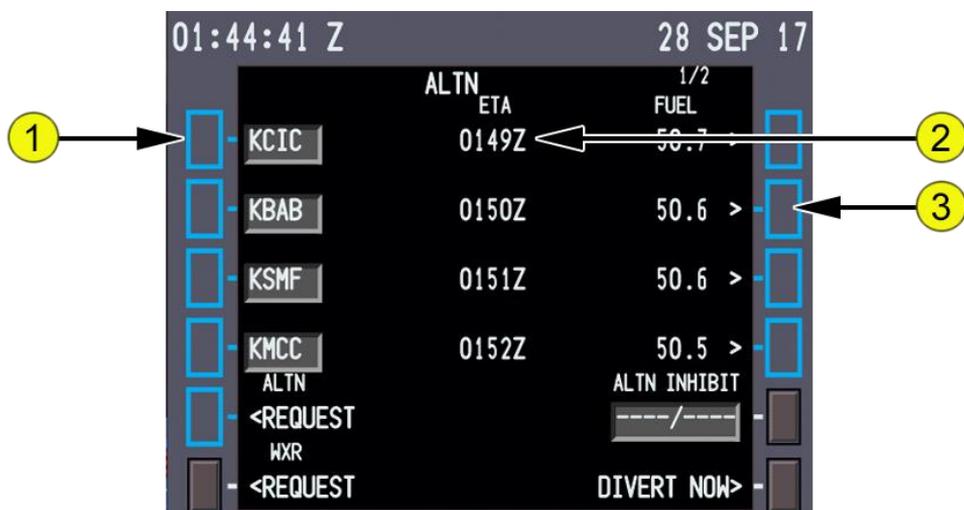
1. **Alternate Airports**
   - Displays the identifier of the four alternate airports in ETA order when airborne; and, in distance order when on the ground.
2. **ETA**
   - ETA is calculated based on the routing, altitude, and speed displayed on the XXXX ALTN page.
   - Displays the alternate airport ETA.
   - Blank when aircraft is on the ground.
3. **FUEL**
   - Predicted arrival fuel is calculated based on the routing, altitude, and speed displayed on the XXXX ALTN page.
   - Displays the alternate airport predicted arrival fuel.
   - Blank when aircraft is on the ground.

Hold Page

First Hold

The hold page is used to enter a holding pattern in the route.
When the flight plan does not contain a holding pattern, selecting the HOLD function key displays the RTE X LEGS page with the HOLD AT line.
Two versions of the hold page are possible:

- A pilot-entered holding pattern

The holding page displays actual or default data about the holding pattern.
Entries modify the route. Modifications can be erased or executed.
Active holding patterns are magenta on the ND.

Hold Page (Existing Hold)

When one or more holding patterns exist in the route, select the HOLD key to display the hold page for the first holding pattern. When the hold is the next LNAV event, active commands display in magenta. Holding parameters can be monitored and changed on this page. New holding patterns are added using the NEXT HOLD prompt.
On the ACT RTE HOLD page, selecting and executing EXIT HOLD> causes LNAV to command the aircraft to continue in the holding pattern until arriving at the holding fix, at which time the aircraft exits the holding pattern.
Following execution of the exit hold, only the remaining portion of the holding pattern back to the holding fix displays. Exit from the holding pattern may occur prior to crossing the holding fix (fly-by) if the course to the next waypoint is not closely aligned with the holding inbound course. The exiting flight path remains within the confines of the protected holding airspace. The exit flight path displays on the ND.

How to Access

You can access this page by the selecting the HOLD mode key
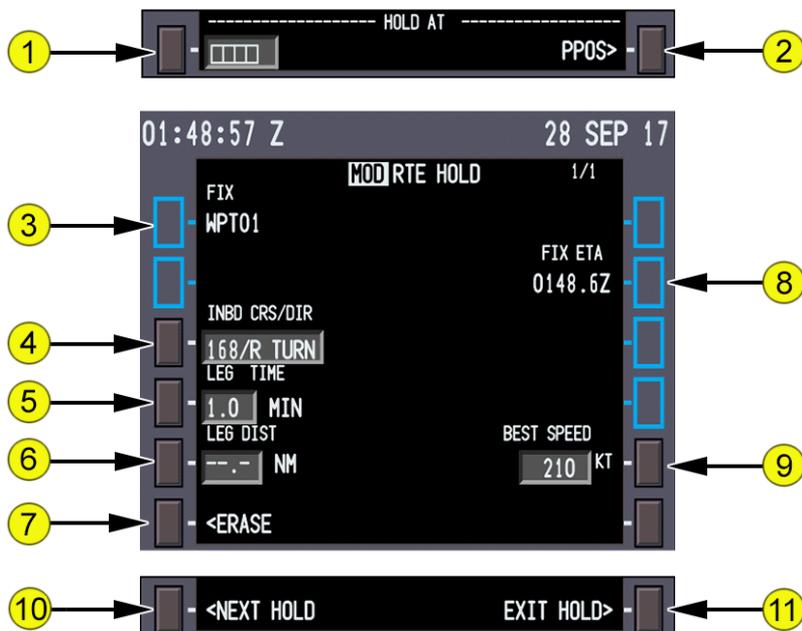
1. **HOLD AT**
   - Displays boxes to enter the holding fix: a RTE LEGS, database, or pilot-defined waypoint; a navaid or airport identifier; or a FAF already in the flight plan.
   - Entering a holding fix displays the RTE X HOLD page.
2. **HOLD AT Present Position (PPOS)**
   Select
   - o Creates a holding pattern at present position.
   - o Execution establishes the holding fix at the position when EXEC is selected and displays RTE HOLD.
3. **Holding FIX** Displays the holding fix.
4. **Inbound Course/Direction (INBD CRS/DIR)**
   - Displays inbound course and turn direction.
   - Valid entry is XXX (inbound course), XXX/X (inbound course/turn direction), /X or X (turn direction).
5. **Leg Time (LEG TIME)**
   - Displays 1.0 MIN by default

- Displays dashes when an entry made on LEG DIST line.
- Valid entry is X, X.X, or .X.

6. Leg Distance (LEG DIST)

- Normally displays dashes. Allows entry of leg distance for hold.
- Entry displays dashes on LEG TIME line.
- Valid entry is X, XX, X.X or XX.X, where X is any integer.

7. **ERASE** Erases all FMC modification.

8. FIX ETA Displays time the aircraft will next pass the holding fix.

9. **BEST SPEED** Displays the best holding speed for the aircraft gross weight, altitude, and flap setting.

- Note: May exceed ICAO limit speed

10. NEXT HOLD

Select Displays a new hold page for a new holding pattern entry.

11. EXIT HOLD

Select

- o Arms a holding pattern exit.
- o EXIT ARMED displays in shaded white; when executed, aircraft returns to the holding fix via the inbound course for holding pattern exit.

FMC QualityWings Specific Pages

Announcement Status

The Announcement Status Page provides for the following QWPAS and QWCAS Interfaces:

- Displays current status of QWCAS
- Displays current status of QWPAS
- Displays current status of the Landing Checklist feature in QWCAS
- Mode Skip Control
- Ability to disable modes
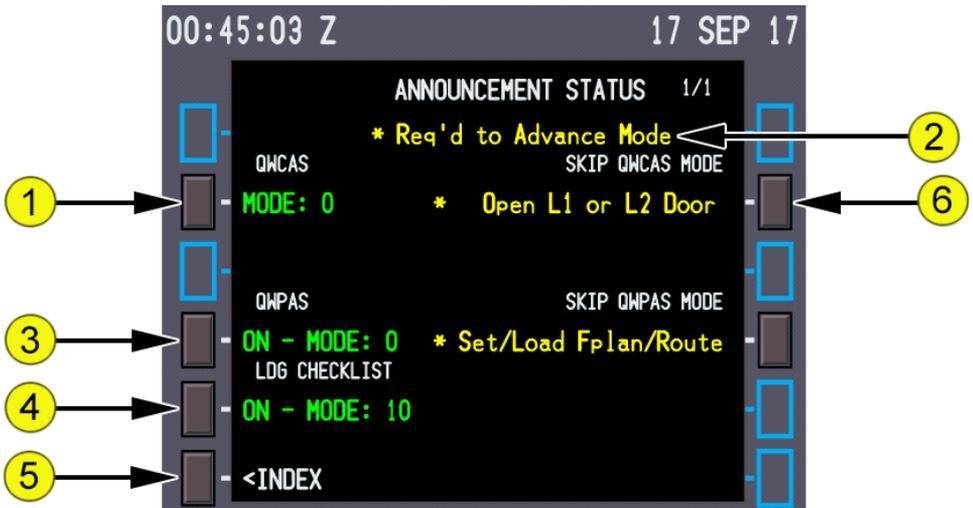
1. **QWCAS On/Off Control**
   - Allows you to turn QWCAS OFF.
   - When OFF is selected, **MODE** changes to **OFF**
   - The Mode indicates the last completed Mode
2. ***Req'd to Advance Mode Title**
   - Simply a legend so that you understand the next steps required to advance the QWPAS and QWCAS modes as indicated adjacent to LSK 2R and 4R

3. **QWPAS On/Off Control**
   - Allows you to turn QWPAS OFF.
   - When OFF is selected, **ON: MODE** changes to **OFF**
   - The Mode indicates the last completed Mode
4. **QWCAS Landing Checklist On/Off Control**
   - Allows you to turn QWPAS OFF.
   - When OFF is selected, **ON: MODE** changes to **OFF**
   - The Mode indicates the last completed Mode
5. **INDEX** Displays the INDEX Page
6. **Skip Control**
   - Allows you to skip to the Next QWCAS mode at LSK 2R
   - Allows you to skip to the Next QWPAS mode at LSK 4R

QWCAS Mode	
1	Initialized
2	Preflight Checklist
Unannunciated Mode	Pilot Flying Welcome Aboard
3	Before Start Checklist
Unannunciated Mode	Pilot Flying Crew Brief
4	Before Taxi Checklist
5	Before Takeoff Checklist
6	Runway Verified
7	Pilot Monitoring 80 knots
8	787 Automated VEE ONE
9	Pilot Monitoring Rotate
10	Pilot Monitoring VEE TWO
11	Positive Rate, Gear Up
12	Pilot Flying Flaps 5 Call
13	Pilot Flying Flaps 1 Call
14	Pilot Flying Flaps Up Call
15	After Takeoff Checklist
16	Descent Checklist
17	Approach Checklist
Unannunciated Mode	Landing Checklist

QWPAS Mode	
1	Initialized
2	Automated Boarding Announcement
3	Automated Departure Announcement
4	Safety Demonstration
5	Automated Flight Attendants Be Seated for Departure Announcement
Unannunciated Mode	After Takeoff Welcome
6	Automated After Takeoff Announcement
7	Pilot Flying Cruise Announcement
8	Automated Seatbelts ON in cruise Announcement
9	Automated Immigration Announcement
10	Automated US Customs Announcement
11	Automated Initial Descent Announcement
12	Automated Final Approach Announcement
13	Automated Flight Attendants Be Seated for Arrival Announcement
14	Automated After Landing Announcement
15	Pilot Flying Flaps 1 Call

Flight Plans

The FLIGHT PLANS page(S) allow for selection of User Stored Flight Plans and automatically stored Flight Plans. Stored Flight Plans are those that have been placed in the following folder in your Flight Sim Directory:

- QualityWings\QW787\FlightPlans\

QWTip: We suggest keeping Filenames as short as possible. A format that I think can work is [ICAO Origin ICAO Destination]. As an example:
KSEAKSFO
KSEAKSFO1

You can have multiple pages of Flight Plans saved.
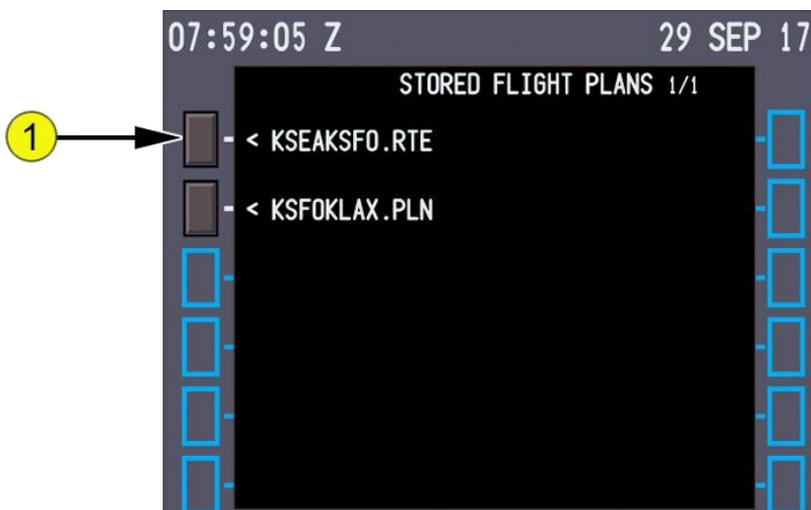
1. **Stored Plan (Typical)**
   Select Loads the Stored Flight Plan

Load ATC Route

If you load a Flight Plan via the Flight Simulators Flight Planner from the Menu, you can load the ATC Route.
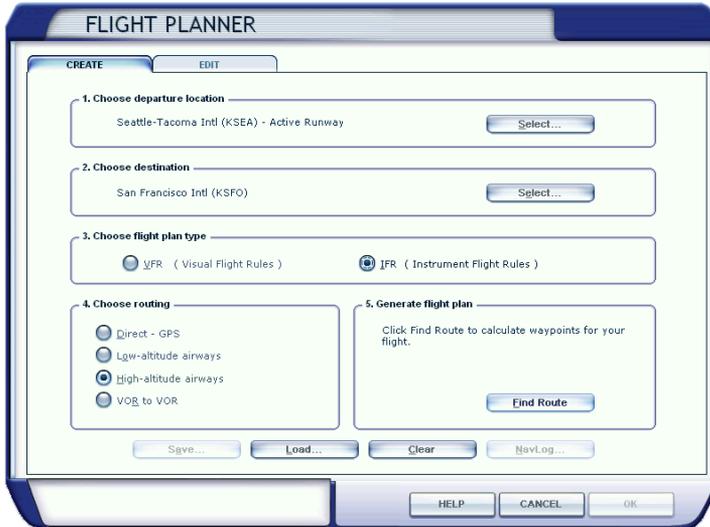
When you finally Click "Find Route" and save your flight, the Flight Sim will ask if you want to move the aircraft to the departure runway. Regardless of whether you choose to or not, the ATC route will be loaded.

Once it has loaded, just click LOAD ATC ROUTE

After a brief delay, you will automatically be taken to the ROUTE Page.

- Note: You will still need to activate your route

QWTip: More information about the ROUTE page can be found in the FMC Preflight Pages section

Load Panel

The STORED PANELS page allows selection of any user stored panel states. Stored Panel States are those that have been saved to the following folder in your Flight Sim Directory:

- QualityWings\QW787\PanelStates\

*QWTip: To load the Cold and Dark Situation by default, an entry to a configuration file must be made manually. In the QualityWings folder in your Flight Simulator Directory, simply add the line: **panelstate=coldanddark.pnl** A Simpler way of doing this will be available in the future*


1. **Stored Panels (Typical)**
   Select Loads the Stored Panel States

QualityWings SIMULATIONS

Save Panel

The SAVE PNL prompt saves the current panel state for retrieval in the LOAD PNL page

- Once saved, a CDU Help Window will show the following message

Save Flightplan

The SAVE FPL prompt saves the current flight plan for retrieval in the LOAD FPL page

- In order to save a Flight Plan, it must be ACTIVE.
- Once saved, a CDU Help Window will show the following message: