
FSWS
PC-12/47 USER MANUAL
Microsoft Flight Simulator
PILATUS
OFFICIALLY LICENSED
PC-12


OH-PBL

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1. INTRODUCTION

1.1 ABOUT THE SWS PC-12/47

The SWS PC-12/47 is a representation of the iconic PC-12 Series 10 manufactured by Pilatus Aircraft Ltd. of Switzerland. With more than 2000 aircraft produced since its first flight in 1991, the PC-12 has proven itself as a versatile and reliable aircraft, capable of operating out of short, unprepared airstrips just as well as out of paved runways. The aicraft fulfills a variety of roles: executive transport, commuter, cargo transport and air ambulance.

By bringing together the expertise of the manufacturer, aircraft operators and pilots, we have tried to provide the full PC-12 experience, from flight handling and sounds, to the different interior configuartions.

1.2 ACKNOWLEDGEMENTS

The SWS PC-12 was created under license from Pilatus Aircraft Ltd. All included liveries, logos and trademarks were created under license from their respective operators.

SimWorks Studios Ltd. holds an exclusive license for the creation of liveries of Fly7 Executive Aviation for the SWS PC-12 for Microsoft Flight Simulator.

1.3 DEVELOPMENT TEAM

Development of the aircraft has gone through numerous downs, so SWS team members contributed in multiple areas of development to be able to complete the aircraft. In no particular order:

- **Nawfal Benbennasser:** Base aircraft model
- **Elias Strikos:** 3D model refinement, interior textures, exterior textures
- **Matt Wynn:** interior textures, exterior textures, liveries
- **Evripides Efthymiou:** Avionics programming
- **Alexander Losev:** Avionics programming
- **Paul Frimston:** Flight dynamics
- **Alex Vletsas:** 3D model refinement, animations, systems programming, engine modelling
- **SimAcoustics:** Sound recording and mixing
- **Akis Karagiorgos:** Vector graphics

1.4 SPECIAL THANKS

We would like to extend our sincerest thanks to all the people that had to bear with us during the long development process of the SWS PC-12. Starting with our families and friends, special thanks go to:

- **Fly7 Executive Aviation, Yves Roch (CEO) and Thomas Goncalves (Fly7 Community)** for providing us a flight in the aircraft, sound recordings and a week of simulator time and instruction on the PC-12, all undertaken at the Fly7 Training Center in Lausanne, Switzerland.

FIVE STARS TWO WINGS FLY7 FLY7 COMMUNITY

- **MS Aviation South Africa** for reaching out very early in the project, providing a wealth of reference material and advice for the creation of the aircraft.
- **Tradewind Aviation** for providing us with reference material to faithfully recreate their aircraft livery.
- **Revue Thommen AG** for providing us with the manual to the DC20 Chronograph and helping us make an authentic rendition of it.
- **Brandon Hostetter f**or his diligent testing and feedback in refining the flight model & systems simulation of the aircraft. Brandon helped us delve into intricacies of the Legacy PC-12 that we otherwise couldn't have known.

- **Raul Morales (FSReborn):** Raul has been a “silent contributor” during the development, as we exchanged knowledge and worked together for the betterment of our turboprop aircraft. A lot of back and forth has helped both our businesses and products and we intend to keep it that way!
- **Dr. Evangelos Vaos:** for providing his insight and advice on several problems that occurred during the development and release of the SWS PC-12.

1.5 FEATURES

Any items marked with an asterisk (*) are subject to MSFS limitations in their respective area.

EXTERIOR MODEL

- Accurate riveting and high resolution stencils
- 4 and 5-bladed propellers
- Custom animations
  - Trailing link landing gear
  - Custom nose wheel steering
  - Stabilator trim
  - Engine bypass door
  - Chocks
  - Pitot and AoA vane covers
  - Engine bay
  - Tail interior
  - De-icing boots
- 8 liveries:
  - White
  - OH-JEM (Fly7 Executive Aviation)
  - HB-FVA (Fly7 Executive Aviation)
  - OH-FUK (Fly7 Executive Aviation)
  - OH-DEN (Fly7 Executive Aviation)
  - OH-PBL (Fly7 Executive Aviation)
  - N881TW (Tradewind Aviation)
  - PH-ONE (Private)

INTERIOR MODEL

- Fully functional cockpit
- Three interior configurations: Executive, Commuter and Cargo
- Working exits
- Fully working custom lighting
- GNS530/430
- PMS & TDS GTN option and Sky4Sim tablet compatiblility (PC-Only)
- Easily customisable for repainters
- Numerous custom animations:
  - Lavatory
  - Armrests
  - Drawers
  - Sun visors
  - Window shade
  - Gust lock
  - Passengers
  - Cargo

FLIGHT MODEL

Created after spending a week in the real simulator with PC-12 instructors and with constant pilot feedback during development, the SWS PC-12 features:

- Realistic handling and performance
- Different 5-blade and 4-blade propeller simulation
- Custom engine simulation:
  - Correct ITT/altitude behaviour and limitations
  - Correct Torque/Ng relationship
  - Torque limiter
  - Hot starts (no damage)
- Correct starter operation
- Torque effect on yaw*
- Nose-down approach attitude*

SYSTEMS

- High performance avionics using the MSFS Avionics Framework:
  - Bendix/King EFIS50 Avionics
  - Engine Instrument System
  - Thommen DC20 Chronograph
  - KAS927B
- Full Electrical system with working circuit breakers

- Custom stall protection system:
  - Stall warning system
  - Stick shaker
  - Stick pusher, including pusher ice & test modes
- Custom nosewheel steering system with free-castering nosewheel when applying brakes
- Custom trim system with realistic timings*
- Custom de-icing system:
  - Realistic boot operation
  - Individual windshield heating
- Custom air conditioning & heating system:
  - Adjustable temperatures based on real system limits
  - Flow and volume based temperature distribution
  - Insulation & open door effects
- Custom oxygen system, accounting for number of crew and passengers on board
- Custom warning system:
  - Fully working CAWS system
  - Numerous aural warnings for aircraft systems
  - EGPWS system mode 1, 2, 3 and 5* and TAWS inhibition

SOUNDS

High quality sounds recorded from three different aircraft

- 5-bladed engine sounds
- 4-bladed engine sounds
- Full aircraft sounds including starter, ignition, flap actuators, hydraulic pumps, warnings and electrical system components
- Full interior aircraft soundscape
- Correct sound insulation properties

1.6 INSTALLATION

The SWS PC-12 is distributed either with the SWS Installer or via the Microsoft Flight Simulator Marketplace.

SWS INSTALLER

Installation options

The SWS installer will present you with the following installation options pertaining to the GPS units installed in the cockpit and whether you want to use Sky4Sim on the included tablet.

Sky4Sim's free or paid version needs to be downloaded separately at https://sky4sim.com/.

- **PC-12 with GNS:** Default option. The cockpit will come with the Working Title GNS530 & GNS430 GPS units.
- **PC-12 with GNS & Sky4Sim:** The cockpit will come with the Working Title GNS530 & GNS430 GPS units. The tablet will use Sky4Sim NG.
- **PC-12 with TDS GTN & Sky4Sim:** The cockpit will become compatible with the TDS GTN750/650Xi. If detected, it will deactivate the GNS units and display the GTN.
- **PC-12 with TDS GTN & Sky4Sim:** The cockpit will become compatible with the TDS GTN750/650Xi. If detected, it will deactivate the GNS units and display the GTN. The tablet will use Sky4Sim NG.
- **PC-12 with PMS GTN & Sky4Sim:** The cockpit will become compatible with the PMS GTN750/650. If detected, it will deactivate the GNS units and display the GTN.
- **PC-12 with TDS GTN & Sky4Sim:** The cockpit will become compatible with the TDS GTN750/650Xi. If detected, it will deactivate the GNS units and display the GTN. The tablet will use Sky4Sim NG.

"Path too long" installation error

This can occur if the Community folder is located within the Appdata folder, as the final path of the installed files might exceed 256 characters. There are numerous technical workarounds for this issue. The simplest solution is to install the add-on in another location and create a symbolic link into your community folder, which will see it as if the plane is installed there.

Virus alerts

The downloaded package contains numerous elements that can be falsely flagged as malware. The installer's own .exe file, as well as the numerous .xml, .html and JavaScript code files included with the aircraft can be flagged as malicious by antivirus software. The SWS PC-12 files and installer have been checked using online virus scanners like VirusTotal and Internxt.

FLIGHT SIMULATOR MARKETPLACE

The GTN cockpit and Sky4Sim options of the product cannot be made available through the MSFS Marketplace due to limitations imposed by the platform.

PC users will be able to get the required mod files by going to **this page** and manually installing the version they wish to use. These options are not available for Xbox users.

1.7 SUPPORT

In the event you encounter any issue with the aircraft we recommend that you contact us on our support venues with the following information:

1. What is the problem? - I.e. reds and chocks will flicker
2. What were you doing before the problem happened? - Looking at the plane.
3. Did you try running the plane alone in the community folder, with all other mods removed?
4. If you did #3, did you encounter the problem again? What is the reproduction rate? - I.e. 2 out of 10 times it happens.

Please contact us with the above information at:

- SWS Support page - Read the known issues or Contact Support
- SWS Discord server - Open a ticket at #official support

1.8 CONTROL ASSIGNMENTS

All basic flight controls of the SWS PC-12 are assigned to default MSFS events. A special case is the condition lever, that can be mapped to either the default Condition Lever, or Mixture lever assignments in the MSFS controls screen. The assignments have been modified via custom code to work the same and avoid accidental engine cut offs or light ups.

The plane also makes use of custom variables, which are listed in a separate document available in the SWS PC12 page under "Free Extras". These variables can be used by power users to control non-default functions of the aircraft.

The variable list and names are likely to change as the aircraft evolves.

1.9 DEVELOPMENT ROADMAP

The SWS PC-12 will continue to be updated with more features in the near future. Some of the upcoming features were not possible until very late in the development cycle, while until very recently, others were beyond our technical reach.

FREE UPDATES

- EFIS50 Weather RADAR*
- EFIS50 Flight Plan mode
- EFIS50 Composite mode
- SWS Tablet featuring:
  - Aircraft logs (per tail number)
  - Aircraft persistent state saving (per tail number)
  - Flight planning
  - Weight & Balance
  - Walkaround*
  - PDF reader*
  - Charts
  - Feature controls: hide passengers/cargo, adjust their volume

**The walkaround feature is partially available through the preflight item "EXT LIGHTS CHECK" in the ingame checklists.*

PLANNED EXPANSIONS

While the present add-on is a very extensive simulation of the real PC-12/47, failures were omitted from the package. This is because the majority of MSFS users do not wish to experience failures since they may overwhelm them, cause problems with secondary software (i.e. interrupting VATSIM traffic), or detract from a limited flying time that would otherwise not have distractions..

Therefore, we are planning on a payware expansion that will include deeper simulation of the various aircraft subsystems and failures associated with them. The way we are approaching failures is different compared to the "aircraft mechanic simulator" taken by most add-ons, as we want to focus on the flying part. Some examples of the improvements planned for the expansion package are:

- Custom Fuel Control Unit with improved simulation of the various inputs
- Improved fuel system simulation
- Deeper electrical system simulation
- Organic manifestation of problems and failures based on component wear and abuse
- Realistic maintenance feedback -no magical "know-it-all" tablet listing

2. QUICKSTART GUIDE

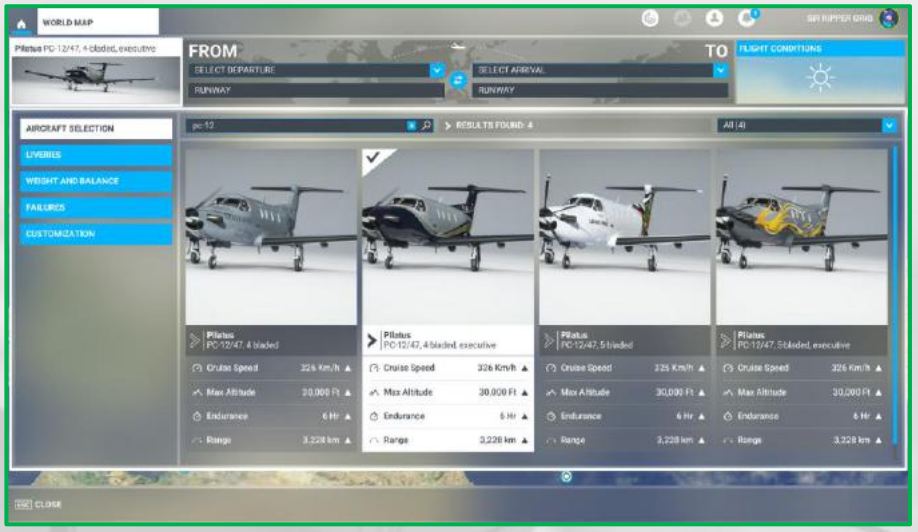
This section aims to supplement the in-game checklists and prepare you for some new behaviours you will experience with the SWS PC-12.

2.1 SELECTING AIRCRAFT VARIATIONS

The SWS PC-12 comes with two exterior and three interior models that can be found in the AIRCRAFT SELECTION option. Because different flight models were required for the Executive and Cargo/Commuter versions, the Executive versions appear as different aircraft. Interior configurations can be differentiated by the aircraft title shown on the thumbnails.

Available options are:

- 4-Bladed: Cargo or Commuter cabin with 4-bladed engine
- 4-Bladed, Executive: Executive cabin configuration with 4-bladed engine
- 5-Bladed: Cargo or Commuter cabin with 5-bladed engine
- 5-Bladed, Executive: Executive cabin configuration with 5-bladed engine



2.2 WEIGHT AND BALANCE

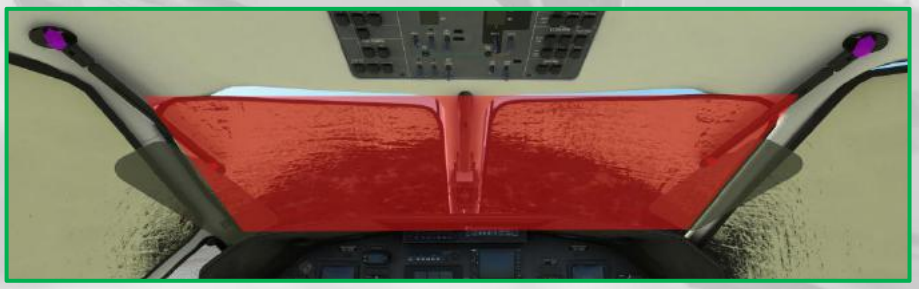
The SWS PC-12 can be loaded using the ingame “Weight and Balance” menu. This will allow you to set the cargo and passenger weights and will automatically make them appear in the cabin.

If adjusting the weight using the sliders always check to make sure that your Center of Gravity is within the limits of 12.8 to 52.9%. Exceeding these limits will put the plane out of balance and can result in uncontrolled flight behaviour.

2.3 GUST LOCK & SUN SHADE

When the aircraft is cold & dark and the gust lock is installed, a large clickable area will occupy the forward windshield. Clicking this area allows you to install or remove the cockpit sun shade. When the sun shade is installed, the visors will automatically move down to support it.

The sunshade can be removed by clicking on the forward windshield area or removing the gust lock from the pilot's yoke. The visors will not retract automatically when the sun shade is removed. In order to quickly retract the visors you may click at their pivot on the outboard corner of each glareshield window.



Sunshade and sun visor clickspots

The SWS PC-12 also features a working gust lock. When the plane is started cold & dark, the gust lock will be on the yoke. When starting in any other state, the gust lock can be found on the left cockpit wall, next to the pilot's seat. When the gust lock is inserted into the yoke's base, the aircraft controls can no longer be moved.

To insert the gust lock:

- Click on the stowed gust lock on the left cockpit wall. Doing so will put it "in your hand"
- A new clickspot will become available above the pilot's yoke and in front of the HSI. Make sure the yoke is centered and insert the gust lock by clicking this area. This will lock all flight controls in a centered position.

To remove the gust lock:

- Click above the pilot's yoke to remove it from the controls. This will put the gust lock "in your hand'.
- Find the stow on the left cockpit wall. Click on the stow area to secure the gust lock

If you do not stow the gust lock it will remain "in hand". This allows you to insert it by accident and jam your controls. This was done on purpose to ensure that users will learn how to stow and unstow the gust lock correctly and familiarise themselves with the procedure.

2.4 HIDING THE CREW AND PASSENGERS

The co-pilot headrest can be used to show or hide the passengers in the executive and commuter variants.
The adjument handle at the bottom of the pilot and co-pilot seats can be used to show or hide the respective crew member avatar.

2.5 CABIN DRAWERS

Drawers can be dragged open by clicking on their faceplate and dragging UP to close or DOWN to open them. A left/right operation was not possible due to the perspective being different depending on the camera position.

2.6 EXITS

Exits in all SWS aircraft open and close in a two-step process. The first step is to unlock the exit using the handle. When the engine is unlocked, a clickspot will become available that will allow you to open and close the door.

- To open the passenger exit, click on the red handle to unlock it. Afterwards, click on the middle of the door to open or close it.
- To open the cargo door, first click on the handle area, at the center of the door. To open or close it, click on the area under the cargo door window.

2.7 CONTROL CURVES

The plane was developed to be flown with linear response curves. Setting the curves to anything else will adversely affect the aircraft's response to control inputs.

2.8 TAKE-OFF TRIM

The trim indicators can be found on the forward edge of the pedestal. There are three indicators for aileron, rudder and elevator trim. Green markings on the indicators denote the optimum trim for take-off.

ELEVATOR TRIM

Knowing your CG from the previous step is important in setting the take-off trim correctly. The aircraft is trimmed nose-down in order to avoid early rotation of the aircraft on take-off. Takeoff trim range is from the green rectangle down to the green diamond. For CG position greater than 39% MAC trim should be set to the green diamond.

RUDDER TRIM

Due to the PC-12's very powerful engine, the aircraft displays a strong tendency to yaw to the left when applying power and especially during the take-off roll. Rudder trim should be set in the green zone for take-off. If crosswinds are present:

- For left crosswind add more right rudder trim
- For right crosswind add more left rudder trim

RUDDER PEDAL INPUT

The PC-12 requires right rudder input during the initial take-off roll. As the rudder becomes more effective, pedal input is reduced and towards the end of the take-off roll left rudder input will be required.

2.9 AILERON-RUDDER INTERCONNECT

The aileron and rudder controls are mechanically linked with an interconnect system, whereby when the yoke is turned, rudder pedals also follow in the same direction and vice versa. The purpose of the system is to assist turn coordination and reduce adverse-yaw. The aileron-rudder relationship is 1:1 up to 25kts. After that point, the ratio of the interconnect begins to reduce and is very subtle above 150 knots.

As it is not possible to feel the control forces on a desktop controller, you will need to cross-control with your desktop controls. As you apply aileron control in one direction, the aircraft's pedals will follow suit in order to better co-ordinate the turn. If you want to stop it, you would need to apply opposite rudder pressure in order to keep them centered.

2.10 STALL PROTECTION

While the stall protection system will be covered in more detail later, a short introduction to the stick pusher will help you understand better how the system works. The stick pusher protects the aircraft from going into a stall by pushing the yoke forward.

Published stall speeds for the PC-12 are not the actual aerodynamic stall speeds, but where the pusher activates. The actual stall speed can vary depending on many parameters such as aircraft weight, airspeed and load factor.

Each flap setting has an angle of attack range used for pusher activation, which results in certain airspeeds. The speed range for Flaps 40 is 51 to 65 knots indicated and what airspeed the pusher will trigger at depends on the current engine torque setting. Running the engine at idle will trigger the pusher at 51kts, while higher settings will make it trigger at up to 65kts. Activation speeds will be even higher if the ice protection system is active, or the plane is flying at a higher load factor.

Activation speeds with flaps up are significantly higher and can go up to 93 knots indicated, which shows how large the aircraft's safety margins and performance envelope can be.

2.11 YAW DAMPER

The yaw damper will reduce unintended around the yaw axis of the aircraft by automatically adjusting the pedals and rudder trim.The yaw damper should be turned OFF until after takeoff is complete. It should remain on during all phases of flight and turned off during final approach.

The reason the Yaw Damper is turned off for takeoff and landing is that it will react to pilot input by applying opposite control, thereby enhancing adverse control effects and putting the aircraft out-of-trim, potentially resulting in loss of aircraft control.

2.12 YAW FROM TORQUE

As mentioned earlier, the PC-12's engine has a strong effect on aircraft yaw and will pull the aircraft's nose strongly to the left, especially with the yaw damper is off.

This effect is simulated in the SWS PC-12 so you must be mindful of it as power changes will cause the nose to drift, especially on approach when the yaw damper is turned off.

2.13 APPROACH AND LANDING

A good landing depends on many factors, but we will try to provide you with some key points that will make the entire process more streamlined.

CORRECT FLAP SETTINGS

Flap selection is typically determined by the prevailing flight conditions and runway availability. In standard scenarios, most operators opt for flaps 40. Flaps 15 is employed during instrument approaches, in gusty conditions, or when requested by Air Traffic Control (ATC) for a condensed approach. Flaps 30 is typically reserved for windy days, provided that the runway length allows for its usage.

Crosswind is a very important factor in determining flap setting for approach. Refer to the maximum demonstrated crosswinds to decide the correct flaps for your situation.

ENTER THE APPROACH EASILY

The PC-12 is built to make flying easier for the pilot and you can stay ahead of the aircraft easily by using some rules of thumb.

- When flying level and clean (flaps up, gear up), setting engine Torque to 15psi will yield you approximately 150 knots.
- With flaps 15 and gear up, a torque setting of 20psi will get you back up to 150kts.
- In the 150kts speed range the nose-down effect from the landing gear drag will cancel out the ballooning effect of Flaps 15 deployment. Lowering both at the same time will keep your nose pointed in the same place.

APPROACH TIPS

A successful approach is determined by doing no more than what is necessary to keep the plane where you want it. Know how to manage the aircraft's energy and use trim and subtle control inputs to direct it.

Rudder trim should be set one line left of the green zone. Further adjustment might be needed for crosswind.

Torque setting used on approach is 9-12 psi, most often between 9 and 10psi. For a 500fpm descent rate, these settings will yield:

Flap setting (Degrees)	Torque	Airspeed (kts)	Max demo. crosswind
15	9-10psi	110-120	25kts
30	9-10psi	95-105	20kts
40	9-10psi	80-90	15kts*

*Landing only

One last tip has to do with trimming the nose up. As the aircraft bleeds off speed and settles into the approach, trimming the nose up will reduce the need for aft yoke application. This will make landing much easier but beware in poor visibility conditions as in the event of a go-around you will need to aggressively prevent the nose from climbing because of the uptrim and speed increase.

FLARING AND TOUCHDOWN

The PC-12 will approach the runway with a nose-down attitude and if you lose awareness of that fact it will be very easy to land nose-first. For this reason, flaring should begin earlier than usual as you have more of an angle to cover.

Some tips to make flaring and touchdown easier:

- When crossing the "fence", start bringing back the power
- When over the numbers you should be idle and 10kts below your approach speed
- At the touchdown point you should just hear the stall warning horn
- Before applying beta or reverse, make sure that you have full lateral control of the aircraft.
- When applying reverse be ready to counter the left pull
- At 50kts exit reverse and apply brakes

3. AIRCRAFT OVERVIEW

3.1 AIRCRAFT DESCRIPTION

The PC-12/47 is a large, single-engine turboprop aircraft capable of performing a wide range of missions. The plane is used in the roles of cargo transport, air ambulance, commuter transport, executive transport and ISR platform.

Its powered by 1200hp engine, coupled with its high lift wing give it exceptional short-field performance, while its pressurised cabin allows it to fly at altitudes up to 30,000ft at speeds up to 269KTAS.

OPERATING LIMITATIONS	
Maximum operating airspeed	Lower of 236KIAS or M0.48
Maximum take-off weight	10,428lbs/4,740kg
Maximum speed, flaps ≤15°	165KIAS
Maximum speed, flaps >15°	130KIAS
Maximum landing gear operating speed	177KIAS
Maximum landing gear extended speed	236KIAS
Max demo. crosswind	
Flaps 0°	30kts
Flaps 15°	25kts
Flaps 30°	20kts
Flaps 40°	15kts (landing only)

3.2 ENGINE

The aircraft is powered by the PT6A-67B engine rated at a maximum take-off power of 1200hp and maximum cruise/climb power of 1000hp at 1700rpm.

A constant-speed, 105" Hartzell propeller provides thrust and in the SWS PC12/47 we provide two propeller options, eached separately modelled:

- The 4-bladed HC-E4A-3D aluminium propeller.
- The HC-E5A-3A 5-bladed composite propeller.

PT6A-67B engine limits				
	Max reverse	Max cruise/climb	Take-off - limited to 5 minutes	Maximum
Power (hp)	900	1000	1200	1200
Torque (psi)	34.25	36.95	44.34	61.00 (1)
ITT (°C)	760	760	800	1000 (2)
Np (RPM)	1650	1700 (3)	1700 (3)	1870 (1)
Ng (%)		104	104	104
Oil Pressure (psi)	90 to 135	90 to 135	90 to 135	40 to 200 (1)
Oil Temperature (°C)	10 to 105	10 to 105	10 to 110	-40 to 110
Annotations	(1) Limited to 20 seconds max (2) Limited to 5 seconds max (3) Allowance of ±30rpm for governing accuracy			

3.3 INTERIOR ARRANGEMENT

As of version 1.0, the SWS PC-12 comes with three interior arrangements: Cargo, Commuter and Executive. A medical interior is being researched for inclusion in a later version.

All cabins feature opening exits, visible payloads, opening exits and custom animations where applicable.

4. COCKPIT FAMILIARISATION

The pupose of this section is to familiarise yourself with the cockpit lay-out and location of each instrument, while introducing the names and terminology for the systems that will be referenced in more detail later in this manual.

4.1 PILOT PANEL

1. EADI
2. Slip indicator
3. EHSI
4. RMI
5. OBS
6. Standby attitude indicator
7. Airspeed indicator
8. Flaps indicator
9. Master caution light/pushbutton
10. Master warning light/pushbutton
11. KAS927B altitude selector
12. TAWS control switches
13. AM-250 altimeter
14. Pilot AHRS selector
15. Vertical speed indicator

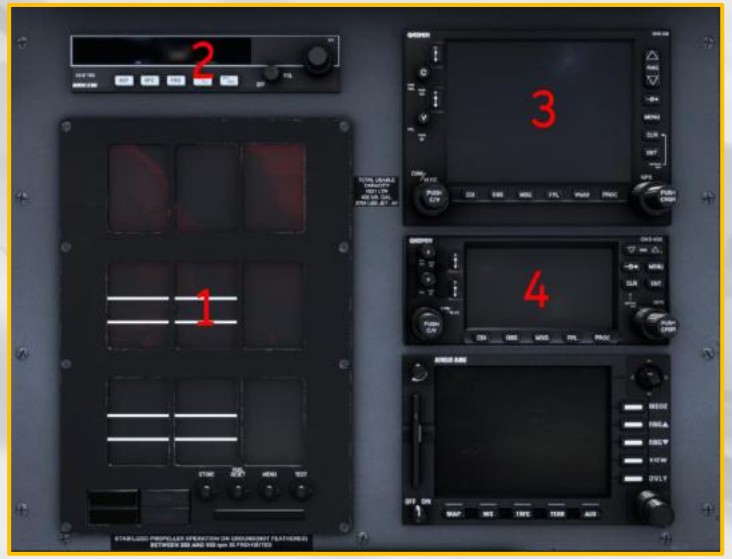
The First Officer panel mirrors the pilot's layout, except for the OBS (5) and standby attitude indicator (6).

4.2 GLARESHIELD PANEL

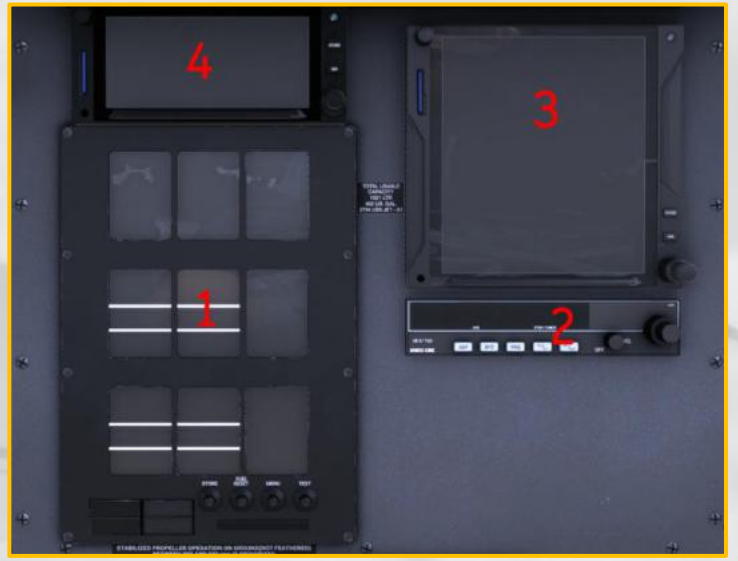
1. KMC321 Autopilot
2. GMA340 Audio Panel

4.3 CENTRE PANEL

The center panel contains the Engine Instrument System (1), ADF radio (2) and GPS units (3 & 4). The aircraft comes with the Working Title GNS530/430 by default. The first GPS unit (3) also handles the COM1 and NAV1 radios, while the second unit (4) handles COM2 and NAV2.



If you choose to install the GTN750 version then the layout will change to a GTN750 & GTN650 version of the cockpit. The GTN units may also include a built-in transponder.



4.4 CENTRAL ADVISORY DISPLAY UNIT

The Central Advisory Display Unit (CADU) is located in the center of the main panel, between the pilot and first officer knee panels. In the PC-12/47 it has a 8x6 layout, with three blank cells. Warnings are indicated in red, cautions in amber and advisories in green colour.

Central Advisory Display Unit, illuminated

4.5 PILOT KNEE PANEL

The pilot knee panel contains the following:

1. Hobbs meter
2. Thommen DC20 chronometer
3. Standby altimeter
4. Emergency Location Transmitter
5. Yoke hider & gust lock
6. Pilot EFIS Composite mode switch
7. Pulse/steady switch for the recognition lights and state indication
8. Emergency Power Supply (EPS) switch and lights
9. AHRS control panel
10. Landing gear lights
11. Landing gear lever
12. EFIS50 CP467 control panel
13. WXR RADAR control panel
14. Oxygen lever

4.6 FIRST OFFICER KNEE PANEL

The First Officer knee panel contains the following:
1. Cabin Pressurisation Control System (CPCS)
2. Yoke hider
3. Transponder #2
4. First Officer EFIS CP467 control panel
5. First Officer EFIS Composite mode switch

4.7 OVERHEAD PANEL

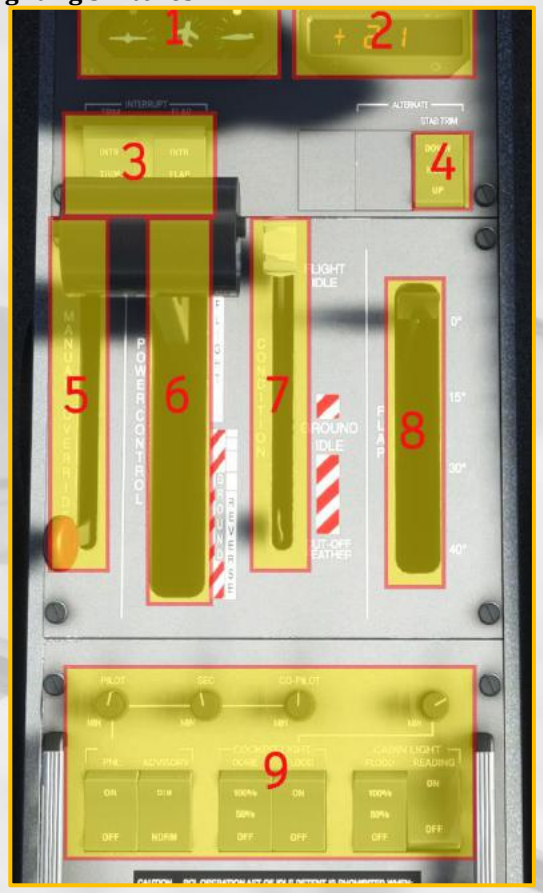
The overhead panel can be separated in the following eight areas:

1. **Test switches:**
   - **LAMP TEST:** On the ground it will illuminate all warning lights in the cockpit. In the air it will only illuminate the gear and CAWS lights
   - **PUSHER TEST:** Initiates the stick pusher test sequence
   - **FIRE TEST:** Tests the fire warning system. When the generator is powered, the “FIRE, FIRE, FIRE” aural warning will also sound
2. **External lighting switches**
3. **Fuel pump switches:** Two push buttons are provided for Left Hand (LH) fuel pump and Right Hand (RH) fuel pump. Pushing the button will toggle the pump between “AUTO” and “ON”
4. **Starter/Ignition switches**
5. **Electrical power management**
6. **De-icing switches**
7. **Air conditioning and heating switches**
8. **Passenger warning switches**

4.8 PEDESTAL

The pedestal is located between the two pilots' seats and contains:

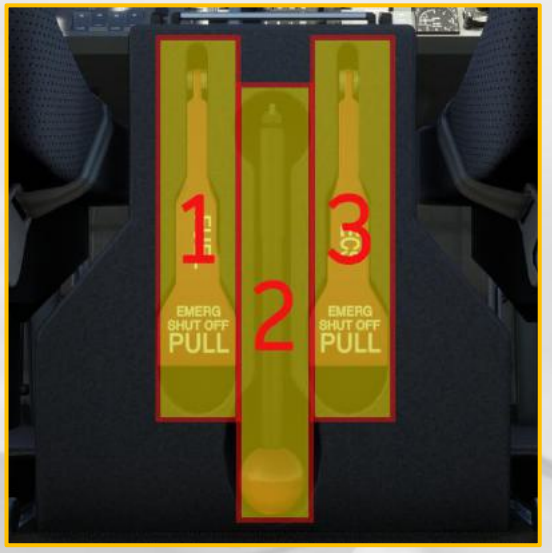
1. **Trim indicators:** there are three trim indicators for roll, yaw and pitch. Each indicator has a "green" range which denotes take-off trim. A light is situated above each trim indicator which illuminates when the trim is in use by the autopilot.
2. **Cabin temperature indicator:** Indicates the current cabin temperature in degrees Celsius
3. **Interrupt switches:**
    - **TRIM INTERRUPT:** Setting the switch to the "INTR" position will de-energise aircraft trim circuits. Setting to "NORM" will resume operation.
    - **FLAP INTERRUPT:** Setting the switch to "INTR" will remove power from the flap actuation system and activate the "FLAPS" CAWS warning. Setting the switch back to "NORM" will not re-energise the flap system and it will need to be reset on the ground by maintenance.
4. **Alternate Stab Trim:** The alternate stab trim is normally used by the Autopilot, but can be used in the event of a failure of the main trim actuator.
5. **Manual Override Lever (MOR):** The Manual Override lever can be used in the event of failure of the Fuel Control unit. The lever allows to manually control the fuel flow into the engine. In order to operate the MOR lever the PCL should be set to IDLE. The MOR lever will set fuel flow from the current "IDLE" setting (ground or flight) to the maximum fuel flow available to the engine. While the MOR is in use, the torque limiter is ineffective so there is a risk of over-stressing the engine.
6. **Power Control Lever (PCL):**
7. **Condition Lever:** The Condition Lever can be set to one of three positions:
    - **CUTOFF:** Stops fuel flow into the engine and feathers the propeller
    - **GROUND IDLE:** Sets fuel flow to ground idle which allows the engine to idle at a lower power setting, suitable for ground operations.
    - **FLIGHT IDLE:** Sets the fuel flow to ensure minimum fuel flow for flight operations, which ensures rapid engine response and allows for the pressurisation system to work at full power.
8. **Flaps handle**
9. **Interior lighting switches**



4.9 REAR PEDESTAL

The rear pedestal contains the levers for:

1. **Firewall fuel shutoff:** Pulling the paddle lever cuts all fuel flow downstream of the firewall shutoff valve
2. **Manual gear extension pump:** Used in the event of a hydraulic failure, the manual gear extension pump allows the pilots to manually lower the landing gear
3. **ECS shutoff valve:** Pulling the paddle lever cuts all power to the ECS and allows fresh air to enter the cabin via a fresh air duct situated on the bottom right side of the nose. This allows the cabin to be cleared of any smoke in the event of a fire.



4.10 CIRCUIT BREAKER PANELS

There are two circuit breaker panels, one on each side of the cockpit. The circuit breakers allow the pilots to control power to each individual aircraft system. The circuit breakers will pop out automatically if excess current goes through the system.

Pilot circuit breaker panel | First Officer circuit breaker panel

5. AIRCRAFT SYSTEMS

5.1 ELECTRICAL SYSTEM

The SWS PC-12 electrical system consists of:

- Two 42 Ampere-hour batteries
- One 300A starter-generator
- A secondary 115A generator
- An 5 Ampere-hour Emergency Power Supply battery providing power to the standby attitude indicator and its light
- A ground power unit (INOP)
- Two inverters providing 26V 400Hz AC power to certain avionics components

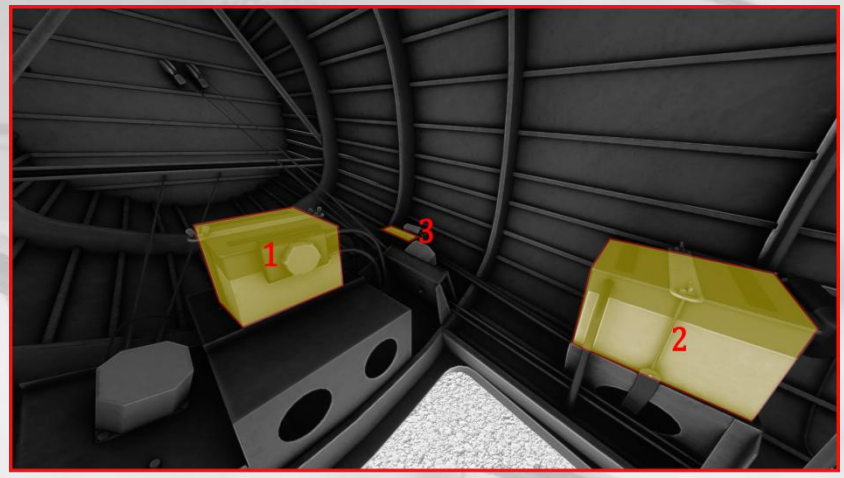
The Electrical system is controlled by the Electrical Power Management section of the overhead panel. Red light indicators in the overhead panel will illuminate when the respective bus is not powered.

BATTERIES

Two 24V, 42Ah lead-acid batteries are installed in the aircraft's tail compartment. Both batteries can provide power to start the engine.
Battery 1 is connected to the **BATTERY BUS BAR** via the **BUS TIE** relay.
Battery 1 is also connected to the **BATTERY DIRECT BUS BAR**.
In the event of a double generator or engine failure, the batteries can supply essential electrical systems for:

- 40 minutes if the load is reduced below 60A
- 60 minutes if the load is reduced below 50A

Electrical system - cockpit



Electrical System - Tail compartment

1. Battery 1
2. Battery 2
3. Tail Circuit breaker panel

ENGINE GENERATORS

The aircraft is equipped with two generators. A 28V DC, 300A Starter-Generator serves as the engine starter motor and is the aircraft's main power source when energised. .

Generator 2 is a 28V DC, 115A 28V generator which supplies essential services in the event Generator 1 fails. Generator 2 is not able to supply the full electrical system load.

WARNING

When toggling the generators, Generator 1 should be turned on first and turned off second. If not done in the correct sequence, the high power demand will cause Generator 2 voltage to gradually decrease and the batteries will discharge.

EMERGENCY POWER SUPPLY

The Emergency power supply (EPS) system is connected to its own 5Ah battery. When active, the EPS provides power to the standby attitude indicator and its light.

The EPS is controlled from the pilot's knee panel through a three-position switch. When the switch is set in the OFF position, the EPS system is deactivated.

Moving the EPS switch to the ARMED position will arm the system. When no generator and battery power is available, the EPS system will be activated and the amber light will illuminate.

Moving the EPS switch to the TEST position will allow the system to test the battery. If the test is successful, the green BAT TEST light should illuminate after a few seconds.

Emergency power supply system controls

BUS BARS

The **BATTERY BUS**, **GEN1 BUS** and **GEN2 BUS** are connected to their respective power sources through the BAT relay, the GEN1, relay and the GEN2 relay, controlled by switches in the overhead panel. Two indicators are installed in the overhead panel, showing the Amperes and Voltage of each battery. Negative Amperes indicate battery discharge, while positive values indicate that the battery is charging.

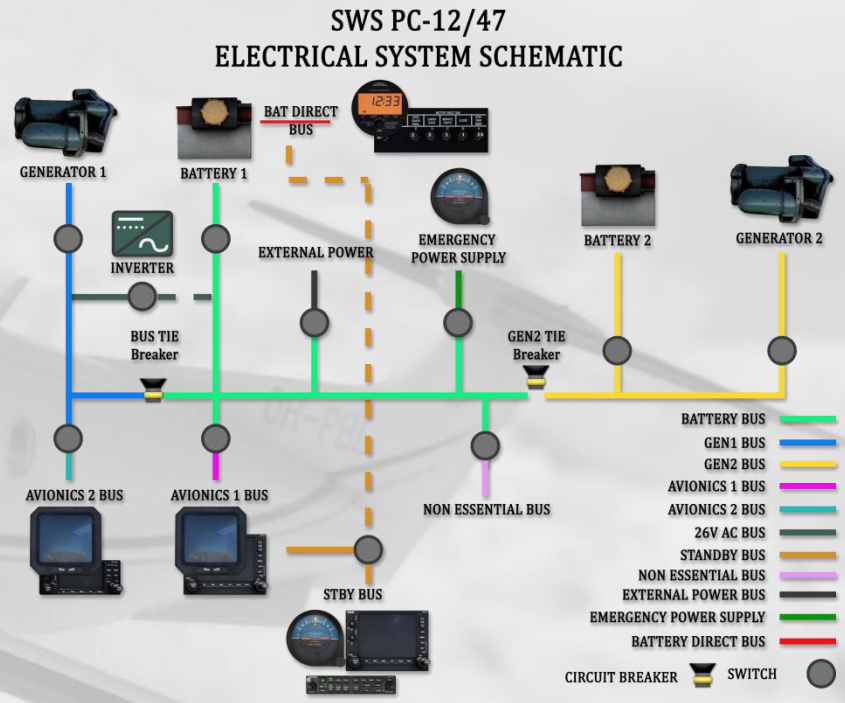
The **AVIONICS 1 BUS** is connected to the BATTERY BUS and the **AVIONICS 2** BUS is connected to the GEN1 BUS. Each bus is connected through relays, controlled by switches on the overhead panel.

The **NON ESSENTIAL BUS** is connected to the BATTERY BUS when the NON ESS switch on the overhead panel is set to AUTO, Generator 1 is on and the engine is running. If there is an engine or Generator 1 failure, an automatic load shedding device will disconnect the NON ESSENTIAL BUS from the BATTERY BUS.

The **STANDBY BUS** supplies power to the Overhead, Audio Panel, GPS #1, COM1, the standby attitude indicator and its light. When the switch labeled STBY BUS is positioned forward, AVIONICS BUS 1 will provide power to the STANDBY BUS. When the STBY BUS switch is moved to the ON position, the STANDBY BUS is powered directly from Battery 1.

The **EXTERNAL POWER BUS** connects directly to the BATTERY BUS bar and is used with an external power unit. ***This bus is currently not simulated.***

AC POWER is provided by a dual static inverter and is used for synchro references for the avionics systms. The No.1 inverter is powered from the BATTERY BUS; the No.2 inverter is powered from the GEN 1 BUS. When the inverter selector switch is set to GEN1, AC power is supplied from the No.1 inverter. When the switch is set to BATT, AC power is supplied from the No.2 inverter.



BUS TIE INTERLOCK

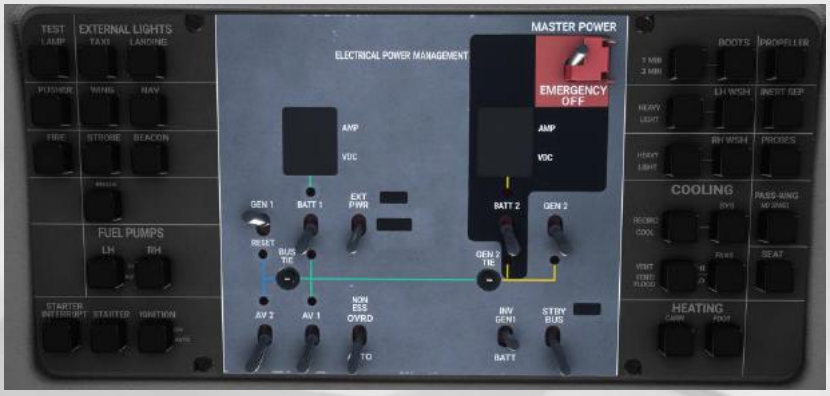
To permit both generators to charge the batteries and supply all electrical services, GEN1 is connected to the BATTERY BUS via the **BUS TIE** relay and GEN2 is connected to the BATTERY BUS via the **GEN2 TIE** relay.

The two relays have an automatic interlock. When the engine is running and both generators are on line, the BUS TIE closes and GEN2 TIE is open. GEN1 will supply the GEN1 and BATTERY busses and charges Battery 1. GEN2 powers the GEN2 BUS and charges Battery 2.

When both generators are offline (engine off or double generator failure), both the BUS TIE and GEN2 TIE will close, allowing the batteries or external power unit to supply all BUS bars.

If GEN1 stops supplying power to the main battery line (GEN1 failure or BUS TIE open), the GEN2 TIE will close, connecting GEN2 BUS and Battery 2 to the BATTERY BUS.

Both circuit breakers also are overcurrent protection devices. The BUS TIE will open automatically when the continuous current exceeds 220A and the GEN2 TIE when the current exceeds 145A.



MASTER POWER SWITCH

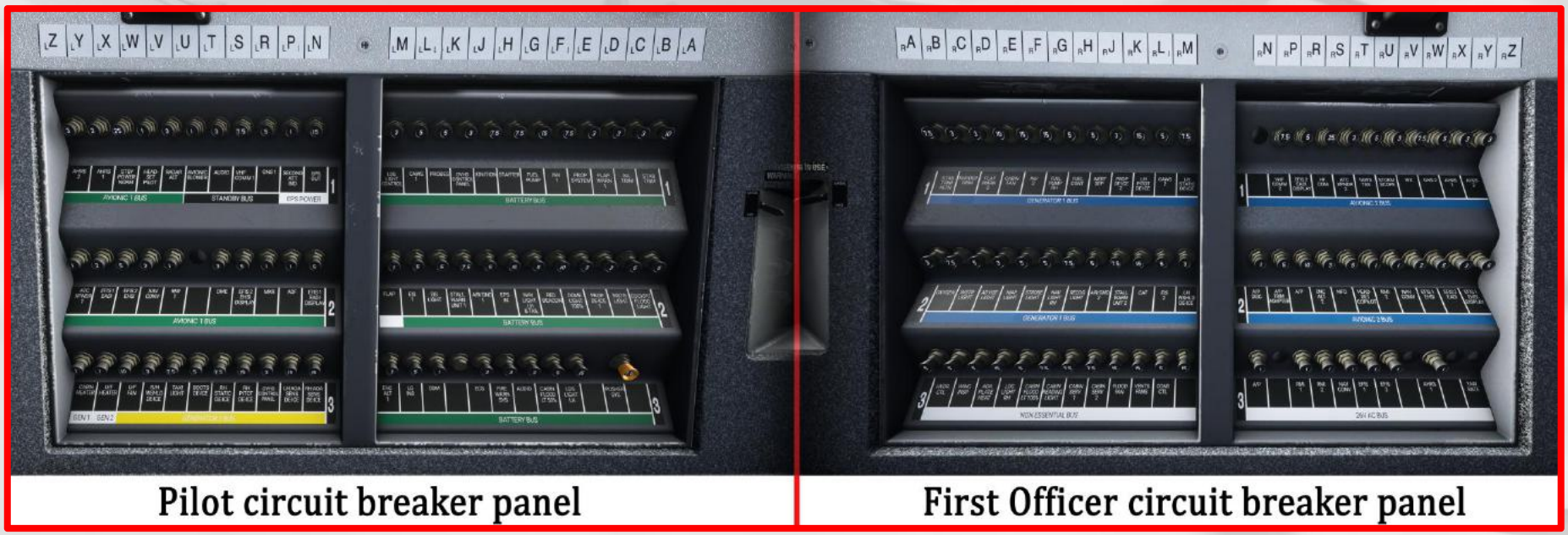
A master power switch protected by a red cover is located on the overhead panel. Moving the master power switch to the OFF position will remove all electrical power from the aircraft.

CIRCUIT BREAKER PANELS

The cockpit contains two circuit breaker panels, one on each side wall. Circuit breakers are labeled in columns from A to Z, using labels above each panel. Under each row of circuit breakers, there are differently coloured labels grouping the circuit breakers depending on the power bus they are tied to and above the coloured band is the name of the electrical circuit each breaker isolates.

On the pilot's side, the forward circuit breaker panel includes breakers for all systems that receive power from the BATTERY BUS bar. The rear panel includes circuit breakers for all systems that receive electrical power from the GEN2, AVIONICS 1, STANDBY and EPS BUS bars.

On the First Officer's side, the forward circuit breaker panel contains breakers of systems that are powered from the GEN1 and NON ESSENTIAL BUS bars. The rear panel includes circuit breakers for systems powered by the AVIONICS 2 and 26V AC BUS bars.



Pilot circuit breaker panel

First Officer circuit breaker panel

EIS INDICATORS

The EIS provides continuous monitoring of the Generator 1 and Generator 2 voltages for close to limit cautions, providing voltage and amperage indications.

In the event that a generator is turned on but the output is zero, the EIS indications for that generator will flash indicating a potential problem.

WARNINGS

The CAWS panel contains Caution and Warning annunciators pertaining to the electrical system.

ELECTRICAL SYSTEM CAWS MESSAGES		
Annunciator	Description	Voice callout
ESNTL BUS	Indicates voltage in GEN1, GEN2 or BATTERY BUS is below 22V.	Warning Essential Bus, Generator 1 Warning Essential Bus, Generator 2 Warning Essential Bus, Battery
AV BUS	AVIONICS BUS voltage below 22V.	Warning Avionic Bus
N ESNTL BUS	NON ESSENTIAL BUS voltage below 22V.	
BAT OFF	Battery is off line.	
GEN 1 OFF	GEN1 is offline.	
GEN 2 OFF	GEN2 is offline.	
BATTERY	Indicates battery current above 60A discharge or battery voltage above 29.6V. Applicable display will flash.	
BUS TIE	BUS TIE open.	
INVERTER	Inverter output below 20V	
BAT HOT	INOP on aircraft with lead-acid batteries	

5.2 CENTRAL ADVISORY AND WARNING SYSTEM (CAWS)

The Central Advisory and Warning System (CAWS) includes:

- The Central Advisory and Display Unit (CADU) panel.
- An Aural Warning System.
- A Caution pushbutton/annunciator on each pilot's side.
- A Warning pushbutton/annunciator on each pilot's side.
- The TEST LAMP pushbutton located in the overhead panel

A Central Advisory Computer Unit (CACU) monitors aircraft systems and passes information to the CADU. Both systems are powered by 28VDC through the 5A CAWS 1 circuit breaker on the BATTERY BUS and the CAWS 2 circuit breaker on the GEN1 BUS.

CADU

The CAWS panel will visually indicate faults, warnings, functions or conditions of selected systems by turning on annunciators. RED annunciations will make the WARNING annunciator/pushbuttons illuminate. AMBER annunciations will make the CAUTION annunciator/pushbuttons illuminate. Pushing the WARNING or CAUTION annunciator/pushbutton will extinguish its annunciation, but the CADU indication will remain on for as long as the situation persists.

CAUTION and WARNING annunciator/pushbuttons

TEST LAMP PUSHBUTTON

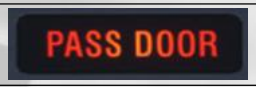
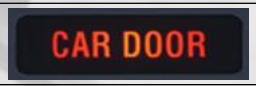
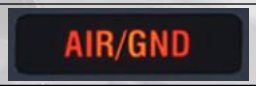
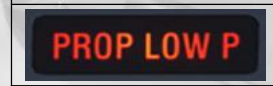
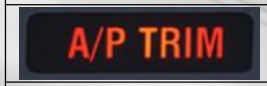
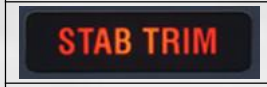
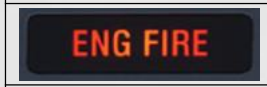
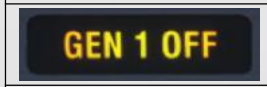
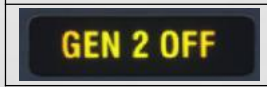
The TEST LAMP push button is at the top left corner and is used to test the CAWS annunciators. Pressing the TEST LAMP push button on the ground will illuminate the CADU, WARNING and CAUTION lights, overhead lights, flap indicator warning light and gear lights. Pressing the TEST LAMP button in the air will only illuminate the CADU annunciators.

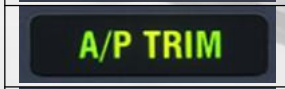
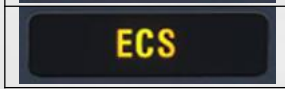
Central Advisory And Warning System (CAWS)

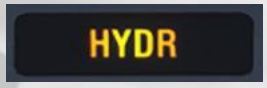
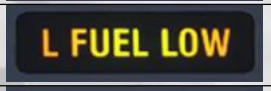
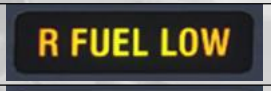
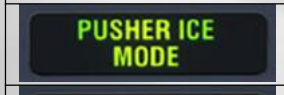
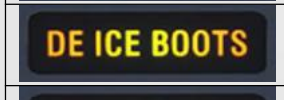
VOICE CALLOUTS

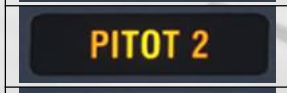
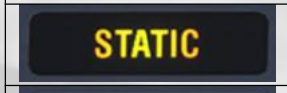
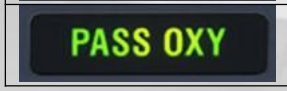
When the aircraft is on the ground and not fully powered, the voice callouts are disabled to reduce nuissance alerts. Aural warnings resume 60 seconds after the engine start cycle has reached 50% Ng. Voice callouts are included for for all Warnings (red annunciations) as well as the event of a flap assymetry.

Additionally, it includes callouts for aircraft of flap overspeed, stall, gear-up approach to landing, decision height, engine warnings, EGPWS and TAWS.

ANNUNCIATION	VOICE CALLOUT	DESCRIPTION
	Warning Passenger Door	Indicates passenger door and/or handle unlocked.
	Warning Cargo Door	Indicates cargo door and/or handle unlocked.
	Warning Cabin Pressure	Indicates cabin altitude above 10,700ft or max cabin pressure differential exceeded.
	Warning Air Ground	Indicates disparity between left and right AIR/GROUND switch.
	Warning Prop Pitch	Indicates propeller pitch <6° while in-flight.
	Warning Autopilot Trim	Indicates Autopilot and/or autotrim failure.
	Warning Essential Bus Generator 1/2/Battery	Indicates Battery, Gen1 or Gen2 bus voltage <22V DC.
	Warning Avionics Bus	Indicates Avionics bus bar voltage <22V DC.
	Warning Trim	Indicates stabiliser trim is unsafe for take-off.
	Warning Oil	Indicates low engine oil quantity (engine off).
	Fire Fire Fire	Indicates engine overtemperature and/or possible fire.
		Indicates generator 1 is off.
		Indicates generator 2 is off.

ANNUNCIATION	VOICE CALLOUT	DESCRIPTION
		Indicates battery over-voltage or over-current condition.
		Indicates that a battery is off.
		**INOP** in SWS PC-12.
		Indicates that the BUS TIE is open.
		Indicates Inverter output <20V AC.
		Indicates non-essential bus voltage <22V DC.
		Indicates fire detection system malfunction
		Indicates metal particles inside engine oil system.
		Indicates low engine quantity (engine running)
		Indicates autopilot pitch and aileron servos disengaged.
		Indicates autopilot trim is operating.
		Indicates a flap system failure.
		Indicates Environmental Control System malfunction

ANNUNCIATION	VOICE CALLOUT	DESCRIPTION
		In flight: indicates low hydraulic pressure On ground: indicates hydraulic pump cylced too often during flight and requires maintenance.
		Indicates fuel system pressure is less than 2psi. Extinguishes when the pressure is greater than 3.5psi.
		Indicates that fuel quantiy in the left tank is 20 US Gallons (75L) or less.
		Indicates that fuel quantiy in the right tank is 20 US Gallons (75L) or less.
		Indicates that the left fuel boost pump is in operation.
		Indicates that the right fuel boost pump is in operation.
		Indicates that the stick pusher computer operates in ice mode.
		Indicates that the pusher system is inoperative due to malfunction, pilot decoupling it or self-test not completed.
		Indicates a CAWS internal failure
		Indicates that the de-ice boots are operating and the pressure sequence is correct
		Indicates de-ice boot system malfunction
		Indicates windshield heating system malfunction
		Indicates prop deice system malfunction

ANNUNCIATION	VOICE CALLOUT	DESCRIPTION
		Indicates inertial separator door operation failure
		Indicates AoA deice malfunctions or DE ICING PROBES switch set to off (3 minute delay).
		Indicates a pilot pitot head heater failure
		Indicates a copilot pitot head heater failure
		Indicates a static port heater failure
		Indicates adequate pressure of oxygen to the passenger masks

5.3 FUEL SYSTEM

Aircraft fuel is stored in two wing fuel tanks. Fuel is transferred from the tanks to:

- Maintenance and firewall shutoff valves
- A fuel filter
- An air separator
- A low pressure engine-driven pump
- A high pressure engine-driven pump
- The fuel control unit


Fuel system

Fuel is transferred to the engine using the engine driven pumps. The aircraft also contains two electrically driven boost pumps, one in each wing tank. The boost pumps are used to balance the fuel across the two wing tanks, or in the event of low fuel pressure.Fuel is loaded through one overwing fuel port on each wing. Each wing tank has a usable capacity of approximately 201 gallons (761L, 1347lbs).

EIS FUEL INDICATIONS

The EIS contains fuel quantity information as analogue and digital readouts. During normal operation, the FUEL QTY window indicates fuel quantity in real time on an analogue scale. The scales are marked in quarters from empty (0) to full (4) and the white segments indicate the quantity left in each tank.

The FUEL window provides a digital readout of the total fuel quantity in either pounds (LB) or kilograms (KG).

WARNING

Fuel quantity is the result of subtracting the engine fuel flow from the the last FUEL RESET performed. If the aircraft has been refuelled, the indicated fuel quantity will not correspond to the real fuel contained in the tanks and the FUEL RESET button must be pressed.

The **FUEL RESET** button is located at the bottom of the EIS. When pressed, the fuel quantity in both tanks is calculated and updated in the FUEL window.

BOOST PUMPS

One electrically driven boost pumps is located in each wing. Each boost pump is controlled through an overhead push button which changes the fuel pump operation from AUTO to ON.

When set to AUTO the boost pumps will activate automatically when:

- A fuel imbalance of more than 10.5 gallons is detected
- Fuel pressure is low

Setting the boost pump to ON will force it to operate.

FIREWALL SHUTOFF VALVE

The Firewall Shutoff Valve revents fuel flow to the engine during an emergency and can be closed by pulling the red paddle lever labelled “FUEL EMERG SHUT OFF” on the aft side of the pedestal.

Firewall shutoff lever

5.4 FLIGHT CONTROLS

The PC-12 uses a conventional set of flight controls using push-pull rods and carbon steel cables. An aileron-rudder interconnect system improves lateral stability and coordination during turn manouevers.

Flight controls

The trim systems for ailerons, elevator and rudder are electrically powered and can be disconnected in a runaway condition. A trim indicator showing the current trim setting for each surface is located in the forward area of the pedestal.

AILERON-RUDDER INTERCONNECT

The PC-12 aileron surfaces are linked using a spring package, forming an aileron-rudder interconnect (ARI) system to assist in coordinating turns and counter adverse yaw from the ailerons. Similarly, rudder pedal input will also move the aileron control system in the direction of turn. Indicative ARI values for maximum deflection of a surface are shown on the following table.

Aileron-Rudder Interconnect gain of rudder for maximum aileron input.	
AIRSPEED	**ARI OUTPUT ON RUDDER**
25	100%
50	63%
100	43%
150	30%
200	21%
230	17%

AILERONS

The ailerons are connected to the cockpit yokes by control cables in the fuselage and push-pull rods in the wings. The left aileron incorporates an electrically operated trim tab. The left aileron trim tab also acts, together with the geared tab installed on the right aileron, as balance tabs when ailerons are moved.

ELEVATOR

The elevator is a two-piece unit attached to the horizontal stabiliser and connected to the cockpit control wheel by carbon steel control cables. Pitch trim is provided by an electrically controlled actuator connected to the movable horizontal stabiliser. A secondary trim motor is installed in the same actuator, is controlled by the autopilot and can also be used as a backup trim system by the pilot.

The leading edge of the stabiliser moves down for nose trim up and up for nose down. At the root of the left horizontal stabiliser leading edge is a trim range indicator with markings showing full travel in either direction and a take-off trim range.

In the event of uncommanded trim operation, all trim operation can be stopped by pressing the TRIM INTR switch located forward of the engine control quadrant on the pedestal.

RUDDER

The rudder is a single piece unit attached to the vertical stabiliser and is connected to the cockpit controls by carbon steel control cables. Both pilot and copilot pedals are adjustable by a crank located between each set of rudder pedals. An rudder trim tab is electrically operated from the cockpit.

FLAPS

The PC-12 is equipped with electrically actuated Fowler type flaps. Each wing has a single piece flap, supported by three flap arms. Flaps are set using a selector handle on the pedestal and may be set in one of the four preset positions: 0°, 15°, 30°, 40°. A flap position indicator is located at the top left of the instrument panel.

A failure detection system detects when a flaps failure or asymmetry state is present. In such an event, the CADU flaps caution will come on.

In the event of flap overspeed, an "A/S" annunciator will illuminate on the flap position indicator.

Flap system operation may be stopped at any time by setting the guarded INTERRUPT FLAP switch on the center pedestal to INTR. If the switch is moved back to the NORM position normal operation will not resume.

HINT
On the SWS PC-12, flap operation can be restored if the INTERRUPT FLAP switch is moved to NORM while parked and cold.

Flap limiting speeds	
Flap setting	**V_{FE} (knots indicated)**
0°	Not applicable
15°	164
30°	130
40°	130

TRIM

A triple trim indicator is located at the forward end of the center pedestal, containing indications for aileron, rudder and elevator trim.

Take-off trim setting for each trim is denoted by green markings on the indicator. Each indicator is equipped with an AUTOTRIM indicator which illuminates when the trim is operated by the autopilot, along with the green A/P TRIM advisory on the CAWS panel.

When the AIR/GROUND switch is in the ground position, a 60-second timer initiates. Upon expiry of the timer, the red STAB TRIM warning will illuminate on the CADU accompanied by a "Warning Trim" callout, indicating that stabilizer trim is not in the take-off position. The warning can be extinguished by trimming the elevator within the take-off trim limits.

5.5 LANDING GEAR


Landing gear

The landing gear is a conventional tricycle configuration that is extended and retracted using hydraulic pressure produced by an electrically powered hydraulic pump. Landing gear extension and retraction is the only function of the hydraulic system and is completely automatic upon pilot selection.

The landing gear is operated by a two position lever on the right side of the pilot's knee panel. The landing gear is locked to the down position when on the ground.

POSITION INDICATORS

Position and warning indications consist of three indicator lights (green/red) and an aural tone with a silencer button. Green lights will illuminate when the landing gear is down and locked. The red warning lights will illuminate when the gear is in transit, not all the way retracted, not down and locked or when the landing gear is up with flaps extended beyond the 15° position. When the gear is fully retracted, all indicator lights are extinguished.

The indicator lights can be tested on the ground by pressing the LAMP TEST switch in the overhead panel. When the LAMP TEST button is pressed, all red and green indicators will illuminate.

NOSE WHEEL STEERING

Nose wheel steering is achieved mechanically by using the rudder pedals and by differential braking. Using the rudder pedals will allow the nose gear to turn ±12 degrees from center, while differential braking will allow deflection up to ±60 degrees from center.

5.6 CABIN PRESSURISATION CONTROL SYSTEM

The Cabin Pressurisation Control System (CPCS) controls the cabin by regulating the rate of exhaust of the outflow air that is provided for pressurisation and ventilation of the cabin. CPCS operation is entirely pneumatic except when switching between ground and flight operating modes and during manual flight depressurisation.


Cabin Pressurisation Control System (CPCS)

The CPCS will maintain the selected cabin altitude up to a maximum pressure differential of 5.75psi, equivalent to 10,000ft cabin altitude at a 30,000ft cruising altitude.

CPCS CONTROL PANEL

The CPCS control panel is located on the first officer's knee panel.

The ECS switch is located at the top left corner and allows the crew to select the CPCS mode of operation. Setting the rocker switch to OFF removes power from the CPCS. AUTO will provide electrical power to the system.

MANUAL will allow the pilot to manually control the cabin pressurisation rate by controlling the solenoid valve using the controller at the top right corner.

At the bottom right is the cabin altitude selector. When ECS is operating in AUTO mode, the cabin altitude selector allows the pilot to set the target cabin altitude through a rotary knob. The outer scale denotes cabin altitude and the inner scale cruise altitude. At the bottom left is the rate of climb knob which can be set from 100fpm (10 o' clock position) to 2000fpm (5 o' clock position). The 12 o'clock position is an altitude change rate of 500fom.

In the center area of the CPCS control panel are located two instruments. The top instrument is a dual cabin altitude-pressure differential indicator. The outer scale denotes cabin altitude in 1000s of feet and the inner scale denotes the pressure differential between the cabin and exterior in psi. The bottom instrument indicates cabin rate of climb, in thousands of feet per minute.

A guarded switch labelled CABIN PRESS allows the pilot to manually depressurise the cabin. An alternate way to depressurise the cabin is to use the Bleed Air Firewall Shutoff valve located at the aft end of the pedestal.

CPCS AUTO MODE

ECS is normally operated in AUTO mode using the ECS switch. Before take-off the pilot should set the cruise altitude plus 500ft into the cabin altitude selector and the pressurisation rate using the rate knob. Upon aircraft lift-off, the CPCS will begin pressurising the cabin at the commanded rate.

At the top of descent, the pilot should set the CPCS to the airfield elevation plus 500ft and the CPCS will begin depressurising the cabin at the rate selected with the rate knob.

It is possible to exceed the normal operating cabin pressure differential because of system malfunction or pilot error and operate between 5.75 and 6.5psid, denoted by a yellow band and a red line at 6.5psid. If cabin altitude exceeds 10,500 ± 200 feet, or the cabin pressure differential is greater than 6.5psid, the CAB PRESS warning will illuminate on the CADU, followed by the "Warning Cabin Pressure" voice callout.

CPCS MANUAL MODE

CPCS manual can be used by setting the ECS switch to MAN and using the MANUAL control knob situated at the top right corner of the CPCS control panel. By rotating the knob clockwise the pilot increases the outflow air, thereby increasing cabin altitude. When operating CPCS in manual mode the pilot should exercise caution when adjusting the climb rate to avoid rapid changes to cabin pressure.

5.7 STALL PROTECTION SYSTEM

The PC-12 utilises a stick shaker/pusher system, which prevents the aircraft from inadvertently entering a stall condition at low speed. When the aircraft is off the ground, two stall warning computers will individually provide a stall warning tone and stick shaker when the aircraft approaches stall angle of attack.

The stall protection system will calculate the stall speeds using data from:

- Stall warning computers
- Angle of attack
- Weight on wheels
- Deicing system
- Flap position
- Power Control Lever
- Engine torque
- Self-test

Stall speeds will vary with load factor, flap setting and Power Control Lever position.

STICK PUSHER

The stick pusher will protect the aircraft from aerodynamic stall by pushing the nose down to reduce angle of attack and is designed to engage approximately 5kts above the aerodynamic stall speed. In order for the stick pusher to operate, both stall warning computers must be operating and the preflight pusher test must be completed.

When operating in PUSHER ICE MODE, the stall AoA is increased to compensate for the reduced lift caused by icing conditions. ICE MODE is engaged when the propeller de-ice is turned on and the inertial separator is in the OPEN position.

STICK PUSHER TEST

The stall warning test can be performed in the air or on the ground. When activated in the air, the pusher test portion of the test sequence is not performed and only the stick shaker is tested.

For a ground test of the stick pusher the engine must be running and generators must be on. To perform the pusher test on the ground:

- Set flaps to 15°
- Press the PUSHER TEST switch on the overhead control panel
- Move the power control lever forward, until the stick shaker engages, then move it back to idle.
- The stick shaker will activate for 2 seconds
- A 1 second pause follows
- The stick shaker and pusher will activate. PUSHER ICE MODE and PUSHER annunciations will illuminate on the CADU
- Hold the PUSHER INTR switch on the yoke. The PUSHER annunciation will extinguish and you should be able to move the yoke freely.

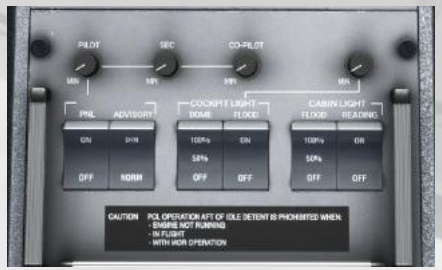
- After keeping PUSHER INTR pressed for about 5 seconds, the PUSHER annunciation will come on again. Release the PUSHER INTR switch.
- Release the overhead PUSHER TEST switch
- Test completed, repeat on other pilot side.

The stick pusher will be inoperative if not tested after starting the aircraft and it is prohibited to take-off without performing the pusher test successfully. Following a successful test, the stick pusher is inhibited for 5 seconds after take-off to avoid inadvertent activation.

5.8 INTERNAL LIGHTING

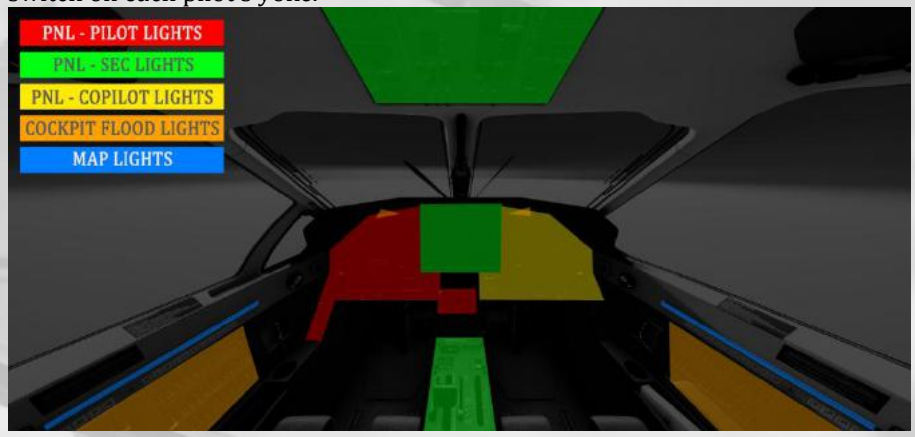
Internal lighting illuminates the cockpit, flight instruments and passenger cabin.

The internal lighting switches are locaded on the back of the pedestal panel and allow control of the following lights:



- **PNL:** Turns on the instrument panel lighting. Three rheostats allow individual brightness control of the PILOT, SEC and CO-PILOT lighting.
- **ADVISORY:** When set to NORM the CADU warning/advisory lights will be at maximum brightness. Setting them to DIM will illuminate the warning/advisory lights to 50% brightness and is more suitable for night flying.
- **DOME:** Controls the cockpit dome lights. 50% will turn on the left dome light, 100% will turn on both left and right.
- **FLOOD:** Controls the orange flood lights situated under the glareshield panel and over the circuit breaker panels. A rheostat is provided to control the brightness.
- **Cabin FLOOD lights:** Controls the cabin flood lighting. Available options are OFF, 50% and 100%.
- **Cabin READING lights:** Turns the cabin reading lights on or off. Reading light intensity can be controlled by individual dimmer switches located on each seat, if installed.

Two map lights installed on flexible tubes are installed over each circuit breaker panel. The map lights can be pulled by clicking the tip and dragging it with the mouse. Scrolling the mouse wheel will rotate the tip of the light. Brightness of the map lights can be controlled via a rheostat installed on each light's base. The map light can be turned on and off using the MAP LIGHT switch on each pilot's yoke.



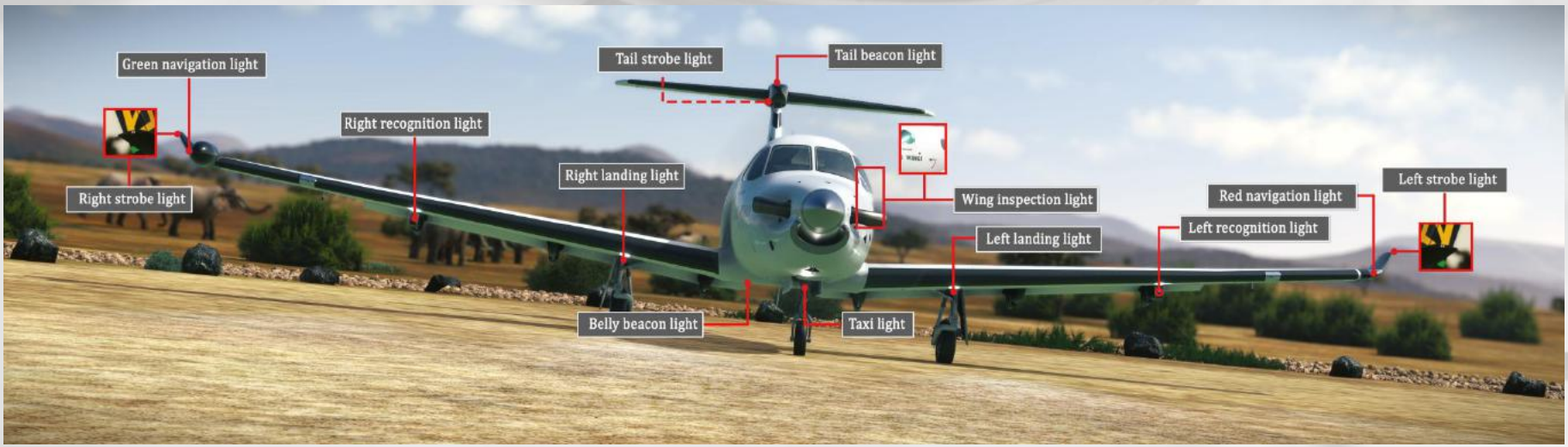
5.9 EXTERNAL LIGHTING

External lighting is controlled from the external lights section on the overhead panel. The position of the exterior lights is illustrated in the following image.

Lighting - External lights

The SWS PC-12 comes equipped with the following lights:

- **Navigation lights:** one red light on the leading edge of the left wingtip and one green light on the right side of the WXR RADAR pod.
- **Strobe lights:** Three lights, one light on each wingtip and one on the aft tip of the horizontal stabilizer fairing.
- **Beacon lights:** Two beacon lights; one beacon light at the belly of the aircraft, under the right wing root; one beacon light at the top of the horizontal stabilizer fairing.
- **Taxi light:** One taxi light on the nose gear
- **Landing lights:** Two lights, one on each main landing gear strut
- **Recognition lights:** One recognition light under each wing, in the leading edge of the outboard fairing. The recognition lights can operate in steady or pulse mode, which can be selected using the RECOG switch on the pilot's knee panel.



6. AVIONICS

6.1 INTRODUCTION

This section will familiarise you with the avionics operation of the SWS PC-12 and their features. As the aircraft evolves, the section will be updated to include new features and functions added to the systems.

The following systems will be covered:

- EFIS50
- AM-250 altimeter
- KMC321 Autopilot and KAS927B Altitude/Vertical Speed preselector
- Engine Instrument System
- Thommen DC20 chronograph

The GNS530/430, GTN750/650 GPS units and GTX330 transponder will not be covered by this manual.

The SWS PC-12 systems were modelled as closely as possible to the real world aircraft, which will require users to break some old habits. There are also certain MSFS limitations that will be covered.

NAVIGATION SYSTEMS OVERVIEW

The SWS PC-12 navigation systems comprise of:

- Two EFIS50, one on each pilot panel
- Two Attitude-Heading Reference Systems (AHRS)
- Two GPS units
- A KMC321 Autopilot and KAS927B Altitude Selector

Each EFIS50 system is connected to an AHRS; the pilot EFIS is connected to AHRS1 and the first officer EFIS to AHRS2. Each crew member can change its AHRS source by pushing the AHRS pushbutton located next to their EHSI.

The pilots can switch between different sources of navigation using the CP467 control panel NAV button, which will allow selection of VOR/LOC, GPS or ADF. The selected navigation mode will be shown on the left side of the EHSI and the GPS units. Appropriate information will be relaid to the EADI and EHSI screens.

NAVIGATION MODE SELECTION

NOTE

Switching navigation source using the CDI option on the GPS unit has been blocked as it is incorrect. The navigation source is tied to the AHRS and not the GPS units.

The pilot AHRS selection is also used to determine which system will provide reference data to the autopilot. If AHRS1 is selected on the pilot's side, that unit will be used for autopilot guidance. The AHRS selector on the first officer's side is only used to switch navigation modes on the EFIS50 and has no effect on the autopilot.

6.2 EFIS50

The EFIS50 systems on the PC-12 comprises of the following components:

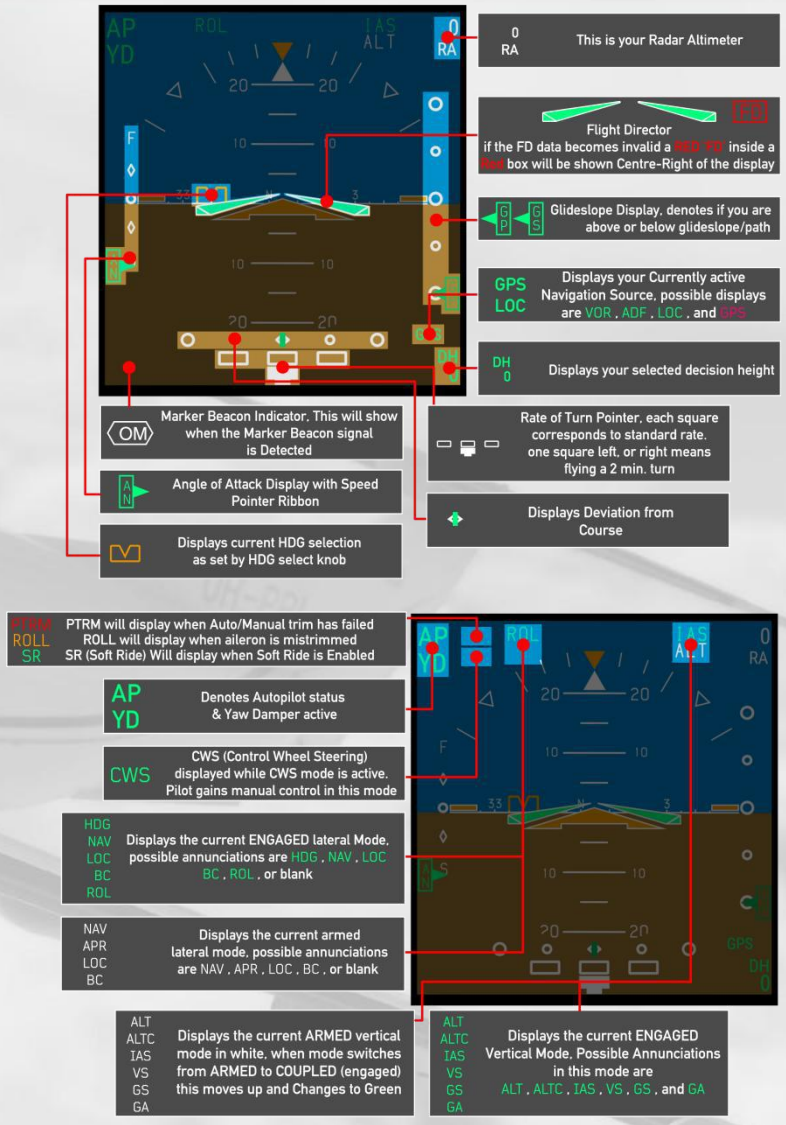
- Electronic Attitude Direction Indicator (EADI)
- Electronic Horizontal Situation Indicator (EHSI)
- CP467 panel
- Weather RADAR control panel (one unit only)

Avionics - EFIS components

EADI SYMBOLOGY

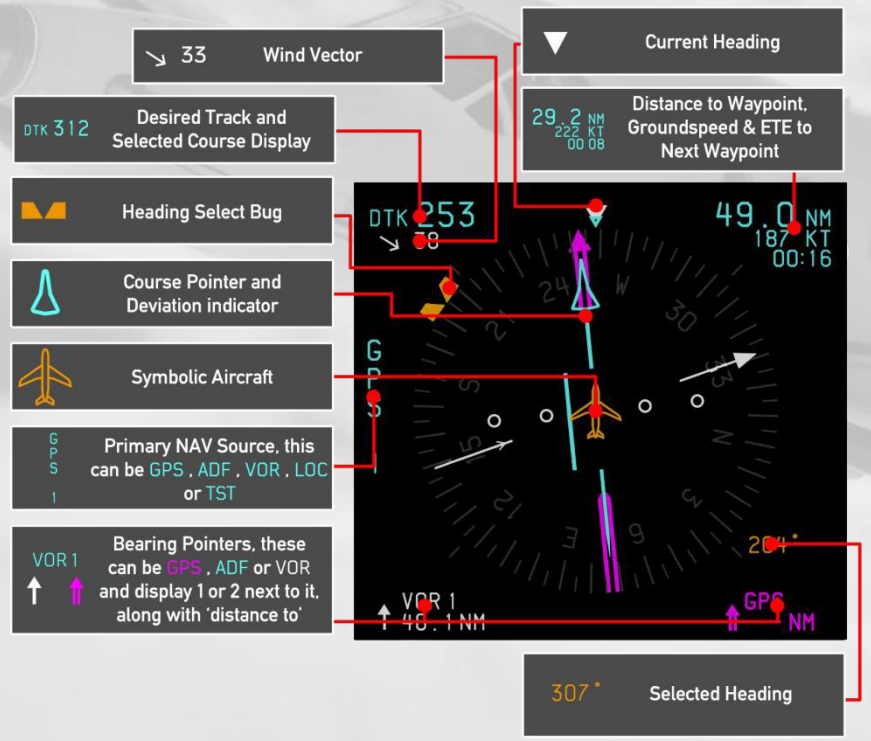
Two EADI screens are available, one installed on each pilot's side. The ADI displays aircraft flight attitude from roll, pitch, yaw and heading data provided by the AHRS. Autopilot mode annunciations are presented at the top of the instrument. Angle of attack information is presented on the left side of the EADI, with "on speed" being 1.3 times the stall speed. An inclinometer installed at the bottom of the EADI presents aircraft slip and skid.

The following images illustrate the various symbols and annunciations visible on the EADI for easier reference.



EHSI SYMBOLOGY

The EHSI operates in either a 360° compass mode or 120° arc mode. The display type is selected using the CP467 control panel. The EHSI symbology can be seen below.



AHRS CONTROL PANEL

The AHRS control panel is situated on the right side of the pilot's knee panel and controls the mode in which the heading indicator operates.

Setting the mode switch to SLAVE will slave the heading indicator to the magnetic heading. This is useful for flying at lower latitudes where the magnetic deviation is smaller. Selecting DG will slave the heading indicator to the directional gyroscope. In this mode the pilot can rotate the heading indicator clockwise (CW) or counter-clockwise (CCW) using the corresponding switch.

Some aircraft are equipped with a second AHRS, in which case two sets of switches will be available on the knee panel.

CP467 CONTROL PANEL

There are two CP467 panels in the cockpit, one located in the forward end of the center pedestal for the pilot and one for the first officer, to the right of the yoke base.

The CP467 panel is used to control EFIS functions and switch between different navigational sources. The following controls can be seen:

- **Decision Height knob:** labelled "DH". The knob can be pulled by clicking on it, which allows the pilot to change the Decision Height in 1ft increments up to 500ft and 10ft increments up to 2500ft. When the aircraft descends below the Decision Height an aural tone will sound.
- **Course knob:** Marked with a green arrow, the courseknob allows the pilot to set the OBS course for the selected navigation source. The OBS course can be set to the current aircraft heading by pulling the knob.
- **Course knob:** Marked with a green arrow, the courseknob allows the pilot to set the OBS course for the selected navigation source. The OBS course can be set to the current aircraft heading by pulling the knob.
- **HSI pushbutton:** Cycles between HSI compass rose and HSI with NAV map*
- **ARC pushbutton:** Cycles between ARC mode and ARC NAV map*
- **NAV pushbutton:** Cycles the navigation source and EHSI between VOR/LOC, GPS and ADF modes. The NAV pushbutton also selects the navigation data source.
- **RNG up/down pushbuttons:** Increases or decreases the range displayed while in NAV map mode.
- **1-2 pushbutton:** Cycles between navigation source 1 and 2. Due to MSFS limitations this is only functional when in VOR/LOC mode.
- **Bearing pointer pushbuttons:** Bearing pointer 1 is represented by an arrow with a single line and bearing pointer 2 by an arrow with a double line. Pushing the bearing pointer buttons will cycle the respective bearing pointer to show towards the currently tuned VOR/LOC receiver, next GPS waypoint, ADF beacon or turn it off.

- **Brightness knobs:** Two brightness knobs are stacked on top of each other at the top right corner. The bottom knob controls brightness of the EADI and the top knob brightness of the EHSI.
- **Heading select knob:** Used to set the autopilot heading. The Selector knob can be set to the current aircraft heading by pulling the knob.

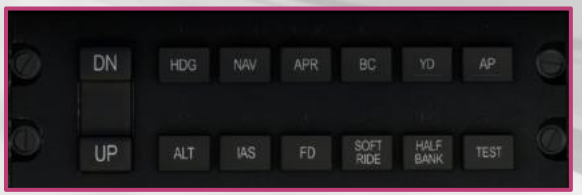
6.3 AUTOPILOT

Avionics - Autopilot components

The PC-12 autopilot consists of the KMC321 Mode Controller located at the top center panel and the KAS927B altitude/vertical speed preselector.

The autopilot has pitch, roll and yaw axis controls. An automatic electric pitch trim system provides pitch autotrim during autoflight operation. A rudder trim relief function provides directional trim durin yaw damper and autopilot operation. When autotrim is operating, a light will illuminate over the respective trim indicator. No aileron autotrim function is available.

KMC321 MODE CONTROLLER



The KMC321 Mode controller is located at the top of the center panel and provides the following functions:

- **HDG:** Engages and disengages the HEADING SELECT mode. **Course knob:** Marked with a green arrow, the courseknob allows the pilot to set the OBS course for the selected navigation source. The OBS course can be set to the current aircraft heading by pulling the knob.
- **NAV:** Engages and disengages the NAVIGATION mode. When active, the autopilot will track the navigation receiver selected on the EHSI primary navigation source. Glideslope coupling is inhibited in NAV mode.
- **APR:** Engages and disengages the APPROACH mode, which will capture and track the selected EHSI primary navigation source with approach accuracy. Glideslope coupling is allowed in the APR Capture or Track mode. BC (Backcourse) is automatically engaged and disengaged.
- **YD:** Engages and disengages the Yaw Damper and rudder relief system. Yaw Damper can be toggled with Autopilot disengaged.
- **AP:** Engages or disengages the Autopilot. Yaw Damper and Flight Director modes are automatically engaged with the Autopilot turned on. Yaw Damper will remain engaged when the Autopilot is turned off.
- **DN/UP:** Controls the vertical axis of the autopilot. In IAS mode it will adjust the target airspeed up or down, thereby changing the aircraft's pitch until the target airspeed is achieved. In VS mode, the vertical speed target is adjusted in increments of 100fpm.
- **ALT:** Engages or disengages Altitude Hold mode. When engaged, it will command the autopilot to hold the altitude existing at the moment of selection.
- **IAS:** Engages or disengages Indicated Airspeed Hold mode. This mode commands the autopilot to maintain the airspeed indicated at the moment of activation, varying aircraft pitch to achieve this.
- **FD:** Engages the Flight Director in pitch Attitude Hold mode and Wings Level mode. Pressing FD when the Flight Director is engaged will disengage all Flight Director modes if the autopilot is not engaged.
- **SOFT RIDE:** INOP due to MSFS limitations
- **HALF BANK:** Engages Half Bank mode. The autopilot's maximum commanded bank angle is reduced to half the normal value to increase passenger comfort.
- **TEST:** INOP

KAS927 ALTITUDE/VERTICAL SPEED PRESELECTOR

The KAS927 altitude/vertical speed preselector is located at the top of the pilot's panel. Two knobs on the right side of the panel allow the pilot to preselect a target altitude or vertical speed, depending on the mode the KAS927 is in.

In Altitude Preselect mode, the pilot is able to select a target altitude in increments of 1000ft with the outer knob, or 100ft with the inner knob. Pressing the ALT ARM button will feed the target altitude to the autopilot, which will go into altitude hold mode when that altitude is reached. When the VS ENG button is pressed while in Altitude Preselect mode, the autopilot wil try to maintain the aircraft's vertical speed at the moment of engagement, rounded to the nearest 100ft.

To get into Vertical Speed preselect mode, the pilot needs to pull out the inner knob by clicking it. In this mode, target vertical speed can be set in steps of 1000ft using the outer knob, or 100ft using the inner knob. Vertical speed is displayed in FT/MIN. Two arrows on the left side of the display will indicate if the vertical speed is positive (UP) or negative (DOWN). Pressing VS ENG while in this mode will feed the selected vertical speed to the autopilot and arm the altitude to the value currently stored in Altitude Preselect mode.

The KAS927 should be set back to Altitude Preselect mode once the desired vertical speed has been set and engaged. If the pilot remains in Vertical Speed preselect mode for 60 seconds or more the screen will start blinking to remind the pilot to switch back to Altitude Preselect.

The KAS927 altitude/vertical speed preselector also contains the following annunciations:

- **VS:** will illuminate on the top leftt of the display when the VS ENG button is pressed and Vertical Speed hold mode is engaged. While VS is engaged, the pilot can change the vertical speed of the aircraft in Vertical Speed preselect mode by rotating the knobs.
- **ARM:** will illuminate on the bottom left of the display when the ALT ARM button is pressed and the autopilot is active. While Altitude Arm is active, the pilot can change the target altitude in Altitude Preselect mode by using the knobs.
- **CAPT:** Illuminates when the KAS297 has switched from an active pitch mode to Altitude Capture mode. The Altitude Capture mode occurs prior to the flight director engaging Altitude Hold mode and the point at which it happens varies with vertical speed.
- **ALERT:** The alert annunciation appears when the aircraft is 1000ft prior to the selected altitude and extinguishes 200ft prior to the selected altitude. The ALERT light on the AM-250 altimeter and an aural tone will also accompany the annunciation.

NOTE

The ENG and ARM buttons require the Autopilot to be on due to MSFS limitations.

6.4 AM-250 ALTIMETER

Two AM-250 altimeters are installed in the cockpit, one for each pilot. An analogue needle indicates barometric altitude in 100s of feet. On the upper half of the altimeter dial, a digital readout indicates barometric altitude from -3000 to +60,000ft, in increments of 10 feet. When the aircraft is below 10,000ft two boxes appear on the left side of the display.

Two screens at the bottom of the dial show the currently selected barometric pressure in hPa and inches of Mercury.

An "ALERT" light is located at the 3 o' clock position of the altimeter. The light is synchronised with the "ALERT" annunciation on the KAS927B altitude/vertical speed preselector.

At the bottom right corner is the Kohlsman knob, allowing the pilot to set the reference barometric pressure. At the bottom left is a pushbutton labelled "STD". When pushed, the reference pressure is reset to 1013hPA/29.92in Hg.

An altimeter reference bug can be moved around the perimeter of the dial by scrolling over the glass on the instrument.

6.5 DC20 CHRONOGRAPH

The DC20 Chronograph is situated on the left side of the pilot's knee panel. It provides four special functions:

- **Local Time (LT)**: 12 or 24h format. It can differ with GMT only by hours.
- **Greenwich Mean Time (GMT)**: 24h format.
- **Elapsed Time (ET)**: starts in min:sec, then ours:min, up to 99:59h
- **Timer (TR)**: Settable up to 59 minutes and 59 seconds, counts down to zero, then counts up.

The clock accuracy is within ±1 second/day, which is simulated in the SWS PC-12. The chronometer is operated through the knob under the display. Rotating the knob allows the pilot to switch through the different modes. Pressing the knob while in a mode allows the performing of the following functions:

Function	Press	Press (held)	Left rotation	Right rotation
LT	Set time	Change 12/24h format (10 sec. press)	Change mode/ Set hour (in set time mode)	Nothing
GMT	Set time/ Enter	Test (10 sec. press)	Change mode/ Set hour (in set time mode)	Change mode/ Set minute (in set time mode)
ET	Start/ Stop	Reset (>1 sec. press when stopped)	Change mode	Change mode
TR	Set time/ Enter/ Start/ Stop and set time/ Enter	Reset (>1 sec. press when entered)	Change mode/ Set minute (in set time mode)	Change mode/ Set second (in set time mode)

6.6 ENGINE INSTRUMENT SYSTEM

The Engine Instrument System (EIS) is situated in the middle of the cockpit panel. It is a computer controlled system that displays engine and other system information. The system is powered by the battery and GEN1 busses through the EIS1 and 2 circuit breakers.

Avionics - Engine Instrument System

EIS SCREEN INDICATIONS

The EIS screen indications are organised in a 3x3 layout and occupy most of the face of the instrument. From left to right:

- **Row 1:** Each instrument contains a circular section providing a visual indication. At the centre is a digital readout providing the exact indication.
  - **Torque indicator*:** indicates engine torque from 0 to 70psi.
  - **ITT indicator*:** indicates engine ITT from 400 to 1200°C.
  - **Ng indicator*:** indicates engine Ng from 0 to 110%.
- **Row 2:**
  - **Np, OAT/ITT and Endurance/Torque**: The first cell indicates propeller RPM (Np). The second cell will indicate OAT in normal mode. If the MENU button is pressed, it will change to ITT. The bottom cell indicates endurance in hours and minutes based on the fuel quantity available and current fuel flow. If menu is pressed, the bottom cell changes to indicate engine torque in PSI.
  - **Fuel quantity, fuel flow, Fuel used**
  - **Fuel quantity for left and right fuel tank**
- **Row 3:**
  - **Generator 1 amperage & voltage output**
  - **Generator 2 amperage & voltage output**
  - **Engine oil indications*:** The left column indicates engine oil temperature, from 0 to 120°C. The right column indicates oil pressure from 0 to 200psi.

The EIS will also provide visual warnings when parameters exceed the normal operating ranges. EIS indications will blink 40 times a minute when in a caution state and 80 times a minute when in the warning range. On indicators marked with an asterisk, normal operating ranges are indicated with green bands. Caution ranges are indicated with yellow. Warning limits indicated with red lines and diamonds.

Caution and Warning annunciators are located at the bottom left corner of the EIS and illuminate when the appropriate parameters are met.

EIS Cautions and warnings		
PARAMETER	CAUTION (40 blinks/min)	WARNING (80 blinks/min)
Torque	44.4 to 61psi	44.4 to 61psi (after 20 sec. delay) or above 61psi
ITT	800 to 870°C 870 to 1000°C (start only) Below 350°C (when Np>1000)	800 to 870°C (after 20 sec. delay) 870 to 1000°C (after 5 sec. delay) Above 1000°C
N_g	Below 60% (engine running)	Above 104%
Oil temperature	-40 to 10°C (Notes 1 & 2) 105 to 110°C	Below -40°C (Note 2) 105 to 110°C (after 10 min. Delay) Above 110°C
Oil pressure	40 to 60psi (Note 1 & 2) 60 to 90psi (after 5 sec. delay) 135 to 200psi	Below 40psi (Note 1 & 2) 40 to 60psi (after 20 sec. delay) 60 to 90psi (after 20 sec. delay) 135 to 200psi (after 20 sec. delay) Above 200psi
OAT	Below +4°C and probes de-ice switch off (Note 2)	None
N_P Ng above 90%	Below 1640 (after 5 sec. Delay) 1760 to 1870	Below 950RPM (on ground, after 5 sec. if unfeather delay) (Note 1 & 2) 1760 to 1870RPM (after 20 sec. delay) Above 1870RPM
DC Volt Gen1	Below 22V (after 3 sec. Delay if Ng more than 50%) (Note 2) Above 31.5V	None
DC Volt Gen2	Below 22V (after 3 sec. Delay if Ng more than 50%) (Note 2) Above 31.5V	None

Note 1: Caution or warning inhibited during pre-start and post-flight.
Note 2: Caution or warning inhibited during engine start.
Note 3: If the warning illuminates for a parameter, the caution automatically extinguishes.

EIS BUTTONS

Four pushbuttons are situated at the bottom of the EIS.

- **STORE:** Will obtain a recording of every parameter for 20 seconds and then stores thm on the storage card with the date and time. The STORE annunciation illuminates to indicate that the system operates correctly
- **FUEL RESET:** Will recalculate the available fuel and update the fuel totaliser
- **MENU:** Will move the Torque and ITT indications to the 2nd row, used in the event of a light failure on the panel during flight.
- **TEST:** Runs the built-in test sequence of the EIS

7. APPENDIX

7.1 CRUISE PERFORMANCE

Maximum cruise performance (ISA)				@7000LB(3175Kg)		@8000LB(3629Kg)		@9000LB(4082Kg)		@10000LB(4536Kg)		@10400LB(4717Kg)	
Altitude	QAT (°C)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)	IAS (kt)	TAS (kt)	IAS (kt)	TAS (kt)	IAS (kt)	TAS (kt)	IAS (kt)	TAS (kt)
0	15	36.9	614	228	232	227	231	226	231	225	229	225	229
2000	11	36.9	595	226	237	225	236	224	235	223	234	222	233
4000	7	36.9	578	224	241	223	240	222	239	220	238	220	237
6000	3	36/9	563	221	246	221	245	220	244	218	242	218	242
8000	-1	36.9	550	219	251	219	250	217	249	216	247	215	246
10000	-5	36.9	539	217	256	216	255	215	253	214	252	213	251
12000	-9	36.9	530	215	261	214	260	213	258	211	257	211	256
14000	-13	36.5	518	212	266	211	265	210	263	208	260	207	260
16000	-17	35.3	498	208	268	206	267	205	265	202	262	202	261
18000	-21	33.4	471	201	269	200	266	198	264	196	261	195	260
20000	-25	31.7	446	195	269	193	266	191	264	189	260	188	259
22000	-29	29.9	422	188	268	187	266	185	264	181	259	180	257
24000	-33	28.1	397	182	268	180	265	177	262	174	257	173	255
26000	-37	26.4	373	175	267	173	263	170	259	166	254	165	252
28000	-41	24.6	349	168	265	165	261	162	256	158	250	156	248
30000	-44	22.8	325	160	262	157	257	153	252	149	245	147	242

Maximum endurance cruise (ISA)			@7000LB (3175Kg)		@8000LB (3629Kg)		@9000LB (4082 Kg)		@10000LB (4536 Kg)		@10400LB (4717 Kg)	
Altitude (ft)	OAT (°C)	TAS (kt)	Torque (psi)	Fuel (lb/h)	Torque (psi)	Fuel (lb/h)	Torque (psi)	Fuel (lb/h)	Torque (psi)	Fuel (lb/h)	Torque (psi)	Fuel (lb/h)
0	15	117.5	9.11	362.5	9.18	368.1	10.17	375.0	10.83	382.7	11.05	385.3
2000	11	121.0	9.08	342.2	9.18	348.1	10.18	354.9	10.86	362.7	11.10	365.5
4000	7	124.6	9.08	323.5	9.21	329.3	10.20	336.1	10.93	344.4	11.18	347.2
6000	3	128.4	9.08	306.1	9.20	312.0	10.28	319.3	11.03	327.7	11.32	330.8
8000	-1	132.4	9.11	290.1	9.25	296.5	10.38	304.0	11.23	313.2	11.52	316.3
10000	-5	136.5	9.23	276.0	9.33	282.4	10.59	290.5	11.46	299.8	11.79	303.2
12000	-9	140.8	9.37	262.7	9.48	269.4	10.80	277.5	11.74	287.1	12.07	290.5
14000	-13	145.4	9.52	250.3	9.65	257.3	11.06	265.8	12.02	275.3	12.36	278.8
16000	-17	150.1	9.73	239.6	9.88	246.8	11.32	255.2	12.35	265.3	12.71	268.8
18000	-21	155.1	9.97	229.9	10.12	237.0	11.64	245.9	12.72	256.2	13.10	259.9
20000	-25	160.3	10.20	220.5	10.38	228.0	11.99	237.3	13.09	247.7	13.49	251.8
22000	-29	165.7	10.48	212.5	10.67	220.4	12.36	229.9	13.52	242.1	13.94	246.4
24000	-33	171.4	10.79	205.8	10.99	214.1	12.76	225.6	13.96	238.5	14.39	243.1
26000	-37	177.5	11.13	200.6	11.35	210.6	13.17	222.8	14.44	236.6	14.89	241.5
28000	-41	183.8	11.48	197.7	11.73	208.5	13.63	221.6	14.95	236.1	15.43	241.4
30000	-44	190.4	11.86	196.1	12.16	207.5	14.11	221.4	15.49	237.0	15.99	242.8

Long range cruise			@7000LB(3175KG)				@8000LB(3629KG)				@9000LB(4082KG)				@10000LB(4536KG)				@10400LB(4717KG)			
Altitude (ft)	IOAT (°C)	OAT (°C)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)	Torque (psi)	Fuel (lb/h)	IAS (kt)	TAS (kt)
0	19	15	30.0	561	211	215	30.0	561	210	214	30.0	561	209	213	30.0	562	207	211	30.0	562	207	210
2000	15	11	28.8	527	206	216	28.9	529	205	215	29.0	530	204	214	29.1	532	203	212	29.2	532	202	212
4000	11	7	27.6	494	200	216	27.8	496	200	216	28.1	499	199	215	28.3	502	198	214	28.4	503	198	213
6000	7	3	26.4	462	195	217	26.8	465	194	216	27.1	469	194	216	27.4	473	193	215	27.6	474	193	214
8000	3	-1	25.2	433	189	217	25.7	438	189	217	26.2	442	189	216	26.6	446	188	216	26.7	448	188	215
10000	1	-5	24.0	408	184	217	24.6	413	184	217	25.2	418	184	217	25.7	424	183	216	25.9	426	183	216
12000	5	-9	22.8	382	178	217	23.5	389	178	217	24.2	395	179	218	24.8	402	178	217	25.1	405	178	217
14000	B	-13	21.6	357	172 172	216	22.4	365	173	217	23.3	373	173	218	24.0	381	173	217	24.3	384	173	217
16000		13-17	20.4	334	166	216	21.4	343	167	217	22.3	353	168	218	23.1	362	168	218	23.5	365	168	218
18000	-17	-21	19.2	311	160	214	20.3	322	161	216	21.4	333	162	217	22.3	344	162	218	22.7	348	163	218
20000	-21	-25	18.0	290	153	212	19.2	302	155	215	20.4	315	156	217	21.4	327	157	218	21.8	331	157	218
22000	-25	-29	16.8	270	146	210	18.1	284	149	213	19.4	298	150	215	20.5	311	151	217	21.0	316	152	218
24000	-29	-33	15.6	251	139	207	17.0	266	142	211	18.5	281	144	214	19.7	296	146	216	20.2	302	146	217
26000	-33	-37	14.4	232	132	203	16.0	249	135	208	17.5	266	138	212	18.8	282	139	214	19.4	289	140	215
28000	-37	-41	13.2	214	124	198	14.9	232	128	204	16.6	250	131	209	18.0	269	133	212	18.7	278	134	213
30000	-41	-44	12.0	196	116	192	13.8	216	120	199	15.6	236	124	204	17.2	257	126	208	17.9	266	127	210

7.2 PUSHER ACTIVATION SPEEDS

LEVEL FLIGHT	Pusher activation speeds (knots)			
Weight (lbs)	**Flaps up**	**Flaps 15°**	**Flaps 30°**	**Flaps 40°**
6400	72	59	53	51
7000	76	62	55	53
8000	81	66	59	57
9000	86	70	63	61
10000	91	73	67	64
10428	93	76	69	66

Note: speeds for 0° bank angle, 1G load factor. Increasing the bank angle and/or load factor will increase the angle of attack and therefore pusher activation speed.

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