F70 & F100 PROFESSIONAL

OPERATIONS MANUAL

Just Flight

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F70 & F100 PROFESSIONAL

Operations Manual

Please note that Microsoft Flight Simulator must be correctly installed on your PC prior to the installation and use of these F70 Professional and F100 Professional simulations.

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INTRODUCTION

The Just Flight F70 Professional and F100 Professional for Microsoft Flight Simulator are high-fidelity simulations of the aircraft at the pinnacle of Dutch aviation engineering.

Intended as an evolution of the popular F28 Fellowship turbojet regional airliner, the F70 and F100 were designed as stretched and modernised versions, targeted at the crowded yet lucrative modern regional jet market. Seating up to 122 passengers in a high-density configuration and powered by Rolls-Royce Tay Mk.620-15 or Mk.650-15 turbofan engines, the aircraft offer a higher seating capacity, greater efficiency and improved performance over their predecessors, whilst still being optimised for short- to medium-haul routes.

With a maximum range of 1,520 miles (2,450 km) and a state-of-the-art glass cockpit and avionics suite, the F70 and F100 were strong competitors against even the larger aircraft types operated by mainline carriers.

With its low wing, T-tail and rear-mounted engines, the F70 and F100 bear a strong resemblance to other regional airliners of the time such as the 717, CRJ and MD-90. The aircraft were optimised for runway performance, with a thick wing leading to short take-off runs and high initial climb rates, even allowing the aircraft to perform flap 0 take-offs – a unique characteristic of the F70 and F100. Upon landing, the aircraft's tail-mounted speedbrake, wing-mounted lift dumpers, reverse thrust and powerful wheel brakes make the aircraft great performers whenever they are on the runway.

The aircraft were well regarded thanks to their low operating costs, quiet engines and comfortable cabin, with 333 aircraft manufactured between 1986 and 1997. Although the aircraft are no longer in production, they continue to prove popular with airlines around the world, with approximately a third of the manufactured aircraft remaining in revenue-earning service in 2025 in places such as Australia, South America and Africa.

Just Flight's complex, high-fidelity simulation of the F70 and F100 is built upon an incredible amount of reference material for the real aircraft. The development team were exceptionally fortunate to get hands-on experience with more than five examples of the type, including some of the final opportunities to get hands on with the type in active service in Europe, as well as to receive a huge amount of input from real-world pilots and engineers.

Aircraft specifications

Doors

1. Front passenger door
2. Nose gear bay door
3. Over-wing emergency exit doors (number varies per variant)
4. Main gear bay door
5. Aft service door (only applicable to some F100 variants)

1. Front service door
2. Forward cargo door – upward-opening (large) or downward-opening (small)
3. Centre cargo door – upward-opening (large) or downward-opening (small)
4. Aft cargo door – upward-opening (large) or downward-opening (small)
5. APU intake door

Dimensions

F70

Length	30.91 m (101’ 5”)
Wingspan	28.08 m (92’ 2”)
Height	8.5 m (27’ 11”)
Wing area	93.5 m^2 (1,006 ft^2)

F100

Length	35.53 m (116’ 7”)
Wingspan	28.08 m (92’ 2”)
Height	8.5 m (27’ 11”)
Wing area	93.5 m^2 (1,006 ft^2)

Weights

F70

Empty weight	22,673 kg (49,985 lb)
Maximum zero fuel weight	33,565 kg (74,000 lb)
Maximum take-off weight	41,730 kg (92,000 lb)
Maximum landing weight	36,740 kg (81,000 lb)

F100

Empty weight	24,375 kg (53,738 lb)
Maximum zero fuel weight	37,420 kg (82,500 lb)
Maximum take-off weight	45,810 kg (101,000 lb)
Maximum landing weight	39,915 kg (88,000 lb)

Performance

F70

Economical cruise	0.73 Mach / 246 IAS at 35,000 ft
Range	1,841 NM / 2,119 M / 3,410 km
Take-off distance (MTOW)	1,760 m (5,774 ft)
Landing distance (MLW)	1,270 m (4,166 ft)

F100

Economical cruise	0.73 Mach / 246 IAS at 35,000 ft
Range	1,323 NM / 1,522 M / 2,450 km
Take-off distance (MTOW)	1,860 m (6,102 ft)
Landing distance (MLW)	1,550 m (5,085 ft)

Engines

Type	2 x Rolls-Royce Tay Mk620-15
Thrust (sea level, static)	61.6 kN (13,850 lbf)
Thrust-to-weight ratio	4.2
Bypass ratio	3.04:1
Length	94.7” (2.405 m)
Fan diameter	44” (1.118 m)
Dry weight	3.310 lb (1,501 kg)

Fuel

Fuel capacity	13,365 litres / 2,940 imp gal / 3,531 US gal

Configurations and liveries

F70

Our extensive research indicates that, unlike its predecessor the F100, all F70s were delivered with the same passenger and cargo door configuration – a downward-opening L1 passenger door with integral airstairs, and upward-opening (large) cargo doors.

One exception to this is the prototype F70, which was fitted with downward-opening (small) cargo doors. However, as this configuration only existed on the prototype – which in turn was originally the F100 prototype before being converted into the F70 prototype and never operated in passenger service – this configuration isn't modelled in this simulation.

F70 | Integral Airstairs | Large Cargo Door

This configuration is the only variant of the F70 that was offered to customer airlines; it features a downward-opening L1 passenger door with integral airstairs, and upward-opening (large) cargo doors.

This configuration has the following liveries:

- Air Littoral
- Alliance Airlines
- American West
- Austrian Airlines
- Demonstrator
- KLM Cityhopper
- Malev Airlines
- Netherlands Government
- TUS Air
- Tyrolean

F100

The F100 was offered to airlines in a highly customisable state, with various types of passenger, service and cargo doors available in any configuration to the buyer. With two different L1 passenger door types, an optional L2 service door aft of the wing and two types of cargo door, there are many possible F100 configurations.

Based on our extensive research of the real-world aircraft, we have identified four primary configurations that are seen across the majority of the F100s in service. These four configurations are modelled in this F100 Professional simulation. Each configuration has its own set of high-quality liveries accurately assigned based on photographs gathered of the respective liveries.

F100 | Integral Airstairs | Small Cargo Door

This configuration features a downward-opening L1 passenger door with integral airstairs, and downward-opening (small) cargo doors.

This configuration has the following liveries:

- KLM UK
- TAT (British Airways)

F100 | Integral Airstairs | Large Cargo Door

This configuration features a downward-opening L1 passenger door with integral airstairs, and upward-opening (large) cargo doors.

This configuration has the following liveries:

- British Midland
- Spanair
- Virgin Australia

F100 | Sliding Door | Large Cargo Door

This configuration features a forward-opening (sliding) L1 passenger door requiring the use of external stairs or a jetway, and upward-opening (large) cargo doors.

This configuration has the following liveries:

- Air Berlin
- Air France Regional
- Air UK
- Alliance Airlines
- Austrian Airlines
- American Airlines
- Carpatair
- Germania
- Helvetic Airways
- QantasLink
- Slovak Government Flight Service

F100 | Integral Airstairs | Small Cargo Door | L2 Door

This configuration features a downward-opening L1 passenger door with integral airstairs, downward-opening (small) cargo doors and an additional L2 service door aft of the wing.

This configuration has the following liveries:

- Air Niugini
- Demonstrator
- TAM

INSTALLATION, UPDATES AND SUPPORT

Installing and activating the aircraft

You can install the F70 Professional and F100 Professional software as often as you like on the same computer system. Follow these steps:

1. Log in to your Account on the Just Flight website.
2. Select the 'Your Orders' button to view your purchases.
3. Select the product and download the version for your simulator.
4. The installer is provided as a compressed (.zip) file. Extract it using a free unzipping tool such as 7-Zip.
5. Run the setup.exe file and follow the on-screen instructions.
6. When prompted, enter your activation code. Your unique activation code can be found in your Account alongside the download link. We recommend copying and pasting the code to avoid errors.

Uninstalling

To uninstall this product from your system, use one of the Windows App management features:

Control Panel > Programs > Programs and Features

or

Settings > Apps > Apps & features

or

Settings > Apps > Installed Apps

Select the product you want to uninstall, choose the 'Uninstall' option and follow the on-screen instructions.

Uninstalling or deleting this product in any other way may cause problems when using this product in the future or with your Windows set-up.

Updates and Technical Support

For technical support (in English) please visit the Support pages on the Just Flight website.

As a Just Flight customer, you can get free technical support for any Just Flight product.

If an update becomes available for this aircraft, we will post details on the Support page and we will also send a notification email about the update to all buyers who are currently subscribed to Just Flight emails.

Regular News

To get all the latest news about Just Flight products, special offers and projects in development, subscribe to our regular emails.

We can assure you that none of your details will ever be sold or passed on to any third party and you can, of course, unsubscribe from this service at any time.

You can also keep up to date with Just Flight via Facebook and X.

SYSTEMS OVERVIEW

The F70 and F100 are short-to-medium-range subsonic aircraft, powered by two Rolls-Royce Tay Mk620-15 or Mk650-15 turbofan engines mounted either side of the rear fuselage. The tail is comprised of a single vertical stabiliser and a high-mounted horizontal stabiliser, commonly referred to a 'T-tail' due to its appearance.

The flight deck has seating positions for a Captain, a First Officer and an observer, whilst the passenger cabin has a seating layout that varies depending on an airline's preference. Passenger seat numbers in the F70 can range from 72 in a low-density configuration to 85 in a high-density configuration. The F100 can seat 85 in a low-density configuration or up to a maximum of 122 in a high-density configuration.

The aircraft are electrically powered using 115V/400Hz from the two engine-driven generators, with each taking half of the total load. An auxiliary power unit (APU) houses an additional generator to supplement the system and an external power source can also be connected. Constant speed drives (CSDs) are fitted to both engine generators to maintain a constant 400Hz frequency across the entire engine RPM range. DC power is obtained from four transformer rectifier units (TRUs) or from the aircraft's batteries.

Two independent hydraulic systems are supplied via two engine-driven pumps, one on each engine. One pump supplies 3,000 PSI to system 1 and the other supplies 3,000 PSI to system 2. An electrically driven pump is installed in each system and is used to increase the pressure in the respective system prior to engine start.

The tricycle landing gear is short and sturdy, allowing for operations from remote dirt airstrips, and is hydraulically operated by the pressure of hydraulic system 1. In the event of a hydraulic system failure, an alternative method of landing gear extension is installed in the form of a lever on the aft side of the pedestal which unlocks the nose and main gear door uplocks, and a dump valve to depressurise the landing gear pressure lines. The main gear inboard doors stay open following an alternative extension and slide strips prevent serious damage on landing.

All flying controls are duplicated across both pilot stations and are mechanically-hydraulically connected to the respective control surfaces. Actuators on each control surface are powered by hydraulic systems 1 and 2, meaning that a single hydraulic system failure does not affect operation. In the case of a failure in both hydraulic systems, the ailerons, elevator and rudder can be operated by direct mechanical control and the stabiliser can be operated via an alternate electrical mode. A flight control lock on the aft pedestal can be used to prevent movement of the flying controls via a mechanical lock.

Four double-slotted Fowler flaps (two per wing) are operated by ball-screw-type mechanical actuators linked to the flap lever on the centre pedestal. The normal take-off flap setting for the F100 is flaps 0 and the flaps can be extended to a maximum of 42° for landing. A hydraulically operated speed brake is located on the rear of the fuselage and controlled by a two-position speed brake lever on the pedestal with IN and OUT positions.

Lift dumpers on the top side of both wings spoil lift and increase drag after touchdown. These are hydraulically controlled via hydraulic system 1 and can only be operated when the aircraft is on the ground. The lift dumpers can be operated manually when the reverse thrust levers are raised, or will be automatically deployed if the arming push-button is pressed on the pedestal.

Two completely independent fuel systems in each wing operate in isolation from each other. A cross-feed system allows both engines to be fed from either tank. The transfer of fuel between left and right tanks is not possible. Fuel can also be stored in a centre tank (if fitted).

The air conditioning and pressurisation systems maintain the air in the pressurised compartments at the desired level of pressure, temperature and freshness. Bleed air is tapped directly from the low pressure (LP) and high pressure (HP) stages of the compressor of either engine and is then cooled, conditioned and distributed to the individual compartments and then discharged overboard.

Ice and rain protection is provided for the engines, horizontal stabiliser and wings in the form of hot bleed air from the engines. The pitot tubes, stall warning vanes and windshields are electrically heated. Variable-speed windshield wipers, a rain repellent system and ice detection systems are also fitted.

A dual-channel Automatic Flight Control and Augmentation System (AFCAS) provides flight director, autopilot, autothrottle and flight augmentation functions. The output of these systems is displayed across six CRT screens on the main instrument panel. A dual FMS provides functions for flight planning, navigation performance management and lateral and vertical guidance facilities.

AIR CONDITIONING AND PRESSURISATION

Air conditioning

Two identical air conditioning systems are installed in the aircraft: pack 1 and pack 2. The airflows from pack 1 (servicing the flight deck and cabin) and pack 2 (servicing the cabin) pass into a manifold. The excess airflow from the flight deck system supplements the cabin airflow. Each system is capable of supporting the aircraft's entire air conditioning and pressurisation requirements.

Controls for the air conditioning packs are located on the AIRCONDITIONING section of the overhead panel.

The airflow to both packs is supplied by the bleed air system. Conditioned air from a ground air conditioning unit may be supplied to the distribution system via the LP ground connection. Ram air can be introduced into the distribution system during unpressurised flights. Cabin air can be recirculated within the cabin by four fans (F100 only). Exhausted cabin air is used for avionics and instrument cooling. Failures will be detected and the relevant alerts presented.

Air conditioning packs

The airflows from pack 1, servicing the flight deck and cabin, and pack 2, servicing the cabin, pass into a manifold. The excess airflow from the flight deck system supplements the cabin airflow. Controls for the air conditioning packs are located on the AIRCONDITIONING section of the overhead panel. The pack valves have a combined flow control and shut-off function.

Flow control

There are three modes of flow control: normal, economy and augmented. Normal and economy flows can be selected manually. With economy selected, economy flow is obtained when both pack valves are open and the automatically controlled cabin temperature is within a preset range from the selected temperature. Economy flow is automatically selected:

- During take-off. Normal flow is restored approx. one minute after lift-off.
- Upon TOGA activation. Normal flow is restored after one minute.
- As long as maximum take-off thrust is selected.

Economy flow is inhibited when both temperature control push-buttons are in manual mode.

The augmented mode is operative when one pack is manually switched OFF.

Temperature control

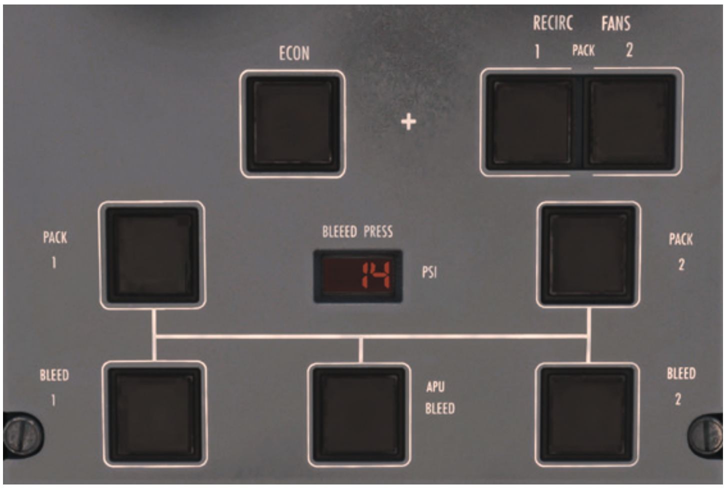
Hot bleed air entering the pack is ducted to the temperature control valve and the cooling system. The cooling system changes the hot bleed air into cold air. Variable opening of the temperature control valve determines the amount of hot air to be mixed with cold air. The temperature may be controlled automatically or manually via the temperature selectors. The air temperature of cabin, cabin supply and flight deck supply can be displayed.

Distribution

Conditioned air from the manifold is distributed to the flight deck and cabin via independent ducts.

The flight deck air outlets for the Captain, First Officer, sidewalls and ceiling are individually adjustable. The outlets on the pedestal are not adjustable. Floor ventilation is controlled by levers located on the respective side panel.

Cabin air is distributed overhead along each cabin wall. The cabin air can be recirculated by four recirculation fans which are mounted in the cabin ceiling. The fans are controlled by the RECIRC FANS push-buttons on the AIRCONDITIONING section of the overhead panel, and are only fitted to the F100.



During unpressurised flight, ram air may be introduced to the manifold via a valve. Control is via the RAM AIR push-buttons located on the ram air panel.

Low-pressure conditioned air can be supplied to the manifold for distribution throughout the aircraft via a ground connection provided on the forward right section of the aircraft.

Avionics cooling system

The avionics compartment, main instrument panel, glareshield and pedestal are cooled by the avionics cooling system. The system consists of three blower fans, two suction fans and an emergency cooling fan. Cabin air is ducted to the system by the blower fans. The used air is drawn from the system by the suction fans and is dumped in the area aft of the forward cargo compartment.

If the used air is above a predetermined temperature while on the ground with no engine operating, cooling air is dumped overboard via the avionics cooling valve. The emergency cooling fan will automatically provide cooling air for EFIS 1 in the event of the avionics cooling system becoming inoperative.

If the avionics cooling system is inoperative, failures will be detected and the relevant alerts presented.

Pressurisation

Cabin pressure is regulated by the outflow valves, which control the outflow of air from the cabin. The outflow valves can be operated in an automatic or manual mode and controls for both modes of operation are located on the PRESSURIZATION panel. The automatic mode allows a maximum differential pressure of 7.46 PSI; this means that a cabin altitude of 8,000 ft can be maintained at 35,000 ft.

An excessive cabin altitude warning is presented at 10,000 ft, and altitude limiting is provided at 13,500 ± 1,500 ft. The outflow valves limit the maximum differential pressure to 7.65 PSI, thus providing protection in both the automatic and the manual mode. The cabin is automatically depressurised upon landing. Two inward pressure relief valves prevent negative cabin pressure. If a fault is detected, an alert will be presented.

Automatic pressurisation control

In the automatic mode the outflow valves are controlled by a single- or dual-channel pressurisation controller. Controls are provided on the LH side of the pressurisation panel. Pressurisation begins when take-off thrust is selected. After take-off the pressurisation controller automatically schedules a cabin altitude for each aircraft altitude and a rate of cabin altitude change for each aircraft rate of climb and descent. The rate of change may be limited by the RATE limit selector. The landing altitude selector provides the pressurisation controller with a reference for computing the scheduled cabin altitude and rate of cabin altitude change. The selected value of landing field elevation may be varied at any time; the system will immediately recognise the new value.

Manual pressurisation control

In the manual mode the outflow valves are controlled pneumatically via the controls on the RH side of the pressurisation panel. The manual mode can be selected by depressing the PRESS CONTROL push-button. The cabin altitude can be changed via the manual control lever. The rate of cabin altitude change is set via the manual rate control knob. Placing the manual pressure control lever to the UP position will fully depressurise the cabin. The cabin will remain depressurised provided that the lever remains in the UP position. The manual mode provides pneumatic pressurisation control independent of electrical supplies.

Bleed air

Bleed air is used for air conditioning, pressurisation, anti-icing and engine starting, as well as for pressurising the hydraulic and water tanks. Bleed air is supplied by the engines. On the ground, bleed air can be supplied by the APU or via an external high pressure ground connection.

The bleed air system is controlled from the AIRCONDITIONING panel.

In the case of an engine fire, the respective bleed air system is shut off when the fire handle is pulled.

Engine bleed

Bleed air is tapped from the low pressure (LP) and high pressure (HP) engine compressors. Normally the HP bleed valve is closed and LP bleed air is used. At low power settings the HP bleed valve opens fully to supply pressure. The pressure in the common duct is indicated on the AIRCONDITIONING panel.

When engine, wing or tail anti-icing is switched on, the temperature modulating function of the HP bleed valve is activated. When the LP bleed air temperature is too low, the HP bleed valve will open just enough to maintain the required bleed air temperature. The modulating function is inhibited as long as either thrust lever is selected to the maximum take-off position and for approximately 60 seconds after TOGA activation.

APU bleed

APU bleed air is provided via the APU bleed valve. The bleed valve can only open during ground operations; in flight it is closed. When engine bleed air is available, a check valve will prevent reverse flow through the APU.

AIRCRAFT EQUIPMENT

Flight deck

The flight deck provides accommodation for two pilots (the Captain and the First Officer) and an observer.

The pilots' seats are each equipped with a five-point harness and are adjustable horizontally and vertically. They feature animated headrests and armrests which are each adjustable via a clickspot on the seats.

The ideal pilot's seating position aligns the bottom of the glareshield with the horizontal white line at the top of the main instrument panel. This is aligned to the 'Landing' camera preset in this simulation.

An observer seat is fitted to the aft wall behind the Captain's seat and features a shoulder harness and lap belt. The seat can be folded out or stowed by clicking one of the two red locking levers.

Side consoles, situated outboard of the Captain's and First Officer's stations, contain ashtrays, cup holders and stowage for flight manuals. Floor ventilation controls are also provided.

Two control columns can be hidden/shown independently via a clickspot located on the SMOKE GOGGLE panel on both sides of the cockpit.

The cockpit door can be opened/closed (if unlocked) via a clickspot on the door handle, providing access to the passenger cabin. Further information on the cockpit door operation and locking systems can be found in the Doors section of this manual.

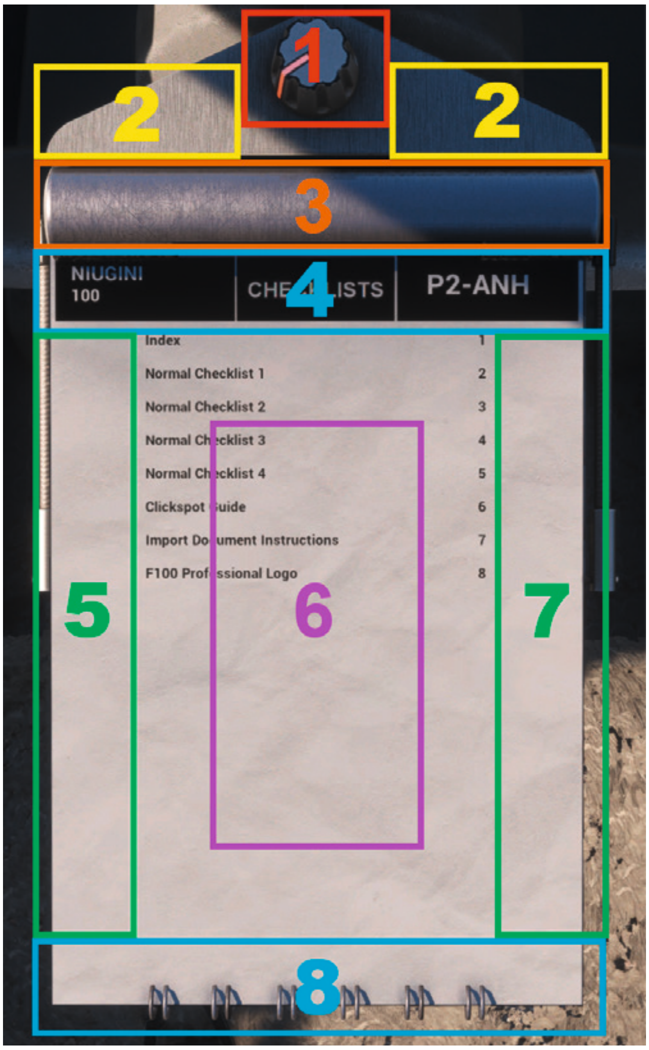
A ‘SUN VISORS’ option on the EFB can be used to toggle the visibility of the sun visors. When enabled, one sun visor is fitted to a rail on either side of the cockpit. Clicking and dragging the sun visor left/right will move it along its rail.

A centralised fault display unit is fitted to the observer’s panel in the F70.

An AFCAS maintenance panel is fitted to the observer's panel in the F100.

Paper checklists

The F70 Professional and F100 Professional feature fully customisable and interactable paper checklists.



Checklists can be fitted to the chart holder on each yoke by clicking the light housing at the top of the chart holder. Once fitted, one of up to 20 checklist pages can be selected from the index page, or you can cycle through the pages by using a variety of clickspots located around the page:

1. Chart holder light dimmer switch
2. Chart holder pivot
3. Hide/show checklist
4. Rotate anti-clockwise
5. Previous page
6. Index page
7. Next page
8. Rotate clockwise

The checklist can be rotated to be in a horizontal or vertical orientation by clicking the relevant clickspots.

A useful tooltip will briefly appear at the bottom of the page when the mouse is over a clickspot, indicating that clickspot's purpose.

A selection of checklists is included by default with the F70 Professional and F100 Professional and additional documents can be added by placing a .PNG file in one of the following file directories:

F70 Professional:

…\Community\justflight-aircraft-f70\Data\Images\Checklist

F100 Professional:

…\Community\justflight-aircraft-f100\Data\Images\Checklist

In order for documents to display correctly in the simulator, they should be A4 sized and in a .PNG format. If you wish to change the file names of the checklists or add any additional checklists, the *F100_checklist_list.ini* files (located in the same file directory) must be updated to reflect the change in file name.

If the simulator is running when document changes are made, a restart of the flight will be required for you to see any changes to the checklists.

When adding/removing/editing any files from an MSFS 2024 aircraft package, the package's layout.json file must be updated to reflect the file changes. The layout.json file is located in the root folder of the package *(…\Community\justflight-aircraft-f70 or …\Community\justflight-aircraft-f100)* and can be edited manually or via the free community-created MSFSLayoutGenerator tool.

A dimmer switch at the top centre of the yoke provides control of the chart holder light.

Forward galley

The forward galley provides accommodation for one or two cabin attendants, depending on the variant. One or two stowable cabin attendant seats are attached to the forward port (left) bulkhead.

Above the cabin attendant seats are controls for the cabin emergency lighting and the digital music player.

On the aft wall in the forward galley, the cabin attendants' panel has the following controls:

- **READ LTS RESET** – when depressed, switches OFF any reading lights that were switched ON by passengers (reading lights not simulated).
- **F/S** – displays the status of the Fasten Seatbelt signs.
- **N/S** – displays the status of the No Smoking signs.
- **ENTRANCE** – ON/OFF and BRIGHT/DIM controls for the lights in the forward galley.
- **SIDE PANELS** – ON/OFF and BRIGHT/DIM controls for the lights on the cabin sidewalls.
- **CEILING** – ON/OFF and BRIGHT/DIM controls for the lights in the cabin ceiling.
- **TOILET AREA** – ON/OFF and BRIGHT/DIM controls for the lights in the rear galley.

On the starboard (right) side of the forward galley is a work area, including ovens, coffee maker and stowage. Light controls for the galley and work area are located at the top of the panel.

The forward galley is fitted with one passenger door (either an integral airstairs or sliding door type) and a service door. Further details on the operation of the aircraft's doors can be found in the Doors section of this manual.

Digital music player

A Becker DP4100 digital music player is fitted on the forward wall of the forward galley and provides a means to play music or announcements in the cabin throughout the flight.

1. ON/OFF button
2. Momentary press – Repeat/Shuffle button
   Press and hold – Music/Announcement mode toggle button
3. Volume knob / Mute button
4. Display
5. Play/Stop button
6. Skip Right button
7. Skip Left button

The digital music player can select and play up to seven different music tracks or announcements. It works much like a typical music player that you might find in your home or car, with Skip Left/Right buttons that are used to select the desired music track or announcement, Play/Pause button to play/pause the track and a volume knob which controls the volume when twisted or mutes the track when pushed in.

The volume of the music/announcements in the cockpit will vary depending on the position of the cockpit door. If the cockpit door is open, the music/announcements will be heard clearly in the cockpit, but with the cockpit door closed, the volume of the music/announcements will be significantly quieter.

In the real aircraft, the aircraft operator would decide which mode they want the digital music player to function in, and insert an SD card with the required software. In this simulation, pressing and holding the MODE button on the digital music player (labelled 2 above) will toggle between the two modes.

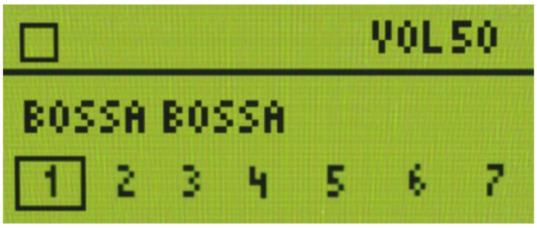
Music mode

A random music track will be selected when loading into the aircraft, meaning that a different music track will be heard the first time the music player is switched on during every flight.

When the Shuffle function is selected, the order in which the music tracks play will be randomised.

When the Repeat function is selected, the music track currently selected will play again when it ends.

If the AUTO CABIN CREW and AUTO CABIN MUSIC options are enabled on the Aircraft page of the EFB, the cabin crew will begin to play music when the passenger door is opened to begin boarding at the start of the flight, as well as at the end of the flight when the aircraft has vacated the runway and the flaps are retracted. If the CABIN ANNOUNCEMENTS option is enabled, the cabin crew will also trigger announcements from the player during various phases of flight. When the cabin crew triggers an announcement from the player, the music will be paused for the duration of the announcement.



Importing custom cabin music

Seven default music tracks are provided with the F70 Professional and F100 Professional, but custom music can also be imported and played through the cabin speakers. A maximum of seven music tracks can be loaded onto the music player.

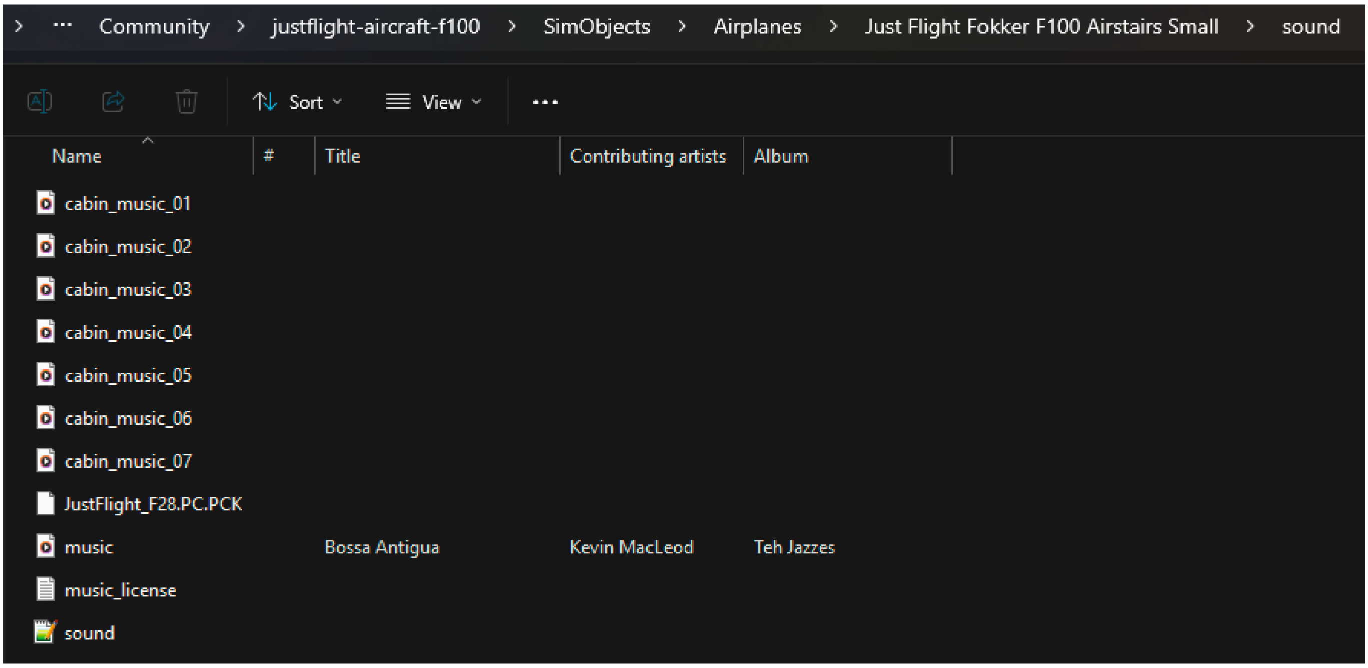
To import custom music, a .wav file must be placed into one of the following file directories, with the same name as the file it is replacing (e.g. 'cabin_music_01'):

F70 Professional:

…\Community\justflight-aircraft-f70\SimObjects\Airplanes\Just Flight Fokker F70\sound

F100 Professional:

…\Community\justflight-aircraft-f100\SimObjects\Airplanes\Just Flight Fokker F100 Airstairs Small\sound



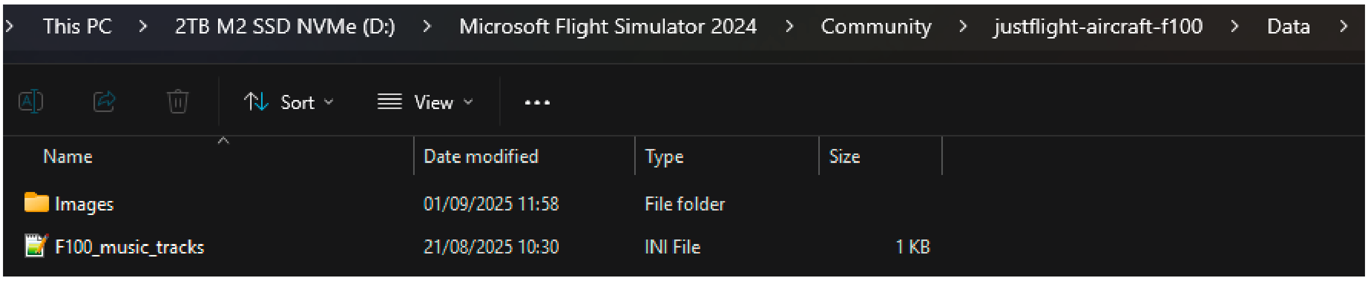
The name and duration of the imported track can be edited in the 'F100_music_tracks.ini' files in the following file directories (instructions for editing the .ini file are included in the file itself):

F70 Professional:

…\Community\justflight-aircraft-f70\Data

F100 Professional:

…\Community\justflight-aircraft-f100\Data



Any custom .wav file placed into this file directory must conform to the limitations of the simulator's core sound engine, so any .wav file must not exceed 16-bit stereo 44.1 kHz. A lower value of 22 kHz or 11 kHz may be used to reduce the quality of the sound, replicating the poor-quality speakers fitted to older aircraft. The reduction in bitrate will also reduce the file size of the track and thus reduce the simulator's memory usage; this can have a dramatic effect on performance, especially on tracks with a longer running time.

For users familiar with audio engineering, the imported music should also be normalised to approximately -23 dB to match the rest of the sound environment.

All the above requirements can be achieved with free audio software such as Audacity.

Note 1: *If a .wav file does not conform to the MSFS sound engine limitations, the music will not be audible within the simulator*

Note 2: *When adding/removing/editing any files from an MSFS 2024 aircraft package, the package's layout.json file must be updated to reflect the file changes. The layout.json file is located at the root folder of the package (…\Community\justflight-aircraft-f70 or …\Community\justflight-aircraft-f100) and can be edited manually or via the free community-created MSFSLayoutGenerator tool.*

Announcement mode

A variety of announcements are available to play when the music player is in Announcement mode. Similar to the Music mode, the announcements can be cycled through by pressing the SKIP LEFT and SKIP RIGHT buttons. The selected announcement can be played by pressing the PLAY button and stopped by pressing the STOP button. The SHUFFLE function is disabled when the music player is in Announcement mode.

In Announcement mode, the following fields are displayed:

- **MIS (Mission)** – identifies the currently selected mission. In this simulation, this field will display the airline's name as listed in the 'ATC_AIRLINE' field of the aircraft.cfg.
- **ANN (Announcement)** – identifies the currently selected announcement.
- **Language options** – not functional. Only English language announcements are supported in this simulation.

If the AUTO CABIN CREW and CABIN ANNOUNCEMENT options are enabled on the Aircraft page of the EFB, the cabin crew will play announcements from the player at various stages throughout the flight.

Importing custom announcements

A variety of announcements are provided with the F70 Professional and F100 Professional, but custom announcements can also be imported and played through the cabin speakers.

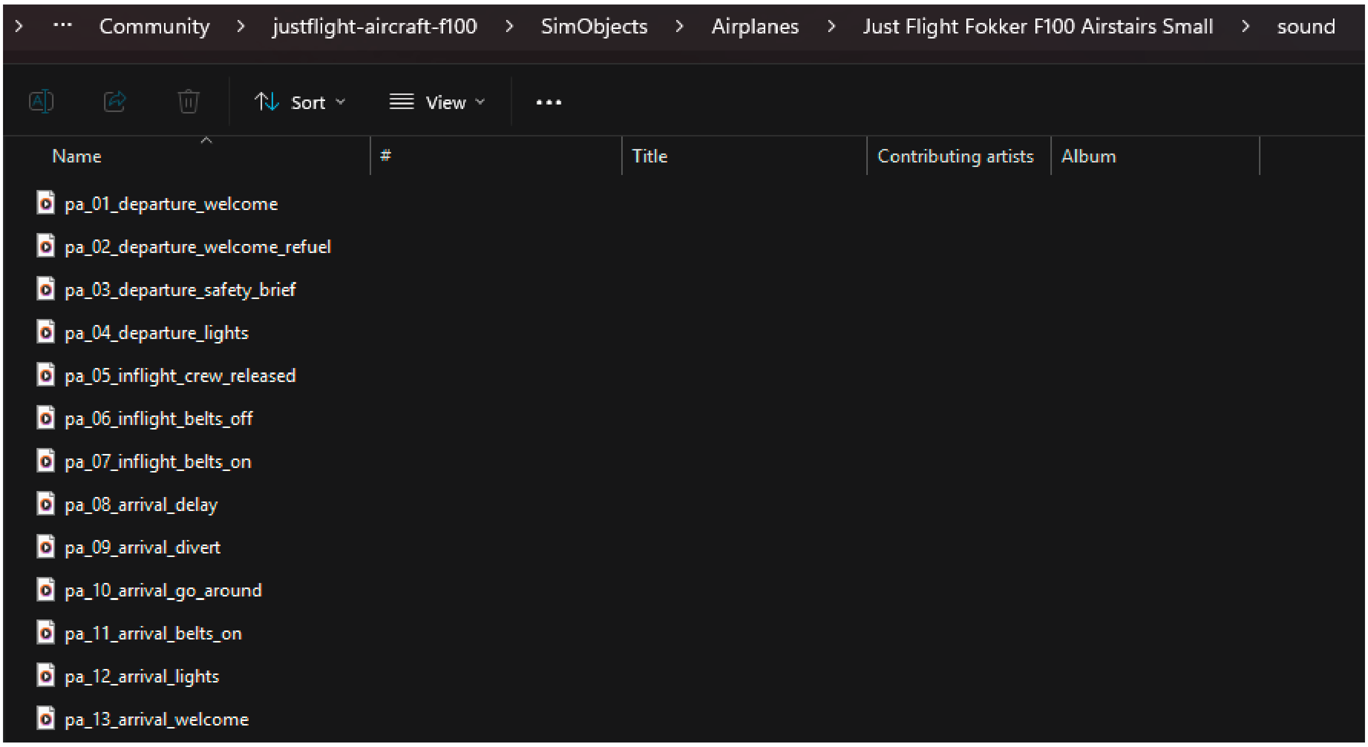
To import custom announcements, a .wav file must be placed into one of the following file directories, with the same name as the file it is replacing:

F70 Professional:

…\Community\justflight-aircraft-f70\SimObjects\Airplanes\Just Flight Fokker F70\sound

F100 Professional:

…\Community\justflight-aircraft-f100\SimObjects\Airplanes\Just Flight Fokker F100 Airstairs Small\sound



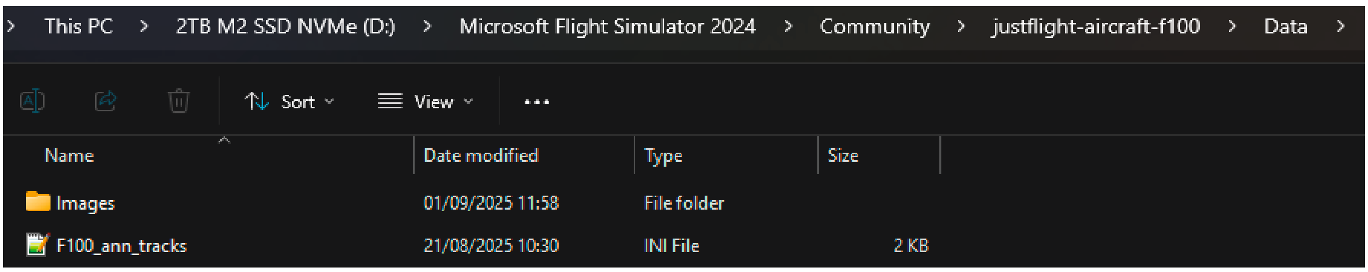
The name and duration of the imported announcements can be edited in the 'F100_ann_tracks.ini' files in the following file directories (instructions for editing the .ini file are included in the file itself):

F70 Professional:

…\Community\justflight-aircraft-f70\Data

F100 Professional:

…\Community\justflight-aircraft-f100\Data



IMPORTANT! *The announcements in the F70 and F100 are coded in such a way that they rely on the order and type of announcement remaining the same as those in the original page. Changing the order or the type of announcements can introduce issues where the intended announcements are not triggered at the correct time by the AUTO CABIN CREW. We therefore only recommend replacing announcements like-for-like. For example, replacing the '[3] SAFETY BRIEFING' announcement with a custom safety briefing .wav file is fine, but replacing it with a custom seat belt .wav file will cause the incorrect announcement to play in the simulator.*

Any custom .wav file placed into the file directories above must conform to the limitations of the simulator's core sound engine, so any .wav file must not exceed 16-bit stereo 44.1 kHz. A lower value of 22 kHz or 11 kHz may be used to reduce the quality of the sound, replicating the poor-quality speakers fitted to older aircraft. The reduction in bit rate will also reduce the file size of the track and thus reduce the simulator's memory usage; this can have a dramatic effect on performance.

For users familiar with audio engineering, the imported announcements should also be normalised to approximately -23 dB to match the rest of the sound environment.

All the above requirements can be achieved with free audio software such as Audacity.

Note 1: *If the .wav file does not conform to the MSFS sound engine limitations, the announcements will not be audible within the simulator*

Note 2: *When adding/removing/editing any files from an MSFS 2024 aircraft package, the package's layout.json file must be updated to reflect the file changes. The layout.json file is located at the root folder of the package (…\Community\justflight-aircraft-f70 or …\Community\justflight-aircraft-f100) and can be edited manually or via the free community-created MSFSLayoutGenerator tool.*

Passenger cabin

The passenger cabins modelled in this simulation will accommodate up to 70 passengers in the F70 and up to 100 passengers in the F100, both in a five abreast configuration.

Three passenger cabin variants are modelled for the F100 and one for the F70, each with different passenger and service door configurations and seating layouts. More details on the F70 and F100 variants can be found in the Configurations and liveries section of this manual.

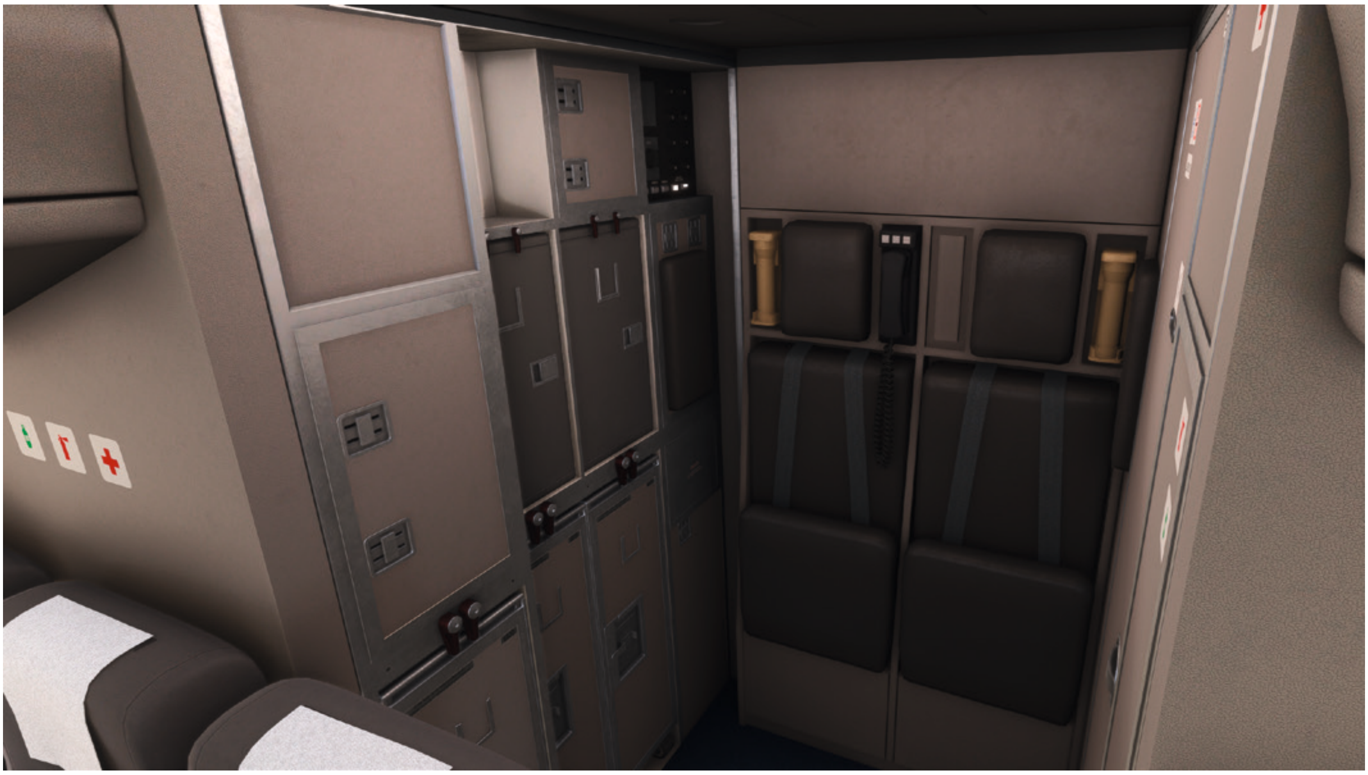
Overhead stowage bins are provided on each side of the passenger cabin, and passenger service units (PSUs) are provided above every seat with functional Fasten Seatbelt and No Smoking signs.

The passenger cabin can be toggled on/off to improve FPS/performance via the 'INTERIOR CABIN' option on the EFB.

Rear galley

The rear galley provides accommodation for two cabin attendants, with two stowable cabin attendant seats attached to the rear bulkhead.

A toilet compartment is located on the starboard (right) side of the galley and a work area is provided.



AUTOMATIC FLIGHT

The aircraft is equipped with an Automatic Flight Control and Augmentation System (AFCAS) which can control the aircraft in pitch, roll, yaw, speed and thrust. The AFCAS consists of three sub-systems:

- **Automatic Flight Control System (AFCS)** – provides Flight Director (FD), Autopilot (AP) and altitude alert functions.
- **Autothrottle System (ATS)** – provides automatic thrust control and speed protection.
- **Flight Augmentation System (FAS)** – provides yaw damping and stabiliser trim.

AFCS, ATS and FAS operate in close conjunction with each other. Calculations are done by two Flight Control Computers (FCC) and one Flight Augmentation Computer (FAC).

Automatic Flight Control System (AFCS)

The Automatic Flight Control System (AFCS) has three functions:

- FD guidance
- AP control
- Altitude alerting

All calculations for these three functions are done by two identical Flight Control Computers (FCC). AFCS output signals are routed to EFIS, to dual aileron, rudder and elevator AP servos, to the FWC and to FMS.

The AP servos are connected to the flight control system by means of slip clutches, which enable the flight crew to overpower a jammed servo motor.

Flight Control Computers (FCC)

The FCCs are the heart of the system. They provide AP control, FD guidance and altitude alerting, and the FCCs calculate the reference speeds for display on the PFDs. For this purpose the FCCs use inputs from several flight deck controls, the flight and navigation data systems, aircraft systems and the FMS.

In normal operations, the FCCs use onside data (e.g. FCC1 uses data from FMS1 and FCC2 uses data from FMS2). FCC1 serves FD1 and AP1, and FCC2 serves FD2 and AP2. Each FD provides display of steering commands on the onside PFD.

When AP1 is engaged, FCC1 is in control. When AP2 is engaged, FCC2 is in control. With both APs engaged (during take-off and autoland), both FCCs are in control.

An FCC failure during flight with AP engaged will cause the onside AP to disconnect automatically. Engaging the offside AP remains possible.

Controls and indicators

The Flight Mode Panel (FMP) has controls to engage an AP, to switch either FD on and off, to select the Flight Path Vector (FPV) display instead of the FD display, and to select AFCS modes, speed, altitude, heading and bank limit. The FMP also has an AP disconnect bar to alternatively disengage the AP (the AP is normally disengaged via disconnect buttons on the control wheels).

To select the TOGA mode for FD and AP, TOGA triggers are installed on the thrust levers. The EFIS presents the flight modes (FMA), steering guidance, reference speeds, selected altitude data and the relevant failure flags. FCC (FD) source selections for the PFD are made at the source select panel.

Detected AFCS failures are presented by the FWC on the MFDUs. A loss of autoland capability is indicated by two AUTOLAND caution lights on the glareshield. The lights can be depressed to reset them.

AP engagement/disengagement

The AP can be engaged when the aircraft is in the air. Normally the AP on the side of the pilot flying is engaged.

When, during take-off, AP1 or AP2 engage button is depressed below 1,500 ft AGL, both APs will engage in the TO mode. Upon leaving the take-off mode (e.g. by selection of the LVLCH mode), the selected AP will remain engaged.

Before take-off a NO AP BELOW 500 FT alert is displayed at MFDS if AP engagement during take-off would result in single AP engagement.

When the AP is engaged while not in the take-off mode or above 1,500 ft AGL, AP1 engages when the AP1 push-button is depressed and AP2 engages when the AP2 push-button is depressed. The AP will now engage in the basic modes: vertical speed and heading hold.

Upon LAND capture the second AP will engage automatically.

The AP can be manually disengaged by depressing the AP disconnect button on either control wheel. This action is accompanied by a double 'cavalry charge' tone and flashing AP annunciation on the FMA. The flashing AP on the FMA can be cancelled by depressing the AP disconnect button again. Alternatively, the AP disengages when the AP disconnect bar on the FMP is pulled, or when both stabiliser trim switches on either control wheel are operated for more than 1.5 seconds. This action directly interrupts the FCC output to the AP servos and is accompanied by a continuous 'cavalry charge' tone and a flashing AP on the FMA. Both are cancelled by depressing the AP disconnect button.

Automatic AP disengagement will occur in the case of a system failure and is accompanied by a continuous 'cavalry charge' tone and a flashing AP on the FMA. Both can be cancelled by depressing either AP disconnect button.

Note: *The AP can only be engaged when two IRSs are in the NAV or ATT mode.*

AP/FD modes

Heading mode

The HDG mode consists of two sub-modes: HDG hold and HDG select.

HDG hold is the basic lateral mode. HDG hold is activated by pushing the heading control knob at the FMP or upon AP/FD engagement when not in the take-off mode. The heading display on the FMP will show dashes. The green heading select light is out and the existing heading will be maintained.

When HDG hold is selected in a turn, the aircraft will maintain the heading after roll-out.

A new heading can be preselected while in the HDG hold mode by rotating the heading control knob; the dashes in the heading display will be replaced by the preselected heading and the heading bug on the EFIS will display the present heading.

The HDG select mode is activated by pulling the heading control knob on the FMP. This action will light up the green heading SELECT light. The selected heading is displayed on the FMP and the heading bug on the EFIS will show the selected heading.

Upon HDG select activation, the aircraft will turn to the selected heading with the amount of bank as set with the bank limit selector on the FMP.

When in HDGs, heading changes of more than 180 degrees can be made without the aircraft changing the direction of turn.

Activation of the HDG select mode cancels the previously selected lateral mode, with the exception of the LAND mode after LAND capture.

Vertical Speed mode

V/S is the basic vertical AP/FD mode. V/S is activated by rotating the V/S wheel on the FMP to the required value, or upon AP/FD engagement when not in the TO mode.

The aircraft will maintain the selected vertical speed, indicated on the V/S display above the V/S wheel on the FMP. Activation of the V/S mode will cancel all previously selected vertical modes, with the exception of the LAND mode after LAND capture. The V/S mode is inhibited during the ALT capture phase.

Altitude mode

The ALT mode consists of two sub-modes: ALT select and ALT hold.

In the ALT select mode the aircraft will automatically capture the altitude selected on the FMP. If during the ALT capture phase a new altitude is selected in the same direction as the aircraft path (i.e. higher when climbing, lower when descending), the system will automatically revert to the previous AP/FD mode with the previous speed or thrust target.

In ALT hold mode the aircraft will maintain the existing altitude after level off. The ALT hold mode is activated when:

- The aircraft captures the selected altitude.
- The ALT control knob is pushed.
- The FMP altitude is rotated through the actual flight altitude against the aircraft direction.

While in ALT hold, a new altitude can be preselected. The aircraft will maintain the present altitude until another vertical mode is selected.

When the ALT control knob is pushed during climb/descent, the aircraft will level off above/below the altitude at which ALT hold was selected. The amount of altitude over/undershoot amounts to approximately 10% of the vertical speed existing at ALT hold selection.

Note: *Changes in altimeter setting while in ALT hold or changing from QNH to STD will not change the aircraft altitude while in ALT hold.*

Level Change mode

In the LVLCH mode the aircraft will climb or descend to a preselected altitude with a (pre)selected speed. LVLCH mode is activated either by pushing the LVLCH push-button on the FMP or, when not in PROF, by pulling the ALT control knob on the FMP. When no speed is (pre)selected, the aircraft will maintain the existing speed at the moment of LVLCH selection.

In LVLCH, climb thrust will be added to maintain the rating as selected on the TRP.

In LVLCH, descent thrust is reduced to a low (idle) limit (LL).

Note 1: *AP/FD acceleration levels are designed for maximum passenger comfort. As a result of this, aircraft reaction to LVLCH selection is relatively slow. If immediate climb/descent is required, the use of V/S mode ensures a faster response.*

Note 2: *When during manual flight in LVLCH the FD steering commands are not followed, speed control by ATS is not available because thrust is set at a constant value (e.g. CLB or LL).*

IAS/Mach mode

The IAS/Mach mode consists of two sub-modes: IAS/M hold and IAS/M select.

In IAS/M hold mode the aircraft will maintain speed either by thrust (e.g. level flight) or by elevator control (e.g. during LVLCH descent). IAS/M hold mode is activated by pushing the IAS/M control knob on the FMP. The IAS/M display will show dashes and the green IAS/M SELECT light is out. A speed or Mach number can be preselected while in the IAS/M hold mode by rotating the IAS/M control knob. The preselected speed or Mach number is indicated in the IAS/M display.

In the IAS/M select mode the aircraft will capture and maintain the preselected speed by either thrust or elevator control. The IAS/M select mode is activated by pulling the IAS/M control knob. The IAS/M display will show the existing speed and a new speed can be selected by rotating the IAS/M control knob. The green IAS/M SELECT light is on.

During **climb** a Mach number can be preselected as follows:

When established at climb speed (e.g. 280 kt), push the IAS/M control knob to activate IAS hold. Depress the IAS/M select button to display Mach numbers and preselect the required climb Mach number (e.g. M.70). When reaching the altitude where 280 kt equals M.70 (cross-over altitude), the system switches automatically to Mach select and the aircraft continues to climb with M.70.

During **descent** the IAS is preselected as follows:

When established at descent Mach number (e.g. M.70), push the IAS/M control knob to activate Mach hold. Depress the IAS/M select button to display IAS and preselect the required descent IAS (e.g. 280 kt). When reaching cross-over altitude, the system switches automatically to IAS select and the aircraft continues to descend with 280 kt.

VOR/Localizer mode

In the V/L mode the aircraft will capture and track a selected VOR radial or localizer course.

To intercept a VOR radial, set the ND mode selector on the EFIS control panel to ARC or ROSE and the APP/VOR push-button to VOR.

Select the required VOR frequency and radial on the VOR control panel. Turn to the required intercept heading and select V/L on the FMP. The existing lateral mode (normally HDG SELECT) remains in control until VOR capture occurs at approximately half a dot.

To intercept VOR1 use AP1. To intercept VOR2 use AP2.

During manual flight with both FDs on, FD1 will capture VOR1 and FD2 will be biased out of view. To intercept VOR2, select FD1 off. The offside FD will be biased out of view upon VOR capture.

Selecting MAP on the EFIS control panel on the side in control after VOR capture results in a VOR mode failure.

To intercept a localizer (only) course, select APP on the EFIS control panel and select localizer course and frequency on the ILS control panel. Turn to the required intercept heading and select V/L on the FMP. The existing lateral mode (e.g. HDG SELECT) remains in control until the localizer is captured at approximately two dots deflection. The interception and tracking of a localizer back beam is not possible in V/L mode.

Navigation mode

In the NAV (or LNAV) mode the aircraft laterally follows the active FMS flight plan. Upon NAV selection the mode is armed until NAV engages. The existing lateral mode (e.g. HDG SELECT) remains in control until NAV captures.

NAV can be armed on the ground. If the take-off runway and the related SID are part of the active flight plan, NAV will capture automatically at 30 ft AGL. When intercepting a flight plan track in the HDG mode the aircraft will, upon NAV capture, maintain the initial intercept angle. Bank angles in NAV are independent of the setting of the bank limit selector on the FMP.

Profile mode

In the PROF (VNAV) mode thrust and pitch commands from the FMS control the vertical aircraft path.

When PROF is selected the mode is armed until PROF engages. In the armed phase the existing vertical mode and thrust mode remain in control until PROF captures. When PROF is armed before take-off, PROF will capture automatically upon reaching Thrust Reduction Altitude (TRA). The altitude selected at the FMP always has priority over PROF commands. For example: When cruising in PROF, the aircraft will not descend at the Top of Descent point in the flight plan unless the pilot lowers the FMP altitude to the clearance altitude.

Note: *NAV mode may be used independently of PROF. PROF mode may be used independently of NAV during take-off, climb and cruise but should not be used during descent and initial approach when NAV is not engaged.*

Land mode

In LAND mode the aircraft will capture and track ILS localizer and glideslope and perform an automatic landing.

Autoland capability is designated LAND2. When the system degrades from LAND2 to LOC/GS, alerts are presented (Autoland caution light and NO ALAND on MFDS).

When LAND is selected, the LOC and GS modes are armed but the existing vertical and lateral modes (e.g. ALT hold and HDG select) remain in control.

To arm the LAND mode, select ILS frequency and localizer course on the ILS panel and select the APP/VOR push-button on the EFIS control panel to APP. Turn to the required intercept angle and select LAND on the FMP.

The maximum intercept angle for localizer capture is 90 degrees. Glideslope capture can only take place after localizer capture.

When the aircraft approaches the glideslope in, for example, V/S or LVLCH, and LAND is armed, either the selected FMP altitude or the glideslope will be captured, whichever comes first.

When tracking the ILS before LAND mode is engaged, ILS frequency and localizer course changes are possible without disengaging the AP. The LAND mode is entered when the aircraft is established on the beam and below 1,500 ft AGL. The LAND mode will not engage when the glideslope is intercepted below 1,000 ft AGL. Upon LAND capture, the second AP will engage automatically. AP mode selections and changes to ILS frequency or localizer are now inhibited.

Runway alignment starts at 150 ft AGL. At 50 ft AGL the flare is started and ATS reduces the thrust to idle. At touchdown ATS will disengage. The AP provides roll-out guidance during the high-speed part of the landing roll.

When the criteria for LAND mode engagement are not met, the system will remain in GS and LOC, allowing a coupled approach with a manual landing.

Go-Around mode

The Go-Around (GA) mode is selected by pulling the TOGA triggers while airborne. In GA mode the aircraft will rotate to a safe climb-out attitude and maintain the heading existing at TOGA selection. ATS advances the thrust levers initially to TOGA thrust and after that controls thrust to maintain a rate of climb of 2,000 ft/min (1,000 ft/min for single-engine operation) or 200 kt. The GA speed can be changed, after TOGA selection, via the FMP. In TOGA mode the existing AP engage status will be maintained.

Take-off mode

To engage the take-off mode the TOGA triggers must be pulled for approximately one second. The TOGA triggers can be active in the simulator either by clicking the triggers themselves, by clicking the hidden clickspot on the screw next to the FD1 switch, or by triggering the AUTO THROTTLE TO GA control assignment.

Lateral guidance and control:

Before take-off the heading bug on the EFIS is slaved to the actual aircraft heading and the FD command bars are centred. To ensure lateral FD guidance to maintain runway heading, the TOGA triggers must be pulled when the aircraft is aligned with the runway centre line as the FD provides guidance to maintain the existing heading at TOGA activation.

When the AP is engaged after lift-off, the aircraft will maintain the existing heading at engagement.

Heading changes can be made using the HDG select mode. Maximum bank angle in TO and GA is 5 degrees below 50 ft AGL and 15 degrees between 50 and 400 ft AGL, independent of the selector position.

If NAV was armed before take-off, NAV engages at 30 ft AGL and the aircraft will laterally follow the FMS flight plan.

Vertical guidance and control:

Before take-off the FD pitch command shows 0 degrees pitch. Upon TOGA activation, 8 degrees pitch-up is displayed.

During rotation and initial climb, FD pitch commands are provided to maintain 18 degrees pitch or V2+10, whichever comes first.

Selection of the LVLCH mode at acceleration altitude or PROF capture at thrust reduction altitude will cancel the take-off mode.

Autothrottle System (ATS)

ATS controls the engines via the thrust levers to either a thrust limit (e.g. climb thrust) or to maintain a constant airspeed or Mach number, depending on the active AP/FD mode. ATS may be used during automatic flight or during manual flight.

Two ATS channels are part of the Flight Augmentation Computer. Each AT channel drives its own thrust lever. If one AT channel fails, the operative channel will drive both thrust levers via a tie-clutch.

ATS engagement and disengagement

ATS can be armed or engaged provided that at least one AT channel is operative. ATS is armed on the ground by depressing the ATS push-button on the FMP. ATS engages when the TOGA triggers are pulled. In the air ATS engages when the ATS push-button on the FMP is depressed. Automatic engagement in flight occurs when the Alpha mode becomes active, when the maximum speed is exceeded, or when the TOGA triggers are pulled.

ATS engagement is shown on the FMA by AT when both channels are operative, or by AT1 or AT2 when only the respective channel is operative.

ATS can be manually disengaged either by depressing the ATS disconnect button on the thrust levers or via the 'AUTOTHROTTLE DISCONNECT' control assignment. This is accompanied by a flashing AT indication at FMA. The flashing AT indication can be cancelled by depressing the ATS disconnect button, or by triggering the control assignment, a second time. ATS disengages automatically on touchdown and when reverse thrust is selected in the event of an aborted take-off.

With ATS in standby, armed or off, the FMA displays MAN.

ATS functional aspects

Control modes

During take-off, ATS controls the engines to maintain either the TO EPR limit or the FLEX EPR target, depending on the pilot's selection on the TRP.

During LVLCH climb, ATS controls the engines to maintain CLB EPR. During LVLCH descent, ATS controls the engines to a low (idle) limit (LL). The idle limit is variable and depends on bleed air demand for pressurisation and anti-icing.

In V/S mode, in ALT hold and in LAND mode, ATS controls to maintain the selected speed.

ATS also maintains the selected speed during manual flight with both FDs OFF or at FPV.

In GA mode the ATS initially controls the engines to the TOGA EPR limit and, when reaching 200 kt (or the selected speed), to maintain speed.

ATS during take-off

Prior to take-off the ATS is armed by pushing the ATS push-button on the FMP.

Upon pulling TOGA triggers, ATS accelerates the engines to take-off EPR. In order to prevent possible thrust lever retardation caused by a system failure during the critical part of the take-off, ATS declutches at 80 kt.

ATS declutch state is indicated by two white 'D's adjacent to the EPR tapes at MFDS.

When taking off in a strong headwind it is possible that 80 kt is reached (and consequently ATS declutches) before the engines have reached take-off EPR. To ensure that take-off EPR is obtained before declutch at 80 kt, the engines should be manually accelerated to 1.30 EPR before pulling the TOGA triggers.

ATS re-clutches when:

- Another thrust rating (normally CLB) is selected, either manually by the pilot or automatically when reaching thrust reduction altitude during take-off in PROF.
- Capturing the FMP altitude or selection of the V/S mode.

Thrust changes below 400 ft AGL via the TRP are inhibited.

ATS during landing

During landing, automatic thrust lever retardation to idle occurs below 50 ft AGL. The FMA will show RET in the thrust window.

Flight envelope protection

AFCAS flight envelope protection consists of:

- Minimum speed protection, i.e. speeds below VMA, the minimum allowable flight speed.
- Maximum speed protection, i.e. exceeding VMO/MMO, VLE or VFE.
- Excessive vertical speed protection.
- Flight path angle protection.
- Automatic gust correction.
- Altitude alerting.

The FCCs calculate the reference speed for display on the PFD speed scale. The speeds are VMA, VSS (stick shaker), VF (flap retraction) and green dot speed (VFTO, the final take-off climb or maximum angle climb speed).

Note: *If, during flight in PROF, conditions occur which activate any of the flight envelope protection features, PROF will disengage automatically. Further system behaviour is as described for the applicable AFCAS mode.*

Altitude alerting

Altitude alerting is comprised of an altitude entry alert and an altitude exit alert.

The altitude entry alert is presented when the aircraft reaches 750 ft below/above the altitude selected on the FMP.

The altitude entry alert is comprised of:

- An annunciation on the PFD – the selected altitude pointer and numerals flash for five seconds.
- An FWS-controlled aural alert ('C' chord), which is available during both manual and automatic flight.

The altitude exit alert is presented when the aircraft deviates more than 250 ft from the selected altitude.

The altitude exit alert is comprised of:

- An annunciation on the PFD – the selected altitude pointer and numerals change colour from blue to amber.
- An FWS-controlled alert.

When, while in ALT hold, a new altitude is preselected, altitude alerting remains armed around the actual altitude until another vertical mode is engaged.

Altitude alerting is inhibited:

- After GS capture.
- When gear is down.
- During drift down (when in PROF mode).

Note: *The altitude exit alert is inhibited upon a resolution advisory generated by TCAS.*

Flight mode annunciations

AP or FD mode annunciation is displayed on the FMA located at the top of each PFD. The FMA is present when AP is engaged or FD is switched on. The annunciation contains five windows:

- Three windows for the vertical flight modes (thrust, speed, vertical path)
- One window for lateral path display (LAT)
- One status window showing AP, FD or Flight Path Vector (FPV) and AT status.

In general, the top line of the THR, SPD, PATH and LAT windows displays the active modes in green; the bottom line shows the armed modes in cyan (blue), except for FLR and ALN which are green.

The status window displays in white AP or FD or FPV status on the top line, and AT status on the bottom line.

A triangle affixed to the annunciation of a mode is used to indicate a capture phase, e.g. after localizer capture until localizer tracking the LAT window displays LOC with the triangle. If the letters are boxed, it indicates that the mode is FMS-related. The table below shows the formats available for presentation on the FMA.

THR	SPD	PATH	LAT	STS
TO	TO	V/S	HDG	AP1
GA	IAS	ALT	HDGs	AP2
OVRD	M	G/S	NAV	AP
RET	MAN	DES	LOC	FD1
MAN		APP	VOR1	FD2
LL		GA	VOR2	FPV
CLB		FLR	ALN	AT1
CRZ		LAND2		AT2
MCT		ROLL OUT		AT
		FPV		

Vertical modes

The information in the THR, SPD and PATH windows is related to the type of control performed by elevator and thrust.

THR window

When a pilot or FMS-selected thrust rating is an EPR target, the specific rating will be displayed in green.

SPD window

When the speed is controlled by the autothrottle system, it is indicated by a green IAS or M in the SPD window followed by the affix T (Thrust).

When the speed is controlled by elevator, it is indicated by a green IAS or M followed by the affix E (Elevator).

PATH window

When the elevator is controlling to a path (e.g. vertical speed or alt hold) it is shown in the PATH window. In normal situations two out of three vertical windows will contain mode information on the top line while one window remains blank.

Lateral modes

Lateral modes are presented in the LAT window.

Combined vertical/lateral flight modes

Certain flight modes such as the APP (LAND) mode require combined vertical and lateral axis control to guide the aircraft along a fixed path.

In these cases the mode is shown over both the PATH and the LAT window.

Status annunciation

AP engage status is displayed on the top line of the STS window as AP1 if AP1 is engaged, AP2 if AP2 is engaged, and AP if AP1 and AP2 are both engaged. When no AP is engaged, the top line displays the onside FD or FPV, if selected.

The bottom line shows AT engage status conforms with the AP engage status.

AP or AT disconnect is indicated by AP flashing amber or AT flashing amber. After an automatic or manual disengagement, the annunciations can be reset by re-engaging AP or AT respectively, or by depressing the respective AP or AT disconnect button.

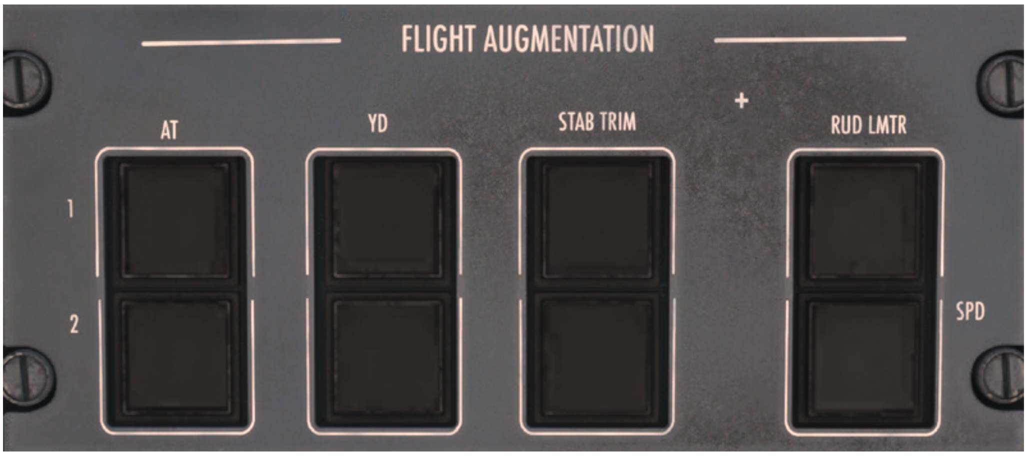
Flight Augmentation System (FAS)

The Flight Augmentation System (FAS) provides yaw damping, turn coordination and stabiliser trim operation. These functions are realised via the two Flight Augmentation Computer (FAC) channels.

Yaw damping and turn coordination

Full-time automatic yaw damping and turn coordination is available with the AP on or off.

The controls and indicators for the yaw dampers are located on the Flight Augmentation Panel (FAP).



Stabiliser trim

The stabiliser trim functions are controlled by the FAC channels and are distinguished as follows:

- Automatic stabiliser trim (AP on)
- Manual stabiliser trimming by the pilot (AP off)
- Mach trim compensation

Controls and indicators for the FAC stabiliser trim channels are located on the FAP.

Automatic stabiliser trim

With the AP engaged, the stabiliser is trimmed automatically in response to AP commands. The stabiliser trim switches on the control column are de-activated when the AP is engaged. Do not operate the stabiliser trim wheel when the AP is engaged.

OUT OF TRIM NOSE DOWN/UP alerts are provided to warn the pilot of an out of trim situation prior to AP disengagement.

In the APP (LAND) mode, an automatic nose-up trim bias will ensure a safe pitch attitude upon AP disconnect close to the ground.

Manual trim

When the AP is not engaged the pilot has to trim the aircraft by means of the stabiliser trim switch on the control wheel. Trim rate is a function of speed, i.e. trim rate is high at low speed and low at high speed.

To achieve stabiliser trim movement, both halves of the trim switch must be operated simultaneously.

A dedicated aural tone (‘whooler’) is generated when the trim switch is operated for more than 2.5 seconds while airborne. On the ground the ‘whooler’ sounds when the stabiliser trim switch is operated for more than one second.

AUXILIARY POWER UNIT (APU)

The Auxiliary Power Unit (APU) is self-contained and located in a fire-proof enclosure at the rear fuselage, aft of the rear pressure bulkhead.

The APU requires fuel, normally supplied from the LH collector tank, and DC electrical power for operation. The APU can be operated on the ground and in flight. On the ground the APU can supply electrical power and bleed air.

When the combination of electrical and bleed air load exceeds the APU capacity, bleed air supply is decreased. In flight the APU can supply electrical power only.

The APU panel, which is part of the right lower overhead panel, contains the APU start selector, an AVAIL light and a FAULT light.

Operation is automatic upon APU start. After the APU reaches operating speed, the AVAIL light comes on and electrical power is available. After approximately two minutes at operating speed, bleed air will be available.

In the case of APU fire or APU overspeed, the APU shuts down automatically. The APU cannot be restarted after an overspeed fault. On the ground the APU will also shut down automatically in the event of a failure and will generate the general APU fault on ground alert. Faults in flight are indicated by the appropriate APU fault alert.

COMMUNICATIONS

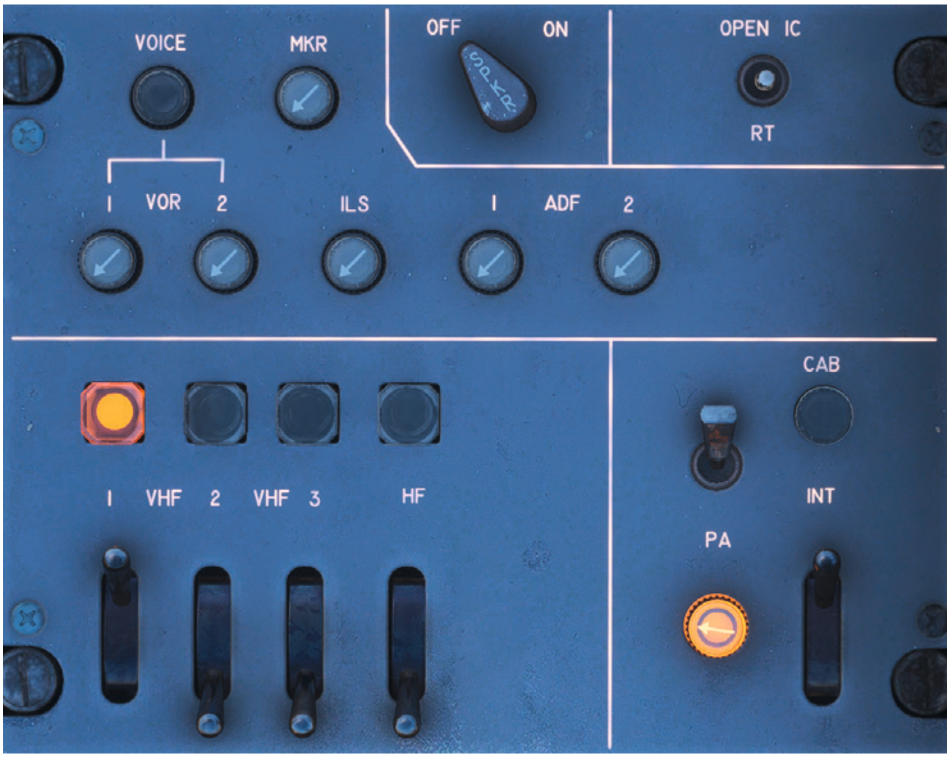
Audio management system

The Captain and First Officer are provided with individual audio systems (L and R). The observer is also provided with an individual audio system. If an audio system fails, operation can be restored by pressing the relevant AUDIO push-button on the AVIONICS panel on the overhead.

Three audio panels provide each pilot and the observer the following communication and navigation facilities:

- VHF radio communication
- Monitoring of navigation aids
- Flight interphone with other pilot, observer and/or ground crew (IC)
- Cabin interphone with attendant(s) (CAB)
- Passenger Address (PA)

Volume control of the selected audio source is possible.



Radio communication

The aircraft is equipped with the following independent communication systems:

- VHF COM 1
- VHF COM 2

These systems are integrated in the audio system and each pilot can select either of them for use via the audio panel. Incoming signals to the selected transceiver can always be heard.

Each VHF COM system comprises an external mounted antenna, a transceiver and a control panel located on the pedestal. Two frequencies can be set on a VHF COM control panel and either frequency can be selected for use. The VHF frequency range is 118.000 to 136.990 MHz, with increments of 8.33 kHz.

Internal communication

Flight interphone

Flight interphone enables communication between Captain, First Officer and observer. Flight interphone is active when IC is selected on either control wheel or when OPEN IC is selected on the audio panel.

Flight interphone also enables communication with the ground crew. A flight deck crew member can request the ground crew to use flight interphone by depressing the GND CALL push-button on the left lower overhead panel. This will activate a horn in the nose-wheel bay. The ground crew can request the pilots to use flight interphone by depressing the pilot call button located next to the external power receptacle. This will result in a GND CALL light on the left lower overhead panel and a horn via the audio system.

Communication with the ground crew can be interrupted via the RESET button, which also resets the CALL light.

Cabin interphone

Cabin interphone enables communication between the flight deck and an attendant, as well as between two attendants.

A flight deck crew member can request an attendant to use the cabin interphone by depressing the FWD or AFT CALL push-button on the left lower overhead panel. In the cabin this will result in a dedicated chime, an area call light and a light on the handset hanger. An attendant can request the pilots to use cabin interphone by depressing a button on the handset hanger. This will result in a FWD or AFT CALL light on the left lower overhead panel and a buzzer via the audio system.

Once the CALL light is on, the cabin interphone can be used by depressing the cabin interphone button (CAB or SVC) on the relevant audio panel. A flight deck crew member can interrupt communication via the RESET button, which also resets the CALL light. An attendant can interrupt communication via the RESET push-button on the handset hanger or by returning the handset to the hanger.

A general attendant call can be issued by depressing the ALL ATTND CALL button. This will result in a dedicated chime in the cabin.

Passenger Address

PA can be used by the pilots and by the attendants. The pilots can use any microphone for PA when PA is selected on the audio panel. The attendants have access to the PA system via hand microphones, located next to the handsets, and via a digital music player. The digital music player provides pre-recorded announcements and boarding music. Announcements from the flight deck override announcements from the cabin. Both override pre-recorded announcements and boarding music. PA volume in the cabin is automatically increased when the engines are running and when the passenger oxygen system is activated. PA announcements and boarding music can be monitored in the flight deck via the PA volume knob.

Cabin signs

Annunciators with ’fasten seatbelts’ and ’no smoking’ legends are provided at each passenger service panel. The signs are controlled from the left lower overhead panel. The ’no smoking’ signs are activated automatically when AUTO has been selected and the landing gear is lowered, or when the passenger oxygen system is activated. The ’fasten seat belts’ sign includes ’return to cabin’ signs in the toilet compartments. A dedicated chime in the cabin announces any on or off switching of the signs.

ELECTRICAL

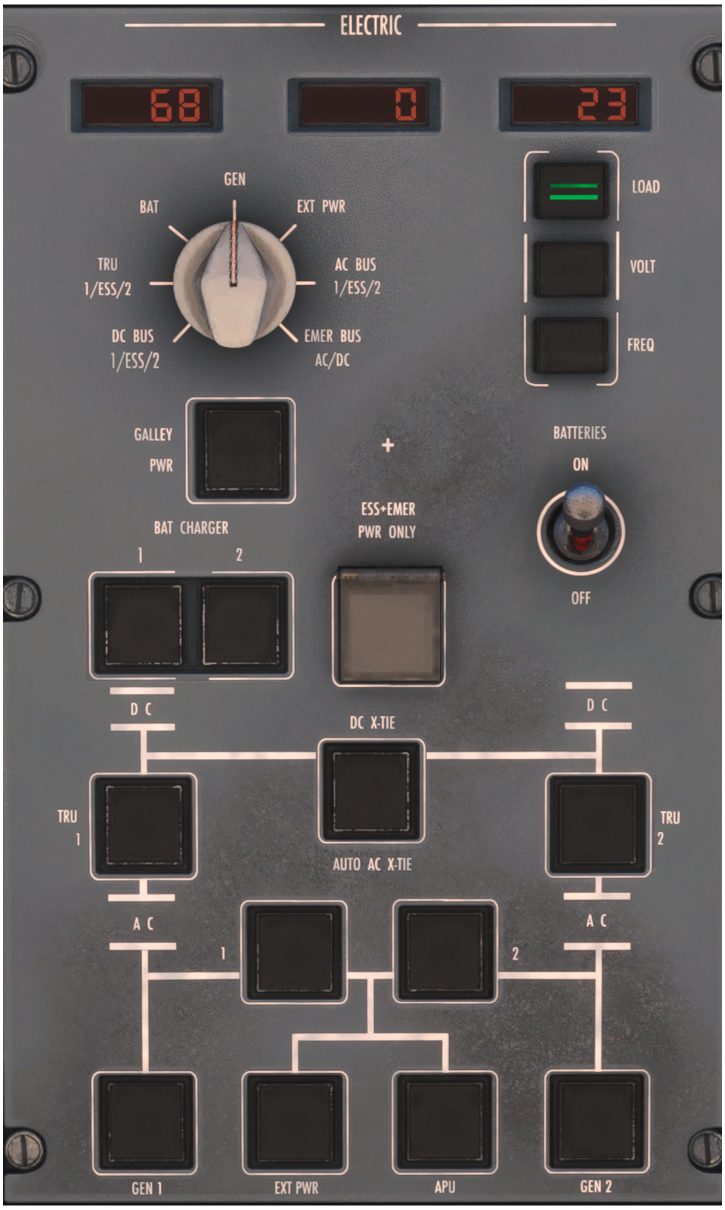
The aircraft's electrical system comprises 115V/400Hz three-phase AC power and 28V DC power, and is controlled from the ELECTRIC panel.

AC power can be supplied by two engine-driven generators, an APU-driven generator and an external power source. Under normal operating conditions, generator 1 supplies AC bus 1 and the essential (ESS) bus, and generator 2 supplies AC bus 2. The emergency (EMER) AC bus is energised by the ESS AC bus.

DC power is supplied by transformer rectifier units (TRU) 1, 2, ESS and Ground Service, which are powered by the respective AC bus. The output of the TRUs is distributed by DC buses 1, 2, ESS, EMER, Ground Service and Ground Handling Bus.

In the event of a loss of generator AC power, the batteries supply emergency power to the EMER DC bus and, via the emergency inverter, to the EMER AC bus. In this event, an AC SUPPLY alert will be presented on the Standby Annunciator Panel (SAP). Total loss of emergency power may occur after 30 minutes.

When AC external power is available, ground service and ground handling buses are energised. When AC external power is not available, the ground handling bus will be energised by the batteries. When DC external power is connected, the DC ground service bus is energised and power is available for the APU starter.



AC power

Generation

AC power is generated via the following three sources:

Engine-driven generators: An integrated constant-speed drive and generator (IDG) is driven by each engine. The IDG output is controlled by a Generator Control Unit (GCU) and the generator push-button. When voltage and frequency are within predetermined limits the GCU automatically connects the generator to the line; it automatically disconnects the generator from the line if a failure is detected.

APU-driven generator: The APU-driven generator provides auxiliary AC power and can be used on the ground as well as in the air. The APU generator output is controlled by a GCU and the APU generator push-button, and functions as described above for the engine-driven generators. The APU generator is not equipped with a constant-speed drive since the APU runs at a constant speed.

External power: A receptacle on the RH forward side of the fuselage provides for the connection of an AC ground power unit. The Ground Power Control Unit (GPCU) automatically disconnects the external power from the electrical system if its parameters are not within limits.

Distribution

AC power is distributed to the following electrical buses:

AC buses 1 and 2: AC buses 1 and 2, normally supplied respectively by generators 1 and 2, can be supplied by the APU or external power. When either AC bus 1 or 2 becomes de-energised due to an inoperative power source, both AC buses are automatically supplied by the remaining power source. This automatic cross-tie function can be inhibited by the respective AUTO AC X-TIE push-button. Power can be removed from AC bus 1 and 2 simultaneously via the ESS+EMER PWR ONLY push-button; the essential AC bus and the emergency AC bus remain energised.

Essential AC bus: The essential bus is normally supplied by generator 1. If generator 1 becomes inoperative, the essential bus will be supplied by generator 2.

Emergency AC bus: Under normal power conditions, the EMER AC bus is supplied by the ESS AC bus. If AC supplies fail and the AC buses 1 and 2 and the ESS AC bus become de-energised, the EMER AC bus is supplied by the batteries via an EMER inverter.

Galley buses: The galley buses 1 and 2 are supplied by AC buses 1 and 2 respectively. In flight during single generator operation, the galley buses are automatically de-energised. The galley buses can be manually de-energised via the GALLEY POWER push-button.

AC ground service bus: The AC ground service bus is normally supplied by AC bus 2. If AC bus 2 is not energised, the AC ground service bus will be automatically powered when external power is available.

Operation

External power: When AC external power is connected and within limits, the AVAIL light in the external power push-button is on, the AC GROUND SERVICE light on the connector is on and the AC ground service bus is energised. When the external power push-button is depressed from AVAIL to ON, the entire electrical system is energised and the EXT PWR FED light on the connector is on. When both external power and APU power are available, the APU will supply the essential AC bus and the external power will supply AC buses 1 and 2.

AC power: With only APU power available, on the ground, the entire electrical system is energised. If one engine generator is inoperative, the APU generator will supply the buses of the inoperative generator. The essential bus will be supplied by the operative generator. If both engine generators are inoperative, the APU generator will supply the AC buses as described in the Distribution section above.

Generator 1 and 2 power: The first generator online will supply its respective AC bus and the essential AC bus. The remaining AC bus is supplied by the APU or external power. When generators 1 and 2 are online, the essential AC bus will be supplied by generator 1 and the APU and/or external power become standby.

DC power

Generation

DC power is generated via the following three sources:

Transformer Rectifier Unit: Four Transformer Rectifier Units (TRU) receive AC power and provide DC power to the respective DC buses. TRU 1 and 2 are supplied from their AC bus via the respective TRU push-button. The essential and ground service TRUs are supplied directly from their AC bus. The TRUs are automatically disconnected in the case of overheat or reverse current. If TRU 1 or 2 should fail, an alert will be presented.

Battery power: Battery power is provided by two batteries. Each battery has a battery charger which receives power from the respective AC bus. A BATTERIES switch is provided to connect the batteries to the DC system and should be ON during all normal operating conditions. The battery charger monitors the condition of the respective battery and regulates the charging current to avoid battery overheat. The battery chargers 1 and 2 are controlled by the respective BAT CHARGER push-button. In the event of a battery overheat or a battery charger failure, an alert will be presented.

External power: Adjacent to the external AC receptacle is a 28V DC receptacle to provide power to the DC ground service bus and the APU starter. There are no controls or indicators on the flight deck related to DC external power.

Distribution

DC power is distributed to the following electrical buses:

DC buses 1 and 2: The AC bus 1 supplies, via TRU 1, DC bus 1. AC bus 2 supplies, via TRU 2, DC bus 2. If either of the DC buses 1 or 2 becomes de-energised, an alert will be presented. Manual operation of the DC X-TIE push-button interconnects the DC buses.

Dual DC bus: DC buses 1 and 2 supply the dual DC bus. It provides an uninterrupted power source for the automatic lift dumpers, automatic rudder limiter, anti-skid and speed brake in the event of a DC bus 1 or 2 failure during landing.

Essential DC bus: The ESS AC bus supplies, via the ESS TRU, the ESS DC bus. If the ESS TRU is inoperative, DC bus 1 will supply the ESS DC bus. If the ESS DC bus becomes de-energised, an alert will be presented.

Emergency DC bus: The ESS AC bus supplies, via the ESS TRU, the EMER DC bus. If the ESS TRU is inoperative, the EMER DC bus is automatically supplied by DC bus 1. When no AC power is available, the EMER DC bus is automatically supplied by the batteries.

DC ground service bus: The AC ground service bus supplies, via a ground service TRU, the DC ground service bus. When AC power is not available, the DC ground service bus can be powered by an external DC power source.

DC ground handling bus: The AC ground service bus supplies, via the ground service TRU, the DC ground handling bus. When no AC power is available, the DC ground handling bus is supplied directly by the batteries. The ground handling bus supplies power to:

- Passenger door with integral stairs
- Fuelling panel
- Towing
- Hydraulic service panel
- Engine starter valve

EMERGENCY EQUIPMENT

Doors

The F70 is equipped with four emergency exits:

- A passenger door exit on the forward LH side
- A service/emergency door on the forward RH side (equipped with a slide)
- Two over-wing escape hatches

The F100 is equipped with six or seven emergency exits, depending on the door configuration:

- A passenger door exit on the forward LH side
- A service/emergency door on the forward RH side (equipped with a slide)
- A service/emergency door on the LH side aft of the wing (equipped with a slide)
- Four over-wing escape hatches

Cockpit door

The cockpit door opens into the cabin. It is equipped with a combined door handle and an electrical locking mechanism. The door can be (un)locked from the cockpit side by pressing the F-DK DOOR push-button. When unlocked, the door can be opened either from the cabin or the cockpit by rotating the door handle.

Normal operation

A F-DK DOOR LOCK push-button is located on the left side of the pedestal and is used to lock or unlock the door. By depressing the F-DK DOOR LOCK push-button the bolt is fixed in the extended position by a solenoid, thus locking the door. If the door is closed and locked, the F-DK DOOR push-button is blank.

The door can be unlocked by depressing the F-DK DOOR LOCK push-button again.

If the door is not closed and locked:

- The white F-DK DOOR 'NOT LKD' light illuminates.
- The green UNLOCKED light illuminates on the EARP.

If the door is not locked for two minutes and at least one fuel lever is open:

- The white F-DK DOOR 'NOT LOCKED' light extinguishes.
- The amber F-DK DOOR 'NOT LOCKED' light illuminates.
- The amber F-DK DOOR lights on the main instrument panel illuminate.

Tooltips are provided on the cockpit door handle to show the current status of the door locking mechanism.

Alternate operation

In the case of a DC bus 1 failure, a lock pin is provided at the flight deck side to lock the door manually, which fixes the bolt in the extended position. With battery power only, the electrical lock is automatically removed and the door can be opened from both sides.

Passenger door – forward-operating door

The forward-operating passenger door can be opened via the following method:

1. Check the yellow door selector is in MANUAL.
2. Rotate door handle in direction of arrow.
3. Check door lock indicator reads RED and OPEN.
4. Move door outward and forward until parking mechanism is engaged.

Passenger door – airstairs door

The airstairs passenger door can be opened via the following method:

1. Unlock the door lock handle (located above the passenger door) by moving the thumb-operated lock release lever down.
2. Move the door lock handle upward to the OPEN position.
3. Push door firmly open.

Service door

The service door(s) can be opened from the inside via the following method:

1. Check the yellow door selector is in AUTOMATIC.
2. Turn door handle fully to OPEN (door lock indicator turns to RED and reads OPEN).
3. Open door.

Emergency lighting

Emergency lighting comprises exit, standby and emergency lights. The escape slide is provided with built-in lighting which comes on when it is deployed.

Exit lights are located:

- Above the doors
- Above the escape hatches
- In the front of the cabin
- In the passenger compartment aisle

The exit lights are on when the landing gear is down.

Standby lights are located in the:

- Passenger entrance
- Passenger compartment aisle
- Aft cabin area
- Toilet compartments

The standby lights in the toilet compartments are continuously on. All other standby lights come on automatically when only battery power is available.

Emergency lights are located:

- In the flight deck
- In the standby and exit light assemblies
- In the integral stair of the passenger door
- Outside the aircraft near the escape hatches

The emergency lights are controlled via a three-position switch on the RH lower overhead panel:

- **OFF** – emergency lights off
- **ARMED (detent)** – emergency lights armed (knob must be pulled to select ON or OFF)
- **ON** – emergency lights on

Oxygen

The cockpit is equipped with one oxygen bottle and three oxygen masks.

The oxygen bottle, which supplies oxygen to the oxygen masks, is mounted aft of the First Officer's side panel. A pressure reducer, a pressure indicator and an ON/OFF knob are fitted on the top of the bottle. The pressure indicator will show the oxygen pressure irrespective of the position of the ON/OFF knob. The oxygen pressure is a nominal 1850 PSI.

The three flight crew oxygen masks are of the quick-donning, inflatable harness type and are stowed in a container. When the release levers are squeezed, the stowage box doors open. As a result an internal valve is opened, the mask harness is inflated and the flow indicator on the stowage box momentarily shows a yellow star. The mask can be donned with one hand. One container is installed in each side console and a third container is installed at the observer's station.

A RESET/TEST lever on the stowage box can be used to test the oxygen flow.

Emergency Locator Transmitter (ELT)

The ELT is automatically activated by the deceleration forces encountered during a crash. It can also be manually activated via the ELT switch on the ELT panel.

The ELT switch has two positions: ON and ARM. A test of the system can be carried out by moving the switch to ON for one second before moving it back to ARM.

FIRE PROTECTION

Auxiliary Power Unit

The APU is equipped with a fire detection system and a fire extinguishing system. The systems are controlled from the APU FIRE panel on the overhead.

The fire detection system consists of a single sensing element loop and a fire detection unit. The sensing element forms a closed loop. The system remains serviceable even when the element is broken. The element is monitored by the fire detection unit. If a predetermined temperature is reached a fire warning is presented, the APU fire shut-off valve in the fuel system closes automatically and the APU shuts down. The fire warning remains active as long as the fire condition exists.

One fire extinguisher bottle is installed in the F70 and two are installed in the F100. The fire warning signal discharges the agent a few seconds after automatic APU shutdown. This time delay is necessary to close the ventilation system of the APU. A discharge switch, located on the APU FIRE panel, is provided to discharge the agent manually; in this event the APU fire shut-off valve in the fuel system closes and the agent will be discharged immediately.

A fire warning system test can be performed by depressing the APU FIRE test button on the TEST panel.

Engines

The engines are each equipped with a fire detection and a fire extinguishing system. The systems are controlled from the ENGINE FIRE panel on the overhead.

The fire detection system consists of dual sensing element loops and a fire detection unit. Each sensing element forms a closed loop. The system remains serviceable even when an element is broken. The elements are monitored by the fire detection unit. If a predetermined temperature is reached, a fire warning is presented and remains active as long as the fire condition exists.

Two fire extinguisher bottles are installed. The fire extinguishing agent can be discharged by one of the two fire handles. Each engine has its own fire handle. Pulling a fire handle will close the respective fire shut-off valves in the fuel and hydraulic systems and the Over Pressure and Shut-Off Valve (OP/SOV) in

the bleed air system.

Rotating the pulled fire handle to DISCH 1 discharges AGENT 1; rotating the pulled fire handle to DISCH 2 discharges AGENT 2.

A fire warning system test can be performed by selecting the ENGINE FIRE test switch on the TEST panel to 1 or 2.

Cargo smoke

The cargo compartments are each equipped with a smoke detection and a fire extinguishing system. The systems for the cargo compartments are controlled from the CARGO SMOKE panel on the overhead panel. Smoke and fault will be detected and the relevant alerts provided.

The forward and aft cargo compartments both have dual smoke detectors. If smoke is detected, a smoke warning is presented. The smoke warning will remain active for as long as smoke is detected.

Two fire extinguisher bottles are installed for the forward and aft cargo compartments. The bottles are divided into one high-rate discharge bottle (agent 1) and one low-rate discharge bottle (agent 2). Agent 1 and agent 2 can be discharged manually via discharge selectors on the CARGO SMOKE panel. Each cargo compartment has its own discharge selector.

Selecting DISCH 1 causes immediate total discharge of agent 1 into the selected compartment. Simultaneously, agent 2 is discharged into the selected compartment at a reduced flow rate to maintain a minimum extinguishing agent concentration.

Selecting DISCH 2 will discharge the same agent 1 and agent 2, but the power supplies are interchanged for redundancy.

The agent 1 low pressure light comes on within seconds after selecting DISCH 1 or DISCH 2 and the agent 2 low pressure light remains off for approximately 60 minutes due to the reduced flow rate.

A smoke warning test can be performed by depressing the SMOKE test button on the TEST panel.

FLIGHT CONTROLS

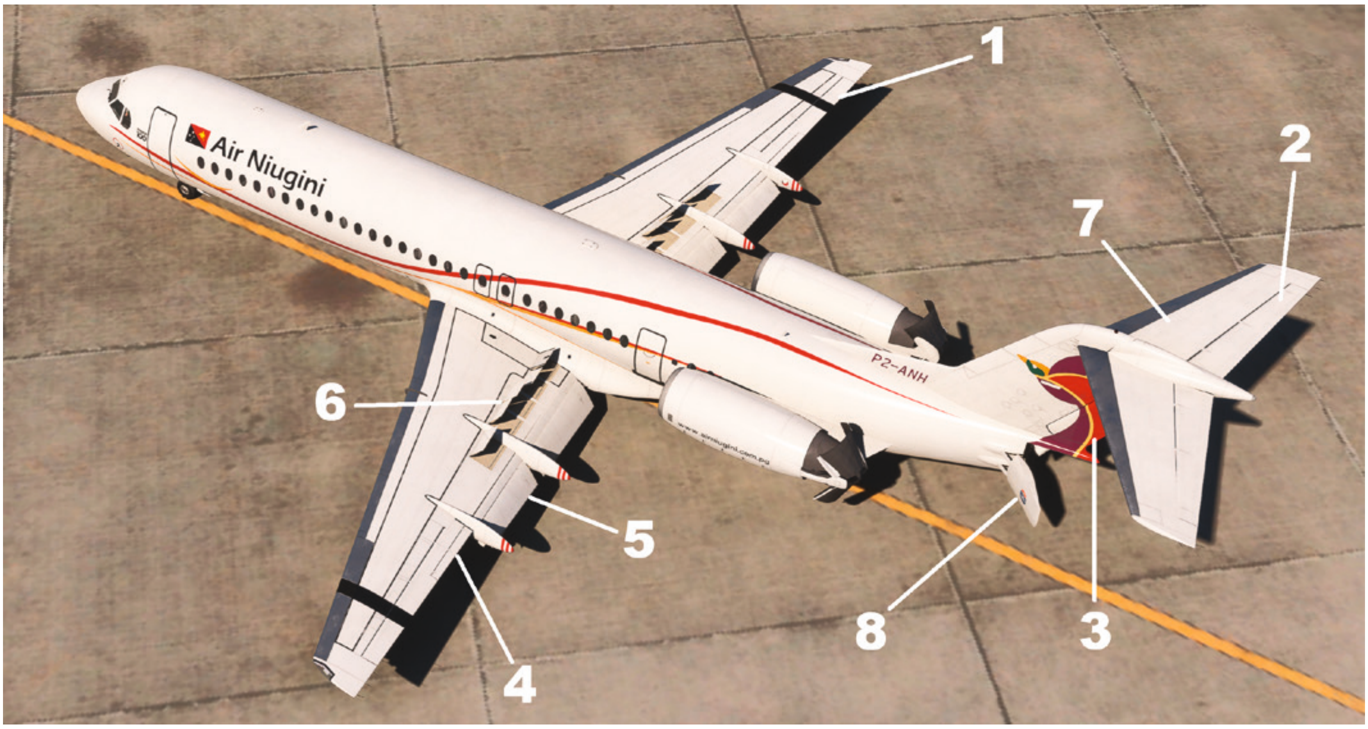
Primary flight controls

The aircraft has three primary flight controls:

1. Ailerons
2. Elevator
3. Rudder

The aircraft has five secondary flight controls:

4. Aileron Trim tabs
5. Flaps
6. Lift dumpers
7. Moveable stabiliser
8. Speedbrake



The horizontal stabiliser is used for pitch trimming. Actuators powered by hydraulic systems 1 and 2 operate the control surfaces. Consequently, a single hydraulic system failure does not affect operation. Push-buttons on the HYDRAULIC panel provide control of hydraulic power for each flight control system.

With the autopilot engaged, the flight controls are hydraulically operated by signals from the Automatic Flight Control System (AFCS). Stabiliser trim, yaw damping and turn coordination are provided by the Flight Augmentation System (FAS).

If hydraulic pressure is not available, the ailerons, rudder and elevator can be operated by direct mechanical control and the stabiliser can be operated via an alternate electrical mode.

Ailerons

The LH aileron is powered by hydraulic system 1 and the RH aileron is powered by hydraulic system 2. The ailerons are interconnected mechanically. A servo tab at each aileron is locked during normal operation. If one aileron actuator becomes depressurised, the servo tab will unlock to assist in the manual operation of the affected aileron. If hydraulic pressure is not available, both servo tabs are unlocked and are operated by the control wheel movement. The ailerons are then operated by the servo tabs.

An aileron trim wheel is located on the pedestal. If one aileron is locked (as a result of damage or icing, for example), the mechanical interconnection allows the opposite aileron to be operated. A considerably higher force is required to operate the control wheel. System design safeguards the internal cable mechanism against over-stress.

Elevator

The elevators are mechanically interconnected and normally powered by two hydraulic actuators. The LH actuator is powered by system 1 and the RH actuator by system 2. Either system is capable of operating the elevator.

A fully moveable horizontal stabiliser provides pitch trim.

In the F70 the horizontal stabiliser is operated by a single hydraulic actuator powered by both hydraulic systems.

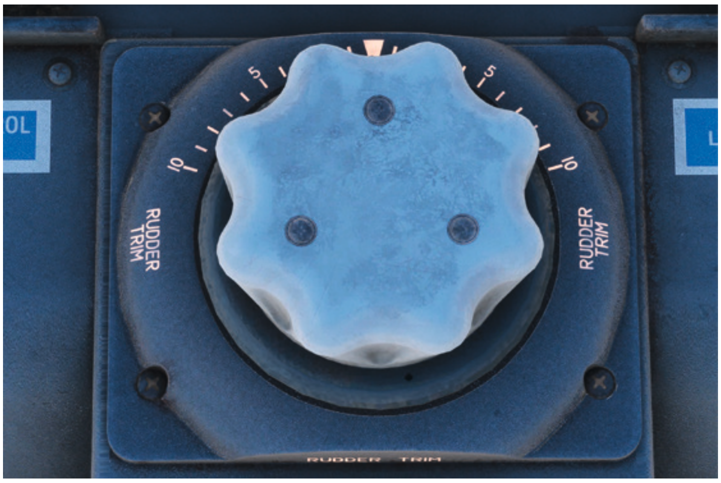
The horizontal stabiliser in the F100 is operated by two hydraulic actuators. The LH actuator is powered by hydraulic system 1 and the RH actuator by hydraulic system 2. Either system is capable of operating the stabiliser.

Stabiliser position is normally controlled by the Flight Augmentation System (FAS). If the FAS fails, the stabiliser trim wheel on the pedestal can be used to position the stabiliser. If hydraulic pressure is not available, the stabiliser can be operated by an electric motor. The motor is controlled by the alternate stabiliser trim switch located on the pedestal.

A stabiliser position indicator is located on the pedestal. The indicator differs between the F70 and F100. Stabiliser position is also indicated by position markers on the vertical stabiliser.

Rudder

The rudder is normally operated by hydraulic system 2. If system 2 hydraulic pressure is not available, the rudder will be operated by hydraulic system 1. A rudder trim wheel is located on the pedestal.



Rudder authority at high speed is reduced by a rudder limiter, which uses airspeed information from both ADCs to reduce the hydraulic pressure at the rudder actuator.

Controls and indicators for the rudder limiter system are located on the FLIGHT AUGMENTATION panel on the overhead.

Flight control lock

The ailerons can be locked in the neutral position and the elevator in the control column forward position by a mechanical system operated from a lever on the rear of the pedestal. The lock is linked with the thrust levers to prevent the selection of take-off thrust with the lock engaged. The locking system is spring-loaded to the unlocked position in the event of a locking system failure. The rudder is hydraulically damped.

Secondary flight controls

Flaps

The flaps are normally operated by hydraulic pressure from hydraulic system 1. A flap selector is located on the right side of the pedestal.

Alternately, the flaps can be operated by an electric motor via an Alternate Flap switch on the pedestal. Operation of the switch de-activates the hydraulic flap drive system. Normal hydraulic flap operation cannot be re-established in flight. Normal flap operation is reset automatically on the ground when the flap lever is moved.

Flap travel is from 0 to 42 degrees. A flap position computer, which receives data about flap and selector positions, provides signals to the flight warning computer, the stall warning computer, the Ground Proximity Warning System (GPWS), the Electronic Flight Instrument System (EFIS) and others. The flap position is displayed on the EFIS PFD.

Asymmetry protection is provided during hydraulic operation. As soon as an asymmetry between the LH and RH flap positions is detected, hydraulic operation will be de-activated and an alert will be presented.

Speed brake

The speed brake is located at the tail cone and is controlled via a two-position speed brake lever on the left side of the pedestal. The lever has an IN and an OUT position.

The speed brake is powered hydraulically by hydraulic system 1. Its position is indicated by two blue speed brake lights on the main instrument panel.

The speed brake can be extended when the thrust levers are below the MIN TO position or when the landing gear is down. Extension is inhibited when AFCAS is in the TO or GA mode. The speed brake can be retracted manually, via the speed brake lever, and automatically. Automatic retraction occurs in the following conditions:

1. The TOGA triggers are activated.
2. A thrust lever is advanced beyond MIN TO with landing gear up.
3. The landing gear is selected up with both thrust levers set above MIN TO.

Lift dumpers

The lift dumpers consist of five doors on the upper surface of each wing that are designed to destroy lift and to achieve more effective braking after touchdown or during a rejected take-off. Due to their effectiveness, the lift dumpers can only be deployed when the aircraft is on the ground. Power is supplied from hydraulic system 1.

The lift dumpers can be operated automatically or manually. When they are extended, a LIFT DUMPER OUT memo message is displayed on the MFDS.

The system can be inhibited via the Lift Dumper push-button on the HYDRAULIC panel on the overhead.

Automatic operation

The arming push-button, located on the pedestal, is used to arm the automatic extension system on the ground and in flight. When armed, an ARM light in the push-button is on. When armed before take-off, the system is automatically disarmed at lift-off. In the event of a rejected take-off with the system armed, the lift dumpers will extend when the thrust levers are retarded and the speed is above approx. 50 kt.

When armed before landing, the lift dumpers extend when the wheels spin up on touchdown and the thrust levers are in idle. The lift dumpers will retract when the thrust levers are advanced or when the system is disarmed. The system will disarm when the arming push-button is depressed.

Manual operation

The lift dumpers will extend when the aircraft is on the ground and the reverse thrust levers are raised. The lift dumpers will retract when the reverse thrust levers are reset.

Stall prevention system

The stall prevention system provides pre-stall warning and post-stall recovery. The system comprises two angle-of-attack (AoA) vanes, one stall computer with two independent control channels (F70) or two stall computers with two stall protection enhancement units (F100), two stick shakers and a stick pusher.

A pre-stall warning is provided by a stick shaker on each control column, with activation occurring based on a function of angle-of-attack, flap position, airspeed and altitude.

Post-stall recovery is provided by a hydraulically (F70) or pneumatically (F100) operated stick pusher, which pushes the control columns fully forward when both stall computers detect a stall condition.

Take-off configuration warning

With the aircraft on the ground and either thrust lever advanced to the MIN TO position, take-off configuration alerts will be presented if any of the following conditions are met:

- Flaps not in TO position or in the alternate mode
- Stabiliser not in TO range
- Parking brake set
- Speed brake not in
- Lift dumper unlocked
- Flight control lock on
- One elevator hydraulic system depressurised

The take-off configuration can be tested prior to take-off by depressing the TAKE-OFF CONF test button on the pedestal. If the take-off configuration is satisfactory, no alerts will be presented and a T-O CONFIG NORM memo message is displayed.

FUEL

Fuel storage and ventilation

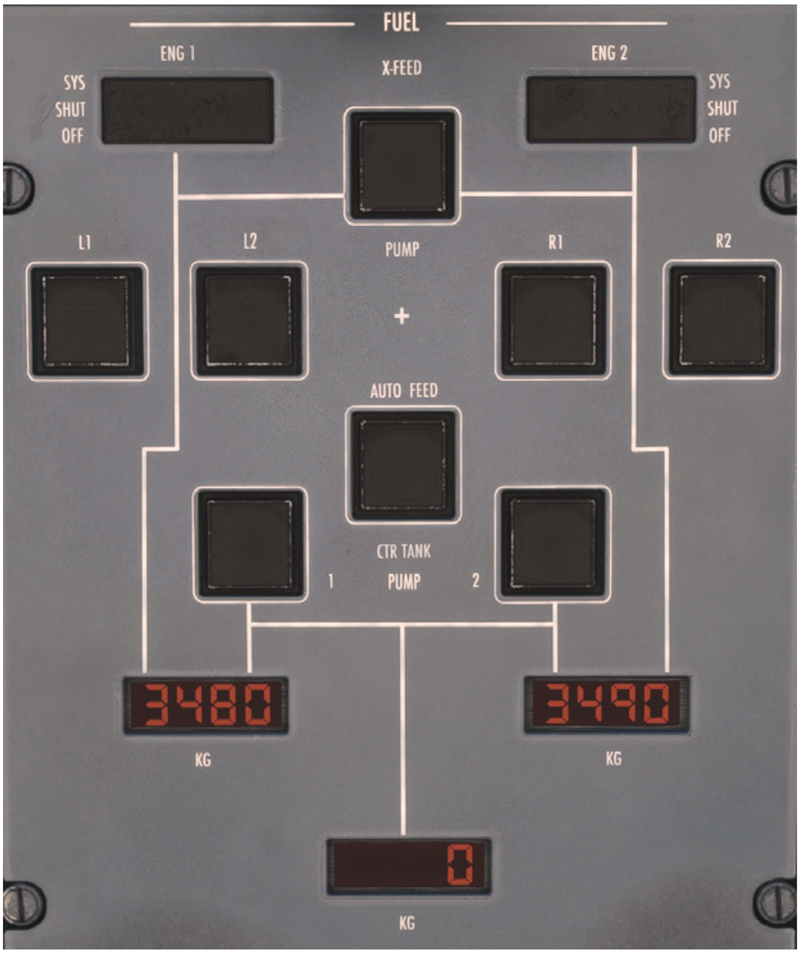
Fuel is stored in two integral wing tanks and an integral or bag-type centre tank. Each wing tank consists of an outer tank and a collector tank.

Fuel volume (litres)	Wing tanks	Centre tank	Total
F70	9,640	3,725	13,365
F100	9,680	3,725	13,405

Two ventilation systems prevent tank over-pressure or under-pressure. Each ventilation system vents a main tank (left or right) and the centre tank to ambient air via vent valves or sniffle valves.

Fuel supply

The fuel supply system supplies the fuel from the collector tank to the engines and the APU. The fuel system is controlled from the FUEL panel on the overhead.



The fuel system is comprised of the following components:

Boost pumps: Two electrically driven fuel pumps (boost pumps) are installed at the bottom of each collector tank. Each boost pump has sufficient capacity to supply one engine in all thrust conditions, or both engines in climb and cruise thrust conditions.

Collector tank transfer system: Two collector tank fuel transfer systems supply fuel from the outer tanks to the collector tanks. These systems each consist of 18 jet pumps, which are powered by a pressurised fuel bleed-off from the boost pumps. These systems keep the collector tanks full and ensure that there is a continuous fuel supply to the boost pumps at all aircraft attitudes. In normal operation fuel from the LH collector tank is supplied to engine 1 and the APU, and fuel from the RH collector tank is supplied to engine 2. When the level in a collector tank drops below approximately 500 kg, a collector tank low level alert is generated. This alert has a 10-minute time delay and will only be generated if the fuel lever is in OPEN for more than two minutes.

Cross-feed: The function of the cross-feed is to prevent a fuel asymmetry during single-engine operation. The supply lines from the collector tanks to the engines are interconnected by a cross-feed line which is normally closed by two cross-feed valves. These valves are controlled by the X-FEED push-button. When the cross-feed system is on, each engine or the APU can use fuel from the left or right collector tank. Cross-feed from one wing tank to the other is not possible because of two pressure-line check valves.

Fire shut-off valve: There is a fuel fire shut-off valve for each engine. In the case of an engine fire, the fuel supply to an engine can be isolated manually with a fire shut-off valve by pulling the respective fire handle. In the event of an APU fire the APU fire shut-off valve is automatically closed.

Fuel transfer

Centre tank system: During normal operation the centre tank is only in use when a fuel quantity in excess of the wing tank capacity is required. Fuel from the centre tank can be transferred automatically or manually to the wing tanks by two electrically driven centre tank pumps. Each pump supplies the onside collector tank at a rate of 20 kg/min.

Automatic fuel transfer: Fuel transfer is automatically controlled when either centre tank pump is switched ON and the AUTOFEED push-button is blank. Automatic fuel transfer takes place when the aircraft is in flight and the fuel quantity in the wing tanks is below 3,300 kg per wing tank. The transfer stops when the contents of one or both main tanks exceeds 3,500 kg. When the centre tank becomes empty a CTR TK PUMPS alert will be presented after 60 seconds.

Manual fuel transfer: If the automatic transfer fails, fuel transfer can be controlled manually. Manual control is possible only when the AUTO FEED push-button is depressed to MAN. In this case, fuel transfer is controlled directly with the centre tank push-button. When the centre tank becomes empty a CTR TK PUMPS alert will be presented after 60 seconds.

When the pumps are switched ON in manual mode, the fuel quantity in the wings must be monitored closely. Fuel transfer will not stop when the wings are full so it is possible to overfill the wings. If fuel is transferred into the wing tanks whilst they are at full capacity, fuel will be vented overboard.

Pump failures: Pump failures will be indicated by a CTR TK PUMP 1 (2) LO P alert. If one pump is inoperative, a fuel asymmetry can exist between the wing tanks when the remaining pump is operated. If both pumps are inoperative, the centre tank contents become unusable.

Fuel quantity indication

Fuel quantity indication: The aircraft are equipped with a fuel quantity indication system that consists of a fuel quantity totaliser and separate displays for each wing tank and the centre tank on the FUEL panel on the overhead.

The fuel totaliser differs between the F70 and the F100.

Fuel asymmetry: A fuel asymmetry alert will be generated if the difference between the contents of the wing tanks is more than 350 kg. The alert will be removed when the difference is reduced below 250 kg.

FLIGHT MANAGEMENT SYSTEM (FMS)

Flight Management Computer (FMC)

The FMS consists of two Flight Management Computers (FMCs) and two Control Display Units (CDUs), and is interfaced with various other systems to perform its tasks.

The two Flight Management Computers (FMCs), which are controlled via the CDUs, perform all the computations required for FMS operation, each using identical computer programs, navigation data and performance data stored in their memories.

The FMCs normally operate in the dual system mode, with one FMC operating as master. The master FMC is the FMC coupled to the autopilot in command or, if no autopilot is engaged, the FMC on the side of the engaged flight director. If neither an AP nor an FD is engaged, the master FMC is the first FMC powered up.

In the dual system mode, cross talk between the two FMCs ensures that both are using identical computer programs, navigation and performance data, flight plan data etc. Via cross talk, the master FMC ensures that both FMCs process simultaneously an entry made on either CDU. This allows both pilots to operate simultaneously on the same or different CDU pages and to enter data on different pages or on different lines of the same page without creating a disparity between the two FMCs.

The FMC navigation data, stored in a database, includes most of the information the pilot would normally obtain by referring to navigation charts. This information can be displayed on the CDU and/or the ND map.

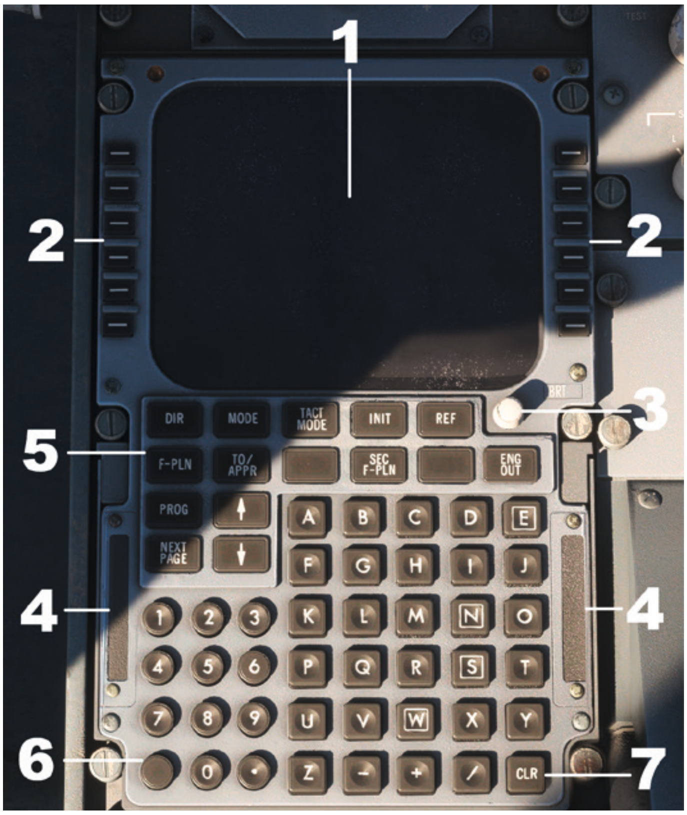
Up to 20 (pilot-defined) navaids can be added to the database. Additionally, up to 20 waypoints or fixes can be added by the pilot or (automatically) by the FMS.

The FMC performance data includes aerodynamic data, engine data, maximum altitudes, maximum speeds, minimum speeds and characteristics that are typical for the aircraft type. The database may also include a fuel consumption factor specific to the aircraft. The FMC uses the performance database to generate pitch and thrust commands for AFCAS and to provide accurate predictions along the entire flight plan.

Control Display Unit (CDU)

The Control Display Unit (CDU) is the interface unit between the pilot and the FMC. It provides a means for manually inserting system control parameters and selecting modes of operation. The CDU also provides a means of reviewing data stored in the FMC's memory. Flight plan and advisory data are continuously available for display on the CDU in formats referred to as 'pages'.

The CDU comprises a display, a keyboard and four annunciator lights. The CDU keyboard consists of an alphanumeric keyboard and mode, function, data entry and scrolling keys. The brightness of the backlit keys is controlled by a remote flight deck control.



1. **Display**
    - Title field provides Page Identification and Next Page annunciation.
    - Left and right fields provide display of line pairs with data and symbols.
    - Scratchpad provides writing data with alphanumeric and clear keys, and also displays FMS-related messages.
2. **Line Select Keys (LSK)**
    - Transfer written data from the scratchpad to the selected line.
    - Display a new page as identified by the selected line.
    - Execute a function as indicated by the selected line.
3. **Brightness knob**

    Rotate to increase/decrease the brightness of the display.
4. **Annunciators**
    - DSPY – displayed page does not represent active flight situation.
    - FAIL – CDU failure.
    - MSG – important message displayed, or available for display, on the scratchpad.
    - OFST – parallel (offset) flight plan in use.

5. **Function and mode keys**

- DIR – Direct-To page
- MODE – Strategic Mode page
- TACT MODE – Tactical Mode page
- INIT – Initialisation page
- REF – Reference Index page
- F-PLN – Flight Plan page
- TO/APPR – Take-Off page and Approach or Go-Around pages
- SEC F-PLN – Secondary Index page (not simulated)
- ENG OUT – Engine Out page (not simulated)
- PROG – Progress page
- NEXT PAGE – Next page (if relevant)
- ↑ or ↓ – Scroll the page vertically (if relevant), or increase/decrease a displayed value (if relevant).

6. **Alphanumeric keys**

Depress relevant keys momentarily to enter desired data into scratchpad.

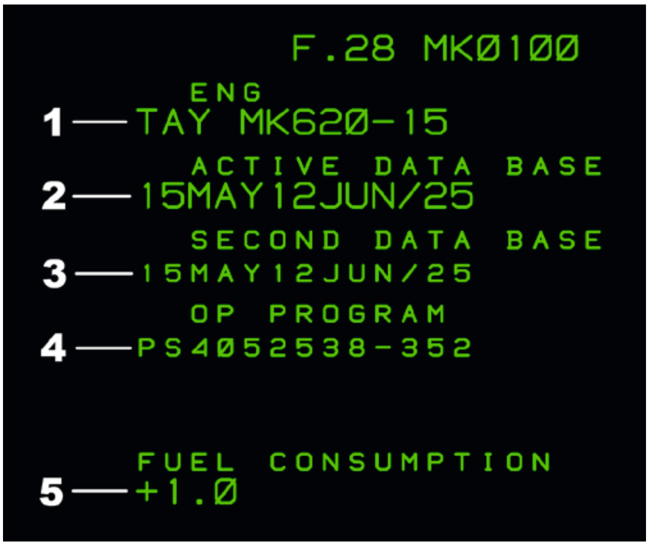
7. **Clear key**

- Momentary press to clear last character entered in the scratchpad.
- Long press to clear the scratchpad.
- Displays CLR in empty scratchpad.

Pre-flight and flight planning pages

Aircraft Status page

The Aircraft Status page provides an overview of the FMS software, installation and database versions. This page is displayed after applying power to the FMS and can also be selected via REF INDEX LSK5L.



1. Aircraft engine type.
2. Installed and used AIRAC cycle (read from Navdata).
3. Installed but not used back-up Navdata cycle (not simulated, will mirror active Navdata).
4. FMC software version.
5. Fuel consumption factor (not alterable by pilot).

Initialisation pages

The INIT pages allow the pilot to enter FMS initialisation parameters. There are two initialisation pages: INIT A and INIT B. INIT A can be accessed by pressing the INIT key. INIT B can be accessed by pressing the NEXT PAGE key from the INIT A page.

The initialisation pages can only be accessed during the pre-flight and completed flight phases.

INIT A

The INIT A page is used to set up basic flight data. This page can be entered by pressing the INIT function key, but only when the aircraft is on the ground during the pre-flight and completed flight phases.

LSK1L: If a company route is stored on your PC, enter the file name of the company route into the scratchpad and select LSK1L. If a stored route is found, it will be automatically loaded into the FMS. Further details on company route functionality can be found in the MSFS-specific functions section of this manual. A flight number can also be entered here by typing a forward slash (/) followed by a 1-4 digit number (for example, '/1234').

LSK2L: Not simulated.

LSK3L/LSK3R: Departure airport coordinates are automatically entered, based on the departure airport entered in the FROM/TO field. Pressing LSK3L/LSK3R swaps the arrow symbols between LAT and LONG. The arrow keys can be used to finely adjust the coordinates (this is particularly useful when fine-tuning the coordinates for your current gate/parking space). This position is used for IRS alignment, so it is important that it is as accurate as possible.

LSK4L: The Cost Index field allows any entry between 1 and 100. The greater the cost index, the closer the aircraft will be to the minimum time extreme (faster speed, higher fuel consumption). The lower the cost index, the closer the aircraft will be to the minimum fuel extreme (slower speed, lower fuel consumption). The cost index is typically set by the airline and will be listed on the flight plan. A cost index of 30 is a good balance between fuel consumption and speed.

LSK5L: A Cruise Flight Level for the flight plan can be entered in any of the following formats: 'FL350', '350' or '35000'. The minimum accepted flight level is 10,000 ft.

LSK1R: The FROM/TO pair is typically the first data a pilot should enter on the INIT A page. The airport pair must each be entered by their four-character ICAO code, separated by a forward slash (/). For example, 'EGPH/EGLL'. Once an airport pair has been entered, the ROUTE SELECTION page will open, allowing you to select any company routes that match the airport pair. 'NONE' will be displayed if no company routes are available.

LSK2R: Enter the alternate airport on your flight plan here. The alternate airport must be entered as its four-character ICAO code, e.g. ‘EHEH’.

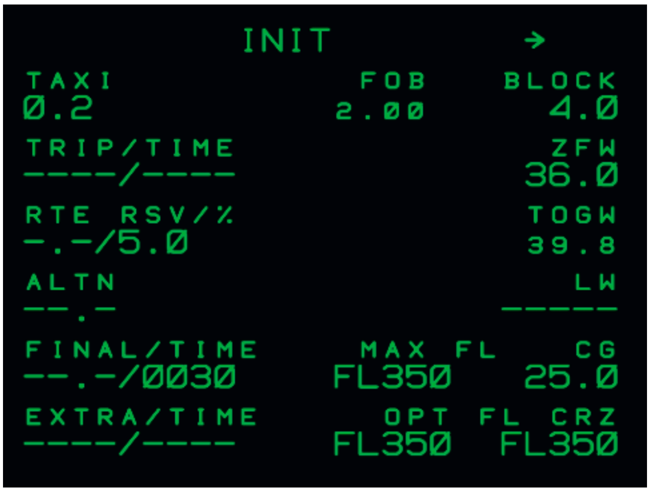
LSK4R: An ALIGN IRS* message will be present here if the IRS are not properly aligned and they require a position input. Once the aircraft’s present LAT/LONG has been entered in LSK3L/LSK3R, pressing LSK4R will start to align the IRSs to that position.

LSK5R: The tropopause altitude and temperature can be adjusted here. This information can normally be found on your flight plan.

LSK6R: The average cruise wind strength and direction can be adjusted here. This information can normally be found on your flight plan. The FMS uses this information for better computation of time and fuel predictions.

INIT B

The INIT B page is used to complete the fuel and weight set-up for the flight. This page can be accessed by pressing the NEXT PAGE key when on the INIT A page, and is only accessible when both engines are shut down.



LSK1L: Predicted taxi fuel can be entered here.

LSK2L: Calculated trip fuel/time are displayed here and cannot be altered by the pilot.

LSK3L: Route reserve fuel can be entered here either as a weight (‘1.0’ for 1,000 kg) or as a percentage of trip fuel (‘/5.0’ for 5%).

LSK4L: Alternate fuel for the flight is displayed here and cannot be altered by the pilot.

LSK5L: Final fuel reserve can be entered here either as a weight ('1.0' for 1,000 kg) or as a time ('/0030' for 30 minutes holding at 210 knots and 2,000 ft AGL).

LSK6L: Remaining extra fuel in weight and time, based on other entered parameters.

LSK1R: Fuel On Board (FOB) displays the total fuel sensed in the aircraft's fuel tanks. The BLOCK fuel for your flight must be entered in the empty field. This information can normally be found on your flight plan.

LSK2R: The aircraft's actual Zero Fuel Weight (ZFW) can be entered here and is automatically computed if TOGW is already entered. This information can normally be found on your flight plan or on the Aircraft page of the EFB. A ZFW OUT OF RANGE message will be generated in the scratchpad if you try to enter an unrealistic value.

LSK3R: The aircraft's actual Take-off Gross Weight (TOGW) can be entered here and is automatically computed if ZFW is already entered.

LSK4R: The predicted landing weight is displayed here and cannot be altered by the pilot.

LSK5R: The aircraft Centre of Gravity (%MAC) is entered here. The value should be set automatically, based on the aircraft's present weight and balance, but it can be manually edited. The Maximum Flight Level for the aircraft's current weight is also shown here.

LSK6R: The optimum Cruise Flight Level is shown here, based on the parameters entered in other fields. The planned Cruise Flight Level can also be edited here.

Flight Plan pages

The flight plan pages allow the pilot to review and revise the lateral and vertical elements of the flight plan in the sequence in which they occur. There are two Flight Plan (F-PLN) pages, referred to as F-PLN A and F-PLN B, which present the waypoints of which the flight plan consists and the distance between these waypoints.

F-PLN A

The F-PLN A page is the main flight plan page which can be accessed by pressing the F-PLN key. When opening the page, the FROM waypoint will always be displayed at the top of the list.

The flight plan page lists the whole flight plan, containing all waypoints and phantom waypoints. At the beginning of a flight, the flight plan starts with the departure airport and ends with the destination airport. As a flight progresses, the FMC automatically sequences through the flight plan, so that the topmost waypoint is always the FROM waypoint (i.e. the waypoint the aircraft is currently flying from).

Beyond the planned destination airport, the -END OF F-PLN- entry is listed, signalling that this the both the end of the primary flight plan and the start of the alternate flight plan. The Up/Down arrow keys can be used for scrolling.

1. The heading FROM indicates that the topmost waypoint is the FROM waypoint.
2. The flight number that was entered on the INIT A page is displayed here.
3. → indicates that there is a NEXT PAGE available, which in this case is the F-PLN B page.
4. The waypoint name or description.
5. Before take-off this field shows the time to the respective waypoint in minutes from the departure airport. Once the aircraft is airborne, the view changes to UTC predictions.
6. The number ahead of the forward slash is the profile speed. When displayed as small letters this is the speed that is to be held at the respective waypoint. When displayed as large letters there is a specific speed restriction for that waypoint listed in the Navdata.
7. The number after the forward slash is the profile altitude. When displayed as small letters this is the altitude that is to be reached at the respective waypoint. When displayed as large letters there is a specific altitude restriction for that waypoint listed in the Navdata. 'FL240' or '6000', for example, would indicate that the aircraft must pass this waypoint at the specified altitude. An altitude listed as '+FL120' indicates an 'at or above' restriction and '-FL100' indicates an 'at or below' restriction.
8. Double inverted commas (") indicate that the speed and/or altitude are predicted to be equal for successive waypoints.

Note: *The FMS does not support waypoints with upper and lower altitude restrictions. It handles such waypoints by displaying the lower altitude constraint on the F-PLN A page altitude window with an 'at or above' symbol (e.g. '+7000'). For the vertical profile calculations, however, the FMS will assume that the lower altitude constraint is an 'at' constraint.*

Waypoints can be directly inputted on both F-PLN pages, first by entering the name of the waypoint in the scratchpad, then pressing the LSKL key of the waypoint before which you want the new waypoint to be entered.

A FPLN DISCONTINUITY may appear in the flight plan, indicating a break in the flight plan between waypoints. A discontinuity may be closed by pressing the CLR key with any empty scratchpad ('CLR' appears in the scratchpad) and then pressing the LSK keys adjacent to the discontinuity.

A flight plan can also be shortened, or a discontinuity closed, by moving a waypoint to an earlier point in the flight plan. This can be done by pressing the LSK adjacent to the waypoint that is to be moved forward in the flight plan, then pressing the LSK next to the point where you would like to move the waypoint in the flight plan. This process will delete all waypoints from the flight plan that have been 'skipped'.

Vertical revisions are used by the pilot to modify elements of the flight plan that affect the vertical profile. In the case of the F-PLN pages, altitude and speed constraints can be directly modified by the pilots via the fields on the right side of the page.

Speed constraints can be modified by typing the speed into the scratchpad followed by a forward slash (/), e.g. '220/'.

Altitude constraints can be modified by typing a forward slash (/) into the scratchpad followed by the altitude, e.g. '/8000'. For 'at or above' altitudes, a 'plus' (+) or 'minus' (-) symbol can be added between the forward slash and altitude, e.g. '/+8000' or '/-8000'. With a modification typed out in the scratchpad, press the respective LSKR key to replace an existing speed/altitude constraint on a waypoint.

Additionally, speed and altitude constraints can be inputted at the same time by combining the above steps, e.g. '220/+8000'.

After any changes to the flight plan, pseudo waypoints are automatically recalculated.

With the F-PLN A page displayed on the FMS and PLAN mode selected on the EFIS control panel, the UP and DOWN arrow keys can be used to cycle through the flight plan waypoints on the EFIS ND.

F-PLN B

The F-PLN B page provides distance and predicted temperature and wind information for the same waypoints as displayed on F-PLN A. The F-PLN B page can be accessed by pressing the NEXT PAGE key when on the F-PLN A page.

1. A DIST heading at the top of the page indicates that distance is being displayed in the column below.
2. Distance between two successive waypoints is displayed here. When the FROM waypoint is displayed in the top row, the distance displayed will be the distance remaining to the next waypoint.
3. Temperature and wind are the predicted temperature and wind at each waypoint. Any temperatures and winds displayed in large letters are pilot-entered (either via the F-PLN B page itself, INIT pages, Vertical Revision page or the Descent Forecast page). Any temperatures and winds displayed in small letters are computed from pilot-entered values and sensed values.
4. Double inverted commas (“) indicate that the temperature and/or wind are predicted to be equal for successive waypoints.

With the F-PLN B page displayed on the FMS and PLAN mode selected on the EFIS control panel, the UP and DOWN arrow keys can be used to cycle through the flight plan waypoints on the EFIS ND.

Pilot waypoint types

There are seven pilot waypoint types that can be entered into the F-PLN pages:

Format	Description	Example
ZZZZZ	5-letter identifiers for an intersection or RNAV waypoints	*‘LISTO’, ‘GASKO’*
ZZZ	3-letter identifiers for a VOR, VOR/DME, DME, LLZ or LLZ/DME	*‘POL’, ‘BIG’*
ZZZZ	4-letter identifiers for an LLZ or LLZ/DME	*‘IFNE’*
ZZZNB	3-letter identifier + ‘NB’ for NDB	*‘LBANB’*
ZZNB	2-letter identifier + ‘NB’ for NDB	*‘TDNB’*
ZZZZ	4-letter identifier for an airport	*‘EGNT’*
ZZZZNN	4-letter airport identifier + runway identifier for a runway threshold position	*‘EGNT07’, ‘EGLL27R’*

Special waypoint types

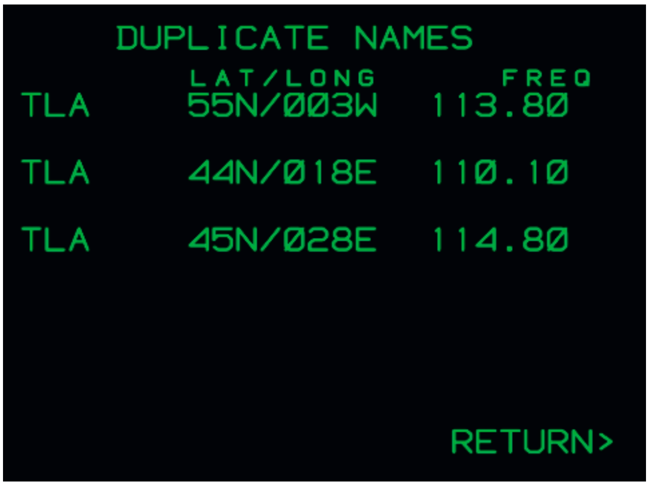
There are three special waypoint types that can be entered into the F-PLN pages:

Format	Description	Example
DDMM.MH/DDDMM.MH	Direct Latitude/Longitude entry. D = Degree M = Minute H = Hemisphere The first waypoint of this type will show in the flight plan as 'LL00', the second will show as 'LL01' etc.	*'4714.6N/01614.3E'* for 47°14.4' N and 16°14.3' E
ZZZ/DD	Place Distance waypoint. ZZZ = Waypoint Identifier DD = Distance in NM A Place Distance waypoint is DD miles after the ZZZ waypoint in the flight plan tack direction. If DD is negative, it's positioned backwards from ZZZ. Displayed in the flight plan as 'PD01', 'PD02' etc.	*'POL/20'* to create a waypoint 20 NM outbound from the POL VOR in the same direction of the inbound leg to POL.
ZZZ/BBB/DD	Place Bearing Distance waypoint. ZZZ = Waypoint Identifier BBB = Bearing from the waypoint DD = Distance in NM A Place Bearing Distance waypoint is DD miles along the BBB bearing from the ZZZ waypoint. If DD is negative, it's positioned backwards from ZZZ. Displayed in the flight plan as 'PBD01', 'PBD02' etc.	*'BIG/200/10'* to create a waypoint 10 NM outbound of the BIG VOR on a bearing of 200 degrees.

Duplicate names

If multiple entries are detected in the Navdata for an inputted waypoint, the DUPLICATE NAMES page is automatically displayed. It lists all matching waypoints, with the nearest waypoint appearing at the top of the list. Latitude/longitude and frequency (navaid only) are shown.

Press the respective LSKL key to select a necessary waypoint and it will be added to the flight plan.



Pseudo waypoints

Pseudo waypoints indicate when major vertical events occur in relation to the lateral flight plan. These waypoints do not exist in the Navdata and are generated by the FMS based on other inputted parameters and sensors. The possible pseudo waypoints are:

(SPD)(LIM): Indicates the position where the aircraft reaches the speed limit altitude of 10,000 ft / 250 kt. The altitude/speed of this waypoint can be manually altered. The waypoint can be deleted from the flight plan by pressing the CLR key followed by the LSKL or LSKR key adjacent to the (LIM) waypoint.

(T/C): Indicates the Top of Climb, the point on the flight plan where the aircraft reaches the cruise altitude. This is calculated based on the computed path of the FMC, not the actual climb profile, so in cases of strong winds or incorrectly entered weight parameters, the calculated Top of Climb can differ significantly from the actual Top of Climb.

(T/D): Indicates the Top of Descent, the point on the flight plan where the aircraft reaches the start of the idle thrust descent profile that takes into account all speed and altitude constraints.

(LEVEL): Indicates the point where the aircraft will reach the preselected altitude set in the AFCAS altitude window.

(FLXXX): Indicates the point where the aircraft reaches the altitude set in the TACTICAL page prediction field.

(I/P): Indicates the intersection profile, the point where the aircraft will intercept the vertical descent path. This will be visible if the aircraft is significantly above or below the descent path profile and correcting.

Flight plan modification pages

Lateral Revision page

The Lateral Revision (LAT REV) pages allow the pilot to perform revisions to the lateral part of the flight plan. These pages are used for the selection or definition of SIDs, STARs, airways, holding patterns and procedure turns. They can be accessed by pressing an LSKL key of a waypoint with an empty scratchpad. If the LSKL key is pressed next to an airport, the LAT REV page for that airport will open.

LSK1L: Opens the SID selection page (option only available if the departure airport is selected).

LSK2L: Opens the Airway page, which is used for entering airway routing from the selected waypoint.

LSK4L: Allows entry of a new waypoint after the selected waypoint.

LSK6L: Activates the alternate flight plan with a direct-to to the first waypoint in the ALTN FPLN.

LSK1R: Opens the STAR selection page (option only available if the destination airport is selected).

LSK2R: Opens the holding page to define a holding pattern at the selected waypoint.

LSK3R: Opens the PROC T (procedure turn) page for the selected waypoint.

LSK4R: Not simulated.

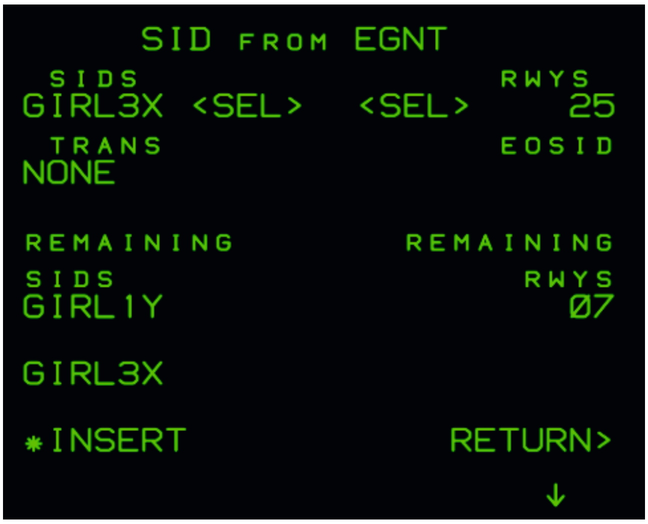
LSK5R: Allows entry of a new destination airport. This will input a direct-to from the selected waypoint to the new destination airport and delete the current flight plan.

LSK6R: Used to return to the F-PLN page.

SID page

When the Lateral Revision page is opened for the departure airport, the SID (Standard Instrument Departure) page can be opened by pressing the LSK1L key.

A list of runways listed in the Navdata for the selected airport is displayed on the right side of the page. A list of all SIDs listed in the Navdata for the selected airports is displayed on the left side of the page.



A runway and a SID can be selected by pressing the respective LSK keys next to the desired option. Upon selecting the LSKL key for the selected SID, or LSKR key for the selected runway, <SEL> text will appear to indicate the selected options, and the other list will be filtered to only show SIDs/runways that are compatible with the selected SID/runway.

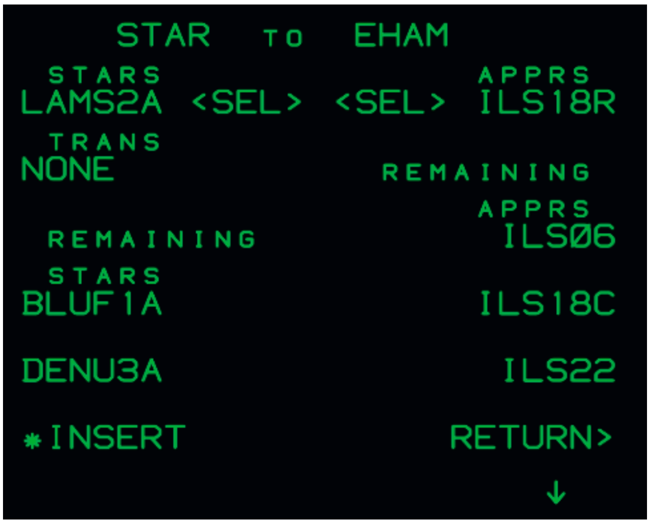
The runway/SID selection can be inserted into the flight plan by pressing the LSKL6 key (INSERT).

If a transition is available in the Navdata for the selected SID, a SID Transition (SID TRANS) page will open, allowing for selection of the transition. Pressing the LSKL key next to the desired transition, followed by the LSK6L (INSERT) key, will input the transition into the flight plan.

STAR page

When the Lateral Revision page is opened for the destination airport, the STAR (Standard Terminal Arrival Route) page can be opened by pressing the LSK1R key.

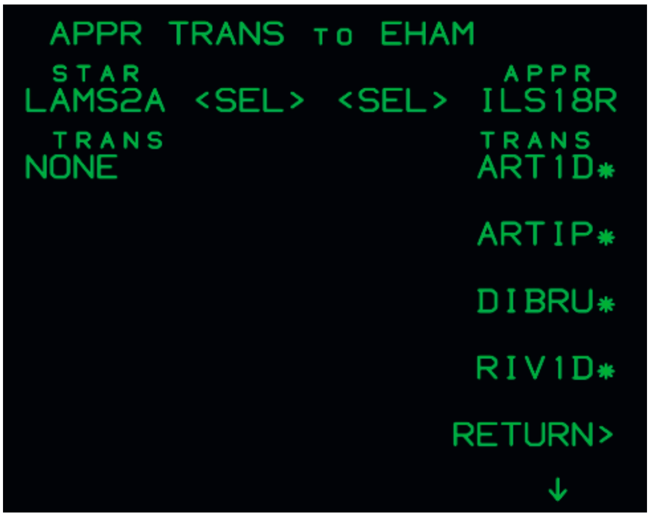
A list of approaches listed in the Navdata for the selected airport is displayed on the right side of the page. A list of all STARs listed in the Navdata for the selected airports is displayed on the left side of the page.



An approach and a STAR can be selected by pressing the respective LSK next to the desired option. Upon selecting the LSKL key for the selected STAR, or LSKR key for the selected approach, <SEL> text will appear to indicate the selected options, and the other list will be filtered to only show STARs/approaches that are compatible with the selected STAR/approach.

The approach/STAR selection can be inserted into the flight plan by pressing the LSKL6 key (INSERT).

If a transition is available in the Navdata for the selected approach/STAR, an Approach Transition (APPR TRANS) page will open, allowing for the selection of a transition. Pressing the LSKL or LSKR key next to the desired transitions, followed by the LSK6L (INSERT) key, will input the transition waypoints into the flight plan.



Airways page

The Airways page can be accessed by pressing the LSK2L key on the Lateral Revision page when a waypoint is selected.

This page allows for an efficient method of waypoint entry, by allowing the pilot to input an outbound airway from the selected waypoint and a termination waypoint. Based on the inputs, all the waypoints on the inputted airway between the initial waypoint and the termination waypoint will be entered into the flight plan.

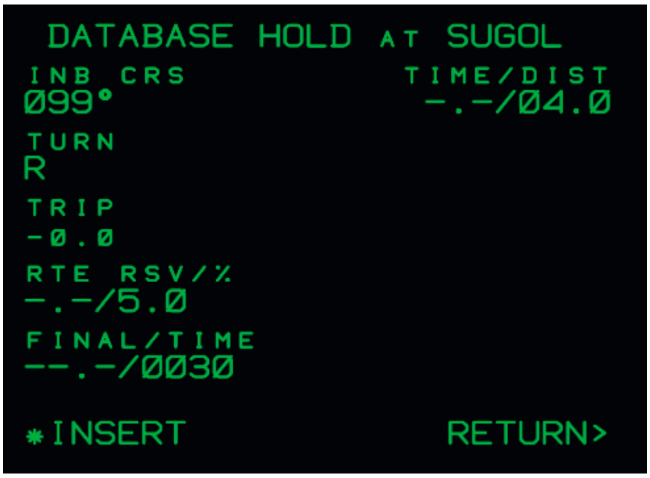
Desired airways are entered on the left side of the display, and the desired termination waypoints are entered on the right side. When more than one airway is entered, each intermediate termination point is the intersection of two airways. These are automatically calculated by the FMS. Only the last airway requires the entry of a termination point.

Selection of LSK6L (INSERT) incorporates the selected airways in the flight plan. Selection of LSK6R (RETURN) returns to the F-PLN page without inserting the airways.

Holding page

The Holding page can be accessed by pressing the LSK4R key on the Lateral Revision page; it can be used to select, define or modify a holding pattern.

A holding pattern can be inserted at any waypoint in the flight plan. A lateral revision at an existing holding fix allows changes to the associated holding pattern.



LSK1L: Inbound course to holding fix.

LSK2L: Turn direction.

LSK3L: Calculated trip fuel.

LSK4L: Fuel reserve setting.

LSK5L: Final fuel/time selection.

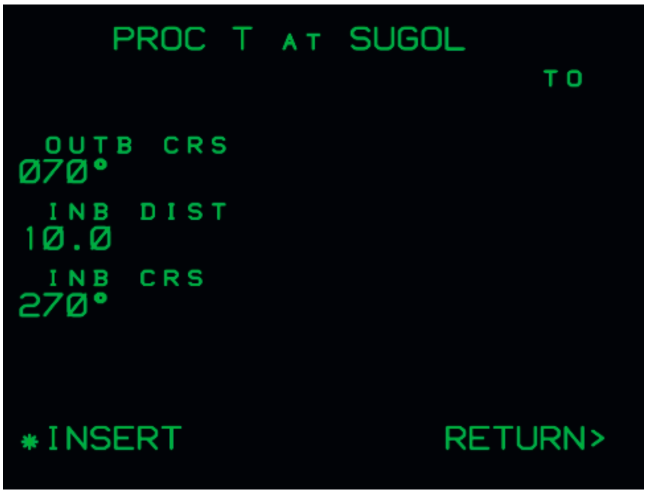
LSK6L: INSERT function used to insert the holding pattern into the flight plan.

LSK1R: Holding time/distance.

Procedure Turn page

The Procedure Turn (PROC T) page can be accessed by pressing the LSK3R key on the Lateral Revision page when a waypoint is selected.

A procedure turn may be included in a terminal area procedure or may be manually inserted into the flight plan. A procedure turn included in a terminal area procedure terminates when the approach localizer is captured (if AFCAS is in the APP or V/L mode) or when the inbound course is captured (if AFCAS is not in the APP or V/L mode).



LSK2L: Outbound course of selected fix.

LSK3L: Inbound distance into selected fix.

LSK4L: Inbound course into selected fix.

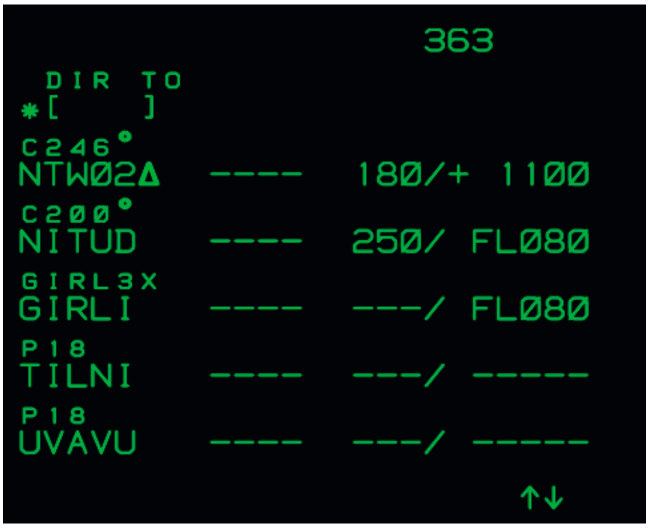
LSK6L: INSERT function used to insert the procedure into the flight plan.

LSK6R: RETURN function used to return to the previous page without inserting the procedure.

Direct-To page

The Direct-To (DIR TO) page can be accessed by pressing the DIR key. It is a modified F-PLN A page with the FROM waypoint in 1L replaced by a DIR TO field. This page allows the pilot to insert a direct path from the aircraft's present position to any selected waypoint, deleting all waypoint in between.

After the selection of the direct-to waypoint, the aircraft will immediately initiate the manoeuvre to the selected waypoint.

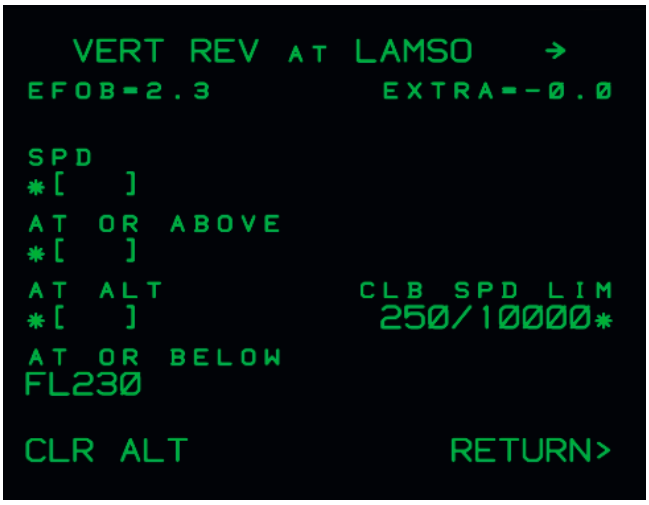


Vertical Revision page

The Vertical Revision (VERT REV) pages allow the pilot to modify the elements of the flight plan that affect the vertical profile. They can be accessed from the F-PLN page by pressing a LSKR key adjacent to a waypoint, and the NEXT PAGE key will cycle between the pages.

Vertical Revision page A

The VERT REF page A provides entry and modification of time, speed and altitude constraints at a waypoint. The VERT REV page A can be accessed from the F-PLN page A using the right LSKs.



LSK1L: The Estimated Fuel On Board (EFOB) at the selected waypoint.

LSK2L: Allows entry of a speed constraint at the selected waypoint.

LSK3L: Allows entry of an ‘at or above’ altitude to which the aircraft will be constrained when crossing the selected waypoint.

LSK4L: Allows entry of an ‘at’ altitude to which the aircraft will be constrained when crossing the selected waypoint.

LSK5L: Allows entry of an ‘at or below’ altitude to which the aircraft will be constrained when crossing the selected waypoint.

LSK6L: When a constraint has been entered for the selected waypoint, a CLR SPD/CLR GMT/CLR ALT option will become available, allowing the pilot to clear the constraint.

LSK1R: The estimated extra fuel remaining at the destination.

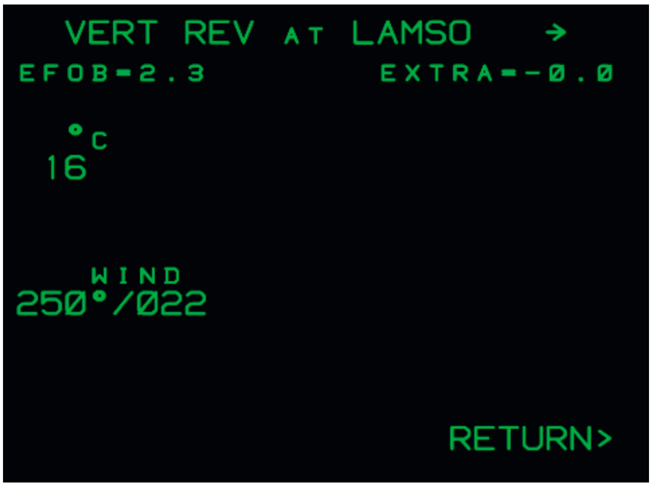
LSK4R: The altitude speed limit. There can only be one limit for climb and one for descent. By default this is set to 250 kt below 10,000 ft (‘250/10000’).

LSK6R: Used to return to the F-PLN page without performing a vertical revision.

Vertical Revision page B

The VERT REF page B provides entry and modification of temperature and wind

at a waypoint. The VERT REV page B can be accessed from the VERT REV page A by using the NEXT PAGE key.



LSK1L: The Estimated Fuel On Board (EFOB) at the selected waypoint.

LSK2L: Allows entry of the temperature at the selected waypoint.

LSK4L: Allows entry of the wind direction and speed at the selected waypoint.

LSK1R: The estimated extra fuel remaining at the destination.

LSK6R: Used to return to the F-PLN page without performing a vertical revision.

Performance Mode pages

The FMS features dedicated Performance Mode pages for selection of the strategic and tactical performance modes.

Strategic Mode page

The Strategic Mode, also referred to as the MODE page, allows the selection of an overall strategic mode for the entire flight before departure. The MODE page can be accessed by pressing the MODE key.

Three strategic mode are available for selection; these vary the aircraft's speed schedule based on the required fuel or time priorities:

LSK2L: ECON strategy is the default mode and uses the entered Cost Index to determine en route speeds.

LSK3L: MIN FUEL strategy reduces the climb and cruise speeds for the minimum fuel consumption.

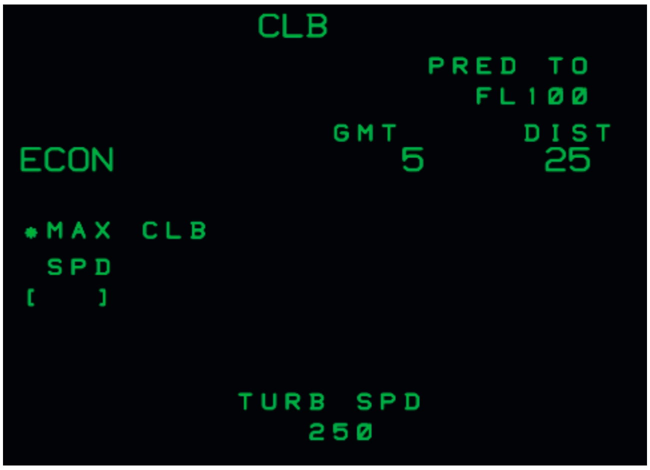
LSK4L: MIN TIME strategy uses high speeds for climb and cruise to reduce the overall flight time.

The active mode is displayed in large text, with other available modes displayed in small text with an asterisk (*). The modes can be selected by pressing the respective LSKL key.

Several time and fuel predictions associated with the selected strategic mode are displayed on the right side of the page.

Tactical Mode page

The Tactical Mode, also referred to as the TACT MODE page, allows the selection of a tactical mode that can be used during the climb, cruise or descent phase of flight. The TACT MODE page can be accessed by pressing the TACT MODE key.



The climb tactical modes (MAX CLB and SPD) can be selected any time before transition to cruise.

The cruise tactical modes (MAX END and SPD) can only be selected during cruise.

The descent tactical modes (MAX DES and SPD) can be selected any time after transition to descent until flight completion.

The flight phase is displayed in the title line.

LSK2L: Will display ECON/MIN TIME/MIN FUEL based on the selection made on the MODE page.

LSK3L: The available tactical mode(s) for the current phase of flight.

LSK4L: Allows a specific target speed to be entered by the pilot.

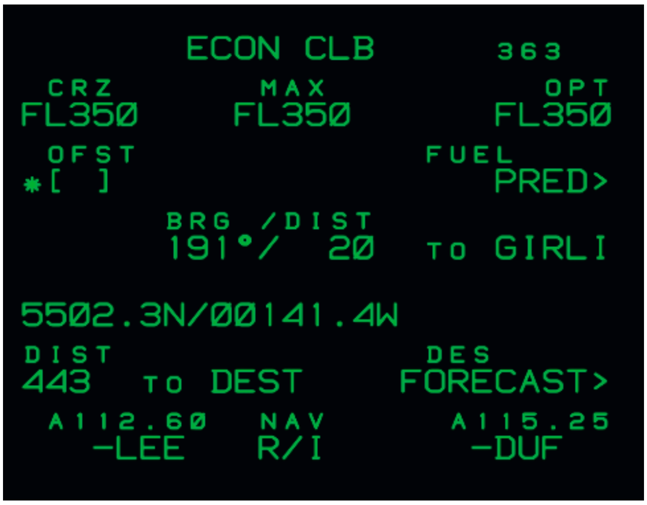
Several time and distance predictions associated with the selected strategic mode and altitude are displayed on the right side of the page.

Flight information reference pages

These pages provide the pilot with information about flight progress and about specific flight phases, as well as information about database and pilot-defined waypoints, navaids and airports.

Progress page

The Progress (PROG) page displays a summary of the aircraft position, tuned navaids, cruise flight levels, flight phase and performance mode. The page can be accessed by pressing the PROG key.



The title line displays the current flight phase and the flight number entered on the INIT A page.

LSK1L: Displays the currently selected Cruise (CRZ) flight level and can be manually adjusted by the pilot.

LSK2L: Allows for a lateral flight plan offset to be entered (not simulated).

LSK3L: Displays the bearing and distance to the pilot-selected waypoint in LSK3R.

LSK4L/LSK4R: Display the FMC-calculated present aircraft position as a latitude and longitude. The display is constantly updated. A new position can be entered as a latitude and longitude, and an ‘UPDATE’ option will become available in LSK4R. Pressing LSK4R will update the FMC’s calculated position.

***Note:** Changing the FMC position can cause map shifts and major navigation errors. Use caution when changing positions.*

LSK5L: Displays the distance from the aircraft’s present position to the destination, measured along the active flight plan.

LSK6L: Displays the frequency and identifier of the navaid selected for display on the Captain’s ND and RMI. See the Navaid remote tuning section below for further information.

LSK1R: Displays the computed maximum and optimum flight levels.

LSK2R: Provides access to the Fuel Prediction page.

LSK3R: Allows entry of a waypoint whose bearing and distance will be displayed in LSK3L.

LSK4R: Displays an ‘UPDATE’ option when a new aircraft position has been entered in LSK4L.

LSK5R: Provides access to the Descent (DES) Forecast page.

LSK6R: Displays the frequency and identifier of the navaid selected for display on the Captain’s ND and RMI. See the Navaid remote tuning section below for further information.

Navaid remote tuning

Navaid remote tuning is used by the FMC to correct the IRS position along the flight and to guarantee the position integrity. The currently tuned navaids are displayed on the LSK6L and LSK6R row of the PROG page.

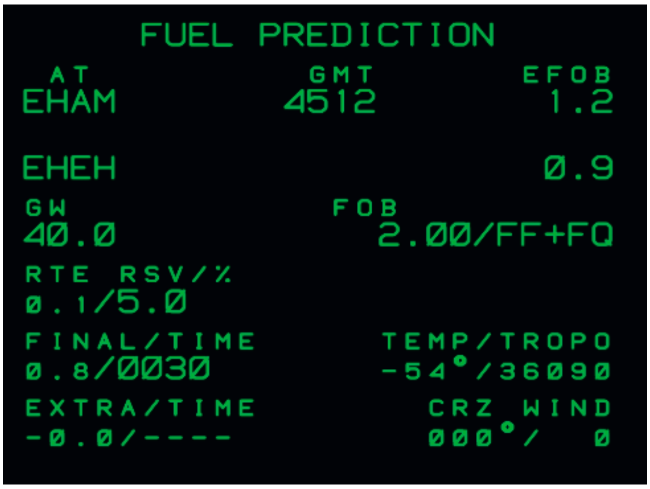
Small letters indicate the tuned frequency and large letters indicate the VOR-DME identifier. When the frequency is prefixed by an ‘A’ (e.g. ‘A111.50’), this indicates that the frequency is automatically tuned by the FMC. When the frequency is prefixed by an ‘’R (e.g. ‘R112.10’), this indicates that the frequency is remotely tuned by the pilot, either by entering the identifier or the frequency of a navaid into LSK6L/LSK6R.

A remote tuning can be released by pressing the CLR key with an empty scratchpad, followed by LSK6L or LSK6R.

Remote and auto tuning are only possible as long as the displays on the VOR DME receiver panel on the pedestal indicate dashes ‘---.---’, which is dependent on APP/VOR selection and EFIS mode selection on the EFIS control panels. If a VOR is manually tuned on the VOR DME panel, the frequency displayed on the FMS will be the same as on the panel, and will be prefixed by an ‘M’ (e.g. ‘M113.80’).

Fuel Prediction page

The Fuel Prediction (FUEL PRED) page provides fuel and time predictions for the active flight plan. This page is only available after engine start, and can be accessed by pressing the LSK2R key on the Progress page.



LSK1L/LSK1R: Display the predicted Estimated Fuel On Board (EFOB) at the primary destination airport.

LSK2L/LSK2R: Display the predicted Estimated Fuel On Board (EFOB) at the alternate destination airport.

LSK3L: Displays the current gross weight of the aircraft. This value can be altered by the pilot. When the ZFW has not been initiated on the INIT B page, the FMS cannot calculate values for the gross weight and other fields, and a manual entry is required. In this simulation a manual gross weight entry will be required when a flight is started on the runway.

LSK4L: Alternate fuel for the flight is displayed here.

LSK5L: Final fuel reserve can be entered here either as a weight (‘1.0’ for 1,000 kg) or as a time (‘/0030’ for 30 minutes holding at 210 knots and 2, 000 ft AGL).

LSK6L: Remaining extra fuel in weight and time based on other entered parameters.

LSK1R: Fuel On Board (FOB) displays the total fuel sensed in the aircraft's fuel tanks. The BLOCK fuel for your flight must be entered in the empty field; this information can normally be found on your flight plan.

LSK3R: The total Fuel On Board (FOB) computed with inputs of Fuel Flow (FF) and Fuel Quantity (FQ).

LSK5R: The tropopause altitude and temperature can be adjusted here. This information can normally be found on your flight plan.

LSK6R: The average cruise wind strength and direction can be adjusted here. This information can normally be found on your flight plan. The FMS uses this information for better computation of time and fuel predictions.

Descent Forecast page

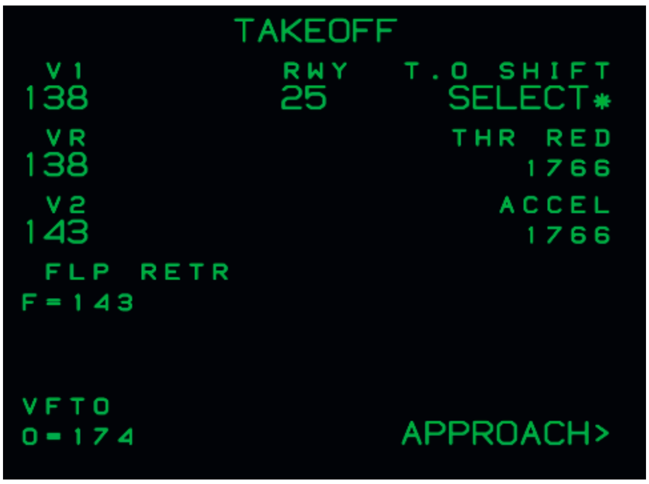
The Descent Forecast (DES FORECAST) page allows entry of the forecasted winds encountered during the descent to the active destination. The wind at various altitudes may be entered. Entries are used for fuel and descent path calculations. The page can be accessed by pressing the LSK5R key on the Progress page.

LSK2L/LSK3L/LSK4L: The wind speed and direction, and the altitude at which the wind will be encountered, can be entered here.

LSK5L: The wind speed and direction at the destination airport can be entered here.

Take-off page

The Take-off page displays take-off parameters which can be adjusted by the pilot. The page can only be accessed during the pre-flight phase, by using the TO/APPR key.



LSK1L: V1/decision speed, which can be entered and changed here. When no value is entered, the field displays boxes.

LSK2L: VR/rotation speed, which can be entered and changed here. When no value is entered, or when VR becomes less than V1, the field displays boxes.

LSK3L: V2/safety speed, which can be entered and changed here or on the FMP. When no value is entered, the field displays boxes.

LSK4L: Flap retraction speed – calculated by the FMC but can be altered by the pilot.

LSK6L: Final take-off or green dot speed – calculated by the FMS.

LSK1R: Take-off runway, as selected on the SID page, is displayed in the centre of the page. Pressing LSK1R triggers T.O. SHIFT which updates the aircraft's position 970 metres down the runway and displays ACTIVE.

LSK2R: Thrust reduction altitude, displayed in feet above MSL and can be altered by the pilot.

LSK3R: Acceleration altitude, displayed in feet above MSL and can be altered by the pilot.

LSK6R: Provides access to the Approach page.

Approach page

The Approach page provides pilot selection of the landing configuration and display of selected aircraft speeds. The Approach page can be accessed by pressing LSK6R on the Take-off page during the pre-flight flight phase and via the TO/APPR key during the climb, cruise, descent and approach flight phases.

LSK1L/LSK2L/LSK3L: Allow selection of the flap setting for landing. The selected setting is displayed in large text.

LSK4L: Approach speed, calculated by the FMC based on flap setting and wind correction factor.

LSK5L: Wind correction factor. Pilot-alterable to correct VAPP for wind.

LSK6L: Provides access to the Go-Around page.

LSK1R: Displays the predicted landing weight.

LSK2R: Final take-off or green dot speed, calculated by the FMS.

LSK4R: Flap retraction speed, calculated by the FMS and can be altered by the pilot.

Go-Around page

The Go-Around page provides a means to review and modify the go-around speeds and altitudes. The page can be accessed by pressing LSK6L on the Approach page during the cruise, descent and approach flight phases, and via the TO/APPR key during go-around. The page is automatically displayed when the TOGA triggers are activated while the Approach page is displayed.

LSK4L: Flap retraction speed. Calculated by the FMC but can be altered by the pilot.

LSK6L: Final take-off or green dot speed – calculated by the FMS.

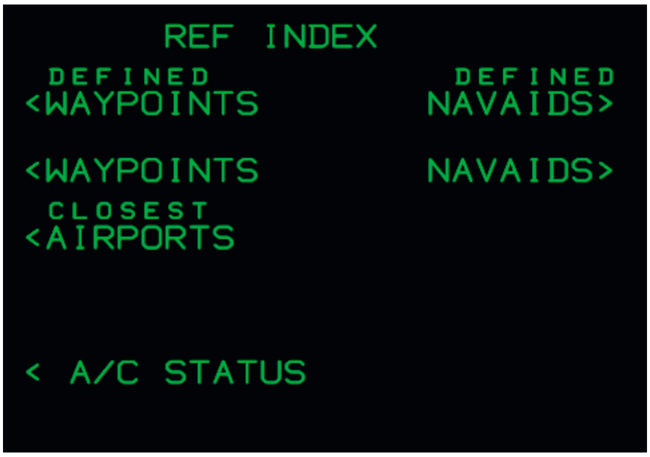
LSK2R: Thrust reduction altitude, displayed in feet above MSL and can be altered by the pilot.

LSK3R: Acceleration altitude, displayed in ft above MSL. Can be altered by the pilot.

LSK6R: Provides access to the Approach page.

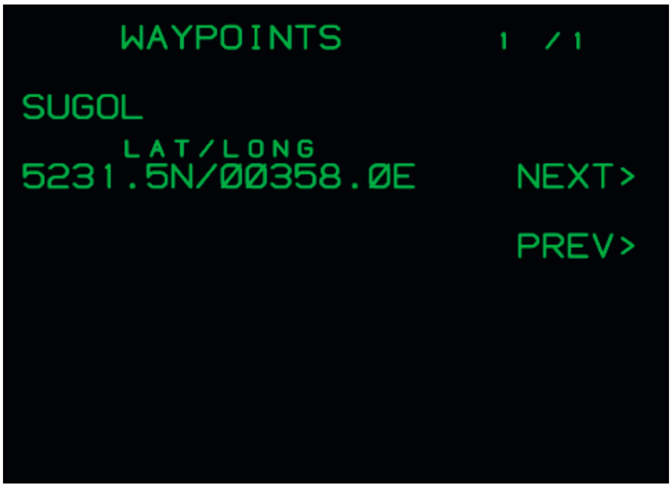
Reference pages

The FMS includes special pages for reference to and definition of waypoints and navaids. These pages can be accessed via the Reference Index (REF INDEX) page, which can be accessed by pressing the REF key.



Waypoint page

The WAYPOINT page provides information about waypoints in the navigation database. Pilots can enter a waypoint identifier into LSK1L and get information such as the type of waypoint, latitude/longitude, elevation and runway length.



LSK1L: Requires pilot entry of a waypoint identifier. A runway should be entered as a combination of the airport identifier and the runway designation (e.g. ‘EGLL27R’).

LSK2L: Displays the location (latitude and longitude) of the selected waypoint.

LSK4L: Displays the runway elevation in feet of the selected airport and runway.

LSK5L: Displays the runway length in feet of the selected airport and runway.

LSK6L: Displays the runway course for the selected airport and runway.

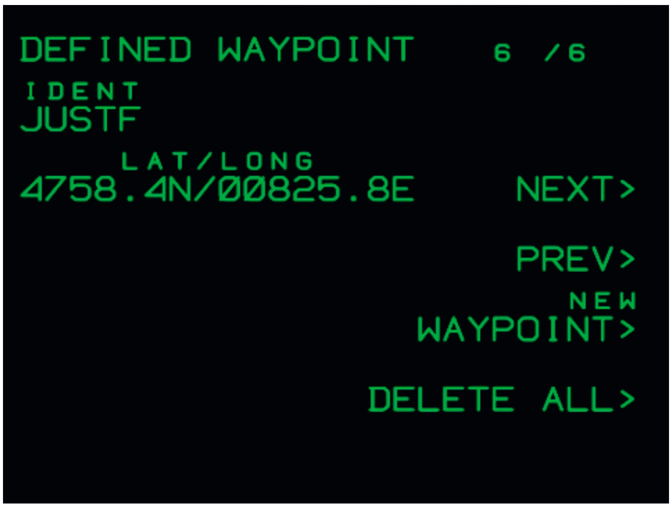
LSK4R: Displays the ILS category of the runway.

Defined Waypoint page

The DEFINED WAYPOINT page shows the pilot-defined waypoints and allows them to be deleted. The page also provides access to the New Waypoint page and will display the New Waypoint page if no pilot-defined waypoints exist in the database.

Pilot-defined waypoints can be defined by:

- **Lat/Long:** Latitude and longitude of the waypoint
- **Place/Bearing/Distance:** The bearing and distance of the waypoint from a specific place, which can be another waypoint or a navaid.



LSK1L: Displays the waypoint identifier.

LSK2L: Displays the location (latitude and longitude) of the selected defined waypoint.

LSK3L: Displays the place/bearing/distance of the waypoint relevant to another waypoint. This field is only displayed when the waypoint is defined as place/bearing/distance.

LSK2R: Selection of the next waypoint in the database.

LSK3R: Selection of the previous waypoint in the database.

LSK4R: Provides access to the New Waypoint page.

LSK5R: Selection deletes all pilot-defined waypoints in the database.

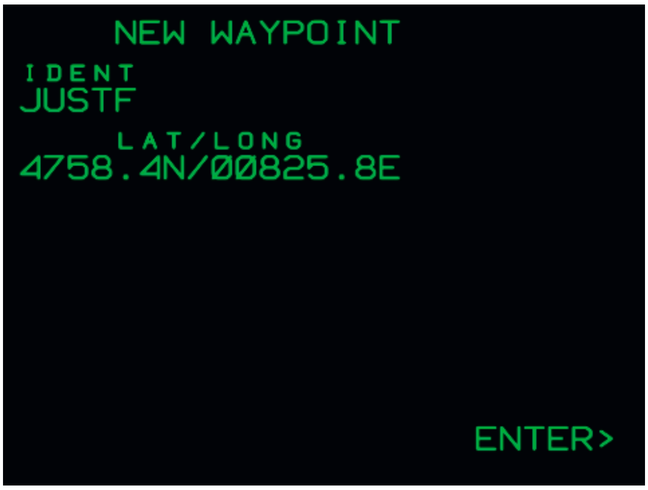
New Waypoint page

The New Waypoint page allows the pilot to create a new waypoint. The page displays similar fields to the Defined Waypoint page with empty boxes. The fields adjacent to LSK4L, LSK5L and LSK6L are only displayed when a runway identifier is entered.

Once all parameters are defined, ENTER is displayed in LSK6R. Selection inserts the new waypoint into the database which is stored locally on your PC/console. Up to 20 waypoints can be defined. When 20 waypoints are already defined, the entry of a new one deletes the first defined waypoint that is not in the flight plan.

The waypoint identifier may be any combination of alphanumeric characters, but a specific combination is reserved for runways: ’RWxxD’, where ’xx’ is the runway number and ’D’ is the runway designator (L, R or C).

Waypoints can also be defined directly on the flight plan pages via scratchpad entries. The formats of scratchpad entries are identical to those of the fields LSK2L and LSK3L (e.g. ’4758.4N/00825.8E’ or ’POL/270.0/20.0’).



Navaid page

Upon initial entry, the navaid page provides information about the navaids that are tuned by the FMC. Four pages are available:

- **Page 1:** The navaid tuned for display on the RMI and the ND.
- **Pages 2 and 3:** The navaids tuned for position computation.
- **Page 4:** The ILS DME tuned for display.

The navaid page also provides a review of navaids in the navigation database via entry of the navaid identifier in LSK1L. When a navaid identifier is entered in LSK1L, the page number in the title line and the NEXT> and PREV> prompts in LSK2R and LSK3R disappear.

LSK1L: Displays the navaid identifier.

LSK2L: Displays the location (latitude/longitude) of the navaid.

LSK3L: Displays the frequency of the navaid.

LSK4L: Displays the elevation of the navaid.

LSK5L: Displays the class of the navaid (VOR, DME, VORDME, ILSDME, VORTAC, LOC or LOCDME).

LSK6L: The figure of merit and the usable range of the navaid. The figure of merit indicates the altitude and range to which the navaid is reliable.

LSK1R: Displays the station declination (magnetic variation) of the navaid.

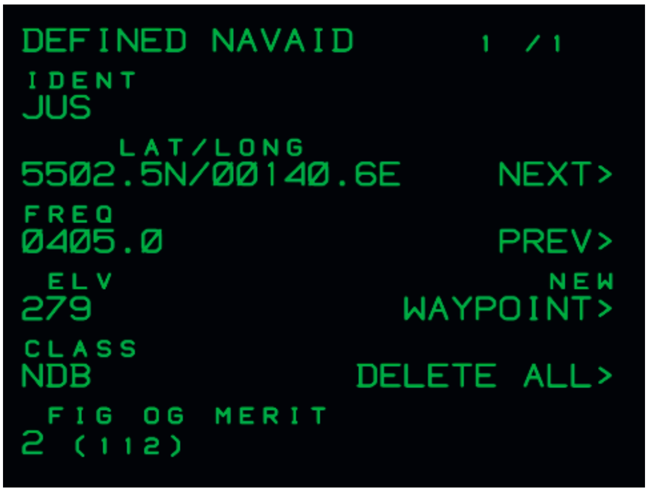
LSK2R: Allows selection of the next page.

LSK3R: Allows selection of the previous page.

LSK4R: Allows entry of the navaid identifier to be deselected.

Defined Navaid page (New Navaid)

The Defined Navaid page provides information about the pilot-defined navaids and allows deletion of them. The page also provides access to the New Navaid page. The layout and function of all fields on the Defined Navaid page are identical to those on the Navaid page.



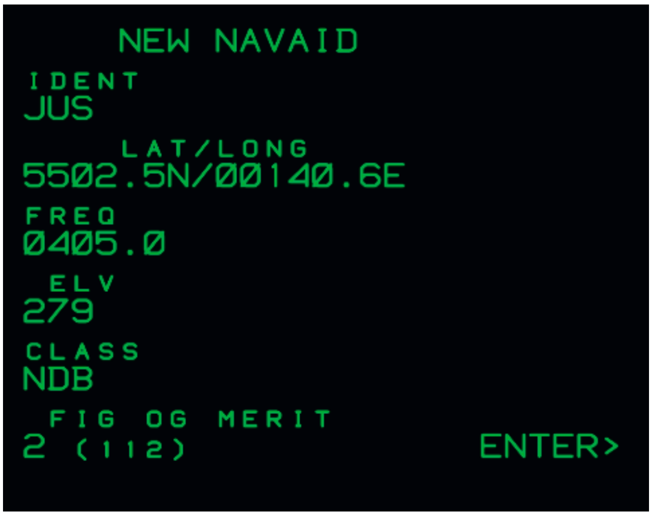
New Navaid page

The New Navaid page lets the pilot define a new navaid. After entry of the identifier, all fields on the left side of the Defined Navaid page are displayed with boxes.

The ELEV field (LSK4L) is not displayed for a VOR-only or LOC-only station. The STATION DEC field (LSK1R) is only displayed for VOR, VORDME and VORTAC stations.

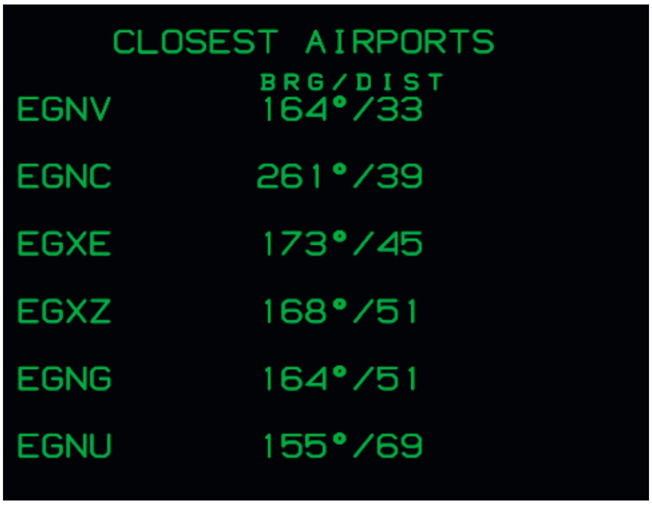
Once all parameters are defined, ENTER is displayed in LSK6R. Selection inserts the new navaid into the database which is stored locally on your PC/console. Up to 20 navaids can be defined. When 20 navaids are already defined, entry of a new one deletes the first defined navaid that is not in the flight plan.

The navaid identifier may be any combination of alphanumeric characters.



Closest Airports page

The Closest Airports page shows the five airports in the database that are closest to the aircraft's position. The airports, along with their bearing and distance, are displayed in increasing order of distance. Only airports between 2 and 2,000 NM are displayed. If no airports are found within 2,000 NM, a 'NONE WITHIN 2000 NM' message is displayed next to LSK3L/LSK43R.



MSFS-specific functions

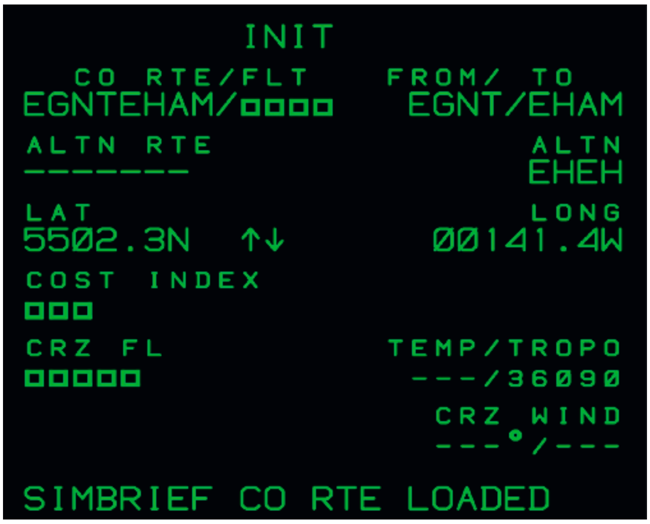
Flight plan import (SimBrief API)

A SimBrief Operational Flight Plan (OFP) can be imported directly into the FMS by using the SimBrief API. This method is useful for both PC and Console users as it imports the flight plan directly from the SimBrief website and does not require any file management.

Prior to importing a SimBrief OFP directly into the FMS, a SimBrief account must be linked to the aircraft. You will be prompted to enter your SimBrief Pilot ID the first time the EFB OFP app is opened.

Your SimBrief Pilot ID will be saved between flights and it can be edited or removed on the EFB Options page.

With an OFP generated on the SimBrief website and your SimBrief account linked to the aircraft, your most recently generated OFP can be imported into the aircraft by entering the ICAO codes of the departure and arrival airports into the CO RTE field on the FMS INIT A page. The CO RTE field only accepts inputs in ICAOICAO format (e.g. 'EGNTEHAM' or 'KORDKMSP').



Once the ICAO codes have been entered into the CO RTE field, a 'SIMBRIEF CO RTE REQUESTED' message will be generated in the scratchpad, indicating that the request is in progress, followed by a 'SIMBRIEF CO RTE LOADED' message once the import is complete. This message can be cleared from the scratchpad with the CLR key.

The CO RTE functionality will populate the TO/FROM and ALTN fields on the INIT A page, and will add all enroute waypoints and airways to the F-PLN page. It will not populate Departures and Arrivals in the flight plan, and other mandatory fields including COST INDEX, CRZ FL and FLT on the INIT A page, BLOCK, ZFW, and TOGW on the INIT B page, must be populated manually by the pilot prior to flight.

If a SimBrief import fails, a 'NOT IN DATABASE' message will be generated in the scratchpad. The most likely causes of this are an incorrect or missing SimBrief Pilot ID on the EFB, an ICAO airport pair that does not match the airports in your most recently generated SimBrief OFP, or your aircraft type does not match the aircraft type in your most recently generated SimBrief OFP.

Flight plan import (local files)

Flight plans that are stored locally on your PC can be imported into the FMS. This method is only available for PC users due to file management requirements.

This method of flight plan import requires flight plan files to be saved in an .RTE format and in a specific file directory on your PC. The exact file directory is dependent on the product and the version of MSFS being used:

F70 Professional

MSFS 2020 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-f70\work\FlightPlans

MSFS 2020 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-f70\work\FlightPlans

MSFS 2024 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-f70\work\FlightPlans

MSFS 2024 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-f70\work\FlightPlans

F100 Professional

MSFS 2020 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-f100\work\FlightPlans

MSFS 2020 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-f100\work\FlightPlans

MSFS 2024 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-f100\work\FlightPlans

MSFS 2024 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-f100\work\FlightPlans

These file directories will be created automatically the first time a flight is loaded in the aircraft.

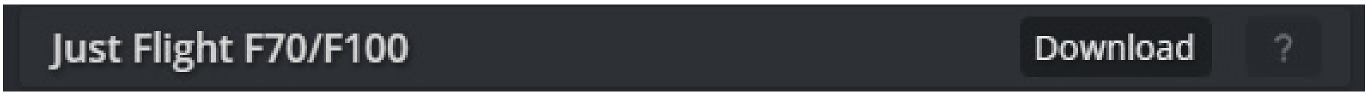
It is recommended that the flight plan files are named in an ICAOICAO.rte format (e.g. EGNTEHAM.rte or KORDKMSP.rte).

With a flight plan saved in a .RTE format and in the correct file directory, enter the exact file name of the flight plan file into the CO RTE field on the FMS INIT A page (e.g. 'EGNTEHAM' or 'KORDKMSP').

Once the file name has been entered into the CO RTE field, a 'LOCAL CO RTE REQUESTED' message will be generated in the scratchpad, indicating that the request is in progress, followed by a 'LOCAL CO RTE LOADED' message once the import is complete. This message can be cleared from the scratchpad with the CLR key.

The CO RTE functionality will populate the TO/FROM and ALTN fields on the INIT A page, and will add all enroute waypoints and airways to the F-PLN page. It will not populate Departures and Arrivals in the flight plan, and other mandatory fields including COST INDEX, CRZ FL and FLT on the INIT A page, BLOCK, ZFW, and TOGW on the INIT B page, must be populated manually by the pilot prior to flight.

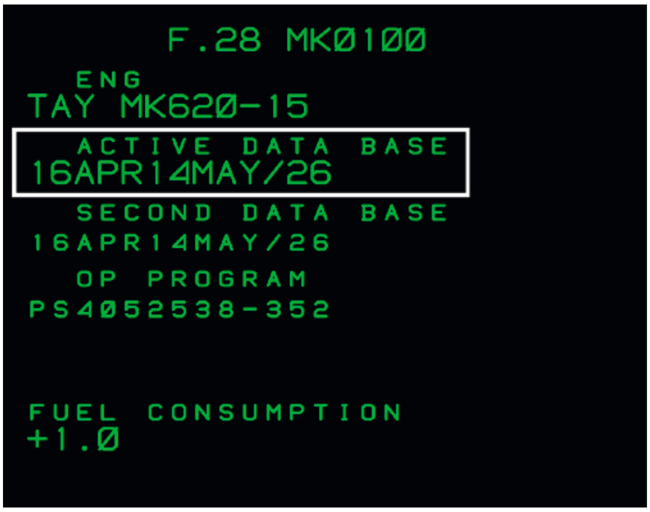
If a local file import fails, a 'NOT IN DATABASE' message will be generated in the scratchpad. The most likely causes of this are inputted text in the CO RTE field not exactly matching the filename, or the .RTE file not being placed in the correct folder.



We recommend the use of the SimBrief Downloader desktop app to streamline the process of saving flight plan files in the correct format and location. Once the file directories are set up in the SimBrief Downloader app, all future OFPs generated on the SimBrief website will be automatically saved in the correct format and location without any manual file management.

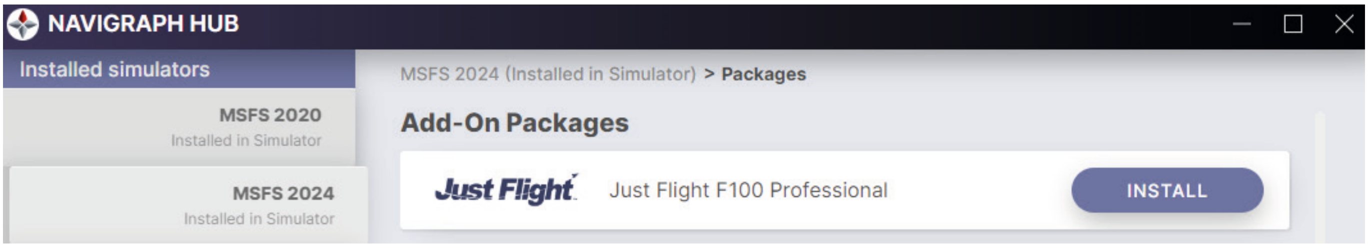
Updating Navdata

The current AIRAC cycle used by the FMS is displayed on the Aircraft Status page. The validity period of the installed Navdata is displayed, but the FMS provides no other indication if the Navdata is out of date.



This simulation of the F70 and F100 includes Navdata from the AIRAC 2503 cycle as standard. Although this is not the most up-to-date AIRAC cycle, this Navdata should be sufficient in the majority of cases and should have little to no effect on your overall simulator experience.

PC users with an active Navigraph subscription can update their Navdata using the NAVIGRAPH HUB desktop application. After opening the app, click the green UPDATE button for the required aircraft. Once the Navdata has been successfully updated, the button will turn red and the text will change to REMOVE, allowing you to remove this newly installed Navdata.



The navdata used by the FMS is stored in the following file directories; these vary depending on the product and the version of MSFS used:

F70 Professional

MSFS 2020 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-f70\work\NavData

MSFS 2020 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-f70\work\NavData

MSFS 2024 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-f70\work\NavData

MSFS 2024 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-f70\work\Navdata

F100 Professional

MSFS 2020 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-f100\work\NavData

MSFS 2020 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-f100\work\NavData

MSFS 2024 – Microsoft Store: C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-f100\work\NavData

MSFS 2024 – Steam: C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-f100\work\Navdata

HYDRAULICS

The aircraft is equipped with two independent hydraulic systems: hydraulic system 1 and hydraulic system 2. Both systems are fundamentally identical; they only differ in capacity and the sub-systems that they supply.

Hydraulic system 1 operates the following systems:

- LH aileron
- Elevator
- Stabiliser
- Rudder
- Alternate brakes
- Landing gear
- Nose-wheel steering
- Flaps
- Speed brake
- Lift dumpers
- Stick pusher (F70)
- Thrust reversers

Hydraulic system 2 operates the following systems:

- RH aileron
- Elevator
- Stabiliser
- Rudder
- Normal brakes

The hydraulic systems are controlled from the HYDRAULIC panel on the overhead.

System components

Hydraulic tanks: Each tank is pressurised by bleed air and is equipped with a fluid quantity transmitter. Low fluid quantity, fluid overheat and low tank air pressure are signalled.

Engine-driven pumps: Hydraulic power is supplied at a nominal system pressure of 3,000 PSI by two engine-driven pumps on each engine. One pump supplies system 1 and the other supplies system 2. When a fire handle is pulled, the relevant fire shut-off valves close. This will isolate both engine-driven pumps from the tank supply.

Electrically driven pumps: A low-capacity electrically driven pump is installed in each system. Its main purpose is for maintenance system testing. It can also be used to pressurise the brake system prior to engine starting.

Priority valve: The priority valve will close if hydraulic system 1 pressure falls below a preset value, to ensure that power remains available for the flight controls, speed brake and thrust reversers. This valve will open to restore pressure to the landing gear, nose-wheel steering, lift dumpers, alternate brakes, stick pusher (F70) and flaps, when the pressure rises above a preset value.

ICE AND RAIN PROTECTION

The aircraft is equipped with anti-icing systems to prevent ice accumulating on the following areas:

- Wing leading edge
- Tail leading edge
- Engines
- Flight deck windows
- Pitot heads
- Static ports
- Angle-of-Attack vanes

Engine bleed air is used for engine, wing and tail anti-icing. The anti-icing controls are located on the ANTI-ICING panel on the overhead.

An ice detector is located on the bottom of the fuselage and provides an alert to the flight crew when ice has accumulated to a predetermined thickness. The alert will only be removed when icing conditions no longer exist.

A black stripe is provided on the outboard wing to aid in visual inspection for ice contamination during flight and on the ground. The wing inspection lights are pointed towards the stripe.

Engine anti-icing

The nacelle leading edge, the inside of the air intake and the engine spinner are provided with ice protection. When engine anti-icing is selected via the engine anti-icing push-button, a pressure-regulating and shut-off valve is opened, provided that the engine is running and bleed air pressure is sufficient. Pressure-regulated bleed air is then routed through the nacelle leading edge.

Wing anti-icing

When the aircraft is in flight and the wing anti-icing is selected via the wing anti-icing push-button, a pressure-modulating and shut-off valve is opened, provided that bleed air pressure is sufficient. Pressure-regulated bleed air is then routed through the leading edge.

Operation of the wing anti-icing system is inhibited as long as either thrust lever is set to the maximum TLA for approximately 60 seconds after lift-off (take-off) and for approximately 60 seconds after TOGA activation (go-around).

When the aircraft is on the ground, the on-ground wing leading edge heating system (GWLEHS) provides a means of wing anti-icing. The system is automatically activated when either engine anti-icing system is switched on, provided that the aircraft is on the ground and bleed air pressure is sufficient. The system regulates the temperature of the wing leading edge by opening and closing the modulating and shut-off valve. Operation of the on-ground wing leading edge heating system is inhibited as long as either thrust lever is set above the MIN TO position, as long as the aircraft is airborne or for approximately 60 seconds after the TOGA triggers are activated. When engine anti-icing is on during landing, the on-ground wing leading edge heating system will automatically be activated after touchdown.

Tail anti-icing

When tail anti-icing is selected via the tail anti-icing push-button, a temperature-modulating and shut-off valve is opened, provided that the aircraft is airborne and bleed air pressure is sufficient. Temperature- and pressure-regulated bleed air is now routed through the leading edge of the horizontal stabiliser. Operation of the tail anti-icing system is inhibited as long as either thrust lever is set to the maximum TLA for approximately 60 seconds after lift-off (take-off) and for approximately 60 seconds after TOGA activation (go-around).

Probe heat

Three pitot heads, six static ports and two angle-of-attack vanes are electrically heated to prevent ice formation. Heating of the pitot heads and the angle-of-attack vanes can be switched on/off via the controls on the PROBE HEAT panel on the overhead. The heating of static ports is terminated when heating of the associated pitot head is switched off.

In a battery-power-only condition, only pitot head 1 is heated.

Window heat

The flight deck front windows and sliding windows are electrically heated. Two independent systems automatically control the window heat to the required temperature for anti-icing, demisting and increased impact resistance. Each system has two operating channels – one provides temperature control and monitoring for a front window and the second controls the adjacent sliding window. Heating of the left and right windows can be individually switched on/off via the controls on the WINDOW HEAT panel on the overhead.

Wipers

Both of the front flight deck windows are fitted with variable-speed wipers to improve forward visibility during rain. Two selectors with OFF/LO/HI positions are located on the left and right lower overhead panels and these vary the speed of the wipers. When a selector is moved to OFF, the associated wiper will automatically be positioned in the park position.

INSTRUMENTS AND RECORDERS

Air data system

The air data system consists of the following components:

- Three pitot-static systems
- Two air data computers (ADC)
- Two angle-of-attack vanes
- Two temperature probes

Pressure information to various instruments and systems is provided directly from the pitot-static system, or indirectly via the ADC.

Pitot-static system

Three independent pitot-static systems provide pitot and static pressure to various instruments and systems, and to the air data computers. Three pitot heads are located on the forward fuselage. Three static ports are located on the fuselage LH side, and three static ports are located on the forward fuselage RH side. The respective LH and RH static ports are interconnected to minimise side-slip effects.

Pitot and static systems 1 and 2 provide pressures to the respective air data computers 1 and 2. Pitot and static system 3 provides pitot and static pressures to the standby airspeed indicator, and static pressure only to the standby altimeter, cabin differential pressure indicator and air conditioning pack automatic shut-off control.

The pitot heads and static ports are electrically heated to prevent icing

Air data computer

Two air data computers receive information from the respective pitot-static system, outside air temperature probe, angle-of-attack sensor and Altimeter Set Panel (ASP). The QNH reference pressure can be set on the ASP.

The inputs are then converted into electrical signals which are supplied to the following systems:

- Automatic Flight Control and Augmentation System (AFCAS)
- Flight Management System (FMS)
- Attitude and heading system
- Electronic Flight Instrument System (EFIS)
- Flight Warning System (FWS)
- Ground Proximity Warning System (GPWS)
- Flight data recording system
- ATC transponders
- Stall prevention system
- Engine pressure ratio indication system
- Pressurisation controller

In the event of a failure, an alert will be presented and the offside ADC can be selected with the ADC source select push-button on the onside source select panel.

Attitude and heading system

IRS

Dual Inertial Reference Systems (IRS) are installed, each providing attitude and navigation data. The system consists of:

- Two Inertial Reference System units
- One Mode Select Unit (MSU)
- One Inertial Systems Display Unit (ISDU)

Each IRS is controlled via the MSU on the overhead panel. The MSU houses two four-position mode selector switches:

- **OFF:** Respective IRS off
- **ALN:** Respective IRS will align. Respective IRS can be initialised.
- **NAV** (pull to reposition): Initially the respective IRS will align and accept initialisation. After alignment and initialisation, respective IRS will provide navigation data.
- **ATT:** Respective IRS will provide attitude date only (and heading, if entered).

The MSU also features four lights which illuminate depending on the IRS state:

- **ALIGN:** Respective IRS in alignment mode (will flash if an alignment problem is detected).
- **ON DC:** Respective IRS operating on battery power.
- **DC FAIL:** Battery power low to respective IRS.
- **FAULT:** Respective IRS failure / respective IRS navigation capability lost.

The ISDU, located on the pedestal, provides data display and entry functions. Output signals are provided to various flight and navigation systems. IRS 1 (L) and IRS 2 (R) provide signals to the LH side and RH side instruments respectively. The offside IRS can be selected with the ATT/HDG source select push-button on the source select panels.

The ISDU incorporates a combined Display Selector/Brightness control knob with the following functions:

- **TEST:** System test.
- **TK/GS:** Displays track angle and ground speed.
- **PPOS:** Displays present position.
- **WIND:** Displays wind direction and speed.
- **HDG/STS:** Displays true heading and status codes / displays time-to-go during alignment.
- **BRT:** Rotate to set brightness of the IRS display.

A system selector switch is used to toggle which IRS is selected for data display or test.

A keyboard is used to write and insert data into the IRS (position alignment can also be established via the INIT A page of the FMS CDU). Lights illuminate in the ENT and CLR keys when they can be used.

Alignment and initialisation

The system must be aligned and initialised prior to use. This can be accomplished with the mode selector on the MSU in either the ALN or NAV position. During the alignment period, in which the ALIGN MODE light on the MSU is on, the aircraft must remain stationary. Alignment time varies from 3 to 15 minutes depending on the latitudinal position of the aircraft. Alignment is obtained automatically, but initialisation should be established manually. If alignment cannot be achieved, the ALIGN mode light will flash.

Navigation

The navigation mode is entered automatically after alignment in the NAV mode; in ALN mode the mode selector should be set to NAV before moving the aircraft. On the ISDU, navigation data from each IRS can be displayed in accordance with the position of the system and display selectors. The information comprises true track angle and ground speed, present position, wind direction and speed, and true heading.

Attitude

When attitude (ATT) mode is selected the ALN mode light will come on for approximately 20 seconds. While the light is on, the aircraft must stay level and maintain constant speed. In this mode, only attitude and heading data are provided. Magnetic heading can be entered and updated via the keyboard.

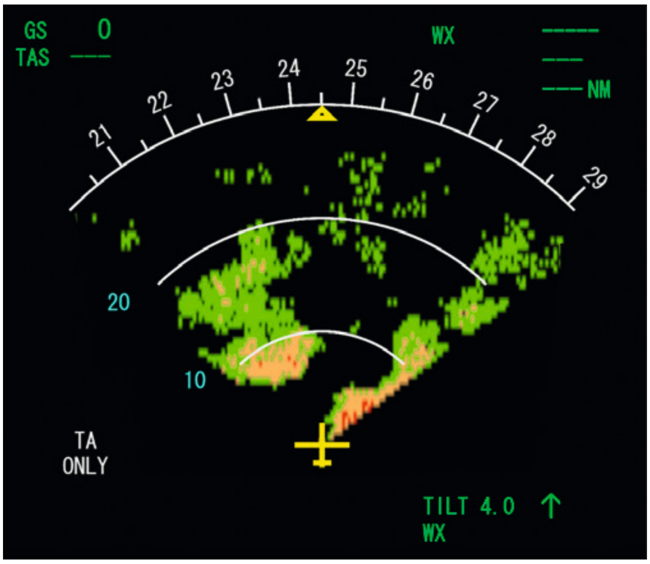
Radio altimeter

Two radio altimeter systems are installed, each consisting of a dual-antenna and receiver/transmitter unit that provides radio altitude information to the Electronic Flight Instrument System (EFIS), Flight Warning Computer (FWC), Automatic Flight Control and Augmentation System (AFCAS), Traffic alert and Collision Avoidance System (TCAS) and the Terrain Awareness Warning System (TAWS).

The range of the system is 0-2,500 ft AGL.

Weather radar

An airborne radar system is fitted and provides each pilot with a coloured display of weather conditions ahead of the aircraft.



A weather radar panel is located on the pedestal with the following controls:

- **Gain selector:** Rotate to adjust gain in WX(VAR) and MAP modes.
- **Ground clutter suppression button:** Not simulated.
- **Tilt selector:** Rotate to select antenna tilt.
- **Mode selector:** Select one of five weather radar modes:
    - **WX:** Weather information with automatic calibration
    - **WX+T:** Weather and turbulence information with automatic calibration
    - **WX(VAR):** Weather information with manual gain control
    - **MAP:** Ground mapping information with manual gain control
    - **TEST:** System self-test
- **BELOW CAL light:** Light not functional, as per the real aircraft.

The weather radar can be powered on via the WX control knob on each EFIS control panel, which also controls the brightness of the weather radar display.

The weather radar is a coloured display, with each colour identifying the intensity of precipitation:

Colour	Returns	Rainfall rate
Black	Very light or no returns	< 0.7 mm/hr
Green	Light returns	0.7 to 4.0 mm/hr
Yellow	Medium returns	4.0 to 12.0 mm/hr
Red	Strong returns	> 12.0 mm/hr
Magenta	Turbulence (when mode selected)	-

Note 1: *The weather radar is functional in this simulation, but certain functions may be limited due to core simulator limitations.*

Note 2: *The weather radar will only display returns from precipitation (rain/snow) ahead of the aircraft. It will not display returns from clouds (as per the real aircraft).*

Electronic Flight Instrument Systems (EFIS)

The aircraft is equipped with two independent Electronic Flight Instrument Systems (EFIS), one on the Captain's side and one on the First Officer's side. Their purpose is to display the aircraft's attitude and relative position.

Each system consists of two display units (DU) and one EFIS control panel.

Each system receives data from:

- Inertial Reference System (IRS)
- Air Data Computer (ADC)
- Flight Management System (FMS)
- Automatic Flight Control and Augmentation System (AFCAS)
- VHF Omni-Directional Range (VOR)
- Instrument Landing System (ILS)
- Distance Measuring Equipment (DME)
- Automatic Direction Finder (ADF)
- Radio Altitude (RA)
- Marker Beacon (MB)
- Weather Radar (WXR)
- Traffic alert and Collision Avoidance System (TCAS)
- Flap position computer

Display Units (DU)

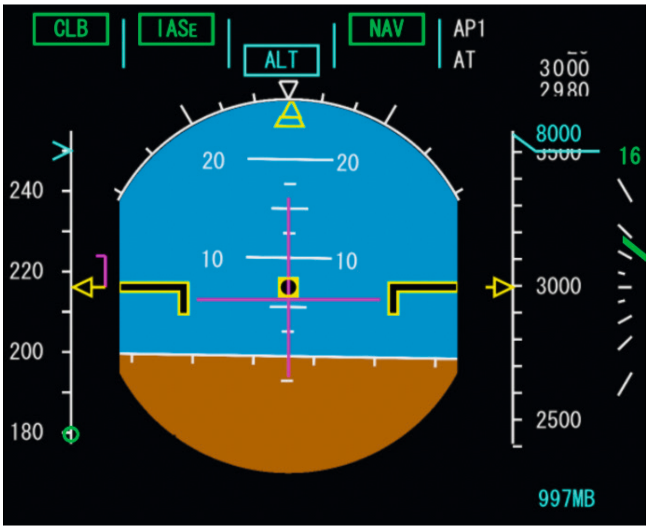
The display units are formed of two colour cathode ray tube (CRT) displays stacked on top of each other, each with an integrated symbol generator (SG). The configuration is matched for both pilots.

In normal operating conditions the upper DU is the Primary Flight Display (PFD) and the lower one is the Navigation Display (ND). A PFD/ND transfer push-button is located on the source select panel, which can transfer the PFD and ND in case of a DU failure.

Primary Flight Display (PFD)

The PFD presents the following information to the pilots:

- Aircraft attitude
- Selected heading
- Flight director steering commands
- Flight path vector
- Flight path target
- Airspeed
- Vertical speed
- Barometric altitude
- Radio altitude
- Decision height
- Minimum descent altitud
- Descent altitude
- Localiser deviation
- Glideslope deviation
- Flap position
- FMS ILS/DME distance
- Marker beacon
- TCAS resolution advisories
- Flight mode annunciation
- FMS messages



Navigation Display (ND)

The ND presents the following information to the pilots:

- Heading
- Track
- Selected course
- Course deviation
- VOR to-from station
- DME distance
- Vertical deviation
- ADF bearing and source
- Ground speed
- True airspeed
- Wind direction and velocity
- Navigation source
- Weather radar
- Range rings
- Intercept point of preselect altitude
- Cross-track deviation
- Map data
- TCAS traffic display
- FMS information

The ND presents the information in the form of four display modes that are selectable via the mode selector on the EFIS control panel:

ND – ROSE format

ROSE mode displays a 360-degree compass rose with ILS or VOR information, TCAS traffic display, ADF information and FMS information.

ND – ARC format

ARC mode displays a forward segment of 90 degrees from the compass rose, with ILS or VOR information and FMS information. ADF information can be selected for display and weather system data can be superimposed in this mode.

ND – MAP format

MAP mode displays a forward segment of 90 degrees from the compass rose, with FMS information and TCAS traffic display shown. Two back view ranges are available for selection (15B and 30B), which display a larger forward segment of 220 degrees from the compass rose and the aircraft symbol shifts up the display, allowing for the display of FMS information behind the aircraft. ADF information can be selected for display and weather system data can be superimposed in this mode. MAP symbols can be added by means of the MAP symbol push-buttons on the EFIS control panel.

ND – PLAN format

PLAN mode displays a simplified 360-degree compass rose. An FMS-generated, true-north-oriented map is superimposed on the compass rose, centred on a reference waypoint. MAP symbols can be added by means of the MAP symbol push-buttons on the EFIS control panel.

Source select panel

A source select panel is installed on the Captain's and the First Officer's side of the main instrument panel. The source select panel provides indications and functions to select the onside, offside or back-up system for the following:

- **ATT/HDG:** Attitude/Heading source select
- **ADC:** Air Data Computers source select
- **ILS:** ILS source select
- **Radio altimeters:** Radio altimeter source select
- **FCC:** Flight Control Computer source select

A PFD/ND transfer push-button is provided to switch primary and navigation information from the upper to the lower DU (or vice versa).

ADF vector push-buttons are used to toggle the display of ADF bearing information in MAP and ARC modes (in ROSE mode ADF bearing is always displayed).

Integral FAULT lights within the push-buttons indicate a failure of the onside system. ALTN lights indicate that the respective offside system is supplying data.

EFIS control panel

An EFIS control panel is located on both sides of the glareshield, one for each pilot's EFIS. The following sections cover the function of each control on this panel.

ND mode selector

The ND mode selector controls which mode is displayed on the respective EFIS ND.

It has four positions:

- **PLAN**
  - Simplified 360-degree compass rose
  - FMS information
  - TCAS status annunciation
  - TCAS traffic alerts
  - MAP symbols (if selected)
- **MAP**
  - Forward segment of 90 or 220 degrees (back view) from the compass rose
  - FMS and ADF information
  - TCAS status annunciation
  - TCAS traffic display alerts
  - MAP symbols (if selected)
  - Weather radar systems data (if selected)
- **ARC**
  - A forward segment of 90 degrees from the compass rose
  - FMS, ADF and ILS or VOR information
  - TCAS status annunciation
  - TCAS traffic alerts
  - Weather radar systems data (if selected)
- **ROSE**
  - A 360-degree compass rose
  - FMS, ADF, ILS or VOR information
  - TCAS status annunciation
  - TCAS traffic alerts

APP/VOR push-button

The APP/VOR push-button provides options to toggle the PFD/ND between approach and VOR mode. The selected mode will illuminate green. When MAP or PLAN mode is selected, both modes are disabled and the push-button will be blank.

- **APP**
  - ND and PFD show ILS information (if ARC or ROSE mode is selected)
  - Only PFD shows ILS information if MAP mode is selected
- **VOR**
  - ND shows VOR information (if ARC or ROSE mode is selected)

Range selector

The range selector controls the range displayed on the EFIS ND.

- **15/30/60/120/240**
  - Range selection in NM on the ND with PLAN, MAP or ARC mode selected
- **15B/30B**
  - Range selection in NM on the ND with PLAN or ARC mode selected
  - Backview range selection in NM on the ND with MAP mode selected

FPA, M/DA, DH display/selector

An LCD display is located above the FPA, M/DA, DH selector which displays the selected value. The selector has two knobs; the outer one is used for mode selection and the inner knob is used for selecting values as shown on the display. The outer knob has three modes:

- **FPA**
  - Flight plan target display on PFD, provided that flight path vector is selected on the FMP
  - Selected value shown on the above display
  - Values can be selected between -9.9 and +9.9 degrees
- **M/DA**
  - Selected minimum descent altitude or selected decision altitude
  - Selected altitude displayed on PFD above 2,500 ft AGL, and below 2,500 ft AGL if DH is zero
  - Values can be selected between 0 and 8,193 feet in increments of 10 feet
- **DH**
  - Selected decision height
  - Selected decision height display on PFD above 2,500 ft AGL, and below 2,500 ft AGL if M/DA is zero
  - Values can be selected between 0 and 600 feet in increments of 1 foot

PFD/ND brightness control knob

This combined knob is used to control the brightness of the PFD and ND.

- **Outer knob**
  - Fully anti-clockwise (OFF) – lower DU blank
  - Fully clockwise (BRT) – lower DU full brightness
- **Inner knob**
  - Fully anti-clockwise (OFF) – upper DU blank
  - Fully clockwise (BRT) – upper DU full brightness

Map symbols push-buttons

Four push-buttons along the bottom of the EFIS control panel control which map symbols are displayed on the respective EFIS ND. Once a mode is selected, a green bar will illuminate at the bottom of the respective push-button.

- **CSTR (constraint)** – ND shows the waypoint-related constraints (altitude, speed) which exist in the flight plan.
- **WPT (waypoint)** – ND shows the stored waypoints within the selected range.
- **STA (station)** – ND shows the stored navaids (VOR/DME) and stored NDBs within the selected range.
- **ARPT (airport)** – ND shows the stored airports within the selected range.

Traffic display push-button

A fifth push-button along the bottom of the EFIS control panel controls the visibility of the traffic display (depending on transponder mode). Once the mode is selected, a green bar will illuminate at the bottom of the push-button.

- **TRFC (traffic)** – ND shows full-time TCAS traffic display when MAP or ROSE mode is selected.

Altimeter reference pressure push-button

The altimeter reference pressure push-button is used to toggle between QNH and STD pressure on the respective EFIS PFD. The selected mode will illuminate green.

- **QNH**
    - Altitude displayed on PFD based on selected altimeter reference pressure
    - PFD display value in millibars or inches of mercury (depending on weight unit selection on EFB)
- **STD**
    - Altitude display on PFD based on standard altimeter reference pressure
    - PFD displays STD

WX brightness control knob

The weather brightness control knob is used to control the brightness of the weather radar overlay on the lower DU (depending on weather radar modes).

- **WX**
    - Fully anti-clockwise (OFF) – weather display is blank on lower DU
    - Fully clockwise (BRT) – weather display is full brightness on lower DU

Secondary instruments

Radio Magnetic Indicator

Two Radio Magnetic Indicators (RMI) are installed, one at the Captain's main instrument panel and one at the First Officer's. Each RMI shows the aircraft's magnetic heading, relative bearing to VOR-selected ground station and DME distance. Magnetic heading is normally supplied by the onside attitude and heading system and is indicated by the lubber line against the rotating compass rose. A heading system failure is indicated by a heading flag.

Bearing is indicated on the azimuth card by two pointers: a single pointer (connected to VOR1) and a double pointer (connected to VOR2).

Clock

Two electronic clocks are installed, one at the Captain's main instrument panel and one at the First Officer's. Each clock has two displays with separate controls. Greenwich Mean Time (GMT) or date is set on the upper display. The lower display is for either Elapsed Time (ET) or the chronometer (CHR).

Each clock has the following controls:

- **CHR (chronometer button):** Depress momentarily to start, stop and reset the chronometer.
- **DATE:** Depress to display GMT in hours and minutes. When depressed momentarily, the day/month and year will alternate at one-second intervals.
- **ET (elapsed time selector):**
  - o RESET: Spring loaded to HLD. ET CHR display blank and remains blank in HLD.
  - o RUN: Elapsed time is reset to zero and starts counting.
  - o HLD (from RUN): Elapsed time stops counting.
- **GMT (Greenwich Mean Time selector):**
  - o RUN: Normal operating position. GMT is shown.
  - o HLDY: No counting of time.
  - o SSM: Set time slowly (1 min/sec)
  - o FSD: Set time rapidly (1 hr/sec)

A chronometer button is also provided at each control wheel.

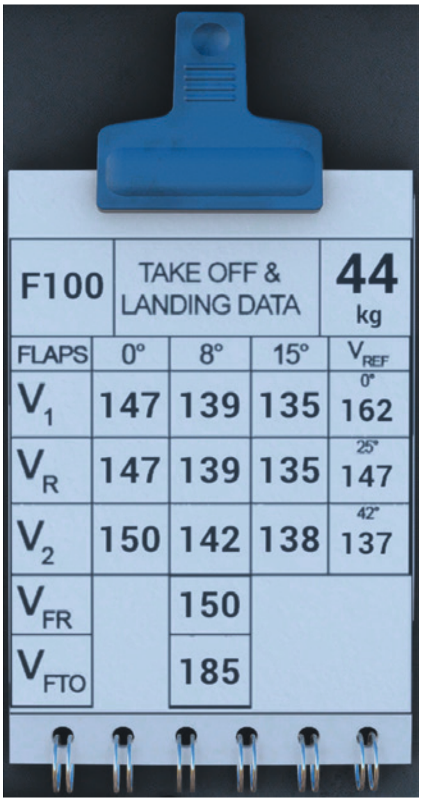
Standby instruments

Standby airspeed indicator

A standby airspeed indicator is installed on the Captain's main instrument panel. The indicator shows indicated airspeed (IAS) in knots. Airspeed information is derived from pitot-static system 3.

Speed bugs around the outside of the instrument can either be set manually, or will be set automatically to appropriate speeds when the speed flipchart is clicked. With the 'FLIPCHART OPTIONS' option enabled on the EFB, clicking a specific area of the flipchart will set the speed bugs accordingly. With the 'FLIPCHART OPTIONS' option disabled, clicking anywhere on the flipchart will set the speed bugs based on the current flap setting and phase of flight.

The speed flipchart is located on the Captain's main instrument panel, immediately to the right of the standby instruments. There are cards for each 1,000 kg (or 1,000 lb) of aircraft gross weight and the correct card will be automatically selected based on the current gross weight. The automatic selection logic can be toggled on/off via the 'FLIPCHART WT SYNC' option on the EFB.



Each card displays take-off, climb and approach speeds for a specific flap setting:

- **V_1** – Decision speed
- **V_R** – Rotation speed
- **V_2** – Safety speed
- **V_{FR}** – Flap retraction speed
- **V_{FTO}** – Final take-off or green dot speed
- **V_{REF}** – Approach reference speed (provided for flap 0°, 25° and 42°)

The First Officer will also call out these speeds if the 'PILOT CALLOUTS' option is enabled on the EFB.

Standby altimeter

A standby altimeter is installed on the Captain's main instrument panel. The altimeter shows altitude in feet. Altitude information is derived from pitot-static system 3. The altimeter contains a vibrator to optimise the accuracy of the indication.

Standby horizon

A standby horizon is installed on the Captain's main instrument panel. The horizon provides an indication of aircraft attitude that is independent of the attitude and heading system. The horizon is powered as long as the Batteries switch on the ELECTRIC panel is ON or when either fuel lever is opened. The gyro reaches operational speed approximately three minutes after power has been applied.

Standby compass

A magnetic standby compass is installed on the lower end of the overhead panel. The compass provides aircraft magnetic heading at all times. Deviation correction cards are fitted on the ceiling, just above the sliding windows. A compass light switch is provided for integral lighting of the standby compass.

Recorders

Flight Data Recorder (FDR)

The flight data recording system comprises a Flight Data Recorder (FDR), a Flight Data Acquisition Unit (FDAU), an underwater locator beacon and a ground control push-button. The FDAU processes input signals received from various systems, such as power plant, flight controls, air data computer and automatic flight control systems, for recording.

The FDR system operates automatically whenever either FUEL lever is open, and continuously during flight. On the ground, before engine start, the system may be operated by depressing the FDR/CVR GND CTL push-button on the avionics panel. Prior to engine starting, operation is indicated by an ON light in the push-button. The light extinguishes as soon as either engine is started.

Cockpit Voice Recorder (CVR)

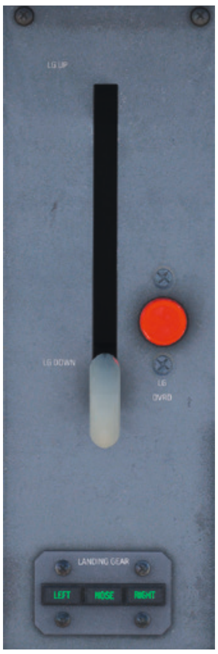
The CVR records the last 30 minutes of flight deck audio. Flight deck conversation is recorded via the remote area microphone, installed on the lower side of the overhead panel. Operation is automatic from engine start until five minutes after engine shutdown. Operation prior to engine start is obtained by depressing the FDR/CVR GND CTL push-button on the AVIONICS panel.

LANDING GEAR

Landing gear operation

The landing gear consists of two inward-retracting main gears and a forward-retracting nose gear. Doors enclose the landing gear bays. The landing gear is retracted and extended by hydraulic system 1. In the event of hydraulic system 1 failure, the landing gear can be extended by gravity.

Hydraulic operation



Hydraulic operation is controlled by a two-position (UP and DOWN) landing gear selector, located on the centre main instrument panel.

The landing gear selector operates a selector valve which directs hydraulic system 1 pressure in accordance with UP or DOWN selection. Door sequence valves ensure that the landing gear doors open and remain open while the nose gear and main landing gears are in transit. Inadvertent UP selection on the ground is prevented by an electrical landing gear selector lock. The landing gear selector lock will release automatically when the aircraft becomes airborne.

In the event of automatic lock-release failure, the lock can be released by depressing a landing gear lock override button.

Alternate operation

The alternate landing gear selector is located on the rear of the pedestal on the RH side.

Operation of the selector releases the locks of the landing gear doors and dumps the landing gear hydraulic system pressure. The landing gear will then extend by gravity and lock down mechanically. The main gear inboard doors will stay open. Slide strips protect them against serious damage on landing. Nose-wheel steering becomes inoperative after alternate gear extension.

Indications

Landing gear position lights are located below the landing gear selector. The down and locked position of each respective gear is indicated by a green light. The lights will be out when the landing gear is not fully extended.

A blue light incorporated in the landing gear selector knob will come on during retraction until all landing gear doors are closed and locked, and during extension until all landing gears are down and locked. When the light comes on due to alternate landing gear extension, it remains on until the landing gear selector is selected down.

Nose-wheel steering

The nose-wheel steering system provides directional control of the aircraft during ground operations. The nose-wheel steering angle is controlled via the Captain's steering tiller and the rudder pedals, which provide inputs to the steering control valve. Full steering tiller deflection provides the maximum steering angle of 76 degrees. Towing angles are provided up to approximately 130 degrees.

When the landing gear is selected up, the nose-wheels are hydraulically centred.

Upon landing gear down selection, the steering system will be depressurised to prevent inadvertent steering angles while using the rudder pedals. Steering pressure will be restored approximately five seconds after touchdown of the LH main gear.

If the landing gear has been extended with the alternate LG selector, nose-wheel steering will not be available as both the landing gear and nose-wheel steering systems are depressurised.

A RUDDER STEERING AXIS option on the EFB tablet toggles the nose-wheel steering control method within MSFS. When enabled, the RUDDER AXIS control assignment will also control the tiller for nose-wheel steering. When disabled, the STEERING INC/DEC and NOSE WHEEL STEERING AXIS control assignments can be used to control the tiller independently of the rudder pedals.

It is also possible to click and drag the nose-wheel steering tiller.

Brake control system

Brake operation

Both the Captain's and the First Officer's brake pedals can be used for normal and alternate braking.

Normal brake operation provides for skid protection on all four wheels individually. Normal brake operation is provided when hydraulic pressure from system 2 is available.

Alternate braking operates on pressure from hydraulic system 1. Automatic change-over to alternate brake operation occurs when the pressure of hydraulic system 2 drops below a preset value. Alternate brake operation provides for skid protection of paired wheels on either side. In the event of loss of system 1 pressure, the accumulator in the alternate brake system will provide for a limited number of brake applications. An alternate brake system pressure indicator is located on the RH main instrument panel.

A parking brake handle is located on the LH side of the pedestal. An accumulator in the alternate brake system provides hydraulic pressure for parking when hydraulic pressure from system 2 and 1 is not available.

A memo message is presented by the MFDS whenever the parking brake is set.

Automatic brake operation

The Automatic Brake System (ABS) provides for symmetric skid-protected brake pressure to each main wheel during landing or a rejected take-off. The system can be armed or disarmed by the pilot via the autobrake selector on the main instrument panel.

The system will only arm if no fault is detected in the ABS, anti-skid system, or in the supply pressure from hydraulic system 2. The pilot can take over 'manual' brake control at any time by depressing the toe brakes.

The autobrake selector has five switch positions:

- **OFF** – Autobrake system off.
- **RTO** – Rejected take-off braking mode armed.
- **LO** – Low braking mode armed.
- **MED** – Medium braking mode armed.
- **HI** – High braking mode armed.

An amber FAULT light illuminates when a fault is detected in the ABS.

Skid protection

The anti-skid system provides locked-wheel protection at touchdown and skid protection during all brake operation. An anti-skid switch on the pedestal, normally guarded to ON, can be used to deactivate the system if required.

The anti-skid system can be tested from the test panel when the landing gear is down and wheel speed is zero or low. If a failure is detected, an alert will be presented.

Temperature indicators

Two brake temperature indicators, one for each pair of main wheels, show the temperature of each individual brake. Both indicators are located on the right-hand main instrument panel.

LIGHTS

Exterior lighting

Exterior lighting is controlled from the EXT LIGHTS panel on the overhead panel. It is comprised of landing, taxi/landing, wing inspection, beacon, strobe, navigation and optionally fitted taxi/flare-out light and logo lights.

A retractable landing light is installed at each wing tip. The landing lights can only illuminate when the lamps are not fully retracted.

A retractable taxi/landing light, and an optionally fitted taxi/flare-out light, are installed underneath the aircraft's nose. The nose taxi/landing lights can only illuminate when the lamp is fully extended.

If a landing, flare-out, taxi light, or taxi/landing light is not retracted, a memo message is presented on the MFDU primary page.

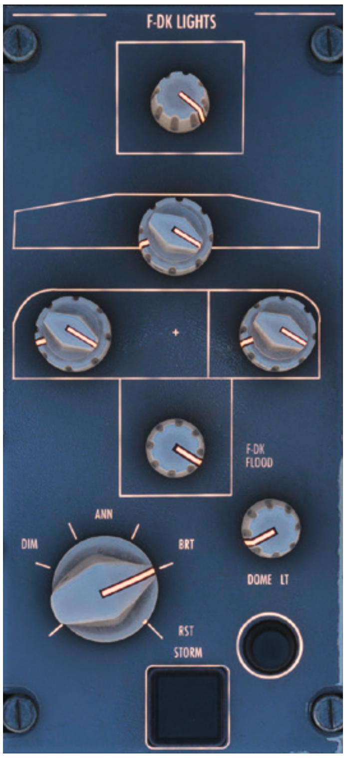
Two wing inspection lights are installed in the fuselage to illuminate the wing leading edges.

Two beacon lights are installed: one at the bottom of the fuselage and one at the top of the vertical stabiliser.

Three navigation light units are installed: one red unit on the left wing tip, one green unit on the right wing tip and one white unit in the vertical stabiliser fairing. Each navigation light unit also contains a strobe light. The strobe lights can be controlled manually or automatically. When controlled automatically, the strobe lights are on only when the aircraft is airborne.

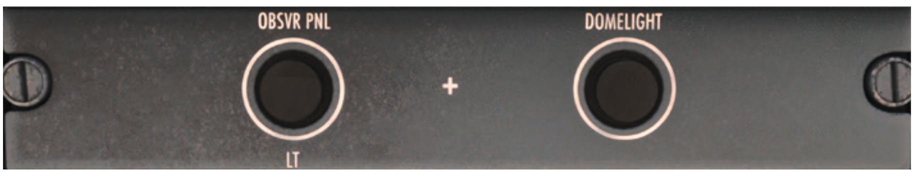
Two optionally fitted logo lights can be installed: one in each outboard flap track fairing. The logo lights are on when the aircraft is on the ground or when the flaps are extended, provided that the NAV/LOGO switch is set to ON.

Flight deck lighting



Flight deck lighting systems can be controlled from the F-DK LIGHT panel on the pedestal; they include panel lights, annunciator lights, floodlights and dome lights. Reading lights, chart holder lights and side panel lights can be controlled locally. The lights for the observer's panels can be controlled from the dome light panel.

Dome lights, for general flight deck illumination, are located left and right at the top of the overhead panel. In addition to the button on the F-DK LIGHT panel, the dome lights can also be switched on or off from the dome light panel.



The overhead panel, glareshield, pedestal and the instruments on the main instrument panel are provided with integral lighting, which can be controlled independently for each panel.

All panels are also provided with floodlights. The main instrument panel floodlights and the glareshield floodlights can be controlled independently for each panel. The flight deck floodlights, which provide general flight deck lighting and lighting of the overhead panel and the pedestal, are integrated in the dome light assemblies. Control, however, is independent of dome light switching.

The brightness of all annunciators is controlled by one dim/bright selector. Those lights that are normally blank have two brightness levels: dim and bright. All other lights have six brightness levels: three dim and three bright. The maximum brightness level is the reset position (RST).

Individual reading lights for the Captain, the First Officer and the observer are installed in the flight deck ceiling. The lights have integrated on/off and dimming controls. Lighting of each side panel is controlled by a selector located on the side console. Two chart holder lights, one at each control wheel, can be controlled by a knob on top of the chart holder.

NAVIGATION

VOR/DME and marker beacon

Two VOR navigation systems provide directional VHF Omnidirectional Range (VOR) data. The Distance Measuring Equipment (DME) provides slant range distance to a DME-equipped VOR/localizer ground station. Each system comprises a VOR/DME panel installed on the pedestal, a receiver and an antenna.

The VOR frequency range is from 108.00 MHz to 117.95 MHz. Channel spacing is 50 kHz. Each system is tuned to a VOR frequency either automatically by the Flight Management System (FMS) or manually via the relevant VOR/DME panel. The frequency display on the VOR/DME panel shows the frequency of the VOR when manually tuned and dashes when automatically tuned. When tuning is changed from automatic to manual, the VOR/DME panel will show the frequency of the last manually tuned VOR.

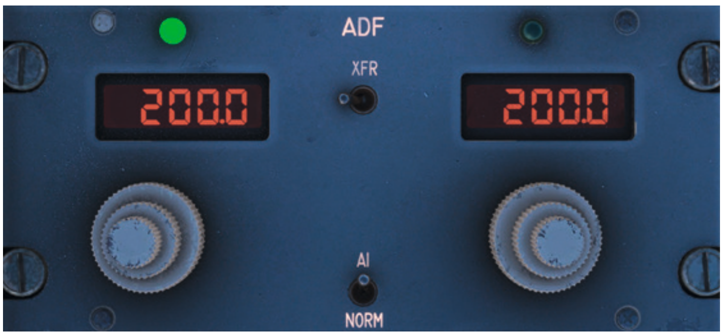
The systems provide VOR information to the EFIS, RMI, FMS and AFCAS. VOR information is displayed on the EFIS as bearing and course deviation and on the RMIs as bearing. DME information is used by the FMS and displayed in nautical miles on the RMIs and EFIS.

Marker beacon signals are presented visually by the EFIS and aurally via the audio panels.

ADF

Two Automatic Direction Finding (ADF) receivers, ADF1 and ADF2, are installed to provide relative bearing and aural information from selected non-directional radio beacons. ADF bearing information will be displayed on the Navigation Display (ND).

The ADF panels are installed on the pedestal. Each panel provides two frequency selectors and displays, a transfer (XFR) switch, two transfer lights and a Beat Frequency Oscillator (BFO) switch. Frequencies between 190 kHz and 1,750 kHz can be (pre)selected in steps of 0.5 kHz. The BFO switch provides a 1,000 Hz signal for the identification of CW stations.

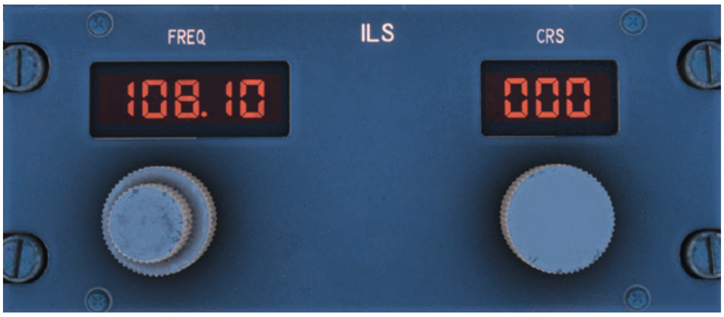


ADF bearing information can be displayed in ROSE, ARC or MAP mode. ADF ARC/MAP push-buttons are provided at each source select panel to select ADF1 and/or ADF2 bearing information for onside display in ARC or MAP mode.

ILS

Two Instrument Landing Systems (ILS) are installed to provide flight path data. The ILS comprises an ILS panel installed on the pedestal, two receivers, two localizer antennas and two glideslope antennas. In the event of a failure, an alert will be presented and the offside ILS can be selected with the ILS source select push-buttons on the onside source select panel.

The ILS frequency range is from 108.00 MHz to 111.95 MHz. Channel spacing is 50 kHz. The systems can be tuned manually to an ILS frequency via the ILS panel. Frequency tuning is inhibited when the APP (LAND) mode is engaged.



The systems provide ILS information to the EFIS, AFCAS, FMS and to the flight data recording system. If an ILS has an associated DME, the DME distance will be displayed in the lower left corner of the PFD when:

- A valid ILS frequency is selected on the ILS panel,
- A valid ILS signal is being received,
- APP is selected on the EFIS DCP

  and
- Aircraft is within 30 NM of the ILS/DME transmitter.

ATC transponder

The aircraft is provided with two Mode S transponders and a Traffic alert and Collision Avoidance System (TCAS).

The system comprises one transponder panel with keyboard. Transponder 1 or 2 can be activated by rotating the XPNDR select knob. At power up, the last ATC code and Flight ID will be displayed.

The transponder panel has a mode select knob with the following functions:

- **STBY:** Both Mode S transponders in STBY. No replies or interrogations. TCAS is OFF. Altitude reporting is OFF.
- **ALT OFF:** Altitude reporting is OFF. The selected XPNDR is active. TCAS is OFF.
- **XPNDR:** The selected XPNDR and altitude reporting are active. TCAS is OFF. TCAS OFF message displayed on EFIS.
- **TA:** TCAS is in TA Only mode. Selected XPNDR in ALT reporting mode. TA ONLY message displayed on EFIS.
- **TA/RA:** TCAS is in TA and RA mode. Selected XPNDR in ALT reporting mode.

A test button is located on the face of the knob. Momentarily pressing the TEST button will initiate the functional test. During a functional test the control panel indicators and display segments are all illuminated for approximately three seconds. After three seconds the display will show ‘CP1 PASS’ and ‘CP2 PASS’ if the test is successful. The display will show ‘CP FAIL’ if a failure is detected.

A TCAS test pattern will also display on the ND.

The XPNDR select knob has two positions:

- **1** – transponder 1 active.
- **2** – transponder 2 active.

TCAS will show traffic information based on the position of the altitude display mode select knob:

- **ABV (above):** +9,900 ft to -2,700 ft
- **N (normal):** +2,700 ft to -2,700 ft
- **BLW (below):** +2,700 ft to -9,900 ft

The ATC indicator will illuminate white when an ATC code is selected.

The Flight ID indicator will illuminate white when FID is selected, and flashes white when a FID code is being entered.

The XPNDR fail indicator illuminates when the selected transponder fails.

The IDENT button is used to transmit the ATC radar aircraft identification.

An ATC/FID button on the keyboard toggles between ATC mode and Flight ID mode.

POWER PLANT

This is a simulation of an aircraft fitted with two Rolls-Royce Tay Mk620-15 engines. Located on either side of the rear fuselage, the Tay is a twin-spool, high-bypass ration engine with a thrust of 13,850 lbf. The low-pressure spool comprises a single-stage fan and a three-stage compressor driven by a three-stage turbine. The high-pressure spool consists of a twelve-stage compressor driven by a two-stage turbine.

The engine is started by an air starter motor. The fan bypass airstream and the turbine exhaust are mixed before discharge through a nozzle which incorporates a two-door thrust reverser. The thrust reverser can be deployed after touchdown to decelerate the aircraft. Both engines are equipped with fire detection and extinguishing systems.

Starting and ignition

Starting

Each engine is equipped with an air-operated starter motor. Pneumatic power and electrical power must be available to operate the starter motor. The aircraft batteries can be used for starting if AC electrical power is not available. Air can be supplied to the starter motor by the APU, a ground supply unit, or cross-bleed from a running engine.

Air is admitted to the starter motor when the electrically operated starter valve is open. The starter valve will open when the engine selector is operated. The starter system is electrically armed and disarmed via the START push-button.

Both fuel and ignition are applied when the respective fuel lever is opened. The starter motor rotates the HP shaft. At a preset value of N2, starter cut-out occurs and the starter valve closes.

During engine start the air conditioning packs are shut off, and the output of hydraulic and pneumatic power from the respective engine is inhibited.

During engine start with battery power only, hydraulic and pneumatic inhibit, and automatic air conditioning shut-off is not provided.

Ignition

Each engine has two ignition systems installed, system 1 and system 2, to operate the respective igniter plug. One IGNITION selector provides the selection for both engines of system 1, system 2, or both systems simultaneously, via the position of the selector:

- **CONT 1:** Ignition system 1 activated with the fuel lever in OPEN. Memo message IGNITION ON on MFDU.
- **NORM:** Ignition system 1 activated if engine failure detected with the fuel lever in OPEN. Ignition systems 1 and 2 activated when engine-out is detected with the fuel lever in OPEN.
- **CONT 2:** Ignition system 2 activated with the fuel lever in OPEN. Memo message IGNITION ON on MFDU.
- **RELIGHT:** Ignition systems 1 and 2 activated. Memo message IGNITION ON on MFDU.

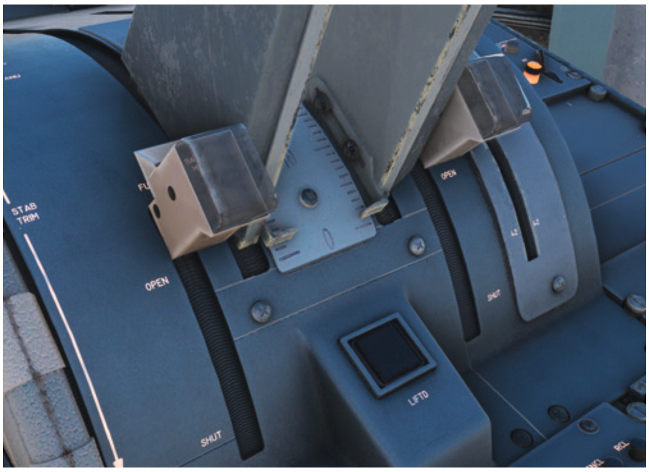
Engine control

Engine fuel

The fuel system is a mechanical all-speed governing system which controls fuel flow automatically to maintain a selected N2 and provide rapid, surge-free acceleration and deceleration control.

Fuel is supplied from the aircraft fuel system via an engine-driven LP fuel pump through an oil cooler, filter and fuel flow transmitter to an engine-driven HP fuel pump. Ice formation in the fuel system is prevented by the transfer of heat from oil to fuel which takes place in the fuel-cooled oil cooler. From the HP pump, fuel is delivered to a fuel flow regulator, which meters it into two separate flows to the spray nozzles. One flow passes through the N1 shaft governor to the HP fuel valve, and the other flow passes direct to the HP fuel valve.

The fuel lever which controls the HP fuel valve has two designated positions: SHUT and OPEN. An integrated white light in each fuel lever illuminates in the event of a Level 3 alert which might require an engine shutdown.



The fuel flow regulator is controlled by the thrust lever, which can be operated manually or automatically by the autothrottle system. The fuel flow regulator makes adjustments to maintain N2 values as set by the thrust lever. The fuel flow can be limited by control of N1, N2, TGT and HP compressor outlet pressure limiters.

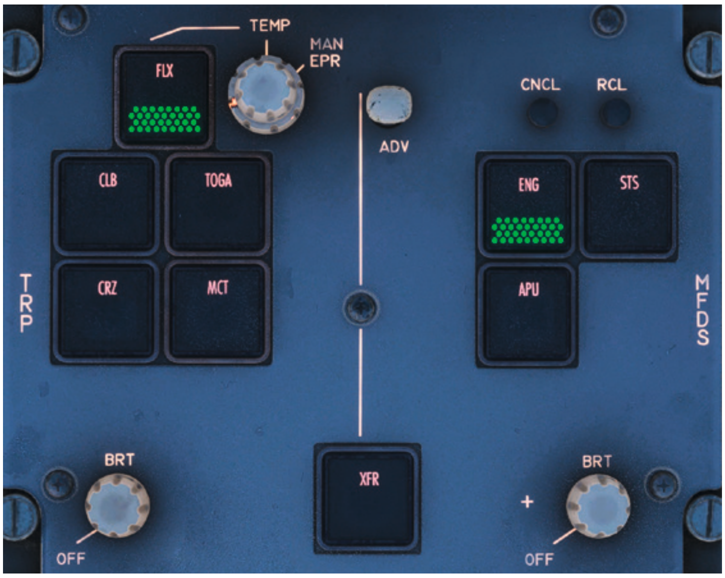
Thrust control

The thrust levers are operated either automatically via the autothrottle system, or manually by the pilot. The autothrottle system is integrated in the AFCAS. When the flight control lock is on, forward thrust lever movement is limited (to approximately 80% N2).

Thrust Rating Panel (TRP)

A thrust rating can be selected by depressing a thrust rating select push-button on the Thrust Rating Panel (TRP) on the pedestal. The TRP contains five thrust rating select push-buttons which are used to select and annunciate a thrust rating:

- **TOGA:** Take-Off or Go-Around
- **FLX:** Flexible take-off
- **CLB:** Climb
- **CRZ:** Cruise
- **MCT:** Maximum continuous



When FLX is selected, an assumed temperature can be set by rotating the TEMP selector on the TRP. In addition to the manual selection on the TRP, a thrust rating can be automatically selected by AFCAS or by FMS.

The selected thrust rating is annunciated by a light bar on the respective push-button. The selected thrust rating is also indicated on the LH MFDU above the EPR scale.

Reverse thrust

Each engine is equipped with a thrust reverser. The thrust reverser consists of an upper and a lower door which are actuated hydraulically by system 1. When stowed, the thrust reverser forms a part of the engine exhaust nozzle. When deployed, the exhaust flow is deflected vertically and forward.

The thrust reversers, which are operated independently of each other, can only be selected/deployed with the aircraft on the ground. Deployment is initiated by raising the reverse thrust lever to the reverse idle (detent) position. The reverse thrust lever can only be raised with the THRUST lever in IDLE. Reverse thrust cannot be increased above idle before the doors are fully deployed.

When the thrust reversers are fully deployed a green 'R' is displayed on the LH MFDU. If either reverser is not stowed with the reverse thrust lever fully down, or if the reverser is not deployed with the reverse thrust lever raised, a warning will be presented by the FWC. In the case of an FWC failure, an alert light on the STBY ANN panel comes on when the reverser is not stowed in flight.

Engine indications

Engine indications are presented on two pages of the Multi-Function Display System (MFDS).

The primary page displays the primary parameters of both engines, the selected thrust rating, the air temperatures (TAT and SAT) and the fuel flow. The secondary page shows the secondary parameters of both engines. Status messages from either engine are displayed on the status page.

Primary page

The primary page is displayed on the LH MFDU after power-up. If the LH MFDU fails, the primary page is automatically transferred to the RH MFDU.

The primary engine parameters are Engine Pressure Ratio (EPR), Turbine Gas Temperature (TGT), low-pressure spool speed (N1) and high-pressure spool speed (N2). The parameters are presented by a moving tape which indicates the actual value against a vertical scale.

The primary engine parameters can also be read from the Standby Engine Indicator (SEI). The SEI is connected directly to the engines and can be switched on/off any time.

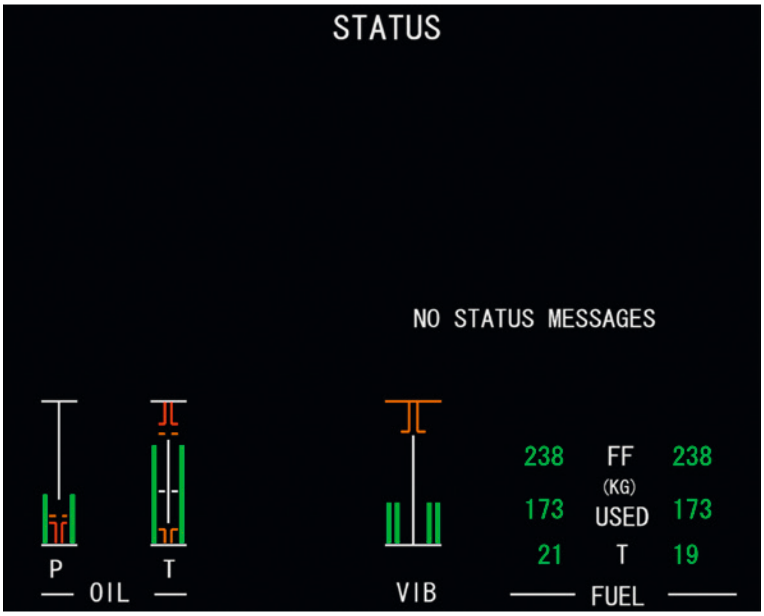
The selected thrust rating is displayed on the primary page above the EPR scale. Dependent on thrust rating and flight mode, the EPR scale displays two symbols: one to indicate maximum EPR and one to indicate target EPR. The target EPR is additionally presented in numbers behind the thrust rating.

Static Air Temperature (SAT) and Total Air Temperature (TAT) are presented at the top of the primary page.

Fuel flow per engine (kg/hr) is presented at the top of the primary page.

Secondary page

The secondary engine parameters are automatically displayed on the RH MFDU after power-up. They can be removed and restored by depressing the engine page push-button on the MFDS control panel. When removed, the displays are restored automatically when a limit is exceeded, during engine start, after engine shutdown, and when the MFDS control panel fails. During single MFDU operation, when the primary page is shown, the secondary page can be displayed by depressing the transfer push-button on the MFDS control panel.



The engine oil parameters are pressure (P), temperature (T) and quantity (Q). The parameters are presented by a moving tape which indicates the actual value above, below, or between limit marks. Oil quantity is shown only on the ground, provided that both engines are out for at least 15 minutes and the START push-button has not been depressed to ON.

Vibration (VIB) is represented by two green tapes for each engine. Each tape represents an engine spool and indicates the actual value above or below a threshold mark. A vibration push-button on the ENGINE panel allows the pilot to verify high vibration levels by selecting alternate sensors.

The engine fuel parameters are temperature (T), fuel used (USED) and fuel temperature (T). The fuel parameters are presented as numbers. The fuel used value is set to zero when, on the ground, the START push-button is depressed to ON.

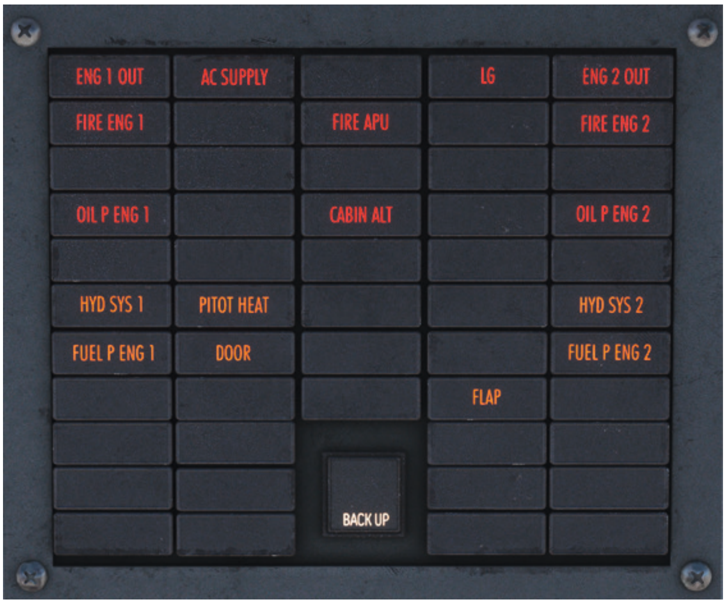
WARNING SYSTEMS

Flight Warning System (FWS)

The main component of the Flight Warning System (FWS) is a two-channel Flight Warning Computer (FWC). The FWC processes failure conditions and aircraft system data into visual and aural alerts, procedures and memo and status messages.

Visual alerts can be presented via Master Warning Lights (MWL), Master Caution Lights (MCL), autoland caution lights, local lights and the Multifunction Display System (MFDS). Aural alerts, which comprise attention-getting chimes and dedicated aurals, are presented via the flight deck loudspeakers and headsets. Procedures and memo and status messages are presented by the MFDS only.

Some failure conditions are routed to both the FWC and the Standby Annunciator Panel (SAP). The SAP enables automatic back-up annunciation in the event of the FWC failing completely.



Alert levels

With the exception of a handful of dedicated alerts (some aurals and the autoland caution light), the FWC classifies the alerts in three levels according to the urgency and/or priority of the required action:

Level 3 alerts: Require immediate corrective or compensatory action by the pilot. The presentation comprises a repetitive triple chime, two flashing red MWLs and an MFDU alert message in red. Engine-related Level 3 alerts are accompanied by a white light in the relevant fuel lever. Engine and APU fire are also indicated by a red light on the respective fire panels.

Level 2 alerts: Require immediate pilot awareness and subsequent corrective or compensatory action. The presentation comprises a double chime, two flashing amber MCLs, an MFDU alert message in amber and, if applicable, the relevant amber local light(s).

Level 1 alerts: Level 1 alerts require pilot awareness (which might require action). The presentation comprises a single chime, an MFDU alert message in amber and/or the relevant amber local light(s). Level 1 alerts are not annunciated by the MWL or MCL.

Alert lights

Master warning and master caution lights: Installed on the glareshield in front of each pilot, these annunciate Level 3 and Level 2 alerts respectively. The flashing lights are cancelled when the fault is corrected or when the relevant master light is depressed. Two Level 3 annunciations cannot be cancelled by pressing either MWL:

- Take-off configuration alerts
- Landing gear not down alert

Autoland caution lights: Located on the glareshield, these are dedicated to failures during and involving automatic landings. Either autoland caution light can be depressed to cancel the annunciation.

Local lights: The nature and/or location of a failure is presented by a local light. The lights are cancelled when the fault is corrected. Corrective action for a fault that is presented by a light integrated with a push-button is accomplished by depressing that push-button. Local lights are installed on the overhead panel and on the main instrument panel.

Dimming: All alert lights except MWL, MCL and autoland caution lights have two brightness levels: bright and dim. A brightness selector is located on the flight deck lighting panel. Any new Level 3 or Level 2 alert is presented bright, irrespective of the position of the brightness selector. After depressing the relevant master light, the light reverts to the selected level. Level 1 lights come on bright or dim, as selected. When electrical power is applied to the system, annunciator lights come on bright, irrespective of the position of the brightness selector. Brightness control will be available after selecting the reset position momentarily.

Messages and procedures

Information supplied by the FWC is presented by the Multifunction Display System (MFDS). The MFDS consists of two Multifunction Display Units (MFDU) on the main instrument panel and a control panel on the pedestal.

After power-up, the LH MFDU will show the primary page and the RH MFDU the secondary page. The primary page will present alert messages, memo messages and the primary engine parameters. The secondary page can present procedures, status messages, the secondary engine parameters and, on aircraft with an APU page installed, APU parameters.

In the event of the LH MFDU failing, the primary page is automatically displayed on the RH MFDU. In this case, the secondary page can be displayed by pressing the transfer button. However, the secondary page cannot be displayed if an alert concerning a primary engine parameter is shown.

Alert messages

Alert messages appear in red (Level 3) or amber (Levels 2 and 1) and will be presented in order of descending priority. A maximum of eleven alert messages can be displayed. The last incoming alert message is indicated by a pointer (>). Alert messages are automatically withdrawn when the fault is corrected.

In the unlikely event that more than eleven alert messages exist, as indicated by a ’PAGE 1’ annunciation, the cancel button can be operated to remove the presented amber alert messages in order to display the amber alert messages of page 2.

When all existing amber alert messages are removed with the cancel button, a ‘MSG CANCELLED’ annunciation is displayed. The removed amber alert messages can be restored in order of descending priority with the recall button.

Memo messages

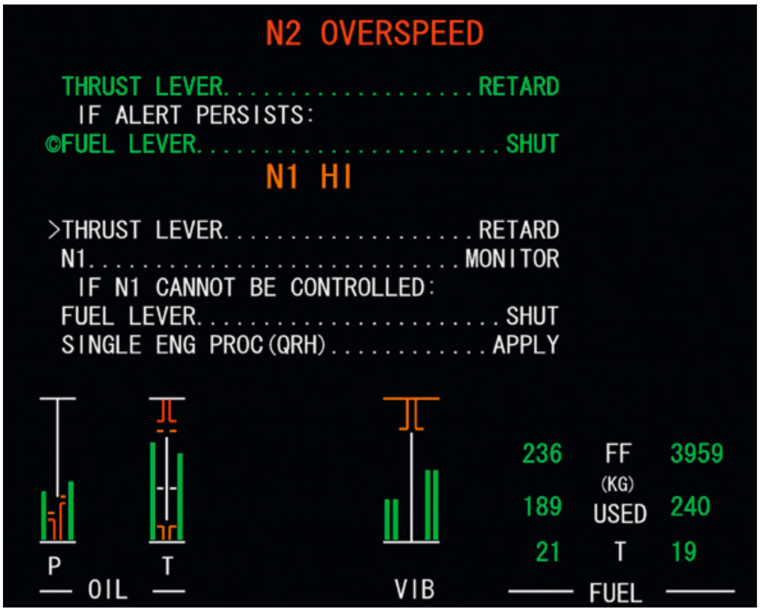
Memo messages are displayed in blue, serve as a reminder and require no action. Memo messages can only be presented when less than eleven alert messages are presented.

Procedures

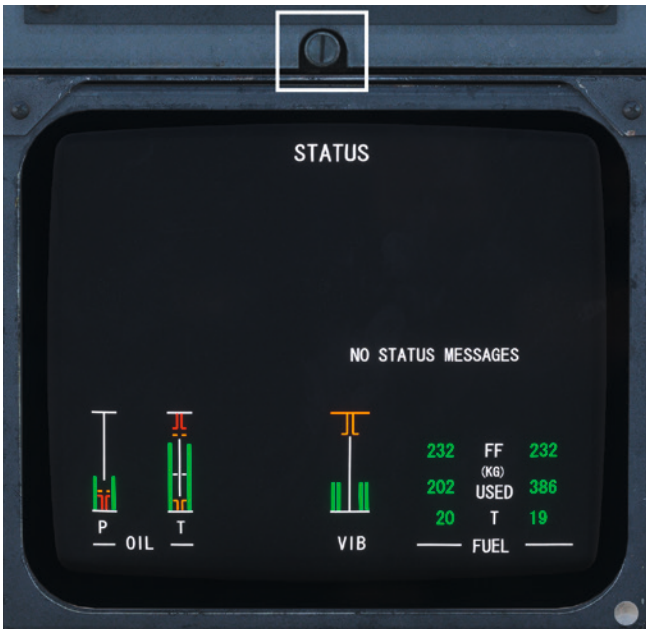
The procedure of the alert message with the highest priority is automatically presented on the secondary page. If space is available, a maximum of two procedures can be displayed. Procedures comprise action and advisory lines. The action line to be executed is preceded by a pointer (>).

Operation of the advance (ADV) switch on the pedestal moves the pointer to the next action line and changes the colour of the executed procedure step from white to green. When the last step has been executed, the ‘procedure completed’ symbol will be shown. The procedure can now be removed by using the advance switch or the status push-button.

If, while working through a procedure, a higher priority alert occurs, the associated procedure is automatically presented, removing the procedure that is being dealt with. After completion of the procedure with higher priority, the removed procedure is displayed again as it was at the time of removal.

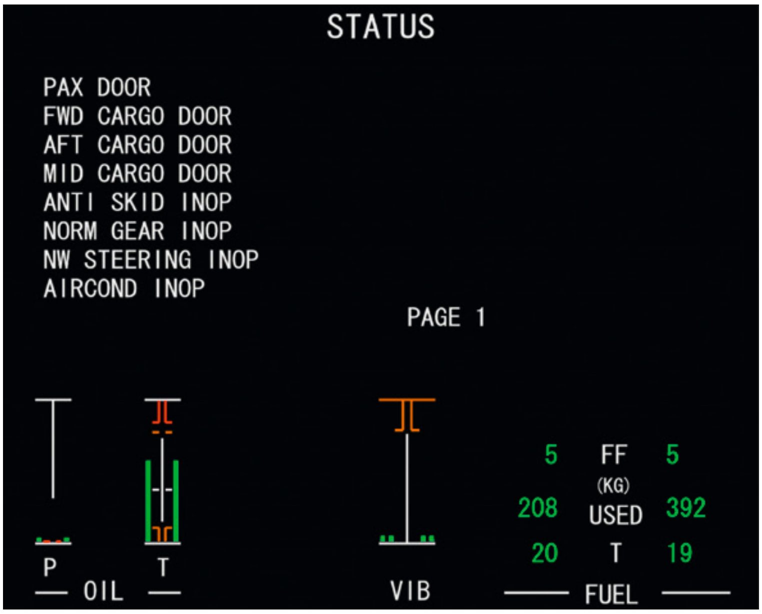


As a quality-of-life addition in this simulation, we have added a hidden clickspot for the advance (ADV) switch on the screw at the top of the RH MFDU.



Status messages

Failed systems or switched off systems result, if operationally relevant, in status messages. The existence of status messages is also dependent on the actual flight phase of the aircraft. If there are status messages, as indicated by STS on the primary page, they can be displayed by depressing the status page push-button. The status page is automatically displayed on the ground when the parking brake is set or when both engines are shut down.



Aural alerts

Attention getting chimes: Aural alerts for Levels 3, 2 and 1 are attention-getting chimes; they identify the level of urgency. The Level 3 alert, which is annunciated by a repetitive chime, is cancelled when the fault is corrected or when either MWL is depressed.

Dedicated aural alerts: The FWC also provides dedicated aural alerts that cannot be cancelled by depressing either master light:

- Cavalry charge – autopilot disengagement
- Whooler – stabiliser in motion due to stab trim switch operation
- Clacker – aircraft overspeed
- ‘C’ chord – altitude entry
- Buzzer – pilot call

System test

A flight warning system test, which can only be performed on the ground, is initiated by depressing the WARN SYS test push-button on the test panel. The test, which is controlled by the FWC, comprises an alert light filament test and an automatic back-up test.

Test in progress is indicated by a TEST light integrated in the WARN SYS test push-button. Completion of the test, with or without faults, is annunciated by a chime. When a fault is detected the TEST light remains on. When no failures are detected, a green CMPL light comes on and the TEST light goes out.

Normal system operation is resumed when the WARN SYS test push-button is reset or when the test has been completed for 30 seconds.

All FWC-controlled lights in the flight deck are tested. Each light has two filaments. During the test, a single filament failure is indicated by the flashing of the other filament. When both filaments in one light fail, all other red and amber FWC-controlled lights come on.

All white, blue and green annunciator lights can be tested by depressing the ANN test button on the test panel.

Terrain Awareness and Warning System (TAWS)

A Terrain Awareness and Warning System (TAWS) comprises the normal GPWS, complete with internal GPS, terrain and airport database. It operates independently of the Flight Warning System.

Based on data from ADC 1 and 2, radio altimeter 1 and 2, attitude and heading information from the IRS system, an internal GPS, FMC 1 and 2, ILS 1 and 2, EFIS 1 and 2 and an internal terrain and airport database, the system continuously monitors the aircraft flight path with regard to terrain. If the projected flight path should result in inadvertent proximity to terrain, the system produces visual and aural warnings.

The TAWS provides the following warnings and/or alerts to the flight crew:

- Mode 1 – excessive descent rate
- Mode 2 – excessive closeness to terrain
- Mode 3 – altitude loss after take-off or go-around
- Mode 4 – inadvertent proximity to terrain
- Mode 5 – excessive deviation below the ILS glideslope
- Mode 6 – call-outs during approach for selected DH and predetermined radio heights
- Excessive bank angle alert
- Look-ahead terrain and display alert

System test may be performed on the ground by depressing the GPWS TEST button on the TEST panel. When the GPWS TEST button is depressed on the ground for five seconds or longer, all the synthesised voice warnings are produced.

Traffic Alert and Collision Avoidance System (TCAS)

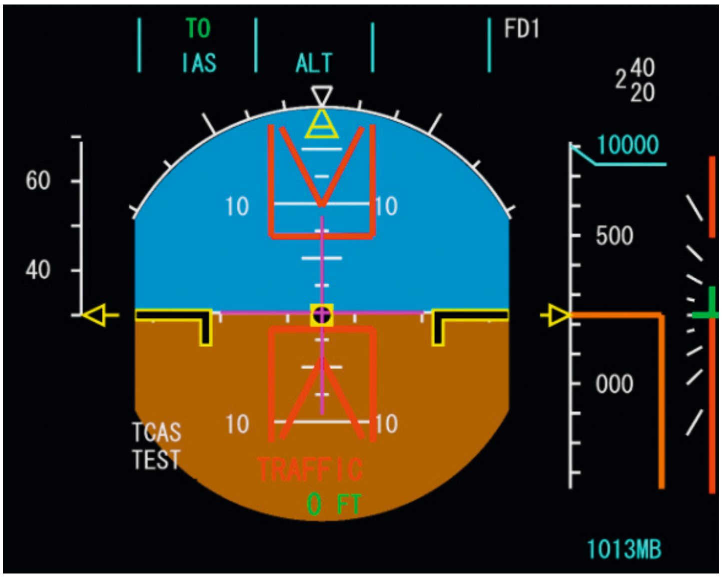
The aircraft is equipped with a Traffic Alert and Collision Avoidance System (TCAS). TCAS detects the presence of nearby aircraft which reply to the beacon signal or which transmit a beacon signal themselves. TCAS then interrogates the detected aircraft to determine their range, bearing and altitude. Multiple aircraft encounters will be resolved.

The surveillance range is approximately 40 NM with a vertical range of 9,900 ft above and below the aircraft. TCAS computes the closure rate and relative position of the detected aircraft to divide them in four categories:

- Resolution Advisory (RA) traffic
- Traffic Advisory (TA) traffic
- Proximate traffic
- Other traffic

TCAS will not classify an aircraft as RA traffic if its reply does not contain altitude information.

RA and TA advisories will be displayed on the PFD.



All detected traffic can be displayed on the ND when in ROSE or MAP mode. Functions of the traffic display on the ND are available on the EFIS control panel.

A TCAS test can be performed by momentarily depressing the TEST button on the transponder.

FLYING THE F70 & F100 (TUTORIAL FLIGHT)

In this tutorial flight we will be taking an F100 on a short hop between Newcastle International Airport, the largest airport in the North East of England, and Amsterdam Schiphol Airport, the birthplace of the F70 and F100 aircraft and once a thriving hub for both aircraft types.

We will initially depart Newcastle to the west before immediately turning south, flying past the cities of Leeds and Sheffield, then turning east to head out over The Wash and the North Sea, where we will begin our descent into Amsterdam.

Covering approximately 350 nautical miles, this regional flight is an ideal length for learning about the important systems on board the F70 and F100 aircraft.

For this tutorial flight we recommend the use of the **F100 | Integral Airstairs | Small Cargo Door | KLM UK** variant/livery, which was prototypical on this route.

Note 1: *The flight plan in this tutorial flight was created using the 2503 AIRAC cycle. This is the default Navdata included with the F70 Professional and F100 Professional. Some minor differences in the flight plan may occur if you complete this tutorial flight with a newer AIRAC cycle.*

Note 2: *All weights, speeds, trim values and other figures in this tutorial are specific to the F100 and will differ from those of the F70. Due to the similarities between both aircraft types, the procedures in this tutorial flight can be used for either aircraft, but we recommend that you calculate your own fuel, weight and performance parameters if you intend to complete this flight in the F70.*

Here are the details for today's flight:

EGNT/25 GIRL3X GIRLI P18 GASKO UY250 MAMUL L603 LAMSO LAMS2A EHAM/18R

Estimated time en route: 60 minutes

Route distance: 344 nautical miles

Departure time: 1310 (local time)

Weather: Few Clouds

Now that we are prepared for the flight, we can proceed to the cockpit to begin our pre-flight checks. To load up the aircraft at the correct location, follow these steps:

1. Start Microsoft Flight Simulator.
2. Select **World Map** (MSFS 2020).

   Select **Free Flight** (MSFS 2024).
3. In the departure airport field, type **'Newcastle'** or **'EGNT'** and select the airport from the list.
4. Expand the runway drop-down menu and select **'GATE 6 – RAMP GA MEDIUM'**.
5. Select **Fly** (MSFS 2020).

   Select **Start Flight** (MSFS 2024).

Upon loading into the aircraft, we should find ourselves sitting in the cockpit at Gate 6 at Newcastle International Airport. MSFS 2024 users will initially find themselves outside the aircraft in 'walkaround' mode and will need to trigger the 'TAKE CONTROL OF CHARACTER' control assignment to enter the cockpit.

As the aircraft has been loaded at a gate, it will automatically initialise in a 'cold and dark' state with all aircraft systems powered off, just as we would find the aircraft prior to the first flight of the day. Beginning in this configuration means we will need to spend some additional time setting up the cockpit, but doing so will allow us to learn a considerable amount about the operating procedures on board the F70 and F100.

If you wish to skip ahead and start this tutorial flight with more systems already set up, you can load the aircraft in a 'TURNAROUND' state via options on the 'Aircraft' section of the EFB.

This tutorial will cover the normal procedures required to get the aircraft from the departure airport to the destination airport safely, but it will not explore each system in depth. Please refer to the other chapters of this Operations Manual for detailed descriptions of each system. A separate EFB manual describes the EFB's functions in depth and can be found in the same location as this manual.

Powering up the aircraft

Before applying any power to the aircraft, we must complete some safety checks.

Check both fuel levers are in the **SHUT** position.

Ensure the landing gear selector is **DOWN**.

Moving up to the ELECTRIC section of the overhead panel, switch **ON** the BATTERIES switch. Rotate the display selector to **BAT** and depress the **VOLT** button to confirm a minimum of **24 volts** is indicated in both batteries.

The batteries can only supply the aircraft's emergency electrical buses for a finite amount of time before they are fully drained, so it is imperative that an additional form of electrical power is connected to the aircraft as soon as possible.

This additional power source can be an external Ground Power Unit (GPU), which connects to the aircraft on the starboard (right) side of the forward fuselage, or the Auxiliary Power Unit (APU) which is permanently installed within the aircraft's rear fuselage. The purpose of both power supplies is to provide enough electrical power to power the aircraft's main electrical buses and to keep the batteries topped up in the case of an emergency. The GPU can only supply electrical power, whereas the APU can supply electrical power and air for air conditioning and other systems.

For this tutorial flight we'll use the APU, as the air conditioning will help keep our passengers comfortable on this rare afternoon of Geordie sunshine.

Before starting the APU, there are some additional safety checks which must be completed. On the APU FIRE section of the overhead panel, ensure the APU FIRE DISCH switch is **OFF** with the red guard closed, and the AGENT LO light is extinguished.

On the TEST panel, depress the APU FIRE TEST button to perform an APU fire test. With the button depressed, confirm a Level 3 aural alert sounds, the Master Warning Lights (MWLs) on the glareshield flash, the FIRE APU alert on the LH MFDU (Left Hand Multifunction Display Unit) is displayed, and the FIRE light on the APU FIRE panel is illuminated. Release the button to complete the test.

With electrical power supplied to the aircraft and system tests being performed, the MWLs (Master Warning Lights) and MCLs (Master Caution Lights) on the glareshield can be triggered at various points. The MWLs and MCLs can be cancelled by depressing the respective button and the associated chime will also be cancelled.

The APU may now be started. On the lower right corner of the overhead panel, rotate the APU start selector to the **ON** position, then **PULL** the selector out over the baulk before rotating it to the **START** position to initiate the start sequence. The selector is spring-loaded from START to ON.

Note 1: *For users of the LEGACY Cockpit Interaction System, there is a clickspot in the centre of the selector to PULL it out over the baulk.*

Note 2: *For users of the LOCK Cockpit Interaction System, the selector can be pulled out either by right-clicking the selector (mouse) or by locking onto the selector and moving the right thumb stick up (PS5/Xbox controller).*

Within approximately one minute, the APU start sequence will complete and the blue AVAIL light will illuminate above the selector.

The APU will immediately begin supplying power to the aircraft's systems if the APU button on the ELECTRIC panel is depressed (ON/lights out).

We can now begin the process of aligning the Inertial Reference Systems (IRSs). Depending on the latitude of the aircraft, alignment of the IRSs can take up to 15 minutes, so it is important to start the alignment early in the pre-flight process so that they are aligned prior to pushback.

An IRS ALIGN SPEED option exists on the Aircraft page of the EFB as a quality-of-life addition. This provides two alignment speed options: REAL (up to 15 minutes) and FAST (10 seconds). We'll let you choose which option you'd like to use for this tutorial flight, but we recommend only changing this option prior to the start of IRS alignment.

To begin the IRS alignment process, head to the IRS MODE SELECT panel at the very top of the overhead and set both mode selectors to **NAV**. Similar to the APU start selector, these switches must be pulled over a baulk to reposition them between ALN and NAV.

Note 1: *For users of the LEGACY Cockpit Interaction System, there is a clickspot in the centre of the selector to PULL it out over the baulk.*

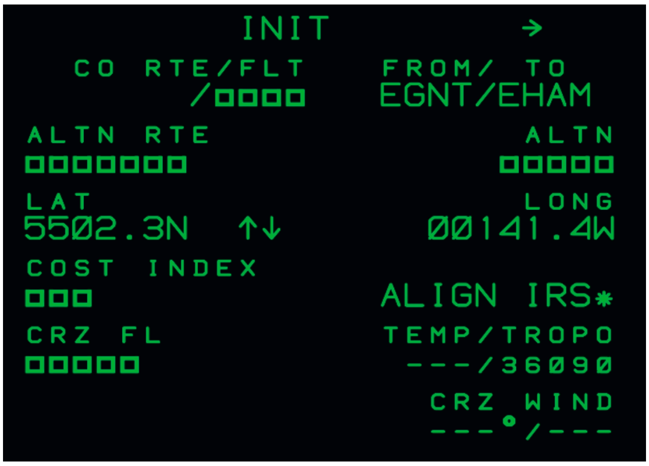
Note 2: *For users of the LOCK Cockpit Interaction System, the selector can be pulled out either by right-clicking the selector (mouse) or by locking onto the selector and moving the right thumb stick up (PS5/Xbox controller).*

The ALIGN lights will be illuminated when alignment is in progress.

The IRSs require the pilots to enter an initial position of the aircraft to align to. There are several methods for how this can be achieved in the F70 and F100, but for this tutorial flight we'll cover the FMS method.

On the FMS, press the **INIT** key to open the INIT A page. The INIT A page is used to enter the primary parameters that define the flight.

First we must enter our FROM/TO airports in the scratchpad. They must be in the format of each airport's four-letter ICAO code separated by a forward slash. For this tutorial flight, enter **'EGNT/EHAM'** into the scratchpad and then press the **LSK1R** key to copy it into the FROM/TO fields.



A route selection page will then open, listing any Company Routes that exist in the database for that FROM/TO airport pair. As this is likely be one of your first flights in the aircraft, there probably won't be any flight plans listed here.

Press **LSK6R** to return to the INIT A page.

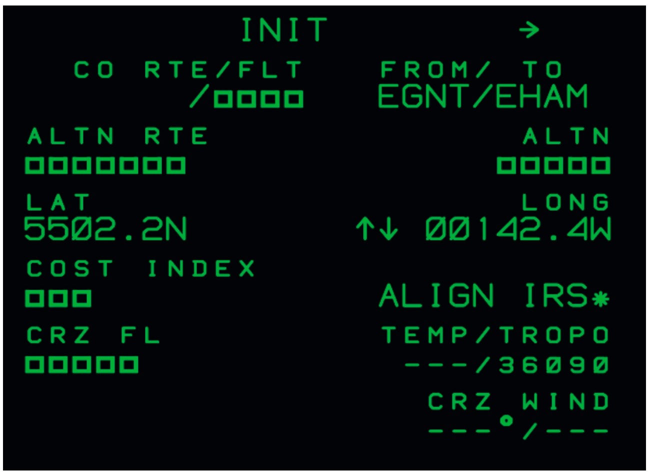
The FROM/TO fields will now be populated with the previously entered airport pair, and the latitude and longitude of the departure airport's data reference point will be displayed in the LAT and LONG fields. The airport data reference point is typically located at the centre of the airport, and so probably won't be perfectly accurate for the aircraft's present position at the gate.

The actual coordinates of the gate may be located on a sign at the gate, or they may be listed in the airport charts. The coordinates for Gate 6 at Newcastle are **5502.2N 00142.4W**.

If the coordinates in the LAT and LONG fields differ from the actual gate coordinates, they can be manually adjusted by pressing either the LSK3L or LSK3R key and then using the 'UP' and 'DOWN' arrow keys.

Once the coordinates in the LAT and LONG fields match the actual gate's coordinates, press the **LSK4R (ALIGN IRS)** key to start the IRS alignment process. Depending on the previously set IRS ALIGN SPEED on the EFB, IRS alignment speed may be as fast as 10 seconds (FAST) or as long as 15 minutes (REAL).

Note: *It is crucial that the initial position is as accurate as possible before IRS alignment. Any inaccuracies can cause the aircraft to fly offset from its published flight plan. If you don't feel comfortable changing the coordinates, leaving them at their default values shouldn't have any significant side effects on this tutorial flight.*



Pre-flight checks

With the IRS alignment in progress, we can start to work through items in the Pre-flight checklist. We'll come back to the FMS once passenger boarding has begun, to enter the remainder of the flight plan and performance parameters.

Returning to the overhead panel, set the emergency lights selector to **ARMED** and confirm that the NOT ARMED light extinguishes.

Switch **ON** the NAV/LOGO lights to let the ground crew know there is crew on board.

There are three crew oxygen panels in the cockpit, one for each pilot and one for the observer. Perform a flow test of each one by briefly sliding the RESET/TEST lever down to the **TEST** position and confirming that the flow indicator momentarily shows yellow and that oxygen flow can be heard. Once the test is complete, return the lever to the RESET position.

On the TEST section of the overhead panel, perform a smoke test by depressing the **SMOKE TEST** button and confirming that a Level 2 aural alert is heard, Master Caution Lights (MCLs) are illuminated, and SMOKE alerts are present on the LH MFDU.

Perform an anti-skid test by depressing the **A-SKID TEST** button and confirming that the A-SKID light illuminates.

Perform a full GPWS test by depressing the **GPWS TEST** button for five seconds and confirm that all GPWS-related visual and aural warnings are triggered.

Perform a warning systems test by depressing the **WARN SYS TEST** button and confirming that the TEST light illuminates, WARN SYS IN TEST is displayed on the LH MFDS, and the WARN SYS light is illuminated on the STBY ANN panel. After a successful test the CMPL (complete) light will illuminate after approximately 20 seconds.

On the GPWS section of the overhead panel, ensure that the FDR/CVR GND CTRL button is **ON**.

On the COCKPIT VOICE RECORDER section of the overhead panel, perform a CVR test by depressing the TEST button and confirming that the needle moves across its entire range.

On the CALLS section of the overhead panel, ensure the NO SMKG switch is **ON** and the SEATBELT signs are **OFF** (the latter should remain OFF until refuelling is complete).

We are now at an optimal point of the pre-flight procedure to begin the refuelling and passenger boarding.

The F70 Professional and F100 Professional both feature boarding and refuelling simulation, with the respective menus in the Aircraft app of the EFB.

Before starting the refuelling and boarding process, we first must enter the required weights for our flight today.

In the Aircraft section of the EFB, select the refuelling icon at the bottom left corner of the page to open the refuelling menu. Select the **TOTAL FUEL WEIGHT** field on the right side of the page, input **4500** using the on-screen keyboard or an external keyboard, and then press **ENTER**.

With the required fuel displayed in flashing boxes, ensure the refuelling speed is set to **REALISTIC** and then press the **START REFUELLING** button.

We can now follow a similar process to set our required payload. Select the passenger icon at the bottom left corner of the page to open the boarding simulation menu. Select the **ZERO FUEL WEIGHT** field, input **31000** and press **ENTER**. This provides us with a relatively light load for this short flight today.

With the required ZFW converted into passenger numbers and cargo weight in flashing fields, ensure the boarding speed is set to **REALISTIC**, the gate type is set to **STAIRS** and then press the **START BOARDING** button.

If the AUTO CABIN CREW option is enabled on the Aircraft page's configuration menu, the cabin crew will automatically open the passenger doors at the start of boarding and close them again once boarding is complete. If the AUTO CABIN MUSIC and CABIN ANNOUNCEMENT options are enabled, they will also trigger boarding music and/or crew announcements at various stages of the flight. If all options are disabled, we must open/close the passenger and cargo doors ourselves, and music and announcements can be triggered on the digital music player in the forward galley.

With boarding and refuelling under way, we can now head back down to the FMS to continue entering our flight plan and performance parameters.

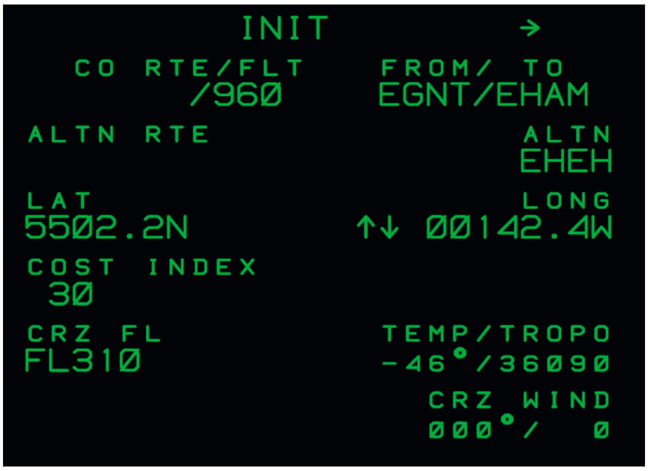
Press the INIT key to return to the INIT A page (if not already open from earlier). The INIT A page features two types of field: fields with square boxes are mandatory fields that must be filled to complete the flight plan, and fields with dashed lines are optional fields which will improve the accuracy of the FMS's performance calculations if accurate data is entered.

Firstly, enter our alternate airport for our flight today into the scratchpad, **'EHEH'**, and then press LSK2R to move it into the ALTN field.

We can now enter our flight number into the FLT field. To do this, enter a forward slash into the scratchpad followed by the flight number, **'/960'**, and then press LSK1L to move it into the FLT field.

The cost index for today's flight will be **30**. Enter this in the COST INDEX field.

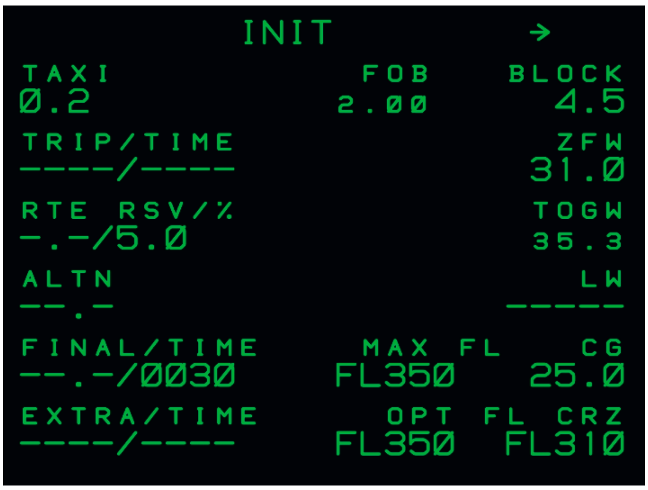
The cruise flight level will be **31,000 ft**. This can be entered into the CRZ FL field as 31000, 310 or FL310.



Press the **NEXT PAGE** key to open the INIT B page. This is where we can enter our fuel and payload, and the FMS will use these parameters to calculate performance throughout the flight.

Enter our block fuel for today's flight of 4,500 kg into the BLOCK field. This can be entered in tonnes as **'4.5'**.

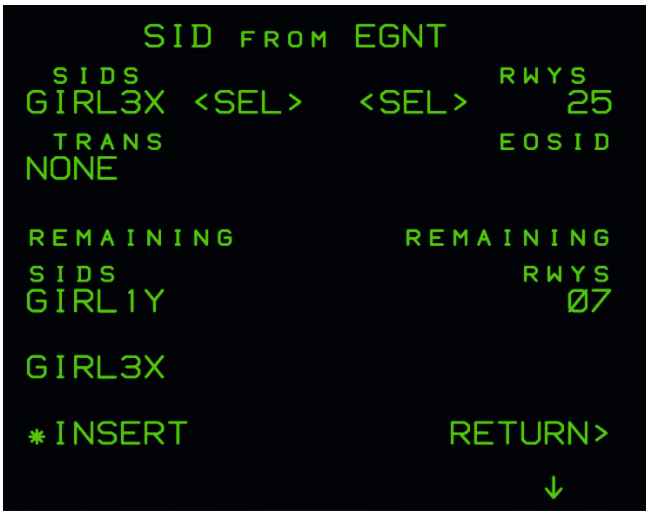
Enter our Zero Fuel Weight of 31,000 kg into the ZFW field. This can be entered in tonnes as **'31'**. The Takeoff Gross Weight field will then be automatically calculated based on the above parameters.



Press the **F-PLN** key to open the F-PLN A page. The F-PLN page is used to create, view and edit the flight plan, including any waypoint speed/altitude constraints.

Press **LSK1L** to open the Lateral Revision (LAT REV) page for our departure airport. Press **LSK1L** again to then open the Standard Instrument Departure (SID) page for our departure airport. Here we can select a departure runway and SID.

We will be departing runway 25 today, which can be selected by pressing **LSK2R**. The selection of a runway will then filter the available SIDs to only display those that are available for the selected runway. We will be flying the **GIRL3X** SID today, which can be selected by pressing **LSK2L**.



Press **LSK6L** (INSERT) to insert the SID into the flight plan. The FMS will then return to the F-PLN A page with the SID waypoints inserted.

Press the **'UP'** arrow key to scroll down through the flight plan until the GIRLI waypoint is displayed. GIRLI is the last waypoint on the SID and we will build the rest of the flight plan from this waypoint.

Press the **LSK** key immediately to the left of the **GIRLI** waypoint to open the LAT REV page for the GIRLI waypoint. Then press **LSK2L** to open the AIRWAYS page. The AIRWAYS page is a useful tool that allows us to build flight plans using a mixture of airways and waypoints. This process allows for a much more efficient method of flight plan creation than entering each waypoint manually. The title line of the page displays the waypoint we are building the flight plan from. Airways from that waypoint can be entered on the left side of the page, and the termination waypoint of that airway can be entered on the right side of the page.

Enter our first airway on the route, **'P18'**, into the LSK1L field and enter the termination waypoint of **'GASKO'** into the LSK1R field.

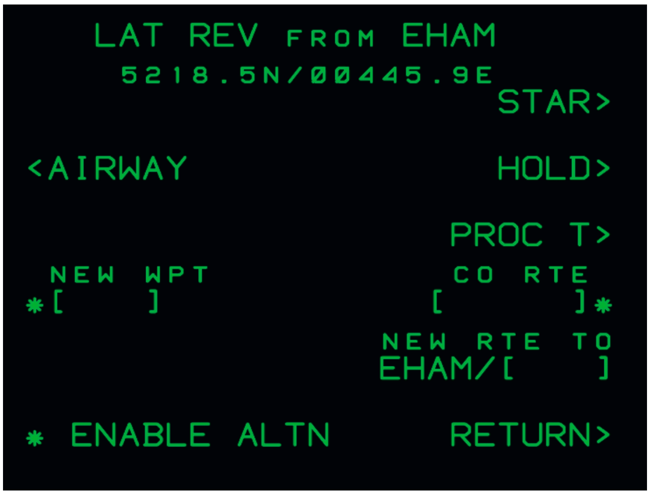
We can then repeat this process for the following airways and waypoints on our flight plan: **'UY250'** to **'MAMUL'** and **'L603'** to **'LAMSO'**.

With the three airways and termination airports entered, press **LSK6L** (INSERT) to insert them all into the flight plan. The FMS will then return to the F-PLN A page with all of the waypoints inserted.

To minimise our workload during the latter stages of the flight, we can now also set up our arrival procedure into Amsterdam. The process for adding our arrival is very similar to that of adding the departure.

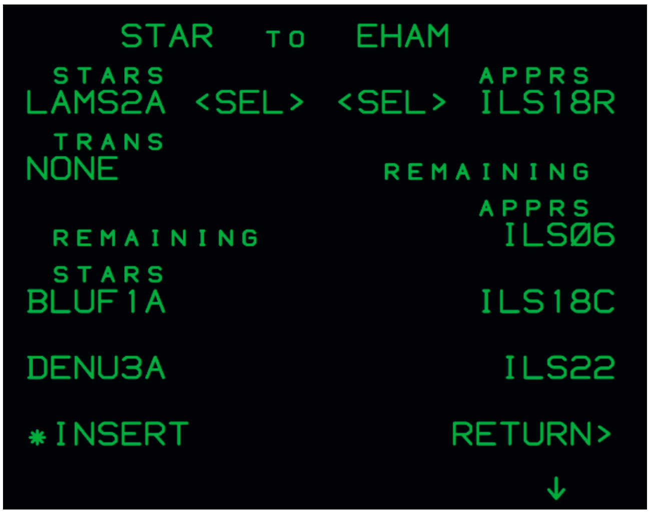
Press the **'UP'** arrow key to scroll through the flight plan until the 'END OF F-PLN' text is displayed. This text indicates the end of the normal flight plan, with anything below this line forming part of the alternate flight plan.

On the line immediately above the END OF F-PLN line, press the **LSK** immediately to the left of our destination airport EHAM to open the LAT REV page.



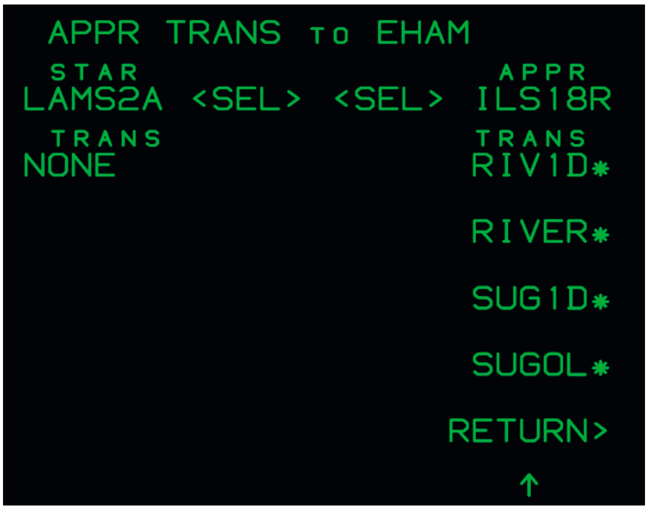
On the LAT REV page, press the **LSK1R** key to open the Standard Terminal Arrival Route (STAR) page for our destination airport. Here we can select an approach procedure, STAR and transition.

With light winds out of the west today and no changes in weather expected, we can plan on arriving on the ILS 18R. Select this approach by pressing the LSK immediately to the right of the 'ILS18R' approach. The selection of an approach will then filter the available STARs to only display those that are available for the selected approach. We will be flying the **LAMS2A** STAR today, which can be selected by pressing the LSK immediately to the left of the 'LAMS2A' STAR.



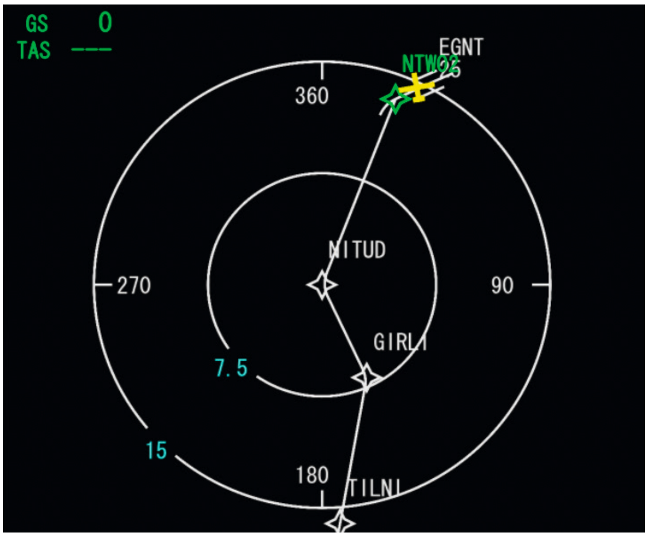
Press **LSK6L** (INSERT) to insert the selected STAR and approach into the flight plan. The FMS will then open the Approach Transition page, which allows a selection of transitions for the approach.

Our transition waypoint for the approach will be SUGOL. Use the 'UP' arrow key to scroll through the list and press the LSK immediately to the right of the 'SUGOL' transition waypoint, followed by **LSK6L** (INSERT) to insert the transition waypoint into the flight plan.



The FMS will then return to the F-PLN A page where the entire flight plan will now be visible. Use the 'UP' and 'DOWN' arrow keys to cycle through the flight plan. It is good practice to always check the flight plan for continuity and to ensure that there are no errors.

With the F-PLN A or F-PLN B page selected on the FMS, set the ND mode selector on the EFIS control panel to **PLAN**. This will display the flight plan's active waypoint at the centre of the EFIS ND. Pressing the 'UP' and 'DOWN' arrow keys on the FMS will cycle through the waypoints on the FMS and the EFIS ND, allowing us to visually check for continuity in the flight plan.



A quirk of the F70 and F100 FMS, compared to some modern systems, is that the FMS does not display the upper and lower altitude constraints on the F-PLN A page – it will only display the lower limit of the two. This becomes apparent when we look at our approach procedure and find that the SUGOL waypoint has an altitude constraint of 'below FL100, above FL070'. The way the FMS accounts for this is that it will display the lower altitude constraint on the F-PLN A page altitude window with an 'At or Above' symbol (e.g. '+7000'), but for the vertical profile calculations, the FMS will correctly respect both the upper and lower constraints.

No action is required by the pilots to correct this, but it is some FMS logic that we feel is worth highlighting in this tutorial flight.

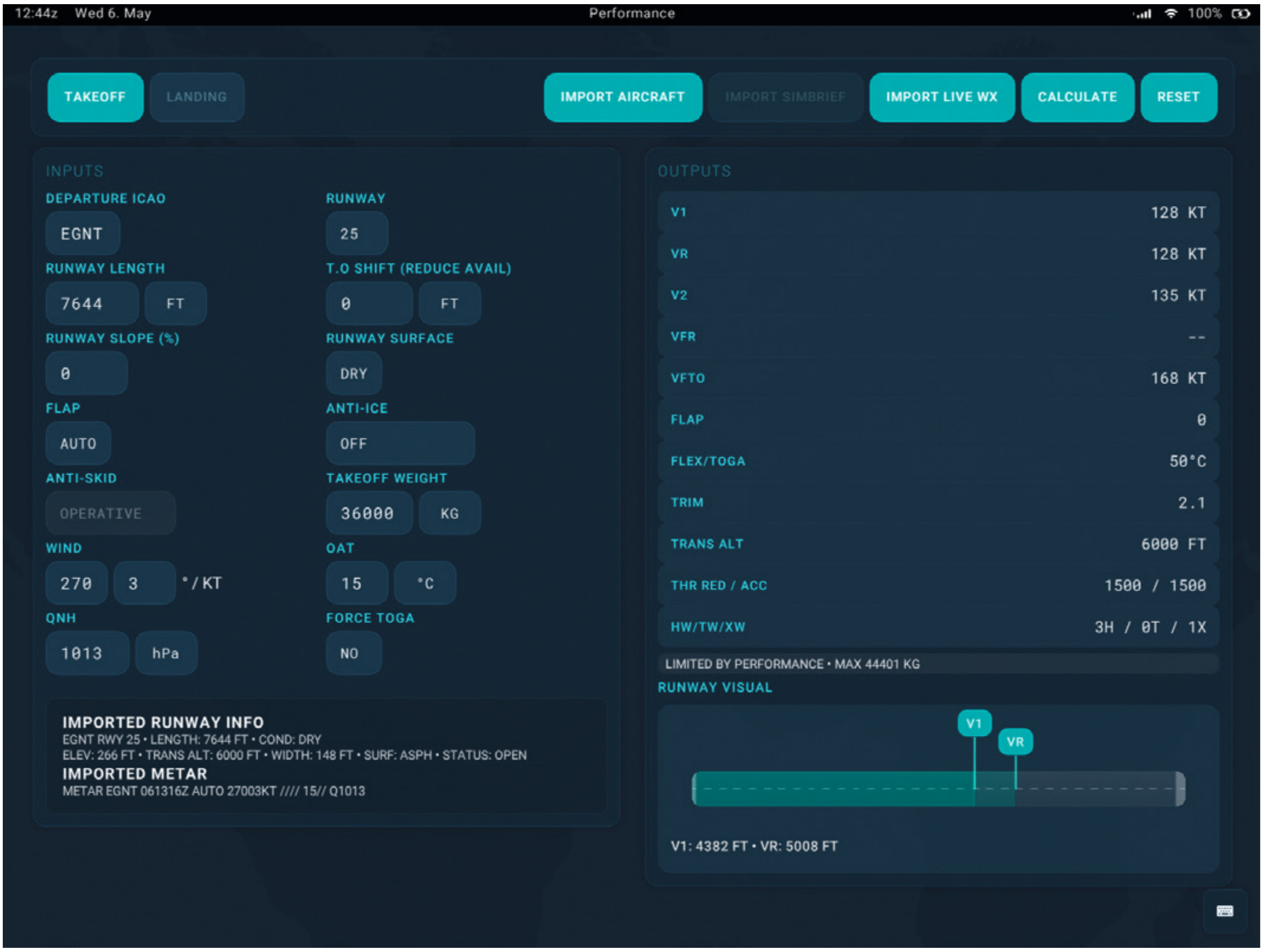
With our flight plan entered, we can now move onto our take-off performance calculations.

On the EFB tablet, open the Performance app and select the **TAKEOFF** page. Here we need to fill all of the INPUT fields with accurate data in order to receive an accurate OUTPUT. To do this, we can enter all of the data manually, or we can use the import options at the top of the page.

Firstly, as we haven't imported a SimBrief OFP for this flight, we will need to manually input the DEPARTURE ICAO and RUNWAY. Enter **EGNT** into the DEPARTURE ICAO field and select RUNWAY **25**.

Next, press the **IMPORT AIRCRAFT** button to import the aircraft's current weight, then press the **IMPORT LIVE WX** button to import the current weather conditions at Newcastle.

With all the INPUT fields populated, press the **CALCULATE** button to generate our take-off performance.

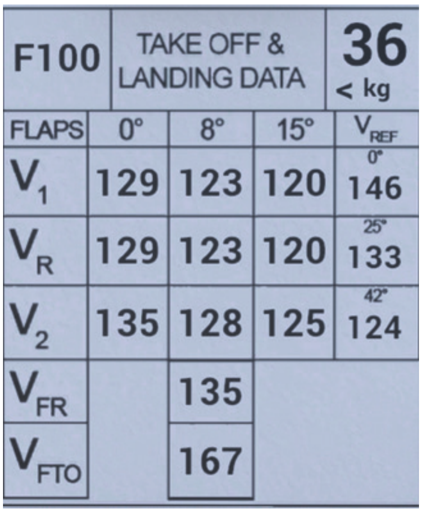


On the right side of the page we can find our V-speeds, required flap setting, FLEX/TOGA temperature and stabiliser trim. We will use all of these values as we continue to configure the aircraft for flight.

The first values we will use are the V-speeds, which we need to enter into the FMS. Press the **TO/APPR** key to open the TAKEOFF page. The take-off page is used to input our take-off speeds and we can also edit our thrust reduction and acceleration altitudes here.

Take-off speeds vary depending on aircraft weight and flap setting. The aircraft's take-off speeds can be found on the aforenoted Takeoff Performance calculator, and they can also be found on the TAKE OFF & LANDING DATA flipchart on the Captain's main instrument panel.

Speeds are displayed for each of the possible take-off flap settings, and corresponding weight is displayed at the top right corner of the page. If the 'FLIPCHART WT SYNC' option is enabled on the EFB, this weight will be automatically synchronised with the aircraft's current weight. If the 'FLIPCHART WT SYNC' option is disabled on the EFB, you can cycle through the flipchart by using the two arrows at the bottom of the weight field.



F100	TAKE OFF & LANDING DATA			36 < kg
FLAPS	0°	8°	15°	V_{REF}
V_1	129	123	120	0° 146
V_R	129	123	120	25° 133
V_2	135	128	125	42° 124
V_{FR}		135		
V_{FTO}		167		

The standard take-off flap setting for the F70 and F100 is flap 0, which is what was suggested by the take-off calculator. The aircraft's thick wing is optimised for runway and climb performance, so in most cases it is recommended not to use flaps 8 or flaps 15 if sufficient runway length is available, and if the surrounding terrain dictates our best climb performance.

Our Take-off Gross Weight today is approximately 35,500 kg. We'll therefore round this up to the nearest 1,000 and use the **36,000 KG** card for our take-off weights. We'll perform a standard **flaps 0** departure, which gives us the following speeds:

V1 – **129 kt**

VR – **129 kt**

V2 – **135 kt**

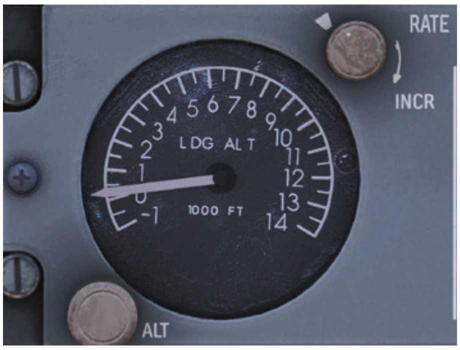
Clicking on the respective area of the flipchart will also automatically set the speed bugs on the standby airspeed indicator.

Returning to the FMS, these speeds can then be entered into the V1/VR/V2 speeds on the TAKEOFF page.

We'll leave the thrust reduction and acceleration altitudes at their default values of 1,500 ft AGL.

With the FMS now set up for our flight, we can run through some additional pre-flight checks on the overhead panel as we await the completion of passenger boarding and refuelling.

On the PRESSURIZATION panel, set the approximate altitude of our departure airport. For runway 25 at Newcastle, that is **239 ft**.



On the PROBE HEAT panel, set both window heat buttons to **ON**.

Moving down to the main instrument panels, we can now set up the EFIS control panels for departure. The standard configuration for take-off is:

ND mode – **MAP**

ND range selector – **15B**

Display option push-buttons – **CSTR** and **TRFC**

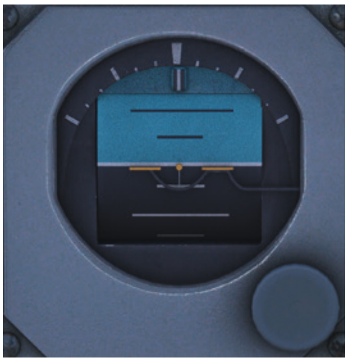
We can then also set the display brightness of the PFD and ND via the **PFD/ND** brightness knobs.

Moving across to the Flight Mode Panel (FMP), and once IRS alignment is complete, we can set both Flight Director switches **ON**.

Set the NORMAL-V2 selector to **NORMAL** and set a preselected departure speed of **180 knots** in the IAS/M window – this is the first speed restriction on the SID.

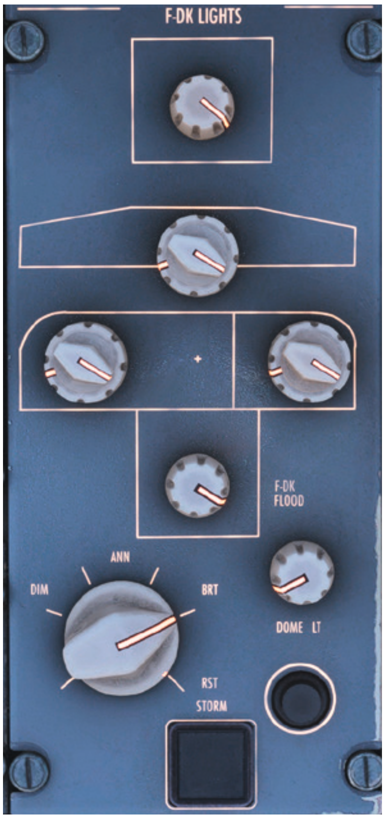
In the ALTITUDE window, we can set our cruise altitude of **31,000 ft**.

On the main instrument panel, pull the gyro caging knob on the standby attitude indicator to fast-erect the gyro and level the horizon.



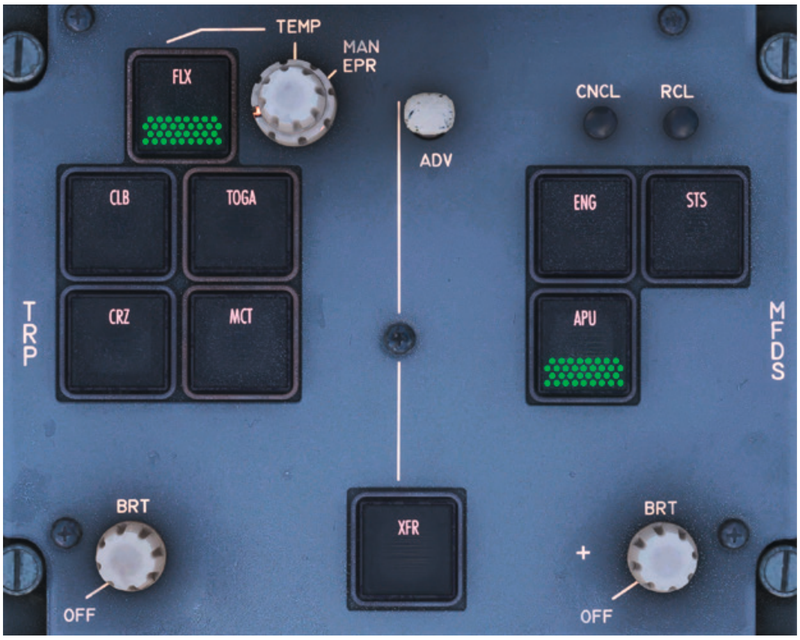
Moving down to the pedestal, set the current airfield altimeter on the ALTM SET panel. As we are using the 'Fair Clouds' weather preset for this tutorial, the airfield pressure should be 1,013 mb.

Continuing down the pedestal, the flight deck lights can be set as required on the F-DK LIGHTS panel.



Ensure that the flap and speed brake handles are in the **UP** and **IN** positions respectively, and that both fuel levers are in the **SHUT** position.

On the Thrust Rating Panel (TRP) we can set the required engine parameters for departure. We will be performing a reduced-thrust take-off, as is standard procedure to preserve engine wear. To enable this, press the **FLX** mode button on the TRP and then, using the inner TEMP knob, set the FLX temp to **50°C**.



The selected TRP mode and FLX temperature is displayed at the top left corner of the LH MFDU.

On the transponder panel we can set the flight number for our flight. Press the **ATC/FID** button to enter Flight ID mode, press and hold CLR to clear the field, and then type our flight number today: **KL960**. Press the **ENT** button to confirm the entry, then press the ATC/FID button to return to the ATC mode.

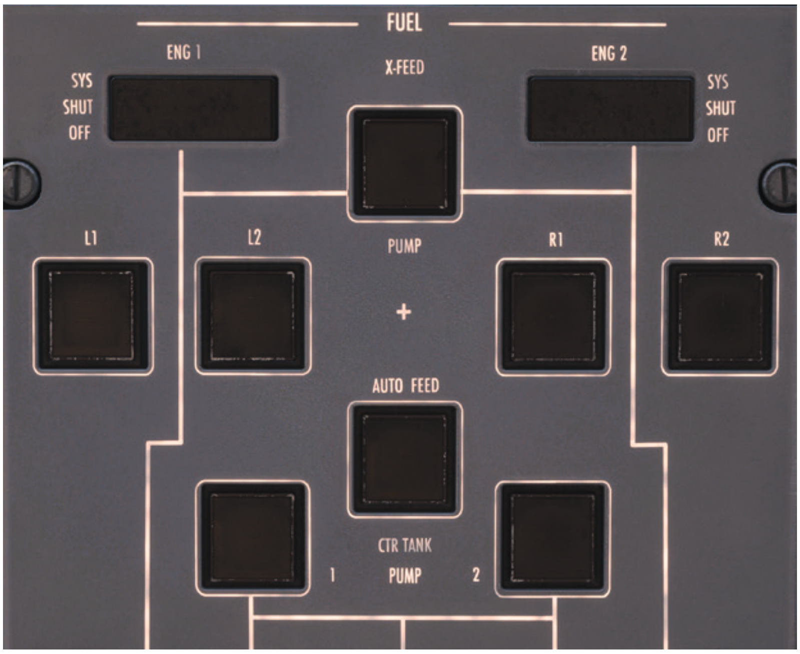
On the weather radar panel, ensure that the GAIN selector is set to the **12 o'clock** position, the MODE selector is set to **WX+T** or **WX**, and the TILT selector is set to at least five degrees UP.

Before engine start

Once both IRSs have aligned and passenger boarding and refuelling is complete, we can start to work through the 'Before starting' checks.

On the overhead panel, switch **ON** the seatbelt signs.

Set L1, L2, R1 and R2 fuel pumps to **ON** and confirm all indicators are blank. As we don't have any fuel in the centre tank today, we can leave the centre tank fuel pumps **OFF**.



Set all seven probe heat and window heat push-buttons to **ON**.

On the pedestal, set the transponder mode to **XPNDR**.

Ensure that all exterior doors are **closed** and that there are no door messages present on the MFDS STATUS page.

Now is also a good time to remove the **CHOCKS** on the Aircraft app of the EFB.

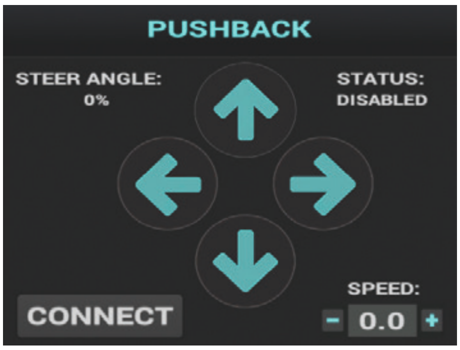
Close the cockpit door by clicking on the cockpit door handle and depress the **F-DK DOOR** push-button on the pedestal to lock it. Confirm that the NOT LKD light extinguishes.

On the overhead panel, set the beacon lights to **ON** and the aircraft is now ready for pushback and engine start.

Engine start

We require a pushback tug to push us out of the gate and onto the taxiway. This can be achieved either via the pushback controls on the Aircraft app of the EFB or you can use a third-party pushback tool of your choice. For this tutorial flight we will cover the pushback controls on the EFB.

Press the three-headed arrow icon at the top right corner of the Aircraft app to open the pushback controls. Four arrows are presented for directional control, plus a CONNECT/CANCEL button and a SPEED control.

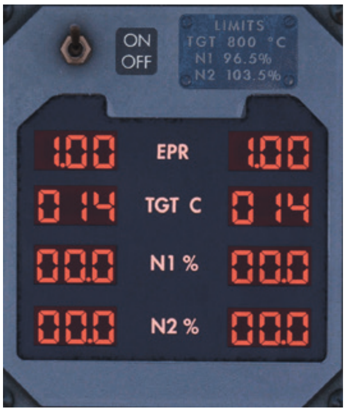


To initiate pushback, **release the parking brake**, press the **CONNECT** button and press the ‘down’ arrow to begin pushing back. We want to turn the aircraft’s tail to the left during pushback, with its nose facing east on the taxiway.

Once pushback is complete and the aircraft is at a complete stop, **engage the parking brake**, press the **CANCEL** button on the pushback controls menu and close the menu.

We can now begin the engine start procedure.

On the Captain’s main instrument panel, switch **ON** the Standby Engine Indicator (SEI). This provides us with precise engine parameters during engine start.



On the ENGINE section of the overhead panel, set the START push-button to **ON** and the ignition selector to **NORM**.

Momentarily hold the engine selector switch to the number **2** position to start engine 2.

Monitor the engine indications and set the engine 2 fuel lever to **OPEN** once 15% N2 is indicated.

Once engine 2 has stabilised at ground idle, repeat this process for starting engine 1.

With both engines running, depress the START push-button to **OFF** and confirm that the ON light extinguishes.

The SEI is not required for normal operations, so it can be switched **OFF**.

The APU is also no longer required. Set the APU start selector to **OFF**.

We can now set flaps for take-off, which for this flight is **flaps 0**, and we can set our stabiliser trim based on the aircraft's centre of gravity. To set the correct stabiliser trim for take-off, we need to take the Take-off Centre of Gravity (TO CG %) from the Aircraft app of the EFB and then set that value on the stabiliser trim indicator on the pedestal. At our current weights, the TO CG % should be approximately 21.3, which corresponds to a stabiliser trim value of approximately **2.7 UP**.

Taxi

With both engines running and all ground equipment clear from the aircraft, we are ready to taxi.

Switch **ON** the taxi light, release the parking brake, apply power and begin taxiing to Runway 25 via taxiways A and D.

During taxi we should receive confirmation from the cabin crew when the cabin is secure. The calls from the cabin are received in the form of an aural buzzer, and a call light will illuminate on the overhead panel. Calls can be answered by depressing the CAB/INT button on the audio selector panel, with the volume control at maximum.

If the 'F/O HANDLES INTPH' option is enabled on the EFB, the First Officer will answer all calls from the cabin and reset the calls panels at the appropriate times, leaving us free to focus on taxiing the aircraft.

On the FMP, arm **ATS**, **NAV** and **PROF**.

On the pedestal, **ARM** the lift dumpers.

Set the flight control lock to **OFF** and perform a full and free movement check of the primary flight controls (ailerons, elevator, rudder).

At the centre of the main instrument panel, set the autobrake to **RTO**.

Note: *The throttles must be in the idle position to select the RTO (rejected take-off) position.*

As we approach holding point D1, bring the aircraft to a stop and apply the parking brake. We can now run through the before take-off checks.

On the overhead panel, depress the **ALL ATTND** button to inform the cabin crew of an imminent take-off.

On the pedestal, depress the **TAKE-OFF CONF** test button and confirm that the 'T-O CONFIG NORM' memo message appears on the MFDU.

As we are about to enter the runway, switch **ON** the landing lights, switch **ON** the strobe lights and switch **OFF** the taxi light.

Set the transponder to **TA/RA** and increase the brightness of the weather radar display.

We are now ready to enter the runway. Release the parking brakes and apply a small amount of power to taxi onto the runway.

Come to a complete stop once lined up with the runway centreline.

Take-off

Hold the aircraft on the brakes and smoothly advance the thrust levers until 1.30 EPR is indicated. Confirm good engine indications before then gently releasing the brakes and triggering the **TOGA** triggers.

The TOGA triggers can be triggered either via clickspots on the triggers themselves, by the 'AUTO THROTTLE TO GA' MSFS control assignment, or by a hidden clickspot on a screw under the Captain's Flight Director switch.

With ATS engaged, the AFCAS will take over full control of the throttles until it is disengaged later in the flight.

As the aircraft accelerates, maintain directional control using small rudder inputs. It is recommended to keep forward pressure on the yoke during the whole take-off run to ensure that the nose gear remains in contact with the ground.

The First Officer will provide various callouts during the take-off run. As we pass **129 knots** a "Rotate" callout will be heard. Gently raise the nose of the aircraft to approximately 8 degrees and the aircraft will lift off the runway.

As the aircraft climbs, the First Officer will call for "Gear up". Move the gear lever to the LG UP position and confirm that all lights go out.

With NAV and PROF modes engaged, follow the flight director bars on the PFD, which provide guidance to remain on the correct lateral flight plan and vertical profile. Use stabiliser trim as necessary. During the initial climb we will maintain a speed of **V2+10**, or **18 degrees pitch**, whichever comes first.

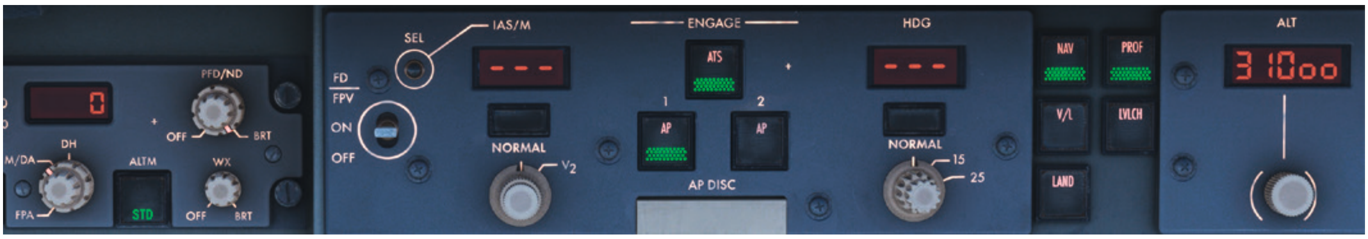
As we approach the first waypoint on the SID, depress the **AP1** push-button to engage the autopilot. With AP and ATS engaged, alongside NAV and PROF, the aircraft will now fly the lateral flight plan and vertical profile listed in the FMS and displayed on the EFIS displays.

Climb

At 1,500 ft the aircraft will pass through the preselected thrust reduction and acceleration altitude, and the TRP mode will automatically change from FLX to CLB. A small reduction in engine thrust may be observed and the aircraft will pitch down to start accelerating to the next speed restriction on the SID.

With the aircraft in a steady climb, press the **ALL ATTND** button on the CALLS panel to inform the flight attendants that it is safe to begin their duties.

As the aircraft passes Newcastle's transition altitude of 6,000 ft, depress the ALTM push-button on the EFIS control panel to select **STD**. This will set the main altimeters to the standard ISA pressure of 1013 mb (as indicated by the 'STD' text on the PFDs). The format of the altitudes displayed on the PFD, as well as on the ALT window of the FMP, will also change to indicate the change to flight levels.

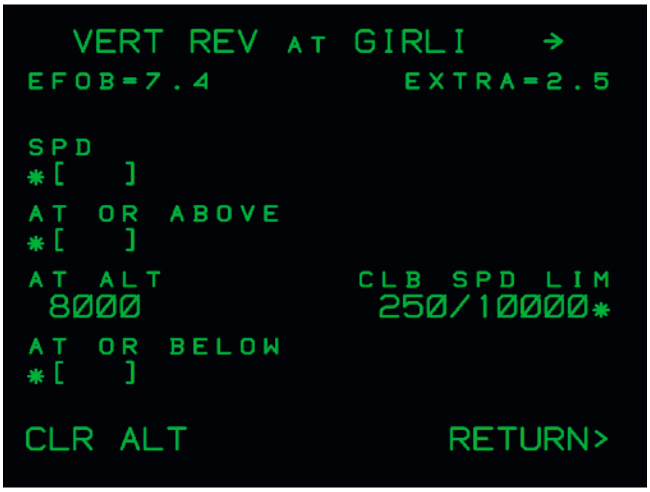


The next waypoint on the SID, NITUD, has a speed restriction of 250 knots and an altitude constraint of 'at 8,000 ft'. With PROF mode engaged, the aircraft will not exceed either of these restrictions.

As the aircraft approaches 8,000 ft it will automatically level off at that altitude. If no AFCAS controls are touched, and the aircraft remains in PROF mode, the aircraft will remain at 8,000 ft until passing the final waypoint on the SID with that altitude restriction, which on this SID is GIRLI.

If ATC permits, the altitude constraint can be overruled by engaging **LVLCH** mode. The airspeed at the time of engagement will be selected in the IAS/M window. The aircraft will set climb power and adjust pitch to maintain the climb speed. Once the aircraft has passed the final waypoint on the SID with the altitude constraint, **PROF** mode can be re-engaged and the aircraft will follow an updated vertical profile to the top of climb.

Alternatively, it is possible to clear a waypoint's altitude constraint via the LAT REV page on the FMS.



If PROF mode is engaged as the aircraft passes 10,000 ft, the AFCAS will automatically lower the nose and accelerate to the new climb speed of 275 knots. The climb speed is dictated by the Cost Index we entered at the start of the flight.

Above 10,000 ft we can switch **OFF** the landing lights and switch **OFF** the seatbelt signs.

Now is also a good time to set the ND range selector to a larger range for better situational awareness of what is coming up on the flight plan.

As we continue to climb, monitor the navigation and engine instruments to ensure that the aircraft continues to fly the correct course and vertical profile.

The aircraft will maintain the climb speed of 275 knots until passing the IAS/Mach change-over altitude at approximately 27,000 ft, at which point the speed will switch over to Mach 0.69.

Cruise

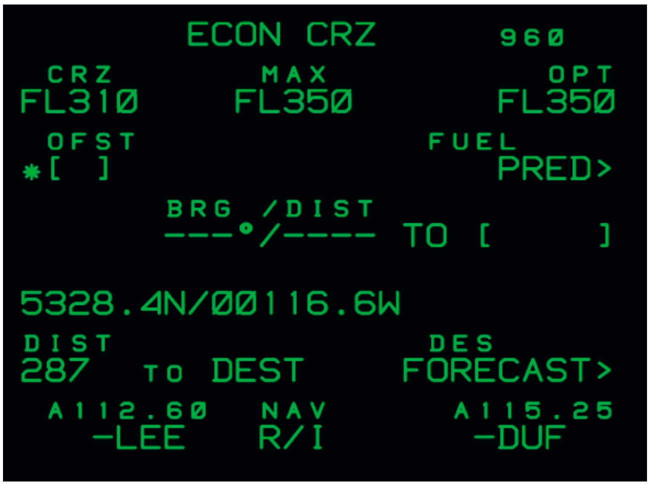
On reaching the preselected cruise altitude of 31,000 ft, ALT HOLD mode will automatically engage and the aircraft will level off and hold the altitude.

The aircraft's cruise speed is predominantly dependent on the Cost Index that was entered at the start of the flight. For this flight a Cost Index of 30 has given us a cruise speed of approximately Mach 0.69 – a good balance between speed and fuel consumption. The cruise speed can be changed on the MODE and TACT MODE pages of the FMS; the former is used to change the Cost Index for all flight phases, and the latter can be used to change speed only in the current phase of the flight.

On the lower overhead panel we can monitor the cabin pressurisation on the three analogue instruments. All indications should remain stable in the cruise and below their marked limits. The landing altitude should also remain set on the LDG ALT panel.

On the LDG ALT panel, we can set the approximate landing altitude for runway 18R at Amsterdam, which is **-13ft**.

On the FMS, press the PROG key to open the progress page. This is a useful page to monitor as it provides such information as present position, distance to destination, currently tuned navaids, and fuel predications. For extra situational awareness, you may wish to have the PROG page open on one FMS and the F-PLN page open on the other.



Aircraft tour

This short sector doesn't give us too much time in the cruise, but this is a good opportunity to briefly explore some features of the cockpit and cabin which are otherwise not covered in this tutorial flight.

On the left and right sidewalls of the cockpit resides the EFB/tablet. This features a variety of useful apps to assist you when flying the aircraft. The Aircraft app is something which has been covered extensively in this tutorial flight, but other apps contain features such as checklists, maps, and SimBrief and Navigraph charts integration.

The EFB on either side of the cockpit can be switched between two positions: the cockpit side wall or the window. Click the EFB's bezel to switch between the two positions. The EFB can be hidden entirely by clicking the microphone attached to the window frame.

Similarly, the yokes can be hidden either by clicking the SMOKE GOGGLE panel on the cockpit side panels.

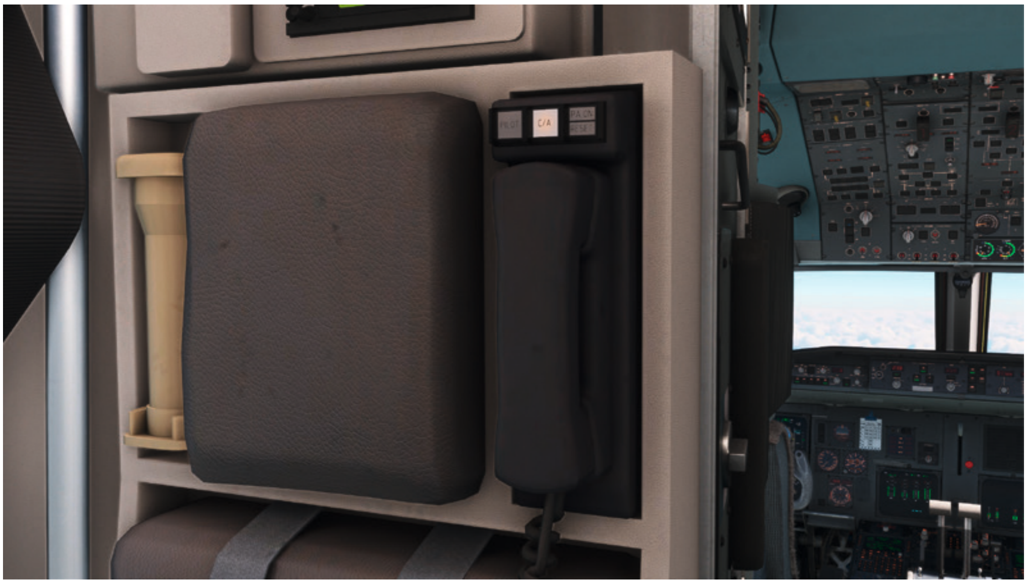
The face of the yoke features a chart holder with interactive paper checklists. These checklists display up to 20 pages, with clickspots on the paper used to cycle through the pages. Custom documents can be added to the checklists, and the checklists can be hidden by clicking the light housing at the top of the yoke.

Both pilot seats feature animated armrests and headrest, and you can slide the chairs between forward/aft and up/down positions. An observer's seat is stowed behind the Captain and can be operated by clicking either of the two red latches on the wall.

Sun visors are fitted to rails on either side of the cockpit. They can be moved along the rail by clicking and dragging the attachment point. Their visibility can be toggled via the SUN VISORS option on the EFB.

The cockpit door is simulated with locking functionality. In order to open the cockpit door, the F-DK DOOR LOCK button must be depressed on the pedestal before clicking the door handle. With the door unlocked and open, F-DK DOOR and NOT LKD lights will illuminate in the cockpit after two minutes to inform the pilots of the unlocked condition. Once the door is closed, depressing the F-DK DOOR LOCK button will lock the door and extinguish the lights.

Using a combination of the left-alt and arrow keys on your keyboard (L1 and thumbsticks on a PS5 controller, LB and thumbsticks on an Xbox controller), it is possible to move the camera rearwards into the passenger cabin. The passenger cabin is extensively simulated in the F70 and F100, including handset panels in the forward and aft galleys (and L2 door position in applicable variants) that communicate with each other and the cockpit, cabin lighting controls on the aft wall of the forward galley and even functional hot water taps and ovens. You'll even hear the cabin crew using these features throughout the flight!



The aircraft's passenger and service doors are also fully interactable and can be opened and closed when on the ground, although it's probably best that we don't try to open them at 31,000 ft! Two different passenger door types are modelled and simulated on the F100, as well as two different service door types depending on the variant.

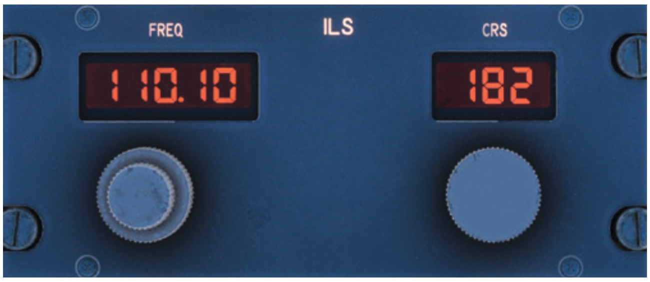
A digital music player is fitted to the forward wall of the forward galley. It has two modes: Announcements and Music. In the real aircraft the two modes can be toggled by inserting specific SD cards with the respective software, but in this simulation the modes can be toggled by pressing and holding the MODE button for a few seconds, or via the 'CABIN MUSIC' option on the EFB. Up to seven music tracks can be selected and played in the cabin, and a variety of announcements can also be made.

We can return to the cockpit either by moving the camera back manually, by pressing the **[F]** key on your keyboard, or by resetting the camera via the MSFS camera menu.

Descent

To reduce the workload in the descent and approach phases, we can tune the ILS frequency for the approach into the ILS radios now and set the localiser course.

On the ILS radio on the aft pedestal, set a frequency of **110.10** and set a course of **182** degrees.



On the EFIS control panel, depress the APP/VOR button until **APP** is selected.

The localiser and glideslope scales will now be visible on the PFD and the indicators will come alive once within range of the ILS.

Continuing on the EFIS control panel, rotate the DH selector to **M/DA** and set our barometric decision height of 187 ft. The M/DA increases in 10-foot increments, so we can round up and set **190 ft**.

On the PRESSURIZATION panel, ensure our landing altitude is still set to approximately **-13 ft**.

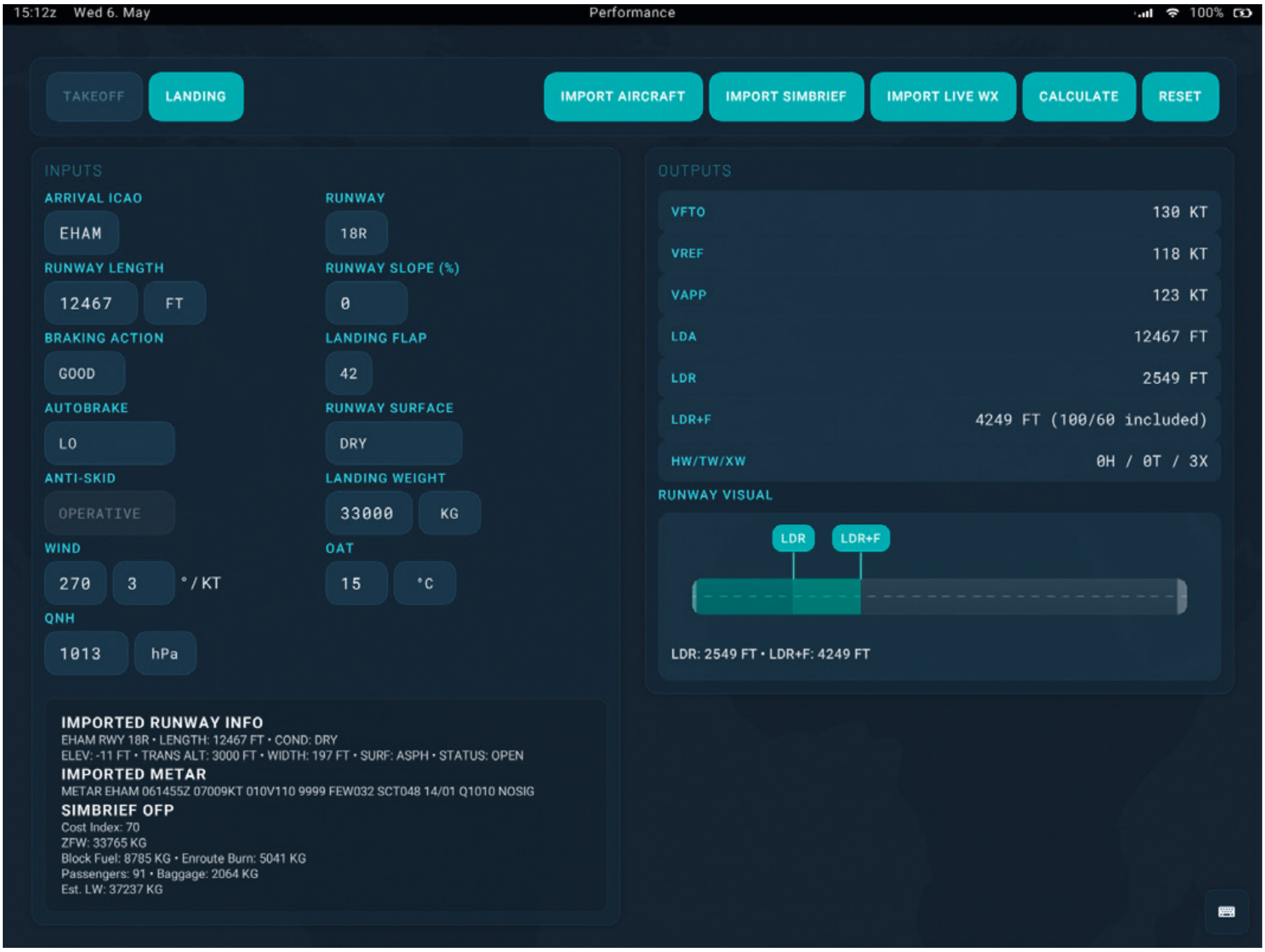
On the EFB tablet, open the Performance app and select the **LANDING** page. This page works similarly to the TAKEOFF page whereby we must populate all the INPUT fields with accurate data in order to receive an accurate OUTPUT.

As we haven't imported a SimBrief OFP for this flight, we will need to manually input the ARRIVAL ICAO and RUNWAY. Enter **EHAM** into the ARRIVAL ICAO field and select RUNWAY **18R**. Enter our estimated landing weight of **33,000 kg** into the LANDING WEIGHT field.

Runway 18R at Amsterdam has a length of over 12,000 ft (3,800 m), so we won't need to use maximum braking. Set the AUTOBRAKE value to **LO**.

Next, press **IMPORT LIVE WX** to import the current weather conditions at Amsterdam and press the CALCULATE button.

With all the INPUT fields populated, press the **CALCULATE** button to generate our landing performance.



We can now prepare the aircraft for landing using the outputted data.

Moving down to the centre of the main instrument panel, set the autobrake to **LO** (low setting).

On the FMS, press the **TO/APPR** key to open the APPROACH page. This page displays the approach speeds for the selected landing setting. By default, flaps 42 is the default landing setting and that is what we will use today. A WIND CORR field allows the entry of a wind correction in windy conditions, but as the wind speed is expected to be less than 10 knots at the destination, we don't need to input any wind correction.

Next, press the **PROG** key to open the PROGRESS page, followed by **LSK5R** to open the DES FORECAST page. On this page we can enter winds at up to three points on our descent profile, plus at the destination airport. Entering the forecasted winds allows the FMS to more accurately calculate the descent profile. As we are flying with minimal winds today, we can just enter the wind for our destination airport. Enter **'270/3'** into the scratchpad and press **LSK4L** to move the values into the destination airport field.

If we wanted to enter winds for other altitudes throughout the descent, we can enter them in the format of '5000/270/3', where 5000 is the altitude in feet, 270 is the wind direction in degrees, and 3 is the wind speed in knots.

The FMS automatically calculates the top of descent (T/D) point based on the current flight conditions and the flight plan. It displays this information in the form of a blue '(T/D)' symbol on the ND, as well as on the F-PLN page of the FMS.

Descents in the F70 and F100 are typically conducted in PROF mode, as this ensures all speed and altitude restrictions are obeyed by the AFCAS. In certain situations, however, pilots may prefer to use LVLCH or V/S modes to have more control over their descent profile.

As we approach 15 NM from the calculated top of descent point, decrease the preselected altitude on the FMP to our first altitude restriction on our descent profile, **10,000 ft** at SUGOL.

Momentarily **PULL** the ALTITUDE knob to arm DES (descent) mode. The armed mode will display as a blue 'DES' on the PFD.

If the aircraft flies over the top of descent point with DES mode armed, it will automatically capture the descent profile and initiate the descent.

With DES mode armed prior to the top of descent, an immediate descent (IMM DES) can be triggered on the F-PLN A page. This can be particularly useful for passenger comfort if we wanted to initially fly a shallower descent profile. Let's try that out now by opening the **F-PLN A** page and pressing **LSK1R** (IMM DES).

The aircraft will initially descend at -1,000 ft/min, as indicated in the LSK1R field. This number can be adjusted by copying a new value from the scratchpad, but we'll leave it at its default value for this tutorial flight.

As this descent rate is less than the calculated decent profile from the top of descent point, we will intercept the original descent profile at some point during the descent. This intercept point is indicated by an '(I/P)' symbol on the ND.

Once passing the intercept point, the aircraft will recapture the original descent profile and continue to descend on that profile.

Although we may not need them on this flight, the speed brakes are available with no limitations throughout the entire flight regime. The two-position speed brake lever is positioned on the pedestal and has IN and OUT positions.

Note: *The speed brake lever only has two positions: IN and OUT. It is not infinitely variable.*

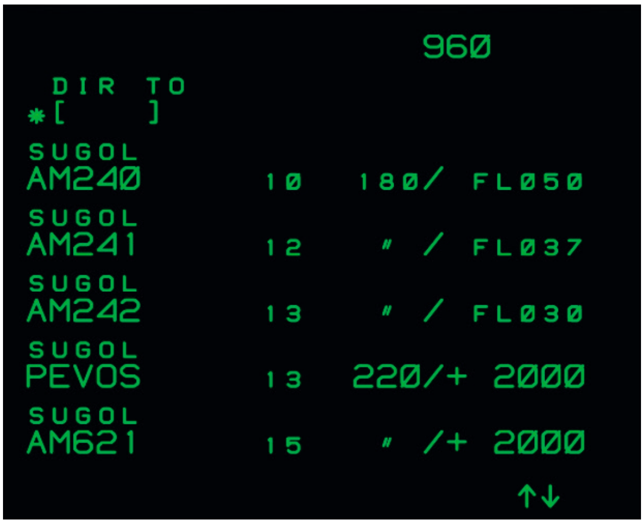
Approach and landing

Passing through 10,000 ft, switch **ON** the seatbelt signs and switch **ON** the three main landing lights. The aircraft will begin to slow to the speed limit of 250 knots below 10,000 ft.

As we approach the SUGOL waypoint, the aircraft will automatically level off at 7,000 ft. At this point it is worth considering that the approach procedure entered into the FMS is the exact approach procedure listed in the Navdata, which includes a holding pattern above the SPL VOR at the centre of the airport. Although this approach procedure is correctly displayed, in the real world we would typically expect to receive instructions from ATC to either vector us via headings to the final approach fix, or to fly directly to one of the later waypoints on the approach procedure.

For this tutorial flight, let's assume that ATC has cleared us directly to the **AM241** waypoint.

Once we have passed SUGOL, press the **DIR** key on the FMS to open the Direct-To page, and use the 'UP' and 'DOWN' arrow keys to scroll through the list until the AM241 waypoint is displayed. Press the LSK to the left of 'AM241' to trigger a Direct-To from the aircraft present position to the selected waypoint.



The FMS will delete all skipped waypoints from the flight plan and will recalculate the descent profile to the next speed/altitude constraints.

We can now begin descending further towards the altitude of the final approach fix. Set **2,000 ft** on the FMP and engage **LVLCH** mode. The aircraft will select idle thrust and will adjust pitch to maintain a descent at the aircraft's present speed.

Approaching Amsterdam's transition altitude of 3,000 ft, depress the ALTM button on the EFIS control panel so that **QNH** is displayed. Ensure all altimeters show the airfield's current barometric pressure of 1013 mb.

As we level off at 2,000 ft, we can start to reduce our speed in preparation for landing. Reduce the selected speed on the FMP to our green dot plus 20 kt speed of **183 knots**.

On reaching 183 knots, the First Officer will call out to select flaps 8. When the callout is heard, select **flaps 8**.

Once inbound to the PEVOS waypoint, we will be on an intercept heading for the localiser. Engage **LAND** mode on the FMP and the aircraft will automatically capture the localiser and glideslope once within range.

Inform the flight attendants of our upcoming arrival by pressing the ALL ATTND button on the overhead. Await confirmation from the crew that the cabin is secured.

Once we hear a callout from the First Officer we can select the landing gear **DOWN**. Confirm that three green lights are illuminated.

With the landing gear down, we can **ARM** the lift dumpers by depressing the LIFTD ARM push-button on the pedestal and confirming that the blue ARM light illuminates.

As we roll out on the localiser, continue reducing the selected speed further to the green dot minus 10 kt speed of **153 kt**.

The aircraft will automatically capture the glideslope, and when the First Officer calls out for **flaps 25**, select flaps 25 and reduce the selected speed to the VMA + 5 kt speed. This is 5 knots above the amber strip on the PFD speed scale and should be approximately **135 kt** in this tutorial flight.

Once stabilised on the ILS, the First Officer will call out Flaps 42. We can select **flaps 42** and reduce our selected speed to the VAPP speed of **125 kt**.

We can now perform the landing checklist.

Confirm that the cabin has been warned.

Check that all altimeters are set to the correct airfield pressure.

Set the FMP altitude to our missed approach altitude of **2,000 ft**.

Confirm that the landing gear is down and all three green lights are illuminated.

Confirm the lift dumpers are armed and the blue ARMED light is illuminated.

Confirm that the flaps are set to flaps 42 and that the PFD indicates the correct flap setting.

Passing through 500 ft, if the autoland conditions have been met, a LAND 2 annunciator will be displayed at the top of the PFD, indicating that an autoland can be performed. However, as conditions are perfect for flying today, this is a good time to disconnect the autopilot and autothrottle and to fly the remainder of the approach manually.

As the aircraft crosses the runway threshold, the GPWS will provide aural alerts for each 10 feet of altitude loss. At 30 feet gently bring the thrust levers to idle and begin to flare, gently raising the nose just above the horizon. The aircraft should touch down smoothly.

After touchdown, select reverse thrust and gently lower the nose-wheel onto the runway. The lift dumpers will deploy automatically.

At 60 knots, deselect reverse thrust and momentarily apply manual braking to disengage the autobrake. Slow the aircraft down further to taxi speed, using manual brake applications.

Once the aircraft has slowed, take the first available taxiway to the left.

Once safely off the runway, we can carry out the ‘Taxi in’ checklist.

Switch **OFF** the landing lights and strobe lights.

Switch **ON** the taxi light.

Start the APU by first moving the APU start selector to **ON**, then momentarily to **START**. Remember to pull the selector over the baulk between the ON and START positions.

Switch off the weather radar by setting both WXR brightness knobs to **OFF** and setting the tilt to **5° UP**.

Set the transponder mode to **XPNDR**.

Select **flaps UP**.

Retract the lift dumpers by depressing the **LIFTD ARM** push-button.

Push the yoke fully forward and set the flight control lock to **ON**.

We can now begin taxiing to the nearest available gate. Unfortunately for us, we have landed on runway 18R at Amsterdam, the Polderbaan, which is famous for its long taxi distance. The time it takes to taxi to the gates here can often be as long as the flight time!

In order to get us to the prototypical gates on A-Apron, taxi via: V, Z, B, Q, B and A2.

Shutdown

When turning into the gate, switch **OFF** the taxi light.

Once the aircraft has come to a complete stop, engage the parking brake.

Confirm the APU AVAIL light illuminates on the APU panel and then set both engine fuel levers to **SHUT**.

Switch **OFF** the seatbelt signs.

Once the engines have shut down, set the beacon light to **OFF**.

Set L1, R1, L2 and R2 fuel pumps **OFF**.

Set all seven pitot heat and window heat switches to **OFF**.

With the aircraft on the ground, it is also good practice to dim all the CRT displays when they are not in use.

Use the EFB as we did at the start of the flight to enable the **CHOCKS** and open the **FWD PAX** and **CARGO** doors ready for deboarding.

We can begin the passenger deboarding by opening the Boarding menu on the EFB and then clicking the **START DEBOARDING** button.

Leaving the aircraft

Once all passengers have deboarded the aircraft, we can run through the 'Termination' checklist for returning the aircraft back to a 'cold and dark' state.

At the top of the overhead panel, set both IRS mode selectors to **OFF**. Remember to pull the switches over the baulk between the NAV and ALN positions.

Set the brightness of all display units to **OFF**.

Set all exterior lights to **OFF**.

Set the emergency lights selector to **OFF**.

Shut down the APU by moving the APU start selector to **OFF**.

Note: *It is important to wait 70 seconds after the switch has been set to OFF, as this provides sufficient time for APU shutdown and ensures that the APU inlet door closes before battery power is removed from the aircraft.*

Finally, switch **OFF** the batteries switch.

Congratulations – you have completed the F70 Professional and F100 Professional tutorial flight. It's time to start planning your next destination in these aircraft!

LIMITATIONS AND SYSTEM DATA

General limitations

Minimum crew

Cockpit: Two pilots

Cabin: Two cabin attendants

Runway slope limits

Maximum (mean-runway slope): ± 2%

Maximum (touchdown zone) runway slope for autoland: ± 0.8%

Maximum wind components

BRAKING ACTION	GOOD	MEDIUM to GOOD	MEDIUM	MEDIUM to POOR	POOR
Friction Coefficient	≥ 0.40	0.36 – 0.39	0.30 – 0.35	0.26 – 0.29	≤ 0.25

Take-off and Manual Landing					
CROSS	35	-	15	-	5
TAIL	10	-	5	-	0
CAT II Manual Landing					
HEAD	30	-	30	-	30
CROSS	25	-	15	-	5
TAIL	10	-	5	-	0
TOTAL	30	-	30	-	30

Autoland Applicable for F100 with flaps 42 and F70. Values in brackets for F100 with flaps 25.					
HEAD	25 (15)	-	25 (15)	N/A	N/A
CROSS	25 (15)	-	15 (10)	N/A	N/A
TAIL	10 (10)	-	05 (05)	N/A	N/A
TOTAL	25 (15)	-	25 (15)	N/A	N/A

Flight manoeuvring load acceleration limits

Flaps up: + 2.5g to -1.0g

Flaps extended: + 2.0g to 0.0g

Instrument limit marks

Red arc, band or line: Min. and max. limits, warning area

Amber/yellow arc or band: Caution area

Green arc or band: Normal area

Altitude limits

Maximum operating altitude: 35,000 ft

Maximum take-off and landing altitude: 8,000 ft

Maximum operating temperature

Take-off, flight and landing with air conditioning operative: IAS + 35°C

On the ground with avionics cooling and air conditioning operative: 44°C

Minimum operating temperature

Take-off with ATS engaged: -54°C

Flex take-off with ATS engaged: -25°C

In flight: -70°C

To ensure arming of the T.O. configuration warning system:

Take-off with ATS not engaged: -2°C

Flex take-off with ATS not engaged: -5°C

Speed limitations

Minimum control speeds (F70)

VMCG: 101 kt

CMCA: Below VSR

Minimum control speeds (F100)

VMCG: 89 kt

CMCA: Below VS

Maximum flap operating speeds

Flaps 8: 250 kt / M.50

Flaps 15 and 25: 220 kt / M.45

Flaps 42: 180 kt / M.36

Maximum altitude for flap extension is 20,000 ft.

Landing gear limit speeds

Maximum LG operating speed (VLO):	200 kt
Maximum speed with gear down and locked:	200 kt

Maximum altitude for gear extension is 25,000 ft.

Recommended speed in turbulence

VB: 250 kt / M.65

Speed brakes

No limitation.

Lift dumper

Maximum lift dumper extension speed: 170 kt

Maximum tyre speed

Maximum tyre speed (ground speed): 195 kt (225 mph)

Cockpit windows open speed

Maximum speed: 160 kt

Weather limitations

Lowest possible weather minima

CAT I:	550m visibility or TDZ RVR
CAT II:	300m TDZ RVR
CAT IIIA:	200m TDZ RVR

Maximum crosswind components

Hydraulic system 1 failure:	10 kt
Hydraulic system 1 and 2 failure:	10 kt
Rudder manual (RUD 1 AND 2):	10 kt
Aileron manual (AIL 1 AND 2):	15 kt
Fuel asymmetry in excess of 350 kg:	20 kt
Nose-wheel steering inoperative:	10 kt

Restrictions due to glideslope TCH

Minimum threshold crossing height:	30 ft HAT
Descent limit shall not be lower than:	200 ft HAT
Visibility or RVR shall not be less than:	1,000 m

Air conditioning and pressurisation

Temperature control

Full cold:	15°C
12 o'clock position:	23°C
Full hot:	29°C

Cabin differential pressure

Nominal differential pressure:	7.45 PSI
Maximum differential pressure:	7.65 PSI

Cabin altitude rate of change

Climb:	500 ft/min
Descent:	300 ft/min

Cabin altitude warning

Excessive cabin altitude alert:	10,000 ft
Maximum passenger oxygen masks drop altitude:	14,000 ft
NO SMKG automatically on at:	14,000 ft

Avionics ground operation with OAT above 40°C

Ground operation without air conditioning not allowed.

If external air conditioning is on:	Unlimited ground operation
If air conditioning and APU are on:	APU duty cycle 20 minutes on and 60 minutes off

Pneumatic pressures

Bleed valve modulating pressure:	55 PSI
Over-pressure valve closes at:	70 PSI

Automatic flight

AP/FD glideslope limits

Minimum glideslope angle:	2.0°
Maximum glideslope angle:	4.0°
Vertical speed limits for glideslope capture:	-2,000 to +500 ft/min

Autopilot

Minimum altitude for us of AP after take-off in TO mode:	35 ft AGL
Minimum altitude for use of AP in cruise modes:	700 ft AGL
Minimum altitude for use of AP during non-precision approach:	250 ft AGL
Minimum altitude for use of AP during an ILS approach with G/S-LOC annunciation:	80 ft AGL
Minimum altitude for use of AP with LAND 2 annunciated:	0 ft AGL
Minimum altitude for use of AP after TO with NO AP BELOW 500 displayed:	500 ft AGL

Autothrottle

Before initiating thrust lever retard on one engine only; the ATS should be disengaged. The ATS may be re-engaged after both thrust levers have been aligned.

Autoland

Certified configurations: Flaps 25 and flaps 42.

Surface wind limits:

BRAKING ACTION	GOOD	MEDIUM to GOOD	MEDIUM	MEDIUM to POOR	POOR
Friction Coefficient	≥ 0.40	0.36 – 0.39	0.30 – 0.35	0.26 – 0.29	≤ 0.25

CAT II Manual Landing					
HEAD	30	-	30	-	30
CROSS	25	-	15	-	5
TAIL	10	-	5	-	0
TOTAL	30	-	30	-	30

Autoland					
HEAD	25 (15)	-	25 (15)	N/A	N/A
CROSS	25 (15)	-	15 (10)	N/A	N/A
TAIL	10 (10)	-	05 (05)	N/A	N/A
TOTAL	25 (15)	-	25 (15)	N/A	N/A

Note: *The values in brackets are applicable for F100 with flaps 25.*

Required runway surface condition for Autoland:

a. Reporting braking action MEDIUM or better.

b. Runway not contaminated.

AFCAS speed tracking performance

AFCAS (including ATS) speed tracking is inaccurate with one or more IRSs in the ATT mode.

Auxiliary Power Unit (APU)

Starter duty cycle

If an APU start is unsuccessful, the start selector must be selected to OFF before attempting another start. After an OFF selection restarting is inhibited for 30 seconds.

A maximum of three APU start attempts are allowed, provided a two-minute period is observed in between the start attempts.

APU fuel consumption

Normal flow (on ground):	90 kg/hr
Economy flow (on ground):	70 kg/hr
In flight:	90 kg/hr

After APU shutdown, wait 70 seconds before switching off batteries to allow for APU self-test and APU door closure (unless external power available).

To reduce APU fuel consumption and to increase APU service life, it is recommended to select the air conditioning ECON mode on (with TEMP CONTROL in auto) when OAT is below 15°C.

Start envelope

The APU may be started through the aircraft's operating envelope.

APU bleed air cannot be used in flight.

APU electrical supply may be used in flight up to FL350.

Electrical

The following table displays allowable voltage, load and frequency values for various electrical buses, generators, TRUs and external power:

DISPLAY SELECTOR	DISPLAY BUTTON	DISPLAY LEFT	DISPLAY CENTRE	DISPLAY RIGHT
DC BUS 1 / ESS / 2	VOLT	26 - 31	26 - 31	26 - 31
TRU	LOAD	100	100	100
1 / ESS / 2	VOLT	26 - 31	26 - 31	26 - 31
BAT	LOAD*	+30 / -30		+30 / -30
	VOLT	24 - 32		24 - 32
GEN 1 / APU / 2	LOAD - Continuous - 5 minutes - 5 seconds	 100 133 150	 100 133 150	 100 133 150
	VOLT	111 - 119	111 - 119	111 - 119
	FREQ	395 - 405	395 - 405	395 - 405
EXT PWR	VOLT		110 - 120	
	FREQ		395 - 415	
AC BUS 1 / ESS / 2	VOLT	111 - 119	111 - 119	111 - 119
	FREQ	395 - 405	395 - 405	395 - 405
EMER BUS AC / DC	VOLT	111 - 119		
	FREQ	396 - 404		

Note: *During APU start, BAT LOAD will indicate momentarily -120 / -120.*

Emergency equipment

Minimum pressure for dispatch

Crew oxygen (2 crew): 1,060 PSI

Crew oxygen (2 crew plus one observer): 1,560 PSI

Each passenger oxygen pack delivers oxygen for at least 12 minutes.

The table below shows the duration (in minutes) of crew oxygen supply:

Number of cockpit crew	2 crew			3 crew		
Indicated bottle pressure	1,000 PSI	1,500 PSI	1,850 PSI	1,000 PSI	1,500 PSI	1.850 PSI
Mask regulator 100 %						
• 0ft cabin altitude	11	16	20	-	11	13
• 8,000 ft	15	22	27	-	25	18
• 25,000 ft	29	43	52	-	29	36
• 35,000 ft	45	68	84	-	45	56
Mask regulator NORM						
• 14,000 ft cabin altitude	129	198	246	86	132	164
• 20,000 ft	88	135	167	58	90	112
• 25,000 ft	65	99	124	43	66	82
• 30,000 ft	64	98	121	42	65	81
• 35,000 ft	86	132	164	57	88	110
Emergency descent:						
• From 35,000ft to 10,000ft	10	10	10	10	10	10
• Level flight at 10,000 ft	113	182	231	70	116	149
• Total time (min)	123	192	241	80	126	159

The passenger system is automatically activated when the cabin altitude exceeds approximately 14,000 ft. Manual activation is obtained by operating the MAN OVRD p/b. In both cases the SYS ACTV light will come on and the No Smoking signs in the cabin will come on. The duration of the oxygen supply is independent of the number of passengers.

Flight controls

Maximum flap speeds

Flaps 8: 250 kt / M.50

Flaps 15 and 25: 220 kt / M.45

Flaps 42: 180 kt / M.36

One PFD flap indication may deviate by a maximum of one degree (plus/minus) from the selected flap position.

Maximum altitude for flap extension: 20,000 ft.

Do not use flaps in en route conditions.

Do not use flaps during prolonged holding.

Maximum lift dumper extension speed: 170 kt.

Intentionally switching off the hydraulic pressure to the stabiliser actuators in flight is prohibited, other than in the case of an abnormal situation.

Rapid and large alternating rudder and elevator control inputs, especially in combination with large changes in pitch, roll or yaw (e.g. large side slip angles) are prohibited, as they may result in structural failures at any speed.

Do not arm the lift dumper system before the landing gear is down and locked.

Fuel

Useable fuel tank capacity

Units	Wing tanks	Centre tank	Total
Litres	9,640	3,725	13,365
Kilograms (at 0.8 kg/l)	7,712	2,980	10,692

The capacity of each collector tank is approx. 925 litres (740 kg at 0.8 kg/l).

Refuelling/defuelling

Maximum refuelling pressure: 50 PSI

Maximum refuelling flow rate: 1,200 l/min

Maximum defuelling (suction) pressure: 7 PSI

Maximum defuelling flow rate: 450 l/min

Maximum allowable fuel asymmetry between wing tanks

Aircraft in flight: 1,000 kg

Landing: If fuel asymmetry is in excess of 350 kg, max. crosswind 20 kt.

In addition, if landing weight below 26,500 kg, use flap 25.

Maximum fuel level for fuel suction feed

JET A-1 or JET A: FL150

JET B: FL50

Unusable fuel

Fuel suction feed: 120 kg/tank

L1 or R1 fuel pump u/s: 14 kg/pump

L2 or R2 fuel pump u/s 120 kg/pump

Approved fuel types

JET A-1 kerosene (freezing point -47°C)

JET A kerosene (freezing point -40°C)

JET B (freezing point -50°C)

Hydraulics

Engine-driven pumps pressures

Minimum:	2,700 PSI
Normal:	3,000 PSI
Maximum:	3,500 PSI
Electric pumps:	3,000 PSI
Priority systems activated at:	2,300 PSI

Engine pump low pressure alerts

FAULT light on:	2,500 PSI
Reservoir low air pressure alert:	15 PSI

Reservoir capacities (nominal)

System 1:	23 l
System 2:	4 l
Minimum quantity indication for dispatch:	70%
Fluid low level alert system 1:	37%
Fluid low level alert system 2:	20%
Fluid overheat alert:	90°C

Fluid type to be used

Normal:	SKYDROL LD-4
Alternate:	SKYDROL 500B4, HYJET 4

Ice and rain protection

Speed limits

With any front window heat inoperative: MAX 300 kt IAS below 10,000 ft.

Engine anti-icing

Minimum duct pressure:	4 PSI
Maximum duct pressure:	25 PSI

Wing and tail anti-icing

Minimum bleed pressure: 4 PSI

Minimum duct temperature: 35°C

Instruments and recorders

The IRS may not be aligned nor used:

- Above 73° north latitude
- Below 60° south latitude

PFD

Flight path vector may not be used:

- By the PF in IMC
- During take-off

ND

When using NDBs as navigation or approach aids, the following ND mode/range combinations may not be selected:

- ARC (all ranges)
- MAP / 15, 30, 60, 120, 240

Altimeters

Aircraft on ground (valid from -1,000 ft to 8,000 ft MSL):

	EFIS (L and R)	STBY altimeter
Field elevation	Elev. +/- 45 ft	Elev. -35 / +80 ft

Weather radar

The weather radar system may not be used on the ground except when lining up for take-off.

Landing gear

Gear operating time

Retraction: 9 seconds

Extension: 32 seconds

Speed and altitude limits

For gear retraction or extension (VLO): 200 kt/FL 250

With gear extended (VLE): 200 kt/FL 250

Nose-wheel steering angle

Using rudder pedals:	7°
Using steering tiller:	76°
Aircraft towing:	130°

Brakes

Alternate brake system accumulator pressure:

- Normal: 3,000 PSI
- Minimum: 1,000 PSI

Maximum brake temperature before take-off: TOP GREEN BAND

Tyres

Maximum tyre (ground) speed: 195 kt

Navigation

FMS

The FMS may only be used as a supplemental means of navigation.

The FMS may not be used:

- Above 70° north latitude
- Below 60° south latitude.

The FMS fuel and weight computations shall not be used as primary information for the fuel and or range planning.

Use of the FMS to fly non-precision approaches (APP mode) is not permitted.

BRNAV requirements

BRNAV operation shall not be continued if the following FMS message is displayed: LOW POSITION ACCURACY.

PRNAV requirements

General PRNAV limitations:

- The distance to destination airport is 40 NM or less.
- Manual tuning of navaids is not allowed.
- FMS navaids are automatically or remotely tuned. Remotely tuned navaids must be within 40 NM.
- Distance from the destination airport.
- An FMS database shall be current.

PRNAV procedures

Prior to take–off:

- Align IRSs.
- Verify on FMS CDU ’ALIGN IRS’ message is not present.
- Select correct departure runway on FMS CDU.
- Arm NAV mode on FMP.

At take–off:

Select TOGA triggers.

Prior to PRNAV entry:

- Select MAP mode on EFIS.
- Select NAV mode on FMP.
- ’R/I’ mode indicated on FMS CDU.

At entry PRNAV airspace:

A reasonableness position check is made before descending below Minimum Safe Altitude (MSA) by comparison of FMS CDU and RMI distance and bearing.

PRNAV operation

Operation in PRNAV designated areas may not be initiated if:

- NAV mode cannot be engaged.
- The ’IRS ONLY NAVIGATION’ message is displayed on FMS CDU.
- One of the following FMS CDU messages is displayed:
    a. DEAD RECKONING NAV
    b. RADIO ONLY NAVIGATION
    c. VERIFY A/C POSITION
    d. FMC POSITION MISMATCH
    e. INDEPENDENT OPERATION
- ’NONE’ on FMS CDU Progress page (no navigation).

PRNAV required accuracy is lost and PRNAV operation may not be continued if:

- The FMS a/c position does not pass the reasonableness check.
- The ’FMS LO POS ACCURACY’ message is displayed on MFDS.
- NAV mode is disengaged.
- The ’IRS ONLY NAVIGATION’ message is displayed on the FMS.
- One of the messages as given above for initiation of PRNAV is displayed.

ILS back course

ILS back course operation is not allowed.

Power plant

Power plant limitations

Condition	Max. Duration	TAY 620		
		Max. TGT	Max. N1	Max. N2
Starting	Momentary (not exceeding 2 seconds)	700°C	-	-
Relight		780°C		
Ground/Approach Idle	Unrestricted	-	-	47.9% minimum
Take-off and Go-around	5 minutes	800°C	96.5%	103.5%
Max. Continuous	Unrestricted	735°C	96.5%	100.5%
Max. Overspeed	20 seconds (transient)	-	99.4%	106.6%
Max. Overtemp	20 seconds (transient)	820°C	-	-
Emergency Max. Reverse Thrust	60 seconds	800°C	96.5%	100.0%
Max. Reverse Thrust	60 seconds	-	-	-

Fuel temperature

Maximum (unrestricted): 90°C

Maximum (for 15 minutes): 130°C

Oil quantity

Minimum quantity (before engine start): GREEN BAND

Maximum consumption: 0.426 l/hr

Oil pressure

Oil pressure varies directly with N2 RPM.

Oil pressure in caution area (amber band):

- Aircraft on ground: Take-off not permitted.
- Aircraft in flight: Continued normal engine operation permitted as long as temperature remains within limits. If temperature comes outside limits, engine must be shut down.

Oil pressure in warning area (red band):

- Engine must be shut down.

Oil temperature

Minimum for starting:	-50°C
Minimum for taxi-out:	-30°C
Maximum (unrestricted):	105°C
Maximum (for 15 minutes):	120°C

Engine start limitations

Duty cycle:

- Normal use of the starter is limited to four times with a maximum of 2 minutes per attempt.
- Observe minimum 30 seconds rundown time between each attempt.
- After four attempts, delay use of the starter for at least 15 minutes.

Starter air pressure (APU bleed)

Recommended:	25-35 PSI
Minimum:	20 PSI

Starter air pressure (external air source)

Recommended (indication at external source):	30-50 PSI
Recommended (indication in cockpit):	25-45 PSI
Minimum (indication in cockpit:	20 PSI

Starter air pressure (bleed air)

Approximately: 30 PSI

Starter air pressure (start with battery power only)

Minimum (indication at external source): 35 PSI

Engine restart altitude

Maximum guaranteed engine restart altitude: FL250

Thrust reverser

TAY 620 engines:

- Thrust reversers are intended for ground use only.
- Intentional use of reverse thrust in flight is prohibited.
- If required, Emergency Maximum Reverse thrust may be used in emergency conditions and must be recorded in the AML.
- Powering back is prohibited

NORMAL PROCEDURES

Checklists

CHECKLISTS

POWER UP

Circuit Breakers	CHECKED
Fuel Levers	SHUT
LG Selector	DOWN
Batteries	ON
External Power/APU	ON
IRS	NAV
Emergency Lights	ARMED
Exterior Lights	SET

PREFLIGHT

Emergency Equipment	CHECKED
Oxygen	CHECKED
MFDS	ON
Test Panel	CHECKED
Flight Recorder	ON
Aircraft Documents	ON BOARD

PREPARATION

Circuit Breakers	CHECKED
Pins and Covers	ON BOARD
Oxygen	ON
Overhead Panel	CHECKED
Main Instrument Panels	CHECKED
Altimeters	.... SET
Pedestal	CHECKED
Parking Brake	SET
Fuel Quantity	.... KG
Serviceability	CHECKED
Crew Briefing	COMPLETED

CHECKLISTS

BEFORE STARTING

Seat Belts.. ON
Fuel Panel.. SET
Window and Probe Heat.. ON
Take-Off Data.. CHECKED AND SET
Transponder.. XPNDR
Windows and Doors.. CLOSED
Arm Slides.. ANNOUNCED
Beacon Lights.. ON

BEFORE TAXI

Anti-Icing .... OFF/.... ON
APU .... OFF/ON
Alert Lights .... OUT
Flaps.. .. Set
Trims .... SET
Ground Equipment.. REMOVED

DELAYED STARTING

Thrust Lever .... IDLE
Bleed Pressure.. CHECK
----------START SECOND ENGINE----------
Thrust Levers .... IDLE
APU.. OFF/ON
Alert Lights.. OUT

TAXI-OUT

Nav Systems.. SET
FMP.. SET
Fuel Levers.. OPEN
Liftdumpers .... ARMED
Transponder.. .... SET
Flight Controls .... CHECKED

CHECKLISTS

BEFORE TAKE-OFF

Cabin	READY/WARNED
TO Config	NORMAL
Brakes	CHECKED
Strobe Lights	ON
Transponder	TA/RA
WX Radar	ON
Crew Briefing	COMPLETED
Take-off Clearance	RECEIVED

AFTER TAKE-OFF

Altimeters	....SET
MFDS	CHECKED

DESCENT

Terrain Clearance/FMS Position	CHECKED
WX Radar	ON
Pressurization	SET
MFDS	CHECKED
Approach Preparation	COMPLETED

APPROACH

Seat Belts	ON
Approach Settings	CHECKED and SET
Crew Briefing	COMPLETED
Altimeters	.... SET

LANDING

Cabin	WARNED
Altimeters	.... SET
Missed Approach Altitude	.... SET
Gear	DOWN
Liftdumpers	ARMED
Flaps	.... SET

CHECKLISTS

TAXI-IN

Exterior Lights	SET
APU	ON/OFF
WX Radar	OFF
Transponder	XPNDR
Speed Brake	IN
Flaps	UP
Lift Dumpers	IN
Flight Controls	LOCKED

AFTER PARKING

Parking Brake	SET
DISARM SLIDES	ANNOUNCED
Fuel Levers	SHUT
Transponder	STBY
Seat Belts	OFF
Exterior Lights	SET
Anti-Icing	OFF
Fuel Pumps	OFF
Window and Probe Heat	OFF

TERMINATION

IRS	OFF
Display Units	OFF
Exterior Lights	OFF
Emergency Lights	OFF
Oxygen	OFF
APU	OFF
Batteries	OFF

Normal take-off

Temperature of individual brakes to be checked for possible brake dragging.

Once lined up, compass heading and aircraft position should be checked for position runway identification.

Thrust application may not be commenced until aircraft is lined up.

It should be checked that the required EPR is obtained prior to 80 kt.

Directional control during take-off run must be maintained by rudder pedal steering.

Keep forward pressure on the control column during the whole take-off run.

The NAV mode is normally armed before take-off. If not, engage NAV or HDG SELECT when appropriate and established in initial climb.

Rolling take-off

This is the standard take-off technique. Once the aircraft is lined up on the runway centre line with brakes released, advance thrust levers to above MIN TO position, wait for EPRs to reach approximately 1.30 EPR and pull TOGA triggers for approximately one second.

Static take-off

Bring the aircraft to a stop at the beginning of the runway, aligned with the runway heading. Advance thrust levers to above MIN TO position, wait for EPRs to reach approximately 1.30 EPR, gently release brakes and pull TOGA triggers for approximately one second.

A static take-off is recommended if:

- An engine run-up is required.
- Contaminated/slippery runway conditions exist.
- ATS is not available.
- RVR is less than 400 m.
- The difference between the runway length/obstacle limited take-off weight and the actual take-off weight is less than 300 kg.

Noise abatement take-off

There are different procedures for noise abatement. The standard Noise Abatement Procedure has an acceleration height of 3,000 ft HAA.

Rejected take-off

The rejection of a take-off at high speed can be extremely hazardous, especially when runway length and/or conditions are critical. Therefore, the take-off should only be rejected if continuation is considered less safe. The decision to reject may only be made before V1.

A rejected take-off will be initiated for:

- MFDS alerts
- Engine malfunctions
- Control problems affecting safe aircraft handling

The take-off rejection crew co-ordination procedure is initiated by the call “STOP” from either pilot. In all other cases, the decision to initiate the rejection is made by the Captain.

Once a rejection is initiated, it must be completed.

Crew coordination procedure

Following the “STOP” callout by either pilot:

- Move thrust levers rapidly to idle.
- Apply maximum brake pedal deflection.
- Pull thrust reverse levers to the idle stop.
- Apply normal/maximum reverse thrust.
- Maintain forward pressure to the control column, and correct for crosswind.

At 60 knots reduce reverse thrust to idle.

When aircraft is stationary:

- Parking brake set.
- Flaps 42 set.
- Reverse levers full down.
- Lift dumpers disarm.

If immediate assistance is required:

- Start APU.
- Shut down engines.
- Switch off beacon and strobe lights.

In case of a high speed RTO, a subsequent take-off should not be attempted within 10 minutes after the RTO.

If a decision is made to continue with another take-off:

- Reset FCCs by selecting the FD switches to OFF, then ON.
- On the TRP, select CLB and then reselect TOGA or required FLEX.
- If V1/V2 speed are not displayed on the EFIS, use the V2 selector on the FMP or, alternatively, use speeds from the FMS CDU or take-off data card.

Manoeuvring conditions after take-off

Minimum altitude and speed for turns after take-off

TYPE OF DEPARTURE OR CONFIGURATION	MINIMUM ALTITUDE HAA	MINIMUM SPEED
Normal departure	500 ft	V2 + 10
Noise abatement departure (SID)	300 ft	V2 + 10
Special engine-out procedure	100 ft	V2

Normal clean up

Flap retraction	Accel. height	F

Climb procedures

Climb speed schedule

Below FL100: 250 kt IAS or FMS departure speed.

FL100 and above:

- When PROF mode is used: As calculated by the FMS
- When PROF mode is not used: 280 kt IAS/M.73.

Maximum climb gradient speed is green dot speed.

Maximum rate of climb speed is 250 kt/M.65

Weather radar operations

When radar terrain clearance is assured and weather conditions permit, the weather radar may be switched off.

Use of landing lights

Landing lights may be retracted when passing transition altitude.

Cruise procedures

The standard cruise speed is the speed calculated by the FMS. When PROF mode is not used, use 310 kt/M.73.

The maximum speed during normal operation should be limited to 310 kt/M.75.

RVSM operations

Operation within RVSM airspace includes special requirements with regards to altitude indications and height keeping:

The autopilot shall be used for all operations in RVSM airspace except when re-trim, system resets, turbulence or TCAS alerts require momentary disengagement.

It is recommended to limit climb/descent rates to 1,000 ft/min in the last 1,000 feet to level off in order to avoid TCAS alerts.

The aircraft shall not be allowed to over/undershoot the cleared level by more than 150 ft.

Upon entering RVSM airspace (i.e. when climbing through FL290) and at least every hour during cruise, the PFD altitude indications shall be checked for compliance with RVSM requirements (maximum difference 200 ft).

Any of the following system failures/conditions shall render the aircraft non–compliant with RVSM requirements:

- Difference between PFD altitude indications of more than 200 ft.
- Loss of autopilot capability (both APs unserviceable).
- Loss of one or both ADCs or other failure resulting in the loss of two independent primary altitude indications.
- Any failure indicated in ECL as affecting RVSM capability.
- Turbulence resulting in inability to maintain cleared FL within required limits.

Contingency procedures following the loss of RVSM capability:

- Notify ATC immediately.
- Maintain cleared FL using remaining serviceable systems/indications.
- Watch for conflicting traffic.
- Make maximum use of exterior lights.

Descent procedures

If FMS PROF mode is used, descend via the FMS-calculated flight path and descent speeds.

If PROF mode is not used, use LVLCH and select speeds according to the standard descent speed schedule, and plan TOD as:

(3 x flightlevel) / 10 = NM in still air.

Do not use PROF mode during descent when NAV mode is not engaged.

Descent speed schedule

Above FL100:

- When PROF mode is used: As calculated by the FMS.
- When PROF mode is not used: 280 kt/M.73.

Below FL100: 250 kt.

Use of landing lights

Landing lights should be ON when passing transition level.

In conditions of reduced visibility (haze, fog, low clouds or precipitation) the use of landing lights is SCD in view of the possibility of undesirable reflections or disorientation.

Use of landing lights not only serves to ’see and be seen’ but also reduces the risk of bird collisions.

Use of speed brake

The speed brake may be operated without any speed restrictions and in all aircraft configurations.

Holding

Fly holding speed as calculated by FMS, or green dot + 20 kt.

Do not use flaps during prolonged holding.

Approach and landing procedures

The use of the full capacity of the AFCAS for approach and landing is recommended.

If visibility/RVR is less than 1,200 m and/or ceiling is less than 400 ft, an autoland is recommended.

All approaches must be stabilised no later than 1,000 ft HAA/HAT in IMC or 500 ft HAA/HAT in VMC. A stabilised approach means:

- In configuration.
- In lateral and vertical profile.
- In speed (FAS).
- In vertical speed.
- In thrust.
- Landing checklist completed.

After stabilisation flight manoeuvres should be restricted to corrections necessary to maintain the required flight path only.

If the approach is not stabilised at or after going below 1,000 ft HAA/HAT in IMC or 500 ft HAA/HAT in VMC, a go-around must be initiated.

The touchdown should take place in an area situated between 300 and 600 m after the runway threshold. This area is indicated by TDZ lights and/or markings.

Arrival crew briefing

The pilot flying shall give the arrival crew briefing, preferably before top of descent. The crew briefing shall cover at least the following items:

- Any deviation from the standard AOM procedures.
- Applicable minimum altitudes.
- Type of approach/landing and landing flap setting to be used.
- Approach profile, descent limit and, for non-precision approaches, rate of descent and MAPt.
- Missed Approach Procedure and how it is flown (NAV, HDGs, V/L).
- Runway condition and landing distance (if marginal).
- Transfer of control after landing when RH side tiller is not fitted.
- Initial taxi-in route.
- Set-up of NAV equipment.
- Operational impact of aircraft deficiencies, aircraft version (e.g. RH side tiller), fuel status, NOTAM/airport information and weather, if not yet covered.
- Reversion to a conventional procedure if a PRNAV arrival is planned.

Speed settings and wind correction

Approach speeds

The PFD speed symbols are used as the primary speed setting reference. The speeds on the landing data card are used as a back-up. These speeds are normally obtained from the FMS.

Conditions permitting, select flaps near to the normal manoeuvring speed for the actual configuration, to avoid large pitch corrections.

Normal manoeuvring speeds for configurations are:

- Flaps 0: Green dot plus 20 kt.
- Flaps 8: Green dot minus 10 kt.
- Flaps 15: Green dot minus 10 kt.
- Flaps 25 or 42: VMA + 5 kt (VMA = 1.23 VSR, and is displayed at the top of the amber strip at the PFD speed scale).

CAUTION! *Do not use an FAS below 100 kt. This lower limit will ensure that the TAS during the landing flare will not drop below 100 kt.*

Wind corrections

The approach speed (VMA + 5 kt) should be increased for wind, including gusts, as follows:

- Wind 10 kt or less: No correction.
- Wind (+ gust) 11-20 kt: + 5 kt.
- Wind (+ gust) more than 20 kt: +10 kt.
- Windshear suspected or reported: + 20 kt (maximum).

Landing flap setting

Flap 25 and flap 42 may be used for landing (including autoland).

Flap 42 should be used:

- If landing distance is limiting.
- If technical malfunctions require a correction of the landing distance.
- When landing on contaminated runways or runways with reduced braking action.

Speed brake

The speed brake may be used without restriction during approach and landing. Its use can shorten landing distance by helping ensure (positive) touchdown in the touchdown zone – particularly when making an autoland. It also causes a minor decrease in roll-out distance.

In particular, use of the speed brake during approach and landing may be considered when:

- Actual Landing Distance (including 200 m margin) approaches LDA.
- Braking action is less than good.
- Making an autoland on a wet/slippery runway (braking action must be MEDIUM or better for autoland).
- A steep approach is made.

If the speed brake is to be used during approach and landing it should be selected out no later than the last speed reduction (reduction to FAS) and then remain extended until after touchdown.

Approach initiation

Before starting the approach both pilots should check the following:

- Approach checklist completed.
- Altimeters set QNH.
- Navaids selected as required.
- ND modes selected as required.

Do not use LVLCH descent mode below 2,000 ft HAT.

Early stabilisation in speed/power and aircraft configuration, especially in low visibility conditions, is of great importance for a safe and successful approach.

For autolands the approach should be stabilised as to configuration, descent profile, speed and thrust, with the LANDING checklist completed no later than 1,000 ft HAA.

Maximum allowable LOC intercept angle is 90°.

The aircraft should be on the localizer prior to G/S interception. If circumstances require a descent from above the glide path or a descent prior to LOC interception, use the V/S mode and set the FMP altitude selector at 300 ft above the DA (rounded up to the next higher 100 ft).

CAT II approach

Approaches in CAT II weather conditions (DH between 100 and 200 ft) must be flown with the AP engaged. The use of ATS is recommended. In case of a GS/LOC indication at the FMA, the AP must be disengaged at the 'MINIMUMS' call, so as to ensure the minimum use height of 80 ft is adhered to, and a manual landing must be made.

In case of a LAND 2 indication at the FMA, the pilot has the option to autoland or to land manually. Autoland is recommended.

CAT III approach

Approaches in CAT III weather conditions must be flown with the AP engaged and an automatic landing is compulsory. For operation in CAT III weather conditions (DH between 50 and 100 ft) a LAND 2 indication at the FMA is required. The use of ATS is recommended.

Before approach, loss of autoland capability is displayed on MFDS (NO ALAND alert) and precludes CAT III operation.

Landing roll procedures

Autoland roll out

Touchdown:

After main gear touchdown, immediately select idle reverse. Increase reverse thrust if required.

Upon nose gear touch down:

If auto ROLL OUT is not allowed, disconnect AP. Continue with 'Manual Landing'.

Roll out:

- Monitor roll out.
- Reduce to idle reverse not later than 60 kt.
- Disconnect AP not later than 60 kt

Below 60 kt:

- Hand over control to left-hand-side pilot (if no steering tiller is fitted to the right-hand side)
- Cancel reverse thrust when taxi speed is reached.

Runway vacated beyond protection area:

Command TAXI IN checklist.

Manual landing

Aim at the touchdown target, about 300 metres beyond the landing threshold, on the centre line.

Cross the runway threshold at 50 ft RA.

Initiate the flare at 30 ft RA and slowly reduce thrust to idle.

When speed on short final is in excess of VMA + 5 kt, counteract the tendency for the aircraft to float and aim to land at the normal touchdown point.

When landing with flaps 42 and speed in excess of VMA + 20 kt, take care not to land the nose-wheel first. If in doubt go–around.

Upon touchdown of main landing gear, select idle reverse and lower the nose-wheel smoothly. After nose-wheel is on the ground, apply braking as necessary. Increase reverse thrust if required.

Reduce to idle reverse not later than 60 kt.

Below 60 kt hand over control to left-hand-side pilot (if no steering tiller is fitted to the right-hand side)

Stow one or both reverser(s) when taxi speed is reached.

When runway is vacated perform the TAXI IN checklist.

Crosswind landing

In crosswind, the AP applies rudder and aileron to align the aircraft for the automatic landing. Upon disengaging the AP during the ALN (ALIGN) phase (below approx. 150 ft AGL), initially hold rudder and aileron controls in the same positions as commanded by the AP at the time of disengagement.

When the aircraft is manually landed in crosswind conditions it is recommended to de-crab and align the aircraft with the runway between 100 and 50 ft. Aim for a positive touchdown on the upwind wheel. Counter the tendency for the upwind wing to lift by positive use of ailerons during touchdown and roll out.

Reverse thrust

Idle reverse thrust is normally used for all landings. Both reverse thrust levers must be pulled since the reverse thrust levers function as a manual lift dumper control.

Normal maximum reverse thrust (TAY 620) may be used at the pilot’s discretion, and if required, emergency reverse thrust (TAY 620) or maximum reverse thrust (TAY 650) may be used in emergency conditions.

Maximum efficiency is obtained when reverse thrust is selected at high speed and immediately after main gear touchdown.

When landing in a strong crosswind and/or when the runway surface friction is reduced, apply reverse thrust slowly and symmetrically.

If directional control problems occur:

- Release the brakes.
- Select idle reverse thrust, or even forward idle thrust.
- Regain runway centreline.
- When directional control is re-established, resume braking and (normal) maximum reverse thrust as required.
- When reaching taxi speed, stow one or both reversers.

Non-precision approaches

Automatic control of the aircraft is recommended during non-precision approaches using VOR/LOC or HDGs and V/S mode.

For VOR approaches, the pilot flying may use ROSE or ARC mode (any range). The pilot not flying may use ROSE, ARC or MAP mode, provided raw data can be monitored (via the RMIs). The pilot not flying should use FPV if the approach is flown using V/L or may alternatively remain with FD if the approach is flown using HDGs.

For localizer approaches, either pilot may use ROSE, ARC or MAP mode. The pilot not flying may use FD or FPV.

For NDB approaches, either pilot may use ROSE mode or MAP mode. If MAP mode is used, only ranges 15B or 30B may be selected by either pilot. The pilot not flying may use FD or FPV.

Step down fixes should not be crossed below their minimum crossing altitudes.

A continuous descent approach is required.

Level flight below 600 ft HAT is prohibited.

When reaching MDA, a decision should be made to either continue for landing or to go-around.

In case of a go-around, maintain final approach track until MAPt.

Circling approach

Study the approach charts carefully, as each circling is different. Pay special attention to the location of high ground and obstacles, the wind direction and velocity, and the cloud base.

Descend on the instrument letdown procedure to circling altitude. Use the navigation aids of an instrument runway if available. On an ILS letdown do not use LAND/APPR mode, as reversion to other modes required for the circling approach is not possible after LAND2 is annunciated. The use of VOR/LOC and V/S modes is therefore recommended.

Automatic control of the aircraft is recommended during these approaches, using FD modes as applicable for the instrument part of the approach. Set go-around altitude in the FMP altitude window and use ALT hold to level off at or above circling MDA. Level flight is permitted at or above MDA to the MAPt for the approach runway. If visual reference is not established by the MAPt, the appropriate go-around procedure should be flown. Use HDGs to establish on downwind for the landing runway. The AP may be used until intercepting 3° slope.

Plan on a definite circling procedure to be used when ground contact is established, preferably allowing a frequent visual check of the position relative to the landing runway. FMS bearing/distance to the landing runway will give additional guidance. The visual part must be executed at or above the MDA (minimum 600 ft HAA) and visual contact must be maintained at all times. The approach should be stabilised as to configuration, descent profile, speed and thrust, with the LANDING checklist completed no later than 500 ft HAA.

Visual approach

A visual approach can be made using automatic control, but manual control of the aircraft is recommended.

The description of the visual approach covers the standard circuit. When the circuit is amended, the configuration/speed schedule should be adjusted accordingly, taking into account the distance to go to touchdown and interception of the visual glide path.

Arrange the configuration changes and speed schedule so as to be established at 1,500 ft HAT, with flaps 8 and speed at green dot -10 kt, not later than abeam touchdown, or the comparable position if the standard pattern is not used.

Use all available navaids as a back-up to visual clues.

FPV/FPA display is normally selected no later than the end of the downwind leg.

When abeam threshold:

- Start timing (35 seconds +/- 1 second per 2 kt wind component).
- Select gear down.

End of downwind:

- AP off.
- Command or select HDG bug to the runway track.
- Turn base.
- Start descent along a 3° glidepath.
- Select flaps 25.
- Select required speed.
- Complete LANDING checklist.
- Aim to roll-out on final at approx. 800 ft HAT.
- Set go-around altitude.

At approx. 800 ft HAT on final and landing assured:

- Select flaps 42 (if flaps 42 is final flap setting).
- Select FAS.

Flight Path Vector

FPV only provides flight path indication relative to the ground and does not provide vertical or lateral information referenced to the landing runway. This means that actual aircraft path should always be judged against a combination of raw data, altimeter and visual cues.

For VOR approaches, the pilot not flying should select FPV if the approach is flown using V/L mode, since the FD will disappear at the moment of VOR/LOC capture on the pilot flying's side. If the approach is flown using HDGs, the pilot not flying may select either FD or FPV.

For NDB approaches, the pilot not flying may select FPV or FD.

FPV may be used by the pilot flying after becoming visual, to monitor the flight path and detect excessive flight path deviation at an early stage. Whenever the pilot flying selects FPV during an approach, the pilot not flying must also select FPV to avoid side-in-control logic problems.

For visual circuits FPV shall be used by both pilots.

Use of FPV in a visual circuit

If desired, FPV may be used to fly an exact downwind track.

Join the circuit by using the FD. Not later than at the end of the downwind leg, switch on the FPV.

Command or select downwind track. Fly the FPV aligned with the heading bug, so correcting for drift and thus flying an exact downwind track. To maintain constant altitude, keep the FPV on the horizon.

When turning to base leg, initiate a 3° descent angle by pitching the FPV down to the flight path target.

Command 'Set runway track'. Avoid overbanking by taking the roll pointer into the instrument scan.

With the heading bug selected to the runway track and visually established on the final approach track, keeping the FPV below the heading index will ensure proper drift correction.

The descent angle can be maintained or adjusted as necessary and once visually established on a 3° glide path in relation to the touchdown point, the FPV can be used as a cross-check that the desired aircraft path is maintained.

In case of a GO-AROUND, pulling the TOGA triggers will present the FD in GO-AROUND mode.

Go-around procedures

A go–around must be initiated by pulling the TOGA triggers.

- ATS will select GA EPR (if at standby, ATS will engage automatically).
- With the AP off, the pilot flying has to manually follow FD command bars.
- After rotation to go–around attitude, AFCAS will limit the rate of climb to 2,000 ft/min with existing speed (minimum F70: 1.13 VSR, F100: 1.2 VS) and a maximum speed of 200 kt.
- The top of the amber strip at the PFD speed scale shifts from F70:1.23 VSR to 1.13 VSR, F100: 1.3 VS to 1.2 VS, and F speed is displayed.
- The FD is automatically displayed, irrespective of FPV/FD selection, to provide go-around guidance.
- If speed brake was selected it will retract automatically.

The flaps must be selected from 25 (or less) to 0 or from 42 to 15.

For minimum height loss select GA flaps after achieving positive climb.

When go-around initiated:

- Command “GO-AROUND” and simultaneously pull TOGA triggers.
- Check FMA.
- Monitor that thrust levers move forward.
- Montor or control rotation (max. 18°) and speed (min. VMA).

When positive climb achieved:

- Command “FLAPS UP” or “FLAPS 15”.
- Command “GEAR UP”.
- Command “SET AUTOPILOT” (if not already in use).

Initial climb:

- Monitor speed, min. VMA +10 kt and pitch max. 18°.
- Command or set NAV or HDGs.

At GA altitude:

- Command “FLAPS UP” (if applicable).
- Command “SET CLIMB THRUST”.
- Check aircraft acceleration.

Rejected landing

The rejected landing procedure is similar to the go-around procedure, except that the manoeuvre begins with the thrust lever at or near idle and altitudes below 50 ft.

During dual autopilot operation, AFCAS will provide a safe climb-out, provided the TOGA mode is activated in-flight. When the TOGA mode is active, touchdown will not result in deactivation of the TOGA mode.

When the manoeuvre is flown manually, pay special attention to the following aspects:

- Pull TOGA triggers and check FMA.
- Increase pitch attitude, initially only to stop descent.
- During thrust application devote full attention to pitch attitude control.
- Do not rotate to a climb attitude until the speed is a minimum of FAS.
- Be prepared for a slow and/or uneven spool-up.
- Touching of the main gear must be expected, as it takes a few seconds for the engines to accelerate from approach idle to TOGA thrust.
- Do not command “GEAR UP” until the critical phase has been passed and a positive rate of climb is established.

MSFS CONTROL ASSIGNMENTS

Microsoft Flight Simulator allows users to customise the controller scheme of their external hardware, which can allow for a much more immersive experience. These controls can be set up within MSFS by navigating to Options > Controls Options.

The following table shows a list of non-normal MSFS control assignments that can be used in conjunction with the Just Flight F70 Professional and F100 Professional:

Aircraft control	MSFS control assignment
APU selector to OFF	APU OFF
APU selector to START	APU STARTER
Autopilot disconnect (yoke)	AUTOPILOT OFF
Autopilot engage (FMP)	AUTOPILOT ON
Autopilot engage/disengage toggle	TOGGLE AUTOPILOT MASTER
Flight Director switches (OFF/ON)	TOGGLE FLIGHT DIRECTOR
Fuel levers (OPEN/SHUT)	SET ENGINE 1 FUEL VALVE SET ENGINE 2 FUEL VALVE
Lift dumpers ARM/DISARM	TOGGLE ARM SPOILERS
MWL/MCL cancel	TOGGLE GPWS TOGGLE MASTER CAUTION TOGGLE MASTER WARNING
Nose-wheel steering tiller	NOSE WHEEL STEERING AXIS
TOGA triggers	AUTO THROTTLE TO GA

Note: *This is not a complete list of all MSFS control assignments for the F70 Professional and F100 Professional, and it does not include the basic control assignments for controls such as Pitch, Roll, Yaw, Throttles etc. which are shared between all aircraft.*

LVARs

Home cockpit users who require the use of LVARs to set up external hardware can find a complete list of LVARs used in the simulator by enabling Developer mode. Then, on the bar at the top of the screen, navigate to: Windows > Behaviours > Local Variables.

Entering instrument names or abbreviations into the ‘Filter’ field will vastly speed up the process of finding LVARs. For example, if you are trying to find the LVARs used for the strobe lights, you can search for ‘strobe’ and you will find the following LVAR: **XML_LIGHT_STROBE_SWITCH**.

With the Behaviour debug menu open, it is also possible to automatically populate the Filter field with the LVAR name of a specific control. With the Behaviour debug menu open, move your cursor over any control in the cockpit and then press **[CTRL]+[G]**.

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Thank you to all the testers for their invaluable contributions.

We would like to extend our special thanks to the many F70/F100 pilots and engineers who generously shared their expertise throughout this project. Our sincere appreciation also goes to the team at AM&TS (Curio) Woensdrecht for granting us access to their aircraft – particularly Winfried Mulders and Rob van den Berg, as well as Airline Technical Support for their assistance in recording the aircraft's engines and system sounds. Finally, we would like to thank Digital Aviation for their cooperation with this project.

In Memoriam

We would like to dedicate our F70 Professional and F100 Professional products to the memory of A.W. Maarse. The father of M. Maarse of SimAcoustics, he has been instrumental in the successful organisation and realisation of many sound recording sessions conducted by SimAcoustics. He played a key role in the sound development of the F70 and F100, two aircraft at the pinnacle of his home country's aviation industry.

Although he is no longer here to enjoy the final mix, we hope these products carry his memory for years to come. He will be greatly missed.

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