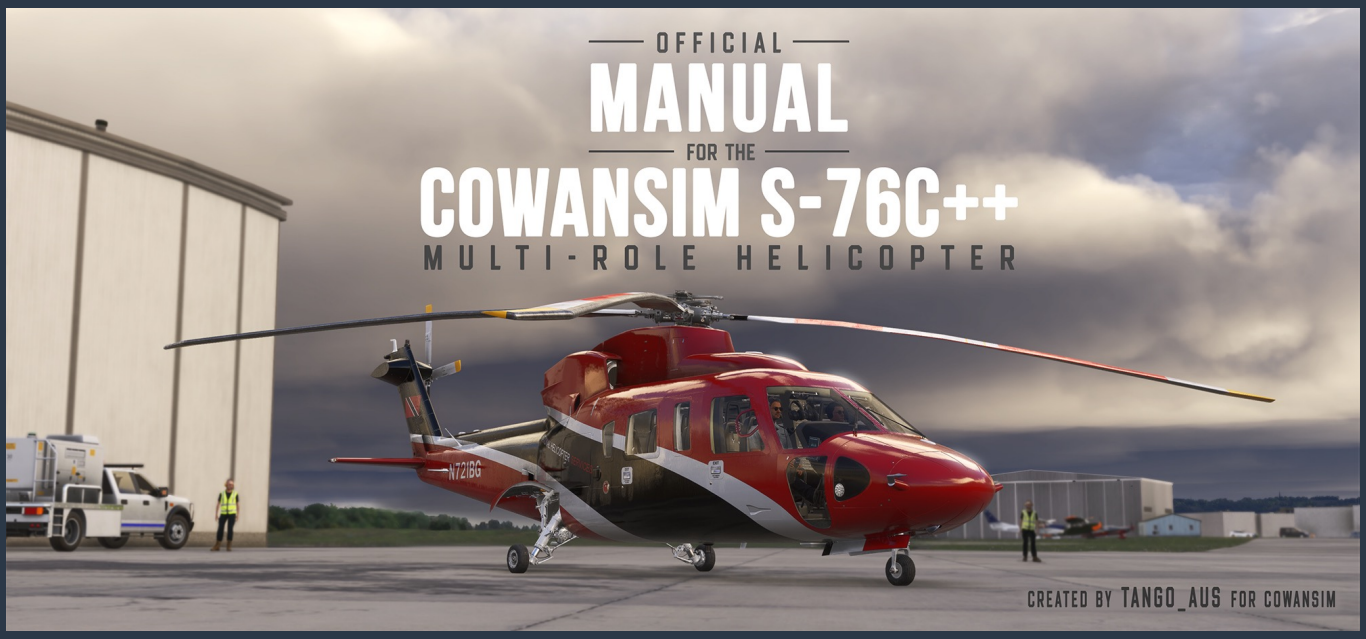


ACKNOWLEDGEMENTS

This **official manual** is designed to help flight simulator enthusiasts come to grips with the **CowanSim S-76C++ for Microsoft Flight Simulator**. This document was originally produced as an unofficial guide for that helicopter; however, the developer graciously permitted it to be designated as the official manual for their product. This manual is applicable to Version 1.2.0. of the CowanSim S-76C++ and although the contents were developed using MSFS 2024, the manual is also valid for MSFS 2020.

The author wishes to their express admiration for the outstanding work by **Josh Cowan** and his team to deliver this remarkable helicopter to the flight simulation community.

Valuable advice on some of the systems and procedures described here was provided by **Toni_L** (CowanSim Discord) and **Matthew Crawford** (YouTube - Let's Fly!). Thank you!

CONTENTS

About the Sikorsky S-76C multi-role helicopter

The S-76 helicopter is a medium-size commercial utility helicopter developed by Sikorsky Aircraft during the mid-1970s. The S-76 helicopter was designed to serve the off-shore oil market and meet the requirements to carry 12 passengers and a crew of two on a 400 nautical mile radius mission, fitted with flotation equipment, and able to operate in IFR conditions.

The initial production variant was the S-76A, with first deliveries completed in February 1979. The S-76 enjoyed strong demand in its targeted industry sector and as a VIP transport helicopter. Development of the helicopter continued through several models, until the S-76C++ became the main production version in the 2000s. Principal improvements included active noise suppression, vibration dampers, a composite main rotor, and more powerful twin Turbomeca Arriel 2S2 engines.

Production began to decline during the 2010s, in the face of rising costs and strong competition from newer helicopters such as the AgustaWestland AW139. The final orders for the S-76C++ were accepted in 2022.

More than 870 aircraft were delivered world-wide. The S-76 helicopter has a strong safety record, with only two crashes being attributed to equipment failure in 2002 and 2005 respectively. Five other accidents were due to pilot error.

Variants of the S-76 helicopter remain in service around the world with airlines, corporations, hospitals, and government operators. The S-76C++ is still a valuable helicopter; for example, a used 2010 model could sell for $5.5 million USD today.

About the CowanSim S-76C++ for Microsoft Flight Simulator

CowanSim is a highly respected developer of helicopters for flight simulation, for both the Microsoft Flight Simulator and X-Plane platforms. The Sikorsky S-76C++ is the latest addition to their lineup.

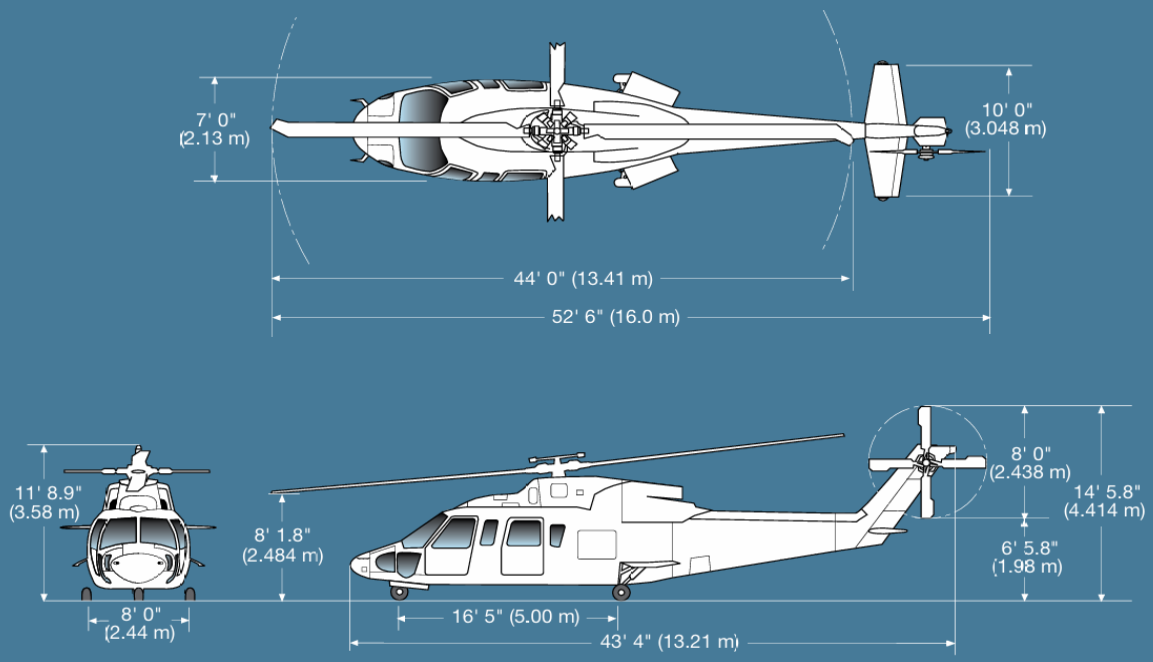
Highlights are the meticulously recreated aircraft systems including an advanced autopilot, detailed rendering of the airframe especially the main and tail rotors, and an immersive custom sound set. The easily-altered cabin has options for VIP luxury seating, an emergency medical configuration, or as an offshore transport helicopter with 12 seats for up 10 animated passengers.

The CowanSim S-76C++ helicopter was designed for Microsoft Flight Simulator 2020 but is highly compatible with MSFS 2024 with only minor discrepancies, none of which detract from the challenge and enjoyment of flying this beautiful rotorcraft.

Continued next page ⟶

S-76C++ Specifications

Maximum speed (Vne)	155 kts	287 kph
Maximum cruise speed	155 kts	287 kts
Hover ceiling, in ground effect	7,050 ft	2,149 m
Hover ceiling, out of ground effect	3,300 ft	1,493 m
Range (4,000 ft, 30 mins reserve)	345 nm	639 km
Maximum takeoff gross weight	11,700 lb	5,306 kg
Empty, utility configuration	7,005 lb	3,177 kg
Useful load, utility configuration	4,695 lb	2,129 kg



S-76C Fun Facts:

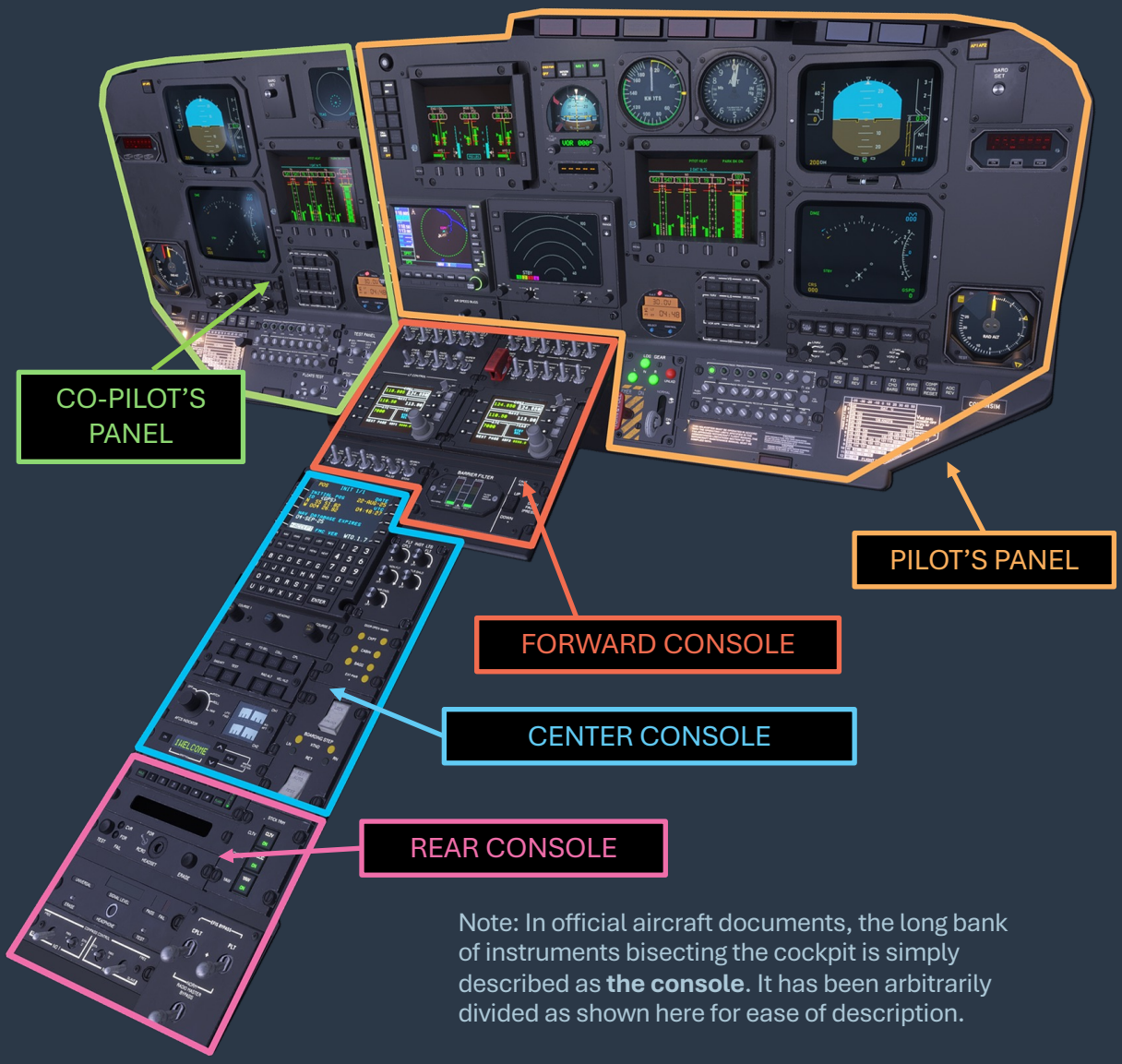
An S-76C completed the **first circumnavigation of the world** in an east-to-west direction by a helicopter in June 1995, piloted by Australian adventurer Dick Smith.

In June 2016, an S-76C configured for **autonomous operation** flew 30 miles (48 kms) including takeoff and landing, with only limited human inputs via a tablet computer.

The Philippine Air Force operated a small number of **armed versions of the S-76C**, designated **AUH-76**, with two fixed forward-firing miniguns and two rocket pods.

[End of Section 1]

COCKPIT PANELS



Note: In official aircraft documents, the long bank of instruments bisecting the cockpit is simply described as **the console**. It has been arbitrarily divided as shown here for ease of description.

The S-76C: Lots to love, lots to learn

Sikorsky promoted the S-76C as the safest civilian helicopter in the world. It could be certified for single-pilot full-spectrum IFR operations.

Sikorsky's confidence was based on an impressive suite of features that included a fully redundant dual Full Authority Digital Engine Control system, a four-axis dual fully-coupled autopilot, a Dual Automated Fight Control System, an Integrated Instrument Display System, and Electronic Flight Instrument System glass cockpit.

Additional components comprised a dual COM/NAV system, a transponder and Traffic Collision Avoidance System, ADF, DME and a radio altimeter, alongside a Weather Radar, Ground Proximity Warning System, plus a Flight Data Recorder and Cockpit Voice Recorder system.

Flight simulation pilots converting to the S-76C++ have much to learn about the intricacies of this wonderful helicopter and its multi-faceted avionics and flight control systems. Enjoy!

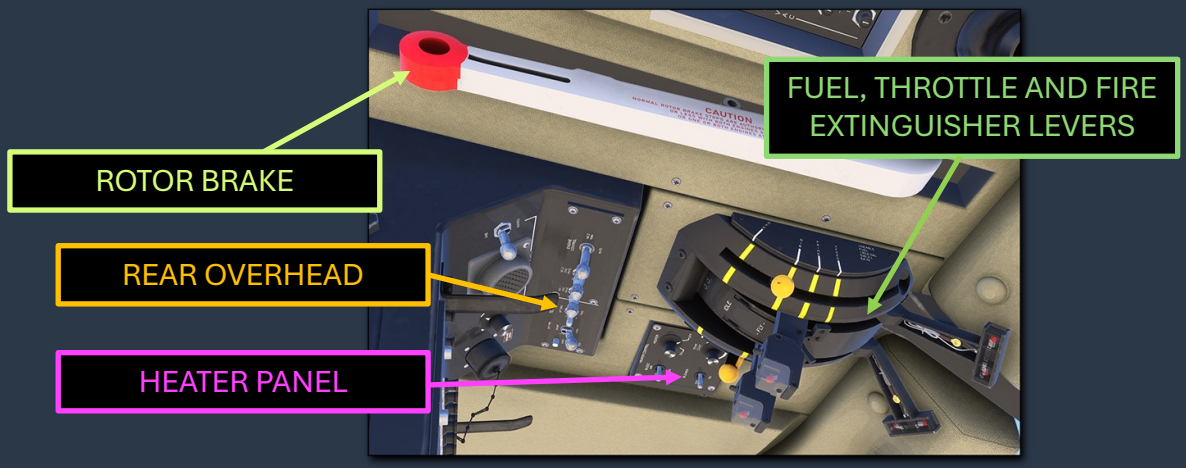
[End of Section 2]

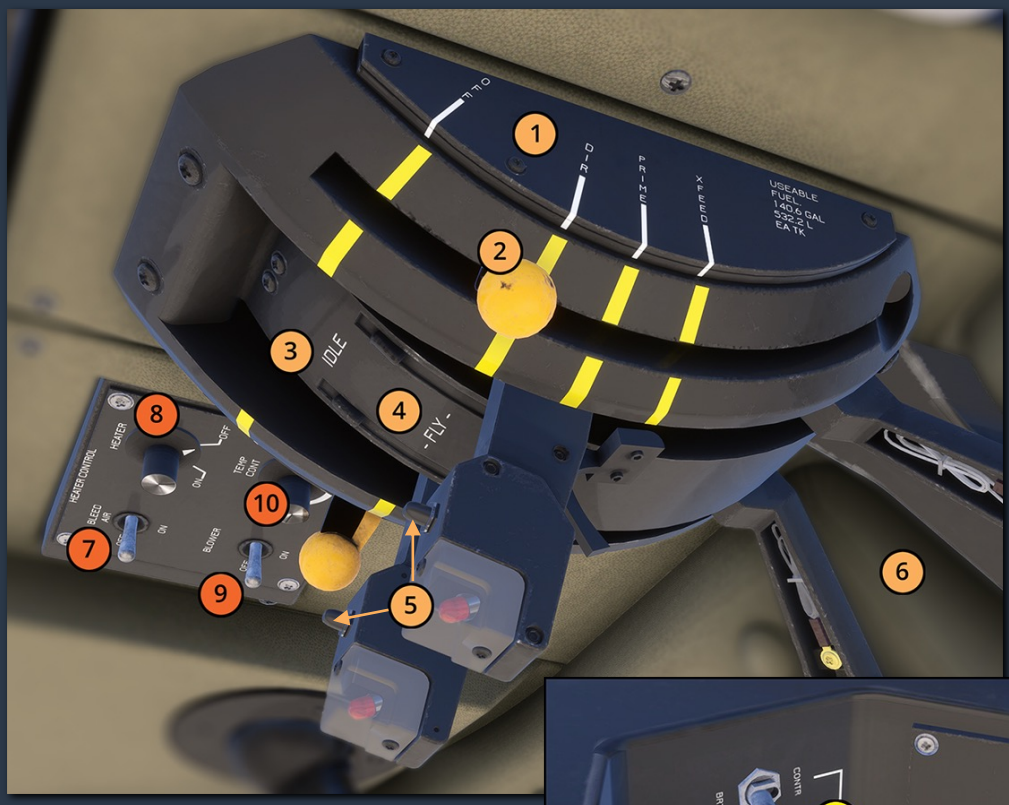
COCKPIT: MAIN PANEL ELEMENTS

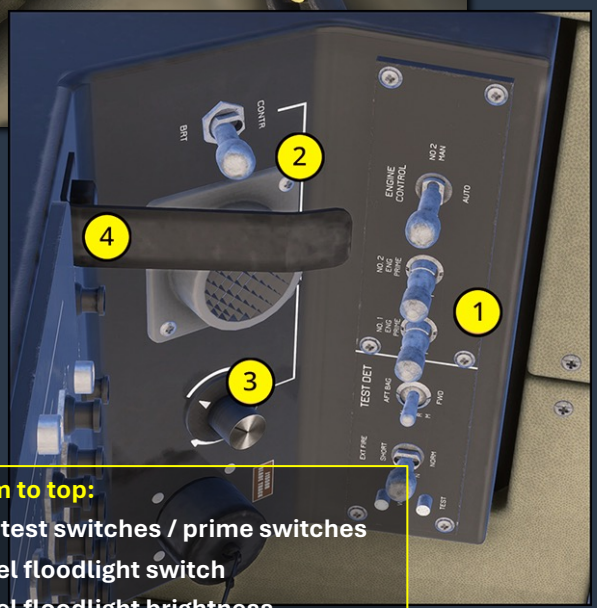
A. Master warning panels (pilot and co-pilot)
B. Dual Automated Fight Control System Caution panel (pilot and co-pilot)
C Barometric setting knob (pilot and co-pilot)
D. Traffic Collision Avoidance System (TCAS) display
E. Annunciator selector panel
F. Standby Attitude Indicator (SAI) and selector panel
G. AL-300 Air Data Command Display and Altitude Preselect Controller
H. Standby airspeed indicator
I. Standby barometric altitude indicator
J. DME readout and selector panel (pilot and co-pilot)
K. Radio altimeter and Decision Height dial (pilot and co-pilot)
L. Electronic Horizon Situation Indicator (EHSI) selector panel (pilot and co-pilot)
M. Autopilot Flight Director mode selection panel (pilot and co-pilot)
N. Digital clock (pilot and co-pilot)
O. Airspeed bugs control panel
P. Electronic Attitude Direction Indicator (EADI) display (pilot and co-pilot)
Q. Electronic Horizon Situation Indicator (EHSI) display (pilot and co-pilot)
R. Garmin GNS 530 GPS/NAV/COM control unit
S. Honeywell Primus 440 weather radar
T. Integrated Instrument Display System (IIDS) displays (co-pilot, center, pilot)
U. IIDS selector panel (INOP)
V. Vne placards (pilot and co-pilot)
W. Audio selector and control panels (pilot and co-pilot)
X. Landing Gear Warning light (pilot and co-pilot)
Y. Floats test panel
Z. Generators and Engines test panel

[End of Section 3]

COCKPIT: OVERHEAD ELEMENTS







1. Fuel Lever Position labels – OFF / DIR / PRIME / XFEED
2. Fuel levers (both sides)
3. IDLE throttle lever position
4. FLY throttle lever position
5. Engine starter buttons – ENG 1 on left, ENG 2 on right
6. Fire T-Handles
7. Heater panel bleed air switch
8. Heater control ON / OFF
9. Heater blower switch
10. Heater temperature control

Bottom to top:

1. Fire test switches / prime switches
2. Panel floodlight switch
3. Panel floodlight brightness
4. 2x Headphone cradles (click to hide headphones)

[End of Section 4]

MAIN PANEL – KEY INSTRUMENTS AND DISPLAYS

In the order as indicated on page 5

A

Master warning panel (provided for both pilot and co-pilot)

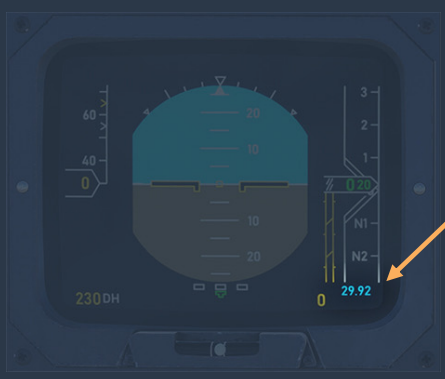
B

DAFCS Caution Panel (provided for pilot and co-pilot)

1. Autopilot alert
2. Collective/Decouple alert

C

Barometer setting knob (provided for pilot and co-pilot)



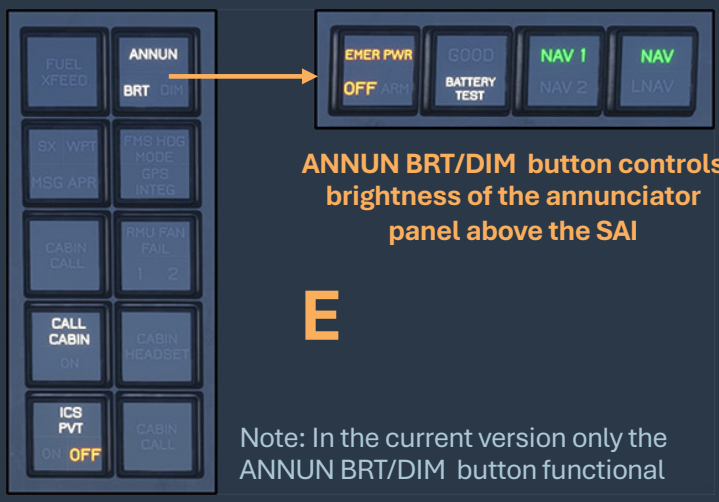
Value is displayed in EADI

D

TCAS Display

Note: In the current version only the DN button is functional

Annunciator Control Panel



ANNUN BRT/DIM button controls brightness of the annunciator panel above the SAI

E

Note: In the current version only the ANNUN BRT/DIM button functional

Continued next page ⟶

Standby Attitude Indicator

1. See Standby Attitude Indicator (SAI) test in checklist
2. See SAI test as above
3. NAV 1 / NAV 2 source selector
4. NAV / LNAV source selector
5. SAI with pitch ladder, flags, and deviation bars
6. VOR course selector
7. VOR / LOC course readout
8. Cage / Uncage knob

F

AL-300 Air Data Command Display and Altitude Preselect Controller

G

1. **Pre-select display (showing target altitude)**
   Depending on mode shows **VS**, **IAS** or **HDG** value
2. **Altitude pre-select knob**

Standby Airspeed and Altitude Indicators

H

I

1. **Standby Altitude Indicator setting knob**
2. **Standby Airspeed Indicator bugs (INOP)**

Continued next page ⟶

Collins IND-42A DME Indicator and selectors

J

1. Channel selector 1, 2 or 3
2. Mode selector – distance, knots, or minutes
3. Power button (INOP)
4. DME display

Note: The selected source can be 'locked' using DME-H (HOLD) button on the COM/NAV controller

Collins ALT-55A/B Radar Altimeter Gauge

1. Decision height alert lamp
2. Test button
3. DH bug
4. DH bug selector knob

K

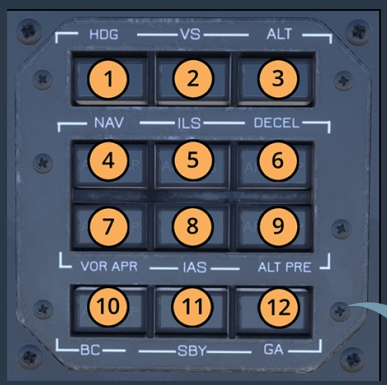
Radar altimeter in TEST mode: alert is lit, needle fully rotated

Electronic Horizon Situation Indicator (EHSI) Selector Panel

See page 10 for details

L

Autopilot Flight Director Mode Select panel



1. Heading mode
2. Vertical speed mode
3. Altitude mode
4. Navigation mode – ARM / CAP
5. ILS mode – ARM / CAP
6. DECEL mode – ARM / CAP
7. VOR Approach mode – ARM / CAP *
8. Indicated airspeed mode
9. Altitude Pre-select – ARM / CAP
10. Back course mode
10. Standby mode
12. Go-around mode

* VOR Approach mode behaves like NAV mode if out of range

M

Press and hold SBY button to Activate TEST mode, all lights will illuminate.

Continued next page ⟶

Digital Clocks (pilot and co-pilot)

N

1. **Cycle upper window – OAT F° / OAT C° / Volts**
2. **Time/timer mode – Universal, Local, Flight, Elapsed**
3. **Time/timer selector**
4. **Press to control start / stop / reset for UT, LT and ET**
   - Press & hold to reset FT

Airspeed Bugs panel

O

1. **Set selected airspeed bug**
2. **Selects the desired bug**

Electronic Attitude Direction Indicator (EADI)

P

1. **Various mode indicators may appear here**
2. **Airspeed tape**
3. **Decision Height indicator**
4. **Pitch ladder and flight director bars**
5. **Vertical Speed Trend Vector** (predicted six seconds ahead at current rate – light blue bar)
6. **Current Altitude indicator**
7. **Barometric pressure setting**
8. **Radio Altitude indicator**
9. **Slip indicator**

Continued next page ⟶

Electronic Horizon Situation Indicator (EHSI)

1. Various displays may be selected for this device (see below for other examples)
2. Various source indicators may appear
3. Course setting
4. Display range arc
5. Vertical speed indicator
6. Ground speed indicator
7. Cycle display

Q

8. Cycle map range
9. Toggle Ground speed / Time to Go
10. Toggle attitude source
11. Toggle heading source
12. Toggle navigation source
13. Select lateral navigation
14. Select bearing source - VOR1 (V), ADF1 (A) or LNAV1 (L)
15. Inner – change DH; Outer – EADI brightness
16. Inner – WX brightness (INOP); Outer – EHSI brightness
17. Select bearing source – VOR2 (V), ADF1 (A) or LNAV2 (L)

Alternative EHSI displays

Example active bearing indicators:
Blue circle = 1
Green diamond = 2

Rose - course direction/deviation arrow

Arc - course direction/deviation arrow & dots

Multiple guides on the GNS 530 in MSFS are available online. An excellent YouTube guide by Jonathon Beckett can be found using **this link**.

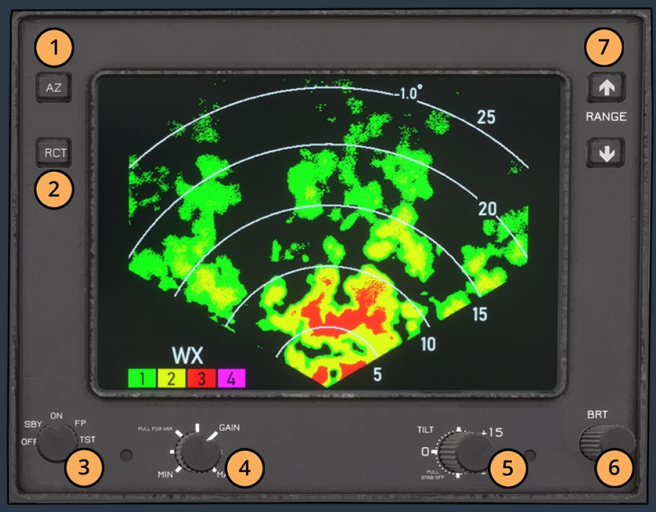
R

Continued next page ⟶

S

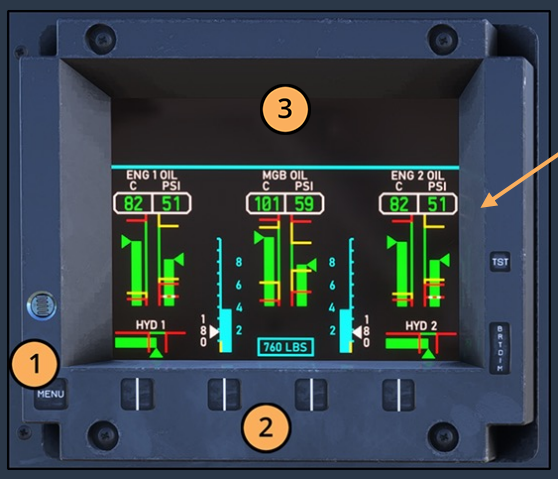
MAIN PANEL – KEY INSTRUMENTS AND DISPLAYS continued

Honeywell Primus 440 Weather Radar



1. Azimuth selector
2. REACT signal loss selector (INOP)
3. Power
4. Gain selector
5. Tilt selector (INOP)
6. Brightness control
7. Range selector

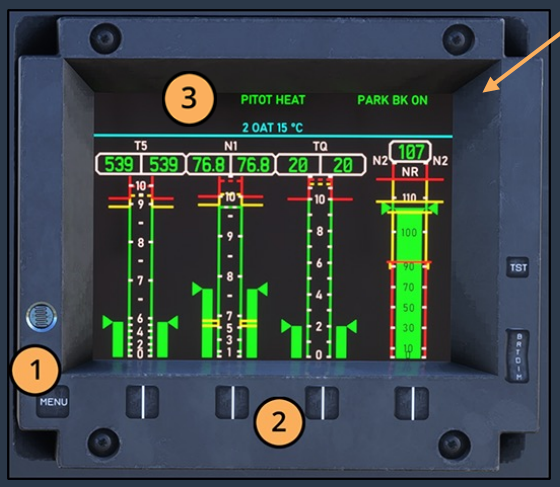
Parker-Gull Integrated Instrument Display System (IIDS)



Center IIDS Display

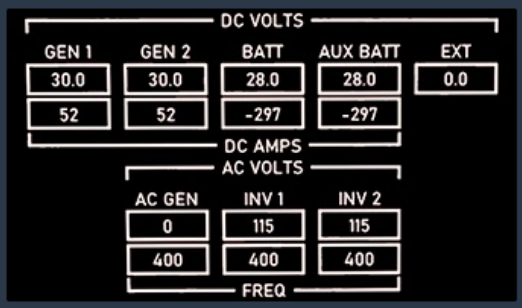
1. Menu select button (example below)
2. 4x menu item soft keys
3. Annunciator display

T



Pilot's IIDS Display
- Duplicated on Co-pilot's panel

1. **Menu select button** (example below)
2. **4x menu item soft keys**
3. **Various status indicators**



Example of one of the menu pages accessed via the Menu button

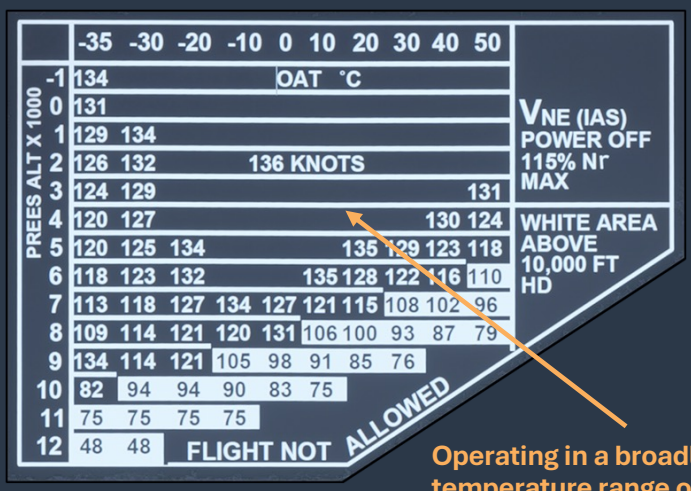
IIDS Selector Panel (INOP)

U

Continued next page ⟶

Vne Placard (provided for both pilot and co-pilot)

V



Operating in a broadly 'average' OAT temperature range of 0-20° C, at 'average' mission altitudes, Vne varies between 115-136 KIAS

Communication Panel (INOP)

W

Continued next page ⟶

Landing Gear Warning Indicator

X

Landing Gear Warning Indicator when lit

Test Panel (Generators and Engines)

Y

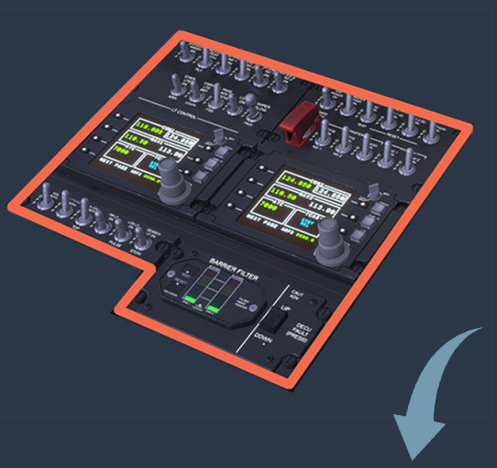
Floats Test Panel

Z

1. Generators 1 and 2 test switches
2. Engines 1 and 2 test switches
3. AC Generator Over/Under Volt test switch
4. Feeder test switch
5. Floats test panel

[End of Section 5]

FORWARD CONSOLE ELEMENTS



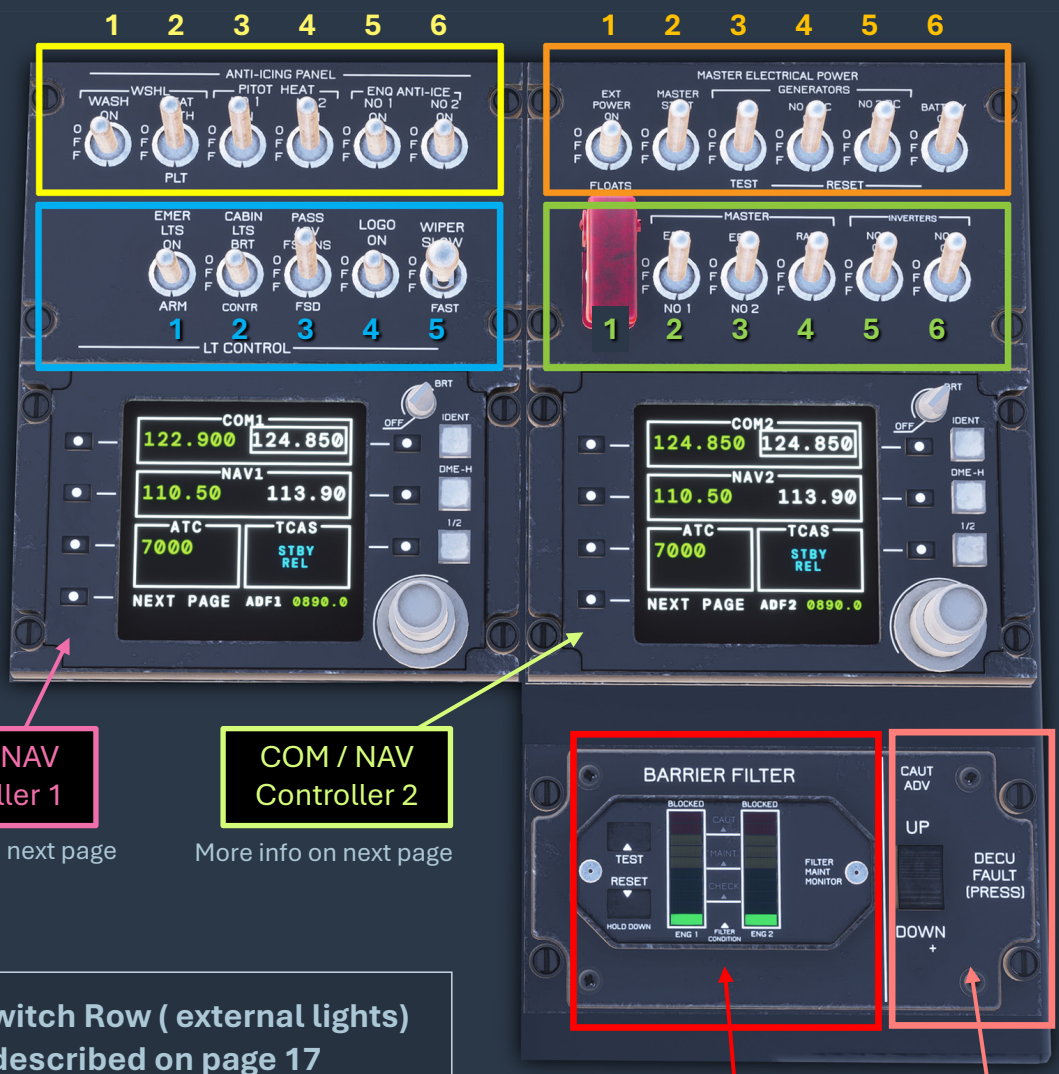
Upper Switch Rows

1. Windshield Wash
2. Windshield Heat
3. Pitot Heat 1
4. Pitot Heat 2
5. Engine Anti-Ice No. 1
6. Engine Anti-Ice No. 2

1. External Power
2. Master Start
3. AC Generator
4. #1 DC Generator
5. #2 DC Generator
6. Battery

1. Emergency Lights
2. Cabin Lights
3. Passenger Signs
4. Logo Light (INOP)
5. Windshield Wipers

1. Floats Arming Switch
2. EFIS (Avionics) 1
3. EFIS (Avionics) 2
4. Radio Master
5. Inverter 1
6. Inverter 2



COM / NAV Controller 1

More info on next page

COM / NAV Controller 2

More info on next page

Lower Switch Row (external lights) is described on page 17

Barrier Filter Status & Test Panel

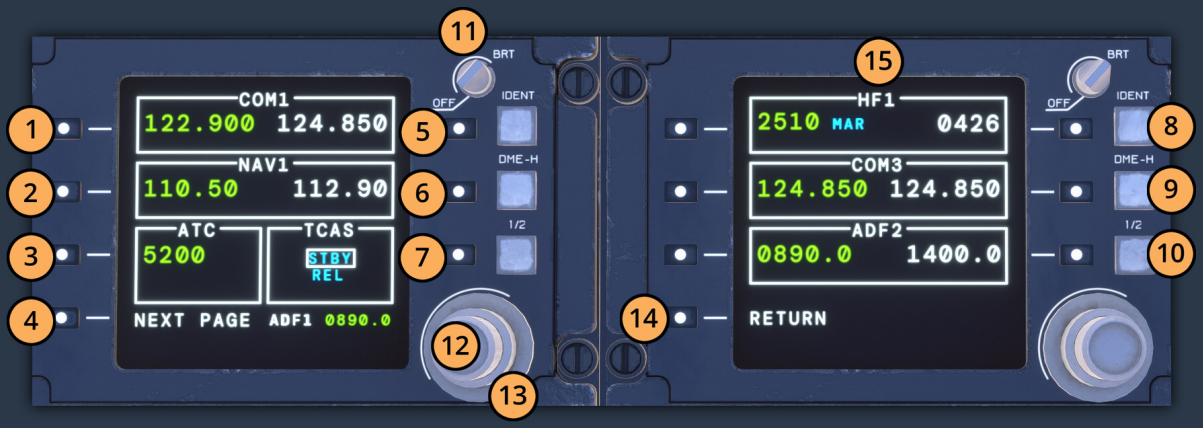
More info on page 17

Caution Advisory & DECU Fault Panel

Continued next page ⟶

FORWARD CONSOLE ELEMENTS continued

Dual Collins RTU-4200 Radio Tuning Units



1. Swap active/standby COM1 frequency
2. Swap active/standby NAV1 frequency
3. ATC code selector button:
   a. Press to activate code indicator, first digit is selected
   b. Change first digit by rotating inner selector knob (12)
   c. Move to next digit using outer selector knob (13)
4. Go to NEXT PAGE (shown in right hand unit)
5. Standby COM1 frequency selector button:
   a. Press to activate frequency, whole MHz value is selected
   b. Change whole MHz value by rotating outer selector knob (13)
   c. Change decimal MHz value by rotating inner selector knob (12)
6. Standby NAV1 frequency selector button, change values as above
7. Select TCAS mode:
   a. Press to activate mode indicator
   b. Change from STBY to TA ONLY by rotating inner selector knob (12)
8. ATC IDENT button
9. DME HOLD selector (when tuned to a NAV frequency, HOLD is lit in DME readout)
10. Selector to swap from COM1/NAV1 to COM2/NAV2 and back
11. Display brightness controller
12. Inner selector knob
13. Outer selector knob
14. Return to previous page
15. HF1, COM3 and ADF2 page, frequency changes as described above

Continued next page ⟶

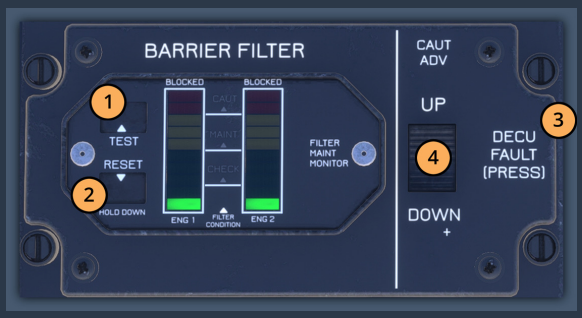
FORWARD CONSOLE ELEMENTS continued

Lower Switch Row – External Lights

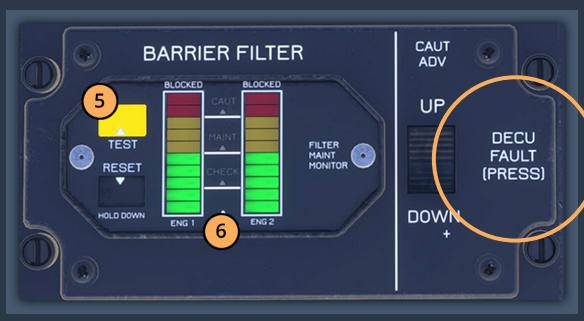
Tip: The searchlight can be panned and tilted using the in-sim hat switch on the **collective** stick. See page 21

1. High Intensity Lights – 2x, on horizonal stabilizer
2. 'Strobe' lights – in fact, green/red navigation lights
3. Anti-collision lights – BOTH (tail and belly) or TOP (tail)
4. Main rotor blades – blue tip lights
5. Landing lights (ON – OFF – PULSE alternate sides)
6. Searchlight ON – OFF – STOW

Barrier Filter Panel



1. **Press to Test button (see image below)**
2. **Test RESET – Hold for 5 seconds**
3. **Digital Engine Control Unit (DECU) fault panel**
4. **DECU Caution Advisory Warnings scroll switch ***



Barrier Filter in test mode

5. **Test button illuminates**
6. **All warning lights illuminate**

What is the DECU?

The **Digital Engine Control Unit I(DECU)** is a crucial component in managing engine parameters digitally to enhance performance, reduce pilot workload, and improve the reliability and lifecycle of the S-76C++

* Scrolls up and down through the Centre IIDS Caution/Warning advisory panel when there are too many captions to display on the screen. In reality this switch has additional functions, but they are not modelled in the simulator.

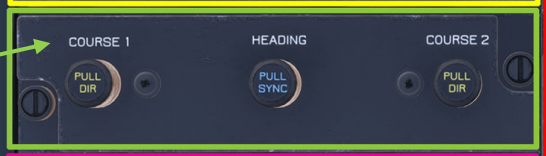
[End of Section 6]

CENTER CONSOLE ELEMENTS

UNS-1 FMS
A tutorial on setting up a simple flight plan using the UNS-1 is provided, starting on **page 24**

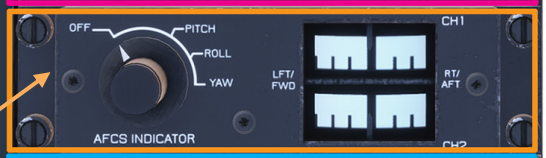
Instrument Lighting Panel

Course & Heading Setting Panel



Autopilot Control Panel

Automatic Flight Control System (AFCS) Channel Monitor Panel



Passenger Announcement Panel

Cabin Door & Step Control Panel

Doors & Hatches Warning Panel

Continued next page ⟶

CENTER CONSOLE ELEMENTS continued

Course & Heading Setting Panel

1. Course 1 selector
2. Heading selector
   - Right click synchronizes bug with current heading
3. Course 2 selector

Further information on the autopilot system is provided in Section 10.

Autopilot Control Panel

4. Autopilot 1 ON/OFF button
5. Autopilot 2 ON/OFF button
6. Flight Director 1/2 button
7. Collective assistance ON/OFF
8. Coupling ON/OFF (AP, FD)
9. SAS / ATT button
10. Autopilot TEST button
11. Radio Altitude ON/OFF button
12. Vertical Velocity Hold button

AFCS Channel Monitor Panel

13. Indicator dial works but otherwise INOP

Pax Announcement Panel

14. Power button
15. Selected announcement
16. Selector buttons
17. Play button

Cockpit Lighting Panel

1. Instruments
2. Non-flight / Glareshield
3. Lower console

Doors & Steps Panel

Doors & Hatches Panel

1. Cockpit, cabin, and baggage alerts
2. External power connection alert

Doors & Step Control Panel

3. Cabin door lock/unlock rocker
4. Boarding step status and retraction rocker

[End of Section 7]

REAR CONSOLE ELEMENTS

1. AirCell ST 3100 Satellite phone (INOP)
2. Cockpit Voice Recorder & Flight Data Recorder (INOP)
3. Compass control panel (switches function but INOP)
4. Stick Trims (collective, cyclic & yaw)
5. EFIS & Radio bypass panel

[End of Section 8]

OTHER COCKPIT ELEMENTS

Cyclic Control Stick

1. Trim (Longitudinal and Lateral)
2. Floats Deploy button
3. Force Trim Reset button

Collective Control Stick

1. Collective trim button
2. Searchlight yaw and and tilt control (press and hold)
3. Engine Limit selector

Standby Compass

1. and 2. Both switch have the same function in the simulation – a light switch for the compass and clock

Parking Brake & Test Panel

1. Parking brake handle (up – engaged, down – released)
2. Engine Out test switch
3. Emergency Bus Recovery switch *
4. ESS Test alert lamp

* When switched on, it provides an alternate current path to the Essential Bus from the #2 Generator in the event of the Essential Bus Volts Low malfunction (Essential Bus Volts < 24) caused by a failure of the bus tie or a low voltage output from the #1 Generator. Thanks Toni_L for this detail!

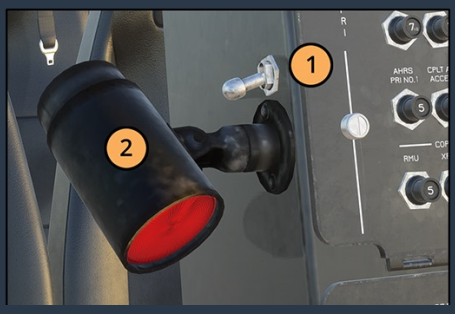
Continued next page ⟶

OTHER COCKPIT ELEMENTS continued

The cockpit of the CowanSim S-76C++ contains several other nicely modelled elements that add to the realism of the simulation experience

Headphones

1. **Click the hook to hide (‘don’) pilot’s headphones**
2. **Click the hook to hide (‘don’) co-pilot’s headphones**



Red Cockpit Lamp

1. **ON / OFF switch**
2. **Lamp – click and hold to swivel**

Door handles (pilot and co-pilot)

1. **Click to open / close**
   - the increase in sound when opened is satisfying

Side Window Vent

1. **Click to open**

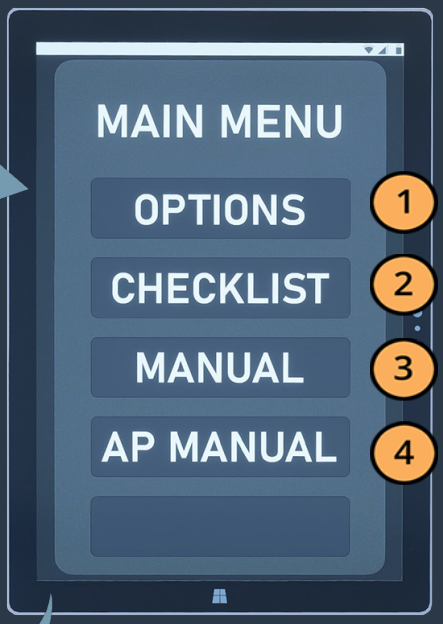
Side Window Vent

2. **Click to close**
   - increased external sound here too

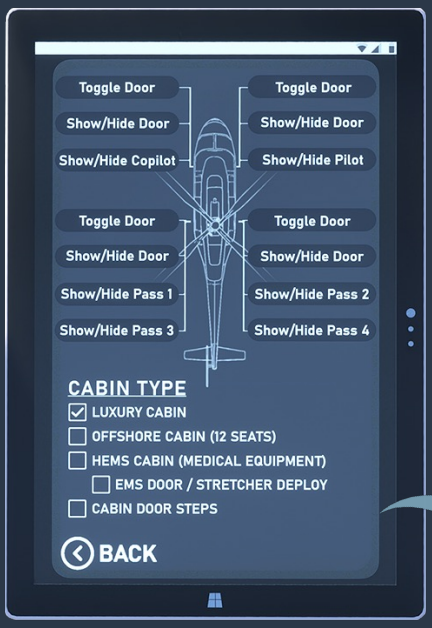
Continued next page ⟶

Electronic Flight Bag / Tablet

1. **Brightness control**



1. **Options menu (opens the screen shown on below left)**
2. **Checklist (non-interactive)**
3. **Opens a page with some additional general information** (this official manual provides more details)
4. **Autopilot 'manual' – a short list of autopilot functions** (for more info see Section 10 of this manual page 29)



The Options page is very cool – it provides a simple method to control doors, hide/show the co-pilot and passengers, add steps, and instantaneously convert the cabin layout to other roles:

- VIP luxury seating and fittings.
- Offshore personnel high-density seating.
- Detailed EMS fit-out with a paramedic and patient, with an option to have the stretchered patient partly unloaded in the doorway.

[End of Section 8]

UNIVERSAL UNS-1 FMS

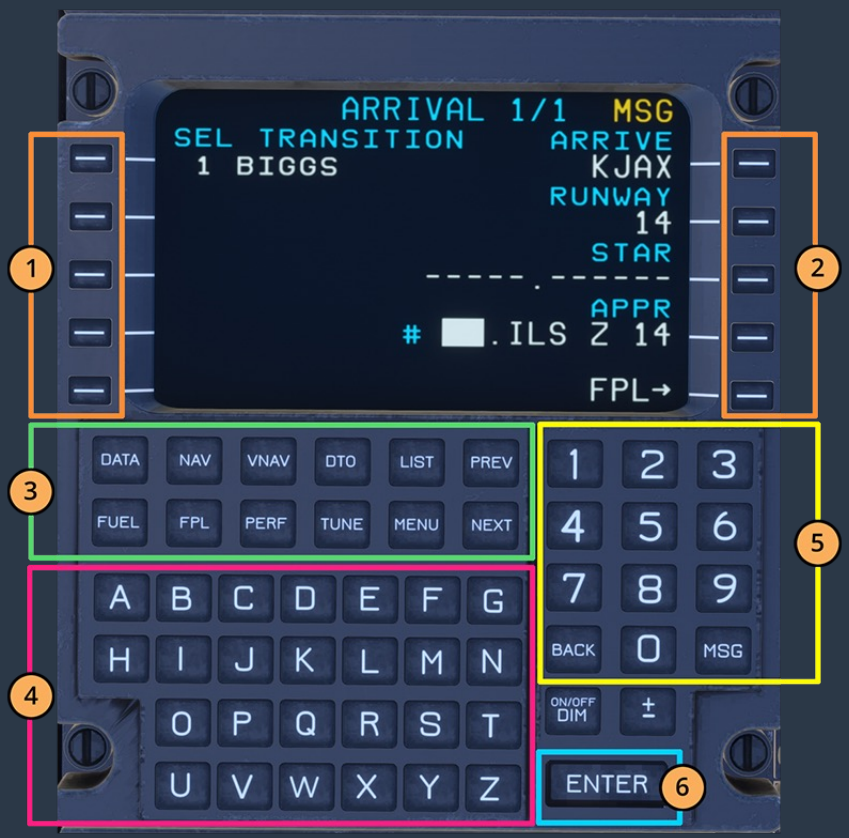
Universal UNS-1 Flight Management System (FMS)

The FMS depicted in the CowanSim S-76C++ is a Working Title Simulations instrument produced for Asobo. It is the same FMS depicted in the MSFS Saab 340B twin-engine turboprop commuter, with minor alterations for use in a helicopter. **A tutorial on setting up a flight plan using the UNS-1 is starts on the next page.**

ESSENTIAL KEYS & BUTTONS

Line Select Keys (LSK) are identified using the soft keys numbered from 1 to 5, plus the relevant side (left/right) of the FMS. 1 2

For example, **LSK3R** is the third key down on the right side of the FMS.

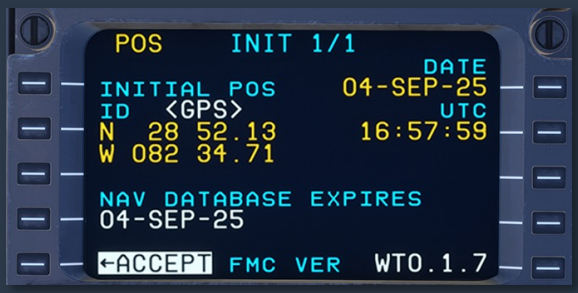


1. **Line Select Keys (Left)**
2. **Line Select Keys (Right)**
3. **Page select buttons**
4. **Alphabetical buttons**
5. **Numeral entry buttons**
6. **Enter (‘action’) key**

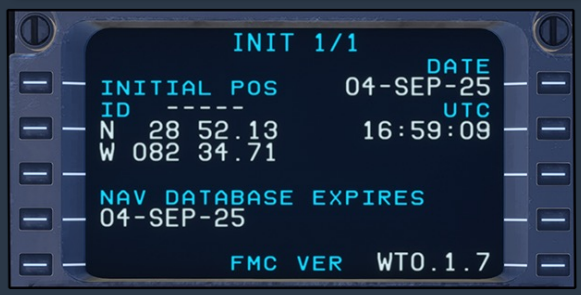
Continued next page ⟶

SETTING UP A FLIGHT PLAN WITH AN ILS APPROACH

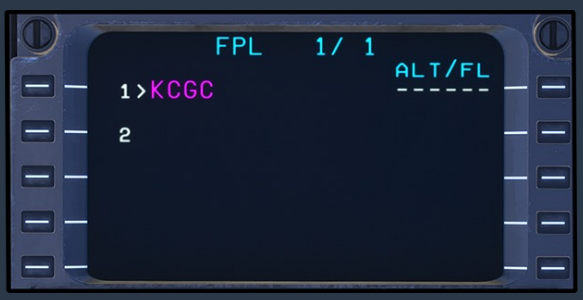
We will create a basic flight plan to simulate a VIP charter to carry a small group of businessmen from **KCGC** Crystal Lake/Davis Field, Florida with a brief stop at **KLCQ** Lake City Gateway airport to drop off one of the passengers, before continuing to **KJAX** Jacksonville, Florida, where the remaining passengers will transfer to commercial interstate flights. It is late in the day when we depart KCGC so we will also set up an ILS approach to land on Runway 14.



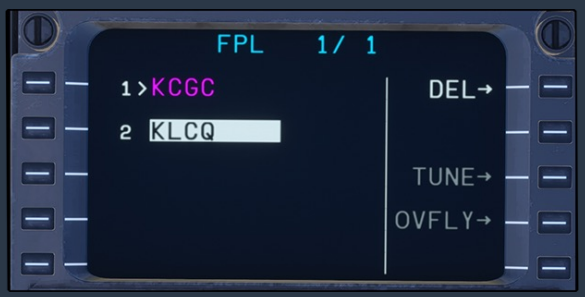
When the system boots up it displays position and date/time, plus the current navigation database info. Click **LSK5L** or the **ENTER** button to accept.



Once accepted, the status screen is displayed. Press the **FPL** button to start the flight plan.



The flight plan page should open with your current location already loaded.



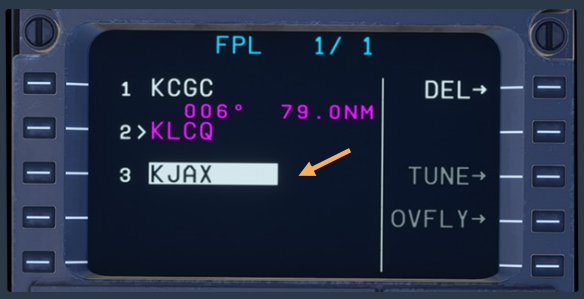
To enter the waypoint at Lake City Gateway, press **LSK2L** then enter the airport ID using the alphabetical keypad, then press **ENTER**.

When you press **ENTER** the FMS will display data about the waypoint. Click **LSK5L** or the **ENTER** button to accept. If you wished to add additional waypoints, you would repeat this step for each one.

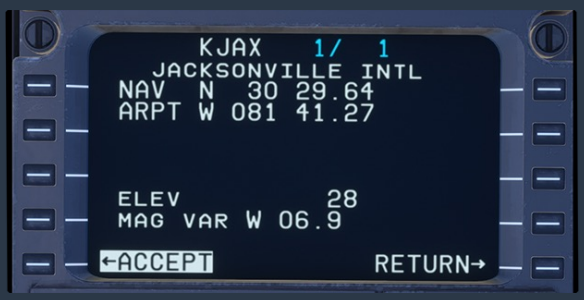
Continued next page ⟶

Historical note: In 2013 KCGC was renamed **Crystal River Airport – Captain Tom Davis Field**. CAPT Tom Davis, USN (Ret), was a US Navy pilot and a recipient of the Legion of Merit and the Distinguished Flying Cross. He saw combat duty during the Koren and Vietnam wars. When he retired after more than three decades of service, CAPT Davis settled in Crystal River and opened a flying school at the airfield, later becoming the airport manager. He passed away in 2022 at the age of 95.

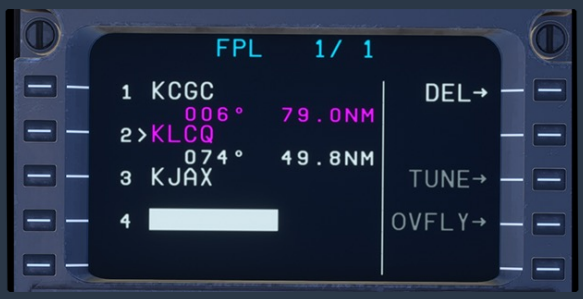
Tom Davis with his flak-damaged F4U Corsair after an attack on a bridge in North Korea in 1951.



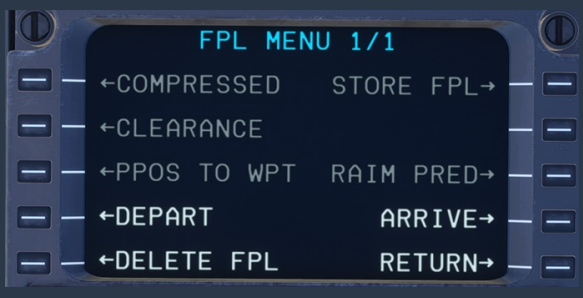
To set up a new waypoint at our destination at Jacksonville, press **LSK3L** then enter the airport ID using the keypad then press **ENTER**.



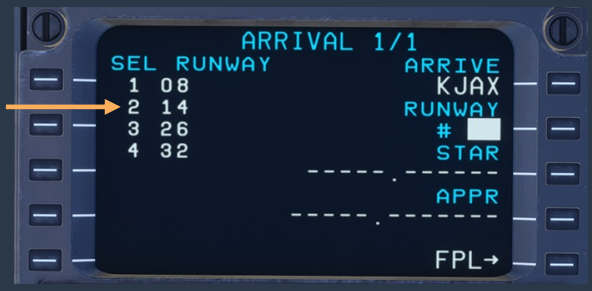
The FMS will display data on the new waypoint. Click **LSK5L** or the **ENTER** button to accept.



The screen will now appear as shown on the left. To tell the FMS that **KJAX** is our destination, press the **MENU** button.



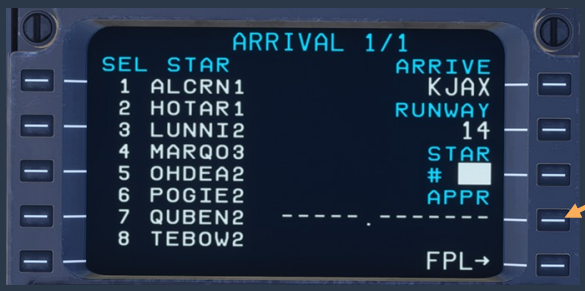
On the **MENU** page press **ARRIVE** at **LSK4R**.



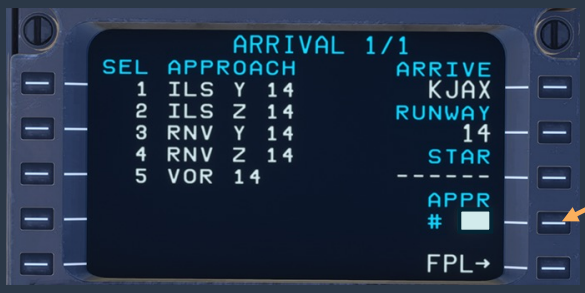
The **ARRIVAL** page will display the available runways. This is where this FMS differs from others you might have used.

You need to note the single digit beside each runway number. A box next to **LSK2R RUNWAY** will be highlighted. Using the numerical keypad, press **2** then the **ENTER** button.

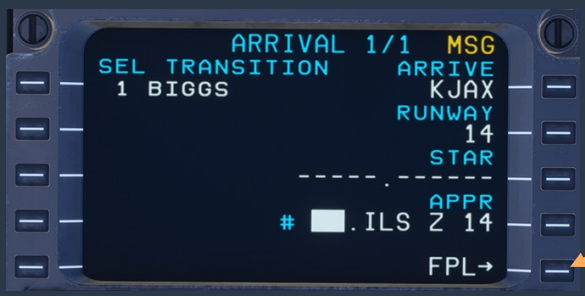
Continued next page ⟶



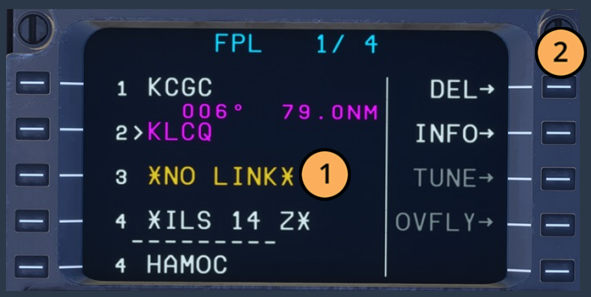
The FMS will display available STARs for Runway 14, but we won't use any of these. Instead, press **LSK4R APPR**.



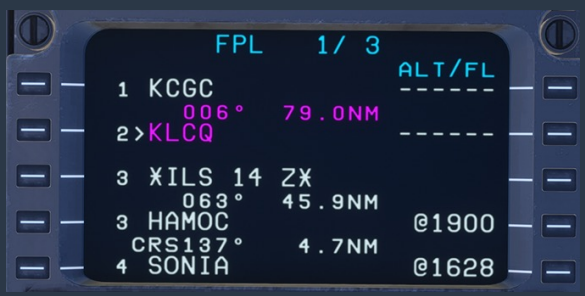
We will use ILS Z 14. Using the same method as previously, use the numerical keypad to enter **2** at **LSK4R** then press the **ENTER** button.



The FMS will offer a TRANSITION to the ILS but we won't need that. Press **LSK5R FPL** to review the flight plan.

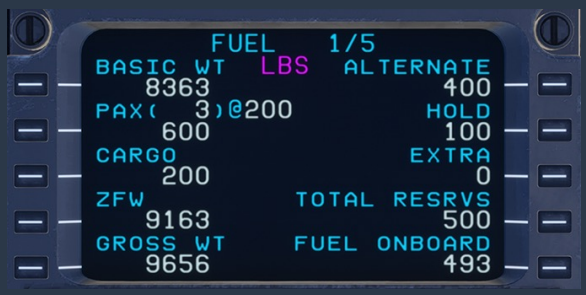


On the **FPL** page you should see ~~¥NO LINK¥~~ flashing at **LSK3L** (1) to warn us that there is no connection from our interim waypoint to the start of the ILS. That's okay; we can clear the warning by clicking the LSK to highlight the warning and then pressing **LSK1R DEL**. (2)

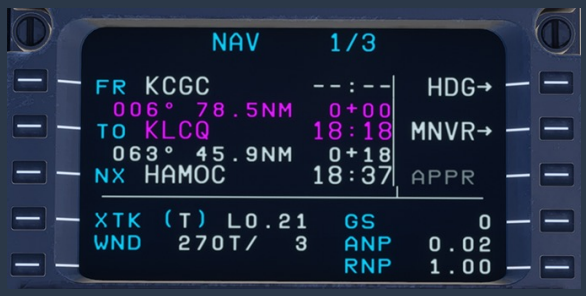


Page 1/3 of the flight plan will be displayed showing out departure, our stop off, and the ILS approach to Runway 14. We can review the rest of the plan, including the Missed Approach procedure, using the **NEXT / PREV** buttons.

Continued next page ⟶



By pressing the **FUEL** button, the FMS allows us to enter the number of PAX, the amount of CARGO, and FUEL settings as desired. These can be obtained from a flight planning app such as **Little NavMap**. When data is added, aircrafts weights are calculated. Unfortunately, these settings don't appear to be reflected in the simulated weight and balance.



When you are ready press the **NAV** button to display a progressive summary of the flight plan.

Finally, go back to the main panel and press **LNAV** on the EHSI selector panel, and you are good to go.

Is it necessary to use the FMS to create a flight plan?

Of course, you can create a flight plan using the built-in MSFS flight planner via the World Map screen, in combination with the EFB. Doing so will load a completed flight plan into the Garmin GNS 530 and the UNS-1 FMS (that's what we will do in the Tutorial Flight in Section 13). If you want a more realistic preparation, programming the GPS and FMS is a satisfying process.

[End of Section 9]

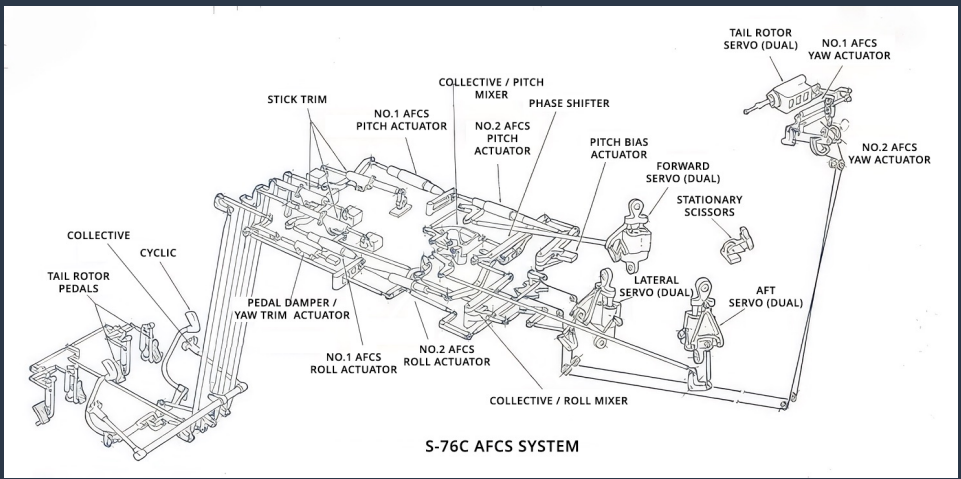
Components of the system

When non-pilots refer to an 'autopilot' they are often thinking of some magic button that controls an aircraft. In fact, what they are referring to is a highly complex and integrated system of sensors, computers, and actuators that automatically stabilize and control an aircraft in flight. That suite of systems is called an **Automatic Flight Control System (AFCS)**.

The impressive AFCS fitted to the S-76C++ helicopter comprises four main elements:

- A **Stability Augmentation System (SAS)** that improves basic helicopter handling qualities by automatically damping oscillations in pitch, roll, and yaw. SAS requires 'hands on' flying. No flight director modes can be used while SAS is engaged. Pilots tend to use SAS when significant maneuvering is required or during turbulence, when the SAS smooths the pilot inputs and external disturbances.
- An **Attitude Retention System (ATT)** that returns the helicopter to a selected attitude after a disturbance. This mode is flown with hands off the controls. In the real helicopter, changes in attitude can be made using a four-way 'beep' switch or using a 'force trim' switch on the cyclic. In MSFS these changes are accomplished using keyboard or controller binding assignments.
- A four-axis **Autopilot (AP)** that applies pitch, roll and yaw stabilization, maintains the desired attitude, controls power input via a collective control function, and includes functional modes for heading, altitude, vertical speed, navigation tracking, and approach.
- A **Flight Director (FD)** that provides the pilots and/or autopilot with lateral and vertical steering commands to fly the helicopter along a desired lateral and vertical flight path. Visual guidance is provided by cues superimposed on the Electronic Attitude Director Indicator (EADI) and Standby Attitude Indicator (SAI).

This 'system of systems' is what makes the S-76C family of helicopters so safe and reliable in a wide range of roles by day, night or in adverse weather conditions.



S-76C AFCS SYSTEM

Original image (slightly modified by the author) from Helicopter Maintenance Magazine *'Understanding Helicopter Automatic Flight Control Systems (*AFCS)' - Paul J. Magno - 06/01/2014

This diagram of the mechanical components of the S-76C AFCS is provided merely to give you an idea how complicated the system is, and this doesn't include any of the computers, wiring, gauges and avionics systems!

Continued next page ⟶

Automatic Flight Control System, continued

CowanSim provides an autopilot guide among the downloadable S-76C++ documents. It is really an abbreviated **AFCS guide**. The CowanSim summary is reproduced here for ease of reference (slightly edited for clarity).

The Downloadable Autopilot Guide

Console and main panel:

- **AP1 / AP2:** Engage or disengage each autopilot computer.
- **FD1 / FD2:** Selects which flight director drives the autopilots.
- **COLL:** Disengages or re-engages collective coupling if available.
- **CPL:** Decouples or recouples actuators from Flight Director commands.
- **SAS/ATT:** Toggles Stability Augmentation or Attitude Retention.
- **TEST:** Runs a preflight check of the autopilot computers – see below for more info.
- **RAD ALT:** Uses collective to hold reference altitude above ground level.
- **VEL HLD:** Enables hover-augmentation mode.
- **AFCS Indicators:** Show current trim deflection status.
- **RA-315 Radio Altimeter:** Displays RA, sets decision height, and conducts tests.
- **AL-300 Air Data Display:** Shows altitude in Altitude Preselect mode, or different values when other modes are in use. Referred to as 'Pre-select display' for brevity.
- **Force Trim Release:** While held retrims control according to user cyclic input.
- **Four-Way Switches:** Adjust trims or reference selections in various modes.

Flight Director Modes:

- **Standby (SBY):** Cancels all attitude modes.
- **Heading Select (HDG):** Commands a turn to and then hold the selected heading.
- **Vertical Speed (VS):** Enables VS mode, holds current VS, or allows VS to be changed using the relevant selector.
- **Altitude Hold (ALT):** Maintains the current altitude.
- **Navigation (NAV):** Tracks a VOR, LOC, RNAV, or LNAV course selected on the HSI.
- **ILS:** Arms LOC and GS for full ILS approach guidance.
- **DECEL:** Automatically slows to 70 knots before reaching the runway.
- **VOR APR:** Optimized VOR approach capture; behaves like NAV if out of range.
- **IAS**: Engages hold mode using current speed.
- **ALT PRE:** Arms and captures a preselected altitude.
- **BC:** Tracks the reverse side (back course) of a localizer.
- **GA:** Cancels all vertical modes and initiates a go-around climb.

Autopilot Test Sequence

Press the **TEST** button, TEST **ON**, **AP1** button flashes

Press the **AP1** button, TEST **ON**, **AP2** button flashes

Press the **AP2** button, END appears in pre-select display, then press **TEST** to complete the test process

Continued next page ⟶

AFCS – Using the key components and functions

Author's note: I am indebted to **Matthew Crawford** for his enjoyable and informative videos on various simulated helicopters including the CowanSim S-76C++ via his YouTube channel: **Matthew Crawford - Let's Fly!** Much of my understanding of the S-76C++ comes from his videos. Make sure to drop by, like and subscribe! 😊

Refer to the cockpit elements diagrams in Sections 3-7 if you have trouble finding the switches/controls mentioned here.

Step-by-step AFCS Guide

Here is a step-by-step guide on how to use the key AFCS components and functions. For the purposes of this guide, I will describe a basic point-to-point flight with a visual approach to land at the destination. We'll cover an ILS approach later (Section 13).

We will assume you are in the S-76C++ with the engines and all systems running, ready to depart from the runway of your choice. We'll also assume you have a valid flight plan loaded into the FMS and Garmin GNS 530.

Step 1

Engage **AP1**, **AP2**, **FD2** and **ATT** in the Autopilot Control panel (center console). This turns on both autopilots, tells the AFCS to use the pilot's Flight Director for guidance, and engages the Attitude Retention System (**ATT**).

Step 2

Right click on the **HEADING** knob on the **Course and Heading panel** (in the center console) to synchronize the heading bug with the current heading. The blue heading bug will jump to the top of the heading arc in the EHSI (main panel).

Step 3

Press the **LNAV** button 

on the **EHSI Selector panel** to prepare the AFCS to follow the programmed flight plan. Press the **FULL | MAP** button 

twice to display the 'compass rose' navigation page.

Step 4

Dial in your initial target altitude – let's use 3,000 ft – by turning the selector knob on the **Air Data Command Display and Altitude Preselect Controller** (hereafter referred to as 'the pre-select display'), then press **ALT PRE** on the **Flight Director Mode Select panel** (main panel) which will display **ARM**. Selecting **ALT PRE** is vital; it tells the AFCS to aim for and hold the selected altitude. You could do this step after taking off but it's easier to get it done now.

Step 5

Take off. Fly the runway heading by hand and add sufficient collective (power) to start a climb to clear any obstacles. When ready, press **HDG** on the Flight Director panel, which will display **ON**. The autopilot will take control of the heading and align on the heading bug.

Note: See Section 12 on key bindings to make using the FD easier.

Step 6

Watch the **Vertical Speed Indicator (VSI)** on the right side of the EHSI. When the climb rate is roughly 500 fpm press **VS** on the Flight Director panel. It will turn **ON**.

Continued next page ⟶

Step 7

It might be necessary to make a turn to intercept the flight plan. The AFCS allows this to be done in several ways but for now we will keep it simple. With **HDG** still engaged, turn to an intercept course using the **HEADING** knob (on the **Course and Heading** panel) or use the **lateral (left/right) trim** hat switch.

Step 8

Once on a heading to intercept the flight plan press **NAV**, which will display **ARM**. When the helicopter approaches the first leg of the flight plan the AFCS will initiate a turn to follow the plan, and the **NAV** button will display **CAP** (captured).

Step 9

If desired, increase or decrease the vertical speed using **longitudinal (forward/back) trim** while observing the pre-select display until the desired **VS** is set. You will see the resulting change in the **EHSI VSI** gauge.

Step 10

As the helicopter nears the target altitude several things happen in sequence:

- With less than 200 ft to go, **ALT PRE** shows **CAP** as the helicopter starts to level off.
- With under 100 ft to go, the **ALT** button shows **ON** as the helicopter levels off.
- At the same time the **ALT PRE** button extinguishes, the vertical speed drops to zero, and the **VS** button extinguishes.

Step 11

At this point you might wish to set a specific airspeed, say 120 knots, using **Indicated Air Speed mode**. Press the **IAS** button, which will display **ON**. The current airspeed will show in the pre-select display. Use **longitudinal trim** to set the required airspeed. The helicopter will adjust power and trim to attain the required airspeed.

Pro Tip: Did you notice that we used the longitudinal hat switch to adjust the vertical speed as well the desired airspeed at different times? Tricky!

When we have engaged **VS** mode, we use the longitudinal hat switch to change the vertical speed. When **IAS** mode is engaged, the same input changes the airspeed. The AFCS knows what mode we are in and responds appropriately.

We'll cover what to do if both IAS and VS modes engaged at the same time later on. Don't worry about it right now.

Continued next page ⟶

Step 12

We are cruising at 3,000 ft with **NAV**, **ALT** and **IAS** and modes all engaged. Let's climb to a new altitude – say **6,000 ft**. Here are two methods to achieve this:

Method A – Hands off (a bit clunky):

- Set **6,000 ft** using the knob on the pre-select panel. Remember to press the **ALT PRE** button which will display **ARM**. Next, turn **IAS** mode off. Press the **VS** button **ON**, then use **longitudinal trim** on the joystick hat switch to set a suitable vertical speed, say **500 fpm**. The helicopter starts a climb.
- As before, nearing the new altitude the helicopter will start to level off, the **ALT PRE** button will show **CAP**. Shortly after that **ALT** button shows **ON** and the **ALT PRE** and **VS** buttons blink out. Turn **IAS** mode back **ON**, adjusting the airspeed if needed once again using **longitudinal trim**.

Method B – Hands on (a better way): Thanks to Matthew Crawford for showing me this method

- This method starts the same as the 'hands on' method above: Set the new altitude in the pre-select panel, then press the **ALT PRE** button which will display **ARM** but don't set a vertical speed. Notice that the **ALT** button stays **ON** and nothing happens because we didn't tell the AFCS how to accomplish the climb.
- No problem, we'll do that part ourselves. Turn **ALT** off then manually increase the **collective**. Only a modest amount of extra power is needed, and you can adjust the power level as the climb proceeds. Observe the increasing vertical speed in the **EHSI VSI** display.
- Glancing down to the center console at the Autopilot Control panel you'll notice the **COLL** button is extinguished, meaning the collective is not currently coupled.
- Once the climb is stable, there's nothing else to do except admire how smart the AFCS is. As in the other method, in due course the helicopter will start to level off, the **ALT PRE** button will show **CAP** then wink out, the **ALT** button will again show **ON** and the vertical speed drops to zero.
- During the climb you might notice that the AFCS slowly lowers the collective control back to the previous position as the helicopter starts leveling out. The **COLL** button returns to **ON** to show that the AFCS has got it.

Collective manually raised, COLL off

Collective lowered by AFCS, COLL ON

Continued next page ⟶

Step 13

Our climb to 6,000 ft went smoothly and our destination is the next waypoint. It's time to start a descent in preparation for landing.

We set the **IAS** to **120 knots** earlier; that's fine for our descent.

Set the lower altitude (the notional circuit height is **1,000 ft** so use that) using the preselect knob on the pre-select display, then press the **ALT PRE** button.

But how do we know when to start our descent? Here's an old-fashioned method:

— The 3:1 Rule to calculate Top of Descent (ToD) —

Divide the altitude you need to lose by 1,000 then multiply that number by three to find the distance in nautical miles from your destination:

(Altitude to lose ÷ 1,000) × 3 = Distance from destination to ToD

For example, to descend from 6,000 ft to a circuit height of 1,000 ft, you need to lose 5,000 ft. In this case the formula would be 5 x 3 = 15, so start your descent around **15 nautical miles out.** A descent of about 800 fpm would take a bit over six minutes at 120 knots. Start further out if you'd prefer a more sedate rate of descent.

...or you can use the old-fashioned eyeball method - just descend when it feels right!

We also need to tell the AFCS how to accomplish the descent. Couldn't we just press the **VS** button then use the longitudinal trim hat set a vertical speed? **No!**

We can't do that because, even with **VS** mode selected **ON**, if we try using the longitudinal hat switch that will change the airspeed. What's going on? And how do we change the vertical speed with **IAS** mode engaged? Read on...

When **IAS** mode is in use, it 'takes over' the longitudinal trim as its own personal input method. But what about changing **VS**, which we set earlier using the same hat trim input? This is where something clever called the **BEEP TRIM** function comes in.

As suggested in the CowanSim documentation, you need to assign the MSFS setting **HELICOPTER ENGINE 1 BEEP TRIM INCREASE / DECREASE** to buttons or (even better) to a **secondary hat switch** on your controller. This will allow you to adjust the desired vertical speed when **IAS** and **VS** are engaged simultaneously.

So, with **VS** mode selected **ON** use a **secondary hat switch** to set a new vertical airspeed, visible in the pre-select display. **Minus 800 fpm** would be appropriate.

Step 14

The AFCS will capture the lower altitude close to your destination. The helicopter will level off. When ready, turn off **NAV**, **IAS** and **VS** before proceeding to land.

Continued next page ⟶

— Key Take-away Points re IAS and VS modes —

- When in **VS mode**, use the longitudinal trim on the principal joystick hat switch to set a new vertical speed.
- When in **IAS mode**, also use the use the longitudinal trim on the principal joystick hat switch to set a new airspeed.
- When in **VS and IAS modes simultaneously**, use longitudinal trim on the **principal joystick hat switch** to change **airspeed**, and use a **secondary hat switch** on your controller to alter the **vertical speed**.

Additional information on the S-76C++ AFCS

In **Step 7** we simply moved the heading bug to change course. There are several other ways to do this including:

- Go from **ATT** to **SAS** mode – make a turn towards the first leg, then re-engage **ATT**.
- Stay in **ATT** mode – use the cyclic to turn as required, using **Force Trim Release** as required to offset stick pressure. Re-trim once on a suitable heading.
- Stay in **ATT** mode – press and briefly hold **lateral (left/right) trim** on the joystick hat switch to set a suitable angle of bank, then release the switch. The helicopter will ease off the bank and fly straight. Repeat if required.
- Turn **HDG** mode off then use **lateral trim**. The heading bug won't move but the helicopter will turn. You can use this technique to 'steer' left or right.

With any of the above methods, you can use **ROTOR TRIM RESET** (assign this to a button) to re-trim the helicopter to fly straight and level.

You might see the terms **2-cue** and **3-cue** in documents discussing autopilots:

- The term '**cue**' is how the real S-76C manual describes the number of flight director modes engaged at any one time:
  - **2-cue** is one roll cue plus one pitch cue – for example **HDG** and **ALT**, or **NAV** and **IAS**.
  - **3-cue** refers the having three operative cues – adding a collective cue to the roll and pitch cues to aid in controlling altitude and airspeed, especially at slower speeds or in approach situations.
- What does that mean for the pilot?
  - 3-cue provides **more precise control** of airspeed and flight path, which is important for holding a specific altitude or airspeed during an approach.
  - A 3-cue system can also significantly **reduce pilot workload**, especially during low-speed flight or approaches, by automating some collective control inputs.

[End of Section 10]

About this Checklist

I have written a custom checklist for every aircraft and rotorcraft in my MSFS hangar, designed according to my personal preferences for style, layout and level of detail.

I did the same for the CowanSim S-76C++ because... I just like my own checklists! I shared a copy with **Matthew Crawford** (YouTube: Matthew Crawford - Let's Fly!) and in turn he provided me with a version he had compiled with input from real-world S-76C pilot **Toni_L** (from the CowanSim Discord).

After further refinement, I have settled on the checklist provided here. I don't claim that this is a definitive version; however, I feel it is a good balance between realism and simulation practicality. I hope you find it useful. You can print it or, as I do, display it on a separate monitor.

The checklist is also available from the flight simulation online resource **flightsim.to**

CowanSim S-76C++ Helicopter – Cold and Dark to Shutdown

By Tango_AUS – Version 3.5

BEFORE START

1. Doors and windows ..... **CLOSED** & **LOCKED**
2. Flight Controls ..... **CENTERED**
3. Standby Attitude Indicator test:
   a. With all power off, press EMER PWR switch ..... **SBY ATT ON**, flag retracts
   b. Press and hold BATT TEST switch (5 seconds) ..... **GOOD** light illuminates
   c. Release BATT TEST switch ..... **GOOD** light out, **SBY ATT** stays **ON**
   d. Pull the PULL TO CAGE knob ..... **CAGE**, then **push** to uncage
   e. EMER PWR switch ..... Remains **ON**
4. Landing gear handle ..... Confirm **DOWN**
5. Landing gear emergency T-handle ..... **IN**
6. Forward Console (Right, top row) – **MASTER ELECTRICAL POWER**:
   a. Battery ..... **ON**
   b. #2 DC GEN **ON1**
   c. #1 DC GEN ..... **ON**
   d. AC GEN ..... **ON**
   e. MASTER START ..... **ON**
   f. EXT POWER ..... **OFF**

   All **ON** except EXT PWR
7. Forward Console (Right, second row) – **MASTER** & **INVERTERS**:
   a. Inverter switches 1 & 2 ..... **OFF**
   b. Radio Master switch ..... **OFF**
   c. EFIS 1 and 2 ..... **OFF**

   All **OFF**
8. Forward Console (Left, top row) – **ANTI-ICING PANEL**:
   a. 1 and 2 Engine Anti-Ice ..... **OFF**
   b. 1 and 2 Pitot Heat ..... **OFF**
   c. Windshield Heat and Washer ..... **OFF**

   All **OFF**
9. Forward Console (Left, second row) – **LT CONTROL**:
   a. Wipers ..... **OFF**
   b. Logo lights ..... **OFF**
   c. PASS ADV ..... **FSB/NS**
   d. CABIN LTS ..... **OFF**
   e. EMER LTS ..... **OFF**

   All **OFF** except PASS ADV
10. Forward Console (Left, third row) – **Exterior Lighting Panel**:
    a. HISL ..... **OFF**
    b. STROBE POS (NAV) ..... **POS** (forward)
    c. A-COLL ..... **BOTH**
    d. MR LT ..... **OFF**
    e. SEARCH LT ..... As required
11. Barrier Filter
    a. Press **TEST** ..... Illuminates, warning in pilot's EADS
    b. Press and hold **RESET** (5 seconds) ..... Clears warning
12. UNS 1 FMS interface ..... **ACCEPT** (LSK 5L) – program as required
13. Garmin GNS 530 ..... Flight plan **ENTERED** as required
14. Cabin passengers:
    a. Alerted ..... Cycle **FSB/NS** to alert passengers
    b. Briefed ..... **PLAY** '1WELCOME'

Continued next page ⟶

ENGINE START:

15. ENGINE OUT TEST switch ..... **TEST** then **OFF**
16. Parking brake ..... **SET**
17. Circuit breakers ..... **ALL IN**
18. Rotor brake ..... **OFF**
19. Headsets ..... **DONNED**
20. Bleed air ..... **OFF**
21. Fuel levers ..... **XFEED**
22. Rotor area ..... **CLEAR**
23. No. 1 engine start:
    a. Engine lever No. 1 ..... **IDLE**
    b. Starter button ..... **PRESS** then release
    c. N1, fuel flow, T5 & oil pressure ..... **INCREASING**
    d. Inverter switches 1 & 2 ..... **ON**
    e. No. 1 engine lever ..... Advance to **50%** for **70% N1** & **65-70% Nr**
    f. HYD 1 and 2 ..... In **GREEN**
    g. MGB pressure ..... **INCREASING**
    h. Flight controls ..... **CHECK** (move approx. 1 inch)
24. No. 2 engine start:
    a. Engine lever No. 2 ..... **IDLE**
    b. Starter button ..... **PRESS** then release
    c. N1, fuel flow, T5 & oil pressure ..... **INCREASING**
    d. No. 2 engine lever ..... Advance to **50%** for **70% N1** & **65-70% Nr**
25. EFIS master switches 1 & 2 ..... **ON**
26. Radio master switch ..... **ON**
27. Both engine levers ..... **FLY** position
28. Both fuel levers ..... **DIR** position
29. AC GEN warning (IIDS annunciator panel) ..... **EXTINGUISHED** – cycle switch if displayed

AFTER START:

30. Weather radar ..... **STBY**
31. EMER LTS ..... **ARM**
32. Radios/Nav frequencies and course selectors ..... **SET** as required
33. Transponder and TCAS ..... Code **SET** and **STBY** mode
34. Engine and transmission instruments ..... Within limits
35. Glareshield ENG CONTROL lights ..... Confirm **EXTINGUISHED** (pilot and co-pilot)

BEFORE TAXI: (IF TAXIING REQUIRED)

36. Engine and fuel levers ..... Confirm **FLY** and **DIR** positions
37. Transmission and hydraulic pressures ..... Confirm **NORMAL**
38. Radio altimeter ..... **SET** and **CROSS-CHECK**
39. Altimeter ..... **SET** and **CROSS-CHECK**
40. IIDS annunciator panel ..... No warnings or cautions
41. Doors and hatches ..... **SECURED**
42. Exterior lights ..... As required
43. Parking brake ..... **RELEASED**

Continued next page ⟶

BEFORE TAKEOFF:

44. Engine and fuel levers ..... Confirm **FLY** and **DIR** positions
45. Annunciator panel ..... **CONFIRM** no warnings or cautions
46. Anti-Icing panel switches ..... As required
47. Weather radar ..... As required
48. Flight instruments ..... **CROSS-CHECK** heading, altitude, altimiter
49. TCAS ..... **TA ONLY**
50. Cabin passengers:
    a. Alerted ..... Cycle **FSB/NS** to alert passengers
    b. Briefed ..... **PLAY** '2TAKEOFF'
51. EHSI Display Control panel ..... Press **LNAV**
52. HDG bug ..... **SYNCH** to runway heading
53. Autopilot:
    a. **AP1** and **AP2** ..... **ON**
    b. **ATT** / **SAS** mode ..... **ATT** (recommended, SAS optional)
    c. **FD2** ..... **SELECT**
    d. STICK TRIM (CLTV, CYCLIC & YAW) ..... All **ON**
    e. Initial target **altitude** ..... **SET**
    f. Flight Director panel ..... **ALT PRE** armed
54. Float Arm Switch ..... As required

TAKEOFF AND CLIMB:

55. Landing gear ..... **RETRACT** above **60 KIAS**
56. Bleed air ..... **ON**
57. Flight Director settings once in stable departure attitude:
    a. **HDG** button ..... **ON**
    b. **VS** button ..... **ON**
    c. **VS** in pre-select display ..... **SET** as desired
58. EHSI Display Selector panel, **FULL | MAP** button ..... **PRESS** to cycle to desired EHSI display
59. **HDG** bug ..... **ADJUST** to intercept first navigation leg
60. Exterior lights ..... As required
61. Flight Director settings once on nav intercept course:
    a. **NAV** button ..... **ON**
    b. **VS** in pre-select display ..... **ADJUST** as desired

CRUISE:

62. Further altitude changes:
    a. New **altitude** ..... **SET**
    b. Flight Director panel ..... **ALT PRE** armed
    c. **VS** button ..... **ON**
    d. **VS** in pre-select display ..... **SET** as desired
63. Descent, approach and landing ..... **PLANNED** and **BRIEFED**

Denotes optional

ILS PREPARATION: *If required*

64. **NAV1** / **NAV2** frequencies ..... **SET**
65. DME readout channel ..... **SELECT**
66. Approach course ..... **SET**
67. Decision Height ..... **SET**

Continued next page ⟶

ILS APPROACH: *If required*

68. Flight Director settings once on ILS intercept course:
    a. **NAV** button ..... Confirm **ON** (for localizer capture)
    b. **ILS** button ..... **ARM** (for glideslope capture)
69. EHSI Display Selector panel, **NAV** button ..... **PRESSED** twice to cycle to **ILS1** in EHSI

BEFORE LANDING:

70. Landing lights ..... **ON**
71. Cabin passengers:
    a. Alerted ..... Cycle **FSB/NS** to alert passengers
    b. Briefed ..... **PLAY** '3DESCENT'
72. Landing gear lever ..... **DOWN** at less then **130 KIAS**
73. Parking brake ..... As required
74. Flight Director, **DECEL** button ..... **ARM** (if used)
75. Float Arm Switch ..... As required (below 75 knots)

AFTER LANDING:

76. If **DECEL** mode is engaged ..... Press **SAS/ATT twice** for **ATT** mode

TAXI:

77. Float Arm Switch ..... **OFF**
78. Cabin passengers:
    a. Alerted ..... Cycle **FSB/NS** to alert passengers
    b. Briefed ..... **PLAY** '4ARRIVAL' (rear console)
79. Weather radar ..... **STBY**
80. TCAS ..... **STBY**
81. Exterior lights ..... As required, strobes **OFF** at night
82. **AP1** and **AP2** ..... **OFF**
83. Standby Attitude Indicator EMER PWR switch ..... **OFF**

SHUTDOWN:

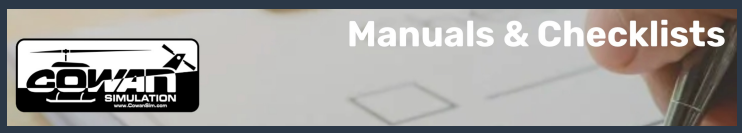
84. Parking brake ..... **SET**
85. Engine Control levers ..... **IDLE** (after 30 seconds cool-down)
86. Engine and Fuel levers ..... **STOP** and **OFF**
87. Forward Console – **MASTER ELECTRICAL POWER** switches ..... All **OFF** – **EXCEPT BATTERY**
88. Forward Console – **MASTER** & **INVERTERS** switches ..... All **OFF**
89. Forward Console – **ANTI-ICING** switches ..... All **OFF**
90. Forward Console – **LT CONTROL** switches ..... All **OFF**
91. Forward Console – **EXTERIOR LIGHTING** switches ..... All **OFF**
92. Rotor brake ..... **APPLIED** as required (below 65% Nr)
93. Battery switch ..... **OFF** (after rotor stops)
94. Cabin passengers ..... **VERBALLY BRIEFED** for disembarkation
95. Doors/windows ..... **OPEN** as required

--- ENDS ---

KEY BINDINGS AND CONTROLLER SETTINGS

Information available from CowanSim

CowanSim provides documents related to their S-76C++ product via the helicopter's in-game EFB, and under the **MSFS manuals-checklists** channel of their Discord server. Those documents are also available from the CowanSim website **at this link**.



There you will find three guides:

- User Manual
- Autopilot Guide
- Checklist

The 'User Manual' contains, along with other information, a list of key binding assignments. This provides a starting point to refine the user's MSFS settings.

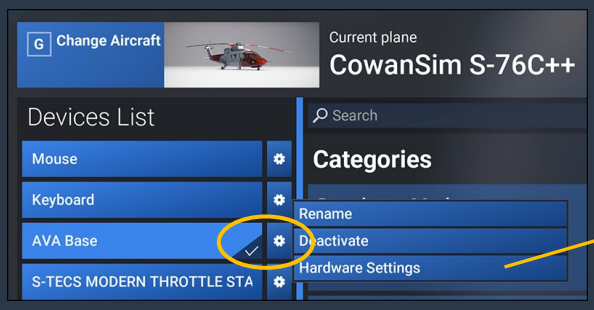
Default Assignments

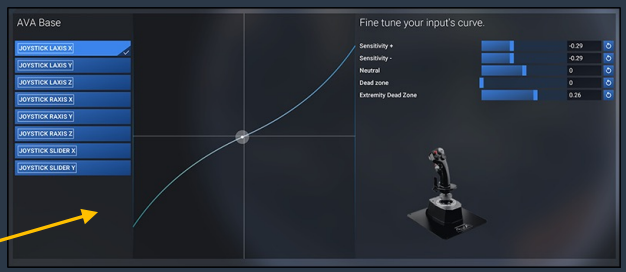
The User Manual from CowanSim includes a section called the **Controls Binding Guide**, which lists the default control events for the CowanSim S76C++. A standard installation will create these in MSFS.

Hardware Curves and Dead-Zone Settings

User-defined adjustments can be made the controller hardware settings for the S-76C++ and other MSFS helicopters. A good hardware profile can help make your flying smoother and easier, especially when hovering.

Go to the **Controls** page of MSFS Settings. Click on the gear icon beside the controller, and then click on **Hardware Settings**. This allows users to dial in the response profile for each device, which is particularly useful for the joystick.





Rather than provide a 'How To' guide here, I suggest you watch a very helpful video on the topic from **Matthew Crawford** on his **'Let's Fly'** YouTube channel **a link to which is here**.

Continued next page ⟶

Important Key Binding Assignments

Section 10 of this manual described the need to assign bindings for **HELICOPTER ENGINE 1 BEEP TRIM INCREASE** and **DECREASE** to buttons or (even better) to a **secondary hat switch** on your controller. This allows the pilot to adjust the desired vertical speed when **IAS** and **VS** are engaged simultaneously.

1.4 Engine & Trim

HELICOPTER_ENGINE_1_BEEP_TRIM_INCREASE: Increases manual throttle or collective trim based on helicopter state.

HELICOPTER_ENGINE_1_BEEP_TRIM_DECREASE: Decreases manual throttle or collective trim based on helicopter state.

HELICOPTER_ENGINE_2_BEEP_TRIM_INCREASE: Tail rotor trim left.

HELICOPTER_ENGINE_2_BEEP_TRIM_DECREASE: Tail rotor trim right.

ROTOR_TRIM_RESET

Force T...

Here they are listed in the **Controls Binding Guide**.

The guide also lists BEEP TRIM bindings for **ENGINE 2** which applies to the tail rotor trim.

Recommended Key Binding Assignments

Recommending the best bindings to use for any MSFS fixed-wing or rotary-wing aircraft is difficult, because every user has different requirements. The settings below and on the following pages are offered as one possible solution for use with the S-76C++ helicopter.

They are provided show the settings I found to be appropriate for my hardware setup. The actual the actual buttons assigned aren't shown – they only apply to a specific set of gear.* Naturally, you should personalize the settings to suit your controllers and flying style.

TOGGLE AUTOPILOT ATTITUDE HOLD	Helicopters	Digital
TOGGLE LANDING GEAR	Helicopters	Digital
TOGGLE PARKING BRAKES	Helicopters	Digital
TOGGLE ROTOR BRAKE	Helicopters	Digital
HELICOPTER ENGINE 1 BEEP TRIM DECREASE	Helicopters	Digital
HELICOPTER ENGINE 1 BEEP TRIM INCREASE	Helicopters	Digital
SELECT HEADING BUG	Helicopters	Digital
SET HELICOPTER FORCE TRIM RELEASE BUTTON	Helicopters	Digital
DECREASE ROTOR LATERAL TRIM	Helicopters	Analog
INCREASE ROTOR LATERAL TRIM	Helicopters	Analog
DECREASE ROTOR LONGITUDINAL TRIM	Helicopters	Analog
INCREASE ROTOR LONGITUDINAL TRIM	Helicopters	Analog
ROTOR TRIM RESET	Helicopters	Digital

These are suggested **joystick** settings.

Here are the crucial **ENGINE 1 BEEP TRIM** assignments.

* See next page

Continued next page ⟶

AUTOPILOT AIRSPEED HOLD	Helicopters	Digital
TOGGLE AUTOPILOT ALTITUDE HOLD	Helicopters	Digital
DECREASE AUTOPILOT REFERENCE ALTITUDE	Helicopters	Digital
INCREASE AUTOPILOT REFERENCE ALTITUDE	Helicopters	Digital
TOGGLE AUTOPILOT HEADING HOLD	Helicopters	Digital
AUTOPILOT NAV1 HOLD	Helicopters	Digital
TOGGLE AUTOPILOT VS HOLD	Helicopters	Digital
GEAR DOWN	Helicopters	Digital
GEAR UP	Helicopters	Digital
DECREASE HEADING BUG	Helicopters	Digital
INCREASE HEADING BUG	Helicopters	Digital
SET STARTER 1	Helicopters	Digital
SET STARTER 2	Helicopters	Digital
TOGGLE ENGINE GOV SWITCH	Helicopters	Digital
SELECT HEADING BUG	Helicopters	Digital
COLLECTIVE AXIS	Helicopters	Axis

These are suggested settings for a **HOTAS throttle**.

Most of the assignments here are standard MSFS bindings.

LEFT BRAKE AXIS	Helicopters	Axis
RIGHT BRAKE AXIS	Helicopters	Axis
TAIL ROTOR AXIS	Helicopters	Axis

These are suggested settings for **rudder pedals** (anti-torque pedals); these are all standard MSFS bindings.

Gamers often ask other gamers what controllers they use. I swap mine to suit the aircraft, but to save anyone interested the trouble of asking, my current controllers for **helicopter flying** are:

VKB STECS Throttle System Mk.II

+

Thrustmaster Warthog stick on the new AVA base

+

Thrustmaster TPR Pendular Rudders

Continued next page ⟶

Autopilot / AFCS Key Binding Assignments

Some users might wish to assign custom key bindings for the various Autopilot / AFCS modes available to an S-76C++ pilot.

The table below shows various control events in the CowanSim User Manual **Controls Binding Guide** applicable to the autopilot / AFCS.

If you assign these to a controller or perhaps a USB button box, you can manage the AFCS modes without reaching for your mouse to click on the monitor screen.

Shown below are the control events linked to the **Flight Director Mode Select** functions, along with my suggested key binds for each one:

Mode/Action	CowanSim Event	MSFS Controls Setting	Suggested Key Bind
VS	AP_VS_HOLD	TOGGLE AUTOPILOT VS HOLD	CTRL + ALT + 0
VS Hold Current	N/A	SET AP CURRENT VS	CTRL + ALT + 1
IAS	AP_AIRSPEED_HOLD	AUTOPILOT AIRSPEED HOLD	CTRL + ALT + 2
HDG	AP_HDG_HOLD	TOGGLE AUTOPILOT HEADING HOLD	CTRL + ALT + 3
HDG Synch	N/A	SET AP CURRENT HDG	CTRL + ALT + 4
NAV	AP_NAV1_HOLD	AUTOPILOT NAV1 HOLD	CTRL + ALT + 5
ILS	AP_LOC_HOLD	TOGGLE AUTOPILOT LOCALIZER HOLD	CTRL + ALT + 6
ALT	AP_ALT_HOLD	TOGGLE AUTOPILOT ALTITUDE HOLD	CTRL + ALT + 7
ALT PRE	FLIGHT_LEVEL_CHANGE	TOGGLE AUTOPILOT FLIGHT LEVEL CHANGE	CTRL + ALT + 8
VOR	AP_VOR_HOLD	TOGGLE AUTOPILOT APPROACH HOLD	CTRL + ALT + 9
GA	AUTO_THROTTLE_TO_GA	AUTO THROTTLE TO GA	CTRL + ALT + G
SAS ↔ ATT	AP_ATT_HOLD	TOGGLE AUTOPILOT ATTITUDE HOLD	CTRL + ALT + A
FD 1↔ 2	N/A	TOGGLE FLIGHT DIRECTOR	CTRL + ALT + F
AP Both On	AP_MASTER	TOGGLE AUTOPILOT MASTER	ALT + A

Other control events (not related to the AFCS) are also suitable for use with buttons on a joystick or throttle. However, some of the items in the Controls Binding Guide have misleading names (most likely a MSFS quirk). Be sure to read the description of each event to avoid confusion.

For example, the event controller to turn on the ***landing*** lights is TOGGLE_***TAXI***_LIGHTS, while turning on the ***searchlight*** uses the event TOGGLE_***LANDING***_LIGHTS. See the table below.

Shown below are some additional control events that you might find useful:

Action	CowanSim Event	MSFS Controls Setting	Suggested Key Bind
DME CHANNEL	DME2_TOGGLE	TOGGLE DME 2	CTRL + ALT + D
Landing Lights	TOGGLE_TAXI_LIGHTS	TOGGLE TAXI LIGHTS	ALT + L
Search Light	TOGGLE_LANDING_LIGHTS	TOGGLE LANDING LIGHTS	ALT + E
Landing Gear	N/A	TOGGLE LANDING GEAR	ALT + G
Parking Brakes	N/A	TOGGLE PARKING BRAKES	ALT + B
Cancel Caution	MASTER_CAUTION_ACKNOWLEDGE	ACKNOWLEDGE MASTER CAUTION	ALT + M
Course Increase	N/A	INCREASE VOR1 OBS	ALT +]
Course Decrease	N/A	DECREASE VOR1 OBS	ALT + [

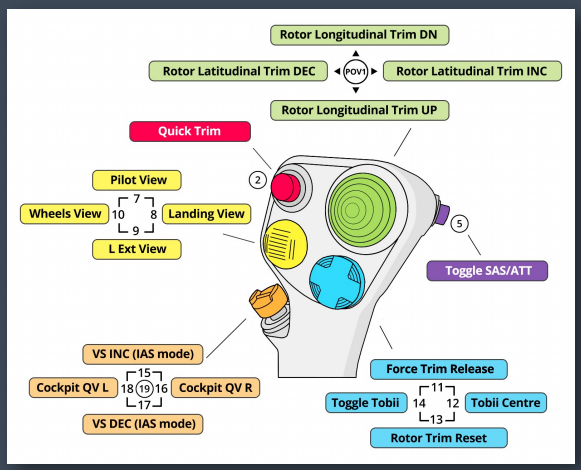
The first entry (Toggle DME 2) changes the source channel on the DME readout. The last two make it much simpler to set the ILS approach course, rather than using the COURSE 1 knob on the console.

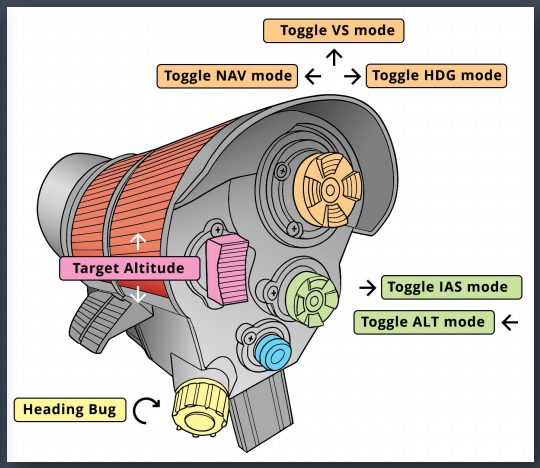
Continued next page ⟶

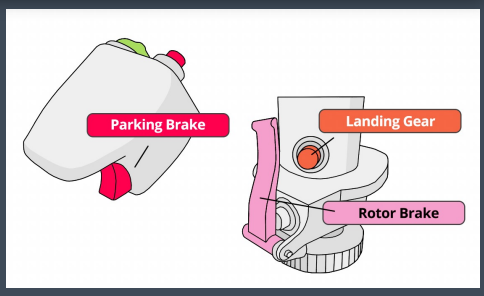
Example – Controller Assignments

Regardless of the brand or type of controllers you use, a well set up system can make a big difference to the 'fluency' of your flying.

Having the right buttons at your fingertips (literally) means you can select Flight Director modes or change the settings for airspeed, vertical speed and altitude, without fuss or stress.



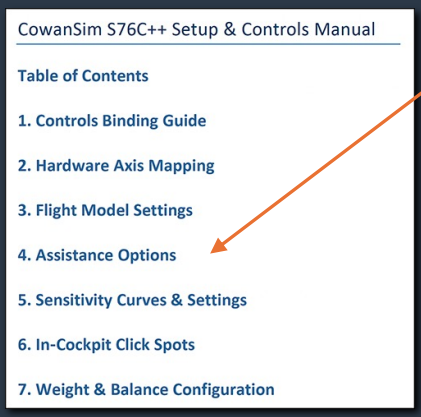




Illustrated here are the button assignments I use for the **S-76C++** as an example of what you might use.

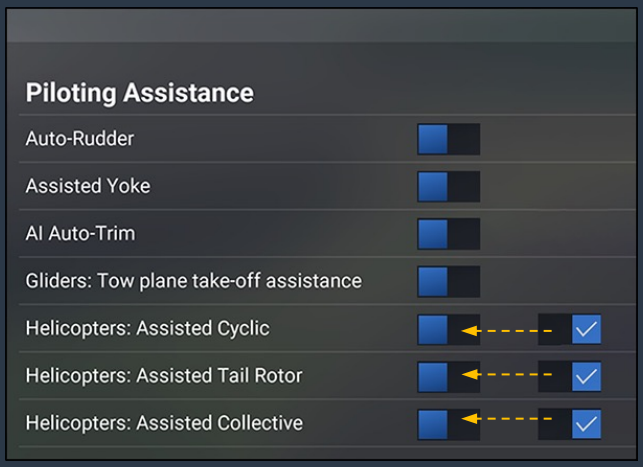
Everyone has different equipment and preferences, so do whatever suits you.

Optional Pilot Assistance Settings



The CowanSim User Manual also includes a section called **Assistance Options.**

The advice here is to turn **Assisted Tail Rotor** OFF and to change **Assisted Cyclic** to OFF as well.



These are optional settings. Leaving them turned ON makes flying helicopters easier.

This is a good option when starting out. When your skills improve, try turning these settings OFF for increased realism.

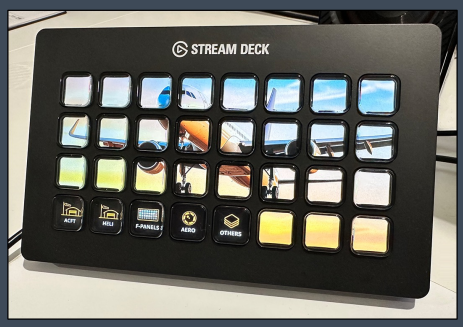
Continued next page ⟶

A 'Niche' Hardware Add-on

The recommendation below isn't so much about flying the CowanSim S-76C++ but is more about flying it **more easily**. I'm referring to using a **Stream Deck (SD) device** to manage your instrument views, external views, and various MSFS actions. These devices aren't cheap (the XL model sells for about $200 USD) but I can honestly say that acquiring one was a game changer for all forms of simulated flight (and other games and tasks).

With one of these you can create your own profiles (for any aircraft) to control things like custom views or other functions. Anything with a keyboard shortcut can be triggered by an SD button push. Even multi-step functions are easy to add; for example, I have one button that turns on both autopilots, swaps the Flight Director to FD2, then switches from SAS to ATT mode, **all with one press**. Unrealistic? Yes. Efficient? Yes. Cool? Definitely.

The layout and purpose of the SD buttons is all managed via an app on a PC. Scores of pages can be cycled through, potentially providing hundreds of buttons for each aircraft. Users can create custom button images or download one of the many of aviation-centric SD icons available online.



One of the Stream Deck XL devices that I use for flight sim, showing a custom screen from which I can select fixed or rotary wing aircraft.

This is my helicopters selection page on an SD device. Each helicopter has its own 'stack' of pages of buttons for various views, Flight Director buttons, and so on.

This is the SD page for my custom S-76C++ buttons. There are several other pages behind this one with other views and functions, including the selection of Flight Director modes.

This Autopilot / AFCS page allows me to manage the Flight Director without reaching for a mouse then trying to click a small spot on the monitor screen.

I can also set the heading bug to the current heading (top left button), set the VS to the current vertical speed (second top left), and set the essential Autopilot modes (in column 7). Or I can set all the AP controller switches with one multi-function button press (top right, column 8).

Please note that I have absolutely no relationship with Elgato, the company that makes Stream Deck. I just think their products are good. Feel free to ignore my recommendation.

Continued next page ⟶

Key Bindings and Controller Settings, continued

Custom Views

Like all MSFS rotorcraft and aircraft, the CowanSim S-76C++ ships with nine instrument views, accessed via **SHIFT+1**, **SHIFT+2**, and so on. These are okay but not always ideal, occasionally repeating the same view or being uncomfortably close to the instrument/panel.

There is plenty of online advice on setting up custom views, both internal and external – I won't repeat that here. It's a great concept; not only do custom camera views provide a way to jump to a pleasing or dramatic external view, but the right custom views can help your 'flow' during procedures such as start-up, critical phases of flight, and shut-down.

All that is fine but personally, I dislike the 'finger fandango' (Patent Pending) of using two or three keys at once to save or load a view – the default key combinations are **CTRL+ALT+[Number]** to save, and **ALT+[Number]** to load). I prefer having a single key press to load a custom view.

To do this, simply change the necessary assignments for saving/loading custom views to **CTRL+NUMPAD Number x** to save, and **NUMPAD Number x** to load, like this:

SAVE CUSTOM CAMERA 0	General	Digital	CTRL	+	NUM 0		LOAD CUSTOM CAMERA 0	General	Digital	NUM 0
SAVE CUSTOM CAMERA 1	General	Digital	CTRL	+	NUM 1		LOAD CUSTOM CAMERA 1	General	Digital	NUM 1
SAVE CUSTOM CAMERA 2	General	Digital	CTRL	+	NUM 2		LOAD CUSTOM CAMERA 2	General	Digital	NUM 2
SAVE CUSTOM CAMERA 3	General	Digital	CTRL	+	NUM 3		LOAD CUSTOM CAMERA 3	General	Digital	NUM 3
SAVE CUSTOM CAMERA 4	General	Digital	CTRL	+	NUM 4		LOAD CUSTOM CAMERA 4	General	Digital	NUM 4
SAVE CUSTOM CAMERA 5	General	Digital	CTRL	+	NUM 5		LOAD CUSTOM CAMERA 5	General	Digital	NUM 5
SAVE CUSTOM CAMERA 6	General	Digital	CTRL	+	NUM 6		LOAD CUSTOM CAMERA 6	General	Digital	NUM 6
SAVE CUSTOM CAMERA 7	General	Digital	CTRL	+	NUM 7		LOAD CUSTOM CAMERA 7	General	Digital	NUM 7
SAVE CUSTOM CAMERA 8	General	Digital	CTRL	+	NUM 8		LOAD CUSTOM CAMERA 8	General	Digital	NUM 8
SAVE CUSTOM CAMERA 9	General	Digital	CTRL	+	NUM 9		LOAD CUSTOM CAMERA 9	General	Digital	NUM 9

Now, all that is needed to jump between custom views is to hit a **single NUMPAD key**. You can assign those NUMPAD keys to controller buttons, then your cockpit workload is easier.

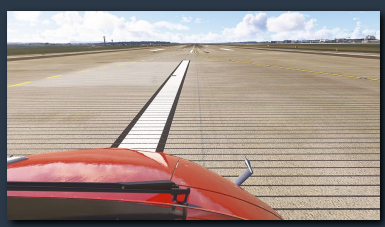
FYI my regularly used custom views for the CowanSim S-76C++ are these:











All external views are a kind of 'cheat' especially my last two, but they help with oil rig landings! 😊

[End of Section 12]

TUTORIAL FLIGHT – COLD & DARK TO ILS APPROACH & LANDING

OVERVIEW OF THE FLIGHT

In this a walkthrough tutorial, we will conduct a simulated charter flight in my home state, Queensland in Australia. The flight starts at the airport near where I live so I know how to get to the airport, at least.

We will fly from **YBSU Sunshine Coast Airport** to **YBBN Brisbane Airport** which services the State capital. We will then make an ILS approach to Runway 19L.

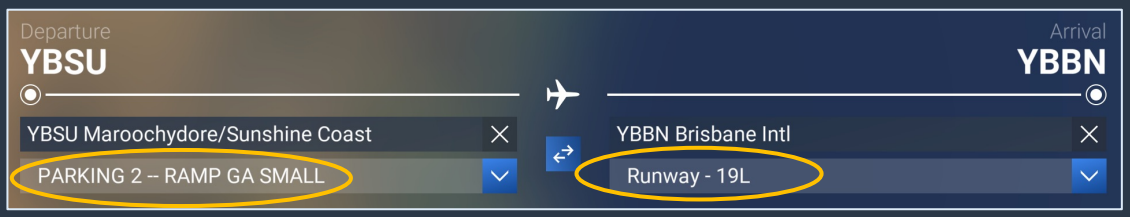
By the way, most non-Australians mispronounce Brisbane as "Briz-bane" which sounds like fingernails on a chalkboard to Aussie ears. The correct pronunciation is "**BRIZ-bun**" with the emphasis on the "BRIZ" and a very short "bun" sound. Next time you visit you'll sound like a local, sort of. 😊

YBSU Sunshine Coast Airport

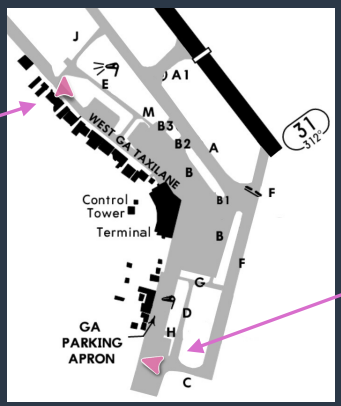
YBBN Brisbane Airport

Load MSFS, select the S-76C++ and the livery of your choice. I'll be using Australian registered **VH-BHM**.

Set your **DEPARTURE** and **ARRIVAL** as shown below. We will check the FMS data when we're on board.



If you would prefer to start with the the helicopter 'hot' with engines running and ready to take off, feel free to start your flight from **Helipad H01** here.



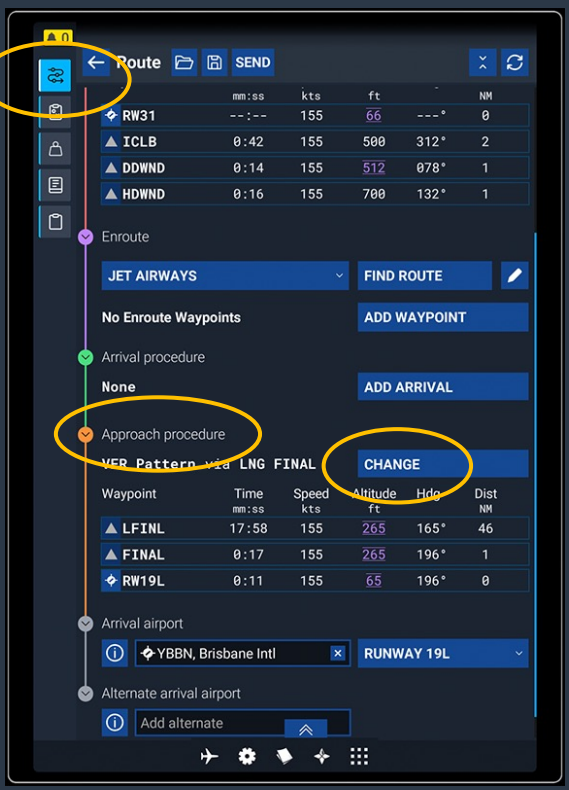
Otherwise, for a **Cold and Dark** start, set your spawn point here at **Parking 2** on the GA Parking Apron. It's an open ramp area with no obstructions.

Continued next page ⟶

SETTING UP THE MSFS EFB

Having selected our departure and arrival, we can use the MSFS EFB to prepare and load our flight plan directly into the helicopter's avionics.

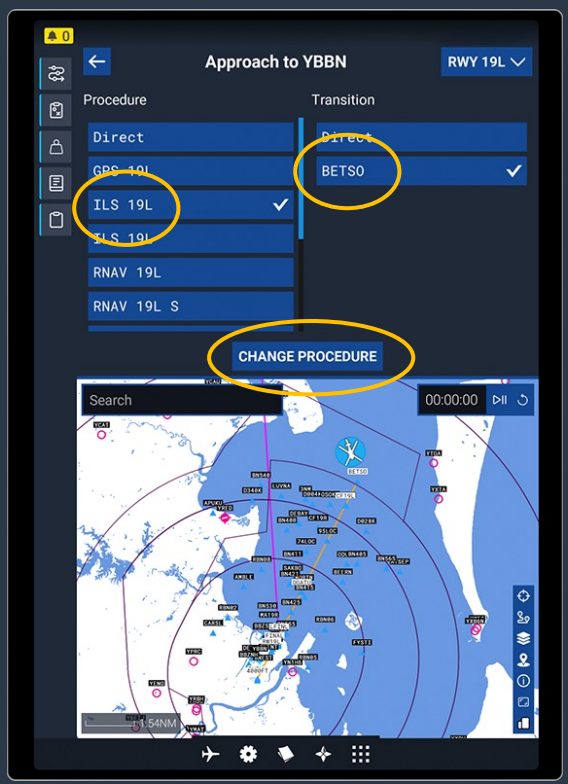
Click on **EFB** button on the MSFS world map screen or press the **TAB** key. TAB EFB



On the Flight Planner page click on the **Route** icon at the top left of the EFB screen.

The page shown on the left will display. Scroll down as needed until you see the **Approach Procedure** section.

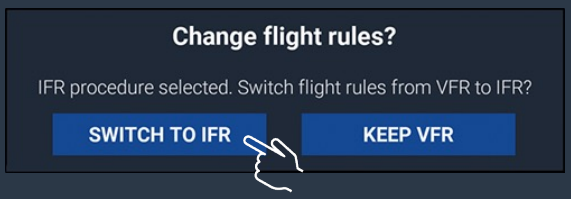
Then, click on **CHANGE**



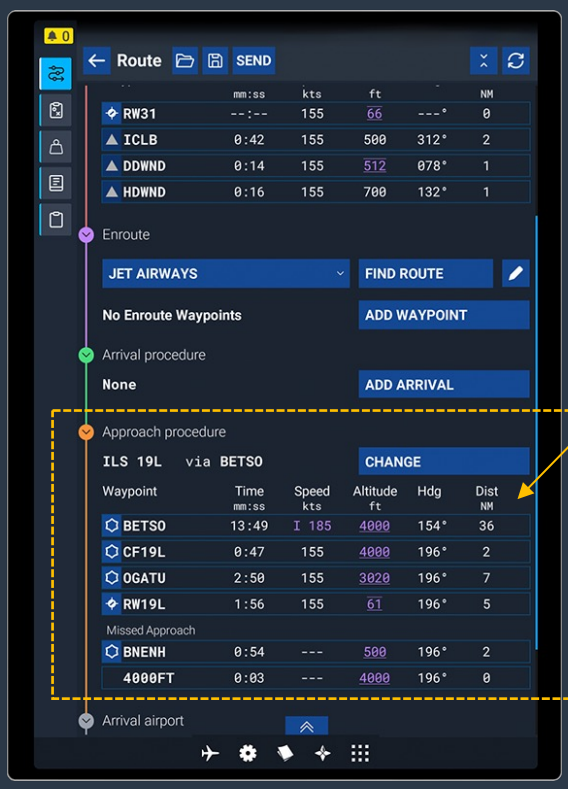
The **Procedure** and **Transition** panels will display. Select **ILS 19L** and **BETSO**.

Then, click on **CHANGE PROCEDURE**.

Continued next page ⟶

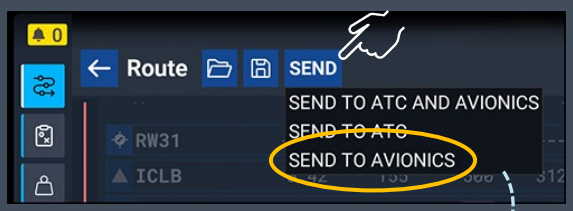


You will probably get a verification message as shown here. It's not important which rules we operate under in this flight, although we will use a published approach into YBBN so go ahead and click **SWITCH TO IFR**

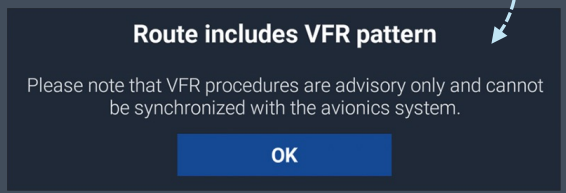


The **Approach procedure** will update to reflect your selections.

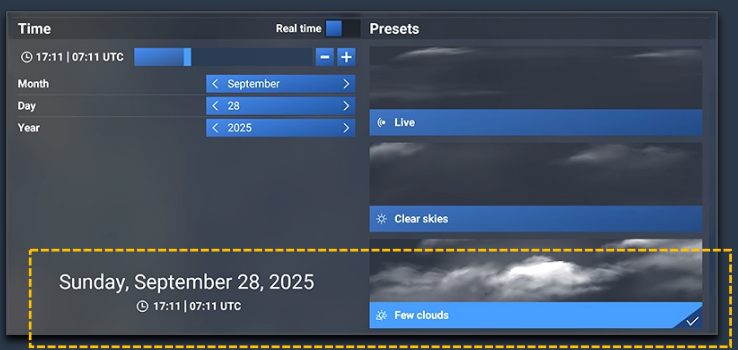
Next, click on **SEND** at the top of the EFB screen. A drop-down menu appears, shown below. Click on **SEND TO AVIONICS** to load the information into both the FMS and GNS 530.



Because we selected IFR earlier, an alert will appear advising that the **route includes a VFR pattern**. This refers to our departure from YBSU. This tutorial doesn't include a departure procedure so we can ignore this warning.* Click on **OK**



* When we fly the route, we will conduct a non-standard departure from YBSU designed to show how to use certain techniques, so don't worry about the departure phase.



The time, date and weather conditions used in this tutorial don't matter. However, if you wished to replicate my settings they are shown here; namely, **September 28, 2025** at **17:11 local** (07:11 UTC), with **Few Clouds**.

The oddly precise 17:11 time is because MSFS wouldn't allow 17:10 for some reason. The time selected provides for a dusk ILS arrival , which looks nice.

Continued next page ⟶

OVERVIEW OF THE ROUTE

This is the route showing our departure **YBSU**, the short 35 nm run south to **BETSO**, then the **ILS approach** into **YBBN 19L**. Also shown is the Missed Approach procedure.

Continued next page ⟶

Use the checklist provided in **Section 11** or an S-76C checklist of your choice. If necessary, go back to **Sections 3-7** if you have trouble finding a particular switch, lever or display.

BEFORE START CHECKLIST

Start working through the **BEFORE START** checklist. You could potentially skip the **Standby Attitude Indicator Test** because system faults aren't modelled but it only takes a few seconds, and the gauge programming is impressive.

BEFORE START

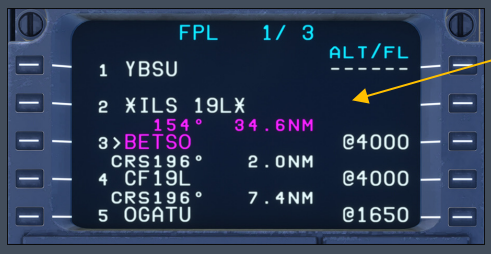
1.	Doors and windows	**CLOSED** & **LOCKED**
2.	Flight Controls	**CENTERED**
3.	Standby Attitude Indicator test:	
a.	With all power off, press EMER PWR switch	**SBY ATT ON**, flag retracts
b.	Press and hold BATT TEST switch (5 seconds)	**GOOD** light illuminates
c.	Release BATT TEST switch	**GOOD** light out, **SBY ATT** stays **ON**
d.	Pull the PULL TO CAGE knob	**CAGE**, then **push** to uncage
e.	EMER PWR switch	Remains **ON**
4.	Landing gear handle	Confirm **DOWN**
5.	Landing gear emergency T-handle	**IN**

Position the switches on the forward console for the **MASTER ELECTRICAL POWER, MASTER & INVERTERS, ANTI-ICING PANEL, LT CONTROL and EXTERIOR LIGHT** rows of switches.

Thanks to Toni_L (a real S-76C pilot) for providing the method used here, a 'flow' moving across the banks of switches

The next item, the **Barrier Filter test**, could also potentially be skipped – the test works but always reports 'all okay' because a dirty filter isn't modelled. The gauge is another nice touch, though.

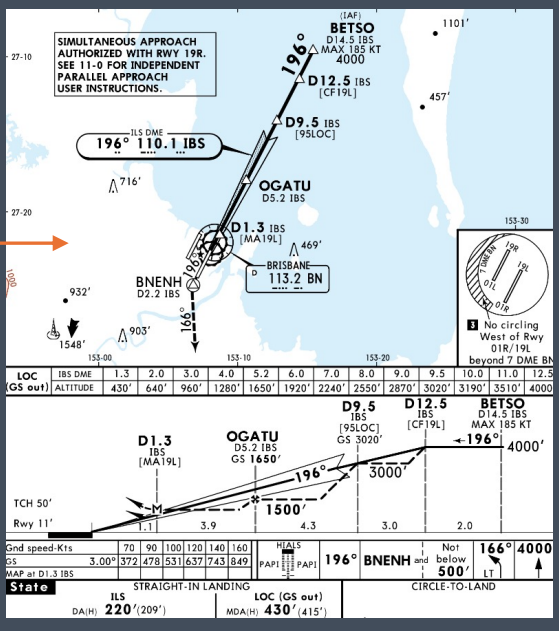
The next checklist item is the **UNS-1 FMC** which is covered in **Section 9.** Perhaps you decided to simply select only our DEPARTURE point on the MSFS World Map screen, meaning you'd now have the satisfaction of programming the FMS from scratch. But we made the selections shown on the previous pages, so the flight plan is already loaded – but we should check the plan and ILS approach entries:



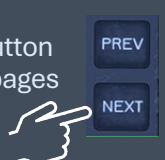
ACCEPT the initial FMS data then press the **FPL** button to see the loaded flight plan.

Here is a chart extract for the ILS approach to **YBBN Runway 19L**. The approach starts at **BETSO at 4,000 ft** (the FMS info matches this). In case of a missed approach, we will go to **BNENH** then on heading **166** awaiting instructions.

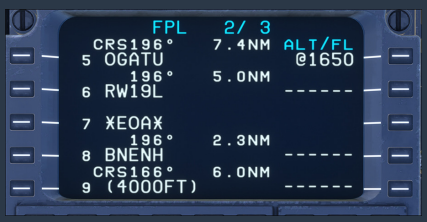
We will review this chart again in-flight.



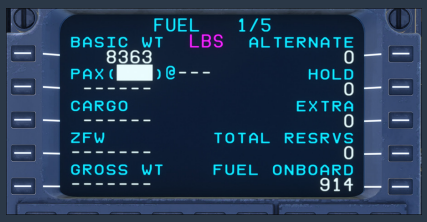
Press the **NEXT** button to view the other pages of the flight plan.



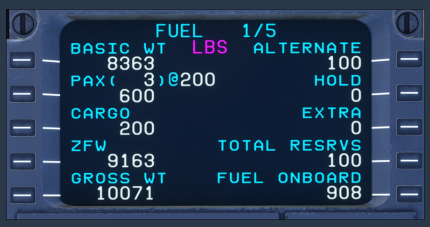
Continued next page ⟶



On page 2/3 of the flight plan we see the waypoints leading right down to runway **RW19L** followed by the Missed Approach information. That's all fine.



The MSFS flight planner calculated and loaded the fuel needed for our trip, but it doesn't hurt to look at that ourselves. Press the fuel **FUEL** button. The screen on the left will appear. You can see that we have 914 pounds of fuel on board, which is sufficient. You can add a few more details if desired.



Here I have added values for the PAX, CARGO and ALTERNATE. Unfortunately, it appears that this doesn't change the fuel/weight settings in the sim, which can be done via the MSFS EFB as normal.

With the FMS flight plan done, complete the final **BEFORE START** item by alerting the passengers and playing the 1WELCOME message using the passenger briefing panel on the center console.

Before Start checklist **complete** ☑

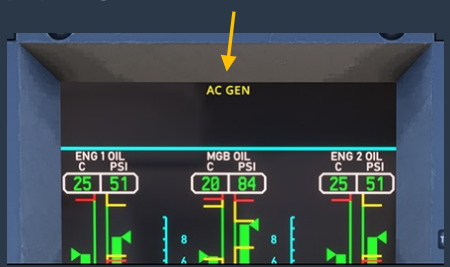
ENGINE START CHECKLIST

ENGINE START:

14.	ENGINE OUT TEST switch (center console, right side)	**TEST** (alert tone sounds) then **OFF**
15.	Parking brake	**SET** (up position)
16.	Circuit breakers	**ALL IN**
17.	Rotor brake	**OFF**; confirm brake light off
18.	Headsets	**DON** (click on both headsets)
19.	Bleed air	**OFF** (overhead, left)
20.	Fuel levers	**XFEED**
21.	Rotor area	**CLEAR**
22.	No. 1 engine start:	
a.	Engine lever No. 1	**IDLE**
b.	Starter button	**PRESS** briefly, release, N1 increasing
c.	Monitoring increasing	N1, fuel flow, T5, oil pressure
d.	Inverter switches 1 & 2	**ON**
e.	No. 1 engine lever	Advance to 50% for **70% N1, 65-70% Nr**
f.	HYD 1 and 2	In **GREEN**
g.	MGB pressure	**INCREASING**
h.	Flight controls	**CHECK** (move approx. 1 inch)
23.	No. 2 engine start:	
a.	Engine lever No. 2	**IDLE**
b.	Starter button	**PRESS** briefly, release, N1 increasing
c.	Monitoring increasing	N1, fuel flow, T5, oil pressure
d.	No. 2 engine lever	Adv to 50% for **70% N1, 65-70% Nr**
24.	EFIS master switches 1 & 2	**ON**
25.	Radio master switch	**ON**
26.	Both engine levers	Move to **FLY** position
27.	Both fuel levers	**DIR**
28.	AC GEN warning (IIDS annunciator panel)	**EXTINGUISHED**, cycle switch if displayed

It's time to make some noise; follow the **Engine Start** checklist. As a bonus, open the vent on the pilot's side window to hear the full suite of sounds.

The final item here deals with the AC GEN warning in the IIDS annunciator sub-panel which sometimes persists in this and other MSFS aircraft. Clear the warning by cycling the AC GEN switch.



Engine Start checklist **complete** ☑

Continued next page ⟶

AFTER START CHECKLIST

AFTER START:

29.	Weather radar	**STBY**
30.	EMER LTS	**ARM**
31.	GPS	Flight plan **ENTERED** as required
32.	HSI navigation sources	**SELECT** as required
33.	Radios/Nav frequencies and course selectors	**SET** as required
34.	Transponder and TCAS	Code **SET** and **STBY** mode
35.	Engine and transmission instruments	Within limits
36.	Glareshield ENG CONTROL lights	Confirm **OFF** (pilot and co-pilot)

With the engines burning JET A-1 fuel we run the short **After Start** checklist.

Key steps here are to press **LNAV** on the **EHSI Selector panel** as well as pressing the **FULL | MAP button** to cycle through to your preferred EHSI navigation page.

Refer to **page 16** for information on setting the necessary **frequencies and transponder/TCAS selections**.

After Start checklist **complete** ☑

BEFORE TAXI CHECKLIST

BEFORE TAXI: (IF TAXIING REQUIRED)

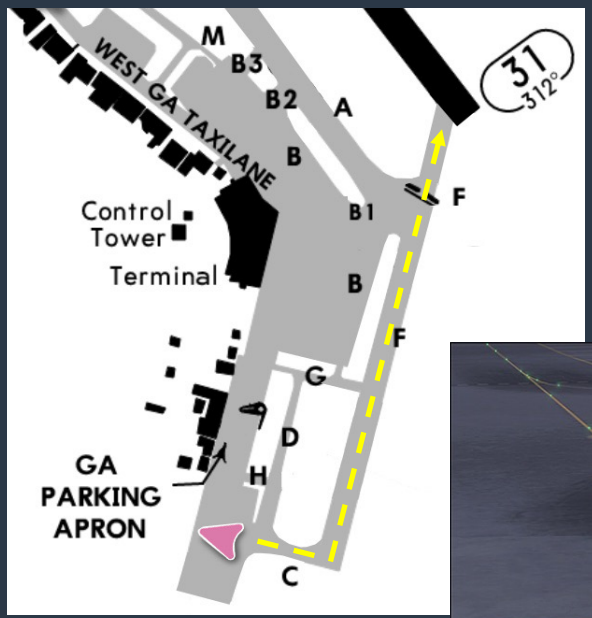
36.	Engine and fuel levers	Confirm **FLY** and **DIR** positions
37.	Transmission and hydraulic pressures	Confirm **NORMAL**
38.	Radio altimeter	**SET** and **CROSS-CHECK**
39.	Altimeter	**SET** and **CROSS-CHECK**
40.	IIDS annunciator panel	No warnings or cautions
41.	Doors and hatches	**SECURED**
42.	Exterior lights	As required
43.	Parking brake	**RELEASED**

The **Before Taxi** checklist is also short and sweet. Make sure you have the engine and fuel levers in the FLY and DIR positions, double check the listed items, then release the parking brake – we will taxi on the wheels, not by taxiing in a low hover.

Before Taxi checklist **complete** ☑

TAXI AS REQUIRED

Taxi to the holding point of the departure runway, namely **Runway 31**.



Start taxiing by adding a little collective.

In the simulated S-76C you also need to gently push forward on the cyclic to tilt the rotor disk slightly to push the helicopter forward. That's not the case in real life.

Use small inputs and keep the ground speed sensible. None of that will happen if you haven't released the parking brake! 😊

Continued next page ⟶

BEFORE TAKEOFF CHECKLIST

BEFORE TAKEOFF:

44.	Engine and fuel levers	Confirm **FLY** and **DIR** positions
45.	Annunciator panel	**CONFIRM** no warnings or cautions
46.	Anti-Icing panel switches	As required
47.	Weather radar	As required
48.	Flight instruments	**CROSS-CHECK** heading, altitude, altimiter
49.	TCAS	**TA ONLY**
50.	Cabin passengers:	
a.	Alerted	Cycle **FSB/NS** to alert passengers
b.	Briefed	**PLAY** '2TAKEOFF'
51.	EHSI Display Control panel	Press **LNAV**
52.	HDG bug	**SYNCH** to runway heading
53.	Autopilot:	
a.	**AP1** and **AP2**	**ON**
b.	**ATT / SAS** mode	**ATT** (recommended, SAS optional)
c.	**FD2**	**SELECT**
d.	STICK TRIM (CLTV, CYCLIC & YAW)	All **ON**
e.	Initial target **altitude**	**SET**
f.	Flight Director panel	**ALT PRE** armed
54.	Float Arm Switch	As required

Follow the checklist to prepare the helicopter for flight. Set the TCAS to **TA ONLY**.

We're not using VATSIM or ATC but set a **transponder code** if you wish.

A key item is to **synchronize the heading bug** with the runway heading. Do this by pulling (right clicking) on the heading knob on the Course/Heading panel, or use a keyboard combo or controller button as per page 44.

Keep the passengers informed – play the 2TAKEOFF message.

Setting the correct AFCS functions now is critical. Engage **AP1**, **AP2**, **FD2** and **ATT** in the Autopilot Control panel on the center console.

We will set our first target altitude now, to reduce our workload after takeoff. Using the knob on the pre-select panel dial in **3,000 ft**. Make sure to also press **ALT PRE** on the Flight Director mode selection panel.

Before Takeoff checklist **complete** ☑

THE TAKEOFF

If you are planning a rolling takeoff (remaining on the runway for a short distance) ensure the parking brake is released. For a rolling takeoff, add a very slight collective input and some forward cyclic to start the takeoff run along the runway centerline. Add more power to lift off when ready.

A balance between power and attitude is now required: pull collective as you push the cyclic forward to gain forward momentum. Manage the power to stay relatively close to the runway as the helicopter accelerates, adjusting the forward cyclic pressure as required.

The main rotor on the real helicopter is mounted at a noticeable forward cant, so adding cyclic isn't necessary when taxiing.

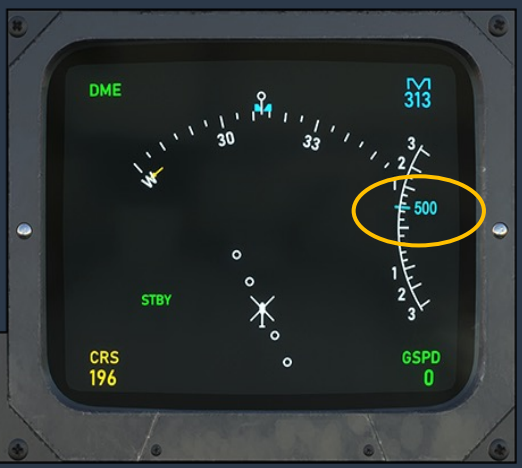
Late afternoon departure from YBSU Sunshine Coast, Runway 31

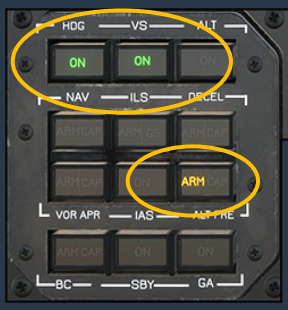
Continued next page ⟶

Continue to fly the runway heading...

When ready add more collective and ease off on the cyclic to start a climb. Use small inputs, balancing collective and cyclic. Once climbing satisfactorily, press **HDG** on the Flight Director panel, which will display **ON**. The autopilot takes over and aligns on the heading bug.

Watch the **Vertical Speed Indicator (VSI)** on the right side of the EHSI. When the climb rate is around 500 fpm press **VS** on the Flight Director panel. It will turn **ON**.





We pressed **ALT PRE** earlier, so it displays **ARM**.

Tip: See Section 12 (page 44) on key bindings to make using the Flight Director much easier.

Above **60 knots** you can raise the gear. Any lower will cause a warning tone and the landing gear warning to illuminate on your lower main panel.

Gear **DOWN** – three green

Gear **UP** – lights out

It is helpful to have your pilot view set so that you can see the lights on the landing gear panel. Also, have **Toggle Landing Gear** assigned to a button on a controller. That way you can raise/lower the gear without having to shift your view or hands during this critical phase of flight.

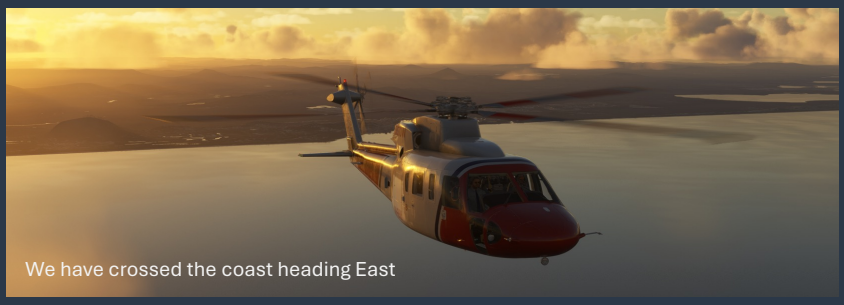
We are climbing towards our initial **3,000 ft** altitude on the runway heading. We need to get into a position from where we can intercept the first of our navigation legs.

Remaining in **HDG** mode, use the heading knob (or lateral trim if preferred) to move the heading bug to an **easterly heading** to fly clear of the airport area. It's easier to see the moving heading bug if you press the **MAP | FULL** button to see the circular 'compass rose' display in the EHSI.

Heading east, positioning to turn towards our first leg.

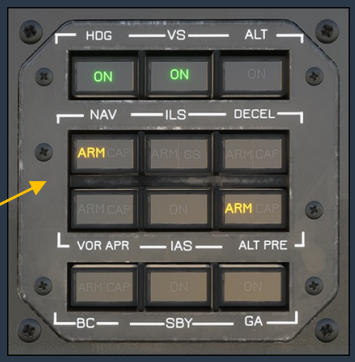
The GNS 530 is a useful aid to visualize our location in relation to the first leg.

Continued next page ⟶



Now, rotate the heading bug to a roughly **southwest heading** that will intercept the first leg of the flight plan.

As we make the turn, the EHSI course deviation bar shows our intended first leg off to the half-right.



Now that we are on a suitable intercept heading, press **NAV** on the Flight Director panel, which will **ARM**.

The AFCS is still climbing us to our target altitude of 3,000 ft so the ALT PRE status light remains in **ARM** mode.

We've been managing the airspeed manually so far but that can be tiring to sustain accurately. Let's set our airspeed mode now. Press the **IAS** button, which will display **ON**. The current airspeed will show in the pre-select display.

Remember the key learning points from the AFCS guide in **Section 10**? When in **VS and IAS modes** simultaneously we must use longitudinal trim on the **principal joystick hat switch** to change **airspeed** and use a **secondary hat switch** to alter the **vertical speed**.

We are still climbing so **VS** remains on. So, we can use **longitudinal trim** on the principal trim hat to set our new airspeed (let's use 130KIAS) but don't forget to use a **secondary hat** to change the vertical speed if desired when **IAS** mode is also in use.

130 knots is a comfortable airspeed to use for the remainder of the flight.

Real-world pilot Toni_L generally sets 70% torque in cruise for a speed of 140-145 KIAS depending on weight, altitude, etc. For best range 130 KIAS is an appropriate setting.

Continued next page ⟶

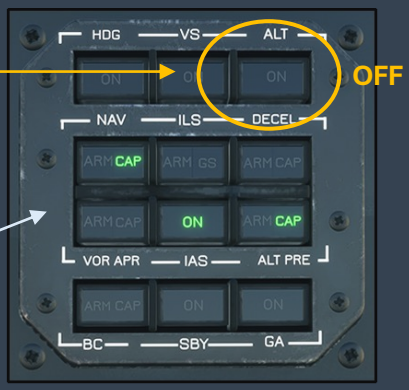
The AFCS has our speed under control and captured our initial **3,000 ft** altitude target.

We have also intercepted and captured the first of our navigation legs.

Let's make another climb, this time to **5,000 ft**. To mix things up we'll use the manual method described in **Step 12** of the AFCS guide. Refer to **page 33** if you need to review that step.

Set the new altitude in the pre-select display, then press **ALT PRE** button as usual **but don't set a vertical speed**.

Press the ALT button to turn that mode OFF. Now pull up gently on the collective to start a climb. Manage the power as needed as we ascend to the new altitude.



The Flight Director selector panel tells the story: **ALT** is **OFF**; **NAV** remains in **CAP** mode; **IAS** is **ON** and maintaining our airspeed; and **ALT PRE** shows **ARM** pending the capture of the newly assigned altitude.

Just below 5,000 ft helicopter will start to level off, the **ALT PRE** button will briefly show **CAP** then extinguish, **and** the **ALT** button will again show **ON**. Done!


It's a beautiful evening for a coastal flight

Now that we are established on our southbound course and climbing to our final target altitude, this would be a good time to confirm the distance to our destination, to help us execute the next phase of the flight.

We also need to review the chart for the **ILS Runway 19L** at YBBN and brief the approach.

We'll do all that on the next page...

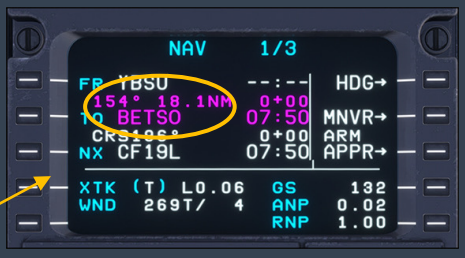
Continued next page ⟶

APPROACH PREPARATION

First, let's confirm the distance to our destination. We can do this in a variety of ways using the equipment in the helicopter.

We can use our primary navigation source, the **FMS**, to check progress by looking at either the **FPL** page or the **NAV** page.

Here we can see that it is currently **18.1 nm** to **BETSO**, the start of the ILS 19L approach.

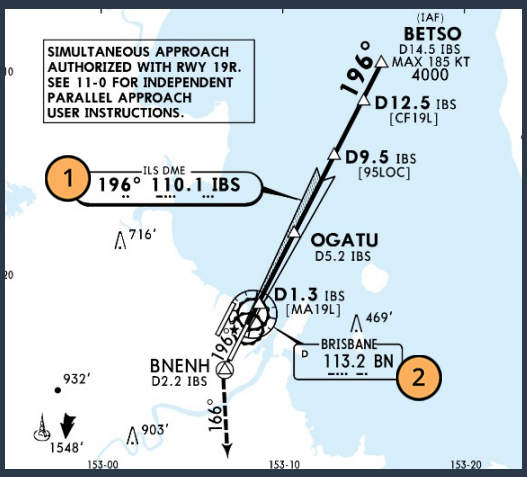


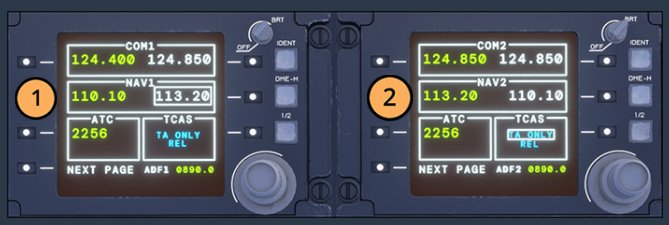
Referring to the **GNS 530,** the **FPL** page also reports that the distance to go (DTG) to **BETSO** is **18.1 nm**. It can be easier to glance sideways at the GNS 530 during the approach, rather than looking down to the FMS, but both are very useful in maintaining our situational awareness.

We can also use **DME readouts** from suitable navigation sources around YBBN by setting the relevant frequencies in the **COM/NAV** panel.

First, note the frequency for the ILS transmitter, shown as **110.1 IBS** on the chart (right). (1)

Check the **NAV1** frequency setting on the comms panel (see below). This should have been set for us when we created the flight. If not, enter it now.





We can now use the **DME readout and selector panel** – set to Channel 1 – to view the DTG to the ILS 19L transmitter, designator **IBS**. Note: On other approaches where terrain is a factor, the DME readout might only come alive closer to the ILS transmitter. In real life the max range is around 12 nm.

The readout will be helpful during our upcoming flight down the ILS glideslope.

DME Channel selector (see Page 9 for more info)

Channel 1

The chart also shows the airport **VOR BN** with a frequency of **113.2** (2)

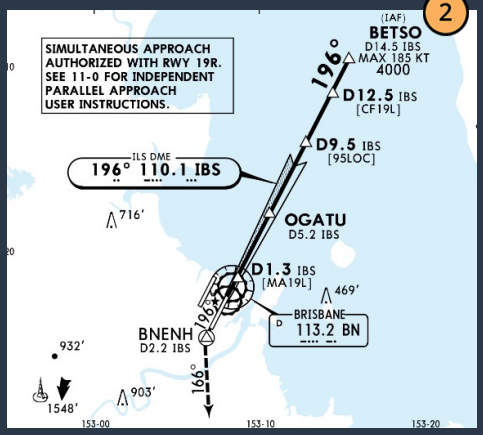
With that frequency set in **NAV2** we can view the DTG to the VOR in Channel 2. While not used during the ILS approach it is useful for general orientation.

Channel 2

Continued next page ⟶

Let's complete our review of the chart and brief the **ILS Runway 19L** approach.

LOC IBS	Final Apch Crs (1)	OGATU	ILS DA(H) (4)	Apt Elev 15′
110.1	196°	1650′ (1639′)	220′ (209′)	Rwy 11′
MISSED APCH: Track 196°, at BNENH (D2.2 IBS outbound) and not below 500′, turn LEFT, track 166°. Climb to 4000′ or as directed by ATC. (5)				



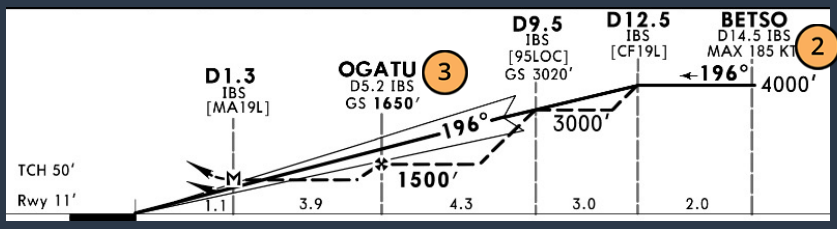
(2)

The course for this ILS approach is **196 degrees**. (1)

As previously mentioned, the approach starts at **BETSO**, which we need to cross at **4,000 ft** to ensure we capture the glideslope – which starts 12.5 nm from the threshold, descending through the **FAF** at **OGATU**. (2) (3)

The **Decision Height** is **220 ft**. (4)

The **Missed Approach** procedure is to fly to **BNENH** not below 500 ft, then climb to **4,000 ft** on a heading of **166** to await instructions. (5)



Noting all that, we can now get ready for the ILS approach.

Not less than **10 nm from BETSO** (check the FMS or GNS 530) take the helicopter down to the required altitude to cross **BETSO**, namely **4000 ft**. You know the drill by now: set the new altitude, press **ALT PRE**, press **VS** and set a suitable descent rate. **Minus 800 fpm** (–800 in the readout) is good. Remember, **IAS** mode is also in use so use your secondary trim hat.

Set the ILS course to **196** using **COURSE 1** on the **Course/Heading Control** panel. The selected course will show in the co-pilot's EHSI, but a clearer readout is below the **Standby Attitude Indicator**. There is no need to set COURSE 2.

Tip: Once again, see Section 12 (page 44) for suggested key bindings to more easily set the course for the ILS.

Set the **Decision Height** to **220** using the knob on the DH gauge.

Continued next page ⟶

ILS PREPARATION CHECKLIST

ILS PREPARATION: *If required*

64. **NAV1 / NAV2** frequencies ..... **SET**
65. DME readout channel ..... **SELECT**
66. Approach course ..... **SET**
67. Decision Height ..... **SET**

ILS Preparation checklist **complete** ☑

About **5 nm** from **BETSO** press the **NAV** button twice on **EHSI Display Control panel** to select the **ILS1** page. It will be visible on the left side of the EHSI.

We must select **ILS1** as our nav source now or we won't be able to arm **ILS** in the next step.

Note: When you change to ILS1 the helicopter might change course slightly, but it will settle down again quickly.

Not less than **3 nm** from **BETSO** press the **ILS** button on the Flight Director, which will **ARM**. The **NAV** mode (already showing **CAP** as it tracked our navigation route) will next capture the localizer while the **ILS** button will capture the glideslope in due course.

ILS APPROACH CHECKLIST

ILS APPROACH: *If required*

68. Flight Director settings once on ILS intercept course:
    a. **NAV** button ..... Confirm **ON** (for localizer capture)
    b. **ILS** button ..... **ARM** (for glideslope capture)
69. EHSI Display Selector panel, **NAV** button ..... **PRESSED** twice to cycle to **ILS1** in EHSI

ILS Approach checklist **complete** ☑

Continued next page ⟶

Turn on the **Landing Lights**.

As we near the localizer, the AFCS will order a turn to capture the localizer. The **NAV** button will continue showing **CAP**.

When the glideslope is captured, the **ILS** shows **GS**. The AFCS will initiate a descent down the glideslope. The GNS 530 will again alert you accordingly. Monitor the deceasing altitude in your instruments.

We still have **130 knots** set as our airspeed. That's okay, but the **maximum gear extension speed is 130 KIAS** so to be safe reduce your airspeed slightly to **120 KIAS.**

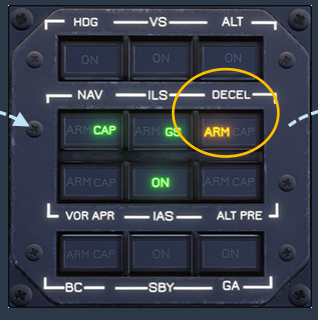
Cycle the **FSB/NS** switch to alert the passengers, then play 3DESCENT

As we continue to descend on the glideslope, we will pass through the FAF at OGATU. At the FAF, lower the **landing gear**. Confirm that you have **three green lights**.

We will be doing a rolling landing on the runway; confirm that the **parking brake** is released.

Tip: You can always check the status of the parking brake by looking at your **IIDS** display. Make sure it is not on, or your touchdown will be quite exciting.

Approximately 3-5 nm from the runway, set the **Missed Approach heading** and **altitude** (do not arm them).



IMPORTANT Around **3 nm** out press **DECEL** which will **ARM**.

Before crossing the threshold **DECEL** will show **CAP**.

Continued next page ⟶

On final for the ILS 19L

BEFORE LANDING CHECKLIST

Complete the **BEFORE LANDING** checklist. If you went through the steps in the previous pages, this checklist is complete. There is no need to set the **Float Arm Switch** today.

BEFORE LANDING:

70.	Landing lights	**ON**
71.	Cabin passengers:	
a.	Alerted	Cycle **FSB/NS** to alert passengers
b.	Briefed	**PLAY** '3DESCENT'
72.	Landing gear lever	**DOWN** at less then **130 KIAS**
73.	Parking brake	As required
74.	Flight Director, **DECEL** button	**ARM** (if used)
75.	Float Arm Switch	As required (below 75 knots)

Before Landing checklist **complete** ☑

THE LANDING PHASE

When DECEL mode is active, the helicopter slows down during late final then flies down the runway centerline at **70 KIAS** and **50 ft AGL**. Cool, right?

Tip: Don't stay in DECEL mode for too long cruising above the runway, or you might find that you are short of runway when you set down onto the surface.

Continued next page ⟶

Keep your hands on the cyclic and throttle controllers. The next actions demonstrate how it pays to have a controller button assigned to toggle ATT/SAS modes...

When ready, disable DECEL mode by pressing the button assigned to toggle SAS/ATT twice

This will briefly drop the AFCS into **SAS** mode so that we can descend, and swapping immediately to **ATT** mode helps us lower smoothly onto the runway surface.

Toni_L heard of this technique on the CowanSim Discord – let me know if it was you so you can be credited!

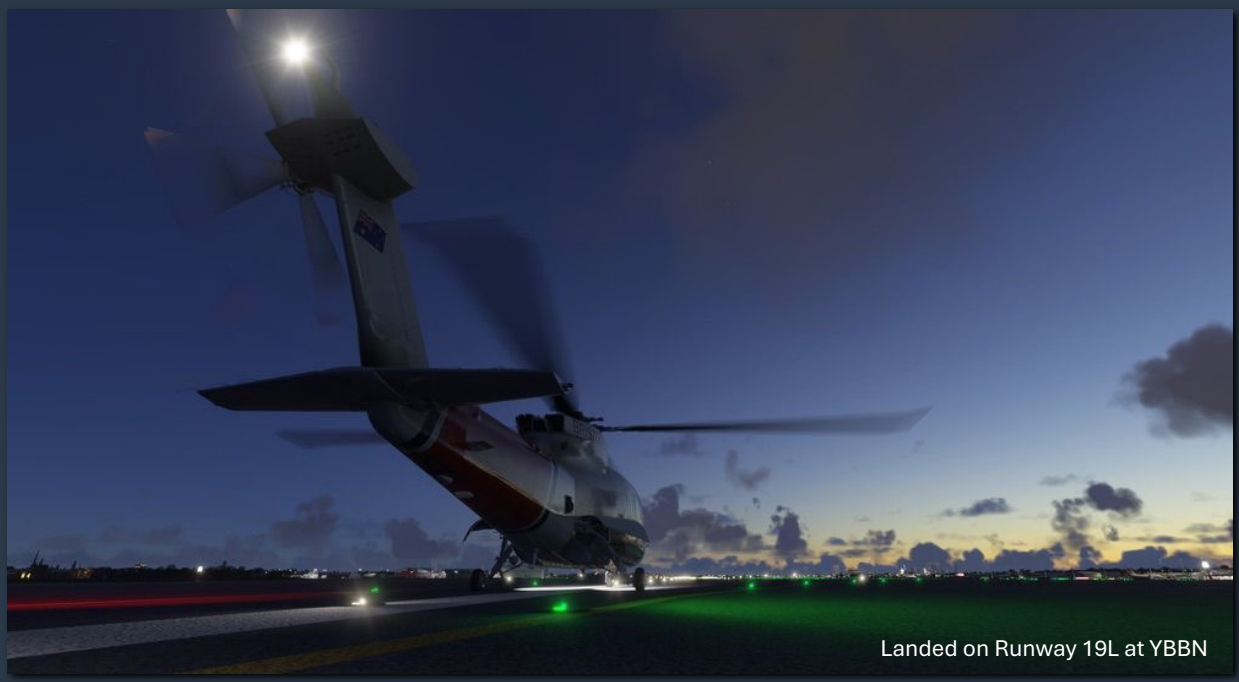
Maintain the centerline and pitch up slightly to **reduce airspeed** while adjusting power lower the helicopter onto the undercarriage **at or below 54 knots**.

AFTER LANDING CHECKLIST

AFTER LANDING:

76.	If **DECEL** mode is engaged	Press **SAS/ATT twice** for **ATT** mode

After Landing checklist **complete** ☑



Landed on Runway 19L at YBBN

Brake as necessary, then exit the runway and taxi towards the terminals (see taxi route on the next page). Cycle the **FSB/NS** switch to alert the passengers, then play the 4ARRIVAL message.

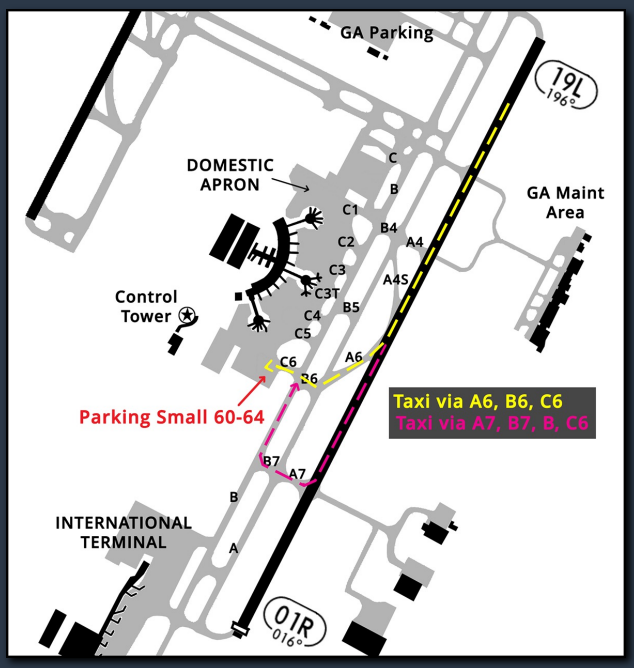
Continued next page ⟶

TAXI TO THE APRON

For the final phase of our flight, we will imagine that we have been directed to park at **Parking 63** on the southern edge of the domestic parking apron ay YBBN Brisbane.

Depending on the length of your landing roll-out, turn right off the runway at **exit A6** or further along at **exit A7**. If you land long, go all the way to the end of Runway 19L then taxi towards the Domestic Terminal via **taxiway A or B** to the assigned parking area. Use the graphic below to navigate the taxiways as required.

When you arrive at the apron, parking 63 is **second from the left**.



Note: I have installed the addon scenery **YBBN Brisbane International Airport V2** from **Orbx** which is a great representation of the airport. It is a MSFS 2020 product but works perfectly in MSFS 2024.

Another developer, **iniBuilds**, has released their own YBBN scenery which looks amazing. It might be a bit harder on framerates due to the complex modelling, but I have not tried it myself.

If you wish to follow along on this tutorial flight, the **default YBBN scenery** is slightly less pretty but is perfectly fine for the flight. It has the same taxiways and parking location.

Taxiing towards the Domestic Terminal apron at YBBN Brisbane

Continued next page ⟶

TAXI CHECKLIST

Complete the **TAXI** checklist on your way to the parking area.

TAXI:

77.	Float Arm Switch	**OFF**
78.	Cabin passengers:	
	a. Alerted	Cycle **FSB/NS** to alert passengers
	b. Briefed	**PLAY** '4ARRIVAL' (rear console)
79.	Weather radar	**STBY**
80.	TCAS	**STBY**
81.	Exterior lights	As required, strobes **OFF** at night
82.	**AP1** and **AP2**	**OFF**
83.	Standby Attitude Indicator EMER PWR switch	**OFF**

TAXI checklist **complete** ☑

Ready to shut down, Parking 63, at Brisbane

SHUTDOWN CHECKLIST

SHUTDOWN:

84.	Parking brake	**SET**
85.	Engine Control levers	**IDLE** (after 30 seconds cool-down)
86.	Engine and Fuel levers	**STOP** and **OFF**
87.	Forward Console – **MASTER ELECTRICAL POWER** switches	All **OFF** – **EXCEPT BATTERY**
88.	Forward Console – **MASTER & INVERTERS** switches	All **OFF**
89.	Forward Console – **ANTI-ICING** switches	All **OFF**
90.	Forward Console – **LT CONTROL** switches	All **OFF**
91.	Forward Console – **EXTERIOR LIGHTING** switches	All **OFF**
92.	Rotor brake	**APPLIED** as required (below 65% Nr)
93.	Battery switch	**OFF** (after rotor stops)
94.	Cabin passengers	**VERBALLY BRIEFED** for disembarkation
95.	Doors/windows	**OPEN** as required

Shutdown checklist **complete** ☑

When you have worked through the **Shutdown** checklist, give yourself a pat on the back. **Mission complete!**

[End of Section 13]

DISCLAIMER

This manual is the product of many hours of research and extensive testing in MSFS 2024.

Please note that in the real world I hold a Private Pilot License with a multi-engine endorsement, qualifications as a glider pilot and instructor, and previously I was a paraglider flier and instructor. However, I am not a helicopter pilot. I once undertook a couple of helicopter lessons given to me as a gift, but that's it.

None of this material represents real-world advice on operating the S-76C family of helicopters. Please don't sue me.

THANK YOU!

*Special thanks are due to the volunteer proof-readers from the CowanSim Discord server who helped ensure that my errors, both technical and grammatical, were spotted and corrected. They were **Toni_L** and **MatthewCr**. Thank you very much!*

***Josh Cowan** and his team at CowanSim reviewed the pre-release version of this manual and provided very positive feedback, for which I was extremely grateful. The time spent on this manual is nothing compared to the 18 months CowanSim spent developing their S-76C++ helicopter – a product that is worth every cent (and then some) of the purchase price.*

FEEDBACK

*Feedback, corrections or new information for inclusion in this document will always be welcomed. Contact **Tango_AUS** via the CowanSim Discord server.*

[End of Section 14]