GNLU-910A FMS OPERATIONS MANUAL

Microsoft Flight Simulator

GNLU-910A FMS OPERATIONS MANUAL

CONTENTS

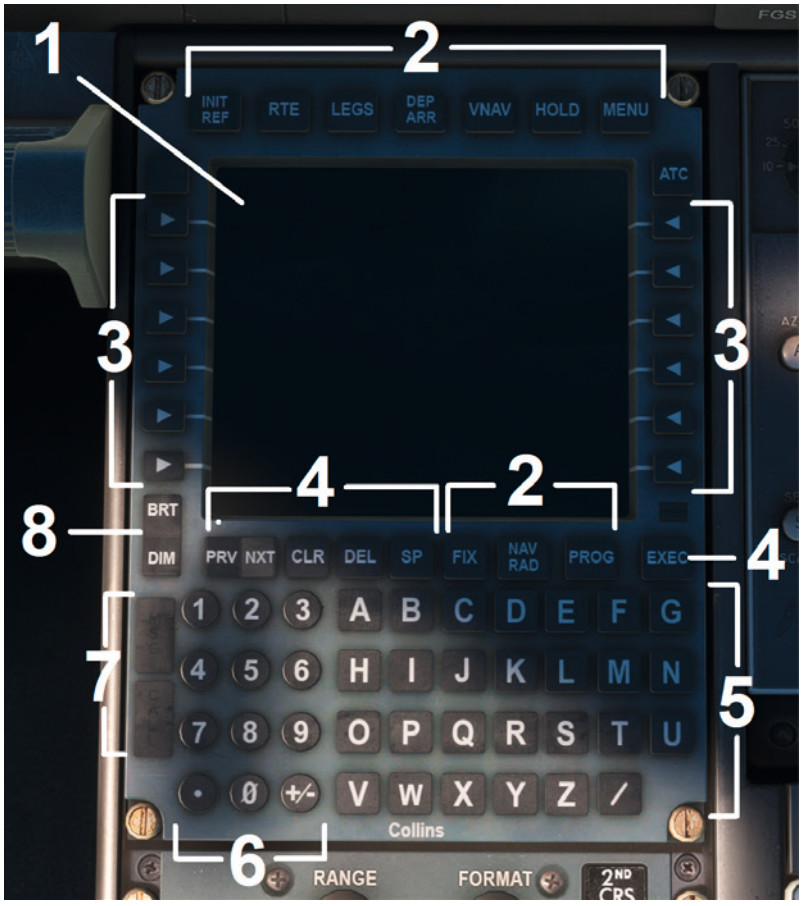
INTRODUCTION

This manual provides details of how to use the GNLU-910A Flight Management System (FMS) which is integrated into the Just Flight Professional series of aircraft for Microsoft Flight Simulator (MSFS).

MCDU operation

The multi-purpose control display unit (MCDU) is the interface unit between the pilot and the flight management computer (FMC) in the GNLU.

The MCDU is a unit with a display, full alphanumeric keyboard and mode, function and data entry (line select) keys. It is used for manually inserting system control parameters and selecting modes of operation. The MCDU displays data from the FMC and verifies the validity of data entered into the scratchpad. Flight plan and advisory data are always available for display on the MCDU.



1. **Display** – the MCDU display shows the FMC data entry and display pages.
2. **Mode keys**
3. **Line select keys** – the MCDU has 12 line select keys, six on each side. These are 1L (left) to 6L and 1R (right) to 6R. Line select keys have multiple functions; they accept data entry, execute functions and display data.
4. **Function keys**
5. **Alphanumeric keys**
6. **Numeric keys**
7. **Annunciators** – there are two annunciators on the left side of the MCDU:
    a. Amber MSG annunciator – illuminates when there is a message in the scratchpad.
    b. CALL annunciator – illuminates when a system whose data is not currently displayed on the MCDU requests control of the MCDU.
8. **BRT/DIM keys** – change the brightness of the MCDU display. These keys do not control the brightness of the MSG/CALL annunciators, which are controlled separately by the cockpit dimming controls. The keyboard backlighting is also controlled by the cockpit dimming controls.

Display format

The following shows possible display formats on the FMC data entry and display pages:

1. **Data status** – some pages may have a data status prefix ahead of the page title, such as ACT (active) or MOD (modified).
2. **Page title** – describes the subject of the data display on the MCDU.
3. **Page number** – some FMS page subjects may have more than one page. If there is only one page for the subject, the page number is 1/1 (one of one). If there is more than one page for a subject, the page number indicates X/Y, where X is the page currently displayed and Y is the total number of pages for that subject.
4. **Slash** – some data entries have a '/' (slash) that separates the left part of the data field from the right part. Data entry to the left of the forward slash ends with a forward slash. Data entry to the right of the forward slash starts with a forward slash. Data entry without the use of a slash will result in the closest field to the line select key being altered. Entry to only the left or right field will not alter the data in the un-entered field.
5. **Data prompts** – "- - - - -" are optional data entries.
6. **Box prompts** – "□□□□□" are required data entries.
7. **Small font** – data displayed in a small font is data entered automatically by the FMS.
8. **Large font** – data displayed in a large font is generally established by the pilot, either by direct entry or indirectly by retrieval from the navigation database.
9. **Function prompt** – prompts "<" and ">" indicate that the adjacent line select key will perform a function when pressed. In some cases, the prompt indicates that the adjacent line select key will provide access to another page. In other cases, the prompt indicates that the adjacent line select key may be used to perform a function.
10. **Scratchpad** – displays messages, keyboard entries and data that is being moved from one line to another. Up to 24 characters can be entered into the scratchpad.
11. **Colours** – the FMS is configured to have data displayed in colours other than white on the MCDU:
    - Magenta – used to highlight the active waypoint in the flight plan, active speed and altitude targets, and active items on the DEPARTURES and ARRIVALS pages.
    - Amber – used to highlight messages that have an alert status.
    - Cyan – used to highlight missed approach route and waypoints when inactive.

Mode keys

The MCDU keys provide direct access to the FMS pages. Of these mode keys, NAV RAD and ATC are not active. When an inactive key is pressed, the advisory message KEY NOT ACTIVE or KEY/FUNCTION INOP displays in the scratchpad. Press the CLR key to clear the message.

- **INIT REF (initialisation/reference)** – pressing INIT REF during initialisation displays pages which require data entry and display reference data. It displays the APPROACH REF page when en route.
- **RTE (route)** – displays the RTE page. The RTE page accepts entry and modification of the origin and destination airports and interlinking airway routes.
- **LEGS** – displays the RTE LEGS page, which shows the flight plan legs for review or modification.
- **DEP ARR (departure/arrival)** – displays the DEP/ARR INDEX page.
- **VNAV (vertical navigation)** – displays the CLB (climb) page before departure and during climb, displays the CRZ (cruise) page during cruise, and the DES (descent) page during the descent.
- **HOLD** – displays the RTE LEGS page with the holding pattern selection field, or displays the RTE HOLD page when the MOD RTE page is displayed and a preplanned hold exists in the flight plan.
- **MENU** – displays a menu giving access to other sub-systems (if any) interfaced with the MCDU.
- **ATC (air traffic control)** – this key is inactive. When pressed, the advisory message KEY NOT ACTIVE or KEY/FUNCTION INOP displays in the scratchpad. Press the CLR key to clear the message.
- **FIX** – displays the FIX INFO page for getting position fixes.
- **NAV RAD (navigation radio)** – this key is inactive. When pressed, the advisory message KEY NOT ACTIVE or KEY/FUNCTION INOP displays in the scratchpad. Press the CLR key to clear the message.
- **PROG (progress)** – displays the PROGRESS page showing flight plan progress.

Line select keys

The MCDU has 12 line select keys, six on each side. These are 1L (left) to 6L and 1R (right) to 6R. Line select keys have multiple functions. They accept data entry, execute functions and display data.

Function keys

These are the function keys on the MCDU:

- **PRV (previous)** – pressing the PRV key displays the previous page of multiple-page displays.
- **NXT (next)** – displays the next page of multiple-page displays.
- **CLR (clear)** – erases text and messages in the scratchpad.
- **DEL (delete)** – enters DELETE in the scratchpad. Pressing a line select key with DELETE in the scratchpad removes data from the data field in that line.
- **SP (space)** – enters a space on the scratchpad.
- **EXEC (execute)** – confirms activation of the new flight plan, modifications to an existing flight plan, and entry and changes to performance factors. The EXEC annunciator comes on as a prompt to press the EXEC key.

Alphanumeric keys

These are the alphanumeric keys on the MCDU:

- **Alphabetical keys** – pressing an alphabetical key enters the selected character in the scratchpad.
- **+/- key** – pressing the +/- key enters a minus (-) symbol in the scratchpad when first pressed. When pressed a second time, the minus symbol changes to a plus (+) symbol. The +/- key also enters a hyphen (-) for text entries.
- **Numeric keys** – pressing a numeric key enters the selected number or a decimal point in the scratchpad.

QUICK START GUIDE

This section is intended to get you up and running with the FMS as quickly as possible. Although it does follow the recommended set-up procedure for the FMS, it does not go into each step in any great depth. For a more detailed description of the GNLU-910A functions, please read the following sections of this manual. For a full tutorial flight, please refer to the FLYING WITH THE GNLU-910A section.

On the ground, prior to take-off

1. Power on the FMS via the aircraft's electrical system.
2. Set the aircraft's IRS switches to ALN (align) to begin IRS alignment (consult the aircraft's operation manual for full details of the aircraft's IRS alignment procedure).
3. On the POS INIT page, enter the current airport into the REF AIRPORT field. If it is available in the database, the current GATE can also be entered into the GATE field.
4. Press the 1R line select key to copy the coordinates from the POS INIT page into the scratchpad, and then press the 4R line select key to input them into the SET IRS POS field.
5. Set the aircraft's IRS switches to NAV and the aircraft's displays will power on once IRS alignment has completed. (***Note:*** *The aircraft should not be moved until IRS alignment is complete.*)

6. Press the line select key labelled ROUTE (6R) to open the RTE page where a flight plan can be created:
    - Input the ORIGIN and DEST (destination) airports.
    - Press the DEP/ARR key and select a departure runway, SID and transition (if available).
    - Return to the RTE page and manually input the first waypoint on the flight plan in the next empty field on the right side of the display. Airways can be used to connect waypoints and these can be entered into the left side of the display, with their termination waypoint on the right side of the display.
    - Continue adding the remainder of the flight plan on the RTE page. Use the PRV/NXT keys to cycle through pages as necessary.
    - An arrival runway and STAR at the destination airport can now be selected via the DEP ARR page (if available).
    - After the flight plan has been inputted, return to RTE page 1 and input the flight number into the FLT NO field.
    - The flight plan can then be activated by pressing the line select key next to the ACTIVATE field (6R) and then pressing the EXEC button.
7. Press the line select key next to the PERF INIT field (6R) to open the PERF INIT page, where the performance parameters for the flight can be entered:
    - Enter the aircraft's gross weight or zero fuel weight into the GW or ZFW fields. The other field will be automatically calculated.
    - Enter the reserve fuel weight in the RESERVES field.
    - Enter the cruise altitude in the CRZ ALT field (this can be feet of altitude ("25000") or flight level format ("250" or "FL250").
    - Press the EXEC button once data has been inputted into these required fields.

With the FMS set up for the flight and the IRS aligned, the FMS is capable of managing lateral navigation and providing vertical navigation guidance. The aircraft's autopilot must be configured in an RNAV or LNAV mode in order for it to track the FMS's lateral navigation. Please refer to the aircraft's Operations Manual for further information on the aircraft's autopilot.

During the flight

The **ROUTE** and **LEGS** pages can be used to monitor the flight plan and see information such as the active waypoint, and altitude and speed restrictions.

The **DEP ARR** page is used to set an arrival runway, STAR and transitions at the destination airport.

The **VNAV** pages can be used to monitor the vertical profile of the climb, cruise and descent portions of the flight. These pages are useful for calculating climb/descent gradients (including Top of Climb (T/C) and Top of Descent (T/D) as well as fuel and time estimations.

The **HOLDING** page is used for creating and editing holding patterns in the flight plan.

The **PROGRESS** page is useful for viewing the distance to go, estimated time of arrival and estimated fuel remaining at the TO and NEXT waypoints and the DEST airport. It also shows information regarding current wind speeds, temperature and XTK error.

The **APPROACH REF** page is useful for calculating approach speeds and enabling/disabling approach options.

APPROACH REF PAGE

The APPROACH REF page can be accessed in flight by pressing the INIT REF key.

The aircraft's current Gross Weight is shown at the top left corner of the page.

A VNAV APPR option can be toggled ON/OFF when a non-precision approach has been selected (e.g. RNAV, VOR, NDB etc.) and there is a defined approach path angle for that approach in the navigation database. When ON is selected in combination with the APPR ENABLE option, a white AVNAV (Advisory Vertical Navigation) scale will appear on the aircraft's EFIS ND displays when the required conditions are met, providing a visual indication of the vertical deviation of the aircraft with respect to the VNAV-computed course (also visible on the LEGS page). When OFF is selected, no AVNAV scale will be displayed on the aircraft's EFIS ND displays. The scale will also automatically disappear during a missed approach procedure.

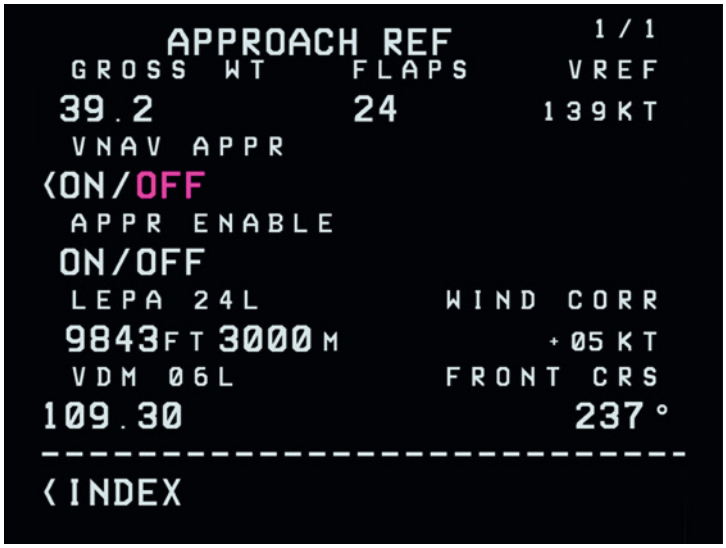
An APPR ENABLE option can be toggled ON/OFF when an FMS approach can be flown. The APPR ENABLE ON setting highlights in magenta when the following conditions exist:

- Aircraft is within 30 NM of the destination airport.
- Final approach fix (FAF) in active flight plan.
- Missed approach point (MAPT) in active flight plan.
- There are no waypoints in the active flight plan between the final approach course fix (FACF) or FAF and the MAPT, except for along-track fixes.
- Cruise altitude has been entered on the PERF INIT page.
- GPS sensor is navigating.

Note: *APPR ENABLE cannot be set to ON if an ILS, LOC or BCRS approach procedure has been selected in the flight plan.*

FMC-calculated Vref speeds are presented on the right side of the page in small font for each of the aircraft's landing flap settings. Pressing the line select key next to the chosen flap setting / Vref speed will cause it to change to a large font, indicating that it is selected. Alternatively, a custom value can be entered into the scratchpad and transferred to one of the lines. These values tell the FMC what speed profile to expect for the approach. The estimated speed at the runway threshold on the LEGS page will show Vref + 5 knots.

The WIND CORR field contains the increment that is to be added to the Vref speed to get the approach speed. The default value is "+05KT" but this can be adjusted based on the destination airport's wind gusts or icing conditions.



Advisory VNAV (AVNAV)

The RJ Professional is simulated without an autopilot-coupled VNAV (Vertical Navigation) mode, which is accurate to the real aircraft. However, the RJ is fitted with one rudimentary type of VNAV, in the form of an Advisory VNAV (AVNAV) system.

The AVNAV system in the RJ is a useful tool that becomes available for use during non-precision approaches that do not have a glideslope (e.g. RNAV, VOR, NDB etc.). When performing a non-precision approach with the AVNAV system active, an AVNAV vertical deviation indicator will appear on the EFIS ND when the aircraft is within 2 NM of the approach's Final Approach Fix (FAF) and will provide vertical guidance from the Final Approach Fix to the runway. It is important to note that, as per the name, this system is only advisory and therefore has no coupled autopilot modes. If the autopilot was to be used throughout the approach, VS mode would be preferred and a reference vertical speed can be found on the VNAV DES page of the GNLU-910A FMS.

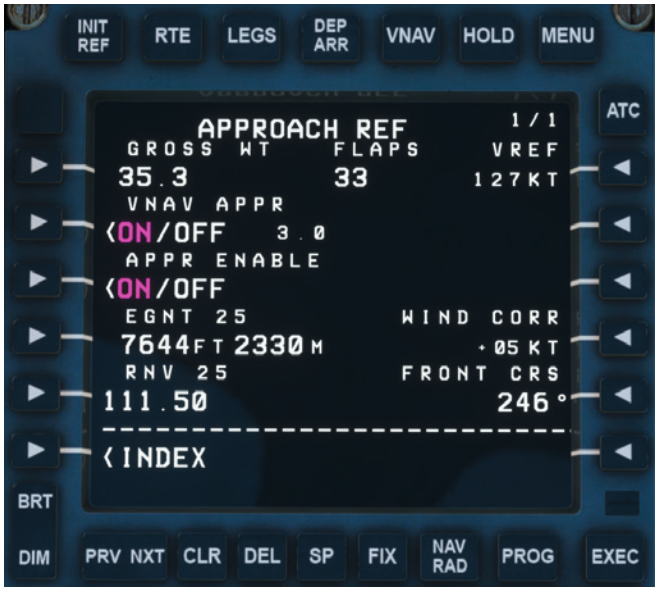
To enable the AVNAV system, a non-precision approach must first be activated in the flight plan on the GNLU-910A FMS (e.g. RNAV, VOR, NDB etc.).

With a non-precision approach activated, the VNAV APPR option will then become available on the APPROACH REF page when the aircraft is within 30 NM of the terminal area of the flight plan.

When passing 2 NM of the Final Approach Fix with the APPR ENABLE and VNAV APPR options both set to ON, the FMS runs through some systems checks. If they pass, the FMS APP annunciator will illuminate on the FLT ANNUNS panel and the AVNAV vertical deviation indicator will appear on the EFIS ND.

The AVNAV vertical deviation indicator will then indicate the aircraft's vertical position with respect to the calculated descent path. The scale indicates a range of +200 feet and -200 feet. Approaches using the AVNAV system can either be flown manually with the autopilot disengaged, or using VS mode if the autopilot is engaged.

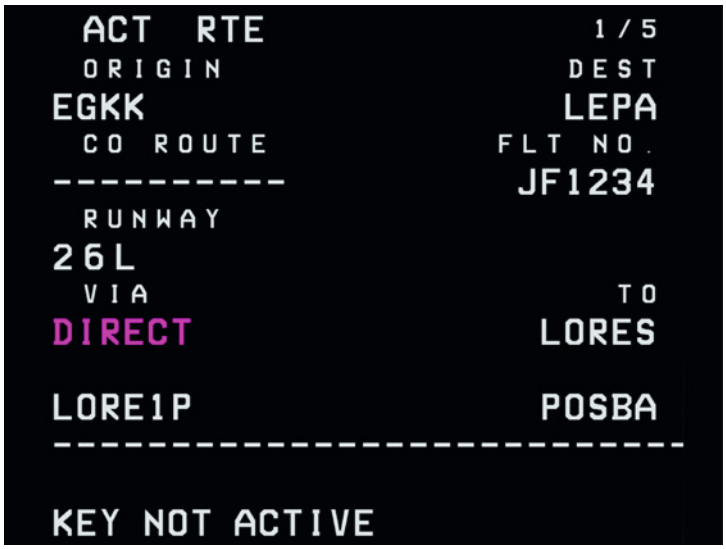
Note: *The AVNAV vertical deviation scale will only appear when the ARC or ROSE format is selected on the EFIS ND controller. There is no AVNAV scale on the EFIS PFD.*



ATC PAGE

The ATC page is simulated to be non-functional, as it is in the real GNLU-910A. When pressing the ATC key the advisory message KEY NOT ACTIVE or KEY/FUNCTION INOP will display in the scratchpad. Press the CLR key to clear the message from the scratchpad.

Communication with Air Traffic Control can be achieved via the aircraft's radio panels and/or the MSFS ATC menu.



FIX INFO PAGE

The FIX INFO page provides bearing and distance from an entered waypoint or navaid, and displays estimated time of arrival, distance to go, and predicted altitude for up to three radial or distance intersections. These intersections are for the current active flight plan and manually entered radials/distances from the fix. The fix entry must be a valid waypoint or navaid in the navigation database. Radial/distance (RAD/DIS) entries can be radials or distances from the entered fix.

There are three types of fix:

- **Abeam** – an abeam fix is at the point of the flight plan where the reference waypoint is 90 degrees from the flight plan leg.
- **Radial** – a radial fix is at the intersecting point of a specific radial from the reference waypoint to the flight plan.
- **Distance** – a distance fix is at the intersecting point of a specific distance from the reference waypoint in the flight plan.

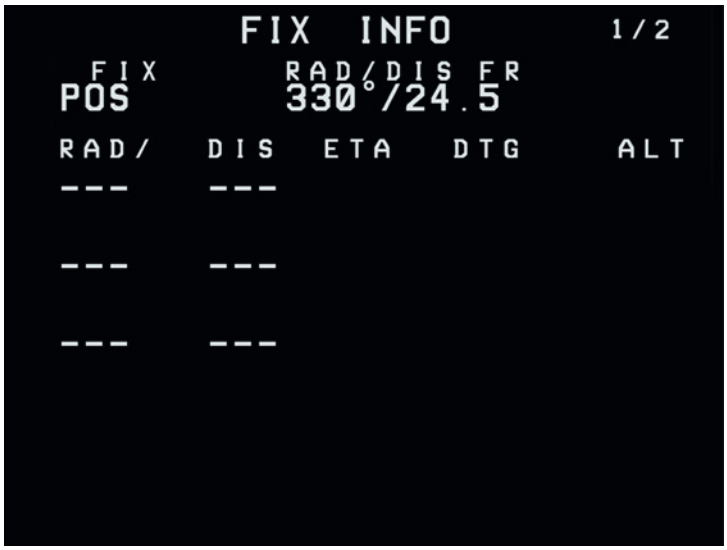
A single reference waypoint can be used to show two fixes at the same time. One fix can be based on a radial or a distance and the other based on the abeam point. Radial or distance intersection data may be copied to the scratchpad by pressing the corresponding line select key. Once in the scratchpad, the data can then be used as a waypoint in the route.

Getting a bearing and distance to a waypoint

The following procedure can be used to find the bearing and distance to a reference waypoint in the flight plan:

1. Press the FIX key to open the FIX INFO page.
2. Enter a reference waypoint into the scratchpad and press the 1L line select key.

The bearing and distance from that point to the aircraft's present position will be shown in the RAD/DIS field to the right of the reference waypoint.



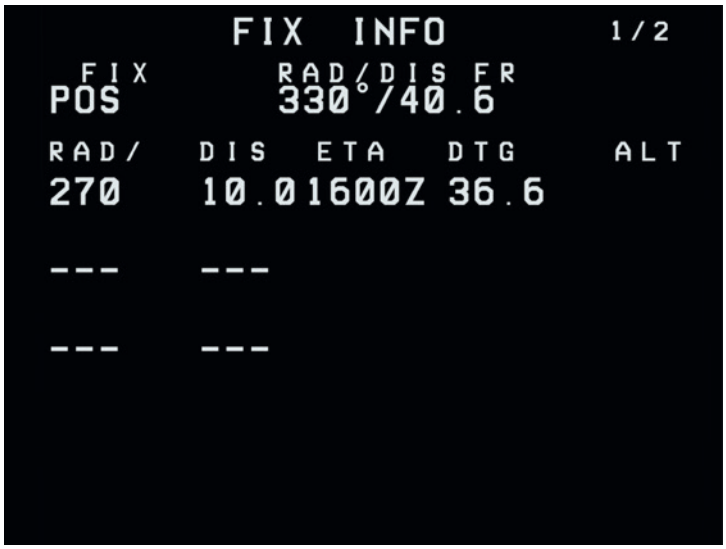
Getting a distance/radial fix

With a reference waypoint entered on the FIX INFO page, the following procedure can be used to find a fix along the flight plan on a specific radial or distance from the reference waypoint:

1. Enter the desired radial or distance in the scratchpad. A radial can be entered as a number (e.g."0.25"). A distance must be preceded by a slash (e.g. "/18").
2. Press the 2L line select key in the first empty RAD/DIS field.
3. Entry of a radial or distance will automatically display the corresponding other value.

4. The estimated time of arrival (ETA), distance to go (DTG) and predicted altitude at the first intersection with the active flight plan will be displayed on the same line.

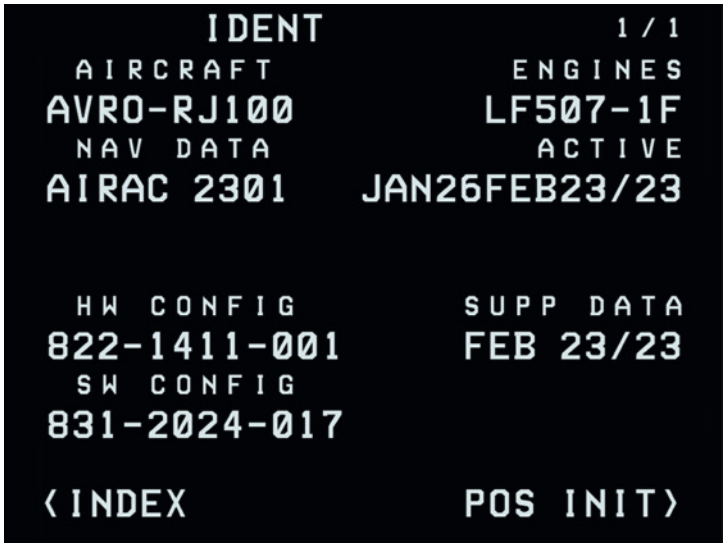
The radial will be displayed on the aircraft's EFIS as a dashed green line with the numeric value of the radial.



IDENT PAGE

The IDENT page can be accessed by pressing the 1L line select key to select "FMC" on the MENU page, or by pressing the 1L line select key to select IDENT on the INIT/REF INDEX page.

The IDENT page is used to check the configuration of the FMS equipment during the pre-flight checks, to verify that the system has proper hardware and software installed.



- **AIRCRAFT** – aircraft model.
- **NAV DATA** – the AIRAC cycle currently used by the FMC.

- **HW CONFIG** – GNLU part number.
- **SW CONFIG** – part number of the software configuration installed in the unit.
- **INDEX** – opens the INIT/REF INDEX page.
- **ENGINES** – aircraft's engine type.
- **ACTIVE** – effective period of active navigation database.
- **SUPP DATA** – effective date for supplemental database.
- **POS INIT** – opens the POS INIT page.

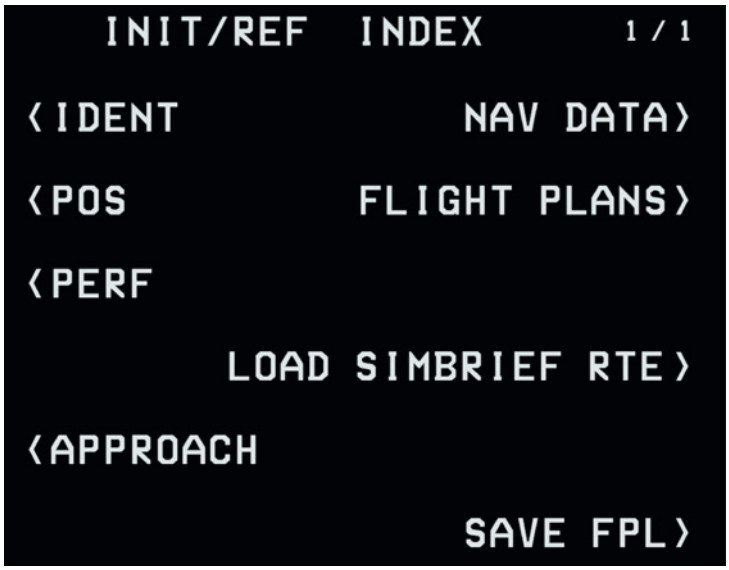
INIT/REF INDEX PAGE

The INIT/REF INDEX page is displayed when the 6L (INDEX) line select key is pressed on any of the following pages:

- IDENT
- POS INIT
- PERF INIT
- APPROACH REF

The INIT/REF INDEX page displays a list of various pages that cannot otherwise be accessed via a single mode key press. Any of the pages listed can be accessed by pressing the line select key adjacent to the desired page:

- IDENT (1L)
- POS (2L)
- PERF (3L)
- APPROACH (5L)
- NAV DATA (1R)
- FLIGHT PLANS (2R)
- LOAD ATC RTE (3R)
- SAVE FPL (6R)



MCDU MENU PAGE

The MCDU MENU page is the first page displayed once power has been applied to the FMS, and it can be accessed from any other page by pressing the MENU key.

The MCDU MENU page displays a list a various sub-systems interfaced with the MCDU and is configurable on a per operator basis, depending on what software is installed on the aircraft.

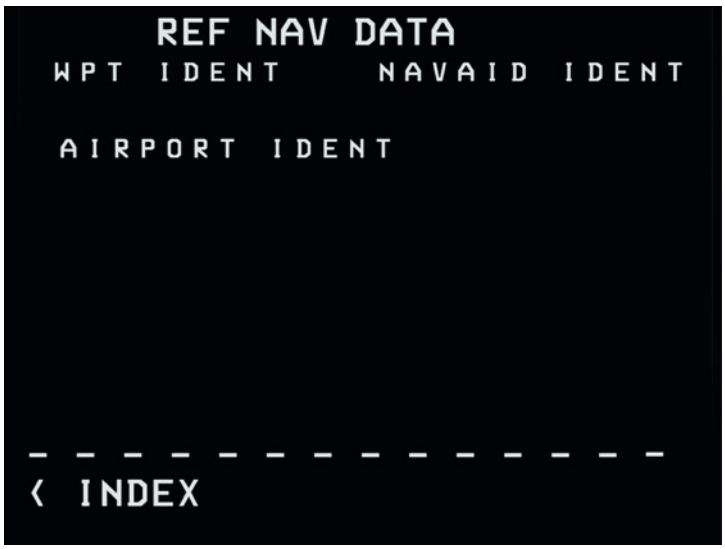
The only system on this page that is fitted to all aircraft is the FMC system. When the 1L line select key is pressed, the IDENT page will be displayed, providing information on the FMS's configuration. From the IDENT page, all other pages of the FMS can be accessed by pressing either the 6L (INDEX) or 6R (POS INIT) line select key.

REF NAV DATA PAGE

The REF NAV DATA page can be accessed by pressing the 1R (NAV DATA) line select key on the INIT/REF INDEX page.

The REF NAV DATA page shows information about waypoints, navigation aids, airports and runway identifiers.

The blank REF NAV DATA page allows entry of waypoints, navaids, airports and runway identifiers to find detailed information.



Finding information about a navaid

1. Enter the navaid identifier in the scratchpad.
2. Press the 1R line select key to input the navaid identifier into the NAVAID IDENT field.

The page will then display navigation database information for the navaid identifier. Such information includes:

- **LATITUDE and LONGITUDE** – the coordinates of the navaid.
- **FREQ** – the frequency of the navaid in MHz.
- **MAG VAR** – the magnetic variation of the navaid in degrees.
- **CLASS** – the classification of the selected navaid:
    - First letter: VOR (optional) –
        - "V" = VOR
    - Second letter: Co-located equipment –
        - D = DME
        - T = TACAN
        - M = Military TACAN
        - I = ILS/DME
        - N = MLS DME/N
        - P = MLS DME/P
    - Third letter: Altitude class –
        - T = Terminal
        - H = High altitude
        - L = Low altitude
        - U = Undefined
        - C = TACAN part of ILS
    - Fourth letter: Voice weather capability (optional) –
        - B = Scheduled broadcast
        - A = Automatic weather broadcast
        - W = No voice on navaid frequency
        - D = Biased ILS/DME or ILS/TACAN
- **ELEVATION** – the navaid's height above sea level in feet.

Finding information about an airport

1. Enter the airport identifier in the scratchpad.
2. Press the 2L line select key to input the airport identifier into the AIRPORT IDENT field.

Once an airport identifier has been entered, a runway identifier can also be entered to find out information about a runway at the airport:

3. Enter the runway identifier into the scratchpad in the RWNNN format (e.g. RW27L).
4. Press the 1L line select key to input the runway identifier into the RUNWAY IDENT field.

The page will then display navigation database information for the airport and runway identifiers. Such information includes:

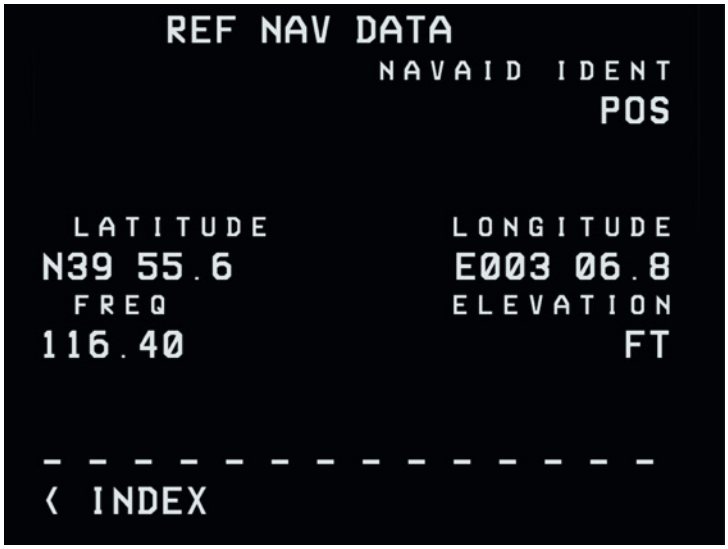
- **LATITUDE and LONGITUDE** – the coordinates of the navaid.
- **ELEVATION** – the navaid's height above sea level in feet.
- **LENGTH** – the length of the runway in feet and metres (requires that a runway identifier has been entered into the RUNWAY IDENT field).

Finding information about a waypoint

1. Enter the waypoint identifier in the scratchpad.
2. Press the 1L line select key to input the waypoint identifier into the WPT IDENT field.

The page will then display navigation database information for the waypoint identifier. Such information includes:

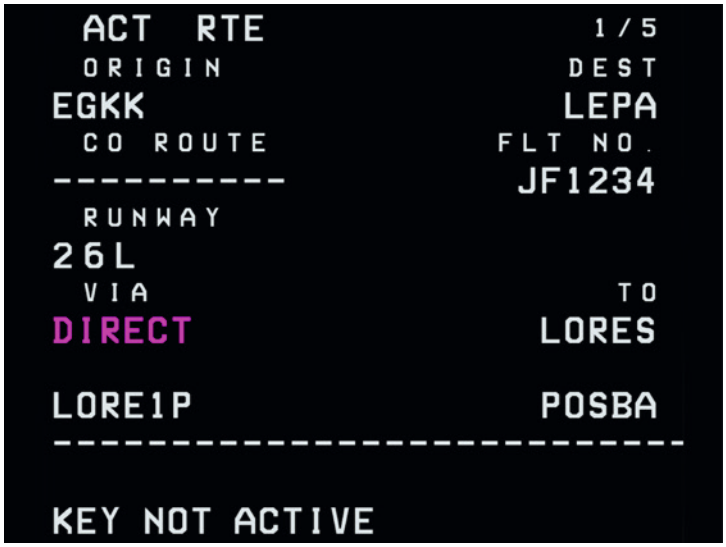
- **LATITUDE and LONGITUDE** – the coordinates of the navaid.
- **MAG VAR** – the magnetic variation of the navaid in degrees.



NAV RAD PAGE

The NAV RAD page is simulated to be non-functional as is the case in many real GNLU-910A units. When pressing the ATC key, the advisory message KEY NOT ACTIVE or KEY/FUNCTION INOP will display in the scratchpad. Press the CLR key to clear the message from the scratchpad.

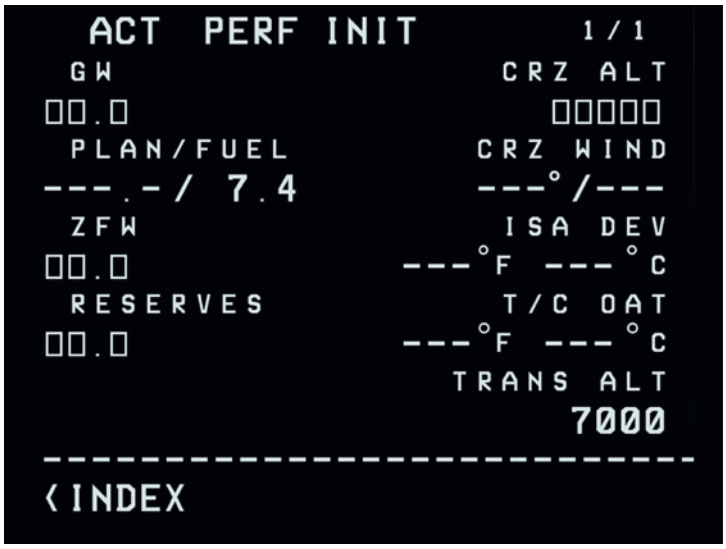
Communication with Air Traffic Control can be achieved via the aircraft's radio panels and/or the MSFS ATC menu.



PERF INIT PAGE

The PERF INIT page can be accessed by pressing the 6R line select key on the ACT RTE page or by pressing the 3L line select key on the INIT/REF page.

The FMS uses the pilot-entered parameters on the PERF INIT page for performance calculations, including estimated time of arrival (ETA) and fuel remaining calculations. The performance parameters should be entered on the PERF INIT page after activating the flight plan.



The PERF INIT page has the following parameters:

- **GW** – gross weight in tonnes to one decimal place (e.g. “37.2”).
- **PLAN/FUEL** – planned fuel weight can be entered to see performance calculations based on this estimated weight. The FMS replaces the estimated calculations with calculations based on the fuel summation data once a different gross weight or zero fuel weight is entered, or when the aircraft is in the air.

Note: *The FMS is not configured to be aware of the maximum fuel capacity of an aircraft. It may accept higher fuel load entries in the PLAN field than the aircraft can carry, depending on the aircraft's fuel tank fit.*

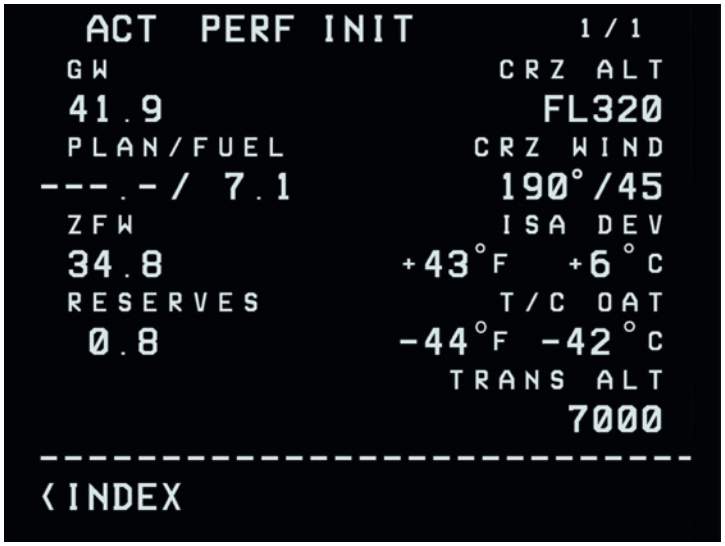
- **ZFW** – zero fuel weight in tonnes to one decimal place (e.g. "28.7").
- **RESERVES** – reserve fuel weight in tonnes to one decimal place (e.g. "2.0"). The weight of the reserve fuel is used to determine when a "USING RSV FUEL" message displays on the MCDU. A pilot may wish to include the weight of the fuel required to reach an alternate destination as part of the reserves.
- **CRZ ALT** – cruise altitude in feet of altitude or flight level format (e.g. 27,000 ft can be entered as "270", "27000" or "FL270"). The cruise altitude entry is used as the cruise altitude on the CLB, CRZ and RTE LEGS pages. The cruise altitude may be set automatically if a company route is used. A "MAX ALT FL XXX" message may appear if the value given is greater than the aircraft's maximum operating altitude.
- **CRZ WIND** – cruise wind direction and speed must be entered with a slash (/) separating the two values (e.g. "250/13"). The wind entry is used for ETA calculations.
- **ISA DEV** – deviation to the ISA standard temperature in Celsius. Fahrenheit temperatures can be entered with an "F" suffix (e.g. "23F"). Negative values can be entered with a minus (-) prefix (e.g. "-12"). This field is not required if data has been entered into the T/C OAT field.
- **T/C OAT** – the outside air temperature at the top of climb in Celsius. Fahrenheit temperatures can be entered with an "F" suffix (e.g. "23F"). Negative values can be entered with a minus (-) prefix (e.g. "-12"). This field is not required if data has been entered into the ISA DEV field.
- **TRANS ALT** – the transition altitude can be edited manually by entering an altitude in feet. The altitude entered will be saved and will form the default value when loading the next flight with the GNLU-910A.

Entering performance parameters

The typical procedure for entering performance parameters on the PERF INIT page is as follows:

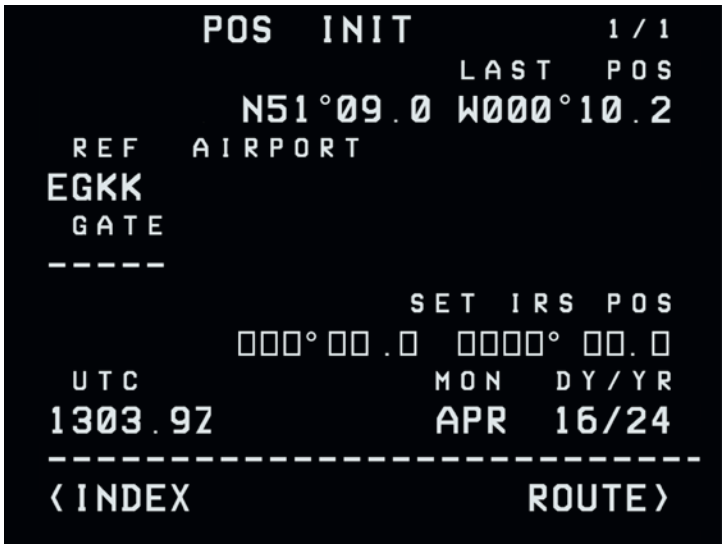
1. Enter aircraft gross weight or zero fuel weight.
2. Enter reserve fuel weight.
3. Enter cruise altitude.
4. Press the EXEC key to activate the performance parameters.

All other parameters on this page are optional and can be entered/edited at the pilot's discretion. Inputting additional parameters can increase the accuracy of the FMS's performance calculations.



POS INIT PAGE

The POS INIT page can be accessed by pressing the 6R line select key on the IDENT page, or by pressing the 2L line select key on the INIT/REF INDEX page.



Entering a position reference

The GNSS sensor takes a period of time to calculate an initial fix when power is first applied to the system. The length of the period varies, but it can be as long as 10 minutes if no position reference is entered. By entering a position reference, UTC and date, the length of the period can be reduced. For instance, if the latitude and longitude of the aircraft is known to within two kilometres (km) of the actual position, the initial fix time should take less than 75 seconds. The more accurate the position reference, the less time is needed to calculate the initial fix. The IRS sensor also needs a position reference for its alignment. The position reference can be the last position of the aircraft calculated by the FMS before power was removed, the airport, the airport gate, or a manually entered latitude and longitude.

The SET POS/HDG field is used as a prompt to enter data for the following situations:

- **SET IRS POS** – means that the IRS needs alignment.
- **SET GPS POS** – means that the GNSS sensor requires a position reference.
- **SET IRS HDG** – means that an IRS is in reversionary attitude (ATT) mode. Enter heading in the scratchpad and then press the 4R line select key.
- **SET FMS POS** – for the special case where the IRSs are not in align or ATT mode and the GNSS sensor has failed and is not in acquisition mode. The position entered initialises the FMC position so that when in the air the proper DME radio frequencies can be acquired.

The following procedure can be used to set the aircraft's position based on a reference airport:

1. Type the airport's four-letter identifier in the scratch pad (e.g. "EGLL").
2. Press the 2L line select key to move the airport identifier into the REF AIRPORT field. The airport's latitude and longitude will be displayed and are available to be set as the position reference.
3. Press the 2R line select key to copy the REF AIRPORT latitude and longitude to the scratchpad.
4. Press the 4R line select key to use the latitude and longitude in the scratchpad to set the position reference.

A similar procedure can be used to set the aircraft's position based on the FMS's last position (LAST POS) or the airport gate where the aircraft is currently parked.

Note: *The availability of airport gate data depends on whether the gate dataset has been included in the navigation database.*

The SET POS field will be removed from the POS INIT page when the GPS sensor is navigating and the IRS is aligned.

PROG PAGE

The PROG (progress) page can be accessed by pressing the PROG key.

The progress page is used to monitor the flight's progress during various stages of the flight. It is laid out in a format similar to that of a standard aircraft radio position report.

PROGRESS page 1/2 displays the following information:

- **Flight number** – the flight number entered on the RTE page is displayed at the top of the page.
- **FROM** – the waypoint which the aircraft is flying from.
- **ALT** – the altitude the aircraft was at when transitioning from the FROM waypoint.
- **ATA** – actual time of arrival at the FROM waypoint.
- **FUEL** – fuel remaining at the FROM waypoint.
- **Line 2** – the active waypoint line highlighted in magenta. It identifies the TO waypoint. A leg direction is shown above the waypoint, which is the course to the waypoint.
- **DTG** – distance to go to the waypoint in nautical miles.
- **ETA** – estimated time of arrival to reach the waypoint and is referenced to UTC.
- **FUEL** – calculated fuel remaining once the waypoint is reached.
- **Line 4** – shows the distance to go, estimated time of arrival and fuel remaining for the flight plan destination airport.
- **Flight phase** – TO T/C means climbing to top of climb. TO T/D means cruising to top of descent. TO E/D means descending to end of descent. Time and distance to the next phase of flight is displayed.
- **GW/FUEL** – current gross weight of the aircraft and the fuel remaining.

PROGRESS page 2/2 displays the following information:

- **HEADWIND/TAILWIND** – current wind component relative to true heading. 1L displays HEADWIND or TAILWIND as appropriate.
- **WIND** – current true wind direction and speed.
- **XTK ERROR** – direction and magnitude of cross-track error from the lateral guidance path.
- **CDI SCALE** – the lateral deviation scale (nautical miles per two dots).
- **CROSSWIND** – current crosswind component relative to true heading. Direction is L for crosswind from left to right, and R for crosswind from right to left.
- **VERT DEV** – during approach only, VERT DEV shows the current vertical deviation from the active path in feet. VERT DEV is blank for the climb and cruise flight phases.
- **SAT/ISA DEV** – the current static air temperature and equivalent ISA deviation. SAT is blank when the aircraft is on the ground.
- **TAS** – current true airspeed in knots.

RTE PAGE

The RTE page can be accessed by pressing the 6R (ROUTE) line select key on the POS INIT page or by pressing the RTE key.

The RTE page is used to construct a flight plan either via manual input or via a company route import.

Constructing a lateral path

The lateral path is defined by pilot entry. The general flight plan consists of a SID, enroute segment, a STAR and an approach. The paths defined by SIDs, STARs and approaches are derived from a navigation database. Each SID, STAR or approach consists of several paths that are specifically assembled by a navigation database supplier. The navigation database supplier assembles a sequence of specific path elements to allow the FMS to construct a path that is equivalent to that of the corresponding charted procedure. The enroute segment of the flight plan is defined by great circle path segments between geographically specified fixes. The FMS will generate a circular arc transition between great circle paths that meet at a fix with a change in direction.

For SIDs, STARs and approaches, the paths are generally quite dependent upon the aircraft's situation. For example. the length of legs that terminate at an altitude will be dependent upon the climb rate of the aircraft. The radius of turns will be dependent upon the predicted airspeed, wind, track angle change and bank angle of the aircraft. When below 3,000 ft above the departure or destination airport, 210 kts is the maximum speed that will be used for turn predictions, regardless of the target speed displayed.

For the enroute segment, only the circular arc transitions between the great circle path segments are affected by aircraft and environmental conditions. The bank angle value used to construct the turns is allowed to be dependent upon the course change that is to be accomplished. Small course changes will be performed with small bank angles, as one would expect.

Paths can be defined that cannot be constructed at higher airspeeds. This is particularly true for SIDs and approaches. The speed profile of the lateral path is defined initially using the performance characteristics of the aircraft. It is possible that the speed based on performance characteristics is too high to accomplish the desired lateral path. In such cases the FMS will note the particular waypoint where the difficulty occurs with a 'bypass' indication. Subsequently, the FMS will reduce the speed to attempt to remove the difficulty. The final result is a path that is computed with a speed lower than that based on the performance characteristics with the 'bypass' indication remaining.

Selecting a company route

Company route logic has been simulated in this simulation on the GNLU-910A FMS, using flight plans that are stored locally on your PC. These saved routes can be selected on the RTE page and save the time and effort needed to manually enter the route. Company routes don't typically include SID or STAR procedures as those are normally entered by the pilot prior to departure/arrival, based on current weather conditions.

Saving a company route flight plan

1. Use a flight plan in an .RTE format (flight plans can be generated in an .RTE format with free-to-use programs and websites such as SimBrief and LittleNavMap).
2. Save the flight plan file to one of the following file directories (the exact file directory varies, based on the store where you purchased MSFS as well as the version of MSFS you are using):
    a. **MSFS 2020 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-rj\work\JustFlight\FlightPlans
    b. **MSFS 2020 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-rj\work\JustFlight\FlightPlans
    c. **MSFS 2024 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\FlightPlans
    d. **MSFS 2024 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\FlightPlans
3. Make a note of the file name of the flight plan file as this is the name you will be using to load the flight plan into the FMS later. The standard format for flight plan file names is 'departure airport ICAO code : destination airport ICAO code' (e.g. "EGLLEHAM.RTE").

Note: *The above file directories are for the Just Flight RJ Professional aircraft. Some names in the file directories may vary slightly between aircraft.*

Entering a company route flight plan

1. Launch a flight in MSFS using an aircraft fitted with the GNLU-910A FMS.
2. Set up the FMS ready for flight by completing all necessary steps on the MENU, IDENT and POS INIT pages.
3. On the RTE page, enter the file name of the flight plan into the scratchpad (e.g. "EGLLEHAM"). You do not need to enter the file format, just the file name.
4. Press the 2R line select key to move the file name into the CO ROUTE field and the flight plan will then be imported into the RTE page.
5. Check through the flight plan on the RTE and LEGS pages using the PRV/NXT keys to ensure it has been imported correctly with no obvious issues.
6. Departure and arrival procedures can now be added to the flight plan via the DEPARTURES and ARRIVALS pages. Once finalised, the flight plan can be activated using the 6R line select key and executed using the EXEC key.

Manually entering a flight plan

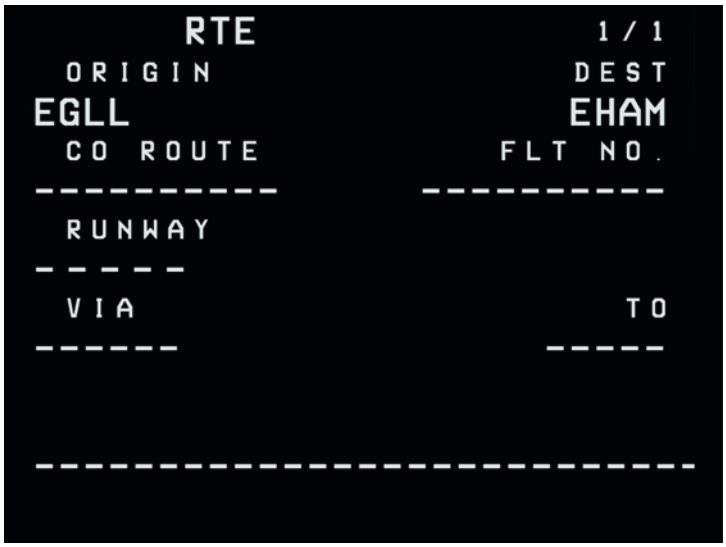
A flight plan consists of the origin and destination airports, departure runway and a series of waypoints that link the two airports. The flight plan can also have Standard Instrument Departure (SID) and approach procedures. All of these items can be manually entered or changed in a flight plan.

Entering origin and destination airports

The origin and destination airports are the first data entered on the RTE page when creating a flight plan. The following procedure is used to enter an origin and destination airport in the flight plan:

1. If on the POS INIT page, press the 6R (ROUTE) line select key to open the RTE page. If on any other page, press the RTE key.

2. Enter the origin airport identifier in the scratchpad (e.g. “EGLL”).
3. Press the 1L line select key to enter the airport identifier into the ORIGIN field.
4. Enter the destination airport identifier in the scratchpad.
5. Press the 1R line select key to enter the airport identifier into the DEST field.



Selecting a departure runway

A flight plan needs to have a departure runway. There are two methods that can be used to enter a departure runway on the RTE page, and both are covered below.

The first procedure involves the use of the DEPARTURES page to enter the departure runway and SID:

1. Press the DEP ARR key to open the DEP/ARR INDEX page.
2. Press the 1L line select key to go to the DEPARTURES page.
3. Press the line select key corresponding to the desired departure runway. If it is not shown, press the PRV/NXT keys to cycle through the available pages. Once selected, a “<SEL>” label will be displayed next to the selected runway.
4. Press the 6R (ROUTE) line select key to return to the RTE page. The selected runway will be displayed in the RUNWAY field.

Alternatively, the departure runway can simply be entered on the RTE page if the identifier is known. The runway identifier must be entered into the scratchpad in one of the following formats: “27”, “27L” or “RWY27L”, and then the 3L line select key is pressed to move it into the RUNWAY field.

Selecting a SID

A Standard Instrument Departure (SID) is selected on the DEPARTURES page.

In some countries a single named SID may be used for several runways. In such cases, the specific path from the runway to the ‘common’ SID path is considered a runway transition. This causes the named SID to have a branching structure, i.e. the SID consists of a common path with one of several runway transitions that may be linked to it as a beginning path. In the same way, the single named SID may have several enroute terminations, each defined by a specified path to the appropriate transition. This causes the SID to have several enroute transitions, which can be linked to the end of the common SID path.

Considering both runway and enroute transitions, a general SID path has the structure: RunwayTransition.CommonPath.EnRouteTransition where the ‘.’ indicates a link to the common path. The link must be a fix.

When selecting a SID for the flight plan on the DEPARTURES page, the pilot is presented with a list of runways and SID names. After selecting a SID, a list of enroute transitions is presented below the selected SID. In this way, the pilot chooses among the runway transitions and the enroute transitions. As mentioned earlier, it is common in some countries to have a SID applicable to only one runway and to not have different enroute transitions. For such cases, selection of the SID specifies the complete path from the applicable runway.

The following procedure is used to input a SID (with a transition and departure runway):

1. Press the DEP ARR key to open the DEP/ARR INDEX page.
2. Press the 1L (DEP) key to open the DEPARTURES page.
3. Press the line select key corresponding to the desired SID. Use the PRV/NXT keys to cycle through the available pages if necessary. Once selected, a "<SEL>" label will be displayed next to the selected SID and the RUNWAYS and TRANS lists are reduced to only those that can be used with that SID.
4. Press the line select key corresponding to the desired departure runway.
5. Press the line select key corresponding to the desired transition waypoint.
6. Press the 6R (ROUTE) line select key to return to the RTE page. The RTE page will then show the selected runway, SID and termination of the SID in the VIA and TO fields.

A runway can be selected prior to a SID by using a similar procedure to that listed above. Selecting a runway before the SID will reduce the SID and TRANS lists to only display those than can be used with that departure runway.

Entering flight plan legs

Flight plan legs are the path between the origin and destination airports. Each leg has a path in the TO column and a termination in the VIA column. The following procedure is used to enter a flight plan using airways and fixes:

1. Enter the first airway identifier on the flight plan in the scratchpad and then press the line select key next to the next empty field in the VIA column, below the SID. Once an airway has been entered into the VIA column, box prompts will show in the adjacent TO column, indicating that an entry must be made in the TO column because a route discontinuity now exists.
2. Enter the identifier of the termination fix of the airway in the scratchpad and then press the line select key for the adjacent field in the TO column.

This process is then repeated for all airways and waypoints on the flight plan. The last entry on the RTE page should be the last fix before the STAR at the destination airport.

The TO fix can also be used to create a direct path between it and the previous TO fix. To create a direct path, leave the VIA field blank.

Entering a flight number

A flight number can be entered for the flight plan. This identifier is forwarded for display on the FMS flight PROGRESS page title line. It is not required data and a flight plan can be activated without a flight number. The flight number can be entered using the following procedure:

1. Enter the flight number in the scratchpad (e.g. “BA1234”).
2. Press the 2R line select key to move the flight number into the FLT NO field.

Activating the flight plan

The flight plan can be activated at any time after the origin and destination airports, departure runway, and at least one waypoint are entered into the flight plan. After the flight plan has been activated, any changes or additions to it need to be confirmed by pressing the EXEC key.

The flight plan can be activated by using the following procedure:

1. Press the 6R (ACTIVATE) line select key to activate the flight plan. The light above the EXEC key will illuminate to prompt you to confirm the activation.
2. Press the EXEC key to confirm activation of the flight plan.

Once a flight plan has been activated, the title line will display “ACT”, indicating an active route. If an entry in the route is changed after pressing the EXEC key, the title line indicates “MOD” (modified) until the EXEC key is pressed again to activate the changes.

Once a route has been activated for the first time, the message “ENTER PERF INIT DATA” appears in the scratchpad to remind the crew of the next step. Pressing the 6R (PERF INIT) line select key will then take you directly to the PERF INIT page, where performance initialisation takes place.

Selecting a STAR, approach and transition

Arrival procedures are usually entered into the flight plan when in the arrival area, after receiving automatic terminal information system (ATIS) or air traffic control (ATC) clearance. If the approach procedures are part of a company route and prefilled in the flight plan, they should be reviewed and adjusted if necessary to match the clearance.

The procedure for entering the arrival part of the flight plan is very similar to that used for entering the departure part of the flight plan, and requires the selection of either an approach procedure or an arrival runway. Only one or the other may be selected. A STAR may be entered for both types of arrival procedure. A runway extension can also be included in the flight plan when an arrival runway has been selected.

When selecting an approach for the flight plan on the ARRIVALS page, the pilot is presented with a list of approaches. After selection of an approach, a list of beginning transitions is presented to the pilot below the selected approach. Just as SIDs may have beginning and ending transitions, the navigation database supports such optional paths for STARs and approaches. Charted approaches often have several beginning transitions. There are no ending transitions for an approach because all approaches terminate in a single common missed approach path.

The approach can be entered into the flight plan using the following procedure:

1. Press the DEP ARR key to open the DEP/ARR INDEX page.
2. Press the 2R (ARR) key to open the ARRIVALS page.
3. Press the line select key corresponding to the desired STAR. Use the PRV/NXT keys to cycle through the available pages if necessary. Once selected, a "<SEL>" label will be displayed next to the selected STAR and the RUNWAYS and TRANS lists are reduced to only those that can be used with that SID.
4. Press the line select key corresponding to the desired approach.
5. Press the line select key corresponding to the desired transition waypoint.
6. Press the EXEC key to confirm the selections and to include them in the flight plan.
7. Press the 6R (ROUTE) line select key to return to the RTE page.

An approach can be selected prior to a STAR by using a similar procedure to that listed above. Selecting an approach before the STAR will reduce the STAR and TRANS lists to only display those than can be used with that approach procedure.

Entering a runway extension

A runway extension is an optional entry that adds a waypoint at the entered distance (between 0.1 and 25.0 nautical miles) before the runway threshold. This waypoint is identified as RX-YYY, where YYY is the runway identifier (e.g. RX-025). A runway extension waypoint can be entered into the flight plan with the following procedure:

1. Press the DEP ARR key to open the DEP/ARR INDEX page.
2. Press the 2R (ARR) key to open the ARRIVALS page.
3. Press the NXT key until the desired runway is shown in the RUNWAYS list in the right column.
4. Press the line select key corresponding to the desired runway. Selecting a runway displays a RWY EXT option to enter a runway extension waypoint in the fight plan.
5. Enter a runway extension distance between 0.1 and 25.0 nautical miles in the scratchpad and then press the 3R line select key to move the distance into the RWY EXT field.

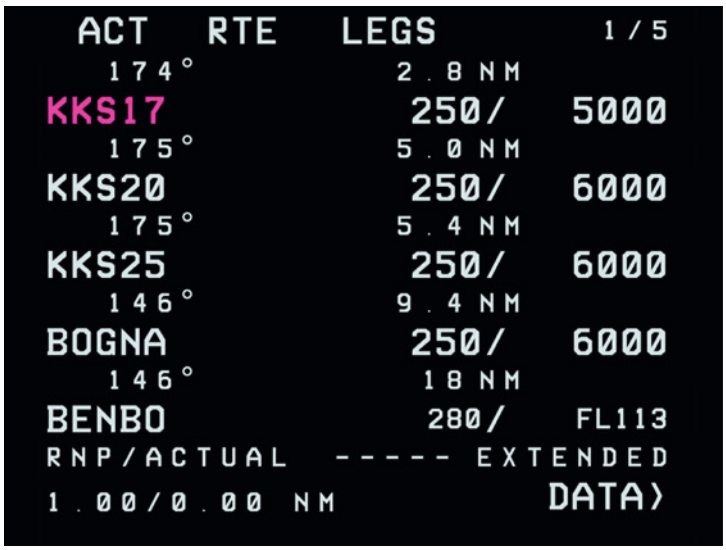
6. Press EXEC to confirm the selections and to include them in the flight plan.
7. Press the 6R (ROUTE) line select key to return to the RTE page.

RTE LEGS PAGE

The RTE LEGS page can be accessed by pressing the LEGS key.

The RTE LEGS page shows details of each flight leg, including course, heading and termination criteria. The flight legs can be displayed using the PLAN or MAP modes of the aircraft's EFIS ND display.

With a flight plan loaded on the RTE page, the waypoints and data of the flight plan can be reviewed on the RTE LEGS page and checked for any unexpected discontinuities. The RTE LEGS page shows ROUTE DISCONTINUITY labels when pilot action is required to make the flight plan contiguous. If no action has been taken, the flight plan proceeds only to the point of the discontinuity. Route discontinuities can be cleared by moving the waypoint that follows the route discontinuity up to the line where the route discontinuity exists, or by entering an appropriate waypoint in the route discontinuity box prompts.



Reviewing details of flight plan legs

The following information can be reviewed on the LEGS page:

- **Leg termination** – the first column of the RTE LEGS page lists the termination of each leg in the flight plan, beginning with the active leg. The first identifier on page 1 is highlighted in magenta, meaning it is the termination of the active leg.
- **Leg direction** – a leg direction field is displayed above the leg termination. The leg direction is the magnetic course of heading of the path leading to the termination. A “HDG” suffix is used to distinguish between a course and a heading. The degrees are reference to magnetic north, but may also be referenced to true north as indicated with a “T” suffix. A turn direction character (“L” or “R”) is prefixed to the course or heading value if a turn direction is specified by the navigation database. Turn direction characters are not shown for holding patterns or for procedure turns.
- **RNP** – the required navigation performance for the current flight leg navigation environment.
- **ACTUAL** – the actual navigation performance. If navigation is based on IRS only, the ACTUAL field is blank.
- **<CTR> label** – when the aircraft’s EFIS ND is in PLAN mode, a “<CTR>” label identifies the waypoint centred on the EFIS plan map. Pressing the 6R (MAP CTR STEP) line select key will move the label to the next waypoint on the RTE LEGS page and centre the waypoint on the EFIS plan map. Pressing the NXT or PRV keys will quickly step through the flight plan.
- **Leg length** – the calculated leg length shows for waypoints that follow the active waypoint.
- **BYPASS** – displays if any of the course, position or speed constraints required by the flight plan cannot be satisfied.
- **Speed and altitude** – speed and altitude for each waypoint are displayed on the right side of the page. Those shown in large font are restrictions from the navigation database or manually entered. Those in small font are calculations made by the FMC. Speeds will be displayed in knots below the crossover altitude, and in Mach above the crossover altitude.
- **Altitude constraints** – altitude restrictions may have a constraint. The constraint can be A (at or above), B (at or below); or “above and below”. For example, “2000A” means the aircraft must be at or above 2000 ft when passing over the waypoint, “2000B” means the aircraft must be at or below 2,000 ft, and “2000A4000B” means the aircraft must be above 2,000 ft and below 4,000 ft.

Modifying a flight plan

Once the flight plan has been activated, modifications can be made on the RTE LEGS page. Some of the changes that can be performed are:

- Deleting a waypoint
- Inserting a waypoint
- Closing (clearing) a route discontinuity

Deleting a waypoint

All waypoints can be deleted on the RTE LEGS page, except the active waypoint, a waypoint that follows an intercept course (INTC) leg termination, and the exit fix for a present position (PPOS) holding pattern.

The following procedure can be used to delete a waypoint:

1. Press the LEGS key to open the RTE LEGS page.
2. Use the PRV/NXT keys to find the RTE LEGS page which shows the waypoint to be deleted.
3. Press the DEL key. “DELETE” will be entered into the scratchpad.
4. Press the line select key next to the waypoint that is to be deleted. The title of the RTE LEGS page will change to MOD and a route discontinuity replaces the deleted waypoint.

5. Press the EXEC key to include the flight plan modification in the flight plan, or press the 6L (ERASE) line select key to erase the changes to the flight plan and to revert to the previously active flight plan.

Inserting a waypoint

The following procedure can be used to insert a waypoint:

1. Press the LEGS key to open the RTE LEGS page.
2. Enter the waypoint identifier of the waypoint that is to be added in the scratchpad.
3. Press the line select key that has the waypoint that will follow the new waypoint (meaning that the new waypoint will be inserted before the selected waypoint). The title of the RTE LEGS page will change to MOD and a route discontinuity is added after the inserted waypoint.
4. If the SELECT DESIRED WPT page shows, press the line select key corresponding to the waypoint that is to be used in the flight plan. The waypoints displayed on the SELECT DESIRED WPT page will be listed in order of increasing distance from either the preceding waypoint or the current aircraft position.
5. Press the EXEC key to include the flight plan modification in the flight plan, or press the 6L (ERASE) line select key to erase the changes to the flight plan and to revert to the previously active flight plan.

Closing a route discontinuity

The FMS adds a route discontinuity for certain flight plan modification such as deleting a waypoint, inserting a waypoint, or if an entered waypoint creates a path having geometry that the aircraft cannot fly. If a flight plan modification results in a discontinuity between two waypoints, LNAV will disengage after passing the last waypoint before the route discontinuity. Route discontinuities and LNAV disengagement can be prevented by pilot action.

A route discontinuity can be closed by one of two methods. In most cases the discontinuity is closed by moving the waypoint following a ROUTE DISCONTINUITY to the ROUTE DISCONTINUITY line. A procedure demonstrating this method is shown below. If the following waypoint appears in parentheses, it is recommended that you use the autopilot HDG mode to transition the waypoint, as these waypoints cannot be selected into the scratchpad.

The other method is entering a waypoint identifier in the scratchpad and then moving it to the ROUTE DISCONTINUITY line. As with any flight plan modification, the EXEC key must be pressed after closing a route discontinuity.

The following procedure can be used to close a route discontinuity:

1. Press the line select key of the flight plan leg that follows the ROUTE DISCONTINUITY.
2. Press the line select key for the line having the route discontinuity box prompts.
3. Press the EXEC key to include the flight plan modification in the flight plan, or press the 6L (ERASE) line select key to erase the changes to the flight plan and to revert to the previously active flight plan.

Entering and exiting holding patterns

The FMS has functions for holding at the present position of the aircraft and for entering a holding pattern in the flight plan.

Holding patterns can be pre-planned and entered into the flight plan. When a pre-planned holding pattern is in the flight plan, the FMC will automatically transition flight into the holding pattern when it is reached.

When a pre-planned holding pattern exists in the flight plan, pressing the HOLD key will display the RTE HOLD page for the first hold fix. Additional holds can be entered via the NEXT HOLD LSK at 6L.

When no pre-planned holding pattern exists in the flight plan, pressing the HOLD key will display the RTE LEGS page with box prompts to identify the fix for a holding pattern. Using the box prompts, a new hold fix can be entered. If a new hold fix is entered, it must be positioned in the flight plan before its RTE HOLD page will display.

There can be up to five holding patterns in the flight plan. Pressing 6L on the RTE HOLD page displays either the RTE LEGS page with the HOLD AT box prompts for identification of the next hold fix or the next holding pattern in the flight plan.

RTE HOLD page

Below is a summary of the data shown on the RTE HOLD page:

- **FIX** – the holding fix that is inserted in the route as part of a company route, part of a procedure or through the use of the HOLD AT field on the RTE LEGS page.
- **TURN DIR** – the turning direction of the holding pattern. It defaults to “R” (right) and can be changed to “L” (left).
- **INBD CRS** – the inbound course to the holding fix. A “T” suffix means the inbound course is relative to true north.
- **LEGS TIME and LEGS DIST** – set the leg length (only one entry is active). The hold defaults to a LEG TIME of 1.5 minutes when above 14,000 ft and 1 minute when at or below 14,000 ft. If a LEG DIST is entered, the LEG TIME blanks.
- **NEXT HOLD** – up to five holding patterns can be entered in a flight plan. Press the 6L line select key to show details of the next holding pattern or the RTE LEGS page where a new holding fix can be entered.
- **TGT SPD** – the target speed for the holding pattern. This speed defaults to the speed in 5R, which is the best speed for the current altitude. The target speed can be manually changed.
- **FIX ETA** – the estimated time of arrival at the holding pattern fix. This field is blank until the holding pattern is being flown.
- **EFC time** – the expected further clearance time for exiting the hold. Entry of an EFC time affects the time and fuel estimates beyond the hold fix, but does not result in automatic exiting of the holding pattern.
- **HOLD AVAIL** – the holding time available before exiting the holding pattern is required in order to reach the destination with the required fuel reserves. The holding time available is in the form of HH+MM (where HH is hours and MM is minutes).
- **BEST SPEED** – the recommended holding speed for the current altitude and conditions.
- **EXIT HOLD** – when a holding point is being flown, the EXIT HOLD operation shows on the RTE HOLD page for exiting the holding pattern.

Planning a holding pattern at a waypoint in the flight plan

1. Press the HOLD key to open the RTE LEGS page.
2. Press the line select key for the waypoint where the aircraft should enter the holding pattern. This copies the waypoint identifier to the scratchpad.
3. Press the 6L line select key to move the waypoint identifier in the scratchpad to the HOLD AT field.
4. Press a line select key to move the holding pattern identifier from the scratchpad to the flight plan. The hold fix is then entered into the flight plan before the selected waypoint, a route discontinuity is entered after the hold fix, and the RTE HOLD page automatically opens.
5. If the entered hold fix has a hold pattern definition in the navigation database, review the default hold settings and modify if needed. If the entered hold fix does not have a holding pattern definition, enter settings in the fields.
6. Press EXEC to activate the holding pattern. The page status field will change from MOD to blank. It will remain blank until the holding pattern is being flown, at which point it will change to ACT (active).
7. Press LEGS to return to the RTE LEGS page.
8. Check for a route discontinuity after the hold fix.
9. Press the line select key of the waypoint that follows the route discontinuity. This copies the waypoint identifier to the scratchpad.
10. Press the line select key for the line containing the discontinuity.
11. Press EXEC to include the modifications in the active flight plan.

Deleting a holding pattern in the flight plan

1. Press the LEGS key to open the RTE LEGS page.
2. Press the DEL key. “DELETE” text will then appear in the scratchpad.
3. Press the line select key corresponding to the holding pattern that is to be deleted.
4. Press the line select key for the waypoint that follows the route discontinuity box prompts.
5. Press the line select key for the line that has the route discontinuity box prompts.
6. Press EXEC to confirm the modifications to the flight plan.

Holding at the present position of the aircraft

1. Press the HOLD key to open the RTE LEGS page.
2. Press the 6R line select key to hold at the present position (PPOS) of the aircraft.
3. Review the default holding pattern parameters and revise if necessary.
4. Press EXEC to activate the holding pattern.

Exiting a holding pattern

Holding patterns can be exited in two ways:

1. Selecting and executing EXIT HOLD on the RTE HOLD page.
2. Initiating a direct-to function to a downstream waypoint while flying the holding pattern.

When a holding pattern is active, an EXIT HOLD option is presented on the HOLD page. Selection of this option will cause the FMS to generate an immediate exit path from the hold pattern. If the aircraft is on the inbound end turn or on the outbound leg, the short circuit hold exit path will be evident on the EFIS as a dashed path leading from the aircraft to the hold fix. The exit path will not become active until the pilot approves the exit with a press of the EXEC button. After pressing the EXEC button, the EXIT HOLD option changes to EXIT ARMED. In this state the aircraft will be steered immediately to the hold fix and will sequence the hold fix at the next passage. The steering to the leg following the hold fix will begin after the overfly of the hold fix.

1. When a holding pattern is being flown, press the 6R line select key on the RTE HOLD page to exit the hold.
2. Press EXEC to confirm exiting the holding pattern. The aircraft will continue to fly the holding pattern until the fix has been reached. It then exits the pattern and continues flight to the next waypoint in the flight plan.

VNAV PAGE

The CLB, CRZ and DES VNAV pages can be accessed by pressing the VNAV key. Pressing the VNAV key before departure and during climb displays the CLB (climb) page. Pressing the VNAV key during cruise displays the CRZ (cruise) page. Pressing the VNAV button during descent displays the DES (descent) page.

Constructing a vertical path

Vertical flight planning is the specification of speed and altitude constraints at waypoints and airports. Vertical navigation includes climb, cruise and descent profiles.

Take-off and climb

The climb profile is determined completely by the performance characteristics of the aircraft and its current weight, using CLB MAX power. Bleed air selections are not sensed by the FMS, resulting in differences between FMS-predicted profiles and the profiles achieved. The speed of the aircraft is held at constant IAS for lower altitudes and at constant Mach for higher altitudes. The most significant characteristic of the profile is the reduced climb rate at higher altitudes. The climb segment is terminated at the cruise altitude. From the vertical profile and the lateral path, the altitude of each waypoint can be assigned.

Cruise

The cruise segment is characterised by a constant altitude (the cruise altitude) and a constant speed. The altitude of waypoints in the cruise segment are assigned the cruise altitude.

Descent from cruise

The descent from cruise to the first altitude constraint is defined by a constant vertical angle. In reality, the path is defined by a constant barometric gradient, i.e. the distance to the waypoint defining the first altitude constraint divided by the altitude remaining to descend to the first altitude constraint is constant.

Descent between altitude constraints

Generally, the descent between altitude constraints is a constant vertical angle. If there are two ‘at’ vertical constraints, the system will attempt to construct a vertical path with a constant vertical angle between them. Intervening ‘at or above’ or ‘at or below’ altitude constraints may interfere with the constant descent between ‘at’ constraints. In such cases. the intervening constraint essentially breaks the vertical path into two constant vertical angle segments.

The altitude constraint values used for construction of the descent profile are displayed on the RTE LEGS page.

Approach construction

The final approach segment defined by the navigation database always consists of a ‘final approach fix’ (FAF) and a ‘missed approach point’ (MAPT). Optionally, the FAF may be preceded by a ‘final approach course fix’ (FACF). These two or three fixes lie on the final approach course.

The vertical path for approaches is built up from the missed approach point, the altitude for which is derived from the database. For ILS approaches, the missed approach point altitude is the runway elevation plus the runway threshold crossing height. For non-ILS approaches, the missed approach point altitude is defined by the navigation database supplier and is provided in the database, but is often unrelated to the MDA on the chart.

The navigation database supplier generally indicates a vertical angle for the path leading to the missed approach point. This vertical angle value is used to define a vertical path from the database FAF to the missed approach point.

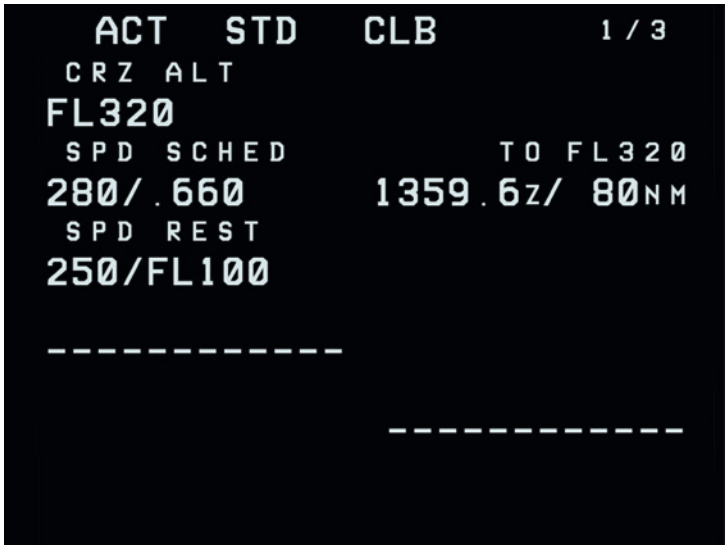
The altitude at the FAF is defined by the navigation database. The FAF altitude will be treated as an ‘at’ restriction. If a FACF is present on the final approach path, it will have an altitude defined in the navigation database. The FACF altitude will be treated as an ‘at’ altitude. The aircraft will intercept the vertical path after the FACF. This will usually be set at a constant vertical angle to the runway through the FAF.

VNAV CLB (Climb) page

The VNAV CLB page can be accessed by pressing the VNAV key before departure or during climb. Alternatively, the CLB page can be accessed at any other point of the flight by pressing the VNAV key and using the PRV/NXT keys to cycle through the VNAV pages.

The following information can be reviewed on the VNAV CLB page:

1. **CRZ ALT** – the cruise altitude is the top-of-climb altitude target. It is preset by an entry on the PERF INIT page and can be changed on the CLB page. Any change is reflected on all pages showing the altitude.
2. **SPD/SCHED** – for a standard climb, the speed schedule contains computed values for calibrated airspeed (CAS) and Mach. Either value in the schedule can be manually changed by the pilot. The active speed target is in knots CAS when below the crossover altitude, and in Mach when above the crossover altitude.
3. **SPD REST** – displays speed restrictions for the active flight leg. If there are no restrictions the field is dashed. A speed restriction may exist for a waypoint, origin airport or default settings for the aircraft.
4. **AT** – identifies the next waypoint in the climb profile that has an altitude restriction (if any).
5. **TO** – the estimated time of arrival and distance to the waypoint in the AT field. If there is no waypoint with an altitude restriction, the TO field is the estimated time of arrival and distance to reach the top of climb.

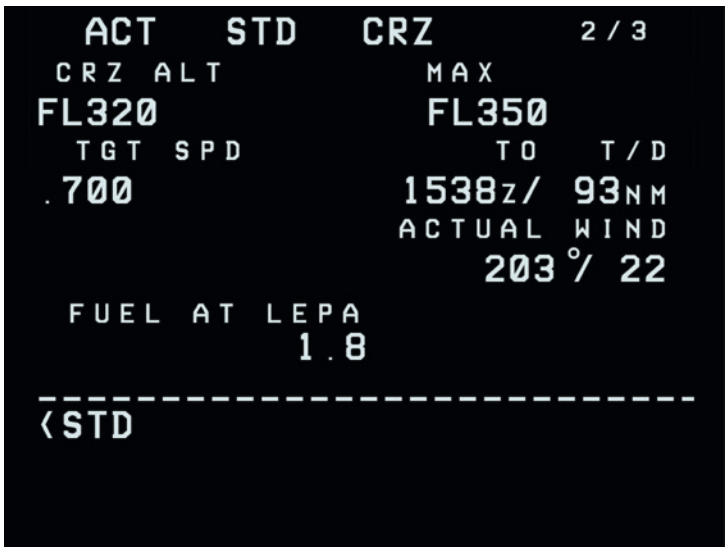


VNAV CRZ (Cruise) page

The VNAV CRZ page can be accessed by pressing the VNAV key during cruise. Alternatively, the CRZ page can be accessed at any other point in the flight by pressing the VNAV key and using the PRV/NXT keys to cycle through the VNAV pages.

The following information can be reviewed on the VNAV CRZ page:

1. **CRZ ALT** – the cruise altitude is preset by an entry on the PERF INIT page and can be changed on the CRZ page. Any change is reflected on all pages showing the altitude. If the cruise altitude is changed on the CRZ page during the cruise portion of the flight, the CRZ CLB or CRZ DES page shows.
2. **TGT SPD** – shows the computed target Mach or calibrated airspeed for cruise. TGT SPD can be manually changed within performance limits. It is highlighted in magenta during the cruise portion of flight.
3. **FUEL AT** – the calculated fuel weight available at the flight plan destination, assuming flight according to flight plan.
4. **MAX** – the maximum altitude that can be set for cruise. In its simplest form, this is the maximum certified altitude for the aircraft.
5. **TO TOD** – estimated time of arrival and distance in nautical miles to the top of descent.
6. **WIND** – displays the actual or estimated current wind direction and magnitude reference to true north. The WIND field is used for ETA and fuel remaining at destination calculations.

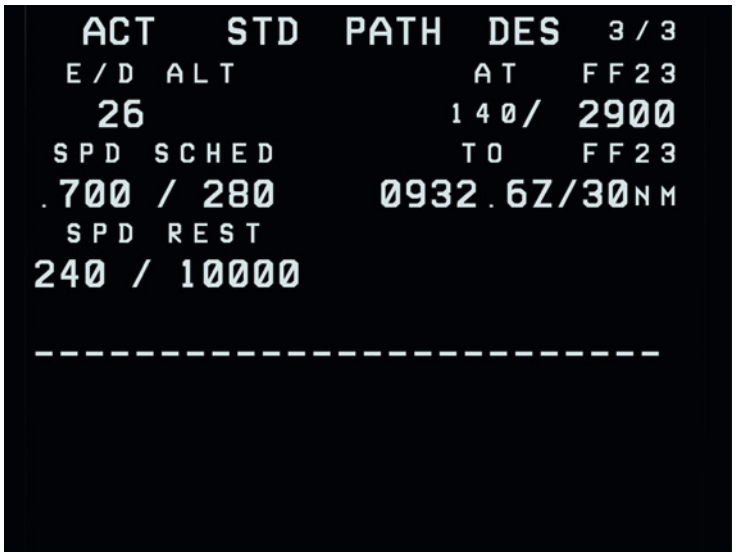


VNAV DES (Descent) page

The VNAV DES page can be accessed by pressing the VNAV key during descent. Alternatively, the DES page can be accessed at any other point in the flight by pressing the VNAV key and using the PRV/NXT keys to cycle through the VNAV pages.

The following information can be reviewed on the VNAV DES page:

1. **E/D ALT** – end of descent altitude is the last AT waypoint constraint prior to the end of the flight plan or next route discontinuity.
2. **SPD SCHED** – the descent Mach/CAS schedule limited by waypoint speed constraints, destination airport speed restrictions, operational limits and flap placard speeds. After manually changing the target speed, the title changes to include the controlling speed parameter. This may be the Mach value or airspeed in knots.
3. **SPD REST** – displays speed restrictions for the active flight leg. When no speed restriction is active, SPD REST displays the destination airport speed restriction.
4. **STD** – appears after manually changing the target speed and provides an option for reselection of the standard target speed settings.
5. **AT** – identifies the next waypoint in the descent profile that has an altitude restriction. If there is also a speed restriction at the waypoint, the speed displays in large font. If there is no speed restriction at the waypoint, a predicted speed displays in small font.
6. **TO** – the estimated time of arrival and distance to the next waypoint in the vertical profile. This may be top of descent (T/D), the next down path waypoint that has an altitude constraint, or an intermediate top of descent.



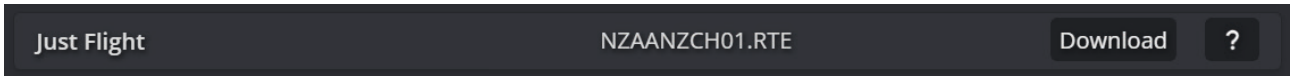
MSFS-SPECIFIC FUNCTIONS

Flight plan import

SimBrief-generated flight plans can be imported into the GNLU-910A FMS using one of the methods below:

Method 1: CO ROUTE (company route)

Once an OFP has been generated in SimBrief, the flight plan file must be saved in an .RTE format by expanding the 'Flight Plan Downloads' box at the bottom of the page and then clicking the 'Download' button in the box displaying the name of the aircraft you are intending to fly.



The route file will then download to the normal download location on your PC and will need to be manually copied across to one of the file directories listed below. The file directory varies slightly depending on the store where you purchased MSFS, and the version of MSFS you are using.

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

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

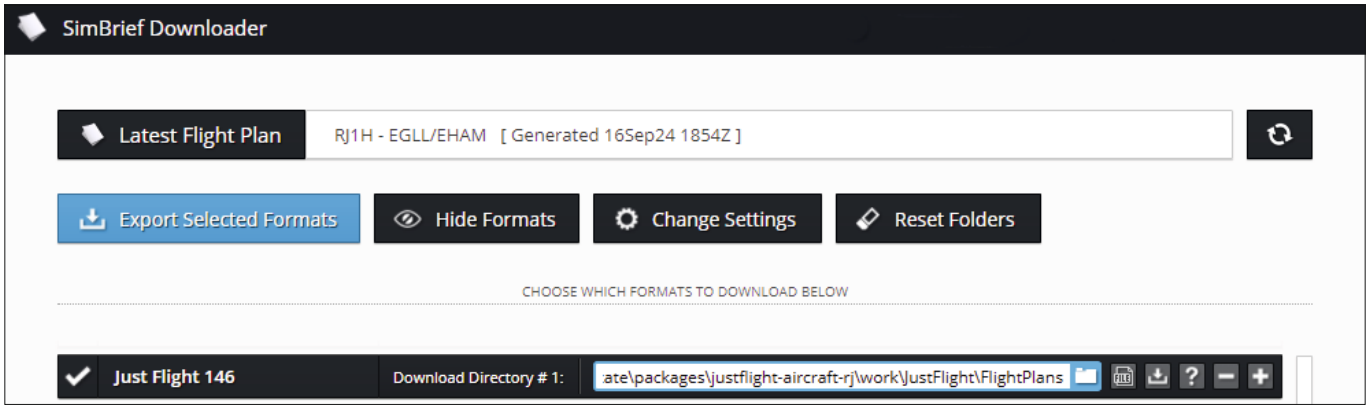
c. **MSFS 2024 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\FlightPlans

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

Note: *The above file directories are for the Just Flight RJ Professional aircraft. Some names in the file directories may vary slightly between aircraft.*

These file directories will be created automatically the first time you load a flight in the aircraft.

Alternatively, the SimBrief Downloader desktop app can be used to simplify this process, as once the file directory has been set up in the app, the flight plan file will automatically be saved in the correct directory every time an OFP has been generated on the SimBrief website.



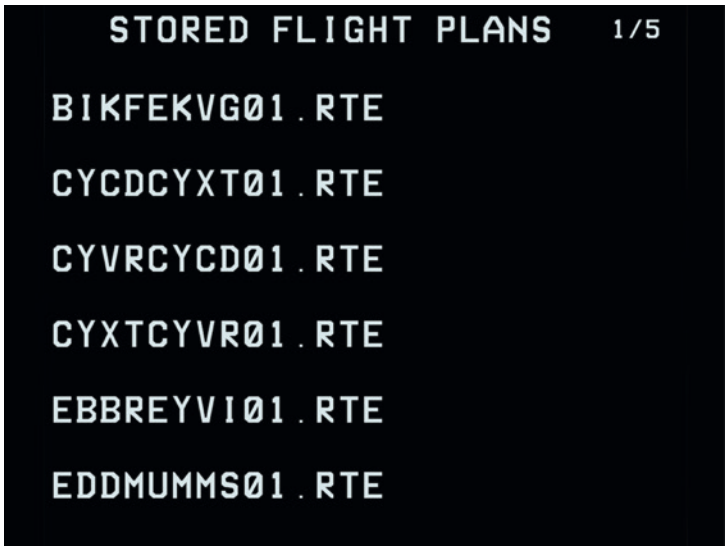
Once a flight plan has been saved to the correct file directory, the flight plan is then ready to be imported into the GNLU-910A FMS.

On the RTE page, enter the filename of the flight plan that is to be imported into the scratchpad and then press the L2 line select key to move the file name into the CO ROUTE field. Once the file name has been entered into the CO ROUTE field, the entire flight plan will be imported into the FMS with the exception of the SID and STAR procedures, which must be manually entered by the user.

By default, SimBrief saves flight plans with a file name in a format of 'departure airport ICAO code : destination airport ICAO code'. For example, the file name of a flight plan from EGLL to EHAM will probably be "EGLLEHAM. RTE", so "EGLLEHAM" must be entered into the CO ROUTE field.

Method 2: Stored flight plans

The STORED FLIGHT PLANS page can be accessed by pressing the 2R line select key (labelled FLIGHT PLANS) on the INIT/REF INDEX page.



The STORED FLIGHT PLANS page will display a list of all .RTE flight plans that have been saved in the file directories listed in Method 1 above. If more than one page of flight plans exists, you can cycle through the pages by using the PRV/NXT keys.

To import a flight plan from the list, simply press the left line select key adjacent to the flight plan that requires importing. Once selected, the FMS will automatically display the RTE page with the selected flight plan imported. SID and STAR procedures will not be included in the imported flight plan and must be manually entered by the user.

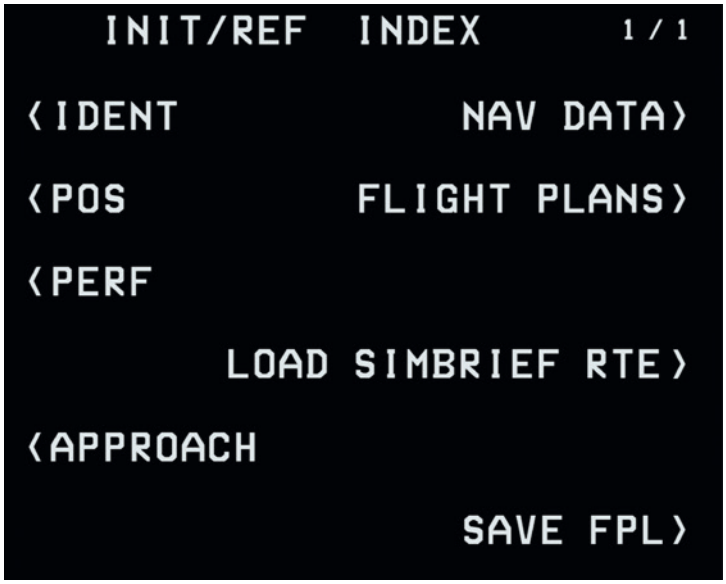
This method is not prototypical for the real GNLU-910A FMS, but we have added it as a quality-of-life feature for users who may prefer to see a list of flight plans that are available for input.

Note: *It is not currently possible to import SimBrief flight plans into the GNLU-910A on Xbox. This is something we are looking into for a future update, but we are unable to provide a timeframe for this. Xbox users are still able to manually input a flight plan into the FMS.*

Method 3: SimBrief import

A SimBrief Operational Flight Plan (OFP) can be imported directly into the GNLU-910A by using the SimBrief API. This method is useful for both PC and Xbox users as it imports the flight plan directly from the SimBrief website and does not require any file management.

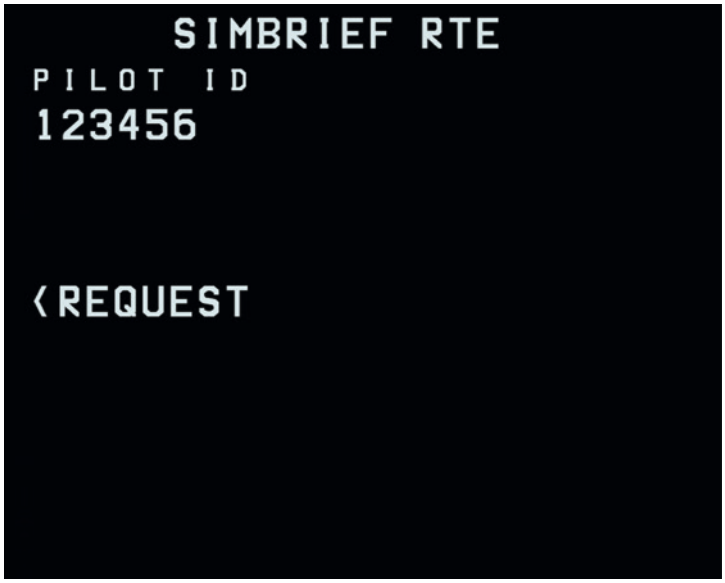
To import a SimBrief OFP directly into the GNLU-910A, navigate to the INIT/REF INDEX page and then press the 4R (LOAD SIMBRIEF RTE) line select key to open the SIMBRIEF RTE page.



The SIMBRIEF RTE page provides a field where your SimBrief Pilot ID can be entered. Your SimBrief Pilot ID is a six- or seven-digit number which can be found in the ‘Account Settings’ on the SimBrief website. To input your SimBrief Pilot ID, use the alphanumeric keys to input it into the scratchpad and then press the 1L line select key to copy it into the PILOT ID field.

Your SimBrief Pilot ID will be saved between flights. To remove the SimBrief Pilot ID, press the DEL key followed by the 1L line select key. A new SimBrief Pilot ID can now be entered or the field can be left empty if no SimBrief Pilot ID is desired.

Press the 3L line select key (REQUEST) to import the most recently generated OFP associated with the inputted SimBrief Pilot ID.



Once a flight plan has been imported into the GNLU-910A, the RTE LEGS page will automatically open, displaying the imported route. By default, the departure airport, destination airport, and enroute waypoint and airways will be imported. The departure and arrival procedures will not be imported, allowing the pilot to manually select these in the simulator.

For PC users, it is possible to change this logic so that the departure procedure (runway and SID) are included with the flight plan import. This can be done by adding *'SimBriefImportSidStar=0'* as a new line in the 'JF_Avro_GNLU.cfg' file. Note that the file directory where the config file is stored will differ slightly depending on the store where you purchased MSFS and the version of MSFS used:

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

b. **MSFS 2020 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-rj\work\JustFlight

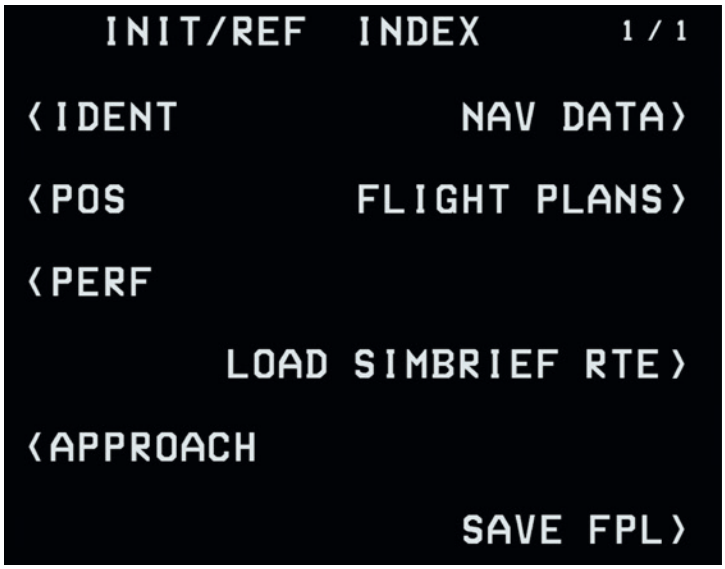
c. **MSFS 2024 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight

d. **MSFS 2024 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\ justflight-aircraft-rj\work\JustFlight

Note: *The above file directories are for the Just Flight RJ Professional aircraft. Some names in the file directories may vary slightly between aircraft.*

Flight plan export

Flight plans can be exported from the FMS by using the SAVE FPL function on the INIT/REF INDEX page. The page can be accessed from any page by pressing the INIT REF key and then pressing the 6L (INDEX) line select key.



On the INIT/REF INDEX page, the current flight plan can be exported/stored by pressing the 6R (SAVE FPL) line select key. The flight plan will be stored with a file name in a format of 'departure airport ICAO code : destination airport ICAO code'. For example, the file name of a flight plan from EGLL to EHAM will be saved as "EGLLEHAM.RTE".

Once the file has been saved, a message will appear in the scratchpad to confirm that the fight plan has been saved and will display the file name. The message can be cleared by pressing the CLR key.

Saved flight plans are stored in the same folder used for importing flight plans, allowing for saved flight plans to be imported on future flights via the methods listed in the Flight plan import section of this manual. The file directories in which the flight plans are saved vary slightly depending on the store where you purchased MSFS, as well as the version of MSFS you are using:

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

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

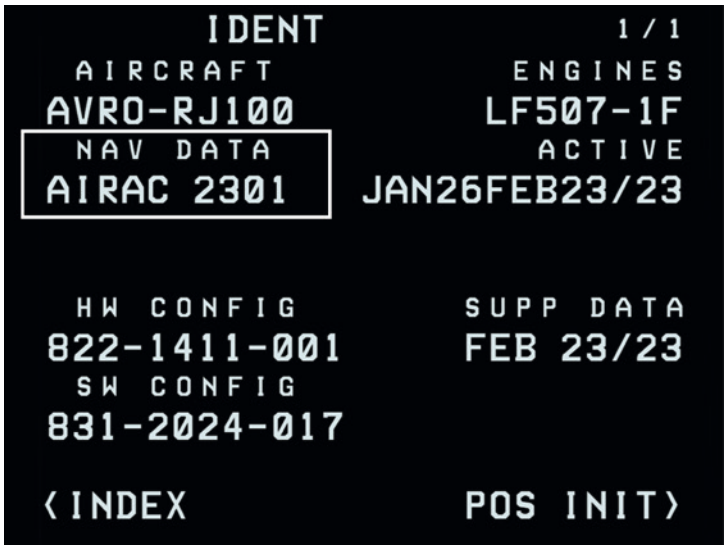
c. **MSFS 2024 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\FlightPlans

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

Note: *The above file directories are for the Just Flight RJ Professional aircraft. Some names in the file directories may vary slightly between aircraft.*

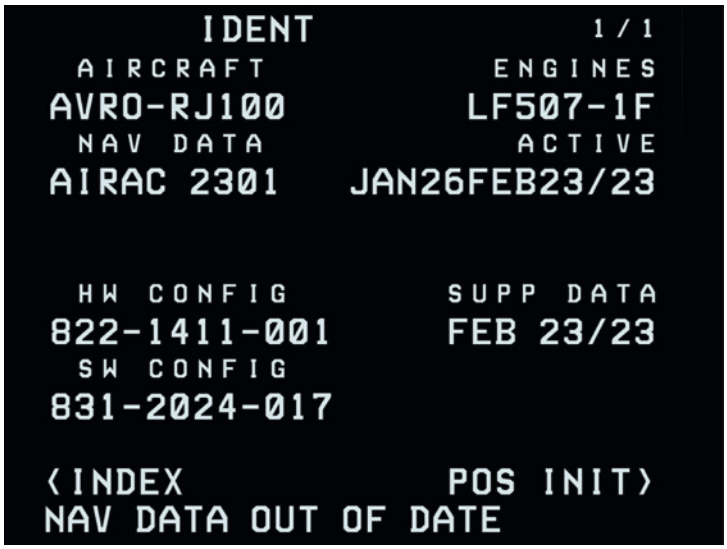
Updating Navdata

The current AIRAC cycle used by the FMS is displayed on the IDENT page.



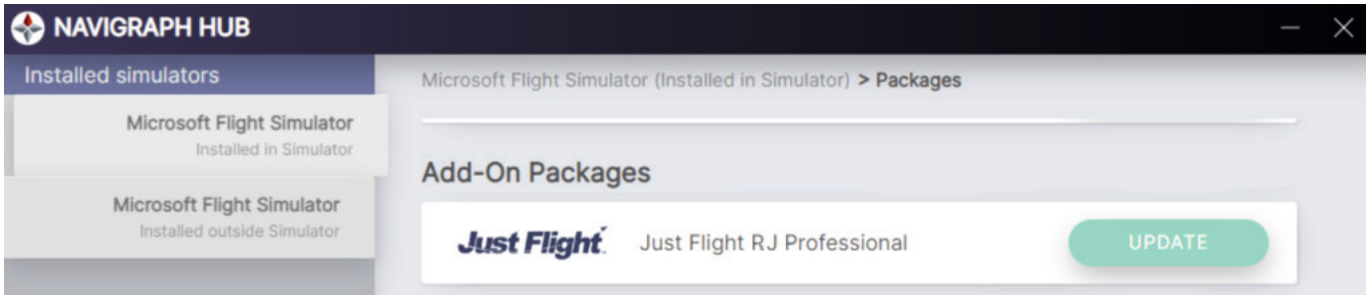
If the FMS detects that out-of-date Navdata is being used, a ”NAV DATA OUT OF DATE” message will display in the scratchpad. The FMS references the date and time used at the start of the current Microsoft Flight Simulator flight, so setting the date in the simulator to be greater than one month different from the real date used by the Navdata can cause false ”NAV DATA OUT OF DATE” messages to display. In such instances, the message can be ignored if you have verified that the latest Navdata is installed on your PC.

The message can be cleared from the scratchpad by pressing the CLR key.



This simulation of the GNLU-910A FMS includes Navdata from the AIRAC 2401 cycle as standard, which will probably generate a ”NAV DATA OUT OF DATE” message on the IDENT page. 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 Just Flight 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 GNLU-910A is stored in the following file directory. The file directories in which the flight plans are saved vary slightly depending on the store where you purchased MSFS as well as the version of MSFS you are using:

a. **MSFS 2020 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalState\packages\justflight-aircraft-rj\work\JustFlight\navdata

b. **MSFS 2020 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator\Packages\justflight-aircraft-rj\work\JustFlight\navdata

c. **MSFS 2024 – Microsoft Store:** C:\Users**USERNAME**\AppData\Local\Packages\Microsoft.Limitless_8wekyb3d8bbwe\LocalState\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\navdata

d. **MSFS 2024 – Steam:** C:\Users**USERNAME**\AppData\Roaming\Microsoft Flight Simulator 2024\WASM\MSFS2024\justflight-aircraft-rj\work\JustFlight\navdata

Note: *The above file directory is for the Just Flight RJ Professional aircraft. Some names in the file directory may vary slightly between aircraft.*

FLYING WITH THE GNLU-910A

This tutorial flight will cover a generic flight between two airports and can be used with any Just Flight Professional series aircraft fitted with a GNLU-910A Flight Management System (FMS). It will therefore cover all the procedures required to set up and operate the GNLU-910A, but it will not cover how to set up the aircraft itself. For information on how to operate the aircraft, please see the relevant aircraft's Operations Manual located in the same folder as this manual.

In this tutorial flight we will be departing from London Gatwick, the second busiest airport in the UK, and flying south across the English Channel, France and mainland Spain to Palma de Mallorca airport, a popular tourist destination in the Balearic Islands.

Covering approximately 730 nautical miles, this flight is a great length for learning how to operate the GNLU-910A on board any Just Flight Professional series aircraft.

The flight plan in this tutorial flight was created using the AIRAC 2401 cycle that is included with the GNLU-910A FMS. Some minor differences in the flight plan may occur if you are using a newer AIRAC cycle.

Here are the details for today's flight:

EGKK/26L BOGNA1X BOGNA L612 BENBO UY47 DRAKE L151 SITET UN859 SOPIL DCT BALAN DCT EVPOK DCT NARAK DCT GAI DCT LOMRA DCT ROCAN DCT IBRAP DCT LORES LORES1P LEPA/24L

Estimated time en route: 120 minutes

Route distance: 733 nautical miles

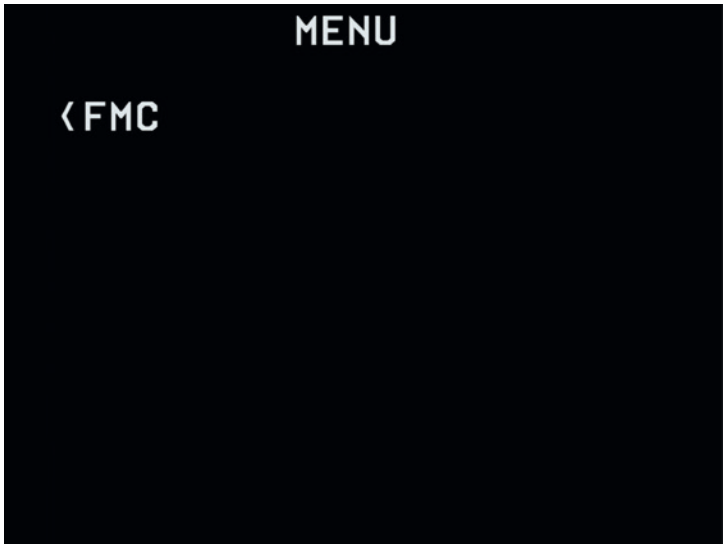
Departure time: 1400 (local time)

Weather: Few Clouds

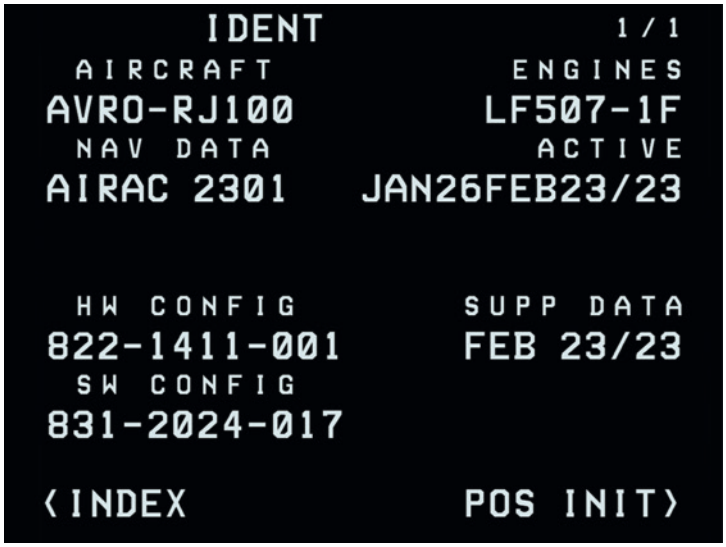
Pre-flight

With electrical power supplied to the aircraft and passenger/cargo boarding in progress, we can run through the setup process to get the GNLU-910A ready for flight.

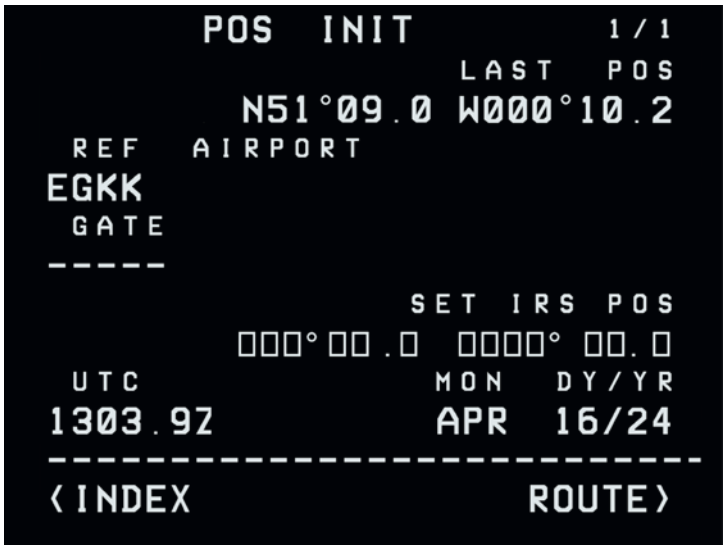
The GNLU-910A has no power button and is powered directly from the aircraft's electrical buses. When the FMS initially powers on it will default to the MENU page. Press the **1L** key to access the FMC and the IDENT page will then open.



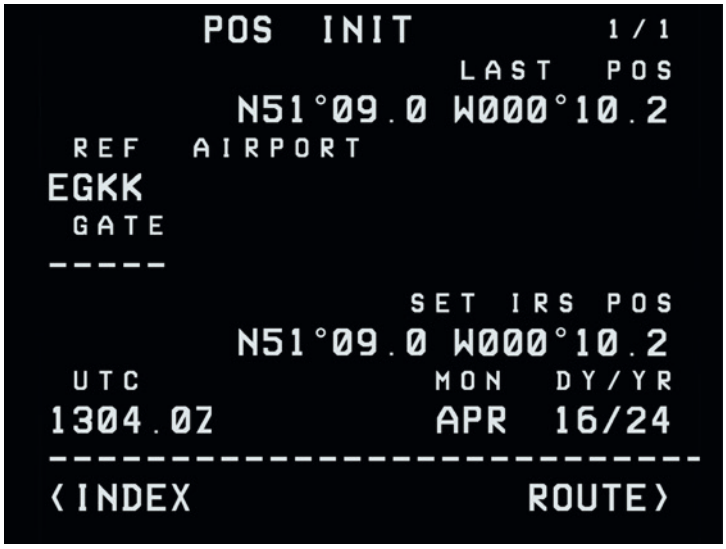
On the IDENT page, confirm that all displayed information is correct before pressing the **6R** key to open the POS INIT page.



On the POS INIT page we can find information that tells the system what our present position is. The coordinates for this position are displayed on the right side of the page.



Press one of the right line select keys to copy the coordinates into the scratchpad and then press the **4R** key to move it into the SET IRS POS field. With this set, the IRS now has an initial position to align to.



Press the **6R** key to open the ROUTE page.

Enter **EGKK** into the scratchpad and press the **1L** key to move it into the ORIGIN field, then enter **LEPA** into the scratchpad and press the **1R** key to move it into the DEST field.

With the origin and destination airports now set, we can input the SID (Standard Instrument Departure) procedure into the flight plan.

Press the **DEP ARR** key to open the DEP/ARR page and then press the **1L** key to open the DEPARTURES page for EGKK.

On the DEPARTURES page we first need to select a runway for departure. As we have light winds out of the west today we will be departing from runway 26L, so we need to press the line select key adjacent to the runway **26L** field. Once selected, "<SEL>" will be displayed next to the selected runway.

Note: *To prevent any confusion with future updates to the Nav database, we will not be referring to specific line select keys when explaining how to input a flight plan into the FMS. We will instead be referring to the necessary line select key as the "adjacent line select key".*

We can follow a similar procedure when selecting our SID. Use the PRV/NXT keys to cycle through the available SIDs and press the line select key next to the **BOGN1X** SID.

With a departure runway and SID selected, press the **6R** key to return to the RTE page and the runway and SID will now be displayed in the flight plan.

We can now begin to enter the remainder of our flight plan. Our flight plan consists of waypoints that are connected by airways which we can see at the start of our flight plan. After departure we will be flying the BOGN1X SID to BOGNA before then flying on the L612 airway to BENBO.

To enter this in the FMS, we first need to find the next empty line in the flight plan (we may need to use the PRV/NXT keys to move to the next page). Airways are to be entered into the fields on the left side of the page and waypoints into the fields on the right side.

Input **L612** into the scratchpad and press the left line select key adjacent to the first empty line in the flight plan. Then input **BENBO** into the scratchpad and press the right line select key on the same line as the inputted airway.

We can repeat this process to input the next airway and waypoint into the flight plan: **UY47** to **DRAKE**.

Continue to add the remaining airways and waypoints of the flight plan into the route page until the last waypoint in the flight plan (LORES) has been entered. If no airway exists between two waypoint, the flight plan will list this a “DCT” (Direct) leg in place of an airway. Waypoints can be entered into the RTE page without an airway simply by inputting the waypoint into the scratchpad and moving it to the next empty line on the right side of the page.

Once the flight plan has been entered, check that it is displayed correctly on the RTE and LEGS pages before pressing the **6R** key to activate it and pressing the **EXEC** (execute) button to confirm the activation of the flight plan. The flight plan is now loaded in the FMS and will be followed by the aircraft's lateral RNAV autopilot mode, once engaged after departure.

Our flight plan is now complete up to our approach procedure at the destination airport. With our flight today expected to take 120 minutes, a lot can change with the weather at the destination airport in that time, so we will not enter the arrival procedure until we are closer to the arrival airport.

We can now begin to input the performance figures for our flight. With the RTE page selected, press the **6R** key to open the PERF INIT page. Press the CLR key to clear any messages in the flight plan.

On the PERF INIT page, input the aircraft's planned Zero Fuel Weight (ZFW) in tonnes, rounded up to the nearest decimal place (e.g. "34.8"), and then press the **3L** key to move it into the ZFW field. Once entered, the Gross Weight (GW) field will automatically populate with the aircraft's gross weight. It is good practice to cross-check these weights against those listed in the flight plan as well as what it loaded into the aircraft, as shown on the EFB.

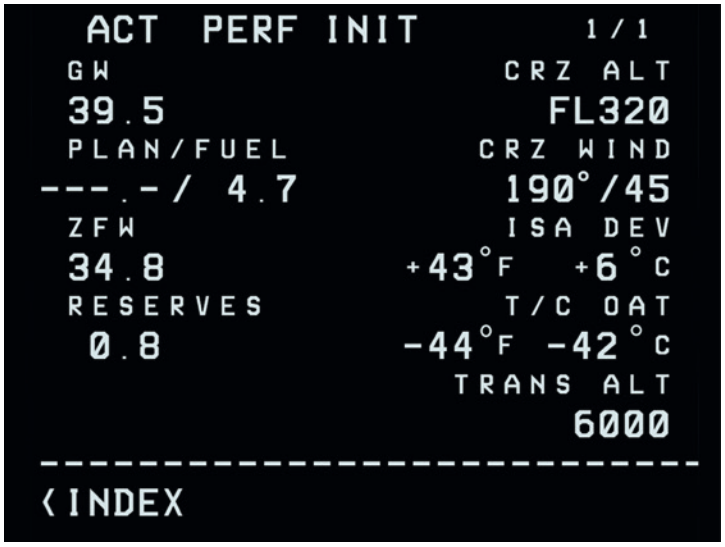
Enter the planned reserve fuel for the flight in tonnes, rounded up to the nearest decimal place, in the RESERVES field (e.g. "0.8").

Enter the planned cruising altitude of the flight in the CRZ ALT field. This can be entered in any the following formats: 32000, 320, FL320.

Enter the estimated average cruise wind in the CRZ WIND field. This should be entered in a XXX/YYY format, where X is the wind direction and Y is the wind strength (e.g. "190/45").

Enter the average ISA deviation listed in the flight plan in the ISA DEV field. This can be entered in Celsius by simply entering any value (e.g. "6") or can be entered in Fahrenheit by adding an "F" at the end of the value (e.g. "6F"). Negative values can be entered by using the +/- key to add a minus symbol in front of the value (e.g. "-6"). Any entered value in the ISA DEV or T/C OAT fields will automatically calculate all other fields.

Finally, enter the transition altitude for the departure airport in the TRANS ALT field and press the EXEC key to confirm all inputs on this page. For EGKK, the transition altitude is **6,000 ft**.



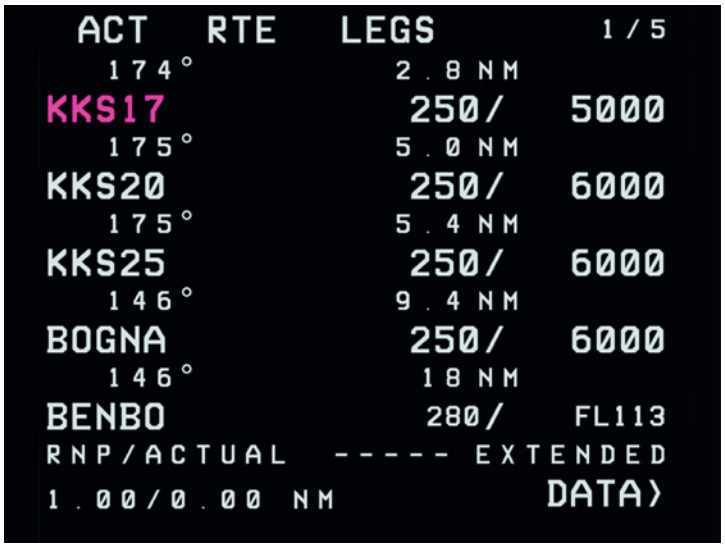
The GNLU-910A now has all the necessary data entered and is configured ready for flight. It is advisable to check the flight plan on the RTE and LEGS pages at this point to ensure there are no obvious issues. On the RTE page, the first waypoint in the flight plan should be magenta, indicating that it is the active waypoint.

Using a combination of the data that has just been entered as well as aircraft performance calculations, the FMS will automatically calculate climb performance, top of climb, top of descent and estimated fuel consumption. If necessary, any of the data that has previously been entered can be edited in the same manner as they were originally entered, remembering to press the EXEC key to confirm any changes. Changes can also be made to the climb speeds on the VNAV CLB page and changes to any altitude or speed restrictions at waypoints can be made on the LEGS page.

The GNLU-910A is now set up for departure. Upon departure the aicraft will begin to following the FMS's lateral navigation as long as the correct LNAV/RNAV modes are configured on the aircraft's autopilot panel.

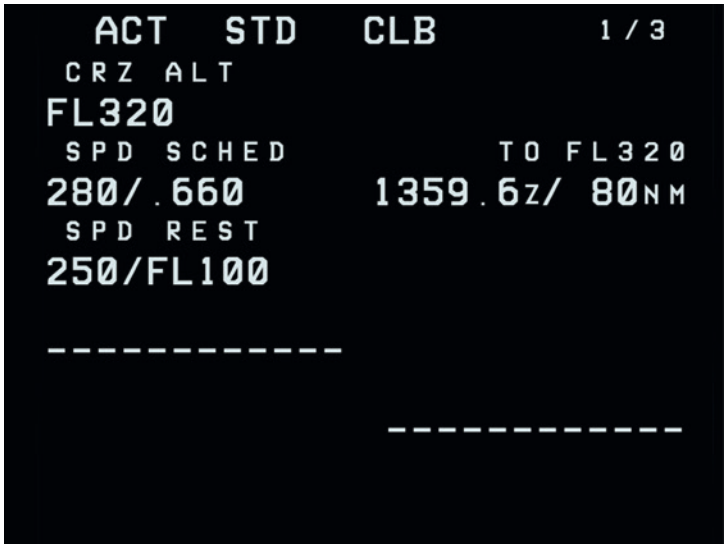
Climb

As we climb on the SID, we can monitor the GNLU-910A's LEGS and VNAV pages to confirm that the aircraft is tracking the correct waypoints and obeying any speed and altitude restrictions. Check that once a waypoint has been overflown, the next waypoint becomes active automatically.



If ATC approves us to perform a shortcut of our route, we can achieve this on the LEGS page. Press the line select key to the left of the waypoint we are cleared to fly directly to, and this will copy the waypoint name into the scratchpad. Press the left line select key next to the current active waypoint and press the EXEC key. The newly selected waypoint will turn magenta, indicating that it is the new active waypoint, and the aircraft will then fly directly to that waypoint.

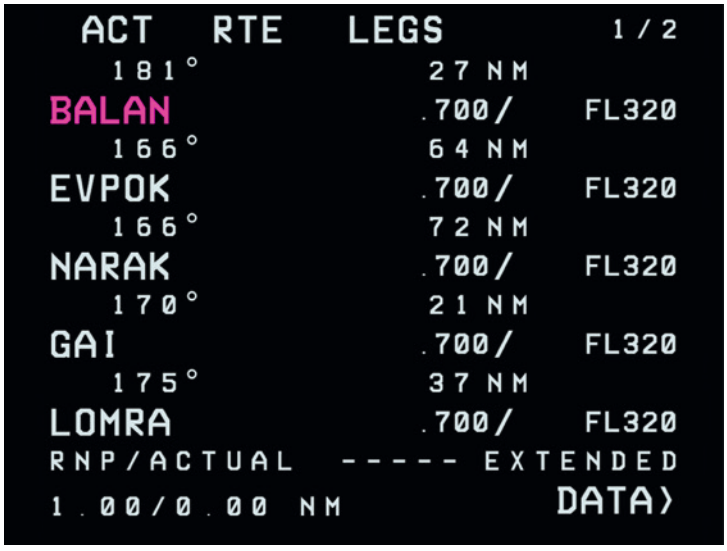
During the climb the GNLU-910A will calculate fuel, time and distance to certain points on the flight plan, based on the speeds and altitudes entered on the LEGS and VNAV CLB pages. Continue to monitor these pages and make any changes as necessary.



Cruise

On reaching cruising altitude we can continue to monitor the various pages on the GNLU-910A and confirm correct lateral and vertical navigation.

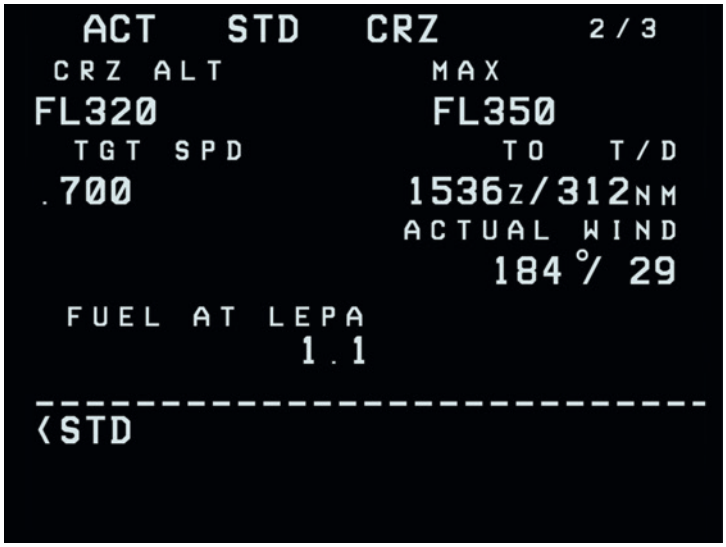
On the **LEGS** page we can view an overview of our position on the flight plan, as well as view the distance to the next waypoint and any speed or altitude restrictions that may lie ahead.



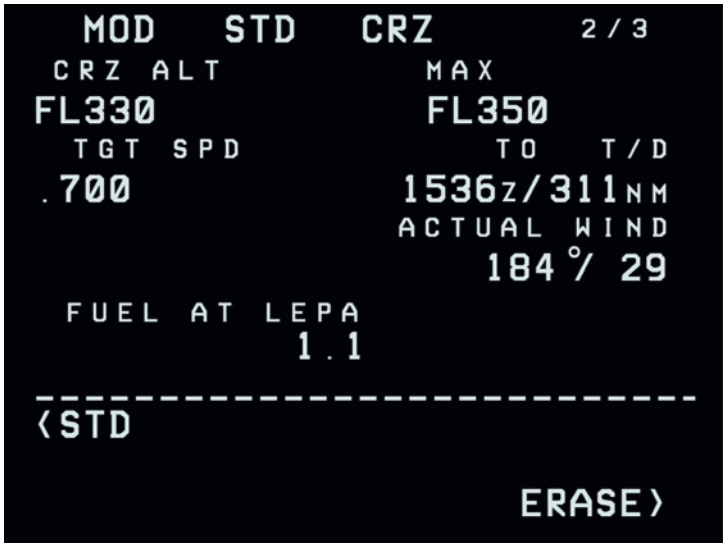
On the **PROG** page we can see the aircraft's current fuel situation, including the time at which we are currently estimated to arrive at LEPA and the amount of fuel we expect to have remaining once we land. If, for instance, we had a very strong headwind, we could be burning more fuel than expected, and we would be able to tell from this page if we could still make it to LEPA with a safe amount of fuel remaining.

Continuing on the **PROG** page, pressing the PRV/NXT keys will cycle between the available pages. Page 2/2 is useful for viewing information regarding the aircraft's present position, such as the current headwind/tailwind, crosswind, temperature, cross-track deviation (XTK) and true airspeed (TAS).

The **VNAV CRZ** page is also a useful page to monitor, as it provides information such as the current assigned cruise altitude, target speed, the maximum altitude the aircraft can climb to in the current configuration, the distance to the top of descent, actual wind conditions and the expected fuel level at the destination airport.



On longer flights, step climbs can be accomplished by editing the CRZ ALT field on the VNAV CRZ page. Once a new altitude has been entered, the aircraft will climb to the new altitude at the currently assigned cruise speed. The waypoints on the LEGS page will also be adjusted with the aircraft's new altitude, and other calculations such as fuel and top of descent will also be adjusted.



Descent preparations

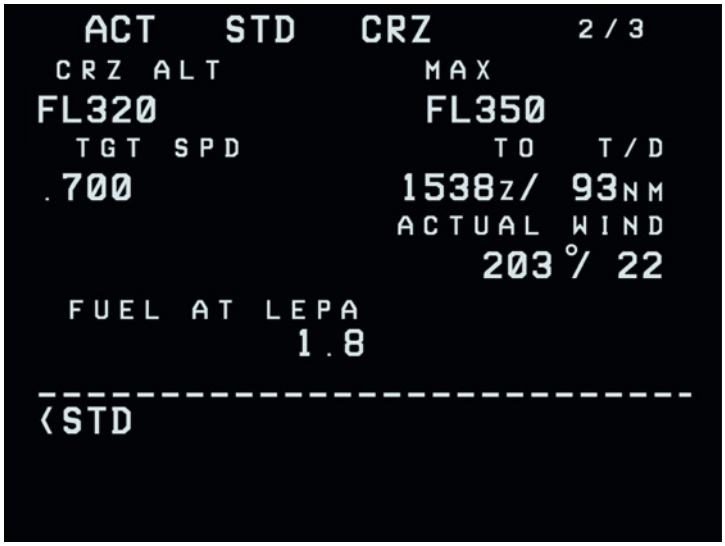
Once we get within 100 NM of our top of descent, we can start setting up our arrival procedure. The process for adding our arrival into the flight plan is very similar to that for adding the departure procedure.

Press the DEP ARR key to open the DEP/ARR INDEX page and then press the 2R function key to open the ARRIVALS menu.

We first need to select the approach, which will be the **ILSY24L**. We can select this by pressing the line select key adjacent to this approach.

We can now select the STAR, which is **LORE1P**, and the transition point is **POS**. With the approach procedure selected, check the flight plan is displayed correctly on the RTE and LEGS pages before pressing the **EXEC** key to activate the changes to the flight plan.

With the approach procedure now entered into the flight plan, the FMS can more accurately calculate top of decent and fuel numbers for our arrival. We can continue to monitor the time and distance to the top of descent on the VNAV CRZ page.

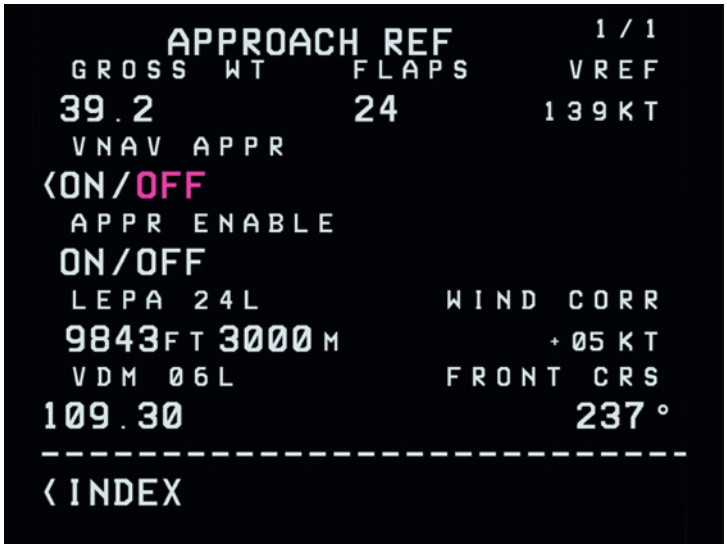


Descent

When the distance to top of descent reaches 0 NM on the VNAV CRZ page we can begin our descent. Although the FMS will calculate the top of descent, it remains the pilot's responsibility to initiate the descent by using the aircraft's vertical autopilot modes. With no altitude restrictions on the LORE1P STAR, we can descend straight to our ILS intercept altitude of 2,500 ft.

During the descent, monitor the LEGS and VNAV DES pages to ensure the aircraft remains on the correct descent path.

We can now view our approach speeds for the aircraft's current gross weight on the APPROACH REF page. This page can be accessed by pressing the **INIT REF** key, followed by the **6L** key to open the INDEX page, and finally the **5L** key to open the APPROACH REF page.



The approach page will show the VREF speeds for the aircraft's current gross weight and each available landing flap setting. A wind correction can also be applied, depending on wind conditions.

As we have an arrival procedure inputted in the flight plan, we can also view information on our arrival runway, including the length in feet and metres, as well as the ILS frequency and course. The latter two are useful, as they will need to be manually entered into the aircraft's VHF NAV radios in order for the aircraft to intercept and track the ILS.

Approach

As the aircraft turns onto the final approach course for runway 24L, it is important to remember that in order for the aircraft to intercept and track the ILS localiser and glideslope, the correct course and frequency must be tuned into the aircraft's VHF NAV radios. The ILS for runway 24L at LEPA uses a course of **237 degrees** and a frequency of **109.30 MHz**.

Once within intercept range of the localiser and glideslope, we can disengage the aircraft's LNAV/RNAV capability and engage the aircraft's traditional autopilot approach modes.

Shutdown

After a successful landing and parking at the gate, the GNLU-910A will clear the flight plan from memory 30 seconds after engine shutdown, allowing a fresh flight plan to be entered from scratch for the next leg of the trip.

If this is the last leg of the day and the aircraft is being completely shut down, the GNLU-910A will automatically be powered OFF once its electrical supply is cut off from the aircraft.

Congratulations – you have completed the GNLU-910A tutorial flight!

CREDITS

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Thank you to all the testers.

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