Grumman Albatross (HU-16E & G-111)

Pilot's Guide

for Microsoft Flight Simulator 2020

DO NOT USE IN REAL AIRCRAFT

Preface

Welcome to the Grumman Albatross for Microsoft Flight Simulator 2020. This manual is intended to aid in understanding and navigating the peculiarities of the Albatross' systems and handling, and to help get the most satisfaction and enjoyment out of each flight in this versatile and rugged aircraft.

Introduction to the HU-16E

The HU-16E Albatross is a twin-engine amphibious seaplane developed and manufactured by American aerospace firm Grumman. The “E” variant is an evolutionary iteration of the original HU-16 design, the prototype of which took its maiden flight on October 24, 1947. The HU-16E was used by the United States Coast Guard from 1951 to 1983 for several maritime mission sets.

Grumman used their Mallard airframe for the base of their G-64 project, a military multi-role amphibious seaplane. The prototype, called the XJR2F-1 Pelican, took its maiden flight on October 24, 1947. This airframe would undergo several evolutionary developments and would ultimately be called the HU-16 Albatross.

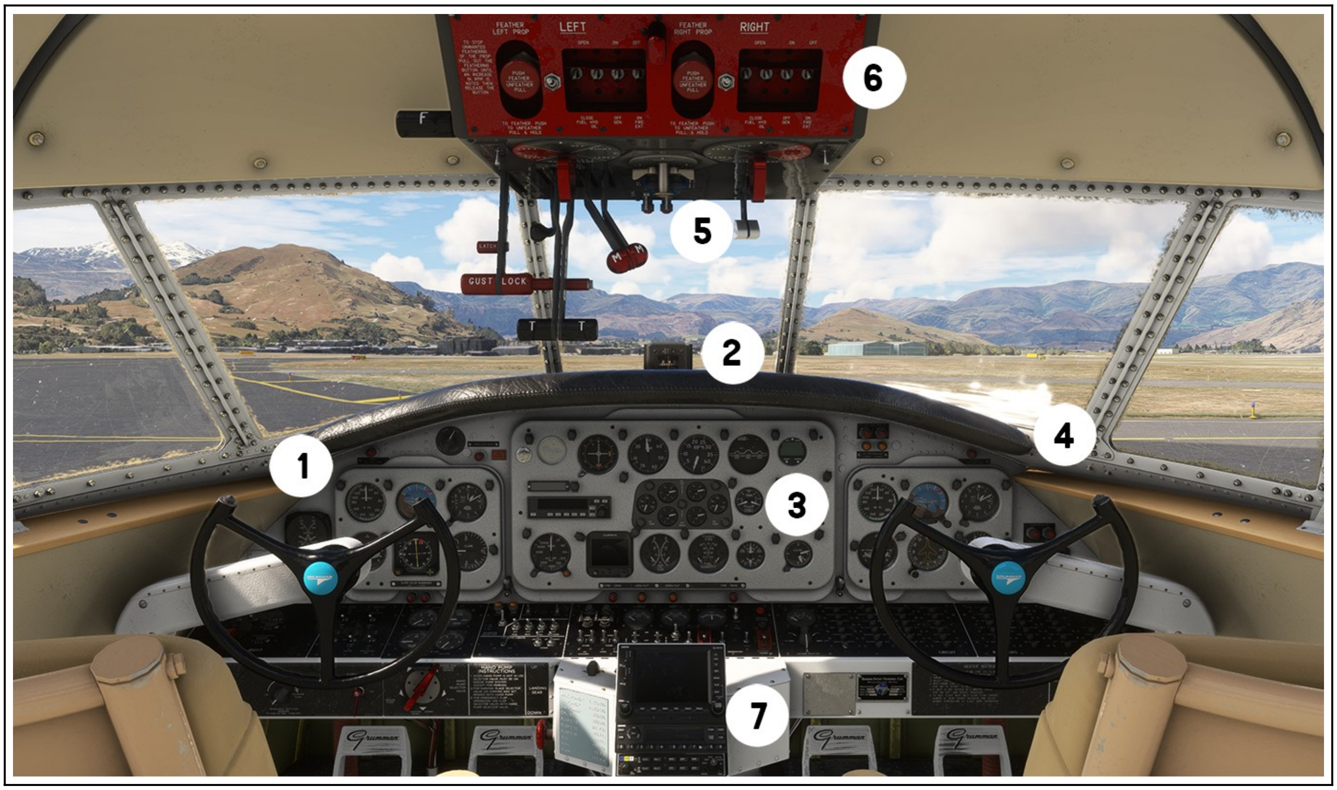
The HU-16 features all-metal construction except for fabric-covered elevator and rudder surfaces. It has a deep V-hull, allowing it to operate in rough seas, and a retractable tricycle undercarriage. The main wing is a cantilever design with stabilizing floats.

The HU-16E variant, which was used by the United States Coast Guard, has a larger wing than initial versions, giving it better performance. It proved an exceptional aircraft during its operational tenure for the service as it could operate from both land and water, boasted a spacious interior, was rugged and reliable, and had great endurance. The aircraft, called the “Goat” by its pilots and crew, performed a wide array of missions for the Coast Guard, including maritime search and rescue, patrol, transport of personnel and cargo, medical evacuation, and general maritime operational support. It participated in several specialized and high-profile operations, including patrols during the Cuban Missile Crisis.

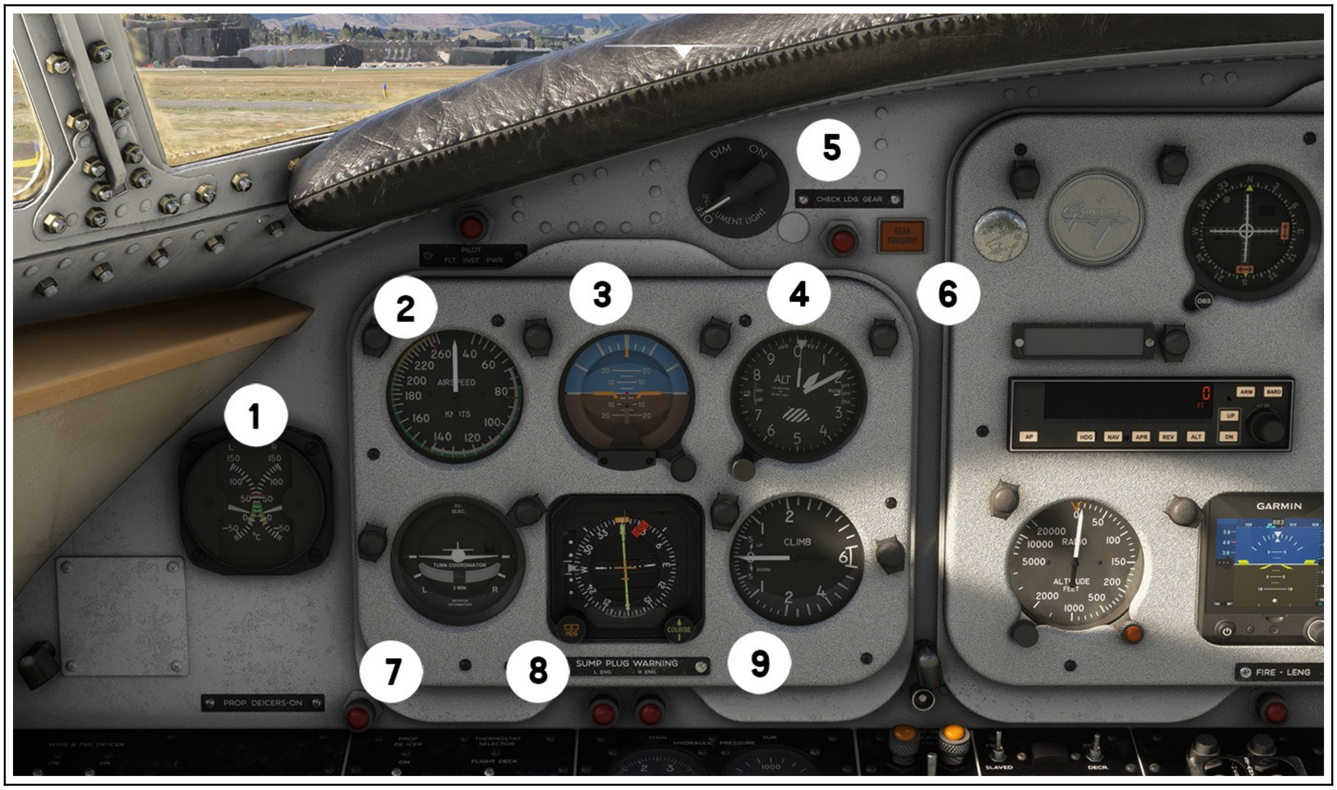
HU-16E General Specifications

Wingspan	96 feet, 8 inches
Length	61 feet, 3 inches
Height	25 feet, 10 inches
Powerplant	2 x Wright R-1820-76B Cyclone 9-cylinder, radial piston engines, 1425 HP each
Range	2100 NM
Cruise Speed	145 KTAS

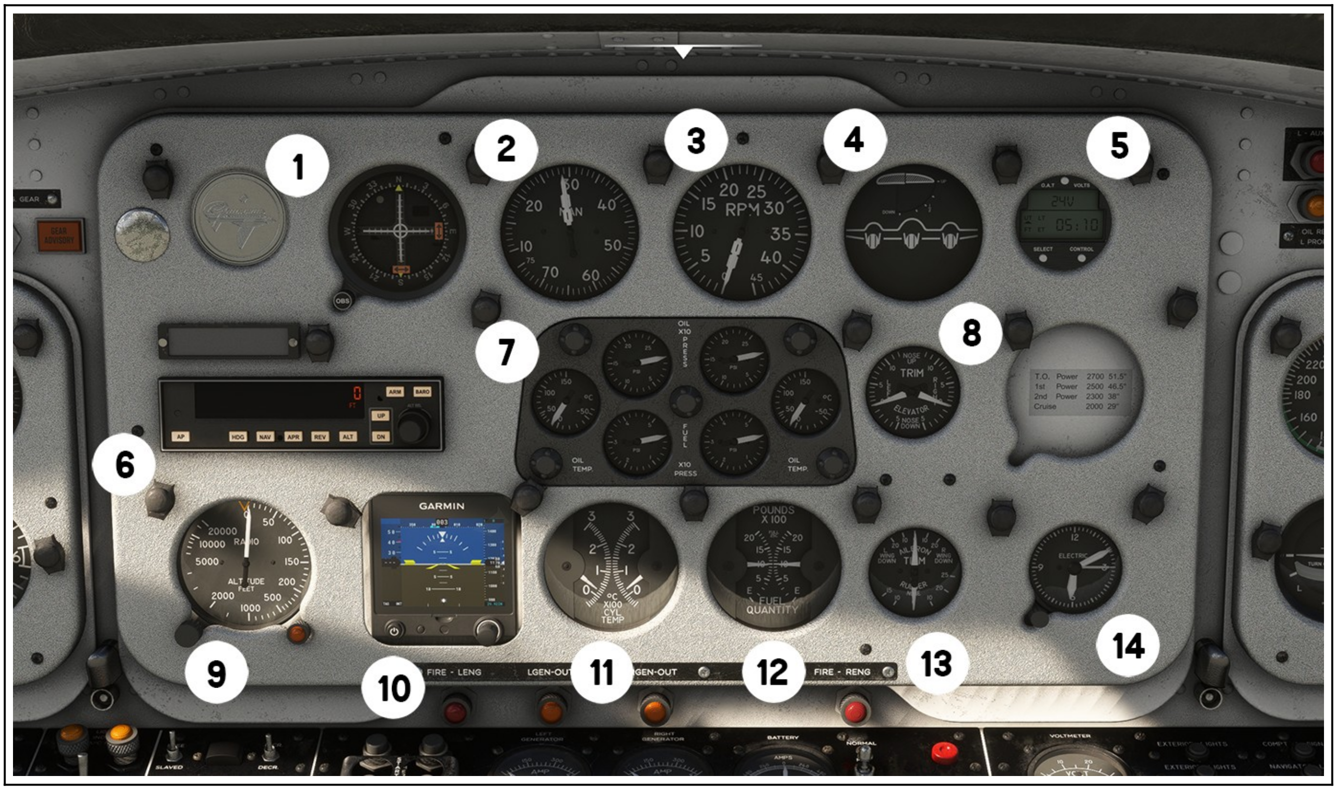
GENERAL COCKPIT ORIENTATION (HU-16E)



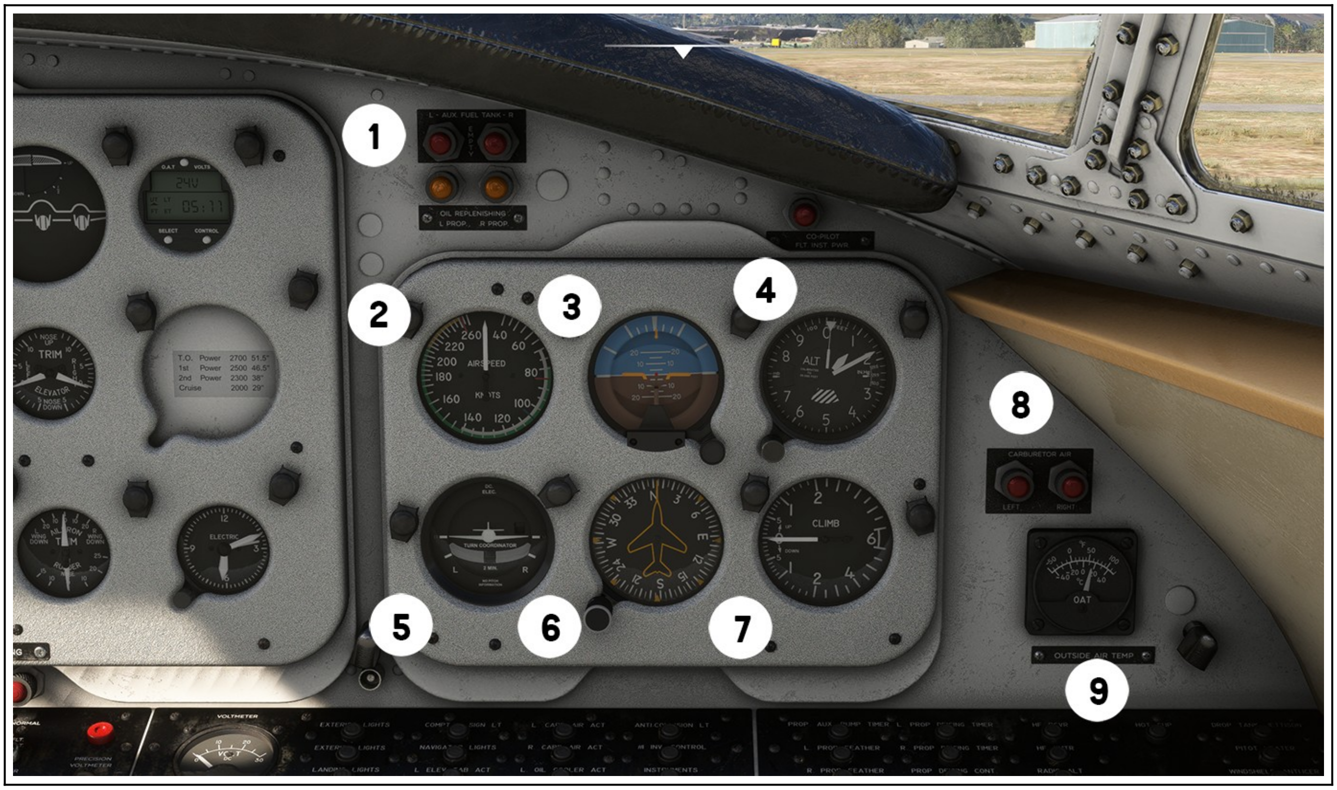
1. Flight Instruments (Pilot's Side)
2. Compass
3. Engine Instruments & Systems Indicators
4. Flight Instruments (Co-pilot's Side)
5. Engine Controls
6. Emergency Controls
7. Radio Stack (Garmin GNS 530, Transponder, Audio Panel)



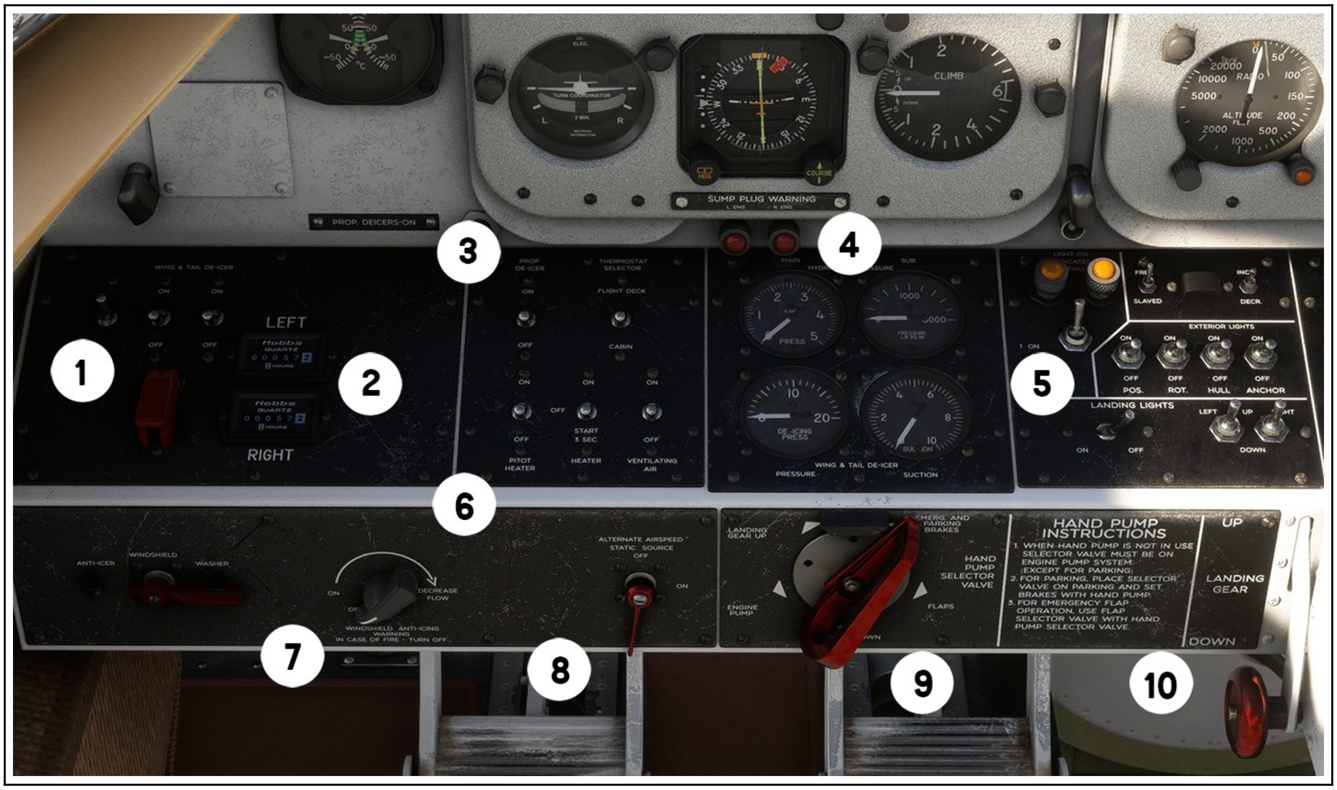
1. Left & Right Engine Carburettor Air Temperature Indicators (deg. Celsius)
2. Airspeed Indicator (in Knots)
3. Attitude Indicator
4. Altimeter (in Feet)
5. Instrument Lights Brightness Control
6. Landing Gear Warning Lights
7. Turn Coordinator
8. Horizontal Situation Indicator (HSI)
9. Vertical Speed Indicator (Feet per Minute x 1000)



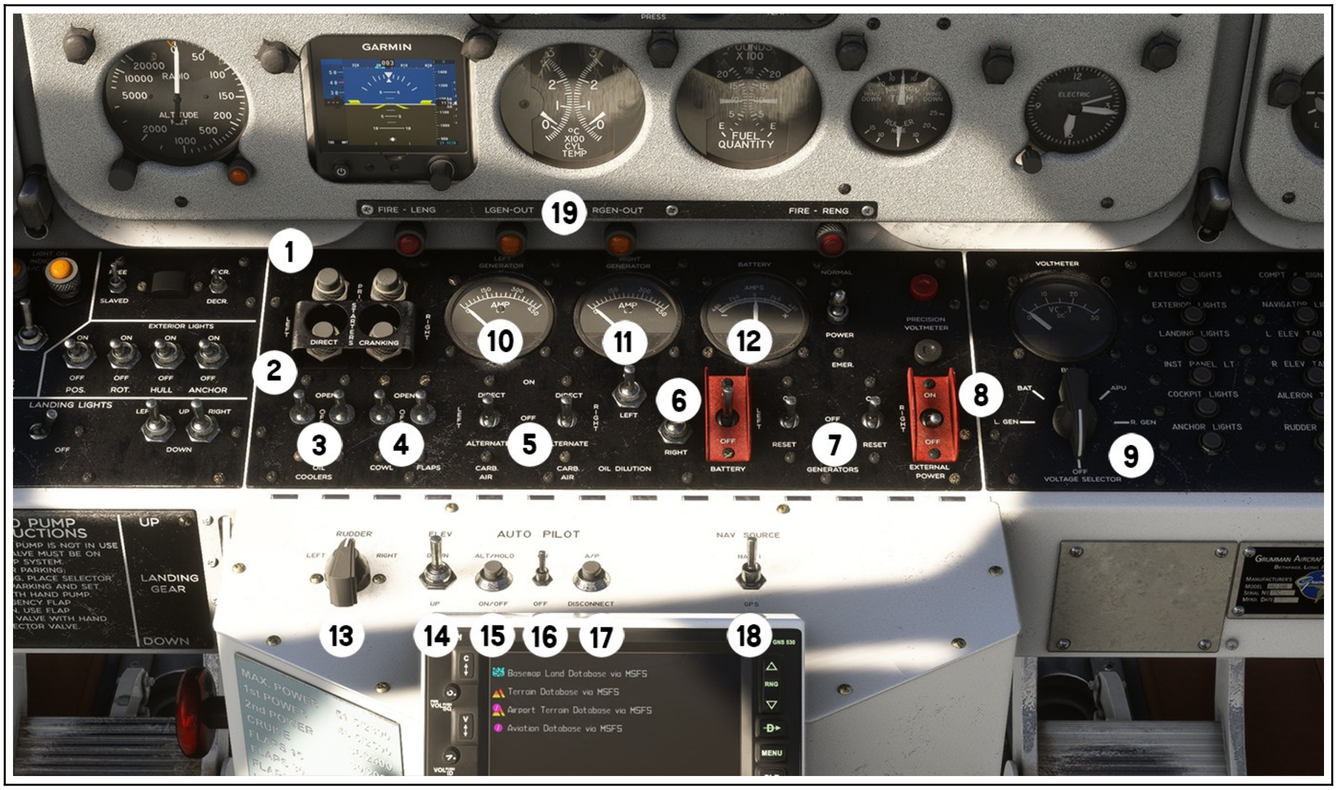
1. OBS (Omni Bearing Selector, Nav 1 Radio)
2. #1 & #2 (Left & Right) Engine Manifold Pressure Indicators (in inches of Mercury)
3. #1 & #2 (Left & Right) Engine Tachometers (in revolutions per minute)
4. Landing Gear and Flaps Position Indicators
5. Chronometer / Timer
6. Autopilot
7. Left and Right Engine Fuel Pressure (Psi), Oil Pressure (Psi), and Oil Temperature (degrees Celsius) Indicators
8. Elevator Trim Position Indicators
9. Radio Altimeter (in Feet)
10. Backup Attitude Indicator and MFD
11. Left & Right Engine Cylinder Head Temperature Indicators (degrees Celsius)
12. Fuel Quantity Gauges (Left and Right Main Tanks only, in pounds)
13. Aileron and Rudder Trim Indicators
14. Clock



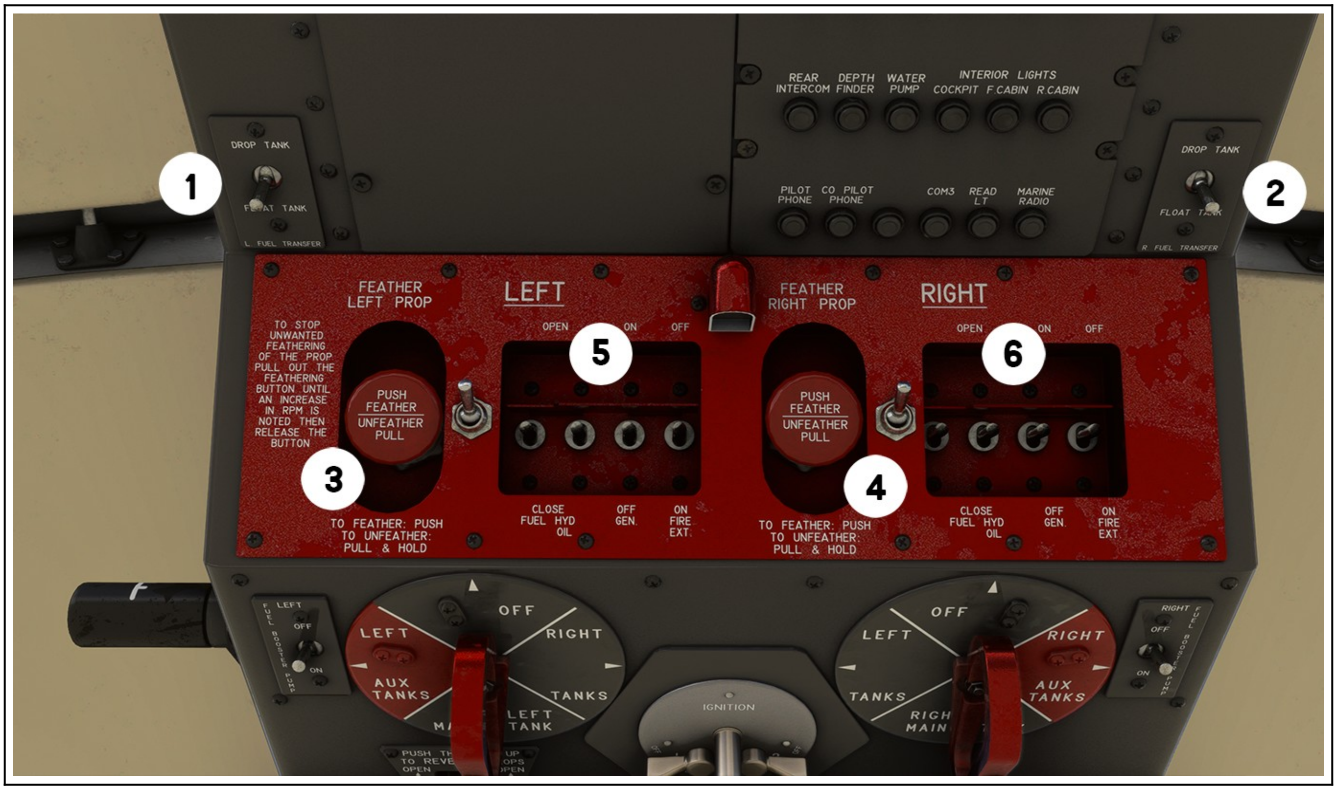
1. Auxiliary Fuel Tank Pump Dry Indicator Lights
2. Airspeed Indicator (in Knots)
3. Attitude Indicator
4. Altimeter (in Feet)
5. Turn Coordinator
6. Gyro Heading Indicator (in degrees)
7. Vertical Speed Indicator (Feet per Minute x 1000)
8. Left and Right Engine Carburettor Alternate Air (Max Carb. Heat) Indicator Lights
9. Outside Air Temperature (in degrees Celsius)



1. Wing & Tail (Structural) De-ice Boot Switches
2. Hobbs Engine Time Indicators (in hours)
3. Propeller De-ice Switch
4. Hydraulic System & Structural De-ice Pressure Gauges (in Psi)
5. Exterior Lighting Switches
6. Pitot Heater Switch
7. Windshield De-ice Switch
8. Alternate Static Air Source Control
9. Backup Hydraulic Line Selector
10. Landing Gear Selector

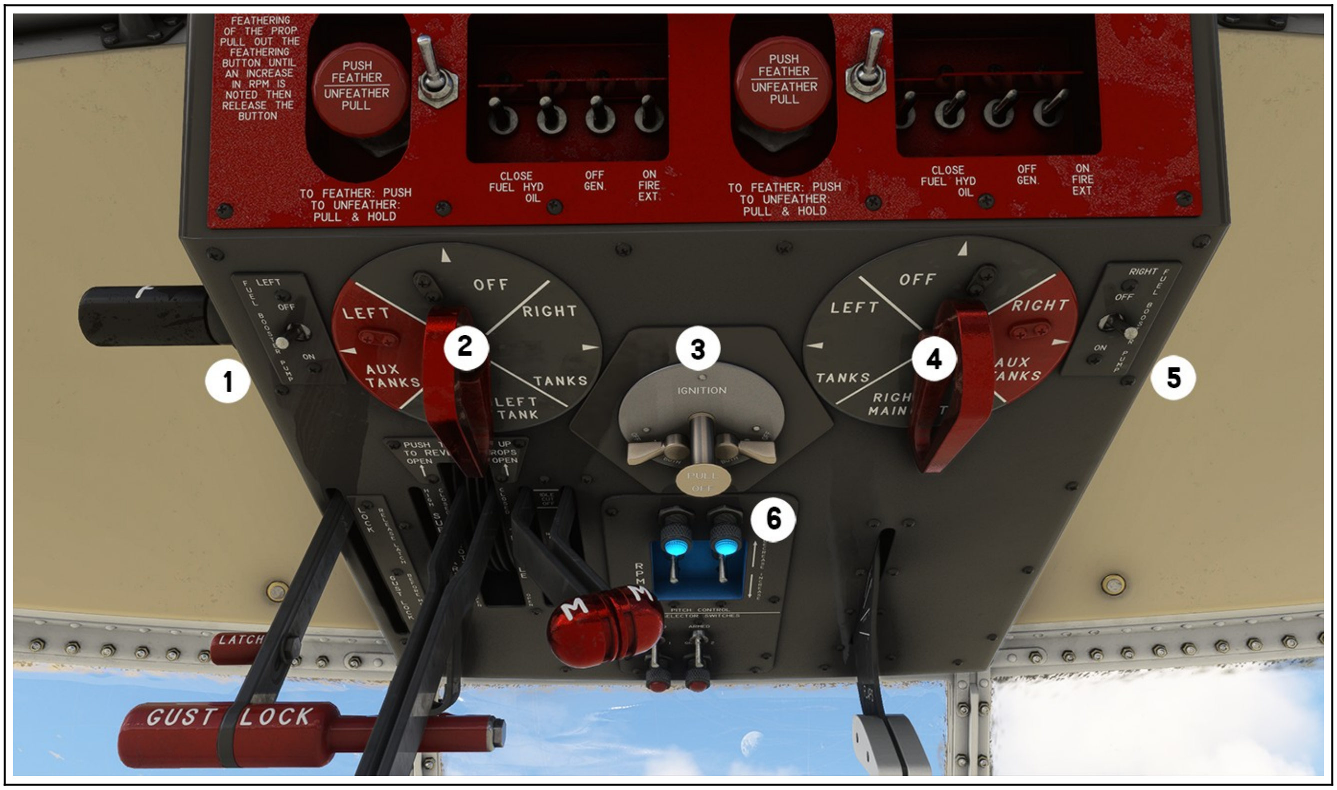


1. Engine Primer Buttons
2. Engine Starter Buttons
3. Engine Oil Cooler Flap Switches
4. Engine Cowl Flap Switches
5. Alternate Carburettor Air (Carb Heat) Switches
6. Master Battery Switch
7. Generator Switches
8. External Power Connection Switch
9. Voltmeter Bus Selector Knob
10. Left Engine Generator Current Load (in Amperes)
11. Right Engine Generator Current Load (in Amperes)
12. Battery Bus Current Load (in Amperes)
13. Rudder Trim Knob
14. Elevator Trim Switch
15. Autopilot Altitude Hold Toggle Button
16. Autopilot On/Off Switch
17. Autopilot Disconnect Toggle Button
18. Localizer Nav Source Switch (GPS / Nav 1 Radio)



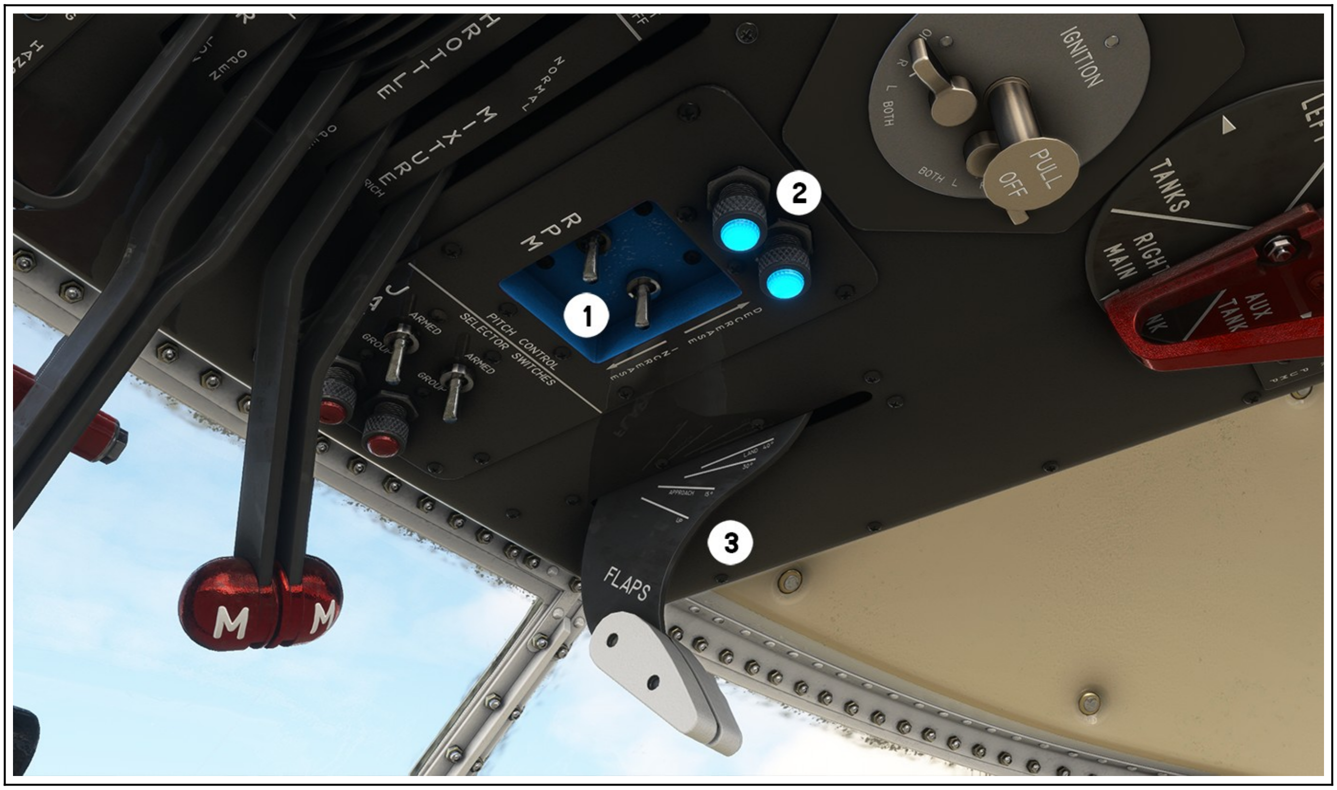
1. Left Side Tanks Fuel Transfer Pump
2. Right Side Tanks Fuel Transfer Pump
3. Left Engine Propeller Feather Switch
4. Right Engine Propeller Feather Switch

5 & 6.
“Crash Bars” and Emergency Cutoff Switches for Left and Right Engines: (Fuel, Hydraulics, Generator, Fire Extinguisher)

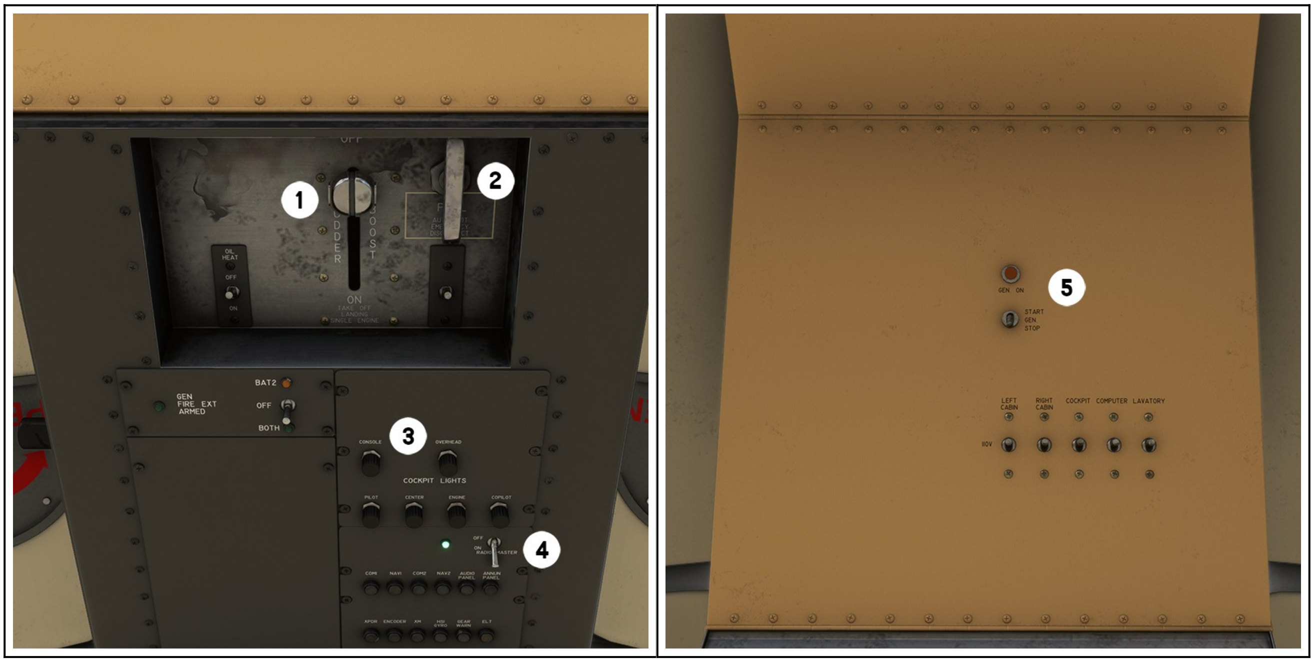


1. Left Engine Auxiliary Fuel Pump Switch
2. Left Engine Fuel Tank Selector
3. Left and Right Engine Magneto Switches
4. Right Engine Fuel Tank Selector
5. Right Engine Auxiliary Fuel Pump Switch
6. Master Ignition Switch

1. Supercharger Gear Control Lever
2. Throttle Gust Lock Release Latch
3. Throttle Gust Lock
4. Throttle Levers
5. Mixture Levers



1. Propeller RPM Control Switches
2. Propeller RPM Limit Indicators
3. Flaps Control Lever



1. Rudder Boost Control Knob
2. Autopilot Disconnect Switch
3. Interior Lighting Knobs
4. Avionics Master Switch
5. Auxiliary Power Unit (APU) Switch

1. Manual Hydraulic Pump Handle

Introduction to the G-111

The G-111 is a twin-engine amphibious seaplane developed and manufactured by American aerospace firm Grumman. It is a civilian variant of the Grumman HU-16 Albatross aircraft used by the U.S. Coast Guard and U.S. Navy. To produce the G-111, Grumman reconditioned previous HU-16 airframes for civilian passenger transport. Called the G-111 Albatross, Grumman also marketed the amphibious seaplane as the G-111 Caribbean. The G-111 is piloted by two and was initially configured to carry up to 28 passengers. Grumman initially planned to build 57 G-111s but ultimately only 13 were produced.

The aircraft features all-metal construction except for fabric-covered elevator and rudder surfaces. It has a deep V-hull, allowing it to operate in rough seas, and a retractable tricycle undercarriage. The main wing is a cantilever design with stabilizing floats.

The G-111 Albatross, remanufactured by Grumman from the late 1970s to the early 1980s, maintains all the ruggedness and reliability of the original HU-16 airframes, with added comfort for passenger service. The ability to operate out of land facilities and on water, including rough seas, makes the G-111 Albatross one of the most versatile aircraft ever created. Despite somewhat successful but brief careers as small regional airliners, most of the G-111s were eventually sold off to private owners, who then heavily updated their furnishings and avionics, effectively turning them into flying yachts. This rendition closely matches one such real world modernized G-111 example and includes advanced flat-panel avionics in the cockpit.

G-111 General Specifications

Wingspan	96 feet, 8 inches
Length	61 feet, 3 inches
Height	25 feet, 10 inches
Powerplant	2 x Wright 982CH9HE3 9-cylinder radial piston engines, 1425 HP each
Range	1480 NM
Cruise Speed	145 KTAS

GENERAL COCKPIT ORIENTATION (G-111)

NOTE: As most primary controls and functions are similar between the HU-16E and G-111 Albatrosses, this section focuses only on those items unique to the G-111's layout.

1. Garmin G1000 Pilot's Display
2. Garmin G1000 Co-Pilot's Display
3. Garmin G1000 Navigation Display

1. Elevator Trim Failure Light & Pitot Heater Active Light
2. Gear Configuration and Position Indicator Lights
3. Garmin Audio Panel

1. Propeller Continuous “Safe” Operation RPM Lights
2. Fuel Totalizer
3. Vertical Card Compass
4. #1 & #2 (Left & Right) Engine Torque Pressure Indicators (in Psi x100)
5. Propeller Reverse Beta Active Lights

1. Left & Right Engine Status Warning Lights (Oil Pressure, Fuel Pressure, Generator etc.)
2. Fuel Transfer Pump “Tank Dry” Lights & Alternate Air (Max. Carb Heat) Lights

1. Exterior Lighting Control Switches
2. Elevator Trim Switch and Position Indicator
3. Aileron and Rudder Trim Switches and Position Indicators

SYSTEMS OPERATION:

Fuel Management Notes

Understanding the operation of the Albatross' fuel system will become very important for long flights. While this system is not particularly complex, its functions may not be immediately obvious.

Both variants of the Albatross have left and right main wing fuel tanks (340 gallons each), auxiliary tanks inside the wing floats (212 gallons each) and, in the HU-16's case only, under-wing external (drop) tanks adjacent to the engine nacelles (295 gallons each).

The fuel quantity gauge on the main instrument panel displays the fuel remaining in the left and right main wing tanks *only*. There is no provision for displaying the fuel level inside the float tanks or in external tanks.

The fuel tank selector handles on the overhead panel will allow you to set each engine to run from the main tank on its own side of the aircraft (left or right), the auxiliary (float) tank on that same side, or from the main tank on the *opposite* side of the aircraft (aka cross-feed). There is no mechanism for the engines to draw fuel directly from external tanks. For this you will need to use the transfer pumps.

The aircraft is equipped with two fuel transfer pumps, each with dual intake lines, allowing fuel to be moved from either the float tanks or drop tanks into the main tanks on the same side of the aircraft. Fuel can be pumped from only one tank at a time (float or drop) and only *towards* the corresponding main tank. There is no option for reverse flow pumping nor is there any mechanism for cross-feed pumping.

The transfer pump switches can be found on the cockpit overhead panel, directly aft of the propeller feathering and engine emergency switches (red panel section). Each switch handles its corresponding side of the aircraft (left or right) and has three positions:

Float Tank → Main Tank **/ OFF /** Drop Tank → Main Tank

When using the transfer pumps you should make sure to run both left and right side pumps at the same time and in the same flow direction to maintain good lateral balance of the aircraft. Failure to do so may present trimming problems later in the flight.

Typically both fuel selectors should be set to their respective "Main Tank" position for start-up and all other phases of flight. Once the aircraft reaches a safe altitude after takeoff both transfer pumps should be set to "float → main" mode to begin pumping fuel from the float tanks to the main tanks.

Once the float tanks have been nearly depleted a pair of “Aux Fuel” warning lights on the co-pilot’s side of the main panel will illuminate (if the transfer pumps are active).

The pumps can then be switched off, or, if external tanks are present they can then be switched to the “Drop Tank → Main Tank” transfer mode. When the drop tanks have been nearly depleted the same “Aux Fuel” lights will illuminate again to indicate a low pump pressure condition. At this point the pumps should be switched off and the remaining main tank fuel consumed.

Note: It is normal practice to transfer and consume as much of the float tank fuel as possible (and then drop tank fuel, if present) during flight before consuming the main tank fuel. This helps to reduce outboard weight and bending stress on the wings from turbulence and landing forces.

Engine & Propeller Management Notes

Throttles:

The throttle levers on the Albatross hang from the overhead panel between the pilot and copilot seats. They are guarded by a red gust lock which must be released and retracted before use. The throttles can be operated independently or together, and can be pushed upwards from the idle gate position into reverse mode when required, which forces the propeller blades into reverse beta.

Further aft motion of each throttle past this detent increases the amount of reverse thrust provided. Reverse thrust should ***only*** be used during a landing roll or when manoeuvring on the water at low speeds. Use of reverse thrust on the ground to taxi the aircraft backward is never recommended as this can result in tipping the aircraft over onto its tail, with resultant damage.

Differential engine thrust is the *primary* means of directional control on water at low speeds, as the aircraft is not fitted with water rudders, and moderate and careful usage of this can be extremely useful for manoeuvring the aircraft in tight spaces.

Propeller Controls:

The constant speed propeller controls on the Albatross are somewhat unusual. Rather than relying on levers to control the governors, as in most aircraft, the propeller speed limits are selected through two momentary switches (left prop & right prop) located on the overhead panel, in a recessed blue box, next to the mixture levers.

These are three-way switches. Holding a switch forward will continuously increase the RPM limit, while holding it aft will decrease it. The upper and lower limits are 2750 rpm and 1400 rpm respectively. If the propeller governor is set to either the upper *or* lower rpm limit, the light adjacent to that switch will glow blue.

NOTE: These switches set the RPM *limit* of the governors only, not propeller blade pitch directly. Engine torque output and airspeed will determine if those limits can actually be reached.

Supercharger Control:

Both engines are fitted with two-geared superchargers to improve power output, especially at higher altitudes. The gear setting for both engines is controlled via a single small lever (labelled “SC”) on the overhead console, adjacent to the throttles. The low gear (default setting) is intended to be used during all engine operation below 10,000 feet MSL altitude. The high gear is meant for altitudes above 10,000 feet.

The low gear can typically maintain sufficient manifold pressure for cruise flight up to approximately 15,000 feet MSL at relatively low gross weight, however beyond this altitude (or at higher gross weights) the high gear will be required to maintain performance. Moving the lever to the aft position will engage the high gear. Prior to changing supercharger gears the throttles should be slowly reduced until engine manifold pressures fall below a maximum of 40 inches, to avoid over-boosting and potentially damaging the engines. After selecting supercharger high gears, once manifold pressure has re-stabilized, the throttles can then be slowly advanced again as needed.

Mixture Controls:

Fuel /Air mixture is controlled via two red handled levers hanging from the overhead panel, adjacent to the throttles. During startup, takeoff, and initial climb-out, the levers should be advanced to the full forward position (full rich). During taxiing, cruise climbs, and in cruise flight, the levers should be moved to the "normal" position to save fuel. In cruise flight the engines may be run "lean of peak" by reducing fuel mixture slightly aft from the "normal" position. This will improve fuel economy, endurance, and possibly range at the cost of some speed.

Important Note: Due to the fact that the engines are supercharged, and constant manifold pressure can be maintained through throttle position alone, the mixture levers do not need to be (and should not be) reduced with increasing altitude as they are on normally aspirated engines. Instead, the throttles should be slowly opened as altitude increases in order to maintain a constant engine manifold pressure. The "full rich" and "normal" settings will give appropriate and precise fuel metering to the engines based on engine manifold pressure alone.

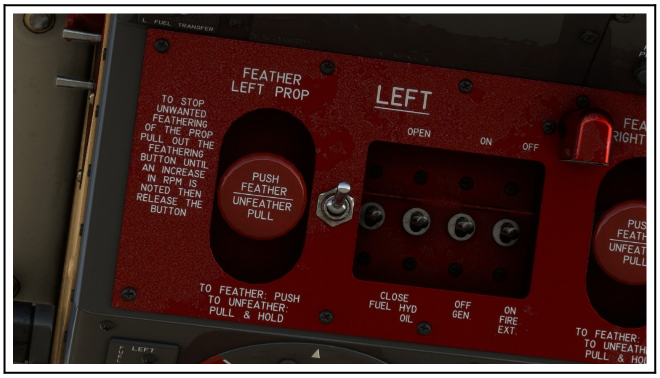
Ignition & Starters:

Each engine is furnished with dual magnetos for safety and redundancy. The controls for these are on the cockpit's overhead console next to the mixture levers. For all phases of flight except start-up and shut-down each engine's magnetos should be set to the "both" position. There is also a "Master Ignition" pole that can be pulled downwards to cut ignition to both engines at once if required.

The engines use electrical starter motors, actuated by a pair of guarded momentary buttons on the main sub-panel. Directly forward of those are similar switches for the electrically driven primer jets. Unless the engines have recently been run and the cylinders are still warm, it is advised to prime each engine for ~4 seconds prior to attempting a start. If the engines will not start within 15 seconds, recheck the fuel level, mixture, and ignition controls for proper settings, re-prime, and try again.

Propeller Feathering & Engine Emergency Controls:

A number of controls to aid in the event of an engine failure or loss of power are located on a red sub-section of the cockpit's overhead panel.



If an engine is failing the affected engine's propeller can be forced into feathered mode to stop the engine from spinning and greatly reduce drag. Depending on the level of the terrain around the aircraft this may be mandatory to prevent a forced approach and landing.

To feather the propeller of a failing or failed engine, first pull that engine's mixture lever to the "cutoff" position. Once this is complete, push in the affected engine's "Prop Feather" button. This will force the propeller blades to approximately 90 degrees of beta pitch and bring the engine to a halt within a few seconds. Once the engine has stopped turning you can reduce the stopped engine's throttle to idle and set its magnetos to the "off" position.

In the case of an engine fire, double engine failure, or any situation requiring an immediate descent and forced landing, there are four emergency switches to the right of each Prop Feather button. These are the "Close Fuel Valve", "Close Hydraulic Valve", "Generator Off", and "Fire Extinguisher" switches. These can be activated individually as required or switched all at once by pulling down the "Crash Bar" above those switches for the affected engine(s).

Engine Cowl Flaps & Oil Cooler Flaps:

The Albatross has electrically actuated mechanical doors on each engine nacelle to provide extra cooling air as needed for the engines and oil cooling radiators. Switches to control their deployment are located below the central main panel. Unless operating the aircraft in extremely cold conditions, both the cowl flaps and oil cooler flaps should be set to 100% open prior to engine start, and then left in these positions until stable cruise flight has been achieved. At that point they can be closed to 50% each, monitored, and adjusted as needed to maintain cylinder head temperatures of 180-200 degrees Celsius.

During descent the doors should be further closed to 10-20% to prevent shock cooling, and then set back to 100% open just prior to final approach. They should remain at 100% open during roll-out, taxi, and then only closed after engine shutdown.

Hydraulic System Management Notes

Rudder Boost Circuit:

A hydraulic boost circuit is present in the aircraft to increase rudder effectiveness and help reduce pilot fatigue in difficult crosswind situations. It should be engaged only when normal rudder authority proves insufficient for the current flight situation (water operations in general, crosswind takeoffs etc.), and disabled when not required to avoid potentially over-controlling the aircraft. The boost lever is located on the aft most section of the cockpit overhead panel.

Backup Hydraulic System:

In case of engine and/or normal hydraulic pump failure, the aircraft is fitted with a backup hydraulic line system and manual pump. As the system is only capable of pressurizing one hydraulic line at a time, a selector handle is provided to allow the pilot to choose which line to pressurize. This handle is located on the sub-panel directly in front of the pilot’s seat. The manual pressurization pump handle is located directly below the right side of the pilot’s seat.

The hydraulic selector has five modes: Parking Brake, Flaps, Gear Down, Gear Up, and Engine Pump.

In most phases of flight, once the parking brake is no longer required, the selector should be moved to the “Engine Pump” position so that the backup system’s pressure can be maintained by the main hydraulic system.

The backup hydraulic system is used for engaging the parking brake regardless of main system functionality. To do this, move the selector to “Parking Brake” and activate the manual handle once. To release the brake activate the handle once again.

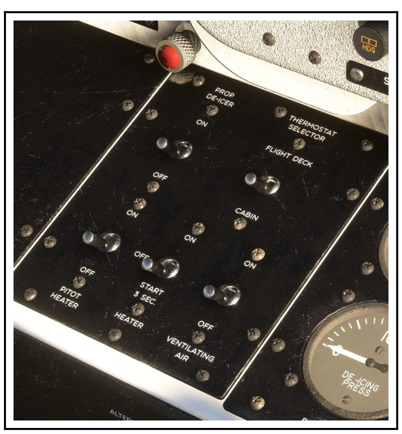
To lower or raise the landing gear, or deploy the flaps, rotate the selector to the appropriate position and activate the hand pump repeatedly. Because hydraulic pressure is lost while moving these large structures continuous pumping will be required to maintain pressure.

Flaps Operation:

Each wing is fitted with hydraulically powered trailing edge split flaps, with an approximate 10 second deployment time. The hydraulic pressure is tuned to always remain under the maximum stress limit for the flaps. Any flap setting can be selected at any speed, and if the hydraulic power cannot overcome the ram force on the flaps they will simply not deploy until airspeed has been reduced. Note that this works in reverse as well. Flying beyond the design speed limit of the deployed flaps at any given setting will force them to retract.

The first flap setting (15 degrees) can be selected at up to 170 knots indicated airspeed if required. The second and full flap settings should only be used below 130 knots indicated. The flaps selector handle is located on the overhead console, to the right of the mixture levers and propeller speed switches.

De-icing Systems:



The HU-16 and G-111 are both fitted with pitot heaters, propeller de-icing and heated alternate air ducts for the carburettors. Additionally the HU-16 has structural de-icing in the form of pneumatic boots on the leading edges of the wings and horizontal and vertical tails.

Control switches for the pitot heat, prop de-ice, and structural de-ice can be found on the far left side of the lower main instrument panel, directly in front of the pilot’s seat. The engine carburettor heat switches (labelled Direct / Alternate Carb Air) are located on the lower centre of the instrument panel next to the main battery switch.

Electrical System Management Notes

The 28 volt electrical system in both variants consists of a primary 36 ampere-hour battery and two engine driven 430 ampere generators. The HU-16 is also fitted with an auxiliary power unit (APU), located in the tail section, to provide electrical power to all systems and maintain battery charge, should the aircraft need to be moored for long periods away from a base. It does not, however, provide sufficiently high current for engine starts.

Warning lamps are located on the main panel in both aircraft to indicate any cut-out or failure of a generator circuit. A voltmeter with bus selector is fitted to the main sub-panel, forward of the centre console, to help diagnose any electrical issues.

Ammeters are provided for each generator circuit and the battery to show current DC load. If the generators are working the battery ammeter will show a positive reading (charging).

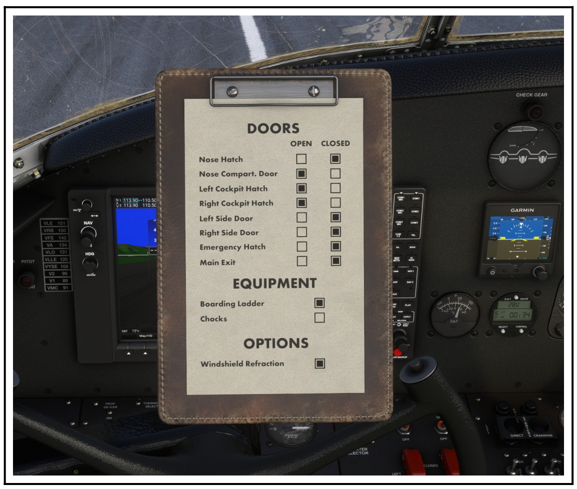
Note: The engine driven generators can not provide stable power if engine rpm is less than 600. If idling below this rpm the generators are automatically disconnected from the bus and the battery will slowly drain. After engine start make sure to maintain at least 700 rpm as much as is practicable.

An external power connector for interfacing with airport ground power units is provided on the left side of the aircraft, and an associated bus tie switch is located on the main sub-panel, next to the voltmeter.

ACCESSORIES BOARD:

A checklist board is located to the left of the pilot's seat in each aircraft. This board is provided as a convenience for opening and closing the aircraft's doors, deploying or stowing the wheel chocks and boarding ladder, and it also provides a setting to enable or disable windshield refraction effects, if so desired. This last setting is persistent between sessions.

Click the top edge of the board to move it into position in front of the yoke, and click again in the same place to stow it.



COCKPIT LIGHTING CONTROLS:

Although the HU-16 and G-111 have very different looking interior night illumination, they are fitted with broadly similar lighting controls.


Most cockpit lighting is controlled by dimmer knobs on the main overhead panel. Note that with the exception of the overhead "dome" lights, there are no circuit on/off switches for any of these panel and map lights.

The main overhead cockpit dome light brightness is controlled both via its overhead panel dimmer and a switch located on the cockpit door frame directly aft of the pilot's seat.

The lights in the forward nose compartment and aft passenger areas do not have dimmers and are controlled by several discrete switches located throughout the cabins.

The HU-16 has a unique instrument light dimmer knob. This is located on the main panel directly in front of the pilot.

NOTE: Due to the fact that almost all cockpit lighting is potentiometer driven, and that these do not play "nicely" with the sim's "toggle all lights" event ('L' key), this event been disabled for all interior lights. It will only toggle the exterior lights in the Albatross.

WATER OPERATIONS:

As with all amphibians / flying boats, special care and attention must be paid during all water operations. Always ensure that the rudder boost hydraulic circuit is active during water ops.

During engine start it is advised to move the throttles into the neutral or very slightly reversed position. This will force the beta angle of the propeller blades to be nearly flat (~0 degrees) and therefore produce minimal thrust. Due to the wide lateral spacing of the engines any asymmetric thrust at all will impart a significant yaw moment on the water, and this effect must be planned for during startup. Once both engines have been started however it is fairly straightforward to maintain any desired heading with differential thrust and rudder.

Takeoffs should be made directly into the prevailing wind whenever possible. Any crosswind component during a water takeoff will increase the difficulty of the operation.

When accelerating for takeoff at higher gross weights (35,000lb +) it is advised to input some positive elevator trim, and to use a low to moderate throttle setting until the aircraft rises onto the “step”, i.e: the hull begins hydroplaning, at approximately 20 to 40 knots. The reason for this is that due to the high mounted position of the engines, any abrupt increase in power at low speed with a high weight can cause a strong forward pitching moment, potentially submerging the entire bow. Takeoffs on water should always be made with flaps at the first setting (15 degrees).

As with takeoffs, all landings should be made into the prevailing wind whenever possible. Any flap setting can be used during landing, depending on the available water area, however when landing at higher gross weights the use of full flaps is recommended.

OPERATING LIMITATIONS:

Mass

Empty Weight (HU-16E)	22,800 lbs
Empty Weight (G-111)	23,500 lbs
Maximum Takeoff Weight (Land)	37,000 lbs
Maximum Landing Weight (Land)	34,000 lbs

Engine Performance

Maximum Power (Takeoff only, 1 minute max.)	54.5” MAP, 2700 rpm
METO (Maximum Except Take Off)	46.5” MAP, 2500 rpm
Cruise Climb	36” MAP, 2300 rpm
Cruise	30” MAP, 1800 rpm

Speeds

Stall (Clean) (V_{S1})	78 KTS IAS
Stall (Full Flaps) (V_{S0})	69 KTS IAS
Minimum Control Single Engine (V_{MC})	105 KTS IAS
Best Angle of Climb (V_X)	90 KTS IAS
Best Rate of Climb (V_Y)	115 KTS IAS
Best Cruise (V_{CE}) 30” MAP, 1800 rpm, @16,000 ft	130 KTS IAS
Never Exceed (V_{NE})	252 KTS IAS
Full Flap Extension Limit (V_{FE})	140 KTS IAS
Landing Gear Operating (V_{LO})	150 KTS IAS
Landing Gear Extended (V_{LE})	150 KTS IAS
Design Manoeuvring (Turbulent Air) (V_A)	120 KTS IAS

Load Limits

Positive G Max @29,500 lb	+3 G
Positive G Max @37,000 lb	+2.4 G
Negative G Max	-2.77 G

CHECKLISTS:

Pre-Flight

Battery Switch	ON
Fuel Quantity Gauges	CHECK
Generator Switches	CHECK OFF
Oil Cooler Flaps	FULL OPEN
Engine Cowl Flaps	FULL OPEN
Cockpit Lighting	AS REQUIRED
Avionics Master Switch	ON
Left & Right Fuel Pump Switches	CHECK OFF
Fuel Mixture Levers	CUTOFF
Throttle Gust Lock	DISENGAGE
Throttles	IDLE
Magnetos	OFF
Fuel Selectors	LEFT MAIN & RIGHT MAIN
Supercharger Gear	LOW
Propeller RPM Switches	MAX RPM
Flaps	UP
Hydraulic Hand Pump Selector Valve	PARKING BRAKE MODE
Parking Brake	SET
Wheel Chocks & Ladder	STOW
Beacon Light Switch	ON

Left Engine Start

Engine Master	ON
Magnetos	BOTH
Mixture Lever	FULL RICH
Left Fuel Pump Switch	ON
Primer Button	PRESS & HOLD (4+ SECONDS)
Starter Button	PRESS & HOLD (15 SECONDS)
Oil Pressure	CHECK
Left Generator Switch	ON

Right Engine Start

Magnetos	BOTH
Mixture Lever	FULL RICH
Right Fuel Pump Switch	ON
Primer Button	PRESS & HOLD (4 + SECONDS)
Starter Button	PRESS & HOLD (15 SECONDS MAX)
Oil Pressure	CHECK
Right Generator Switch	ON

Before Taxi

Cabin Doors	CLOSED & LOCKED
Left & Right Fuel Pump Switches	OFF
Rudder Boost Pump	ON
Elevator Trim	SET NEUTRAL
Navigation Lights Switch	ON
Transponder	STANDBY
Comm & Nav Radios	SET
Altimeter Pressure Setting	SET
Parking Brake	RELEASE

Runway Threshold

Left & Right Fuel Pump Switches	ON
Pitot Heat	ON
Propeller De-ice Switch	ON
Flight Controls Movement	FREE AND CLEAR
Landing Light Switch	ON
Strobe Light Switch	AS REQUIRED
Flaps	SET TAKEOFF (15 DEG)
Engine Indicators	CHECK
Transponder	SET ALT MODE

Normal Takeoff

Throttles	MAX (54.5" MAP)
Rotate	80 KTS IAS
Positive Vertical Speed	TAP BRAKES, LANDING GEAR UP
@300 FT AGL & 115 KNOTS IAS	REDUCE POWER TO METO (45" MAP)
Propeller RPM	SET TO 2500 RPM
Flaps	UP
Airspeed	MAINTAIN 115 KTS IAS

Cruise Climb

Throttles	MAINTAIN 36" MAP
Propeller RPM	SET TO 2400 RPM
Engine Indicators	CHECK
Rudder Boost Pump	OFF
L & R Fuel Boost Pump Switches	OFF
L & R Fuel Transfer Pump Switches	ON : FLOAT TANK → MAIN TANK
Airspeed	MAINTAIN 120 KTS IAS

Cruise

Supercharger Gear (Above 10,000 ft AGL)	SET HIGH
Throttles	MAINTAIN 30" MAP
Propeller RPM	SET TO 1800 RPM
Elevator Trim	SET
Engine Cowl Flaps	HALF
Oil Cooler Flaps	HALF
Engine Indicators	CHECK
Landing Light Switch	OFF

Descent

Supercharger Gear	SET LOW
Throttles	MAINTAIN 20” MAP
Propeller RPM	SET TO 2300 RPM
L & R Fuel Boost Pump Switches	ON
Engine Cowl Flaps	CLOSED
Oil Cooler Flaps	CLOSED
Engine Indicators	CHECK
Landing Light Switch	ON
Rudder Boost Pump	ON
Airspeed	MAINTAIN 115-130 KTS IAS
Elevator Trim	SET

Final Approach

Engine Cowl Flaps	FULL OPEN
Oil Cooler Flaps	FULL OPEN
Propeller RPM	MAX RPM
Throttles	AS REQUIRED
Flaps	AS REQUIRED
Landing Gear	DOWN
Engine Indicators	CHECK
Rudder Boost Pump	ON
Airspeed	MAINTAIN 85-90 KTS IAS
Elevator Trim	SET

After Landing

Throttles	IDLE
Braking	MINIMUM REQUIRED
Landing Light Switch	OFF
Strobe Lights Switch	OFF
Flaps	UP
Transponder	SET STANDBY

Parking / Shutdown

L & R Fuel Boost Pump Switches	OFF
L & R Fuel Transfer Pump Switches	OFF
Avionics Master Switch	OFF
Rudder Boost Pump	OFF
Throttles	IDLE
Mixture Levers	CUTOFF
Magnetos	OFF
Battery Switch	OFF