

RAZBAM FLIGHT MANUAL

TURBOPROP MODELS

Metroliner III SA227-BC AIRCRAFT



Introduction

Thank you for your purchase of RAZBAM's Metroliner III SA227-BC aircraft model. We at RAZBAM have worked to deliver to you the most accurate model of this fascinating aircraft and we promise you that you will enjoy flying it.

The Fairchild Swearingen Metroliner or the Fairchild Aerospace Metro is a 19-seat, pressurized, twin turboprop airliner first produced by Swearingen Aircraft and later by Fairchild

The Metroliner was an evolution of the Swearingen Merlin turboprop-powered business aircraft. Ed Swearingen, a Texas fixed base operator (FBO), started the developments that led to the Metro through gradual modifications to the Beechcraft Twin Bonanza and Queen Air business aircraft, aircraft he dubbed Excalibur. Then the SA26 Merlin, more-or-less a pressurized Excalibur, was developed. Through successive models (the SA26-T Merlin IIA and SA26-AT Merlin IIB) the engines were changed to Pratt & Whitney Canada PT6 and then Garrett TPE331 turboprops. These were marketed as business aircraft seating eight to 10 passengers.

An all-new aircraft was built and called the SA226-T Merlin III with new nose, wings, landing gear, cruciform horizontal tail and inverted inlet Garrett engines. Ultimately a stretch of the Merlin III was designed, sized to seat 22 passengers and called the SA226-TC Metro. Because FAA regulations limited an airliner to no more than 19 seats if no flight attendant was to be carried, the aircraft was optimized for that number of passengers. The standard engines offered were two TPE331-3UW turboprops driving three-bladed propellers.

The Metro and Metro II were limited to a maximum weight of 12,500 pounds (5,670 kg) in the USA and countries using imperial units, and 5,700 kg in countries using SI units. When this restriction was lifted the Metro II was re-certified as the Metro IIA in 1980 with a maximum weight of 13,100 pounds (5,941 kg) and the Metro II's TPE331-3 engines replaced by -10 engines of increased power. The SA227-AC Metro III was next, also initially certified in 1980 at up to 14,000 pounds (6,350 kg) this increasing to 14,500 pounds (6,577 kg) as engines and structures were upgraded. An option to go as high as 16,000 pounds (7,257 kg) was offered. Externally, improvements incorporated into the Metro III were a 10 ft (3.05 m) increase in wing span, four-bladed props, redesigned "quick-access" engine cowlings and numerous drag-reducing airframe modifications, including landing gear doors that close after the gear is extended. A version with strengthened floors and the high gross weight option was offered as a cargo aircraft known as the Expediter.



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CONTROL CONFIGURATION

No special control configuration is required to fly this aircraft.

REALISM CONFIGURATION

The RAZBAM Metroliner has three unique realism settings:

1. Start Locks
2. Engine malfunction due to overtemp conditions.
3. Engine malfunction due to overtorque conditions.

These realism settings can be enabled/disabled by the user as follows:

1. Go to the **RAZBAM_Metroliner** folder in the **Gauges** folder of your FSX/Prepar3D installation.
2. Select the RM3_RSET.xml file
3. Edit the file using a text editor like NotePad.
4. To enable a realism setting change the value to 1. To disable it, change it to 0.
5. The values to edit are:
 - a. Start Locks = RM3_START_LOCKS
 - b. Overtemp = RM3_ENG_OVERTEMP_FAIL
 - c. Overtorque = RM3_ENG_OVERTORQUE_FAIL
6. Leave any other value unchanged.
7. Save the file and start the sim.

These are the default realism settings:






1. Start Locks: Disabled.
2. Overtemp: Enabled.
3. Overtorque: Enabled.

Notes:

SWITCHES NAVIGATION

The Metroliner's cockpit instruments have several types of switches, pushbuttons, knobs and levers. Usually you only have to click with your left mouse-button on the switch to have it change its position, but there are several that have multiple positions that move back and forth. For these multiple position switches and knobs you have to left-click to go forward and right-click to go backwards.

The following is a chart of the different switches and knobs found on the cockpit and how to navigate them.

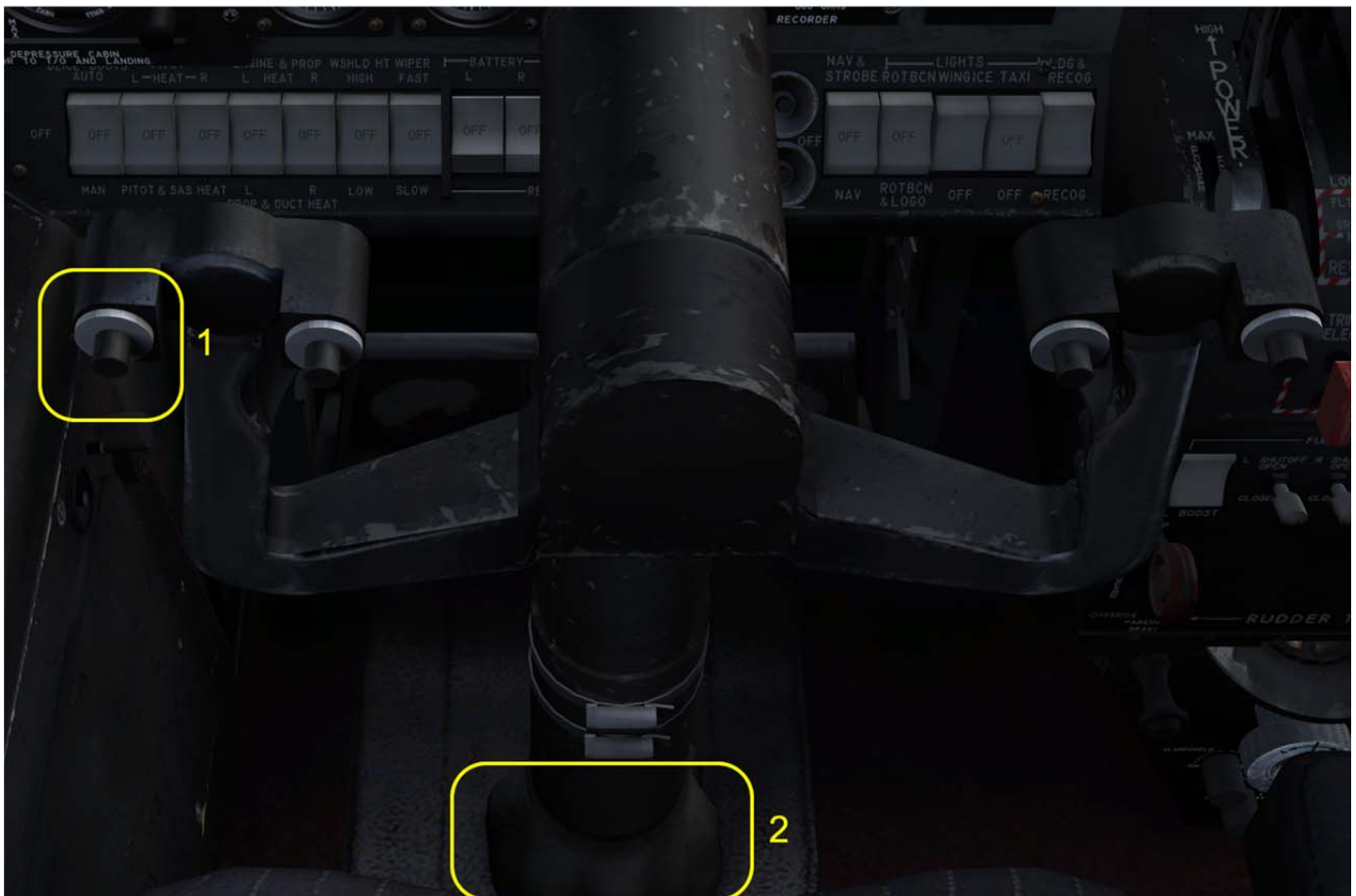
Switch	Type	Navigation
	2-Position Switch	Left-Click changes the position.
	3-Position Switch	Left Click moves forward. Right Click moves backwards. Example: Left Click: ALTER-AUTO-DP PRIM. Right Click: DP PRIM-AUTO-ALTER.
	Multi-position Knob	Left Click moves forward. Right Click moves backwards. In some knobs, clicking on the center wheel will move them forward and backwards as well.
	Pushbutton	Left Click changes the position.
	Rotating knob	Left Click moves forward. Right Click moves backwards. Center wheel moves both forward and backwards faster.

HIDING COCKPIT ELEMENTS

In many occasions, access and visibility of certain cockpit instruments and/or switches, is impeded by other elements like the control yokes and levers. To allow for an easier access to these elements we have implemented a visibility control for the obstructing objects.

CONTROL YOKES

In normal conditions, the placement of the control yokes hinder access to the switches panel that are located just behind them. In the real aircraft both the pilot and copilot has to reach behind them to actuate these switches, something that is not possible in the simulation. To allow an easier access to the switches panel the yokes can be hidden/revealed by clicking on two hot-spots.



- No.1 Hot spot hides the yoke.
- No. 2 Hot spot reveals the yoke.

Note: The hot spots locations are the same for both yokes.

THROTTLES

The position of the throttle levers obstructs the vision of several gauges located behind them. This impairment works for both the pilot and copilot positions. There is a visibility control hot-spot that will hide the throttle levers while the left mouse button is pressed. The throttles will automatically become visible as soon as the button is released.

SPEED LEVERS

The speed levers position prevents access to the engine SYNCROPHASER Switch and makes more difficult reading certain gauges. Like the throttle levers, there is a visibility control hot-spot that will hide/reveal these levers. Unlike the throttle hot-spot, the levers will remain hidden until you either click on the hot-spot again or on the syncrophaser switch.



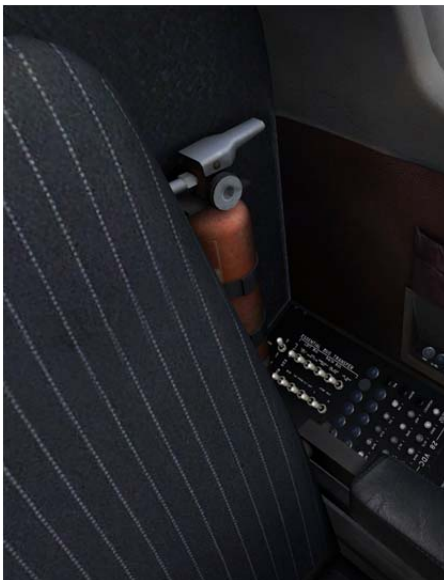
- No. 1 Hot spot hide the throttle levers while the mouse button is pressed.
- No. 2 Hot spot toggles the speed levers visibility.

COCKPIT CURTAIN

The curtain that separates the cockpit from the passenger/cargo deck can be hid/shown by clicking on the following elements:



By clicking on the curtain itself.



By clicking on the fire extinguisher.

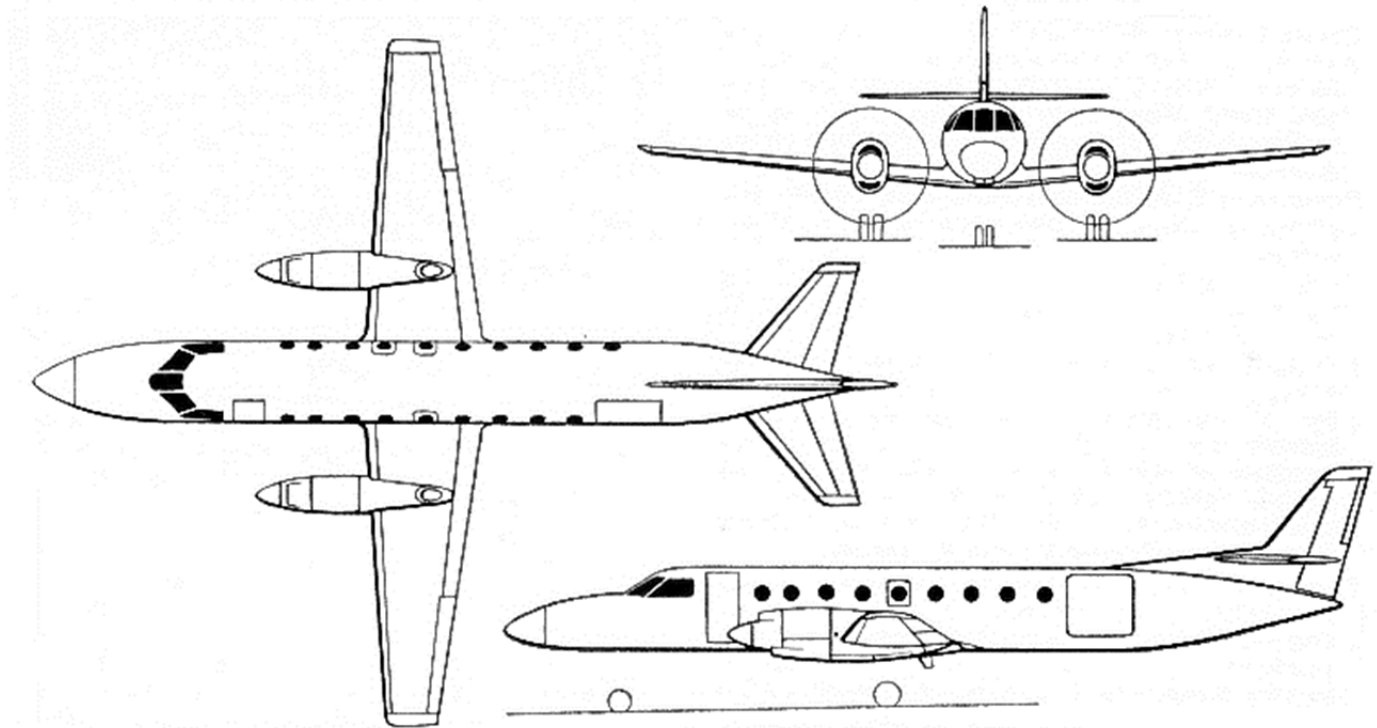


By clicking on the no smoking/seatbelt sign.

AIRCRAFT DESCRIPTION

The Metroliner III SA227-BC is a pressurized twin turboprop airplane built by Swearingen Aircraft and later by Fairchild. The aircraft is powered by two Garrett AiResearch, now Honeywell, TPE-331 turboprops with continuous alcohol-water injection (AWI). Each engine uses a four-bladed McCauley 4HFR34C652 or Dowty Rotol propeller.

GENERAL CHARACTERISTICS



Capacity		Dimensions		Performance	
Crew	2	Length	59 ft 4 in	Max take-off weight	16,000 lb
Passengers	19	Height	16 ft 8 in	Max Altitude	31,000 ft
Cargo Volume	143.5 sq ft	Wingspan	57 ft	Max Speed	246 knots
Max weight	8,700 lb	Wing area	310 sq ft	Range	1,150 nm



INSTRUMENT PANELS



Fig. 1 Main Instrument Panel

1. Pilot's EHSI.
2. Pilot's EHSI Control Panel.
3. Copilot's EHSI.
4. Copilot's EHSI Control Panel.
5. Pilot's Flight Instruments:
 - a. Airspeed Indicator.
 - b. Attitude Indicator.
 - c. Pressure Altimeter.
 - d. Vertical Speed Indicator
 - e. Radar Altimeter.
6. Copilot's Flight Instruments:
 - a. Airspeed Indicator.
 - b. Attitude Indicator.
 - c. Pressure Altimeter.
 - d. Vertical Speed Indicator.
7. Engine Gauges:
 - a. Exhaust Gas Temperature
 - b. Propeller Max. Torque.
 - c. Engine RPM.
 - d. Engine Fuel Flow.
 - e. Engine Oil Temperature & Pressure.
 - f. Fuel Quantity.
 - g. Fuel Pressure
8. Flight Control Gauges:
 - a. Outside Air Temperature.
 - b. Elevator Trim Position Indicator.
 - c. Flaps Position Indicator.
 - d. Hydraulic Pressure.
 - e. Landing Gear Position Indicator.
9. Left Hand Communication Panel:
 - a. VHF 1
 - b. NAV 1
 - c. ATC (Transponder)
10. Right Hand Communication Panel:
 - a. ADF 1
 - b. NAV 2
 - c. VHF 2
11. Left 6 Right Hand Audio Panel.
12. Annunciator Panel.
13. Electronic Gauges:
 - a. Altitude Selector.
 - b. DME Indicator.
14. GPS Unit (Trimble Freeflight 2000).
15. Weather Radar Display Unit
16. Cabin Pressure Controls
17. Cabin Pressure & Temperature Gauges
18. Miscellaneous:
 - a. Battery Temperature Indicator
 - b. Static Source Selector Lever

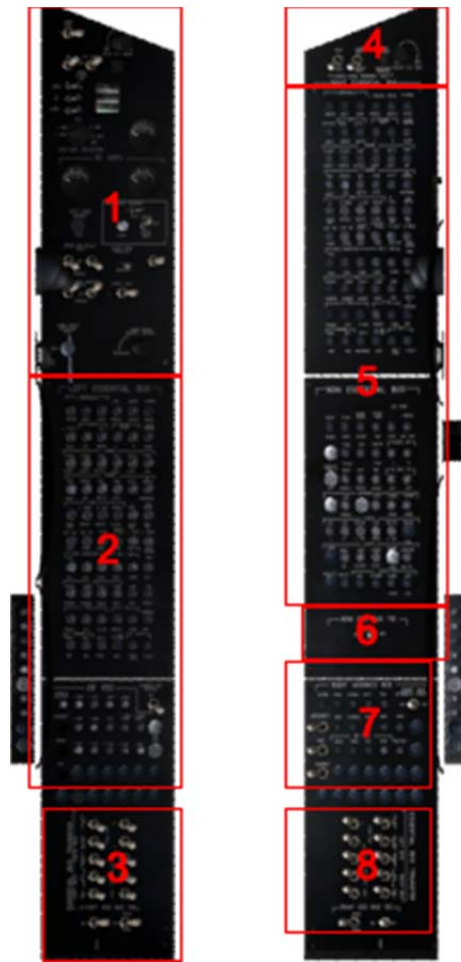


Fig. 2 Lateral Panels

Left Hand Panel	Right Hand Panel
<ol style="list-style-type: none"> 1. Miscellaneous Controls: <ol style="list-style-type: none"> a. Temp Test. b. SRL Switches. c. Pilot Flight Instruments Light Knob. d. Electric Power Usage Indicators. e. AC Bus Voltmeter. f. DC Bus Ammeter. g. Nose Gear Steering System Panel. h. Engine Start System Panel. i. Cabin Pressurization Controls. 2. Left Essential Buss Breaker Panel 3. Left Hand Essential Bus Transfer Switches. 	<ol style="list-style-type: none"> 4. Miscellaneous Controls: <ol style="list-style-type: none"> a. Cargo Door Control Panel. b. Copilot Flight Instruments Light Knob. 5. Right Essential Buss Breaker Panel. 6. Non- Essential Buss Control Switch. 7. Non-Essential Buss Breaker Panel. 8. Right Hand Bus Transfer Switches.

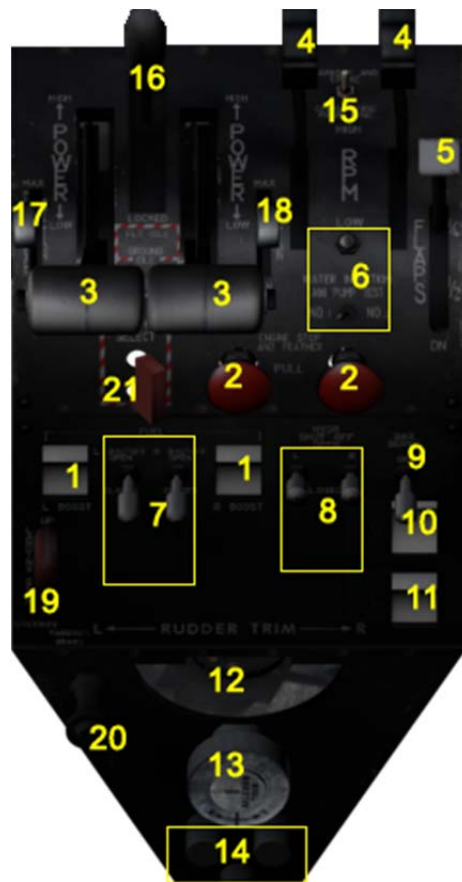


Fig. 3 Center Console

1. Left & Right Boost Pumps Switches
2. Stop & Feather Switches.
3. Engine Throttle levers.
4. Speed Levers.
5. Flaps Lever.
6. AWI Control Panel:
 - a. AWI On/Off Switch
 - b. AWI Pump Selector/Test Switch.
7. Left & Right Fuel Cutoff Switches
8. Left 6 Right Hydraulic Fluid Cutoff Switches
9. SAS Clutch/Servo Switch
10. Aux Elevator Trim Switch
11. Yaw Damper Switch
12. Rudder Trim Wheel.
13. Aileron Trim Knob.
14. Cockpit Light Switches:
 - a. Glareshield Lights. (Accessible from the pilot position)
 - b. Console Backlight.
 - c. Center Instruments (Accessible from the copilot position)
15. Propeller Synchrophaser Switch.
16. Gust Lock Lever.
17. Throttle Friction Lock Lever.
18. Speed Friction Lock Lever.
19. Landing Gear Actuator Lever.
20. Parking Brake Switch.

FLIGHT INSTRUMENTS

There are two sets of flight instruments for both the Pilot and the Copilot. They both work with the Static Pressure and are not subject to failure in the event of losing electric power. If the alternate static pressure source is selected, the Copilot's flight instruments become inoperational.



Fig. 4 Airspeed Indicator

Airspeed Indicator:

The airspeed indicator displays the aircraft speed in Knots.

It has the following elements:

1. A plain needle that indicates current aircraft speed.
2. A stripped needle that indicates maximum airspeed based on aircraft altitude.
3. Three thumb indicators that rotate to display:
 - a. White: Minimum speed for aircraft control.
 - b. Yellow: Minimum speed for safe climbing.
 - c. Blue: Maximum speed for landing gear operation.

The maximum operational speed up to 17,800 feet is 246 Knots. Above that altitude the maximum operational speed will be the following:

Altitude	Knots
18,000	245
20,000	235
23,000	221
26,000	208
29,000	194
31,000	186



Fig. 5 Attitude Indicator

An orange flag appears if either the bank or pitch angles are too high.

Since the alignment of the artificial horizon depends on the point of view, its position can be configured by clicking on the knob at the center.



Fig. 6 Altimeter (Pilot)



Fig. 7 Vertical Speed Indicator (feet/minute)



Fig. 8 Radar Altimeter (Pilot Only)

RADAR ALTIMETER

Among the instruments available to the pilot you can find the radar altimeter.

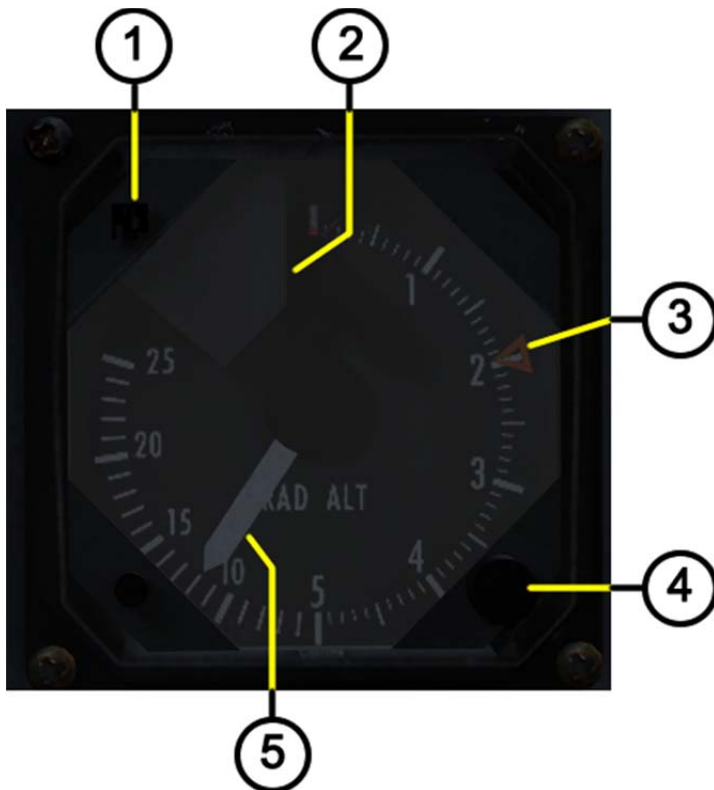


Fig. 9 Radar Altimeter components.

1. Below minimum AGL altitude warning light.
2. OFF flag (hidden).
3. Minimum AGL altitude indicator.
4. Minimum AGL altitude selector knob.
5. AGL altitude indicator.

Operation

The radar altimeter is ON whenever there is power available to the Pilot's Instruments Panel. It indicates altitude above ground level (AGL) from 0 up to 2,500 feet.

The OFF flag appears in two occasions: a) When the aircraft AGL altitude exceeds 2,500 feet; and b) when the radar altimeter has no power.

The radar altimeter also has a Minimum AGL Altitude Selector and Indicator. This feature warns the pilot whenever the aircraft AGL altitude is below the selected AGL altitude by illuminating a warning light in the upper left corner of the instrument. To select an AGL altitude you only need to left-click (to increase selected altitude), right-click (to decrease selected altitude) or use the mouse

wheel until the Minimum AGL Altitude indicator is at the desired level.

STALL AVOIDANCE SYSTEM (SAS)

The Metroliner III is equipped with a stall avoidance system (SAS) which is armed at liftoff and disarmed as speed increases.



Fig. 10 SAS Gauge.

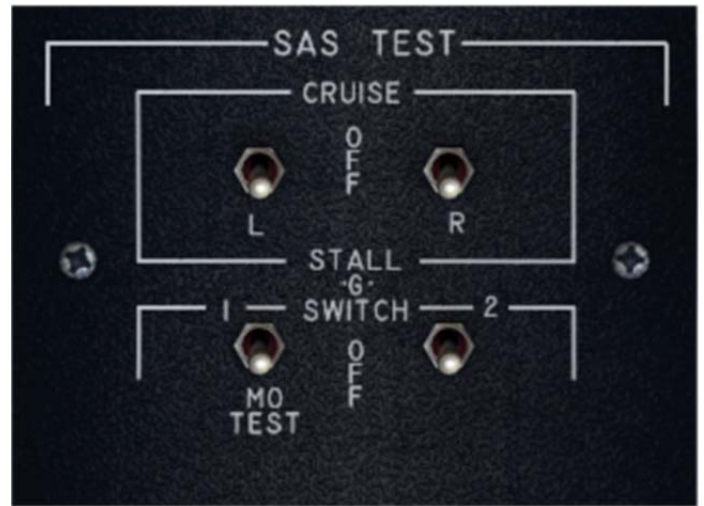


Fig. 11 SAS Test Overhead Panel.



Fig. 12 SAS ON/OFF Switches



Fig. 13 SAS Servo Switch

The SAS provides a visual warning when the aircraft airspeed is insufficient and it is about to enter into a stall condition. The SAS System must be in operation for flight. There are two SAS sensors, one for each pitot tube vane, and yellow SAS L and SAS R lights will illuminate when they are enabled for operation.

The SAS system operates at airspeeds below 140 KIAS, the SAS L & SAS R lights will illuminate indicating that the system is armed. At above 140 KIAS the lights turn off indicating that the system is enabled but not operational.

During operation, the gauge needle will approach the red zone as the airspeed decreases and the aircraft approaches a stall condition. The system is operational when the SAS SERVO switch and the SAS L and SAS R are all in their ON position.

If the SAS SERVO switch is in the OFF position (default) a SAS SERVO light will illuminate in the annunciator panel. SAS L FAIL and SAS R FAIL yellow lights will illuminate if either SAS L or SAS R switch is in the OFF position.

Under low ambient temperature conditions place the PITOT HEAT L and R switches in the PITOT & SAS HEAT position to prevent icing in the SAS vanes. A green SAS DEICE light will illuminate indicating that SAS heat has been selected.

NOTE

The SAS indicator is not certified for use as an in-flight approach indicator. It is certified only for indicating approaching stalls during flight

M850 CHRONOMETER

Both the Pilot and Copilot have a M850 chronometer among their instruments. These chronometers are independent of each other although they keep the same time.



Fig. 14 M850 Chronometer

The chronometers provide the following information:

1. UTC Time (default), also known as ZULU Time.
2. Local Time.
3. Elapsed Flight Time, which is defined as the elapsed time since at least one engine became operational.
4. Countdown Timer.

The UTC, Local and Elapsed Flight times are the same in both instruments, only the countdown timer operates independently from each other. To change the information you only need to click on the SELECT button.

FLIGHT CONTROLS AND TRIM

The primary flight controls, ailerons, rudder and elevators are manually operated by either pilot or the copilot using a conventional yoke and rudder pedal arrangement. Rudder and aileron trim tabs are mechanically controlled from trim wheels on the cockpit pedestal. The elevators do not use trim tabs. Instead, the horizontal stabilizer is electrically moved to provide pitch trim.

The secondary flight controls consist of hydraulically operated flaps.

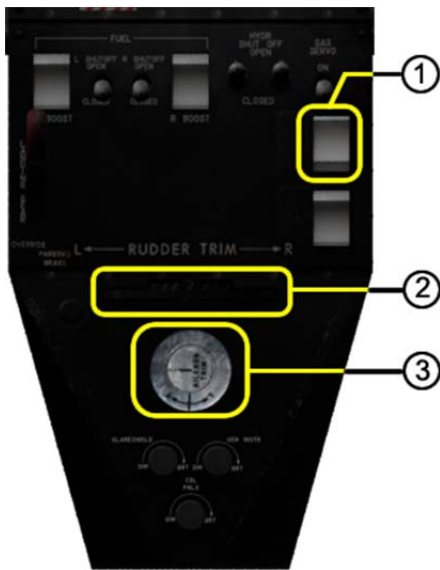


Fig. 15 Trim Controls.



Fig. 16 Trim Controls and Indicators Location.

AILERON (ROLL) TRIM

The trim tab of each aileron is connected to the AILERON TRIM wheel (Fig 15-3) on the pedestal. Left or right clicking on the trim wheel positions both tabs for lateral trim. As the outer wheel rotates, the inner wheel rotates in the same direction at a reduced rate. The aileron trim tabs are in the neutral position when the index lines on both the outer and inner wheels are aligned vertically.

RUDDER (YAW) TRIM

The rudder trim tab is actuated by the RUDDER TRIM wheel (Fig 15-2) on the pedestal. Left or right clicking on the trim wheel positions the tab for yaw trim.



Fig. 17 Pitch Trim Indicator.

ELEVATOR (PITCH) TRIM

There are no trim tabs on the elevators; pitch trim is accomplished by moving the entire horizontal stabilizer. On the real aircraft, pitch trim is controlled by two buttons located on both control yokes (not modelled). There is an auxiliary trim switch located on the pedestal marked AUX TRIM. Left or right clicking on this switch will provide UP or DOWN pitch trim (Fig 15-1).

Stabilizer position is displayed on a PITCH TRIM indicator on the instrument panel (Fig 17).

FLAPS

The aircraft's flaps are electrically controlled and hydraulically actuated. The right and left wing flaps are interconnected to prevent asymmetrical operation.

The FLAP lever (Fig. 19) on the pedestal is used to preselect any flap position from full up to full down. The lever has detents at the $\frac{1}{4}$ (Takeoff position) and $\frac{1}{2}$ flap positions. Flap position is shown on the FLAP POSition indicator (Fig. 19).



Fig. 18 FLAP lever.



Fig. 19 FLAP POSITION indicator.



Fig. 20 FLAP POSITION indicator location.

ELECTRICAL POWER SYSTEM

The electrical power system provides 28 volt DC, 115 volt AC and 26 volt AC power for all airplane electrical requirements. An external power source, engine-driven starter-generators, and nickel-cadmium batteries supply the DC power. AC power is provided by two static inverters. DC and AC power are distributed through two independent bus systems.

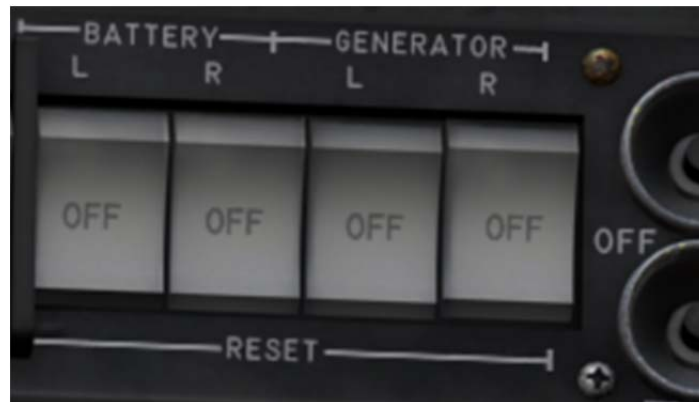


Fig. 21 Battery and generator switches.

DC POWER

DC power supplies basic electrical power for the airplane. This system consists of two starter-generators (one in each engine), two nickel-cadmium batteries and a ground power unit.

NOTE

FSX/Prepar3D only allows for the simulation of a single battery. For this reason battery indicators/switches have been unified.

BATTERIES

Three-position switches, one for each battery, are located on the left switch panel. They are labeled BATTERY (L or R), OFF and RESET (Fig 21). L BAT DISC and R BAT DISC warning lights on the annunciator panel illuminate when the left or right batteries are disconnected.

Battery voltage may be monitored by selecting the appropriate voltmeter switch position. The voltmeter and selector switch are located on the pilot's side console (Fig 22).



Fig. 22 Voltage selector and meter.

The temperature of the batteries is monitored by an indicator and two switches (fig 23). The indicator contains a temperature meter for each battery (fig 23-5), an amber WARM light (fig 23-4), which illuminates if either battery temperature exceeds 120°F, and a red HOT light (fig 23-3) which illuminates if either battery exceeds 150°F.



Fig. 23 Battery temperature indicator.

The temperature scales on the meter read from 100 to 190°F. Below 120°F, the scales are marked in green. Between 120 and 150°F they are marked in yellow, and above 150°F they are marked in red. Two switches above the indicator are labeled “BAT TEMP IND TEST” (Fig 23-1) and “RANGE EXTEND” (Fig 23-2).

Temperatures between 50 and 100°F can be read by clicking on the “RANGE EXTEND” switch. This switch adds 50°F to the battery temperatures and displays the results. The actual temperature will be the scale reading minus 50°F.

GENERATORS

Two engine-driven generators, mounted on each engine, are the airplane's primary source of DC power. Each generator output is limited to 28.5 volts and electrically limited to 305 amperes at 71% engine rpm. The generator control switches are located on the left switch panel (Fig 21) and have three positions: L (or R), OFF and RESET. L GEN FAIL or R GEN FAIL annunciator lights will illuminate whenever the respective generator is off-line.

Each generator voltage can be monitored by selecting the appropriate voltmeter switch position (fig 22). Two DC ammeters, connected as loadmeters are installed on the left side console to indicate the respective generator's output (Fig 24).



Fig. 24 DC Ammeters.

AC POWER

AC electrical power is supplied by single-phase inverters. Two inverters are installed but only one is used at a time. The inverter selector switch position determines which one is used. The inverters produce 115 volt and 26 volt AC power.



Fig. 25 AC power voltmeter.

The AC warning and monitoring system includes a bus selectable voltmeter on the left console (Fig 25) and two bus failure warning lights on the annunciator panel. The AC voltmeter can be selected to monitor either the left or the right 115 volt bus. If power to either 115 volt bus is lost, the respective AC BUS warning light illuminates. Illumination of both warning lights is usually an indication of inverter failure and the other inverter should be selected.

POWER DISTRIBUTION

Aircraft power is distributed through three DC and four AC busses. DC power is distributed through the Left Essential Bus (LEB), the Right Essential Bus (REB) and the Non-Essential Bus (NEB). Both the LEB and RB are limited to 225 amperes while the NEB is limited to 150 amperes. The LEB is located in the left console. The REB and NEB are located in the right console. Each bus is connected to the distribution system with the bus tie switch mounted on the respective console (Figures 26 and 27).

The LEB power ten essential items:

1. Pilot's DC instruments
2. Fuel crossflow valve.
3. Pilot's turn and bank.
4. Surface deicer boots.
5. Landing gear control.
6. Landing gear position indicator.
7. Cabin pressure dump.
8. Left engine intake heat.
9. Right engine intake heat.
10. Left windshield heat.

These items can also be powered by the RB by actuating the BUS TRANSFER switches located on the aft end of both left and right side panels (Figures 26 and 27).



Fig. 26 Left Essential Bus Transfer switches



Fig. 27 Right Essential Bus Transfer switches.

Additionally either the LEB or REB provides power to the inverters to produce AC power.

DC electrical power for control and operation of the No. 1 inverter is supplied by the LEB. The REB supplies the No. 2 inverter. The No. 1 inverter supplies power to the left 115-VAC and left 26-VAC busses while the No. 2 inverter supplies the right 115-VAC and right 26-VAC busses. The 115-VAC busses re connected through a circuit breaker as well as the 26-VAC busses. Consequently either inverter provides power to all four AC busses.

NOTE

Many of the aircraft's gauges and instruments depend on electrical power. If one of them is not working check the electrical power switches to and meters for any power problem.

MASTER WARNING SYSTEM

The master warning system consists of an annunciator panel, a valve position annunciator panel and various other lights. Most lights are located on the annunciator panel. An illuminated light alerts the pilot to a system malfunction (red), a system operating parameter (amber), or a system normal operating condition (green). When a light illuminates, the pilot should follow the approved checklist procedure.



Fig. 28 Annunciator Panel.



Fig. 29 Valve annunciator panel.




Fig. 30 Fire extinguisher annunciators

ANNUNCIATOR PANEL

The annunciator panel (Fig 28) contains red warning lights to advise the pilot of serious system conditions, amber cautionlights to indicate conditions of a less serious nature, and green lights to indicate other specific system conditions.

A PRESS TO TEST switch is located on the left side of the panel. Clicking on the switch will check all the warning system lights.

ANNUNCIATOR	REASON FOR ILLUMINATION
	Illuminates only during test.
L ENG FIRE	Excessive temperature is detected in associated engine nacelle
R ENG FIRE	
CABIN PRESS	Cabin door not properly closed.
BATT FAULT	A battery ground fault has been detected.
L OIL PRESS	Oil pressure is below 40 psi.
R OIL PRESS	
L HYD PRESS	Hydraulic pump pressure is low.
R HYD PRESS	
CARGO DOOR	Cargo door not properly closed.
CABIN ALT	Cabin altitude is above 10,000 feet.
GEAR DOOR	One of the main gear doors is not latched closed (illuminates only during test).
L BETA	Prop pitch control oil pressure is sufficient to

ANNUNCIATOR	REASON FOR ILLUMINATION
R BETA	command reverse operation.
LOW SUCTION	Insufficient suction for vacuum system.
L CHIP DET	Metal particles detected in the engine oil. (Illuminates only during test).
R CHIP DET	
L XFER PUMP	Fuel lever in hopper tank is low (Fuel boost pumps are off).
R XFER PUMP	
GPU PLUG IN	A GPU plug is plugged into the external power receptacle.
L BAR DISC	The indicated battery is disconnected.
R BAT DISC	
SAS SERVO	SAS Servo switch is disconnected.
L SRL OFF	The indicated SRL computer is not working. Normal with less than 80% rpm
R SRL OFF	
L AC BUS	The indicated 115-VAC bus is deenergized.
R AC BUS	
L GEN FAIL	The indicated generator is not working.
R GEN FAIL	
NWS FAIL	Nose Wheel Steering system is disconnected.
L SAS FAIL	The indicated SAS system is disconnected.
R SAS FAIL	

ANNUNCIATOR	REASON FOR ILLUMINATION
L FUEL FILTER	The indicated fuel filter is being bypassed. (Illuminates only during test).
R FUEL FILTER	
L INTAKE HT	If the intake heat switch is on, the engine anti-ice valve is open. If the TEST switch is clicked, the valve is closed.
R INTAKE HT	
L W/S HT	Indicated windshield heat is active.
R W/S HT	
AWI PUMP №1	The indicated AWI pump is operating.
AWI PUMP №2	
NWS	Nose Wheel Steering system is active.
SAS DEICE	The SAS heating system is operating.

VALVE POSITION ANNUNCIATOR PANEL

The valve annunciator panel (Fig 29) is located on the instrument panel above the main annunciator panel. These lights are tested with the main annunciator panel PRESS TO TEST switch.

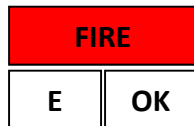
ANNUNCIATOR	REASON FOR ILLUMINATION
L FUEL	Engine fuel shutoff valve is closed.
R FUEL	
L HYD	The engine hydraulic shutoff valve is closed.
R HYD	
X-FLOW OPEN	The fuel crossflow valve is open.

FIRE EXTINGUISHER ANNUNCIATORS

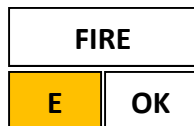
The annunciators for the fire system re located on the instrument panel (Fig. 30). Each is part of a three-lens control switch light. The FIRE portion of the annunciator may be tested with the PRESS TO TEST switch or with the FIRE EXT TEST switch located between the lights.

ANNUNCIATOR

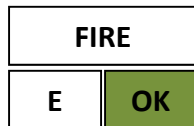
REASON FOR ILLUMINATION



1. Excessive temperature in the engine nacelle.
2. The annunciator PRESS TO TEST switch is actuated.
3. The FIRE EXT TEST switch is actuated



1. The associated fire extinguisher bottle has been discharged and is empty
2. The FIRE EXT TEST switch is actuated



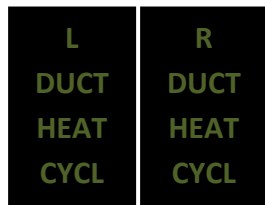
The FIRE EXT TEST is good.

OIL COOLER INLET DUCT HEAT CYCLE LIGHTS

The heat cycle lights for oil cooler inlet ducts are located on the left forward side console.

ANNUNCIATOR

REASON FOR ILLUMINATION



Indicated oil cooler inlet duct anti-ice thermostat is operating to heat the oil cooler inlet duct.

FUEL BYPASS LIGHTS

The fuel bypass lights are located on the pilot's instrument panel just below the EGT indicator.

ANNUNCIATOR

REASON FOR ILLUMINATION



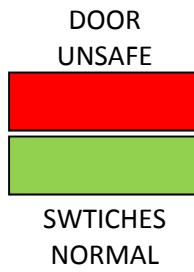
The associated engine fuel bypass valve is open.

CARGO DOOR WARNING AND TEST SYSTEM

The DOOR UNSAFE and SWITCHES NORMAL lights are located on the right forward console. The system indicates door latch position.

ANNUNCIATOR

REASON FOR ILLUMINATION



The cargo door is not closed or safe.

The door handle is in the open position and the click-clack warning switches are operating correctly.

ENGINE INSTRUMENTS AND CONTROLS

The Metro III is powered by two turboprop engines driving four-blade constant speed propellers. The propellers include full-feathering and reversing capabilities. The engines are lightweight, fixed-shaft turboprops manufactured by Honeywell, previously Garret AiResearch, and are designated TPE-331. The engines incorporate a factory-installed alcohol-water injection system (AWI). The TPE-331 is dry-rated at 1,000 shp for takeoff and continuous operation. It is wet-rated at 1,100 shp for a maximum of five minutes from the start of takeoff roll.

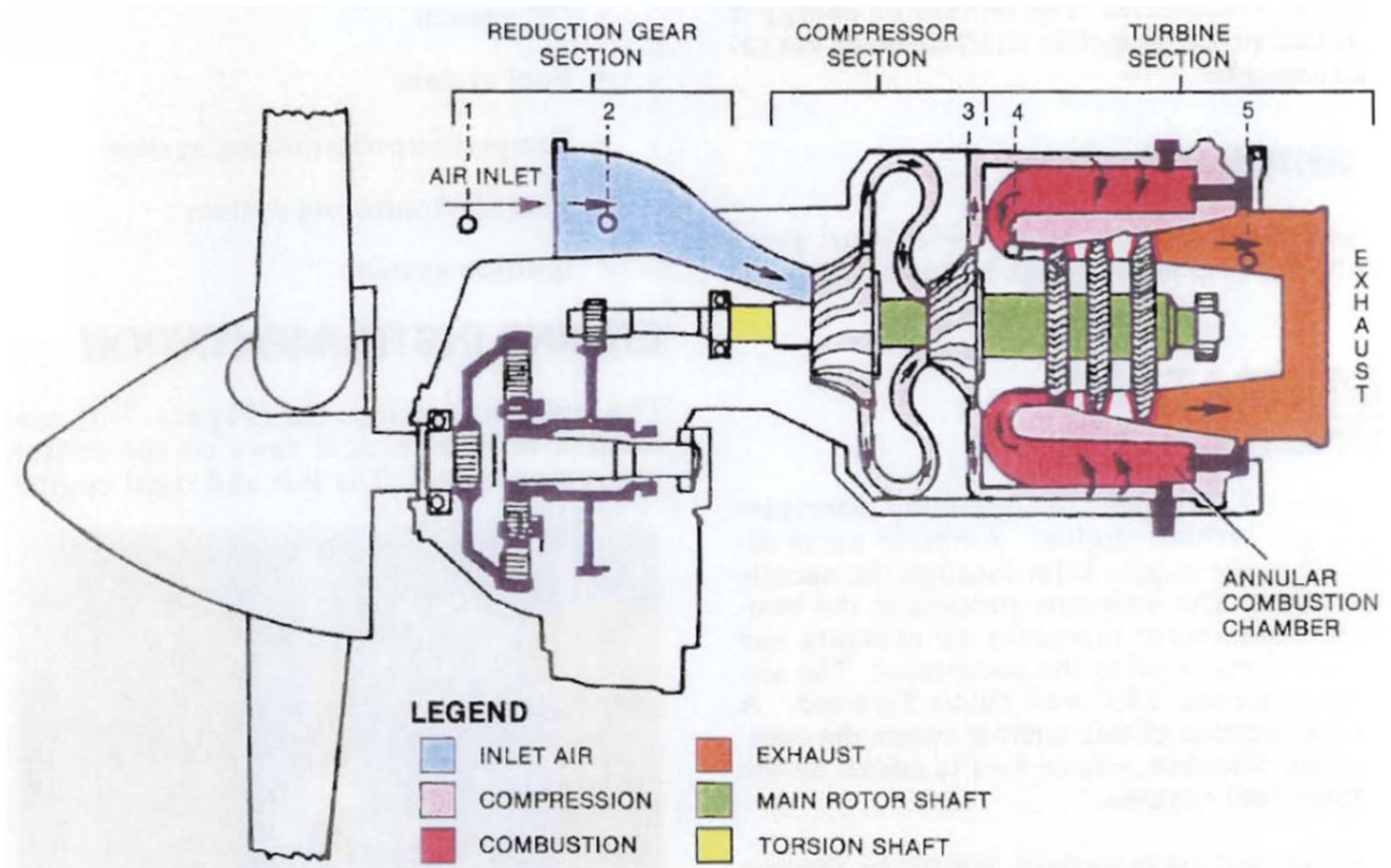


Fig. 31 Engine Stations, Major Sections and Fuel Flow

The engine systems include the following:

- Instrumentation.
- SRL Autostart computer.
- Oil system.
- Fuel system.
- Temperature monitoring system.
- Torque monitoring system.
- Ignition system.

ENGINE INSTRUMENTS



Fig. 32 Engine Instruments

The engine instruments (Figure 32) are located in two vertical rows on the center instrument panel.

From top to bottom, the gauges are:

- **Exhaust gas temperature (EGT):** marked in degrees Celsius.
- **Engine Starter Warning Light:** Indicates when the engine ignition system is active.
- **Fuel Bypass Open Warning Light:** indicates when the SRL computer activates the fuel bypass to maintain engine temperature at safe levels.
- **Engine torque:** marked in percentage of torque from 0 to 120%. 100% is equal to the maximum continuous rating of 1,000 shp at 100% rpm.
- **RPM:** the engine rpm gauges are calibrated in percentage of maximum continuous rpm, which is 100%.
- **Fuel Flow:** calibrated in pounds per hour.
- **Fuel Quantity:** calibrated in 100s pounds.
- **Engine Oil Pressure:** calibrated in pounds-per-square-inch (PSI).
- **Engine Oil Temperature:** calibrated in degrees Celsius.
- **Fuel Quantifier:** Indicates fuel level on each wing tank. Calibrated in pounds.
- **Fuel Pressure:** calibrated in pounds per square inch (PSI).



Fig. 33 Exhaust Gas Temperature



Fig. 34 Propeller Torque %

ATTENTION: Maximum Operational EGT is 650°C.

ATTENTION: Torque increases at lower Propeller Speeds.



Fig. 35 Engine RPM %



Fig. 36 Engine Fuel Flow



Fig. 37 Engine Oil Pressure and Temperature



Fig. 38 Fuel Quantity



Fig. 39 Fuel Pressure



Fig. 40 Engine Ignition Light



Fig. 41 Engine Fuel Bypass Warning Light

SINGLE RED LINE (SRL) AUTOSTART COMPUTER

The SRL autostart computer controls three functions: engine speed switching functions, automatic start fuel enrichment and single red line EGT computation.

The speed switching functions of the SRL include:

1. Automatic control of the start sequence from 10% to 60% rpm,
2. SRL EGT computation above 80% rpm, and
3. Enabling CAWI operation and EGT temperature limiting above 90% rpm.

The automatic start fuel enrichment modulates the start fuel enrichment valve to provide an appropriate amount of fuel during the start.

The SRL EGT computation results in an indicated EGT with a single maximum EGT of 650⁰C for all operations.



Fig. 42 SRL Control Panel.



Fig. 43 SRL Control Panel Location.

OIL SYSTEM

The engine oil system provides for cooling and lubrication of the main engine bearings and the reduction gear. In addition to these functions the engine oil system supplies oil for propeller control, negative torque sensing (NTS) and the unfeathering pump.

If oil pressure drops below 40 PSI the appropriate L or R OIL PRESSURE warning light in the annunciator panel will illuminate.

FUEL SYSTEM

The engine fuel system provides the proper amount of metered fuel to the combustion chamber under the three phases of operation:

- Starting and acceleration to idle,
- Ground operation, and
- Flight operation

Fuel Control Unit

Power (throttle) lever and speed (rpm) lever position are inputs to the fuel control unit and affect the fuel metered to the engines. The fuel control unit contains an underspeed governor, an overspeed governor and manual control of fuel metering.

- The underspeed governor operates to prevent the rpm from going below a value set by the speed lever. If engine speed should decrease below the selected setting, the underspeed governor increases the fuel flow to oppose the speed decrease. The underspeed governor can be set between 71 and 97% rpm by the speed lever.
- Manual control of fuel metering by the power lever occurs when the power lever is moved forward of FLT IDLE (10% Throttle).
- The overspeed governor is a safety device to prevent excessive engine overspeed in the event of propeller malfunction. Excess engine rpm limits fuel metering to prevent additional rpm increase.

Fuel Solenoid Valve

The fuel solenoid valve is opened by the start system and closed by clicking on the STOP button. It can also be closed by pulling the ENGINE STOP AND FEATHER control. If the STOP AND FEATHER control is pushed in, the fuel solenoid valve can be opened by the START button.



Fig. 44 Engine START and STOP Buttons.



Fig. 45 ENGINE STOP AND FEATHER Controls.

ENGINE TEMPERATURE MONITORING SYSTEM

An EGT gauge is provided for each engine for engine temperature monitoring (Figure 33). Below 80% rpm, compensated EGT is displayed on the EGT indicators. Above 80% rpm, a computed EGT is displayed.

Below 80% rpm, the engine temperature signal proceeds to the EGT gauge without modification. Above 80% rpm, the engine temperature signal is sent to the SRL for compensation. The computed EGT shows the pilot how close the engine is to the maximum allowable. The maximum permissible computed EGT is 650°C for all operations except starting.

Display of EGT values for below 80% rpm and computed EGT values for operations above 80% rpm is controlled automatically by the SRL-Autostart computer. Two SRL ΔP/P switches (Figure 42) are provided for SRL activation.

Amber lights marked “L SRL OFF” and “R SRL OFF”, located on the annunciator panel, advise the pilot when raw EGT is displayed on the EGT gauge or when the SRL computer is OFF. The SRL OFF light is normally illuminated below 805 rpm; if a SRL OFF light is illuminated when rpm is over 80% a malfunction is indicated.

TEMPERATURE LIMITER SYSTEM

The system consists of a temperature limiter and a fuel bypass valve. The system functions automatically to limit EGT to 650°C by opening the fuel bypass valve and bypassing metered fuel back to the fuel pump. The temperature limiter is integrated with the SRL computer. It is armed whenever the SRL switch is in the NORM (center) position and rpm is above 90%. The system prevents EGT from exceeding the SRL value of 650°C.

Operation of the temperature limiter is indicated by the illumination of the respective BYPASS OPEN (Figure 19) light on the instrument panel. The bypass valve may operate during takeoff. If the bypass valve opens during climb or cruise, the power lever should be retarded until the BYPASS OPEN light extinguishes.

NOTE

If the BYPASS OPEN light is illuminated during flight there is a small possibility that the EGT slightly exceeds the 650°C value and trigger the engine overtemp code. It is important to retard the power levers as soon as possible to prevent engine loss

A switch marked “TEMP LMTR TEST,” “L” and “R” is located on the pilot’s left forward console, above the SRL switches. It is used while on the ground to test the SRL/Limiter system.

WARNING

**Do not test the temperature limiter in flight.
Engine flameout will result.**

ENGINE TORQUE MONITORING SYSTEM

The torque-measuring system monitors the twisting force being applied to the propeller through the reduction gear. The signal is sent to the torque indicator (Figure 34) in the cockpit.

IGNITION SYSTEM

The ignition system is a high-energy type consisted of an engine-mounted ignition exciter and two igniter plugs located in the combustion chamber. An independent ignition system is provided for each engine. Ignition operation is indicated by amber lights located below the EGT gauges (Figure 40). The associated light is on whenever power is applied to the ignition exciter.



Fig. 46 Ignition System Switches



Fig. 47 Ignition System Switches Location.

The ignition system is controlled by two switches on the left console labeled AUTO/CONT IGNITION. The AUTO position (default position) allows the SRL-Autostart computer to control ignition during start. An additional feature of the AUTO position is that it energizes the ignition if the negative torque sensing (NTS) system is activated. Engine failure or flameout permits the propeller to drive the engine (negative torque), causing the ignition to be energized as long as the negative torque continues, and up to 30 seconds after the negative torque ceases.

Ignition operates continuously when the switch is in the CONTInuous position. The OFF position permits normal engine operation but lacks the NTS feature. The OFF position is not normally used.

PROPELLERS

Each engine drives a four-blade, constant-speed propeller. The propellers incorporate full feather and reverse capabilities, in addition to Beta mode control for ground operation. Propeller start locks are provided to maintain minimum blade angle to reduce propeller drag during engine start.

The propellers are normally controlled by the interaction of the power (throttle) levers, speed levers and the propellers STOP AND FEATHER controls, which are used only under abnormal or emergency conditions.

A propeller is onspeed when the actual rpm equals the selected rpm. Underspeed exists when the actual rpm is less than the selected rpm. Overspeed exists when the actual rpm is greater than the selected rpm. In turboprop engines, rpm is a sole function of blade angle; and in flight at a constant power setting, blade angle is a sole function of true airspeed. A constant-speed propeller makes changes to the blade angle based on airspeed, altitude, temperature, power lever and speed lever position to maintain a selected rpm.

Moving the power levers behind the FLT IDLE (10% throttle) will turn on a light marked "L BETA" or "R BETA" indicating that the propeller is ready for full reverse operation.

FEATHERING

The feathered angle of the propeller is the angle that produces minimum drag. Clicking on the ENGINE STOP AND FEATHER control (Figure 45) shuts off fuel and feathers the propeller. In case of engine failure in flight, operation of the negative torque sensing (NTS) system moves the propeller angle towards feather to minimize the drag of the windmilling propeller.

UNFEATHERING

The unfeather pump is actuated for airstarts by pressing the engine START button when weight is off the landing gear.



Fig. 48 UNFEATHER TEST Switch

The unfeather pump may also be operated by an UNFEATHER TEST switch (Figure 48) with two positions L and R. Holding this switch in the L or R position will unfeather the propeller until the switch is released.

START LOCKS

The propeller start locks are used to maintain a blade angle that will produce the minimum resistance to start acceleration. The propeller must always be on the start locks prior to attempting a ground start.

The propeller start locks consist of two spring-loaded pins that engage the propeller piston and, consequently, lock the blades in a flat pitch position. The start locks remain engaged following engine start because of the shear loads applied to the pins by the propeller piston. The start locks are released when ready to taxi by selecting REVERSE with the power lever to remove shear loads.

During a normal shutdown, the STOP button is first pushed to shut off fuel; then the power lever is moved into REVERSE as the rpm decays below 50%. As the propeller decelerates the start locks re-engage. After the rpm decays below 10% the power levers can be released.

NEGATIVE TORQUE SENSING (NTS) SYSTEM

Negative torque occurs when the propeller drives the engine, as opposed to the positive torque developed when the engine is driving the propeller. Loss of engine power during flight results in loss of positive torque, and the windmilling propeller produces negative torque, which results in drag that decreases performance and increases yaw.

The engine has a negative torque-sensing (NTS) system that provides for automatic drag reduction without any action on the pilot's part. It is NOT an autofeather system, but rather a system that increases blade angle to reduce windmilling drag. The pilot must still feather the propeller.

SYNCHROPHASING

After takeoff and when climb power is established, a propeller synchrophaser can be used to synchronize the propeller rpm and establish a blade phase relationship, called synchrophasing. Combining synchronizing and synchrophasing help reduce propeller noise and result in greater passenger comfort.

The system operates to match the rpm of the slow engine to that of the fast engine over a very limited range. It is recommended that the engines be manually synchronized before turning the system on.

POWERPLANT CONTROL

The powerplant is controlled by the interaction of the power (throttle) levers and the speed (rpm) levers (Figure 49).



Fig. 49 Powerplant Control: 1) Power levers; 2) Speed levers.

POWER (THROTTLE) LEVER

Two power levers operate in a quadrant on the center pedestal which is marked “FLT IDLE”, “GROUND IDLE,” and “REVERSE.” The power lever connects to the propeller pitch control and the fuel control unit.

When the power lever is between FLT IDLE and REVERSE, any movement positions the propeller pitch control to provide a blade angle proportional to the power required. When the power levers is positioned forward of the FLT IDLE, propeller pitch control is provided by the speed levers. The power lever can move freely between HIGH (full forward) and FLT IDLE positions. It is not possible to move aft of FLT IDLE while the aircraft is in the air.

NOTE

In the real aircraft there is a detent to prevent accidental movement aft of FLT IDLE. The power lever has to be lifted before it can move aft. In this case we decided to restrict movement below FLT IDLE while the aircraft is in the air.

SPEED (RPM) LEVER

Two speed levers operate in a quadrant on the center pedestal which is marked “RPM HIGH” (forward) and “LOW” (aft). The speed lever connects to the propeller governor and to the underspeed governor in the fuel control unit.

CONDITION LEVERS

The powerplant does not have user controlled condition levers. They are coupled with the speed levers. Their position changes with the speed levers position. The condition levers are actuated automatically as long as the SRL computer is active; otherwise they are locked at their lowest value.

WARNING

Engine torque tends to increase when the speed levers are at low rpm. An overtorque condition will appear if the power levers are at HIGH while the speed levers are at LOW. Reduce power to keep the torque within safe limits.

IF THE OVERTORQUE CONDITION REMAINS FOR TOO LONG THE ENGINE WILL CATCH FIRE.

STOP AND FEATHER CONTROL

A two-position push-pull knob (figure 45) for each engine, marked "L" or "R" ENGINE STOP AND FEATHER, is connected to the fuel valve and the propeller feather valve. When the knob is pulled out, the selected engine fuel valve will close and the propeller will begin to feather. The feathering process starts after engine combustion is terminated.

Pushing in the control back in will defeather the propeller but the fuel valve remains closed. It can only be opened by clicking on the engine START button.

OPERATION

There are two modes of powerplant operation: propeller governing mode and beta mode. The position of the power lever determines the mode of operation. When the power lever is forward of FLT IDLE, the powerplant is operating in propeller governing mode. When the power lever is aft of FLT IDLE, the powerplant is operating in beta mode.

The power lever determines the direction and value of the power developed by the propeller. The speed lever determines the operating rpm. When the power lever is forward of GROUND IDLE, the propeller is developing forward thrust. When the power lever is aft of GROUND IDLE, the propeller is developing reverse thrust. Movement of the speed lever between high and low rpm adjusts the propeller governor.

During flight, propeller governor rpm should be set at either 97% or 100% with the speed lever. Normally 100% rpm is used for climb and 97% is used for cruise.

Prior to landing, the speed lever is moved forward, setting the propeller governor at 100% rpm. It is important that the speed lever be set at HIGH, in order to have maximum rpm available in case of a rejected landing. After touchdown the power lever is moved behind FLT IDLE into the Beta range (reverse thrust). The BETA lights should be illuminated when the power levers are at or below FLT IDLE.

NOTE

The only way to put the power (throttle) levers below FLT IDLE is by using the keyboard. FSX/P3D limits the movement of the throttle to 0% in the cockpit. Reverse thrust is only achieved by going below 0 % into negative throttle values.

CAUTION

Attempted reverse with the speed levers below the HIGH rpm position may result in engine overtemperature condition.

ENGINE START

Starts may be automatic or manual.

AUTOMATIC GROUND START

1. Set the speed lever at low and the power lever at FLT IDLE (10% throttle).
2. Select the START MODE switch (Fig 28) as required (SERIES or PARALLEL).
3. Click on the START Button (Fig 22).

NOTE

- a. It is recommended that the right engine be started first.
- b. For the first start of the day it is recommended that the START MODE switch be in SERIES.
- c. Check that the SRL switch is in the NORM position.

At 10% RPM the ignition system is engaged. Check that fuel flow is indicated and that the ignition light is illuminated. Rpm will climb to 100% before resting at 80%, the ignition light should extinguish, signaling that the automatic start sequence is completed. As the rpm passes 71%, move the power lever back toward GROUND IDLE.

NOTE

FSX and Prepar3D have a standard way to start turboprop engines that differs from the sequence of the real engine. We have tried to get as close as possible to the original but any deviation is a Sim limitation.



Fig. 50 START MODE Switch



Fig. 51 START MODE Switch location

MANUAL GROUND START

If no fuel flow or ignition is observed at 10% rpm, and there is no EGT rise, it is possible that the automatic start sequence failed. In this case, it is permissible to attempt a manual start as described in the Abnormal Procedures Section.

1. The SPEED SW SELECT must be in OFF prior to a manual start.
2. After clicking on the START button the SPEED SW SELECT switch is moved to the MANUAL position as the rpm reaches 10%.
3. After engine rpm has stabilized return the SPEED SW SELECT switch to the AUTO position.



Fig. 52 POWER SW SELECT Switch



Fig. 53 POWER SW SELECT Switch location

ABORTED START

To abort an engine start, click on the STOP button and click on the ENGINE STOP AND FEATHER control.

NOTE

After an aborted start it is possible that when attempting a new start the engine ignition system gets stuck at 100% rpm. To clear it click on the START button again.

AIRSTARTS

Airstarts are the same as ground starts except for power lever and speed lever positions.

1. Power lever is placed at 15% throttle.
2. Speed lever is placed at 97% propeller governor rpm.

ATTENTION

For ground starts and in order to prevent accidental power surges, the ignition system will not engage if the power lever is above 12% throttle.

Engines will not start either in the ground or in the air if the power levers are in reverse.

ENGINE SHUTDOWN**NORMAL SHUTDOWN**

To accomplish a normal shutdown, click on the engine STOP button (Fig 22). The fuel valve will close and engine rpm will decay.

PREPLANNED SHUTDOWN IN FLIGHT

To accomplish a planned shutdown in flight for training purposes follow the Preplanned Engine Shut Down in the Abnormal Procedures Section.

EMERGENCY SHUTDOWN IN FLIGHT

If an emergency engine shutdown is necessary, click on the ENGINE STOP AND FEATHER control.

CONTINUOUS ALCOHOL-WATER INJECTION (CAWI)

The CAWI system is used during takeoff to recover power lost at high-density altitudes. The CAWI system includes a storage tank in the nose section, two pumps and a spray ring and nozzles in the engine inlet. CAWI may be used only for takeoff and for a maximum of five minutes. In-flight use of CAWI is prohibited. The CAWI storage tank holds 16 gallons of usable SWI fluid (around 128 pounds). A cockpit gauge shows AWI quantity (fig. 32).



Fig. 54 AWI fluid quantity gauge.



Fig. 55 AWI fluid quantity gauge location.

CONTROL

The CAWI system is controlled by: a) a two-position WATER INJECTION switch with positions marked “CONT” and “OFF” located on the center pedestal and b) a three-position switch labeled AWI PUMP TEST. It has two marked positions “No. 1” and “No. 2,” and an unmarked center OFF position (fig. 56).



Fig. 56 CAWI Control switches



Fig. 57 CAWI control switches location.

INDICATION

Two annunciator lights marked “AWI No. 1 PUMP ON” and “AWI No. 2 PUMP ON” are illuminated whenever the associated AWI pump is running and developing acceptable pressure. If the WATER INJECTION switch is OFF, holding the AWI PUMP TEST switch to the No 1 or No 2 position should turn on the associated AWI light.

OPERATION

To activate the CAWI system for takeoff:

1. Engine rpm must be above 90%.
2. Power lever must be slightly forward of FLT IDLE.

3. The WATER INJECTION switch must be placed in CONT.
4. The AWI PUMP TEST switch is placed in either the No 1 or No 2 position.

When these conditions are met, the AWI fluid will flow into the engines. An immediate torque increase between 30% to 35% will be noticed and the selected AWI PUMP ON light will illuminate. AWI fluid flows continuously until the WATER INJECTION is clicked to the OFF position, the AWI PUMP TEST switch is placed in the OFF position, the AWI fluid runs out or engine rpm decreases below 90% rpm.

AWI flow is independent for each engine, so if the flow shuts for one engine it will continue for the other one while the operating conditions are met.

NOTE

When the AWI fluid stops, engine torque will drop by as much as 35%.

FUEL SYSTEM

The fuel system consists of the fuel storage and vent, fuel transfer and engine feed, and indicating systems. The total usable fuel capacity is 4,342 pounds (648 US gallons at 6.7 pounds per gallon).

FUEL STORAGE

The fuel storage consists of two integral wet-wing tanks and a vent system (Fig 58).

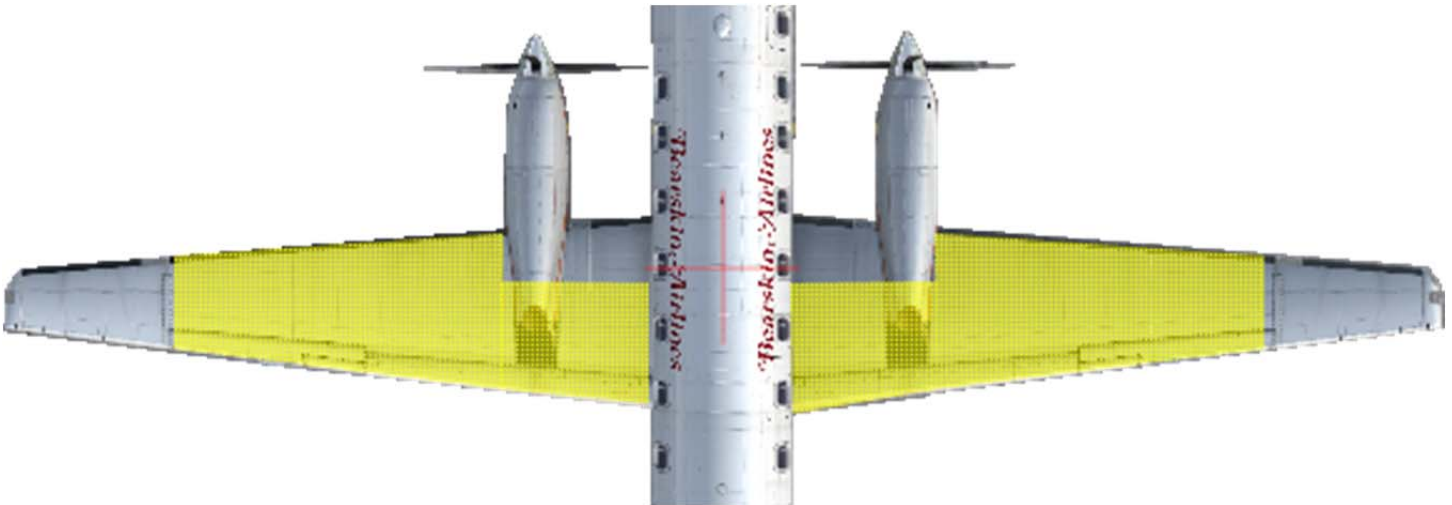


Fig. 58 Fuel Storage tanks.

FUEL TRANSFER AND ENGINE FEED SYSTEM

Fuel to each engine is supplied by an independent fuel system from its respective wing tank. A crossflow line interconnects the left and right wing tanks. Each fuel tank has two submerged boost pumps.

BOOST PUMPS

The boost pumps in each fuel tank are controlled by the L BOOST and R BOOST switches in the pedestal. The positions of these rocker switches are labeled "MAIN", "OFF" and "AUX."

Each boost pump is powered from its respective 28.5 DC Volt essential bus.



Fig. 59 Fuel Boost Pump and Shutoff Valve controls



Fig. 60 Fuel Boost Pump/Shutoff Valve controls Location.

CROSSFLOW SYSTEM

A crossflow line interconnects the left and right wing tanks and incorporates a crossflow valve for fuel balancing from one wing tank to the other. The crossflow valve is controlled by the CROSSFLOW SWITCH, a rotary switch located on the pilot and copilot's switch panel.



Fig. 61 Fuel crossflow switches

The X-FLOW OPEN light on the valve position annunciator panel illuminates when the valve is partially or fully open.

FUEL SHUTOFF VALVE SYSTEM

Each engine has a fuel shutoff valve in the wheel well that is controlled by the FUEL SHUTOFF switch on the center console (Fig. 59). These normally open valves allow fuel to pass to the engines. The amber L or R FUEL shutoff valve light illuminates when the respective valve is closed.

FUEL QUANTITY INDICATOR

The FUEL QTY gauge (Fig. 38) on the instrument panel is calibrated in pounds x 100. This gauge is equipped with two pointers, one for each wing tank. The gauge is tested by clicking on the PRESS TO TEST push-button switch adjacent to it. When holding the mouse button, the pointers should move to the 1,250 pounds position; when the mouse button is released, the pointers return to the pre-test quantity.

FUEL FLOW INDICATOR

The FUEL FLOW indicators (Fig. 36) are calibrated in pounds per hour and indicate the amount of fuel that each engine is consuming.



Fig. 62 Fuel Consumed Totalizer

FUEL CONSUMED TOTALIZER

The fuel-consumed totalizer indicates the total amount of fuel consumed by both engines since the counter was last zeroed. Zeroing is accomplished by clicking on the mechanical reset lever on the totalizer.

NOTE

The fuel consumed totalizer is automatically zeroed when an engine is started.

FIRE PROTECTION SYSTEM

The fire protection system consists of engine overheating detection systems and engine fire-extinguishing systems. There are cockpit warning lights located on the annunciator panel and on the fire extinguisher control assembly (Fig 63).

Heat sensors and a fire extinguisher, which is discharged from the cockpit, are located within each engine nacelle.



Fig. 63 Fire Extinguisher Control Panel

ENGINE FIRE DETECTION

Each engine has a simulated fire detector, when a fire condition in an engine is detected the red FIRE warning light illuminates in both the annunciator panel and in the fire extinguisher control panel. The FIRE light turns off when the fire condition disappears. The PRESS TO TEST switch on the annunciator panel checks that the FIRE lights work as intended.

ENGINE FIRE EXTINGUISHING

Each engine nacelle contains a fire extinguisher bottle; their activation is controlled from the cockpit by using the fire extinguisher control assembly by means of a covered three indicator switchlight. To activate the fire extinguisher bottle you have to click on the clear cover, lifting it. Then click on the illuminated switch light. The selected bottle will discharge and putting out the engine fire. The amber E light will illuminate indicating that the bottle is empty and cannot be used again.

The switchlights can be tested by left or right clicking on the FIRE EXT TEST switch that is between the two switchlights. If the system has no problem all three of the lights will illuminate for as long as the switch is in the test position. The FIRE EXT TEST switch will return to the OFF position after 5 seconds.

PNEUMATIC SYSTEMS

The pneumatic system provides the bleed air manifold with hot compressed air for use by associated systems. The pneumatic system consists of a bleed air system and vacuum system. Both engines provide air to the manifold, but either engine is sufficient to maintain all required system functions during single engine operation.

BLEED AIR SYSTEM

The engines provide bleed air pressure to the following airplane systems:

- Engine and Nacelle anti-icing.
- Air Conditioning.
- Hydraulic reservoir.
- Suction control (Vacuum pump).
- Door seal.
- Window defog.
- Deice boot.

The flight crew monitors system operation with associated suction, pressure and warning devices in the cockpit.



Fig. 64 Suction indicator.

VACUUM SYSTEM

The vacuum system uses bleed air pressure to operate a vacuum pump. The system supplies the necessary suction for operation of a) the vacuum instruments, b) the suction phase of the deice boots, and c) control of the pressurization system.

An amber LOW SUCTION warning light illuminates if the suction drops below limits. The suction indicator on the instrument panel is direct-reading and does not require electrical power.

HYDRAULIC SYSTEM

The main hydraulic system is pressurized by two engine-driven pumps, one on each engine. The system provides pressure for actuation of the landing gear, flaps and nose wheel steering. Two warning lights on the annunciator panel warn of low pump pressure or pump failure.

Supply fluid to the engine-driven pumps passes through shutoff valves controlled by two HYDR SHUT OFF switches on the center pedestal. These switches are normally in the OPEN position and are CLOSED only in the event of fire or engine shutdown in flight. If either of the switches is moved to the CLOSED position, an amber L HYD or R HYD light will illuminate.

A single HYD PRESS indicator serves both hydraulic systems. The indicator always displays the higher value of the two systems.

LANDING GEAR

The airplane has a dual-wheel, retractable, tricycle landing gear enclosed by mechanically actuated doors. Gear position and warning are provided by indicator lights and a warning horn.

The nosewheel steering system provides directional control while taxiing. The nosewheel casters freely when the system is not engaged.

The standard braking system is manual.

LANDING GEAR

The landing gear is controlled by the LANDING GEAR LEVER located in the center console. Clicking on the lever will rise or lower the landing gear. The LDG POS indicator will display landing gear position.



Fig. 65 Landing Gear Lever



Fig. 66 LDG POS indicator (test).



Fig. 67 LDG POS indicator (transition).



Fig. 68 LDG POS indicator (gear down).

Green lights indicate that the landing gear is down and locked. Red lights indicate that the landing gear is in transition and no lights indicate that the landing gear is in the up and stowed position.

DEICING SYSTEM

Ice protection is provided for the following components.

- Wings and horizontal stabilizer.
- Engines and nacelle inlets.
- Propellers
- Pitot tubes and SAS vanes.



Fig. 69 Deicing switches.

The leading edges of the wing and horizontal stabilizer are protected by electrically controlled and pneumatically operated deice boots. To activate the system click the DEICE BOOTS switch to the AUTO position.

The engine inlets are heated by hot bleed air tapped from the engine.

The propellers, pitot tubes and SAS vanes are electrically operated.

The deicing system switch board is located in the left hand instruments panel.

LIGHTING SYSTEM

EXTERIOR LIGHTS

Exterior lighting consists of navigation, rotating beacon, wing ice, landing, taxi, strobe logo and recognition lights.

The exterior lighting system is equipped with:

- Five navigation lights: two red on the left wingtip, two green on the right wingtip, and one clear in the tail cone.
- Two wing ice lights, one in the outboard side of each engine nacelle.
- Two landing lights located under a cover on the leading edge of each wing.

- Two recognition lights located under a cover on the leading edge of each wing.
- Three strobe lights, one on each wingtip and one on the tail.
- One red rotating beacon mounted on top of the vertical stabilizer.
- Two logo lights, one on the top of each horizontal stabilizer.
- One taxi light located on the nose landing gear.

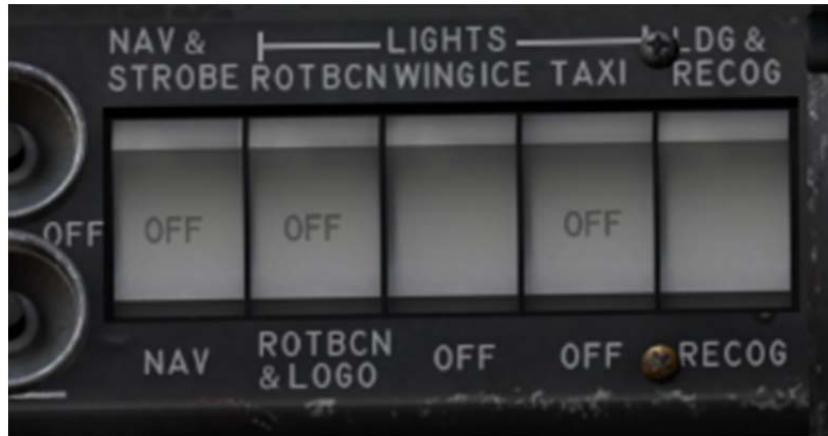


Fig. 70 Exterior lights switch panel.

INTERIOR LIGHTS

Interior lighting consists of cockpit, cabin and emergency lighting.

Lighting for the cockpit area consists of general illumination of the instrument panel, overhead floodlights, pilot and copilot instruments lights, engine and auxiliary instruments lights, map lights and console and pedestal lights.

Pilot and copilot flight instrument lights are controlled by individual dimmers on the left and right forward consoles.



Fig. 71 Pilot's Instruments lights control.



Fig. 72 Copilot's instruments lights control.

The following lights controls are located on the bottom of the center pedestal, below the AILERONS TRIM Wheel:

1. Engine and Auxiliary instruments lights with the GENL INSTR lights dimmer
2. Glareshield lights with the GLARESHIELD dimmer.
3. Console, lower switch panels and pedestal lights with the CSL LIGHTS dimmer.



Fig. 73 Cockpit lights controls

NOTE

It is not possible to activate the exterior and interior lights by using the standard keyboard commands and/or external control boxes. Since the aircraft uses three-position rocker switches instead of simple ON/OFF toggles, a special code was required that cannot be handled from outside the virtual cockpit.



AVIONICS

COMMUNICATIONS AND NAVIGATION

The SA-227-BC Communications and navigation instruments consist of the following:

- Two VHF Receiver/Transmitters.
- Two NAV Receivers.
- One ATC Transponder.
- One ADF Receiver.
- One DME Receiver.
- Two Audio control panels.

All the communications and navigations instruments, except for the DME receiver, are located on the upper portion of the main instruments panel divided in Left Hand and Right Hand sets.



Fig. 74 Communications and Navigation instruments panel.

The left hand panel is used by the pilot and contains the following instruments (from left to right):

- Audio control panel.
- VHF1 Receiver/Transmitter.
- NAV1 Receiver.
- ATC Transponder.

The right hand panel is used by the copilot and contains the following instruments (from left to right):

- ADF1 Receiver.
- NAV2 Receiver.
- VHF2 Receiver/Transmitter.
- Audio control panel.

The DME receiver is located in the center of the main instruments panel to the left of the weather radar display.

NOTE

The communications and navigation instrument panel needs that both electrical power is available and that the Avionics Master Switch is in the ON position.

VHF RECEIVER/TRANSMITTER

The aircraft has two VHF receiver/transmitters. They are capable of receiving and transmitting in the FSX/Prepr3D assigned frequency range of 118.00 to 136.97 MHz, both units have an Active and a Standby frequency.



The displays for the VHF receiver/transmitters are based on the Collins CTL-22 Digital Display.

1. Power/Volume knobs:
 - a. Outer knob: Power.
 - b. Inner knob: Volume (INOP).
2. Frequency selector knobs:
 - a. Outer knob: Whole numbers.
 - b. Inner knob: Decimal numbers.
3. Transfer switch.
4. Status display:
 - a. RX: Unit is the selected receiver.
 - b. TX: Unit is the selected transmitter.
5. Active frequency display.
6. Standby frequency display.

Fig. 75 VHF Receiver/Transmitter display.

OPERATION

The units are OFF by default, to turn them ON click on the OUTER Power/Volume knob. The display will appear and the unit will be ready for operation.

To change a frequency click on the outer knob to change whole values in the 118 to 136 range. Clicking on the inner knob will change values in the 0.000 to 0.975 range.

NOTE

Only the Standby frequency will be changed by clicking on the frequency selector knobs.

To switch between the Active and Standby frequencies click on the Transfer switch.

The status display indicates if the unit is the active receiver (RX) and/or transmitter (TX).

NOTE

FSX/Prepar3D always enables COM1 (VHF1) for reception. It is not possible to deselect it.

NAV RECEIVER

The aircraft has two VHF receivers for NAV frequencies. They are capable of receiving in the FSX/Prepr3D assigned frequency range of 108.00 to 117.97 MHz, both units have an Active and a Standby frequency.



Fig. 76 NAV Receiver display.

The displays for the NAV receivers are based on the Collins CTL-32 Digital Display.

1. Power/Volume knobs:
 - a. Outer knob: Power.
 - b. Inner knob: Volume (INOP).
2. Frequency selector knobs:
 - a. Outer knob: Whole numbers.
 - b. Inner knob: Decimal numbers.
3. Transfer switch.
4. Status display:
 - a. Top: Unit is receiving from selected station.
 - b. Bottom: Morse code Ident audio signal is being heard.
5. Active frequency display.
6. Standby frequency display.

OPERATION

The units are OFF by default, to turn them ON click on the OUTER Power/Volume knob. The display will appear and the unit will be ready

for operation.

To change a frequency click on the outer knob to change whole values in the 108 to 117 range. Clicking on the inner knob will change values in the 0.000 to 0.975 range.

NOTE

Only the Standby frequency will be changed by clicking on the frequency selector knobs.

To switch between the Active and Standby frequencies click on the Transfer switch.

The status display indicates if the unit is receiving signal from the selected station and whether the Morse code ident signal is being heard.

ATC TRANSPONDER

The aircraft has an ATC Transponder unit for traffic control purposes.

The display for the ATC Transponder unit is based on the Collins CTL-92 Digital Display.

1. Power/Volume knob.
 - a. Outer knob: Power.
 - b. Inner knob: Volume (INOP).
2. Code selector knob.
3. Code display.
4. Unit operational mode.



Fig. 77 ATC Transponder display.

OPERATION

The unit is OFF by default, to turn it ON click on the OUTER Power/Volume knob. The display will appear and the unit will be ready for operation.

To input a selected code you must click on both the Outer and Inner Code selector knob as follows:

Outer knob:

- Left-Click to change the 1000s number group.
- Right-Click to change the 100s number group.

Inner knob:

- Left-Click to change the 10s number group.
- Right-Click to change the 1s number group.

ADF RECEIVER

The aircraft has one ADF receiver. It is capable of receiving in the FSX/Prepr3D assigned frequency range of 100.0 to 1799.9 KHz.



Fig. 78 ADF Receiver display.

The displays for the ADF receivers are based on the Collins CTL-62 Digital Display.

1. Power/Volume knobs:
 - a. Outer knob: Power.
 - b. Inner knob: Volume (INOP).
2. Frequency selector knobs:
 - a. Outer knob: Whole numbers.
 - b. Inner knob: Decimal numbers
3. ADF frequency display.

- Radial to selected ADF station display.

OPERATION

The units are OFF by default, to turn them ON click on the OUTER Power/Volume knob. The display will appear and the unit will be ready for operation.

To change a frequency click on the outer knob to change whole number values in the 100 to 1799 range. Clicking on the inner knob will change values in the 0.0 to 0.9 range.

DME RECEIVER

The aircraft has one DME receiver display. It is tied to the NAV receivers and can display DME information when available.



Fig. 79 DME Receiver display

- Power Switch
- Display Mode Switch.
- Channel Switch
- Secondary Information Display
- Secondary Information Label.
- Distance in nautical miles to selected DME Station.

OPERATION

The unit is OFF by default, to turn it ON click on the Power Switch. The display will appear and the unit will be ready for operation. The unit will always display the distance in nautical miles to the selected DME station.

Click on the CHNL switch to change between DME1 and DME2.

Click on the MODE switch to change the DME secondary information display:

- IDENT Code (Default)
- Closure speed in knots.
- Time to reach the selected station in minutes.

NOTE

If no DME data is being received in the selected channel the display will show dashes.

AUDIO CONTROL PANEL

The aircraft has two audio control panels, one for the Pilot's and the other one for the Copilot, from which audio output and transmitter selection can be made.



Fig. 80 Audio Control Panel

The following functions are enabled:

1. AUDIO:

- a. VHF1: Enables audio reception for the VHF1 (COM1) receiver.
- b. VHF2: Enables audio reception for both VHF1 and VHF2 receivers.
- c. NAV1: Enables audio reception for the NAV1 IDENT Morse code.
- d. NAV2: Enables audio reception for the NAV2 IDENT Morse code.
- e. DME1: Enables audio reception for the DME IDENT Morse code.
- f. DME2: Enables audio reception for the DME IDENT Morse code.
- g. ADF1: Enables audio reception for the ADF1 IDENT Morse code.
- h. ADF2: Enables audio reception for the ADF2 IDENT Morse code.
- i. MKR: Enables audio reception for MARKER Beacons signals.

2. MICROPHONE:

- a. VHF1: Selects VHF1 for radio transmission.
- b. VHF2: Selects VHF2 for radio transmission.

OPERATION

All AUDIO functions, except for the VHF1 and VHF2 reception switches, work as a toggle. Clicking on it repeatedly selects/deselects the desired function.

VHF1 and VHF2 reception cannot be deselected by clicking on the same button. Instead they are mutually exclusive, which means that selecting VHF1 will deselect VHF2 and viceversa.

ATTENTION

It is not possible to deselect the audio output for the VHF1 (COM1) radio. Clicking on VHF2 will enable audio output for BOTH radios. It is possible that you will hear another transmission on top of the one meant for you.

EHSI – ELECTRONIC HORIZONTAL SITUATION INDICATOR

The SA-227-BC comes from the factory with an EHSI installed. The EHSI is an Electronic Flight Instrument System (EFIS), it combines the function of a Horizontal Situation Indicator (HSI), RMI, GPS Moving Map and TCAS screen in a single device.

Both the pilot and the copilot have their own individual EHSI. They can be configured independently but all navigation data is shared.



Fig. 81 Pilot's EHSI Display and Control panel



Fig. 82 Copilot's EHSI Display and Control panel.



Fig. 83 EHSI Display



Fig. 84 EHSI Control panel.

The EHSI will display data from the following instruments:

- NAV1 and NAV 2 receivers
- DME1 and DME2
- GPS
- ADF1
- Directional Gyro
- TCAS

EHSI DISPLAY

The EHSI has three display areas: The primary display area, the upper display area and the bottom display area.

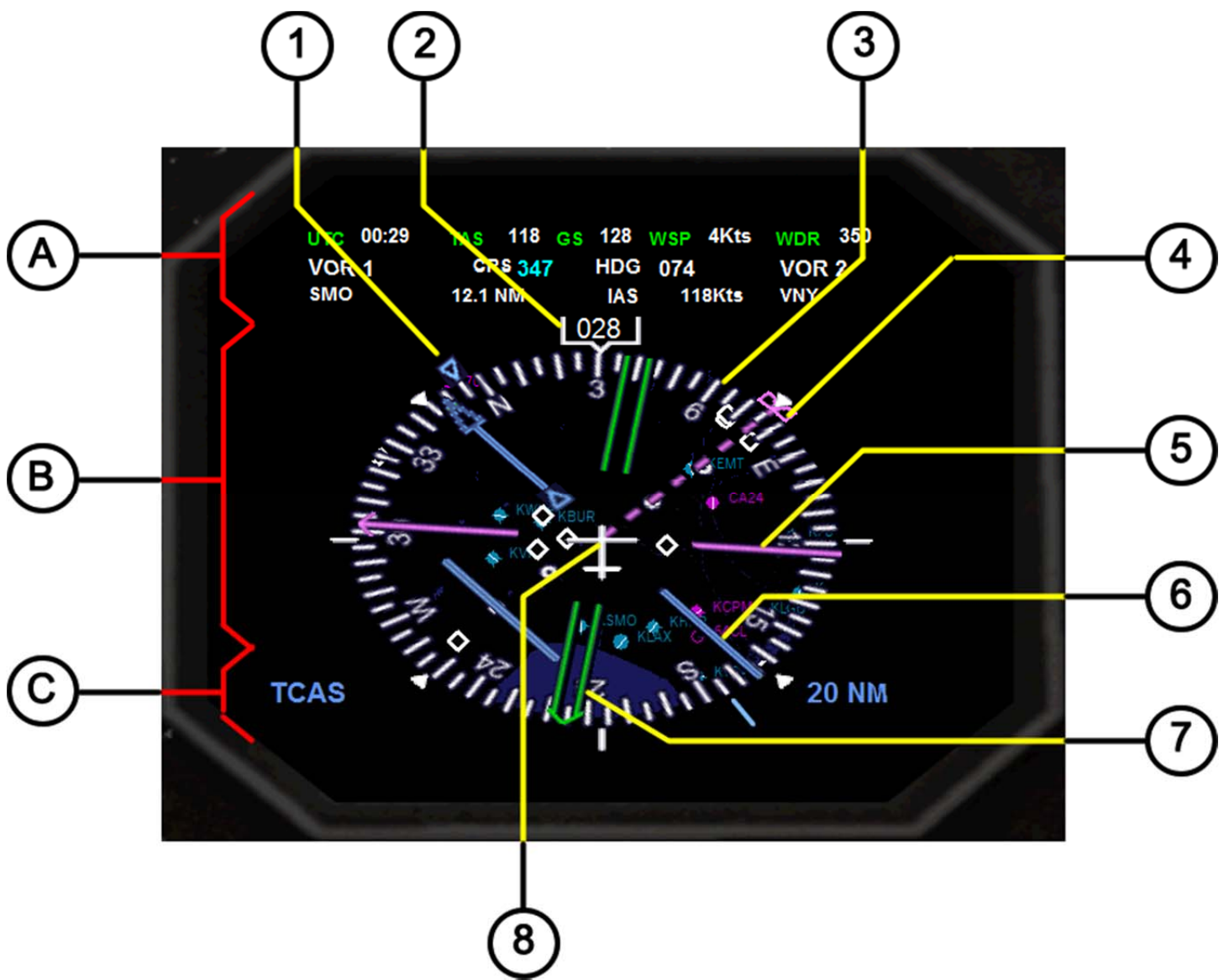


Fig. 85 EHSI Display

- A. Upper display area.
 - B. Primary display area.
 - C. Bottom display area.
-
- 1. Primary NAV bearing pointer.
 - 2. Aircraft current magnetic heading.
 - 3. Compass card.
 - 4. Selected heading cue.
 - 5. ADF1 bearing pointer.
 - 6. Course pointer.
 - 7. Secondary NAV bearing pointer.
 - 8. Aircraft position.

PRIMARY DISPLAY AREA

The primary display area shows either a 360 degree or a 120 degree ARC view, as indicated by the white compass ring. The white airplane represents the aircraft's current position. The primary display area also depicts current GPS flight plan, airports, nav aids, airspaces, intersections and air traffic information.

UPPER DISPLAY AREA

The upper display area presents data from the selected course navigation instrument. The actual data displayed depends on the navigation source (VOR/DME or GPS) but it will include bearing, distance and indicated airspeed. The upper area also displays Coordinated Universal Time (UTC), true airspeed (TAS), ground speed (GS), wind speed (WS) and wind direction (WDR).

BOTTOM DISPLAY AREA

The bottom display area indicates if TCAS information is being displayed and the selected moving map/TCAS range.

DATA COLOR CODING

Alphanumeric data displayed on the EHSI is color coded as follows:

GREEN	<ul style="list-style-type: none"> ▪ Information associated with the VHF NAV1 receiver.
BLUE	<ul style="list-style-type: none"> ▪ Information associated with the VHF NAV2 receiver. ▪ ATC status display (bottom display area)
PINK	<ul style="list-style-type: none"> ▪ Information associated with the ADF1 receiver ▪ Selected Heading.
MAGENTA	<ul style="list-style-type: none"> ▪ GPS information.

SELECTING DATA

The EHSI receives data from several devices within the aircraft. This includes the primary navigational instruments such as the VOR, ADF and GPS as well as instruments like the directional gyro. Heading data from the directional gyro is

always displayed above the compass card. Data from other sensors can be displayed in several ways. The display of the course pointer, bearing pointer, and map data can be configured.

NOTE

Pilot and copilot's EHSI can be configured independently although the data displayed is the same.

The data used by the EHSI depends on the data mode: NAV or GPS. When the system is in NAV mode (default) the data used comes from the navigation receivers. When the system is in GPS mode, it uses GPS data and NAV data is unavailable.

To switch between data modes you have to click on the DATA MODE switch, which is located above the AUDIO CONTROL PANEL.

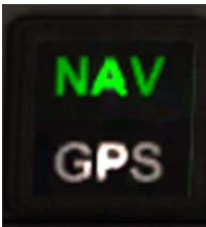


Fig. 86 Data Mode selector switch.



Fig. 87 NAV Mode selected.



Fig. 88 GPS Mode selected.



Fig. 89 Data Mode selector switch location

SELECTING PRIMARY NAV SOURCE

The Course Pointer is driven by the selected Primary Nav Source, which can be either the NAV1 or NAV2 receiver. To select which receiver is the primary nav source you must click on the DG (Data Group) selector switch located by the side of the AUDIO CONTROL PANEL in both the Pilot and Copilot's position.



Fig. 90 DG Selector switch.



Fig. 91 DG1 Selected.



Fig. 92 DG2 Selected.



Fig. 93 DG Selector switch location (Pilot's position).

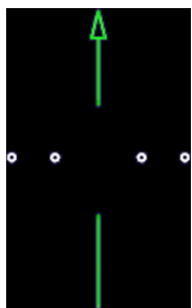
While both the Pilot and Copilot can have the same primary nav source by default the Pilot and Copilot's primary nav sources are crossed, i.e.: NAV1 is the default for the Pilot while NAV2 is the default for the Copilot.

DG1: Selects NAV1 as the primary nav source for course pointer. It can be easily identified by its green color.

DG2: Selects NAV2 as the primary nav source for course pointer. It can be easily identified by its blue color.

BEARING POINTERS FOR NAV1 & NAV2

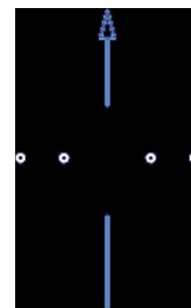
The EHSI provides two independent bearing pointers which function in the same way as a traditional radio magnetic indicator (RMI) for both the primary and secondary nav sources.


NAV1
Course Pointer

NAV1
Bearing Pointer

DG1 Course and Bearing pointers


NAV2
Course Pointer

NAV2
Bearing Pointer

NAV2
Course Pointer

NAV2
Bearing Pointer

DG2 Course and Bearing pointers

The head of the bearing pointer indicates bearing to the nav source and the tail indicates bearing from the nav source (radial).

When the GPS is selected as the nav source, the bearing pointer for the primary nav source indicates the bearing to the current active waypoint.

CONTROLLING THE DISPLAY

The EHSI is capable of displaying a large amount of data at once. Caution must be taken to avoid undesirable clutter.

NOTE

Because the virtual cockpit EHSI display can be hard to read, we have developed a 2D repeater that will appear whenever you click on the EHSI screen. The screen works as a toggle switch hiding/showing the 2D repeater display.

ARC VIEW AND 360-DEGREE VIEW.

The EHSI allows you to switch between a traditional 360-degree view of the compass rose and a forward-looking ARC view. The ARC view places the aircraft symbol at the bottom of the display and the heading indicator along an arc of 120-degrees around the top of the screen. ARC view maximizes the display of the ground track ahead of the aircraft and provides the greatest amount of screen area for the map data.



Fig. 94 360-Degree view mode.



Fig. 95 ARC view mode.

The view can be changed by clicking on the corresponding button in the EHSI control panel:

- To select the 360-degree view click on the HSI button.
- To select the ARC view click on the ARC button

DISPLAYING THE MOVING MAP

The EHSI can display a moving map with navigation data such as flight plan route (if a flight plan is present in the system), nearby airports, nav aids, intersections and airspaces.

The moving map can be displayed in both 360-Degree and ARC view by clicking on the MAP button in the EHSI control panel. Successive clicking will cycle through the map data as follows: Basic (water, airports, ILS (only in ARC view) and

flight plan), Basic + Airspaces (AS), Basic + NDB (NDB), Basic + NDB + VOR (NDB+VOR), Basic + VOR (VOR), Basic + Intersections (INT).

To turn off the map you only have to click on the HSI or ARC buttons.

DISPLAYING TCAS DATA

The EHSI also functions as the TCAS system display. When the TCAS is enabled, TCAS data is displayed in the EHSI screen even if the moving map is off.

To avoid cluttering the screen only air traffic icons are displayed without any auxiliary data. TCAS data is disabled when the EHSI is in ILS mode to prevent clutter.

SETTING MAP AND TCAS RANGE

The map and TCAS range are set by the TCAS control panel. The map range is changed even if the TCAS system is off. The available ranges are 5, 10, 15, 20 and 40 nautical miles.

DISPLAYING THE COURSE AND BEARING POINTERS

The course and bearing pointers are visible when the system is in NAV mode for navigation. They become visible as soon as their associated nav receiver is active. Both course and bearing pointers can be removed from the display for decluttering purposes.

To display/hide a selected pointer you only have to click on either the NV1 or NV2 button in the EHSI control panel. The buttons work as a toggle switch so repeatedly clicking on them will cycle through the display/hide option.

DISPLAYING THE ADF POINTER

The ADF bearing pointer is hidden by default, to make it visible click on the ADF button in the EHSI control panel. The button works as a toggle switch so repeatedly clicking on it will cycle through the display/hide option.

DISPLAYING THE ILS

The ILS system is tied to the secondary NAV source. In ILS mode the following information is available: Glideslope (GS) and Course Deviation (CD) bars, glideslope angular error, Locator bearing. BELOW G/S warning.

To enable the ILS you must click on the HSI or ARC buttons until the ILS mode status is displayed in the bottom display area.

In 360-Degree mode the MAP view is disabled while in ARC mode it is available only in its default mode.

TCAS – TRAFFIC COLLISION AVOIDANCE SYSTEM

The airplane comes with a traffic collision avoidance system (TCAS) installed. The system is not a radar but a beacon receiver, allowing the airplane crew to check other aircraft positions in relation to their own.



Fig. 96 TCAS control panel.

1. Master Mode knob.
2. Range knob (in nautical miles).
3. Operational Mode.
4. Flight level reception mode.

OPERATION

The EHSI displays TCAS data whenever the Master Mode knob is in the ON position. Operational range is determined by clicking on the Range knob. The Range knob also determines the size of the MAP view in the EHSI, even if the TACS system is in the OFF position.

The operational mode determines the type of data received by the system. The only option enabled is the TCAS, both WX and T/WX are disabled.

GPS –FREEFLIGHT 2000 APPROACH PLUS

This SA-227-BC model has a GPS navigator installed. It is based on the Trimble 2000 Approach Plus. It provides with flight plan navigation, position finding, flight progression, navigator functions, etc.

NOTE

The built-in GPS is based on standard FSX/P3D functions and database. It does not have advanced capabilities like data updates.

GPS COMPONENTS

FRONT PANEL

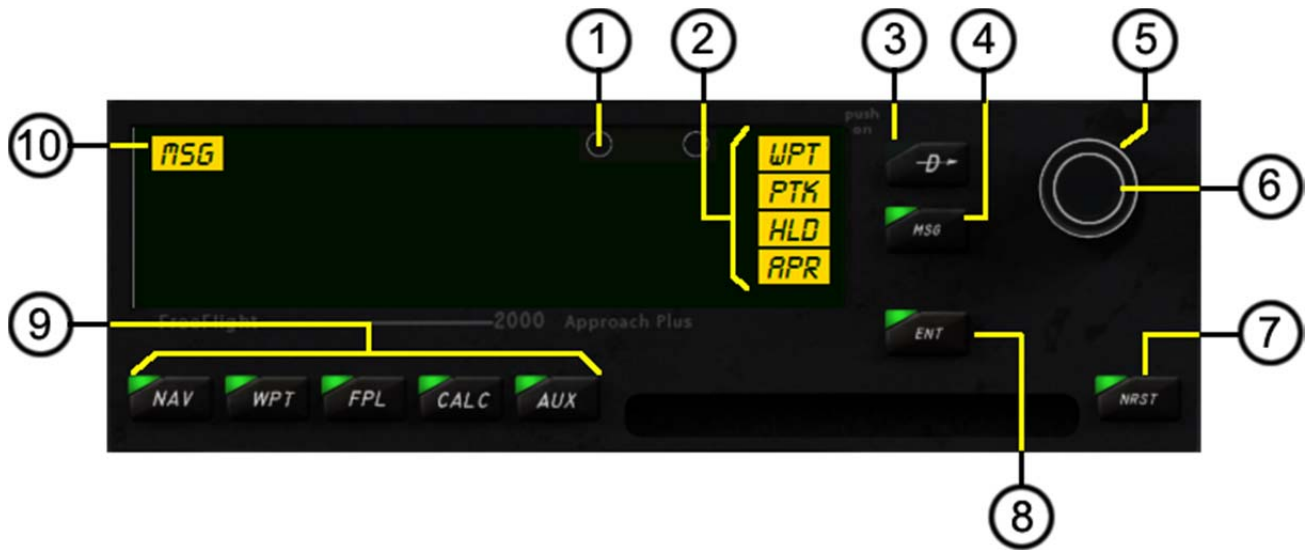


Fig. 97 GPS front panel.

1. Power switch.
2. NAV status annunciators.
3. Direct-To function button.
4. Message function button.
5. Outer knob.
6. Inner knob.
7. Nearest function button.
8. ENTER button.
9. MODE function buttons.
10. Message annunciator.

NAVIGATION DABASE

The navigation database is the standard one included in FSX and Prepar3D. It provides access to worldwide data on Airports, VORs, NDBs, Intersections and Airspace boundaries. The information is only available if a flight plan is loaded.

OPERATION

To operate the GPS you only have to click on the power switch. The GPS will enter into a self-test mode at the end of which a Fuel on Board message appears.



Fig. 98 GPS Start up screen.

The GPS displays information on a two line LED screen. The displayed information varies depending on the selected mode. For example a typical NAV mode display looks like this:



Fig. 99 GPS typical NAV display

In the example, the top line of the display indicates that the next waypoint, marked by the TO header, is a VOR; that its bearing is 56°; distance to waypoint is 101 nautical miles; and the estimated time on transit to the waypoint. The bottom display shows a CDI (Course Deviation Indicator), current Ground Track and current Ground Speed.

KNOBS, MODES AND FUNCTION KEYS

The information displayed by the GPS depends on the selected mode. There are five operational modes:

- NAV: Displays navigation and position information on your selected route.
- WPT: Displays waypoint specific information.
- FPL: Displays and navigates a loaded flight plan.
- CALC: Allows fuel and airdata computations.
- AUX: Displays other information such as system data.

There are four function keys:

- DIRECT-TO: Used to select a waypoint for navigation.
- MSG: Displays system messages.
- ENT: Used for data entry.

The knobs, outer and inner knobs, are used for data navigation:

- The Outer knob is used to navigate the top line of the display.
- The Inner knob is used to navigate the bottom line of the display

INTERNAL ANNUNCIATOR LIGHTS

The internal annunciator lights are located above and to the right of the LED display. They are only visible when lit.

- MSG: The Message annunciator flashes when there is a new message to view. If there are multiple messages that you have not yet viewed, the light continues to flash until all messages have been viewed.
- WPT: The Waypoint annunciator light alerts you to waypoint arrival. The light will flash when approaching the active waypoint.
- PTK: Parallel track annunciator light. Not available, only turns on during self-test.
- HLD: The Hold annunciator light alerts the pilot that Active Flight Plan is suspended at the current Active Waypoint.
- APR: The Approach annunciator light turns on when there is an approach loaded and active.

NAV MODE

The NAV mode is the most frequently used mode in the GPS. Once you had loaded a flight plan, the NAV mode provides information needed to navigate the aircraft through the selected route. In NAV mode each display line has eight data pages available that can be navigated by using the outer and inner knobs.

TOP LINE

The data pages displayed on the top line, starting with the default page and rotating the outer knob clockwise, are:

- TO-Waypoint, Bearing, Distance and ETE (estimated time en route).
- TO-waypoint, ETE and ETA (estimated time of arrival in Zulu time).
- Heading, TAS (True Airspeed), and wind.
- Heading, Ground Track and Drift Angle.
- Current Track and recommended altitude.
- DTK (Desired Track), Fly left or right to correct XTK (cross track error), XTK error.
- MSA (Minimum Safe Altitude) and MESA (Minimum En route Safe Altitude).
- TKE (Track Error), DTK and Distance to Waypoint.

BOTTOM LINE

The data pages displayed on the bottom line, starting with the default page and rotating the inner knob clockwise, are:

- CDI, Ground Track and Ground Speed.
- Current Track and recommended altitude.
- Heading, TAS, and wind.
- Heading, Ground Track and Drift Angle.
- MSA and MESA.
- TO-waypoint, ETE and ETA.
- DTK, Fly left or right to correct XTK, XTK error
- Advisory Waypoint range and bearing.

WPT MODE

To waypoint mode displays waypoint data. It is also possible to change the current waypoint by clicking on the DIRECT-TO function key. There are two mode pages in WPT Mode:

MODE 1 (Flight plan Mode)

Current flight plan waypoint data is displayed as follows:

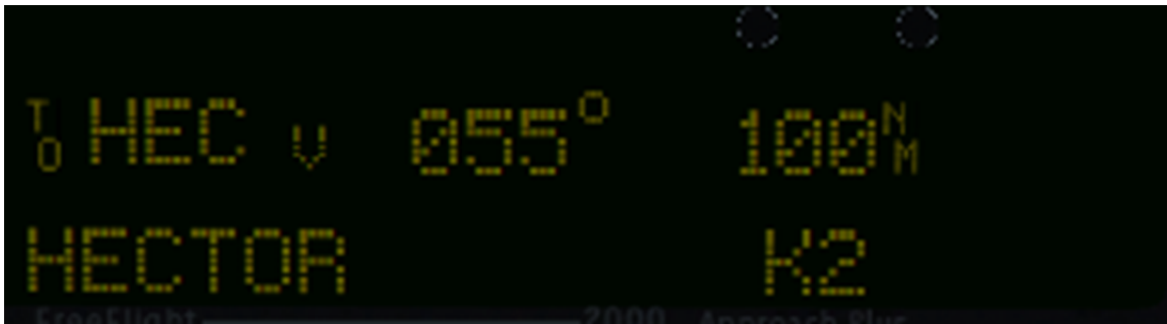


Fig. 100 Typical WPT (Flight Plan Mode) Display

TOP LINE

The data displayed on the top line is always the same:

- Selected Waypoint Identifier, Waypoint Type, Bearing and Distance.

Clicking on the outer knob changes the selected waypoint. The current waypoint does not change by clicking the outer knob. To change the current waypoint you must click on the DIRECT-TO function key.

The waypoint Type is indicated by a single letter code:

- A = Airport.
- I = Intersection.
- V = VOR.
- N = NDB.
- U = User.
- T = ATC.

BOTTOM LINE

The data displayed on the bottom line depends on waypoint type.

For Airports:

- Identifier, city name, facility name.
- Radio frequencies available.
- Airport elevation.
- Type of lighting.
- Active runway, runway type and length.
- Active runway Latitude and Longitude.

For Intersections:

- Name and Region
- Latitude and Longitude

For VORS and NDBs:

- Identifier, City name, Region.

- VOR Type and Class.
- NDB Type.
- Frequency.
- Elevation.
- Latitude and Longitude.

For User:

- Name
- Latitude and Longitude.

MODE 2 (Approach Mode)

If the waypoint data being displayed corresponds to an airport then by clicking on the WPT key will select the approach mode. In this mode, the selected airport's instrument approaches can be reviewed and selected.



Fig. 101 Typical WPT (Approach Mode) Display

TOP LINE

The data displayed on the top line is always the same:

- Airport Identifier.
- Currently selected approach name,

Clicking on the outer knob changes the selected approach.

BOTTOM LINE

The data displayed on the top line is always the same:

- Selected Transition Name.
- Selected Transition's Leg information.,

Left-Clicking on the inner knob changes the selected transition. Right Clicking on the inner knob displays the leg information for the selected transition.

FPL MODE

Flight plan mode is used to review the current loaded flight plan. There are two mode pages in FPL mode.

MODE 1

The top line always display the activate Flight Plan Start and Destination. The bottom line displays the current leg in the route. Clicking on either to outer or inner knobs will change the bottom display indicating the next legs in the flight plan.



Fig. 102 Typical FPL (Mode 1) display.

MODE 2

The top line displays the selected leg in the route. The bottom line displays the following leg information:

- Bearing, Distance and ETE

Clicking on either to outer or inner knobs will change the selected leg in the flight plan.



Fig. 103 Typical FPL (Mode 2) displays.

CALC MODE

Calculator mode allows you to select many common functions and flight plan based calculations. There are two mode pages in CALC mode:

MODE 1 (Flight plan/Fuel Mode)

This mode show current flight plan data and information when available. It can be used as a flight planning calculator. If you are using an active flight plan, this mode uses current ground speed and fuel consumption to compute the following:

- Estimated Time En Route (ETE)
- Estimated Time of Arrival (ETA)
- Flight Plan Distance (DIST)
- Rate of Fuel Consumption

The fuel management pages also estimate the amount of fuel required to arrive at the current destination. If you are flying a multi-leg flightplan, the data reflects calculations from present position through the flight plan to final destination. The pages available in this mode are:

- Time, Distance and Speed Calculations
- Fuel Management
- Fuel Remaining
- Fuel At Arrival
- Minimum Fuel
- Total Fuel Used
- Engine Fuel Flow

Note: All fuel consumption calculations use Gallons Per Hour (GPH).



Fig. 104 Typical CALC Mode (Mode 1) display.

MODE 2 (Air Data Mode)

Air data calculations are available in the Air Data mode. The pages available in this mode are:

- Pressure Altitude Calculations
- Density Altitude Calculations
- True Airspeed Calculations.
- Winds Aloft Calculations.



Fig. 105 Typical CALC Mode (Mode 2) display

AUX MODE

The auxiliary (AUX) mode displays current time information only.



Fig. 106 Typical AUX Mode display.

AUTOPILOT

The Metroliner does not come from the factory with an autopilot. This model has an active autopilot in order to activate the YAW DAMPER function that in FSX/P3D is a function of the autopilot.

Only basic autopilot functions are enabled:

- Yaw Damper
- Altitude Hold
- Heading Hold

OPERATIONS

To activate the autopilot you have to click on the YAW DAMPER switch (Fig. 101-1), located in the center console.



Fig. 107 Virtual Cockpit Autopilot Controls

ALTITUDE HOLD

Autopilot Altitude is controlled by the Altitude Selector (Fig. 101-2).

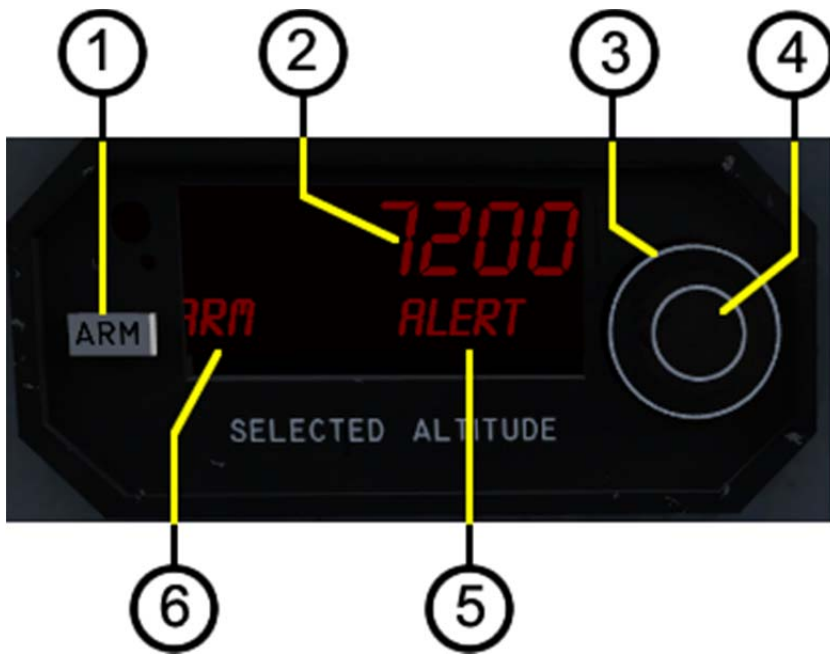


Fig. 108 Altitude Selector

1. ARM switch. Activates the Altitude Hold when the Autopilot is engaged. Also activates the ALERT display
2. Selected Altitude Display (feet)
3. Outer knob : increments/ decrements the selected altitude in thousands of feet.
4. Inner knob: increments/ decrements the selected altitude in hundreds of feet.
5. ALERT display: Indicates when the aircraft is within one thousand feet of the select altitude.
6. ARM display: Indicates that the ALERT and Altitude hold are engaged.

To select the desired altitude, click on the outer and inner knobs until the wanted altitude is displayed.

To activate the altitude hold, click on the ARM button. The ARM warning display will turn on indicating the system is enabled.

NOTE

Sometimes it is necessary to cycle the ARM switch before the altitude hold is engaged.

The ALERT display will turn on when the difference between aircraft current altitude and the selected altitude is less than one thousand feet.

HEADING HOLD

The autopilot heading is controlled by the HDG knob in the EHSI Control Panel. To activate the Heading Hold you can either use the Keyboard Command (Default is Ctrl+H) or the provided 2D panel.

The EHSI Selected Heading Cue will rotate until it reaches the desired heading.

CONTROLS

Although there are no specific autopilot controls in the cockpit, we have provided a 2D control panel accessible through the View Instrument Panels menu (Fig. 102). To view the control panel select the KAP-140 option.



Fig. 109 Autopilot Panel

The buttons are:

- AP: Turns Autopilot On/Off. This can be overridden by the Yaw Damper Switch when it is in the ON position.
- YD: Activates the Yaw Damper. This will be overridden by the Yaw Damper Switch.
- BC: Back Course On/Off
- APP: Approach hold On/Off.
- NAV: NAV hold On/Off.
- HDG: Heading Hold On/Off.
- ALT: Altitude Hold On/Off. This can be overridden by the Altitude Selector's ARM Switch.
- IAS: Airspeed Hold on/Off. Not available. This aircraft does not have an auto throttle that enables this feature.
- FD: Inop.
- SR: Soft Ride On/Off. Inop
- HB: Half Bank On/Off. Inop



PASSENGER AND CARGO HANDLING

The SA-227-BC is both a passenger and cargo airplane and we have created payload managers for each version. To activate the payload manager select the Payload Manager option in the View\Instruments menu.

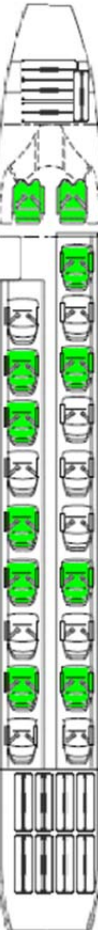
The payload managers are based on the weight and balance calculation sheets provided by the real aircraft's manual. The payload managers can also open/close the main and cargo doors. If for any reason one of the built-in fire extinguishers has been fire, the payload manager can reset it.

The payload manager will help you determine if the aircraft is too heavy for a safe takeoff.

METRO

The Metroliner's payload manager is designed to handle both passenger and cargo. To place a passenger in a seat, click on the seat's row green button. The occupied seat will turn green. To retire a passenger, click on the red button.

SA227-BC



WEIGHT AND BALANCE CALCULATION FORM

STANDARD 19 PLACE CABIN WITH HIGH-BACK, BUCKET SEATS

	PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)
F.S. 42: Forward Baggage	520	0
F.S. 111: Crew Seats	340	0
High-Back, Bucket Seats		
F.S. 148: Row 1 Seat or F.S. 144: Coat Closet	180	0
F.S. 178: Row 2 Seats	0	0
F.S. 207: Row 3 Seats	340	0
F.S. 236: Row 4 Seats	170	0
F.S. 266: Row 5 Seats	0	0
F.S. 297: Row 6 Seats	170	0
F.S. 328: Row 7 Seats	340	0
F.S. 359: Row 8 Seats	0	0
F.S. 389: Row 9 Seats	340	0
F.S. 419: Row 10 Seats	0	0
F.S. 475: Baggage	760	0
TOTAL PAYLOAD AND MOMENT	3160	0

(a)

BASIC EMPTY WEIGHT & MOMENT 8900 0

ADJUSTMENT FOR BULKHEAD

OTHER ADJUSTMENTS

ADJUSTED EMPTY WT & MOMENT 8900 0

(b) (FROM WT. & BAL. RECORD)

(c)

(d)

(e)

EMPTY WT & MOM, EXISTING CONFIGURATION 8900 0

CAWI FLUID WT & MOMENT 128 0

ZERO FUEL WT & MOMENT (a) + (e) + (f) 12188 0

(e)

(f)

(g)*

MAX. ALLOWABLE FUEL 3912

ACTUAL FUEL WEIGHT & MOMENT 3752 0

TAKEOFF WEIGHT & MOMENT (g) + (h) 15940 0

LESS CAWI FLUID CONSUMED 0 0

FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) - (f) 15940 0


(h)

(i)


(f)


*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE




OPEN/CLOSE PASSENGER DOOR.






REFILL ENGINES
FIRE EXTINGUISHERS



OPEN/CLOSE CARGO & BAGGAGE DOORS.



L


R

Fig. 110 Metroliner payload manager.

EXPEDITER

The Expediter's payload manager is configured to handle cargo. There are 5 cargo zones in the expediter, to put cargo in one of the zones, click on the green button. To remove cargo, click on the red button. Using the wheel in either green or red button will add/subtract cargo faster.

SA227-BC




EXPEDITER WEIGHT AND BALANCE CALCULATION FORM


	PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)
F.S. 42: Forward Baggage	200	0
F.S. 111: Crew Seats	340	0
F.S. 148: Row 1 Seat	0	0
F.S. 178: Row 2 Seats	0	0
F.S. 204: Cargo Zone 1	880	0
F.S. 288: Cargo Zone 2	710	0
F.S. 388: Cargo Zone 3	660	0
F.S. 451.5: Cargo Zone 4	450	0
F.S. 510: Cargo Zone 5	410	0
TOTAL PAYLOAD AND MOMENT	3650	0


(a)


BASIC EMPTY WT. & MOM	8900	0	(b)
ADJUSTMENTS			(c)
ADJUSTED EMPTY WT. & MOM	8900	0	(d)
EMPTY WT. & MOM, EXISTING CONFIGURATION	8900	0	(d)
AWI FLUID WT. & MOMENT	128	0	(e)
ZERO FUEL WT & MOMENT (a) + (d) + (e)	12678	0	(f)*
MAX. ALLOWABLE FUEL	3422		
ACTUAL FUEL WT. & MOMENT	2680	0	(g)
TAKEOFF WT. & MOMENT (f) + (g)	15358	0	(h)*
LESS AWI FLUID CONSUMED	0	0	(e)
FLIGHT WT. & MOM, W/AWI FLUID CONSUMED (h) - (e)	15358	0	*


* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE


 OPEN/CLOSE PASSENGER DOOR.



 REFILL ENGINES
FIRE EXTINGUISHERS

 OPEN/CLOSE CARGO & BAGGAGE DOORS.



 **L**


 **R**

Fig. 111 Expediter payload manager.

Cargo zones 1 thru 4 have a 1,150 pounds weight limit, while cargo zone 5 has a 600 pounds weight limit. The payload manager will not allow you to place weight above the limit for any cargo zone.



NORMAL PROCEDURES

BEFORE STARTING ENGINES

COCKPIT

1. Battery switches..... ON
2. Interior Lights..... AS DESIRED
3. Landing Gear Handle..... DOWN

PILOT'S CONSOLE

1. Left Essential Bus Tie Switch:..... ON
2. Bus Transfer Switches LEFT BUS
3. Auto/Cont Ignition switches AUTO
4. Starter Test Switch CENTERED
5. Speed Switch Select Switches AUTO
6. Start Mode Switch..... AS REQUIRED
7. Nose Wheel Steering Switch AS DESIRED
8. Battery Voltage CHECK
9. SRL Switches..... NORMAL
10. Temp Limiter Test Switch..... CENTERED
11. Light Control Knobs..... AS REQUIRED
12. Unfeather Test Switch..... CENTERED

INSTRUMENT PANEL

1. Static Selector NORMAL
2. Cabin Altitude and Rate indicators and Controls..... CHECK/SET
3. All Rocker Switches (except battery switches) OFF
4. Pitch Trim CHECK
5. Fuel Counter..... ZEROED
6. Fuel Quantity..... CHECK
7. Crossflow Switch CLOSED
8. Temperature Controls..... AS REQUIRED
9. Cabin Pressure Dump Switch DUMP
10. Bleed Air Switches..... OFF

COPILOT'S CONSOLE

1. Cargo Door Auxiliary Warning Light..... TEST/CHECKOUT
2. Light Control Knobs..... AS REQUIRED
3. Nonessential Bus Tie Switch ON
4. Right Essential Bus Tie Switch ON

PEDESTAL

1. Light Control Knobs..... AS REQUIRED
2. Aileron Trim NEUTRAL
3. Rudder Trim NEUTRAL

4. PARKING Brake..... SET
5. Auxiliary Trim Switch..... OFF
6. SAS Servo Switch..... OFF
7. Fuel and Hydraulic Shutoff Switches OPEN
8. Fuel Boost Switches OFF
9. Engine Stop and Feather Controls IN
10. Trim Select Switch..... PILOT
11. Flaps Control UP
12. Water Injection Switch..... OFF
13. Control Lock OFF
14. Speed Levers LOW RPM/FRICTION SET
15. Power Levers..... SET AT GROUND IDLE
16. Propeller Synchrophaser TAKEOFF AND LANDING

BATTERY START

1. Battery Switches ON
2. Battery Temperature Indicator TEST
3. Annunciator Panel Lights PRESS TO TEST
4. Fire Extinguisher System TEST
5. Inverter (Check No 2 then No 1) ON
6. All Instruments and Clocks..... CHECKED/SET

RIGHT ENGINE (RECOMMENDED FIRST)

7. SRL OFF Light..... CHECK ON
8. Boost Pumps CHECKED/AS DESIRED
9. Propellers UNFEATHERED/CLEAR
10. Start Mode Switch..... AS DESIRED
11. Engine Start Button:..... CLICK
12. RPM..... 10% TO 12%
13. Ignition Light ON AT 10% RPM
14. EGT MONITOR (770⁰ MAXIMUM FOR ONE SECOND)
15. RPM..... STABILIZED AT 70% TO 72%
16. EGT STABILIZED
17. Fuel and Oil Pressures..... GREEN OR YELLOW ARCS
18. Generator..... RESET/ON
19. SRL OFF Light..... ON BELOW 80% RPM
20. Bleed Air Switch (Right Engine)..... ON
21. Start Mode Switch..... PARALLEL

LEFT ENGINE

22. Right Generator Load..... 150 AMPS MAXIMUM
23. Repeat Steps 7 to 20 for left engine.

TAXI

1. Parking Brake RELEASE
2. Power levers AS REQUIRED
3. Brakes CHECK
4. Nose Wheel Steering System TEST

BEFORE TAKEOFF

1. Controls..... FREE
2. Stabilizer, Rudder and Aileron Trim SET FOR TAKEOFF
3. FlapsSET AT 1/4
4. Propeller Synchrophaser..... TAKEOFF & LANDING
5. Flight InstrumentsSET AND CHECK
6. Engine Instruments CHECK IN GREEN
7. Annunciator Panel..... CHECK
8. Suction, Deice and Hydraulic Pressure CHECK
9. Takeoff Power Setting, V_1 , V_R , V_2 and V_{50} Speeds and Takeoff Weight CONFIRM
10. NTS CHECK
(SEE SYSTEM CHECKS AND OPERATION SECTION)
11. CAWI SYSTEM..... CHECK
12. Ignition Switches AUTO OR CONT
13. Ice Protection SystemCHECK AS REQUIRED
14. Fuel Quantity..... CHECK
(400 POUNDS IS MAXIMUM IMBALANCE WHEN
TOTAL FUEL IS LESS THAN 2,000 POUNDS. 200
POUNDS IS MAXIMUM IMBALANCE WHEN
TOTAL FUEL IS GREATER THAN 2,000 POUNDS)
15. Fuel Crossflow Valve CHECK CLOSED
16. Navigation Equipment AS REQUIRED
17. Interior/Exterior Lights..... AS REQUIRED

TAKEOFF – (DRY)

1. Bleed Air Switches..... AS DESIRED
2. Speed Levers HIGH RPM/SRL OFF ANNUNCIATOR
LIGHTS OUT/FRICTION SET
3. Engine Speed..... CHECK 96% TO 97.5% RPM
4. Power Levers..... SET COMPUTED TAKEOFF SPEED
DO NOT EXCEED 650°C OR 97% TORQUE
5. Engine Speed..... CHECK 100% TO 101% RPM
6. Brakes..... RELEASE
7. NWS Power Lever Button AS DESIRED
8. V_R Speed ROTATE
9. Landing Gear (after liftoff)UP

10. V₅₀ Speed..... MAINTAIN UNTIL OBSTACLES ARE CLEARED
11. FlapsUP

TAKEOFF – (WITH CAWI)

1. Bleed Air Switches..... OFF
2. Speed Levers HIGH RPM/SRL OFF ANNUNCIATOR
LIGHTS OUT/FRICTION SET
3. Engine Speed..... CHECK 96% TO 97.5% RPM
4. Power Levers..... APPROXIMATELY 60% TORQUE
5. Water Injection Switch..... CONTINUOUS
6. CAWI Pump Lights..... CHECK ON
7. Torquemeters CHECK SYMMETRICAL INCREASE
8. Power Levers..... SET COMPUTED TAKEOFF SPEED
DO NOT EXCEED 650°C OR 97% TORQUE
9. Engine Speed..... CHECK 100% TO 101% RPM
10. Brakes..... RELEASE
11. NWS Power Lever Button AS DESIRED
12. V_R Speed ROTATE
13. Landing Gear (after liftoff)UP
14. V₅₀ Speed..... MAINTAIN UNTIL OBSTACLES ARE CLEARED
15. FlapsUP

CLIMB

1. Climb Speed ATTAIN
2. Water Injection Switch..... OFF
3. Bleed Air Switches..... AS DESIRED
4. Climb Power NOT TO EXCEED 650°C EGT OR 100% TORQUE
5. Propeller Synchrophaser Switch CLIMB & CRUISE
6. Ignition Switches AUTO OR CONT
7. Ice Protection Systems..... AS REQUIRED
8. Cabin Pressure Scheduling..... CHECK
9. No Smoking – Fasten Seat Belts Signs..... AS REQUIRED
10. Nose Wheel Steering Switch OFF

10,000 FEET (CHECK AS FOLLOWS)

1. Ammeters..... CHECK
2. Annunciator Panel..... CHECK

CRUISE

1. Bleed Air Switches..... AS DESIRED
2. Cruise Power SET (97% RPM, 650°C EGT MAX)
3. Cabin Pressurization..... AS DESIRED

DESCENT

1. Power AS REQUIRED
2. Altimeters..... SET
3. Cabin Pressure Controller SET TO ENSURE ZERO
CABIN DIFFERENTIAL AT TOUCHDOWN
4. Cabin Rate Control AS DESIRED
5. No Smoking – Fasten Seat Belts Signs..... AS REQUIRED
6. Fuel Quantity..... CHECK
(400 POUNDS IS MAXIMUM IMBALANCE WHEN
TOTAL FUEL IS LESS THAN 2,000 POUNDS. 200
POUNDS IS MAXIMUM IMBALANCE WHEN
TOTAL FUEL IS GREATER THAN 2,000 POUNDS)
7. Fuel Crossflow Valve CHECK CLOSED
8. Ignition Switches AUTO OR CONT
9. Ice Protection Equipment AS REQUIRED

BEFORE LANDING

1. No Smoking – Fasten Seat Belts Signs..... ON
2. Exterior and Interior Lights AS REQUIRED
3. Propeller Synchrophaser Switch TAKEOFF & LANDING
4. Speed Levers HIGH RPM
5. Friction Controls..... SPEED LEVERS – AS DESIRED/POWER LEVERS – OFF
6. Landing Gear/Hydraulic Pressure and Indicators DOWN/CHECK
7. Flaps AS REQUIRED
8. Cabin Differential Pressure CHECK ZERO
9. Nose Wheel Steering Switch ARMED
10. Ignition Switches AUTO OR CONT
11. Fuel Crossflow Valve CHECK CLOSED
12. Final Approach Speed CONFIRM

BALKED LANDING

1. Power Levers..... 650°C EGT OR 100% TORQUE (WHICHEVER OCCURS FIRST)
2. Climb Speed ATTAIN
3. Rate of Climb..... ESTABLISH POSITIVE RATE OF CLIMB
4. Landing Gear UP
5. Flaps RETRACT TO 1/2
6. Airspeed ACCELERATE TO 125 KIAS
7. Flaps UP
8. Engine and Propeller Heat Switches AS REQUIRED
9. Ignition Switches AUTO OR CONT

LANDING

1. Power Levers FLIGHT IDLE
2. Power Levers (after touchdown) GROUND IDLE
3. Brakes AS REQUIRED
4. Nose Wheel Steering AS REQUIRED
5. Power Levers REVERSE (AS REQUIRED)

AFTER LANDING

1. Power Levers GROUND IDLE
2. Flaps UP
3. Speed Levers LOW RPM
4. Ignition Switches AUTO
5. Ice Protection Systems OFF
6. Stabilizer, Aileron and Rudder Trim NEUTRAL
7. Exterior and Interior Lights AS DESIRED

STOPPING ENGINES

1. Nose Wheel Steering OFF
2. Avionics OFF
3. Cabin Pressure Dump Switch DUMP
4. Bleed Air Switches OFF
5. Generator Switches OFF
6. Engine Stop Buttons CLICK
7. Power Levers REVERSE AT APPROXIMATELY 50% REVERSE
8. Fuel Boost Switches OFF
9. Inverter Switch OFF
10. Exterior and Interior Lights OFF
11. Battery Switches OFF
12. Parking Brake AS REQUIRED

SYSTEM CHECKS AND OPERATION

NTS SYSTEM

Check Propeller governor rest function by setting speed lever low and advancing power lever slowly. Note maximum stabilized RPM does not exceed 94.5% RPM.

START LOCKS SYSTEM

To disengage the propeller start locks after an engine start, move the engine throttle to the reverse position for 1 second and return to ground idle.

Start locks will automatically engage when the RPM drops below 10%

SPEED REFERENCE CARDS

10,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	103	103	FLAPS UP 110
VR	103	103	FLAPS ¼ 108
V2	118	121	FLAPS ½ 103
VYSE	123	FULL	99

10,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	103	103	FLAPS UP 112
VR	103	103	FLAPS ¼ 110
V2	115	119	FLAPS ½ 105
VYSE	124	FULL	101

11,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	101	103	FLAPS UP 114
VR	101	103	FLAPS ¼ 112
V2	114	118	FLAPS ½ 107
VYSE	124	FULL	103

V1 = Engine failure recognition speed or takeoff decision speed.

VR = Rotation speed. The speed at which the aircraft's nosewheel leaves the ground.

V2 = Minimum takeoff safety speed.

VYSE = Best rate of climb speed.

11,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	100	102	FLAPS UP 116
VR	100	102	FLAPS ¼ 113
V2	112	116	FLAPS ½ 108
VYSE	124	FULL	104

12,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	100	101	FLAPS UP 118
VR	100	101	FLAPS ¼ 115
V2	110	114	FLAPS ½ 110
VYSE	126	FULL	106

12,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	100	101	FLAPS UP 120
VR	100	101	FLAPS ¼ 116
V2	109	112	FLAPS ½ 111
VYSE	127	FULL	107

V1 = Engine failure recognition speed or takeoff decision speed.

VR = Rotation speed. The speed at which the aircraft's nosewheel leaves the ground.

V2 = Minimum takeoff safety speed.

VYSE = Best rate of climb speed.

13,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	101	101	FLAPS UP 122
VR	101	101	FLAPS ¼ 118
V2	109	111	FLAPS ½ 113
VYSE	126	FULL	109

13,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	102	102	FLAPS UP 124
VR	104	102	FLAPS ¼ 120
V2	111	111	FLAPS ½ 114
VYSE	130	FULL	110

14,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	104	105	FLAPS UP 126
VR	107	105	FLAPS ¼ 121
V2	113	113	FLAPS ½ 116
VYSE	131	FULL	112

V1 = Engine failure recognition speed or takeoff decision speed.

VR = Rotation speed. The speed at which the aircraft's nosewheel leaves the ground.

V2 = Minimum takeoff safety speed.

VYSE = Best rate of climb speed.

14,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	105	107	FLAPS UP 128
VR	109	107	FLAPS ¼ 123
V2	114	114	FLAPS ½ 118
VYSE	132	FULL	113

15,000 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	107	110	FLAPS UP 130
VR	112	110	FLAPS ¼ 125
V2	116	116	FLAPS ½ 119
VYSE	133	FULL	115

15,500 Lbs.

Takeoff	Dry	Wet	Landing Ref
V1	109	113	FLAPS UP 132
VR	115	113	FLAPS ¼ 127
V2	118	118	FLAPS ½ 121
VYSE	134	FULL	116

V1 = Engine failure recognition speed or takeoff decision speed.

VR = Rotation speed. The speed at which the aircraft's nosewheel leaves the ground.

V2 = Minimum takeoff safety speed.

VYSE = Best rate of climb speed.

16,000 Lbs.

Takeoff	Dry	Wet	Landing Ref	
V1	110	115	FLAPS UP	134
VR	117	115	FLAPS ¼	128
V2	119	120	FLAPS ½	122
VYSE	135		FULL	118

V1 = Engine failure recognition speed or takeoff decision speed.

VR = Rotation speed. The speed at which the aircraft's nosewheel leaves the ground.

V2 = Minimum takeoff safety speed.

VYSE = Best rate of climb speed.