



X-Plane Beechcraft Baron 58

Pilot's Operating Manual

Author: Julian Lockwood (julian@x-plane.com)

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Background: The Beechcraft Baron 58 Series



Photo credit: Wikipedia

The Beech Aircraft Corporation first introduced the Baron in 1961. Derived from the Travel Air, the Baron incorporated the fuselage of the Bonanza, and the tail section of the Debonair.

The aircraft was the Beech corporation's answer to the Piper Aztec (launched in 1960), and the improved Cessna 310 of the same era.

Powering the first model, the 55, were two Continental IO-470-L engines, each producing 260 horsepower at 2,625 rpm.

Seating options included room for one pilot, and a four or five, passengers.

Early Model 55s had a gross weight of 4,880 to 5,100 lbs. (2,200 to 2,300 kg.). Typical cruise speeds were in the range of 190 knots, at an altitude of 7,000 ft. Two fuel tank options were available – 116 US gallons, or 136 US gallons.

The Model 55 was manufactured from 1961 to 1982, and by the end of the manufacturing run, this model incorporated improved avionics, some aerodynamic refinements, and an upgraded fuel capacity to 172 US gallons. Four hundred and thirty-three (433) model 55s were built.

The Model 56 was introduced in 1967, as a test-bed for the Beech Duke 60 pressurized twin that was under development at the time. The turbo-charged Lycoming TIO-540-E1B4 engines from the Duke were fitted to the Baron, together with structural modifications to accommodate these. The Model 56 was manufactured from 1967 to 1971. Ninety-three (93) aircraft were built.

The Model 58 was introduced in 1969 – a larger more powerful variant of the Model 55. The new aircraft incorporated club seating, double aft baggage doors, and a gross weight of 5,400 lbs. Two engine options currently applied at the time – the Continental IO-520 (285 hp.), or Continental IO-550 (300 hp.). In 1976, a turbo-charged version called the Model 58TC was introduced, and also a pressurized version called the Model 58P. These models were capable of cruising at 200 knots at an altitude of 8,000 feet, and 220 knots at an altitude of 20,000 feet respectively. The Baron 58 was manufactured from 1969 to 2004, the 58TC from 1976 to 1984, the 58P from 1976 to 1985.

Currently, the Baron Model G58 remains in production. This is essentially the same as the Model 58, with a Garmin G1000 (glass cockpit) avionics package. New 2016 Model G58s sell for approximately \$US 1.1 million.

Approximately 6,700 Baron B58s (of various guises) have been manufactured to date.

B58 Specifications

Engine:		
Model	-----	2 x Continental IO-550-C (piston)
Power	-----	300 horsepower per engine
Propeller	-----	3 blade metal, constant speed
Fuel:		
Capacity	-----	194 Gallons / 1,164 Lbs.
Recommended fuel	-----	100 Octane Low Lead (100LL)
Fuel Burn (average)	-----	32 Gallons per hour / 120 Liters per hour
Weights and Capacities:		
Max. Takeoff Weight	-----	5,500 Lb. / 2,495 Kg.
Max. Landing Weight	-----	5,400 Lb. / 2,449 Kg.
Basic Empty Weight	-----	4,030 Lb. / 1,828 Kg.
Max. Useful Load	-----	1,494 Lb. / 678 Kg.
Maximum Payload	-----	1,370 Lb. / 621 Kg.
Performance:		
Max. Cruise Speed	-----	202 Knots
Stall Speed (Clean)	-----	80 Knots
Stall Speed (Landing Configuration)	-----	74 Knots
Best Climb Rate	-----	1,700 Feet Per Minute
Wing Loading	-----	27.6 Lb. / Sq. Ft.
Power Loading	-----	9.2 Lb. / Hp.
Service Ceiling	-----	20,688 Ft.
Takeoff Ground Roll	-----	1,373 Ft.

The X-Plane Baron B58

Unlike other flight simulators, X-Plane employs a technique called “blade element theory. This technique uses the actual shape of the aircraft (as modeled in the simulator), and breaks down the forces on each part separately. The force of the “air” acting on each component of the model is individually calculated, and combined, to produce extremely realistic flight.

When you “fly” an airplane in X-Plane, there are no artificial rules in place to govern how the aircraft behaves. Your control inputs move the control surfaces of the aircraft, and these interact with the flow of air around it. As such, you may consider that you are really flying the aircraft.

Because of this technique, an aircraft must be modeled with great accuracy in X-Plane, in order that it behave like its real-life counterpart.



This means the fuselage, wings and tail surfaces must be the right size and shape, the center of lift and center of gravity must be in the right places, and the engine(s) must develop the right amount of power. In fact, there are a great many properties that must be modeled correctly to achieve a high-fidelity flight model.

The Beechcraft Baron B58 in X-Plane has been modeled by our design team with a degree of accuracy that ensures its flight characteristics are very like the real aircraft. However, despite this, some differences will be apparent, because even the smallest factor plays into the ultimate behavior of the aircraft, both in real life, and in X-Plane. The systems modeling of this aircraft involves some compromise too, because of the degree of complexity present in a real aircraft. However, in most cases, the actual Baron B58 procedures could be followed when operating the X-Plane version. Checklists are presented later in this document (with modifications to suit a simulation platform). It is recommended that X-Plane pilots follow those procedures to extract the maximum capability and enjoyment from this aircraft.

Instrument panel and controls



The X-Plane Baron B58 features a detailed 3-D cockpit with a great many of the primary controls and systems modeled, including: Flight controls (yoke, rudder pedals, throttles, prop levers, mixture levers), electrical systems, navigation aids, radios, autopilot, instrument, lighting and fuel systems. Elements that are not modeled include cabin environmental systems, and circuit breakers.

Hint:

To best view some of the switches featured in this aircraft, it is helpful to hide the pilot and co-pilot yokes. This can be accomplished by selecting "Joystick and Equipment" from the "Settings" menu, and assigning a button, or key, to the following data reference:

Operation | Toggle Yoke Visibility

Use the assigned button, or key, to toggle the yoke view as required. This will have no effect on the yoke operation.



Creating “Quick Look” views

Before discussing the instrument panel and controls for this aircraft, we suggest that the pilot establish a series of “Quick Look” views that will be helpful later when interacting with this particular aircraft. If you are not familiar with this technique, more information is available in the [X-Plane Desktop Manual](#).

The following “Quick Look” views are recommended for the Baron B58, in a situation where the pilot is not using a Virtual Reality (VR) headset, or a head tracking device. To some degree, these correspond (on the keyboard Number Pad) with their physical locations in the cockpit, and are therefore logical and easy to recall later.



Autopilot



Pilot Switches





Throttle
Quadrant



Co Pilot Switches



Pilot's View





Engine
Instruments

Comm and Nav
Radios

GPS Unit



CoPilot's View



Left Glance View





Right Glance
View



Operating the controls

This section covers the basics techniques for the operation of the controls that you will encounter in the cockpit of an X-Plane aircraft. Control manipulators are consistent across all X-Plane aircraft. However, the specific **ILLUSTRATIONS** in THIS chapter may differ from YOUR aircraft.



Toggle and Rocker switches are operated with a single click of the mouse. Place the mouse pointer slightly above, or below, the center point of the switch, depending on the direction you intend to move it. A small white arrow is displayed to confirm the intended direction. Click the mouse button to complete the operation.



Levers are operated by assigning a peripheral device to the necessary axes in X-Plane (throttle, prop, mixture etc.). More information is available in the [X-Plane Desktop Manual](#).

Levers may also be operated by clicking and dragging the mouse pointer.



Some rotary dials are operated by positioning the mouse pointer on top of the control, and then a click and drag to the right, or to the left. The same can be accomplished using the mouse wheel - if one is present on your device.

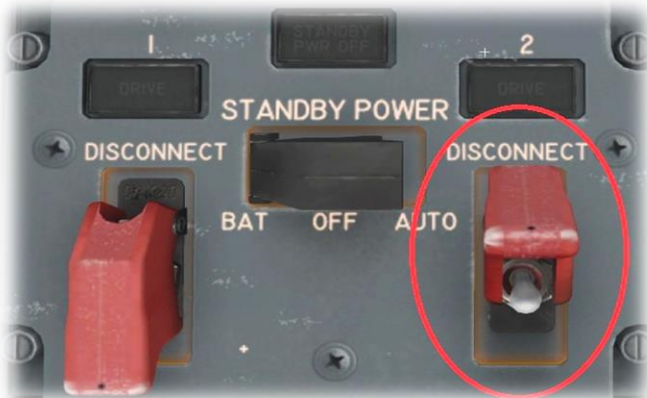
Other rotary controls require finer precision. When the mouse pointer is positioned slightly to the left of such a control, a counter-clockwise arrow appears. This indicates that you are ready to rotate the control counter-clockwise. Correspondingly, a clockwise arrow indicates that you are ready to rotate the control clockwise. After positioning the mouse pointer, changing the frequency in the desired direction is accomplished in two ways:

- i) By rolling the mouse wheel forwards, or backwards
- ii) By clicking (dragging is not supported here)

Radio and Navigation frequency rotary dials are grouped together as "twin concentric knobs". Here, the larger rotary is used to tune the integer portion of the frequency, and the smaller rotary is used to tune the decimal portion. Each works independently, using the same technique, as described above.



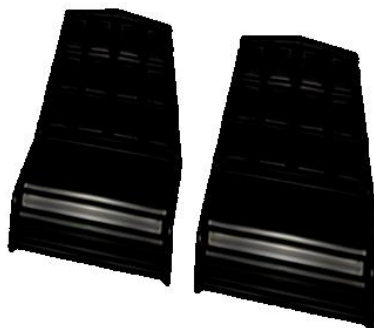
Push buttons are operated by pointing and clicking with the mouse.



Guarded switches are used in situations where accidental activation of the switch must be prevented. To operate a guarded switch, the guard must first be opened. Do this by positioning the mouse pointer over the switch until the two vertical white arrows are displayed. Click once. If the switch is currently closed, it will open, and vice-versa. After the guard has been opened, the switch may be operated like a toggle and rocker switch (see earlier in this section).



The Yoke / Stick / Joystick is operated by assigning a peripheral device to the "roll" and "pitch" axes in X-Plane. This is discussed in greater detail later in the guide.



The Rudder Pedals are operated by assigning a peripheral device to the "yaw" axis in X-Plane. If your rudders also support toe braking, create additional assignments to the "left toe brake" and "right toe brake" axes in X-Plane. This is discussed in greater detail later in the guide.

Note that you may also assign keys on your keyboard, or buttons on your external peripheral to move the rudder to the left or right, or to center the rudder.

Assigning peripheral devices

This section of the manual deals with an “ideal” scenario, in terms of the assignment of external computer peripherals to operate the X-Plane Baron B58 with the highest degree of realism. If you are missing some, or all of these external peripherals, you may elect to choose a different configuration that best suits your hardware.



The Baron B58 is equipped with Yokes, for roll and pitch control.

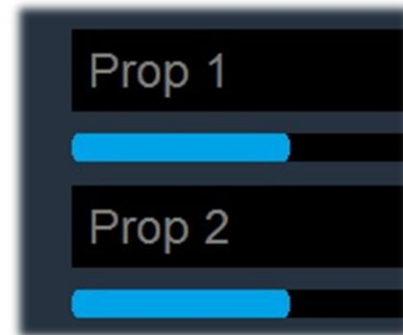
To simulate this, assign the lateral axis of your yoke (or joystick) to the “Roll” command in X-Plane, and the vertical axis to the “Pitch” command.

More information is available in the [X-Plane Desktop Manual](#).

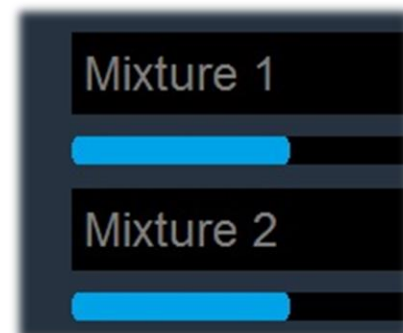


The Baron B58 is equipped with dual throttles – which control the power (measure in Manifold Pressure) transmitted by the left and right engines.

To simulate the throttles for a Baron B58, assign the (black) throttle levers on your quadrant to the “Throttle 1” and “Throttle 2” properties in X-Plane.

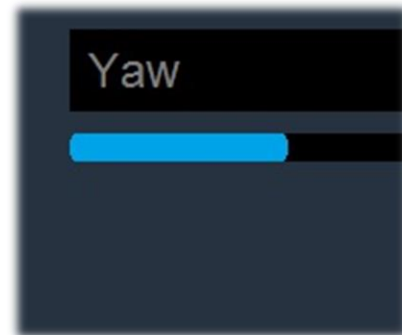
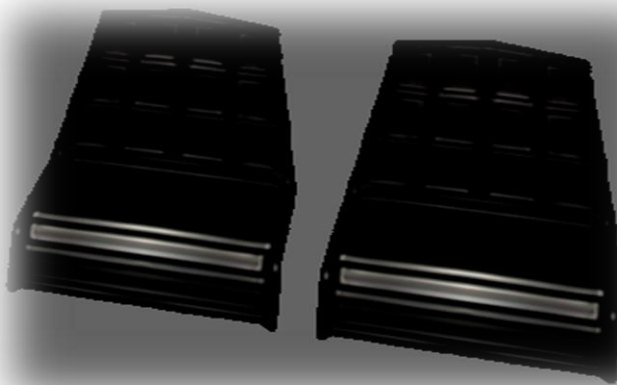


The Baron B58 is equipped with variable pitch propellers. The pitch of the propellers is optimized for each segment of the flight using the Prop Levers. To simulate this, assign the (blue) prop levers on your quadrant to the "Prop 1" and "Prop 2" properties in X-Plane.



The Baron B58 is equipped with "Mixture" levers. These control the ratio of fuel / air that is flowing into the engines, from "Full Rich" (levers forward) to "Full Lean / Cut-Off" (levers backward).

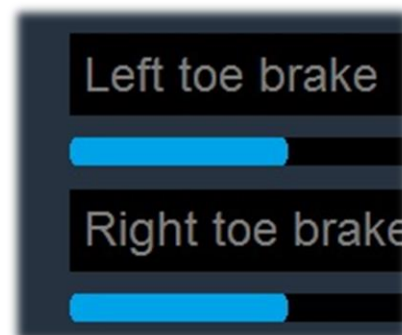
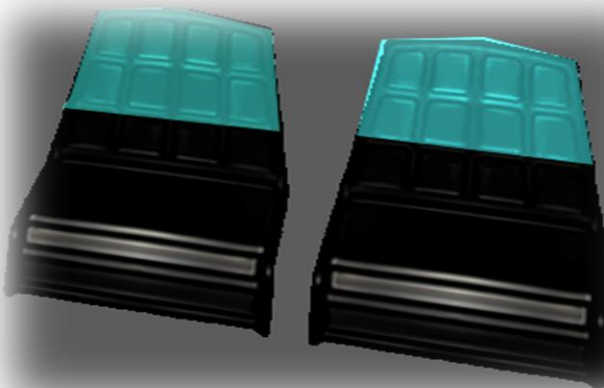
To simulate this, assign the (red) mixture levers on your quadrant to the "Mixture 1" and "Mixture 2" properties in X-Plane.



The Baron B58 has conventional rudder controls, actuated by the rudder pedals.

The pedals activate the rudder, which is part of the tail assembly, and this “yaws” the aircraft to the left or right. The rudder keeps the aircraft straight during takeoff and landing, and also helps make coordinated turns.

To simulate this, assign the yaw axis of your pedals peripheral device (or a joystick axis) to the “Yaw” property in X-Plane.



The Baron B58 has conventional rudder toe-braking, actuated by the tip of the rudder pedals.

To simulate this, assign the brake “toe-tipping” motion of each individual pedal (or a joystick axis) to the “Left toe brake” and “Right toe brake” property in X-Plane.

A Tour of the Cockpit

In this section of the manual, the cockpit will be broken down into distinct functional areas, and the elements that are featured in those areas will be identified and described. This will assist in locating the necessary instruments and controls later, when working through the aircraft check lists, and when flying the aircraft. Only instruments and controls that are operational within the X-Plane Baron B58 will be presented here.

Pilot's Door Panel



Pilot Door Temperature Gauge

This instrument displays the outside air temperature (in degrees Celsius and Fahrenheit).

The outside air temperature is crucial information to a pilot, and helps determine the likelihood of icing and fog - the latter becoming more likely as the gap between the temperature and dew point narrows.

Outside air temperature is also a significant factor in engine performance, and behavior.

At extremely high temperatures, engine and propeller performance is dramatically reduced, due to a drop in air density.

At temperatures at or below freezing, icing can accumulate on the wings and tail section, with a potentially catastrophic loss of lift and aero-performance. Ice can also choke the air flow to an engine.

At even lower temperatures, oil can congeal, rendering engines inoperable.

Pilot's Primary Instruments



Airspeed Indicator

This instrument displays the speed of the aircraft relative to the air around it (and not relative to the ground).



Attitude Indicator (AI)

This instrument displays the aircraft's attitude relative to the horizon. It allows the pilot to determine if the aircraft is turning, climbing, or descending, and is used primarily when the actual horizon is not visible to the pilot, such as when flying in instrument conditions.



Horizontal Situation Indicator (HSI)

This instrument shows the aircraft's magnetic heading, using a compass bezel. The information is presented in 'plan view', as if looking down at the aircraft from directly above. This instrument also features a course deflection indicator. This 'needle' informs the pilot if the aircraft is left or right of the desired course, relative to a selected navigation aid (usually an ILS or VOR).

The rotary control at the lower-right is used to set the autopilot heading "bug".

The rotary control at the lower-left is used to set the Omni-Bearing Selector (OBS). This is the desired radial to follow, when using this instrument together with a VOR navigation aid.



Turn Coordinator

This instrument informs the pilot of both the rate of turn, and whether the aircraft is slipping sideways during a turn.

The "L" (left) and "R" (right) indicators at the four and six o'clock locations on the dial correspond with a "two-minute turn", which is considered ideal when maneuvering an aircraft in instrument conditions. When the wings of the white aircraft in the center of the dial intersect with these markings (during a turn), it will take exactly 2 minutes for the aircraft to make a 360 degree turn back to its original course.

The floating ball is used to assist the pilot in making a "coordinated turn", so the aircraft does not slip to the side, but instead follows the desired course. If the ball moves to the right, depress the right (rudder) pedal, until the ball is centered again. Correspondingly, if the ball moves to the left, depress the left (rudder) pedal, until the ball is centered again. When the ball is centered, the aircraft is making a coordinated turn.



Altimeter

The altimeter displays the altitude above sea level (and not the altitude above the ground). This instrument uses the barometric pressure of the air around the aircraft to determine the altitude. As such, it must be calibrated at the start of the flight, and also periodically re-calibrated during the flight. This is accomplished using the rotary control at the lower-left of the instrument.

To calibrate this instrument, the pilot must be aware of the published barometric pressure at his current location. This information is provided by weather services, and also by ATC communications.



Distance Measuring Equipment (DME) Master Display

This instrument displays the distance, and time, to the selected navigation aid (tuned using the navigation radios). This equipment requires that the selected navigation aid be DME equipped).



Vacuum Gauge

This instrument measures the vacuum developed in the system that drives the air-driven gyroscopic instruments. In the case of the Baron, these are the Attitude Indicator and Turn Coordinator.

A vacuum pressure outside of the indicated scale is an indication that the air-driven gyroscopic instruments are potentially compromised.



ADF (Automatic Direction Finder)

This instrument displays a direct bearing to or from a selected NDB (Non Directional Beacon).

NDBs are simple radio transmitters. As such, the ADF instrument can also provide bearing information to non-aviation related transmitters, such as commercial radio stations, or any other radio source operating within the appropriate bandwidth.



Variometer

The Variometer informs the pilot of the rate of climb, or the rate of descent, in terms of thousands of feet per minute.



VOR / ILS Receiver

This instrument displays the course deviation from the selected radial of a VOR transmitter, or an ILS (Instrument Landing System).

In the case of the VOR, the lateral course deflection is displayed, providing the pilot with the direction in which he needs to steer to intercept the desired radial. The "To/From" indicator informs the pilot if he is flying towards, or away from, the VOR transmitter.

In the case of an ILS, both the lateral and vertical course deflection is displayed, providing the pilot with the direction to steer to intercept the localizer, and also if the aircraft is above, or below, the glideslope.

Engine Instrumentation



Manifold Pressure

These instruments display the manifold pressure of the left and right engines, measured in inches of mercury.

In a piston-powered aircraft with constant-speed propellers (such as the Baron), the manifold pressure instruments indicate the power output of the engines, measured by the air pressure in the intake manifold. The green band indicates the normal operating range.



Propeller RPM

These instruments display the revolutions per minute (RPM) of the left and right propellers.



Fuel Flow

These instruments display the rate at which fuel is flowing from the fuel system into the left and right engines, measured in (US) gallons per hour.



Engine Temperature

These instruments measure the temperature (degrees Celsius) in the left and right engines – at two distinct places - the cylinder-heads, and the exhaust gas manifold. The green band indicates the normal operating range for cylinder-head temperature.



Oil Temperature and Pressure

These instruments display the oil temperature and pressure in the left and right engines, presented in Degrees Celsius, and Pounds per Square Inch. The green bands indicate the normal operating range.

Avionics Panel



Audio
Switching
Panel

The switches in this panel are used to enable or disable audio from the selected radio and navigation devices. For example, if the Comm 1 switch is set to 'On' and the Comm 2 switch is set to 'Off', the pilot will hear only audio from the Comm 1 radio.

Audio from Comm devices will be in the form of speech from ATC, and audio from Navigation devices will be in the form of Morse code. Each navigation aid (VOR, NDB, ILS etc.) has a Morse code identifier, to confirm the frequency selection is correct.



Transponder

A transponder is a radio transmitter/receiver that generates a response to ATC when interrogated by a radar signal. This provides ATC with an enhanced return signal from the aircraft. This return signal may also contain information about the aircraft's heading, altitude, and speed. Aircraft under the control of ATC are assigned a unique transponder code that is set at the start of the flight. Aircraft operating under VFR rules use a common transponder code. In the US, this is 1200.

Prior to the flight, and once the avionics are powered-up, the transponder may be set using STBY (standby mode).

During flight, the transponder should be set to XPDR (transponder) mode.



COMM 1
and COMM
2 Radios

This aircraft is equipped with two communications radios (COMM 1 and COMM 2).

COMM 1 and COMM 2 are used for ATC voice communications, and are identical in function, and either can be used at any time. The presence of two COMM radios provides redundancy, in case of failure of the other unit.



NAV 1 and
NAV 2
Radios

This aircraft is equipped with two navigation radios (NAV 1 and NAV 2).

NAV 1 and NAV 2 may be tuned to receive signals from VOR, NDB and ILS ground radio-based navigation aids.

The NAV 1 radio is linked to the Horizontal Situation Indicator (HSI) on the [Pilot's Primary Instruments](#) panel.

The NAV 2 radio is linked to the VOR/ILS received on the [Pilot's Primary Instruments](#) panel.



GNS 530

The GNS 530 is Laminar Research's interpretation of the Garmin 530 series of GPS (Global Positioning System) receivers.

This unit appears provides the pilot with the ability to input a pre-determined flight plan, which is then presented in 'plan' view on the display. The pilot may elect to follow the course either manually, or using the autopilot.

Instructions for operating the Laminar Research GPS units can be found in [separate \(dedicated\) manuals](#).

Instructions for operating the GNS 530 in tandem with the Baron autopilot can be found later in this manual.



ADF
Frequency
Selection
Panel

This panel is used to select the frequency of the Non-Directional Beacon (NDB) transmitter used in conjunction with the ADF (Automatic Direction Finder – see ["Pilot's Primary Instruments"](#))

Instrument Sub Panel



Master Electrical Switches

The Battery On/Off switch provides power to all electrical systems, with the exception of those that are actuated separately by the Avionics Master Switch.

The Left and Right ALT switches energize their respective alternators, which charge the batteries when the engines are running.



Avionics Master Power and Prop Sync

The Avionics Master switch provides power to the avionics bus. The avionics bus is isolated from the main electrical bus, in order to protect the avionics from voltage fluctuations during engine startup and shut-down.

The Prop Sync switch engages the propeller synchronization mechanism, which ensures the propellers turn at the same speed. This eliminates the beating sound that can result from propellers turning at slightly different speeds.



Pitot Heat Switches

Pitot tubes are small metal cylinders that extrude from the wings or fuselage, and allow on-rushing air to generate pressure, that is converted into an airspeed reading in the cockpit.

Pitot tubes are subject to icing in certain conditions, which can compromise the accuracy of the airspeed indication.

The Pitot Heat switches engage the left and right heaters, which protect the tubes from icing.



Icing Switches

The Stall Warning Icing switch engages the stall warning inlet heater, to ensure the warning is not compromised by ice build-up.

The Prop Icing switch engages an electric heater that keeps the propeller warm, and therefore free of ice.

The Windshield icing switch engages a heater that prevents ice forming on the glass.

The Surface icing switch toggles the wing and horizontal stabilizer pneumatic de-icing "boots" between automatic, and manual modes. In automatic mode, these inflate periodically without any action required from the pilot.

Inflatable de-icing boots are rubber membranes that change shape when compressed is forced inside. This breaks up the ice, which then falls away.

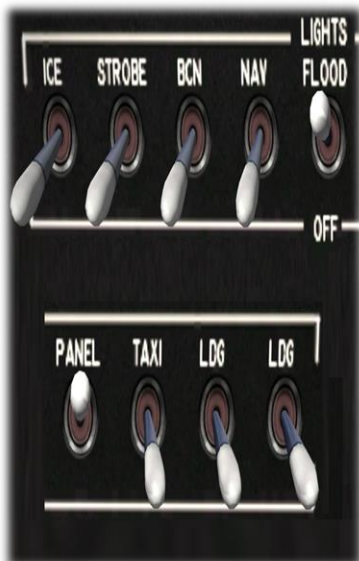


Fuel Boost Pump Switches

These switches activate the left and right Fuel Boost Pumps.

These electrically powered pumps provide fuel to the engines prior to startup. Once the engines are running, the primary (engine-driven) fuel pumps take over this task, and the fuel boost is no longer required.

The Fuel Boost pumps may also be used as backup fuel pumps, in the event the primary pumps fail.



Lights Panel

The Ice light switch illuminates the leading edge of the wing on the pilot's side, to make ice build-up visible in low-light conditions.

The Strobe light switch illuminates the strobe lights, which are located at the wing-tips.

The Beacon light switch illuminates the rotating red beacon on the tail assembly. This indicates, to nearby persons and aircraft, that the aircraft is operating.

The Navigation light switch illuminates the red, green and white navigation lights that are located on the port and starboard wingtips, and the rear fuselage tip. These lights provide other pilots with awareness of the aircraft, and its direction of travel relative to their aircraft.

The Taxi lights switch illuminates the nose wheel-mounted taxi light, which aids the pilot in following taxi routes in low-light conditions.

The Landing light switches illuminate the left and right wing-mounted landing lights, which aid the pilot during approaches to the runway, and also make other pilots aware that the aircraft is departing or arriving.



Landing Gear Lever

Used to raise, and lower, the landing gear.

The three green lights indicate if each of the three landing gear assemblies are down and locked.



Parking Brake

The parking brake keeps the aircraft stationary for extended periods of time, when the pilot-actuated toe-brakes are not in effect.

Pull the parking brake towards to you engage, and push it away to disengage.



Fuel Gauges

The quantity of fuel remaining in the left and right fuel tanks.



Prop Amps and De-Icing Gauges

The Prop Amps Gauge shows the total current being drawn from the electrical system by the propeller de-icing heater.

The De-Icing Gauge displays the available pressure in the pneumatic de-icing system (in lbs. per square inch). The green arc indicates the normal range.



Flap Lever

Used to extend or retract the wing flaps.

When extended, the flaps increase both the lift, and the drag of the wing, giving more desirable properties for slow flight when approaching or departing an airport.

When retracted, the shape of the wing is more suited for cruise flight.

The Baron has three flap positions:

In Transit (fully retracted).
 Approach (partially extended).
 Down (fully extended).



Panel Light Dimmers

These four rotaries control the various lighting available to illuminate the panel.

The Flight Instrument rotary controls the brightness of the primary instrument back-lighting.

The Instrument Flood rotary controls the brightness of the instrument panel front-lighting.

The Engine Instrument Avionics rotary controls the brightness of the engine instrumentation back-lighting, and avionics back-lighting.

The Sub Panel Lighting rotary controls the brightness of the sub panel back-lighting.

Throttle Quadrant and Center Console



Throttle Levers

The Baron B58 is equipped with dual throttles – which control the torque (power) transmitted by the left and right engines.



Prop Levers

The Baron B58 is equipped with variable pitch propellers. The pitch of the propellers is controlled using the Prop Levers. Fine pitch (full forward) is required during takeoff and landing, and a coarser pitch is used during cruise for optimum performance in thinner air.



Mixture Levers

The Baron B58 is equipped with "Mixture" levers. These control the ratio of fuel and air flowing into the engine cylinders. Advance the levers forward to richen the mixture, and retard them for a thinner mixture. Retard the levers all the way to cut off the fuel-flow entirely, thus stopping the engines.

At low altitudes, the air has a higher density, and a richer mixture is required.

At high altitudes, the air is thinner, and a leaner mixture is required.



Rudder Trim Wheel

The rudder is a control surface on the tail, used to yaw the aircraft to the left, or the right. This keeps the aircraft on the desired track in the event of crosswinds, or other asymmetric forces.

The Rudder Trim Wheel operates a trim tab that is built into the rudder. This relieves the pilot from applying continuous pressure to the rudder pedals.

The rudder trim-tab on the Baron is electrically actuated, and thus will only work with the battery master switch in the "On" position.

This wheel may be controlled using the mouse-pointer. However, it is recommended the pilot assign an external peripheral axis to this control, if one is available.



Elevator Trim Wheel

The elevators are control surfaces on the tail assembly, used to pitch the aircraft up, or down, to initiate a climb or descent.

The Elevator Trim Wheel operates a trim tab that is built into the elevators. This relieves the pilot from applying continuous pressure to the yoke.

The elevator trim-tab on the Baron is electrically actuated, and thus will only work with the battery master switch in the "On" position.

This wheel may be controlled using the mouse-pointer. However, it is recommended the pilot assign an external peripheral axis to this control, if one is available.



Aileron Trim Wheel

The ailerons are control surface built into the wings, used to roll the aircraft to the left, or the right. This turns the aircraft in the desired direction.

The Aileron Trim Wheel operates trim tabs that are built into the ailerons. This relieves the pilot from applying continuous pressure to the yoke.

The aileron trim-tabs on the Baron are electrically actuated, and thus will only work with the battery master switch in the "On" position.

This wheel may be controlled using the mouse-pointer. However, it is recommended the pilot assign an external peripheral axis to this control, if one is available.



Cowl Flap Levers

These levers actuate the left and right engine cowl flaps.

Cowl flaps are assemblies on the engine cowlings that may be opened, or closed, to control the intake of air for cooling purposes.

When open, cowl flaps provide more cooling air to the engines, at the expense of increased drag. Cowl flaps are therefore used in phases of flight where the engines are operating at maximum capacity, and where higher drag can be tolerated. This is usually during takeoff. Cowl flaps may also be used in the event the engine temperature is higher than desired.

It is recommended the pilot assign an external peripheral axis to these levers, if one is available.

Copilot's Secondary Instruments



ADF (Automatic Direction Finder)

This instrument displays a direct bearing to or from a selected NDB (Non Directional Beacon).

NDBs are simple radio transmitters. As such, the ADF instrument can also provide bearing information to non-aviation related transmitters, such as commercial radio stations, or any other radio source operating within the appropriate bandwidth.



Altimeter

The altimeter displays the altitude above sea level (and not the altitude above the ground). This instrument uses the barometric pressure of the air around the aircraft to determine the altitude. As such, it must be calibrated at the start of the flight, and also periodically re-calibrated during the flight. This is accomplished using the rotary control at the lower-left of the instrument.

To calibrate this instrument, the pilot must be aware of the published barometric pressure at his current location. This information is provided by weather services, and also by ATC communications.

Autopilot Operation

This section of the manual outlines the basic features supported by the autopilot included with the X-Plane version of the Beech Baron B58. This may differ in some respects versus autopilot models fitted to the real-world aircraft.



AP ON/OFF

This button is used to toggle the autopilot system between on and off. This activates / deactivates the unit. The **Master Battery and Avionics** must already be on in order to activate.

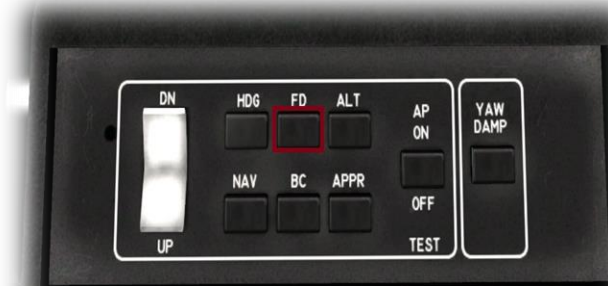
When the autopilot is initially switched to "ON", the pilot still has full manual control of the aircraft, because no autopilot mode has yet been selected.



HDG (Heading) Mode

When this mode is engaged, the autopilot will turn the aircraft to the heading selected by the pilot.

The pilot may select the desired heading using the "Heading Bug", which is controlled by the rotary switch at the lower-left of the Horizontal Situation Indicator (HSI).



FD ON

When the autopilot is off, the FD (Flight Director) will turn on automatically.

The Flight Director is built into the Horizontal Situation Indicator (HSI), and informs the pilot if he is left, right, above, or below the desired course (as set by the active navigation device).

The active navigation device is selected using the "CDI" button on the front panel of the Garmin GPS unit. When set to VLOC, the active navigation device is the NAV 1 radio. When set to GPS, the active navigation device is the Garmin GPS.



ALT (Altitude) Mode

When this mode is engaged, the autopilot will level the aircraft at the current altitude, and hold this.



NAV (Navigation) Mode

When this mode is engaged, the autopilot will steer the aircraft to follow the desired course, as defined by the active navigation device.

The active navigation device is selected using the "CDI" button on the front panel of the Garmin GPS unit. When set to VLOC, the active navigation device is the NAV 1 radio. When set to GPS, the active navigation device is the Garmin GPS.



BC (Back Course) Mode

The pilot may use the BC (Back Course) mode to instruct the autopilot to follow the **back course** of the ILS localizer (selected using the NAV 1 radio). This will keep the aircraft on the desired course towards the runway.

Some ILS approaches use only a single transmitter, which provides a signal on both the front, and back course of the runway. The signal is reversed on the back course, and therefore the autopilot must be in the appropriate mode, in order that it steer accordingly when flying a back course.

The Baron is not equipped with auto-throttles, so the Autopilot cannot follow the ILS glideslope. The glideslope indication is displayed on the HSI, but the pilot is responsible for controlling the rate of descent / ascent, to follow it.

Note: VLOC Mode must be selected (on the front panel of the GPS unit) when using an ILS.



APPR Mode

The pilot may use the APPR (Approach) mode to instruct the autopilot to follow the ILS localizer (selected using the NAV 1 radio). This will keep the aircraft on the desired course towards the runway.

The Baron is not equipped with auto-throttles, so the Autopilot cannot follow the ILS glideslope. The glideslope indication is displayed on the HSI, but the pilot is responsible for controlling the rate of descent / ascent, to follow it.

Note: VLOC Mode must be selected (on the front panel of the GPS unit) when using an ILS.



YAW ON

This button is used to switch on the Yaw Damper system.

A Yaw Damper reduces rolling and pitching oscillations, and uses a computer system that works in conjunction with a series of yaw-rate sensors located on the aircraft.



DN / UP Rocker Switch

This switch is used to adjust the rate of ascent or descent.

When "UP" is clicked, the rate of **ascent** increases.

When "DN" is clicked, the rate of **descent** increases.

This overrides the current pitch instruction from the autopilot.

Flight Planning

Flight planning is the process of determining a route from origin to destination that takes into account fuel requirements, terrain avoidance, Air Traffic Control, aircraft performance, airspace restrictions and notices to airmen (NOTAMS).

General information about flight plans is available on Wikipedia at http://en.wikipedia.org/wiki/Flight_planning

Flight plans can be generated by onboard computers if the aircraft is suitably equipped. If not, simulation pilots may elect to use an online flight planner. A web search for the phrase "Flight Planner" will yield a great many options, many of which are free services.

A good online flight planner will utilize the origin and destination airports, together with the aircraft type and equipment, the weather conditions, the chosen cruise altitude, known restrictions along the route, current NOTAMS, and other factors to generate a suitable flight plan. The waypoints incorporated into the flight plan can be subsequently input into the aircraft's Flight Management Computer (FMS), or Global Positioning System (GPS). Some online flight planners provide the option to save the plan as an X-Plane compatible file, with an .fms extension. A saved flight plan can be loaded into the GPS or Flight Management Computer unit featured in the Baron B58.

It is recommended the pilot generate a flight plan for the chosen route before using the GPS units.

Instructions for operating the Laminar Research GPS units can be found in separate (dedicated) manuals.

Fuel Calculation

ICAO regulations for commercial flights require an aircraft be fueled sufficiently to meet each of the following criteria:

Taxi Fuel

The estimated fuel required to taxi from the startup location to the active runway at the origin, plus the estimated fuel required to taxi from the active runway to the shutdown location at the destination. This is dependent on the ground route that will be followed, and the traffic at the airports in question. The pilot must use his or her judgement to determine the total taxi time. Once this has been estimated, use the following lookup table to determine the amount of fuel required.

Taxi Fuel Table

Taxi Time (minutes)	Fuel Flow (lbs. / hour)	Fuel (lbs.)
10	53	9
20	53	18
30	53	27
40	53	35
50	53	44
60	53	53

Trip Fuel

The estimated fuel required to complete the in-flight portion of the trip. This will be a factor of the expected elapsed time for the flight, which will be provided by your chosen online flight planner. Once this has been calculated, use the following lookup table to determine the amount of fuel required.

Trip Fuel Table

Flight Time (minutes)	Fuel Flow (lbs. / hour)	Fuel (lbs.)
10	177	30
20	177	60
30	177	89
40	177	118
50	177	148
60	177	177
70	177	207
80	177	236
90	177	266
100	177	295
110	177	324
120	177	354
130	177	384
140	177	413
150	177	443
160	177	472
170	177	502
180	177	531
190	177	561
200	177	590
210	177	620
220	177	649
230	177	679

Contingency Fuel

Contingency fuel is carried to account for additional en-route fuel consumption caused by wind, routing changes, or airspace restrictions. The minimum contingency fuel is the greater of the following:

5% of trip fuel

Or

5 minutes of flight time

To determine the contingency fuel, calculate 5% of the "Trip Fuel" (multiply by 0.05) and then compare this with the fuel required for 5 minutes of flight time, which is 15 lbs. (for the Baron B58). Use whichever is the greater of these two values.

Alternate Destination Fuel

In the event a missed approach is required at the original destination, and a diversion occurs to the alternate, the elapsed time from the original destination to the alternate must be accounted for. This can be most easily determined by creating a separate flight plan that uses the original destination as the origin, and the alternate as the destination. Use the Trip Fuel Table to determine the contingency fuel required for this amount of flight time.

Final Reserve Fuel

This provides for an additional 45 minutes of holding flight for aircraft powered by reciprocating engines (including the Baron series), and 30 minutes for aircraft powered by jet engines. Use the Trip Fuel Table to determine the final reserve fuel required for this amount of flight time.

Additional Fuel

This provides for the eventuality of an engine failure, or cabin pressurization loss, whereby the aircraft would consume more fuel than expected due to the inefficiency of flight without all engines operating, or at a lower altitude. For the purposes of this guide, any additional fuel added will be entirely determined by the pilot's judgement.

Discretionary Fuel

As stated, this is at the discretion of the pilot, who must compare the additional safety margins vs the additional weight and cost of the larger fuel load.

Final Calculated Fuel Load

Calculate the sum of the components described above, as follows:

Taxi Fuel + Trip Fuel + Contingency Fuel + Alternate Destination Fuel + Final Reserve Fuel + [Additional Fuel] + [Discretionary Fuel]

Weight & Balance

Proper weight and balance control is crucial to the safe operation of any aircraft. Two elements are vital in this process:

Total Weight

This must be no greater than the maximum allowed by the regulatory body that oversees the operation of the aircraft. In the United States, this is the Federal Aviation Administration (FAA).

Determining the total weight for the X-Plane Baron B58.

The total weight is the sum of the following components:

- Empty weight (3,983 lbs.)
- Fuel weight
- Payload weight

X-Plane will calculate this for you in the Weight & Balance page for this aircraft.

The screenshot shows the 'WEIGHT, BALANCE, & FUEL' configuration window. It features a dark blue background with white text and controls. At the top, there's a toggle for 'Show Units In' set to 'US Customary'. Below this is a 'Center of Gravity' slider. The main section contains five sliders for 'Payload Weight', 'Total Fuel Weight', 'Fuel Tank 1 (Left)', and 'Fuel Tank 2 (Right)', each with a corresponding numerical input field. To the right, a large circular gauge displays the 'TOTAL WEIGHT' as 5193 lbs. Below the gauge, the 'EMPTY WEIGHT' (3983 lbs) and 'MAX WEIGHT' (5500 lbs) are shown. At the bottom right, a digital display shows '02:19:52' for 'FLIGHT TIME NORMAL CRUISE'. A 'Restore Defaults' button is at the bottom left, and a 'Done' button is at the bottom right.

Component	Value (lbs)
Empty Weight	3983
Fuel Weight	400.0
Payload Weight	810.0
Total Weight	5193

In this example, the total weight is 5,193 lbs., which is the sum of the empty weight (3,983), the fuel weight (400 lbs.) and the payload weight (810 lbs.). The empty weight is pre-determined, and the fuel weight is determined by the fuel calculation discussed earlier in this manual. The payload weight and location is entirely at your own discretion, and based on the fictitious scenario for the flight in question.

Notice that the change in center of gravity has not been applied automatically. This must be calculated manually, and is discussed next.

Center of Gravity (CG)

The point at which all weight of the aircraft is considered to be concentrated. This must be within the allowable range published for the aircraft in question.

The CG is expressed as the number of inches aft of the designated datum line, which is usually at, or near, the nose of the aircraft.

The actual center of gravity at the start of each individual flight is determined by the total "moment". This is the combination of the empty weight moment, the fuel moment, the passenger moment, and the baggage moment.

Empty Weight Moment

The Center of Gravity for the X-Plane B58 at an empty weight of 3,983 lbs. is defined (in Plane Maker) as 10.20 feet, which is 122 inches. Therefore, the empty weight moment is:

Empty Weight (3,983lbs) x Empty Craft CG (122) = **485,926 lbs.**

Fuel Moment

Use the following table to calculate the moment for the fuel:

Fuel Moment Table

Fuel weight (lbs.)	Fuel Moment	Fuel Moment (lbs.)
50	136 inches	6,800
100	136 inches	13,600
150	136 inches	20,400
200	136 inches	27,200
250	136 inches	34,000
300	136 inches	40,800
350	136 inches	47,600
400	136 inches	54,400
450	136 inches	61,200
500	136 inches	68,000
550	136 inches	74,800
600	136 inches	81,600
650	136 inches	88,400
700	136 inches	95,200
750	136 inches	102,000
800	136 inches	108,800
850	136 inches	115,600
900	136 inches	122,400
950	136 inches	129,200
1000	136 inches	136,000
1050	136 inches	142,800
1100	136 inches	149,600
1150	136 inches	156,400
1200	136 inches	163,200

Payload Moment

Use the following table to calculate the moment for the payload:

Payload Moment Table

Weight	Crew Arm (inches)	Crew Moment (lbs.)	Passenger Row 1 Arm (inches)	Passenger Row 1 Moment (lbs.)	Passenger Row 2 Arm (inches)	Passenger Row 2 Moment (lbs.)
80	87	6,960	128	10,240	154	12,320
90	87	7,830	128	11,520	154	13,860
100	87	8,700	128	12,800	154	15,400
110	87	9,570	128	14,080	154	16,940
120	87	10,440	128	15,360	154	18,480
130	87	11,310	128	16,640	154	20,020
140	87	12,180	128	17,920	154	21,560
150	87	13,050	128	19,200	154	23,100
160	87	13,920	128	20,480	154	24,640
170	87	14,790	128	21,760	154	26,180
180	87	15,660	128	23,040	154	27,720
190	87	16,530	128	24,320	154	29,260
200	87	17,400	128	25,600	154	30,800
210	87	18,270	128	26,880	154	32,340
220	87	19,140	128	28,160	154	33,880
230	87	20,010	128	29,440	154	35,420
240	87	20,880	128	30,720	154	36,960
250	87	21,750	128	32,000	154	38,500
260	87	22,620	128	33,280	154	40,040
270	87	23,490	128	34,560	154	41,580
280	87	24,360	128	35,840	154	43,120
290	87	25,230	128	37,120	154	44,660
300	87	26,100	128	38,400	154	46,200

Baggage Moment

Use the following table to calculate the moment for the baggage:

Baggage Moment Table

Weight	Baggage Front Compartment Arm (inches)	Baggage Front Compartment Moment (lbs.)	Baggage Rear Compartment Arm (inches)	Baggage Rear Compartment Moment (lbs.)
10	31	310	180	1,800
20	31	620	180	3,600
30	31	930	180	5,400
40	31	1,240	180	7,200
50	31	1,550	180	9,000
60	31	1,860	180	10,800
70	31	2,170	180	12,600
80	31	2,480	180	14,400
90	31	2,790	180	16,200
100	31	3,100	180	18,000
110	31	3,410	180	19,800
120	31	3,720	180	21,600
130	31	4,030	180	23,400
140	31	4,340	180	25,200
150	31	4,650	180	27,000

CG Calculation

The CG for the aircraft will be calculated with and without fuel. This ensures the fuel burn is taken into account. The fuel burn will cause the CG to change during flight, and this must remain within acceptable limits at all times.

CG with fuel = Total Moment / Total Weight

CG without fuel = (Total Moment – Fuel Moment) / (Total Weight – Fuel Weight)

Example

Our flight comprises a pilot (200 lbs.) a co-pilot (160 lbs.), and single passenger in row-1 (220 lbs.), a single passenger in row-2 (150 lbs.), some baggage in the front compartment (20 lbs.) and some baggage in the rear compartment (60 lbs.). The total fuel on-board will be 400 lbs.

The calculation would be as follows:

Empty Weight = 3,983 lbs. (Empty Moment = 485,926 lbs.)

Pilot Weight = 200 lbs. (Pilot Moment = 17,400 lbs.)

Co-Pilot Weight = 160 lbs. (Co-Pilot Moment = 13,920 lbs.)

Passenger-1 Weight = 220 lbs. (Passenger-1 Moment = 28,160 lbs.)

Passenger-2 Weight = 150 lbs. (Passenger-2 Moment = 23,100 lbs.)

Front Baggage Weight = 20 lbs. (Front Baggage Moment = 620 lbs.)

Rear Baggage Weight = 60 lbs. (Rear Baggage Moment = 10,800 lbs.)

Total Weight = Empty Weight (3,983 lbs.)

+ Fuel Weight (400 lbs.)

+ Pilot Weight (200 lbs.)

+ Co-Pilot Weight (160 lbs.)

+ Passenger-1 Weight (220 lbs.)

+ Passenger-2 Weight (150 lbs.)

+ Front Baggage Weight (20 lbs.)

+ Rear Baggage Weight (60 lbs.)

= **5,193 lbs.**

Total Moment = Empty Weight Moment (485,926 lbs.)

+ Fuel Moment (54,400 lbs.)

+ Pilot Moment (17,400 lbs.)

+ Co-Pilot Moment (13,920 lbs.)

+ Passenger-1 Moment (28,160 lbs.)

+ Passenger-2 Moment (23,100 lbs.)

+ Front Baggage Moment (620 lbs.)

+ Rear Baggage Moment (10,800 lbs.)

= **634,326 lbs.**

CG (with fuel) = Total Moment (634,326 lbs.) / Total Weight (5,193 lbs.)

= **122.15 inches**

$$\begin{aligned}
 \text{CG (without fuel)} &= \text{Total Moment} - \text{Fuel Moment} \\
 &= 579,926 \text{ lbs.} / 4,793 \text{ lbs.} \\
 &= \mathbf{120.994 \text{ inches}}
 \end{aligned}$$

Determine if the CG range for the flight remains within the forward and aft limits, as defined for this aircraft in the Plane Maker tool. These values are:

CG Forward Limit	CG Aft Limit
110 inches	134 inches

Setting the CG in the Weight and Balance Page

As mentioned earlier, the Center of Gravity for the X-Plane B58 (empty) is 122 inches. In the example above, the CG at takeoff is 122.15 inches, which is + 0.15 inches relative to empty. Accordingly, you should adjust the CG slider to +0.1 inches in the Weight and Balance Page.

Check Lists

The following check lists are designed with the convenience of the simulation pilot in mind, and differ from those of the real aircraft.

Initial Cockpit Check

Landing Gear Lever –
DOWN.

Parking Brake – ON.

Master Battery Switch –
ON.

Landing Lights – ON.

Taxi Lights – ON.

Navigation Lights – ON.

Beacon – ON.

Strobes – ON.

Flaps – DN (EXTENDED
FULL)



Pre-Flight Exterior Inspection

A Pre-Flight Inspection should always precede flight in any aircraft. The purpose of this inspection is to ensure the aircraft is in a state of readiness for the upcoming flight.

In X-Plane, a pre-flight inspection is not merely undertaken to simulate reality, but does in fact have real purpose, because the control surfaces of the aircraft interact directly with the airflow over and around them, just as in real life. As such, correct movement of all control surfaces is necessary for normal flight.

Prior to the pre-flight inspection, it is recommended the pilot select the "Circle" option from the "View" menu. This provides a convenient camera view for walking around the exterior of the aircraft.



Hold roll axis at full deflection.

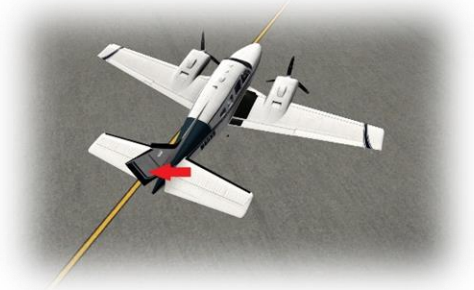




Visually check corresponding movement of ailerons.



Hold pitch axis at full deflection.

Visually check corresponding movement of elevators.

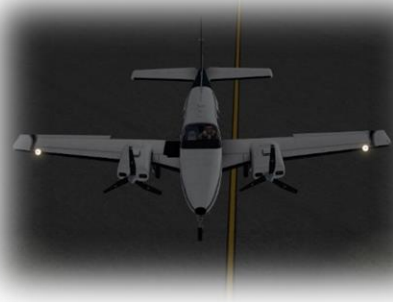


<p>Hold yaw axis at full deflection.</p> <p>Visually check corresponding movement of rudder.</p>	
<p>Visually check flaps are extended.</p>	
<p>Visually check strobe lights are operating.</p>	
<p>Visually check beacon lights are operating.</p>	
<p>Visually check navigation lights are operating.</p>	

Visually check taxi light is operating.



Visually check landing lights are operating.



Before Starting Engines

Exterior Inspection – COMPLETED
 Parking Brake – ON
 Power Levers – SLIGHTLY FORWARD
 Propeller Levers – FULL FORWARD
 Mixture Levers – FULL FORWARD
 All switches – OFF
 Battery Switch – ON
 Fuel Quantity – CHECK
 Check Annunciator Panel Warning Lights.



Engine Start

Master Battery Switch – CHECK ON
 Avionics Master Switch – OFF
 Left Alternator Switch – ON
 Left Magneto Switch – START (hold until engine running)
 When Engine Running:
 Left Power Lever – IDLE (FULL BACK)
 Left Magneto Switch – CHECK BOTH
 Right Alternator Switch – ON
 Right Magneto Switch – START (hold until engine running)
 When Engine Running:
 Right Power Lever – IDLE (FULL BACK)
 Right Magneto Switch – CHECK BOTH



Before Taxi

Flaps – RETRACTED
 Avionics Master Switch – ON
 Lights – AS REQUIRED
 Radios – AS REQUIRED
 TRANSPONDER – ON AND SET



Before Takeoff

Parking Brake – ON

Mixture Levers – CHECK FULL FORWARD

Prop Levers – CHECK FULL FORWARD

Left Throttle Lever – ADVANCE (2,000 RPM)

Left Magneto Switch – RIGHT

Check Left Engine RPM drop OK

Left Magneto Switch – LEFT

Check Left Engine RPM drop OK

Left Magneto Switch – SET BOTH

Right Magneto Switch – RIGHT

Check Right Engine RPM drop OK

Right Magneto Switch – LEFT

Check Right Engine RPM drop OK

Right Magneto Switch – SET BOTH

Left Prop Lever – RETARD 50%

Check Left Engine RPM drops

Left Prop Lever – FULL FORWARD

Right Prop Lever – RETARD 50%

Check Right Engine RPM drops

Right Prop Lever – FULL FORWARD

Elevator Trim – SET TAKEOFF

Flaps – RETRACTED for Standard Operations

Flaps – APPROACH – for short-field operations

Autopilot – OFF



Takeoff

LIGHTS – AS REQUIRED

Parking Brake – OFF

Propeller Levers – CHECK FULL FORWARD

Mixture Levers – CHECK FULL FORWARD

Throttles – TAKEOFF POWER

Engine Instruments – CHECK

ROTATE – 85 KNOTS

SPEED - 92 KNOTS for Best Angle

SPEED - 105 KNOTS for Best Rate



Climb

Gear - UP

Flaps –RETRACTED

Climb Power – SET

Engine Instruments – MONITOR

LIGHTS – AS REQUIRED



Cruise

Cruise Power – SET

Prop Levers – SET (2,200 RPM)

Engine Instruments - CHECKED



Descent

Altimeters – SET.
Descent Power – SET.
Engine Instruments – CHECKED.



Landing

Flaps – AS REQUIRED.
Landing Gear – DOWN.
Landing Lights – ON.
Taxi Lights – AS REQUIRED.
Prop Levers – FULL FORWARD.
Power – AS REQUIRED.



After Landing

Landing & Taxi Lights – AS REQUIRED
Flaps – RETRACTED
TRANSPONDER – OFF



Operational Speeds

Never Exceed Speed (V. NE)	223 KIAS
Maximum Structural Cruise Speed (V. C)	195 KIAS
Maximum Maneuvering Speed (V. A)	156 KIAS
Maximum Flap Extension Speed (V. FE)	152 KIAS
Maximum Speed Landing Gear Operating (V. LO)	152 KIAS
Single Engine Minimum Control Speed (V. MCA)	84 KIAS
Stall Speed Landing Configuration (V. SO)	74 KIAS
Stall Speed Clean (V. S)	80 KIAS
Rotation Speed (V. R)	85 KIAS
Best Angle of Climb Speed (V. X)	92 KIAS
Best Rate of Climb Speed (V. Y)	105 KIAS
Maximum Cruise Speed	202 KIAS