PA-28-181 ARCHER III

OPERATIONS MANUAL

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Just Flight™

PA-28-181 ARCHER III

Operations Manual

Please note that X-Plane 12 must be correctly installed on your PC
prior to the installation and use of this PA-28-181 Archer III simulation.

CONTENTS

INTRODUCTION

The PA-28-181 Archer III is a four-seat, piston-engine aircraft equipped with fixed tricycle landing gear, 180 HP four-cylinder engine and fixed-pitch propeller.

The origins of the Archer start with the Piper Cherokee, which began production in 1961. The Cherokee was introduced as a more affordable alternative to Piper's Comanche and to compete with the popular Cessna 172. Piper continued to develop variants of the Cherokee and the Archer III, certified in the mid-1990s, is one of the most recent PA-28 variants to be built, reflected in its streamlined cowling and cockpit overhead panel controls. Capable of cruising at 118 knots and with a range of nearly 500 miles, it is ideal for touring and flight training.

Aircraft specifications

Dimensions

Length	7.3 m (24 ft)
Wingspan	10.8 m (35.5 ft)
Height (to top of tail)	2.2 m (7.3 ft)
Wing area	15.8 m^2 (170 ft^2)

Engine

Type	Lycoming O-360 four cylinder, horizontally opposed, air-cooled piston
Power	180 horsepower at 2,700 RPM
Propeller	Two-blade, fixed-pitch

Weights

Empty weight	1,683 lb (763 kg)
Maximum take-off/landing weight	2,550 lb (1,157 kg)
Maximum baggage weight	200 lb (91 kg)
Maximum useful load	875 lb (397 kg)

Fuel and oil

Fuel capacity	50 US gallons
Usable fuel	48 US gallons
Oil capacity	8 US quarts

Performance

VNE (never exceed speed)	154 KIAS
VNO (max. cruising speed)	125 KIAS
VA (manoeuvring speed)	113 KIAS (at 2,550 lb)
	89 KIAS (at 1,634 lb)
VFE (max. flap speeds)	102 KIAS
VSO (stall speed)	45 KIAS (landing configuration)
Service ceiling	13,200 ft
Range (max. payload)	522 nautical miles

Paint schemes

The Archer III is supplied in the following six paint schemes:

- D-EFVC (Germany)
- EC-JQO (Spain)
- G-BXTW (UK)
- HB-PPN (Switzerland)
- N6092U (USA)
- VH-PPR (Australia)

INSTALLATION, UPDATES AND SUPPORT

You can install this Archer III software as often as you like on the same computer system:

1. Log in to your 'Account' on the Just Flight website.
2. Select the 'Your Orders' button.
3. A list of your purchases will appear and you can then download the software you require.

To install the aircraft in X-Plane 12:

1. Download the Archer III from your Just Flight Account.
2. Unzip the downloaded .zip file. The resulting folder will be named 'JF12_PA28_Archer_III'.
3. Copy the 'JF12_PA28_Archer_III' folder into the 'X-Plane 12/Aircraft' folder.

Accessing the aircraft

To access the aircraft in X-Plane 12:

1. From the Main Menu, click 'New Flight' or go to the Flight Configuration window.
2. Click on the 'PA28 Archer III' in the aircraft selection screen.
3. Click 'Customize' and choose a livery from the drop-down menu in the top right.
4. Click 'Start Flight'.

Uninstalling

To uninstall this software from your system:

1. Go to your X-Plane 12 folder.
2. Open the 'Aircraft' folder.
3. Delete the 'JF12_PA28_Archer_III' folder.

Recommended X-Plane settings

Joystick/yoke

For maximum enjoyment of this aircraft in X-Plane we recommend setting your joystick 'Stability Augmentation' sliders to 0. This will help prevent control issues, such as running out of pitch trim, and results in more realistic flight behaviour.

To turn off Stability Augmentation, follow these steps:

1. Launch X-Plane and go to the 'Settings' window.
2. Go to the 'Joystick' tab.
3. Click on the 'Control Sensitivity' button along the bottom of the window.
4. Set all three of the 'Stability Augmentation' sliders to 0% to disable them.
5. The Control Response sliders can be set as desired.
6. Press 'Done'.

Website Updates

Please check the News and Customer Service pages on the Just Flight website for news and updates for this aircraft and for all our other products.

Technical Support

To obtain technical support (in English) please visit the Support pages on the Just Flight website. As a Just Flight customer you can obtain free technical support for any Just Flight or Just Trains product.

Regular News

To get the latest news about Just Flight products, subscribe to our regular emails.

You can also keep up to date with Just Flight via Facebook and X/Twitter.

SYSTEMS GUIDE

Airframe

The Archer III is a single-engine, all-metal aircraft with fixed landing gear. It has seating for up to four occupants, a 200-pound luggage compartment and a 180 HP engine.

The basic airframe is constructed out of aluminium alloy. Aerobatics are prohibited in this aircraft since the structure is not designed for aerobatic loads. The fuselage is a semi-monocoque structure. There is a front door on the right side and a cargo door is installed aft of the rear seat.

The wing is of conventional semi-tapered design and employs a laminar flow NACA 652-415 airfoil section. The main spar is located at approximately 40% of the chord aft of the leading edge. The rear spar, in addition to taking torque and drag loads, provides a mount for flaps and ailerons. The four-position wing flaps are mechanically controlled by a handle located between the front seats. When fully retracted, the right flap locks into place to provide a step for cabin entry. Each wing contains one fuel tank.

A vertical stabiliser, an all-movable horizontal stabilator and a rudder make up the empennage. The stabilator incorporates an anti-servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the same direction as the stabilator but with increased travel.

Fuel system

The fuel system was designed with simplicity in mind. Fuel is contained in two 25 US gallon tanks, one in each wing. Of the total 50-gallon capacity, only 48 gallons are usable.

The tanks are attached with screws to the leading edge of the wing and are an integral part of the wing structure.

A fuel tank selector allows the pilot to control the flow of fuel to the engine and is located on the left sidewall below the instrument panel. It has three positions: OFF, LEFT TANK and RIGHT TANK. The arrow on the handle of the selector points to the tank which is supplying fuel to the engine.

An auxiliary electric fuel pump is provided in case the engine-driven pump fails. The electric pump should be adequate for all take-offs and landings and when switching tanks. The fuel pump switch is on the switch panel above the throttle quadrant.

Fuel quantity and pressure are indicated on gauges on the instrument panel. There is a separate fuel quantity gauge for each tank.

Electrical system

The battery master and alternator switches are located on the overhead switch panel. A radio master switch is located just above the throttle quadrant. The circuit breaker panel is located on the lower right side of the instrument panel. Each breaker is clearly marked to show which circuit it protects.

An emergency avionics switch is also provided to supply auxiliary power to the avionics bus in the event of an avionics power switch circuit failure.

Standard electrical accessories include alternator, starter, electric fuel pump and primer, stall warning horn, ammeter and annunciator panel.

The annunciator panel includes alternator inoperative, low oil pressure and low vacuum, low bus voltage, starter engaged and pitot heat indicator warning lights. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly and that the pilot should check and monitor the applicable system gauge to determine when, or if, action is required.

The primary electrical power source is a 28-volt, 70-amp alternator. The alternator provides full electrical power output even at low engine RPM. This provides improved radio and electrical equipment operation and increases battery life by reducing battery load.

Secondary power is provided by a 24-volt battery. The ammeter, as installed, does not show battery discharge; it shows the electrical load placed on the system. With all the electrical equipment off, and the battery master switch on, the ammeter will indicate the charging rate of the battery. As each electrical unit is switched on, the ammeter will indicate the total ampere draw of all the units, including the battery. For example, the average continuous load for night flying with radios on is about 32 amperes. The 32-ampere value plus 2 amperes for charging the battery will then show on the ammeter, indicating that the alternator is functioning properly.

Vacuum system

The vacuum system is designed to operate the air-driven gyro instruments. This includes the directional and attitude gyros, when installed. The system consists of an engine vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The vacuum gauge, mounted on the left instrument panel, provides valuable information to the pilot about the operation of the vacuum system. A decrease in pressure, or zero pressure, over an extended period may indicate a problem with the vacuum system.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads 4.8-5.2 inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM.

Pitot-static system

The system supplies both pitot and static pressure for the airspeed indicator, altimeter and vertical speed indicator.

Pitot pressure is picked up by the pitot head on the bottom of the left wing. The switch for pitot heat is located on the switch panel. Static pressure is sensed by button-type vents on each side of the aft fuselage.

Lighting system

Lights fitted to the aircraft include navigation, anti-collision strobe, landing, instrument panel and cabin dome lights.

The lighting control switches and knobs are located on the overhead switch panel.

Instrument markings

Airspeed indicator markings

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White arc	45-102	Full flap operating range. Lower limit is maximum weight VSO in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green arc	50-125	Normal operating range. Lower limit is maximum weight VS1 with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow arc	125-154	Operations must be conducted with caution and only in smooth air.
Red line	154	Maximum speed for all operations.

Engine indicator markings

INSTRUMENT	Red line or arc Minimum limit	Yellow arc Caution range	Green arc Normal operating	Red line Maximum limit
Tachometer	—	—	500-2,700 RPM	2,700 RPM
Oil temperature	—	—	100-245°F (38-118°C)	245°F (118°C)
Fuel pressure	—	—	0.5-8 PSI	8 PSI
Oil pressure	25 PSI	25-55 PSI (idle) and 95-115 PSI (start/ warm-up)	55-95 PSI	115 PSI
Vacuum gauge	—	—	4.8-5.2 inHg	5.2 inHg

Limits

Weight limits

Maximum ramp weight: 2,558 lb (1,160 kg)

Maximum take-off/landing weight: 2,550 lb (1,157 kg)

Maximum weight in baggage compartment: 200 lb (91 kg)

Centre of gravity limits

Weight (lb)	Forward limit Inches aft of datum	Rearward limit Inches aft of datum
2,550	88.6	93.0
2,050 and below	82.0	93.0

The datum used is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

Manoeuvre limits

This aircraft is certified in the normal category, which is applicable to aircraft intended for non-aerobatic operations. These include any manoeuvres incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles and steep turns in which the angle of bank is no more than 60° and pitch is no more than 30°.

Aerobatic manoeuvres, including spins, are not approved.

Flight load factor limits

Positive load factor (maximum): + 3.8 G

Negative load factor (maximum): No inverted manoeuvres approved

Types of operation

The aircraft is approved for the following operations:

- Day VFR
- Night VFR
- Day IFR
- Night IFR
- Non-icing

Fuel limitations

Total capacity: 50 US gallons

Unusable fuel: 2 US gallons (1 gallon per wing tank)

Usable fuel: 48 US gallons (24 gallons per wing tank)

Landing gear

The Archer III is equipped with fixed landing gear.

The nose gear is steerable through a 30-degree arc each side of centre by use of the rudder pedals and toe brakes. A spring device is incorporated for rudder centring and to provide rudder trim.

The brake system includes toe brakes on the left and right set of rudder pedals and a handbrake lever located below and near the centre of the instrument panel. The toe brakes and the handbrake have individual brake cylinders, but all the cylinders use a common reservoir. The parking brake is incorporated in the lever brake and is operated by pulling back on the lever and depressing the knob attached to the top of the handle. To release the parking brake, pull back on the brake lever and then allow the handle to swing forward.

Doors and exits

The aircraft is fitted with a passenger door and a baggage door.

The passenger door can be opened from within the virtual cockpit by clicking on the two door latches to rotate them to the OPEN position and then clicking and dragging on the door handle to push it open. It can be closed by pulling on the door handle to pull it closed and then clicking on the two door latches to rotate them to the LATCH position.

The Archer's passenger door is programmed in X-Plane to react to environmental forces, such as oncoming air (when trying to open the window while flying), as well as to G-forces (when yawing the plane on the ground or in flight). Not closing and latching it properly may result in some interesting movement, as it would in real life!

Flight controls

Dual flight controls are provided as standard equipment. A cable system provides actuation of the control surfaces when the flight controls are moved. The horizontal surface (stabilator) features a trim tab/servo mounted on the trailing edge. This tab serves the dual function of providing trim control and pitch control forces.

The trim function is controlled by a trim control wheel located on the control console between the two front seats. Rotating the wheel forward gives nose-down trim and rotation aft gives nose-up trim.

The rudder is conventional in design and incorporates rudder trim. The trim mechanism is a spring-loaded recentring device. The trim control is located on the right side of the pedestal, below the throttle quadrant. Turning the trim control clockwise results in nose-right trim and anti-clockwise rotation results in nose-left trim.

Manually controlled flaps are provided. They are extended by a control cable and are spring-loaded to the retracted (up) position. The control is located between the two front seats on the control console. To extend the flaps, pull the handle up to the desired flap setting of 10, 25 or 40 degrees. To retract the flaps, depress the button on the end of the handle and lower the control.

The aircraft will experience a pitch change during flap extension or retraction. This pitch change can be corrected either by stabilator trim or by increased control wheel force. When the flaps are in the retracted position the right flap, provided with an over-centre lock mechanism, acts as a step.

Engine

The Archer III is powered by a four-cylinder, horizontally opposed engine rated at 180 horsepower at 2,700 RPM. It is equipped with a starter, a 70-ampere 28-volt alternator, two magnetos, a vacuum pump drive and a fuel pump. The aircraft is equipped with a fixed-pitch propeller.

Engine controls

The engine controls consist of a throttle control and a mixture control lever. These controls are located on the control quadrant on the lower centre of the instrument panel, where they are accessible to both the pilot and the co-pilot.

The throttle lever is used to adjust the engine RPM. The mixture control lever is used to adjust the air-to-fuel ratio. The engine is shut down by placing the mixture control lever in the fully lean position.

The carburettor heat control lever is located to the right of the control quadrant.

Engine instruments

Indicators enable the pilot to check oil pressure, oil temperature, fuel pressure, RPM and EGT. The engine instruments are on the lower right portion of the left panel.

Ignition and starter system

Engine ignition is provided by a dual magneto on two spark plugs per cylinder. An electrical engine priming system is provided to facilitate starting. The primer and start switches are on the left side of the overhead switch panel, and separate left/right magneto switches are located in the centre of the panel.

Stall warning system

An approaching stall is indicated by a stall warning horn which is activated between 5-10 knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on a graph in the OPERATING DATA MANUAL.

The stall warning horn emits a continuous sound and is activated by a lift detector installed on the leading edge of the left wing. The battery master (BATT MASTR) switch must be ON for the stall warning system to function.

PANEL GUIDE

The instrument panel is designed to accommodate the customary advanced flight instruments and the normally required engine instruments.

The artificial horizon and directional gyros, located in the centre of the left-hand instrument panel, are vacuum-operated. The vacuum (gyro suction) gauge is also located on the upper left-hand instrument panel, along with the electric standby vacuum pump switch. The turn indicator on the left side is electrically operated.

The radios are in the centre section of the panel and the circuit breakers are in the lower right corner of the panel.

An annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure or vacuum systems.

The overhead switch panel contains all the engine-related (left side) and exterior lighting (right side) switches.

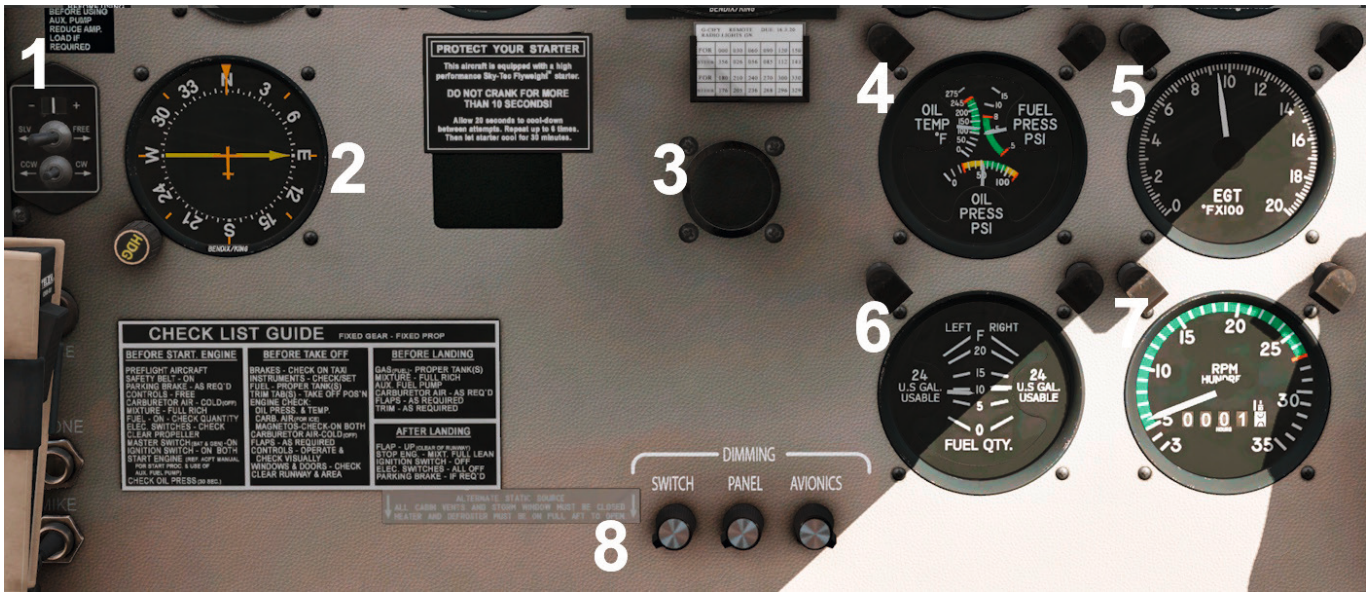
Additional features include a pilot storm window and two sun visors.

A large baggage area, located behind the rear seats, is accessible either from the cabin or through a large outside baggage door on the right side of the aircraft. When baggage is loaded, it is the pilot's responsibility to ensure that the aircraft's centre of gravity falls within the allowable CG range.

Left main panel

1. Emergency locator transmitter switch
2. Clock – a knob allows for adjustment of the hour and minute hands.
3. Airspeed indicator (ASI) – a true airspeed indicator is incorporated into the airspeed indicator. The true airspeed indicator consists of a rotatable ring which is controlled with the knob below the ASI. To set the indicator, rotate the ring until the pressure altitude is aligned with the outside air temperature (OAT). To obtain the pressure altitude, set the barometric scale of the altimeter to 29.92 inHg / 1013.2 hPa and then read the pressure altitude. With the ring set, the true airspeed can be read along the bottom scale.
4. Attitude indicator (AI) – a pitch reference knob allows the position of the pitch bars (aircraft symbol) to be adjusted nose-up or nose-down.
5. Altimeter – a barometric pressure scale is provided for hPa/mb. The pressure setting knob tooltip displays the currently selected pressure in hPa/mb or inHg, depending on which unit of measurement is currently active in the simulator settings.
6. Annunciator lights
7. Annunciator press-to-test button – press to test annunciator lights.
8. Electric elevator trim push-button – push in to enable the electric pitch trim (rocker switch located on yoke).
9. VOR 2 / ILS indicator – driven by GNC 255.
10. Auxiliary vacuum pump switch
11. Vacuum gauge
12. Turn and bank indicator
13. Horizontal situation indicator – course knob (bottom left) controls rotation of the course pointer. HDG knob (bottom right) controls the heading bug. Driven by the default GNS 530 (or RealityXP GNS/GTN, or TDS GTNXi, if installed).
14. Vertical speed indicator (VSI)
15. Stormscope

Left lower panel

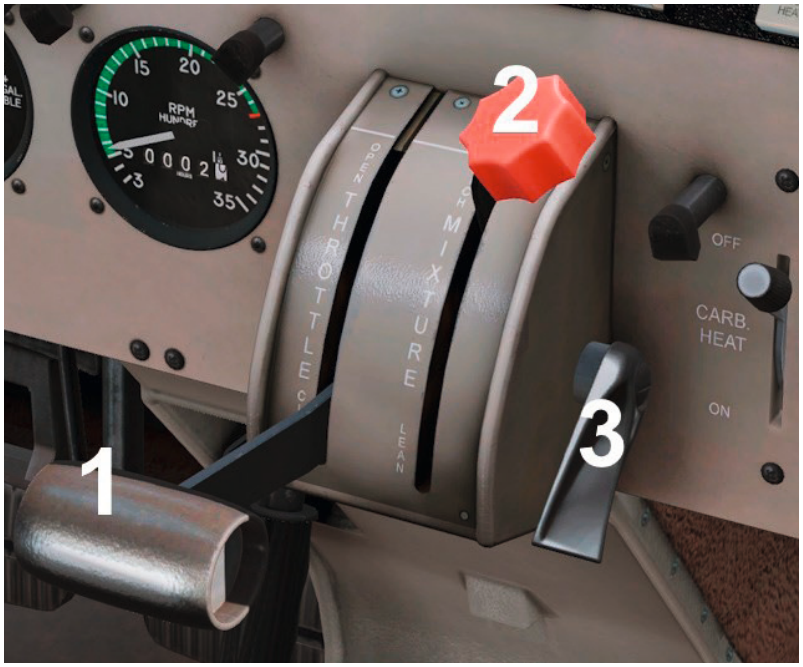


1. Compass slaving controls
2. ADF indicator – driven by KR 87 ADF system. HDG knob controls rotation of the compass card.
3. Yoke toggle clickspot (same location on right yoke)
4. Engine instruments – oil temperature, fuel pressure and oil pressure indicators
5. Exhaust gas temperature (EGT) indicator
6. Left and right fuel tank quantity indicator
7. Tachometer (RPM)
8. Panel light controls

Left sidewall

1. Fuel tank selector
2. Outside air temperature indicator
3. Storm window – the window can be opened by clicking on the latch

Throttle quadrant

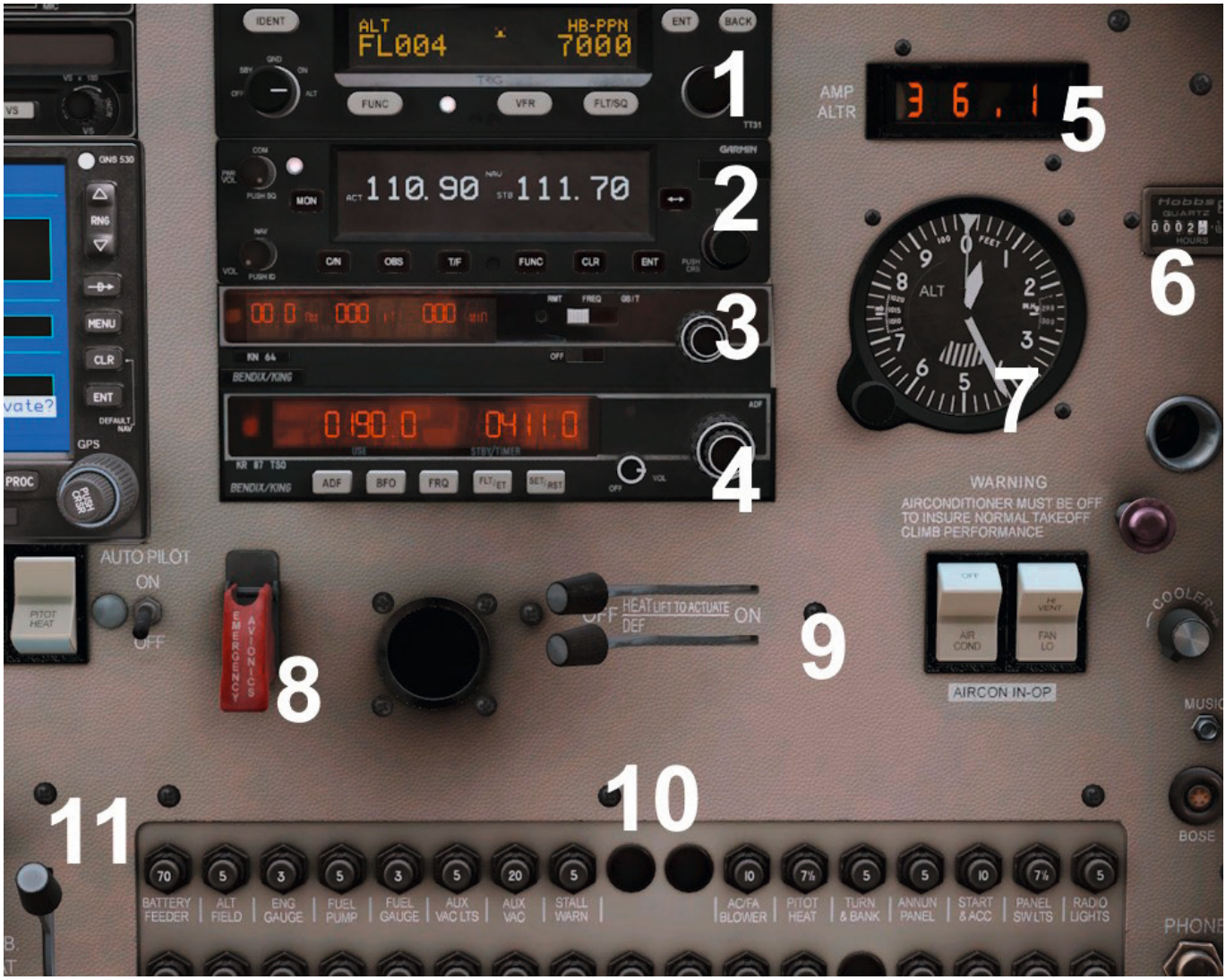


1. Throttle lever
2. Mixture lever
3. Friction control

Centre panel

1. Intercom controls
2. Traffic-Watch
3. KMA 24 audio selector
4. S-TEC 55 autopilot
5. GNS 530 GPS / COM 1 / NAV 1 unit (or RealityXP GNS/GTN, or TDS GTNXi, if installed)
6. Radio master switch
7. DME selector switch – selects whether the GNS 530 (or RealityXP GNS/GTN, or TDS GTNXi, if installed) or GNC 255 is used as the input to the KN 62 DME.
8. Pitot heat switch
9. Autopilot power switch

Right panel



1. TT31 Mode S transponder
2. GNC 255 COM 2 / NAV 2 unit
3. KR 87 ADF receiver
4. KN 62A DME
5. Digital ammeter
6. DATCON hour meter
7. Standby altimeter
8. Emergency avionics switch (guarded)
9. Heating controls
10. Circuit breaker panel
11. Carburettor heat control lever

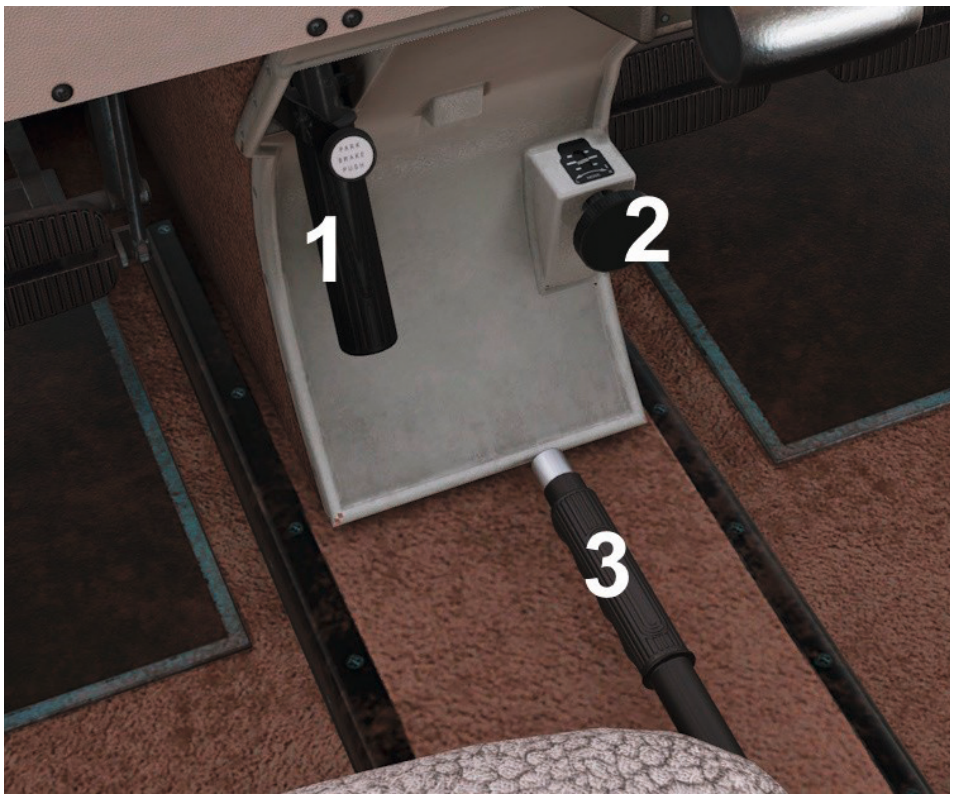
Overhead switch panel

1. Engine start switch
2. Engine prime switch
3. Battery master switch
4. Alternator switch
5. Fuel pump switch
6. Left magneto switch
7. Right magneto switch
8. Landing light switch
9. Navigation lights switch
10. Strobe (anti-collision) lights switch

Upper cockpit

1. Sun visors
2. Whiskey compass

Lower cockpit



1. Parking brake handle
2. Rudder trim knob and indicator – turning the trim control clockwise results in nose-right trim and anti-clockwise rotation results in nose-left trim.
3. Flap lever
4. Elevator trim wheel and indicator – rotating the wheel forward gives nose-down trim and rotation aft gives nose-up trim.

Stormscope – WXR

The panel is fitted with a Stormscope situational aid. This unit detects severe weather conditions and lightning strikes in a 360-degree circle around the aircraft.

Traffic-Watch – traffic monitor

1. Warning envelope switch
2. Display
3. Power/brightness switch

The Traffic-Watch unit provides awareness of AI traffic in the vicinity of the aircraft (up to 9 nautical miles), displaying their range, direction and altitude on the digital display.

Warning envelope

The warning envelope switch allows you to toggle between NEAR, FAR or MUTE modes:

- NEAR mode – traffic warnings are initiated whenever traffic is within 1 NM and less than ±500ft of your aircraft's altitude.
- FAR mode – traffic warnings are initiated whenever traffic is within 3 NM and less than ±1,000ft of your aircraft's altitude.
- MUTE mode – deactivates all warnings.

Brightness control

The power/brightness switch allows you to control power to the unit and toggle between bright or dim modes:

- OFF – power removed from unit
- BRT – display set to maximum brightness. Suitable for daylight flying.
- DIM – display set to minimum brightness. Suitable for night flying.

Display

If traffic is detected, the display will indicate its range (in nautical miles) and relative altitude (above/below aircraft in feet).

KMA 24 – audio selector

1. Marker lights
2. Audio select buttons – control receiver audio selections
3. Microphone selector knob – connects the microphone to the selected output

The KMA 24 is an audio control system which provides control over transceiver and receiver outputs through the use of audio select buttons. The buttons will illuminate when they are selected on.

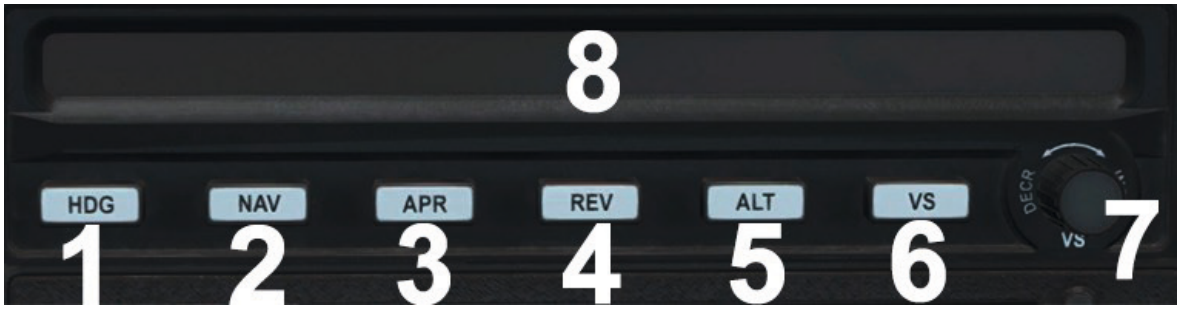
The simulator doesn't allow for separate speaker and headphone outputs so both buttons perform the same function.

The COM 1 and COM 2 buttons are used to toggle the COM 1 and COM 2 transceiver audio, allowing you to select COM 1 and/or COM 2 as the audio source(s) to monitor.

The NAV, DME, MKR and ADF buttons are used to toggle the associated audio sources.

The microphone selector knob connects the microphone to the selected output.

S-TEC 55 – autopilot



1. Heading select button – press to engage/disengage heading select mode.
2. Navigation hold button – press to engage/disengage navigation hold mode.
3. Approach hold button – press to engage/disengage approach hold mode.
4. Back course button – press to engage/disengage back course hold mode.
5. Altitude hold button – press to engage/disengage altitude hold mode.
6. Vertical speed button – press to engage/disengage vertical speed hold mode.
7. Vertical speed knob – rotate to select the vertical speed in 100s of feet.
8. Mode annunciators – illuminate to show which autopilot modes are engaged.

The S-TEC 55 is a digital autopilot. It is a highly capable two-axis autopilot without a flight director.

Auto-trim

The auto-trim system will use the elevator trim to make pitch changes when a pitch mode is active. When the elevator trim is in motion, ‘TRIM’ and the up or down symbol will annunciate to indicate the trim direction of travel.

Heading hold (HDG) mode

Set the heading bug on the HSI to the desired heading and then press the HDG button. The HDG annunciator will illuminate to indicate that heading hold mode is engaged. New headings can then be selected by moving the heading bug.

Navigation (NAV) hold mode

In navigation (NAV) hold mode the autopilot intercepts and tracks VOR and GPS courses.

To intercept and track a VOR course:

1. Tune the frequency for the selected VOR station into the GNS 530 (NAV 1).
2. Select the desired course on the HSI.
3. Press the NAV button. The NAV annunciator will illuminate to indicate that navigation hold mode is engaged.

To intercept and track a GPS course:

1. Program a flight plan into the GPS.
2. Press the CDI button in the lower left corner of the GNS 530 (NAV 1) to toggle the mode to ‘GPS’.
3. Press the NAV button on the S-TEC 55 autopilot. The NAV annunciator will illuminate to indicate that navigation hold mode is engaged.

Approach (APR) hold mode

The approach (APR) hold mode allows the autopilot to intercept and track ILS (localiser and glideslope).

To operate in the approach hold mode:

1. Tune the frequency for the selected ILS into the GNS 530 (NAV 1).
2. Set the course on the HSI to the final approach course.
3. Press the APR button. The APR annunciator will illuminate to indicate that approach hold mode is engaged.
4. The glideslope (GS) annunciator will illuminate to indicate glideslope capture arming, and glideslope capture is indicated by the extinguishing of the ALT annunciation.

Back course (REV) hold mode

The back course (BC) hold mode allows the autopilot to intercept and track a reverse course ILS.

To operate in the back course hold mode:

1. Tune the frequency for the selected ILS back course into the GNS 530 (NAV 1).
2. Set the course on the HSI to the final approach course. The ILS front course must be set, even though you will be flying a reciprocal heading on an ILS back course approach.
3. Press the REV button. The APR and REV annunciators will illuminate to indicate that back course hold mode is engaged.

Altitude (ALT) hold mode

Press the ALT button to engage altitude hold mode. The ALT annunciator will illuminate to indicate that altitude hold mode is engaged. This mode maintains the pressure altitude at the time of the mode selection.

Vertical speed (VS) hold mode

Press the VS button to engage vertical speed hold mode. The VS annunciator will illuminate to indicate that vertical speed hold mode is engaged. The autopilot will synchronise with the aircraft's vertical speed at the time the mode is engaged, and the corresponding vertical speed will be indicated on the display.

The selected vertical speed can be altered in 100ft increments by rotating the VS knob. The positive (+) symbol indicates a climb selection and the negative (-) symbol indicates a descent selection. The maximum selectable VS limits are ±1,600 feet per minute.

GNS 530 – GPS unit

1. Swap standby and active NAV 1 frequencies
2. ON/OFF knob – controls power to the unit
3. Swap standby and active COM 1 frequencies
4. Range key – zooms the map view in and out
5. Direct-To key – selects a waypoint to proceed directly to
6. Menu key – brings up the context-sensitive menu
7. Clear key – clears the last data entry. Press and hold to return to the main navigation view.
8. ENT key – acknowledge or confirm a data entry
9. GPS knob – used for data entry and to move among pages and page groups
10. Procedures key – allows the selection of instrument arrival, departure and approach procedures
11. VNAV key – this is an optional feature that is not implemented in this version of the GNS 530
12. Flight Plan key – brings up the Flight Plan page group
13. Message key – view the Messages page
14. OBS key – used to suspend and unsuspend automatic waypoint sequencing during an instrument approach and to engage OBS mode during navigation
15. CDI key – toggles between NAV 1 and GPS as the active navigation source
16. Frequency knob – tunes the COM 1 or NAV 1 frequency. Press in to switch between COM 1 and NAV 1.

Detailed instructions can be found in your ‘X-Plane 12/Instructions/X-Plane G530 Manual.pdf’.

TT31 – transponder

1. Mode knob
2. Identification button
3. Active mode
4. Reported altitude
5. Reply indicator
6. Function button (not implemented)
7. VFR button
8. Flight ID / squawk code button (not implemented)
9. Enter button
10. Back button (no function)
11. Code knob

Display

The display shows:

- Selected mode
- Current pressure altitude – displays as a flight level (hundreds of feet)
- Current squawk code
- Reply indicator

Modes

The mode knob controls the power to the transponder and is used to select the operating mode:

- OFF – power to the transponder is removed.
- SBY – Standby mode. The transponder is on but will not reply to any interrogations.
- GND – Ground mode. The transponder will respond to Mode S ground interrogations.
- ON – the transponder will respond to all interrogations, but altitude reporting is supressed.
- ALT – Altitude mode. The transponder will respond to all interrogations and provide altitude information.

When you are airborne, the transponder should be set to ALT unless otherwise directed by ATC. On the ground the transponder should be set to GND mode.

Buttons

Six push-buttons allow you to control the transponder:

- IDENT – when you are asked to ident by ATC, press and release the identification button. Your aircraft will be positively identified to the air traffic controller for 18 seconds.
- FUNC – non-functional in this simulation.
- VFR – sets the transponder to 1200
- FLT/SQ – non-functional in this simulation.
- ENT – enters a digit into the code selector.
- BACK – non-functional in this simulation.

The default VFR code can be set in the Archer's manifest.json file. The four digits are stored as 'VFRCode1', 'VFRCode2', 'VFRCode3' and 'VFRCode4'.

For example, the default VFR code could be changed to '7000' by setting 'VFRCode1' to '7', and the rest to '0'.

Code selector knob

The right-hand knob is used to set squawk codes. Clicking on the centre of the knob will highlight the first digit on the display and the digit can then be changed as required. Press the centre of the knob again to advance to the next digit.

When ENT is pressed on the last digit, the new code will replace the previous value.

Important codes

7700: Emergency

7600: Communications failure

7500: Hijacking

1200: VFR code (USA)

7000: VFR code (Europe)

Reply indicator

During normal operation the reply indicator will flash to indicate that the transponder is functioning properly and replying to interrogations from ground radar. Interrogations occur at 10-15 second intervals, corresponding to each radar sweep.

GNC 255 – COM 2 / NAV 2 radio

1. Power and COM volume knob – rotate the knob clockwise to power on the unit and rotate it anti-clockwise to power off the unit.
2. NAV volume knob – rotate the knob to adjust the NAV volume.
3. Frequency monitor button – non-functional in this simulation.
4. COM or NAV frequency selection button – swaps between COM and NAV (VLOC) radio modes.
5. OBS selection button – non-functional in this simulation.
6. To/From selection button – non-functional in this simulation.
7. Function selection button – accesses function categories for the COM/NAV radios and timer. Pressing the FUNC key once displays the function mode and pressing it again exits the function mode.
8. Clear data button – erases information, cancels entries and resets timers.
9. Enter button – saves selected values, confirms prompts and saves the standby frequency.
10. Frequency transfer button – swaps the active (left) and standby (right) frequency.
11. Outer and inner knobs – used for tuning frequencies and data entry.

The GNC 255 is a COM/NAV radio and acts as COM 2 / NAV 2 in the Archer III.

COM radio

Selecting a COM frequency

New frequencies are first selected as a standby frequency and then toggled to the active side using the FLIP/FLOP key. The standby frequency can be adjusted with the outer and inner knobs to select the desired frequency.

1. Press C/N to select the COM radio function.
2. Turn the outer knob to change the values in 1MHz increments.
3. Turn the inner knob to change the values in 25kHz increments.
4. Press the FLIP/FLOP key to toggle the standby frequency to the active frequency.

NAV radio

Selecting a NAV frequency

The selection of NAV frequencies is the same as for the COM frequencies.

1. Press the C/N key to reach the NAV radio function. The NAV annunciator on the top line of the display will appear.

2. Turn the outer knob to change the MHz values.
3. Turn the inner knob to change the kHz values.
4. Press the FLIP/FLOP key to toggle the standby frequency to the active frequency.

The station identifier is shown beneath the frequency.

Functions

Press the FUNC key to show the functions menu. This menu provides access to the COM frequency list, NAV frequency list and Timer (TMR) configuration menus:

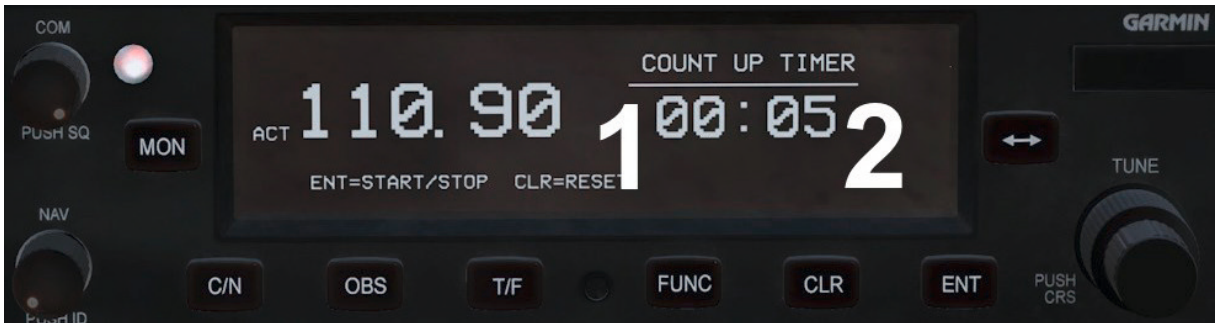
- COM frequency list
- NAV frequency list
- TMR Configuration
  - o Count Up – Count Up timer

Rotate the outer knob and then press the ENT key to select a menu (e.g. TMR Configuration). Rotate the inner knob and then press the ENT key to select a menu entry (e.g. Count Down).

Timers

The GNC 255 has a Count Up timer.

Setting up the Count Up timer



1. Minutes
2. Seconds

To set up the Count Up timer:

1. Press FUNC.
2. Turn the outer knob to TMR CONFIGURATION.
3. Press ENT.
4. Turn the inner knob to COUNT UP.
5. Press ENT.
6. Press the ENT key to start the timer.
7. Press the ENT key again to stop the timer.
8. Press CLR to reset the timer to 0:00.

KN 62A – DME

1. Three-position function switch – determines the information that is displayed and the channelling source.

   On the Frequency (FREQ) setting, the unit can be channelled internally.

   On the Groundspeed/Time-to-Station (GS/T) setting, the unit holds the internally selected frequency and also displays distance, groundspeed and time-to-station information.

   On the Remote (RMT) setting, the DME is channelled when you select your NAV frequency on the NAV 1 receiver (GNS 530) and displays distance, groundspeed and time-to-station.

2. ON/OFF switch – controls power to the unit.

   The KN 62A should be powered on only after engine start-up and should be turned off prior to engine shutdown.

3. Frequency selector knobs – used to alter the internally selected frequency.

   Turning the inner knob tunes the frequency in 0.05MHz steps. Turning the outer knob changes the larger digits (1MHz, 10MHz etc.).

The KN 62A is a Distance Measuring Equipment (DME) system. It can be channelled remotely through the NAV 1 receiver (GNS 530) or the NAV 2 receiver (GNC 255), depending on the position of the DME selector switch, or tuned directly with its own frequency selection knobs. This dual channelling compatibility makes two DME frequencies available to you at all times, allowing for DME holds.

Frequency mode

In this mode the DME displays distance and the internally selected frequency. You can alter the frequency using the frequency knobs.

Groundspeed/Time-to-Station mode

In this position the DME holds the internally selected frequency while displaying distance, groundspeed and time-to-station. A ‘frequency hold’ feature prevents you from accidentally altering the frequency when it isn’t displayed.

Remote mode

With remote mode selected, the DME uses the frequency that is selected on the NAV 1 receiver (GNS 530) or the NAV 2 receiver (GNC 255), depending on the position of the DME selector switch. Distance, groundspeed and time-to-station is shown. Dashes will be displayed when there is no valid signal.

KR 87 – ADF

1. Mode selector button – non-functional in this simulation.
2. BFO button – non-functional in this simulation.
3. Frequency transfer button – swaps the active and standby frequencies.
4. Timer mode button – non-functional in this simulation.
5. Set/reset timer button – non-functional in this simulation.
6. Volume knob – controls the volume of the identification Morse code tone.
7. Frequency select knobs – tune the standby frequency.

Frequency selection

The active ADF frequency is shown on the left side of the display at all times. A standby frequency is shown on the right side of the display.

The standby frequency is selected using the frequency select knobs which are rotated either clockwise or anti-clockwise. The outer knob tunes the 100s. The inner knob tunes the 10s and the small clickspot in the middle of the inner knob tunes the 1s (this simulates pulling the inner knob out).

The standby frequency selected can be transferred into the active slot by pressing the FRQ button. The standby and active frequencies will be exchanged (flip-flopped).

FAILURES

In addition to supporting the simulator's own failures system, this Archer simulation includes a few of the more common failures found on these aircraft:

- **Spark plug fouling** – this can occur if the engine is kept at low RPM for prolonged periods and symptoms include rough running with a subsequent increase in cockpit vibration. If fouling occurs, increase engine RPM and aggressively lean the mixture. This can be done at low power settings on the ground without harming the engine.
- **Vapour lock** – this can occur for up to approximately 30 minutes after the engine has been shut down. After shutdown, fuel vapour can remain within the fuel lines as the result of high temperatures. This vapour disrupts the operation of the fuel system and creates an incompatible mix of air and fuel, so you might need a few attempts at starting the engine before ignition occurs. This problem is more likely to occur when operating in high temperatures. If vapour lock is suspected, operate the electric fuel pump for 20-30 seconds with the mixture in the idle cut-off position, then repeat the engine starting attempt.
- **Battery failure** – the battery can be quickly drained, either by leaving electrical systems switched on without the engine (and therefore alternator) running, or by repeated attempts to start the engine. The battery can be recharged using the Refill Menu on the EFB.

These failures are enabled by default and can be disabled/enabled by clicking on 'Simulate Spark Plug Fouling and Vapour Lock' in the Refill Menu window on the EFB.

If you are unable to start the engine, please check the following items:

Fuel flow – to ensure sufficient fuel flow for ignition, confirm that the fuel pump is switched on and the mixture lever is set to rich (forward). Confirm fuel flow using the flow gauge prior to attempting an engine start. Refer to the NORMAL PROCEDURES section in the manual for more information.

Vapour lock – this can occur for up to approximately 30 minutes after the engine has been shut down. After shutdown, fuel vapour can remain within the fuel lines as the result of high temperatures. This vapour disrupts the operation of the fuel system and creates an incompatible mix of air and fuel. If vapour lock is suspected, operate the electric fuel pump for 20-30 seconds (with the mixture in the idle cut-off position), then repeat the engine starting attempt.

You can also start the engine by using the ENGINES RUNNING toggle located in the Configuration app.

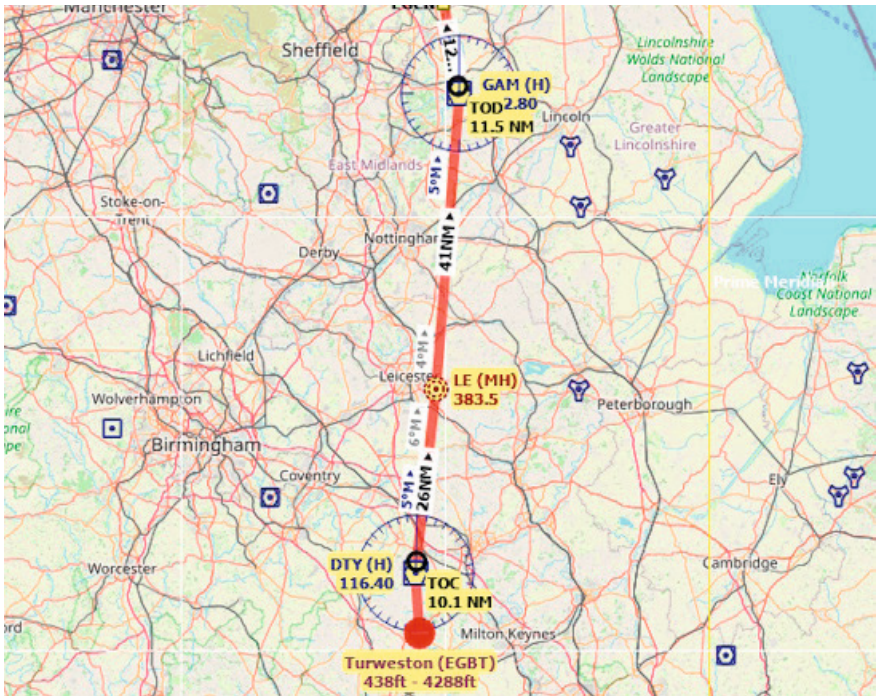
FLYING THE ARCHER

In this tutorial flight we will be departing from Turweston Aerodrome, located close to the Silverstone racing circuit in north Buckinghamshire, UK. We will be heading north, passing to the east of Birmingham and overhead Leicester before approaching Doncaster Sheffield Airport from the south.

Covering approximately 86 nautical miles, this short flight is the ideal length for learning about the essential systems on board the PA-28 Archer III.

Here are the details for today's flight:

EGBT > DTY (116.40) > LE (383.0) > GAM (112.80) > EGCN



Estimated time en route: 40 minutes

Route distance: 86 nautical miles

Departure time: 1200 (local time)

Weather: Clear

Now that we are prepared for the flight, we can proceed to the cockpit to begin our pre-flight checks. To load up the PA-28 Archer III tutorial flight, follow these steps:

1. Start X-Plane 12.
2. From the Main Menu click **New Flight** or go to the Flight Configuration window.
3. Click on the PA28 Archer in the Aircraft Selection screen.
4. Click **Customize**, choose the G-BXTW livery from the drop-down menu in the top right and uncheck the box labelled **Start with engines running**.
5. In the Location box, type **EGBT** and select **Turweston Aerodrome**. Click the **Customize** button.
6. Under 'Starts' select **Ramp** and choose a ramp start location. Press **Confirm** when done.
7. Click **Start Flight**.

You should now find yourself sitting in the cockpit at Turweston Aerodrome. The aircraft is configured in a ‘cold and dark’ state, with all the cockpit systems switched off, as you would find the aircraft prior to the first flight of the day. By beginning in this configuration, we will need to spend some additional time setting up the cockpit but doing so will allow you to learn a considerable amount about the features and functions on board this light aircraft.

This tutorial will cover the necessary steps for you to get from point A to point B, but it will not explore each system in depth. Please refer to the rest of this manual for details of each system.

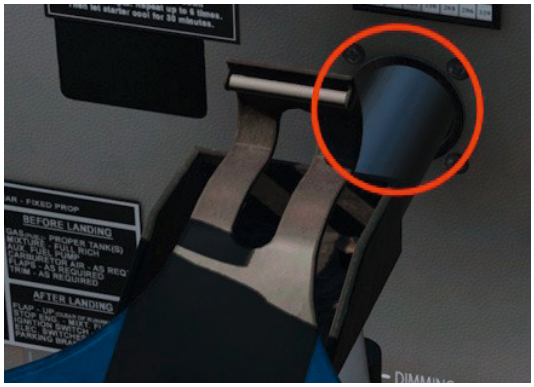
Getting started

The first step is to open the door to allow entry into the cockpit. In the virtual cockpit, click on the upper and lower door latches to rotate them to the **OPEN** position and then click and drag on the door to push it open.

Switch to the exterior (Chase) view and use the EFB Aircraft Options to open the baggage door. Confirm that the baggage door has opened and then return to the cockpit.

We can now start working through the pre-flight inspections.

To enable easier access to the controls, you may want to hide the yoke by using the clickspot at the base of the yoke, where it is mounted to the panel.



Check that the two magneto switches on the overhead panel are set to **OFF**.

Confirm that the parking brake handle is set **ON**.

Check that all avionics and the radio master switch are **OFF**, and that the mixture lever is set to **IDLE CUT-OFF**. Then switch **ON** the battery master.

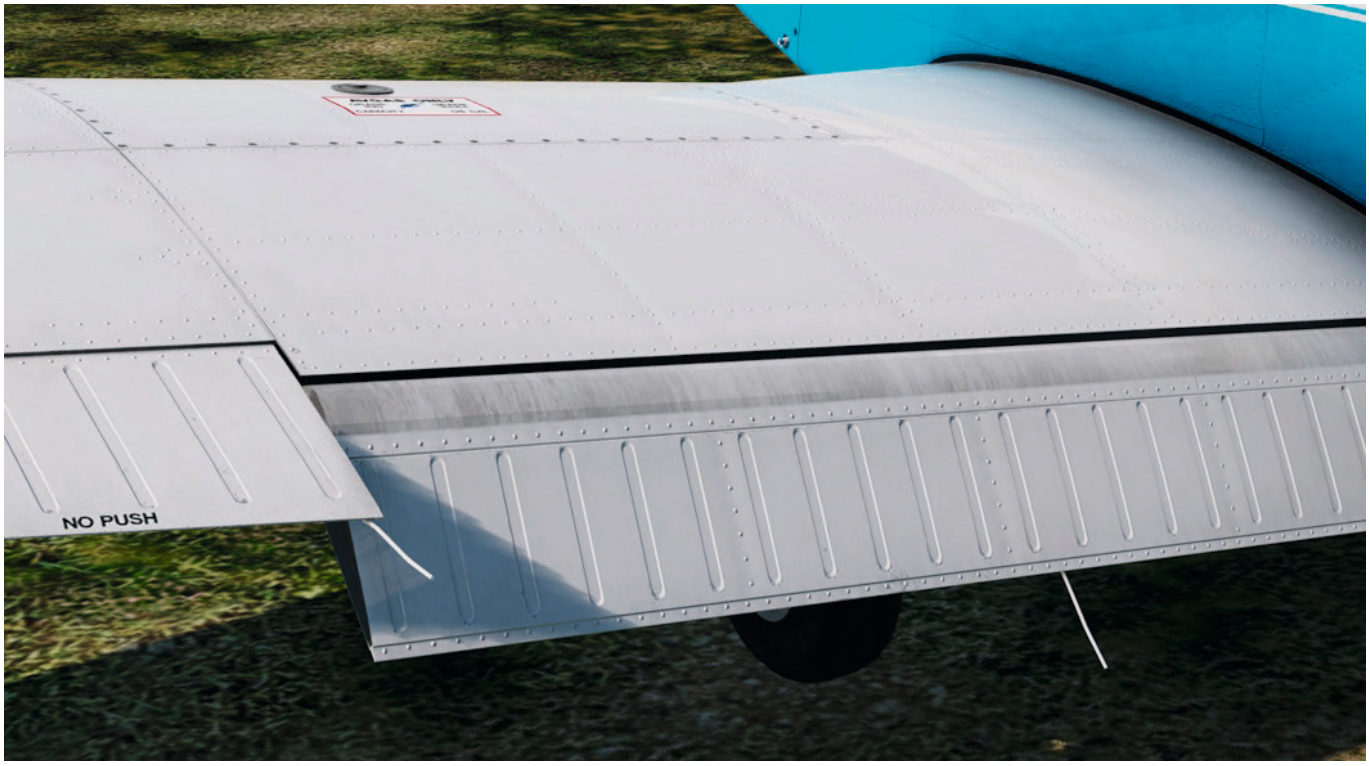
Check the left and right fuel quantity gauges to confirm that we have full tanks (25 gallons per tank).

Switch **ON** the navigation, strobe (anti-collision) and landing lights using the controls on the overhead panel.

Switch to the exterior (Chase) view and confirm that all of the lights are illuminated before returning to the cockpit and switching them all **OFF**.

Press the annunciator panel test button and confirm that all annunciator lights are illuminated. Release the button and then switch **OFF** the battery master.

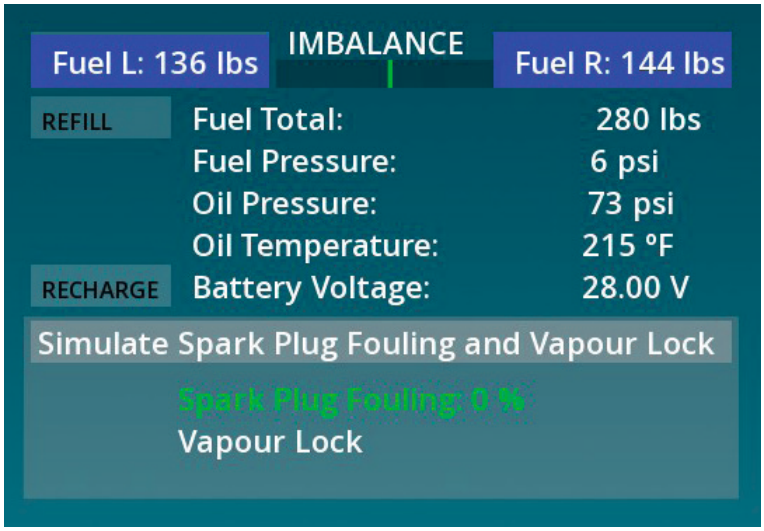
Check that you have full and free movement of the flying controls and that the mechanically controlled flaps extend and retract fully.



Move the elevator and rudder trims to the centre/neutral position.

Switch to the external (Spot) view and carry out a visual inspection of the aircraft. The wheel chocks and tie-downs should be visible. Confirm that the towbar is not connected/visible.

Open the Engine Config menu on the EFB. This menu allows you to refill the fuel, recharge the aircraft battery and check the engine stats.



Use the EFB Engine Config menu to recharge the battery in case it has discharged while you've been finding your way around the cockpit.

We are now finished with this menu, so click the arrow to close the EFB.

Starting the engine

To avoid battery draining, we will start the engine before configuring the avionics for our departure.

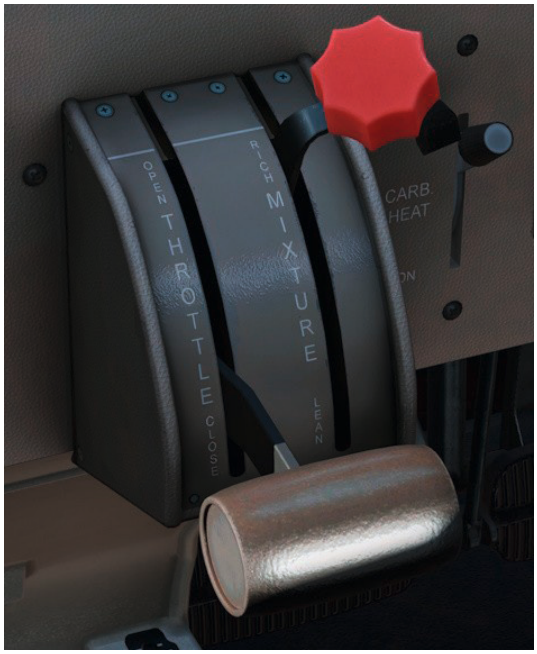
Close the baggage door via the EFB and then close the passenger door by first clicking on the door to pull it shut and then clicking on the door latches to rotate them to the **LATCH** position. Using the EFB Aircraft options, remove the chocks and tie-downs.

Check that the parking brake is set and that all circuit breakers are pushed in.

On the left sidewall, right-click on the fuel selector to rotate it to the **LEFT** position.

On the throttle quadrant, move the mixture lever to the **FULL FORWARD** position and advance the throttle lever to approximately **1/4 open**.

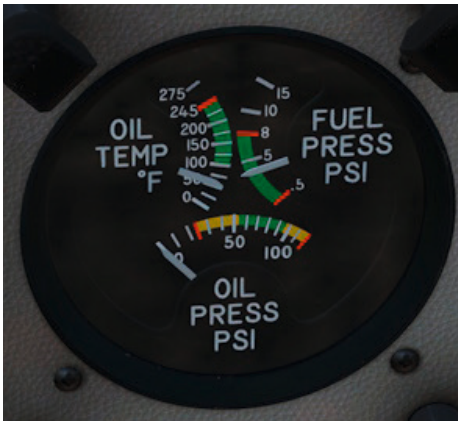
Confirm that the carburettor heat lever is set to **OFF** (up) and that all avionics are still **OFF**.



Switch **ON** the battery master to provide electrical power to the aircraft.

Turn **ON** the navigation lights, warning anyone in the area that we are about to start the engine.

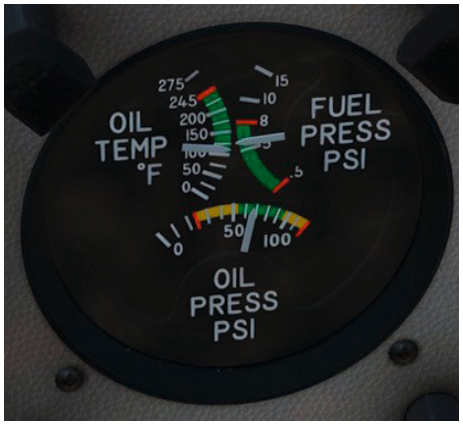
Switch **ON** the fuel pump and confirm that a positive fuel pressure is shown.



Switch **ON** the left magneto.

Check that the area surrounding the aircraft is clear of obstructions and then push the **START** button.

Switch **ON** the right magneto and check that the oil pressure and temperature are rising.



Switch **ON** the ALTR (alternator) and confirm that the associated warning light on the annunciator panel extinguishes.

Adjust the throttle to maintain approximately **1,000 RPM** and check that the vacuum gauge shows suction within the given limits.

With the engine running and the alternator charging the battery, we can now switch on the avionics.

Switch **ON** the radio master and then, starting at the top of the centre panel and working down, switch on the Traffic-Watch, KMA 24, S-TEC 55, GNS 530, TT31, GNC 255, KN 62A and KR 87 units.

Finally, rotate the fuel selector switch to the **RIGHT** and then the **LEFT** position, checking that the engine operates correctly on both tanks before selecting the fullest tank.

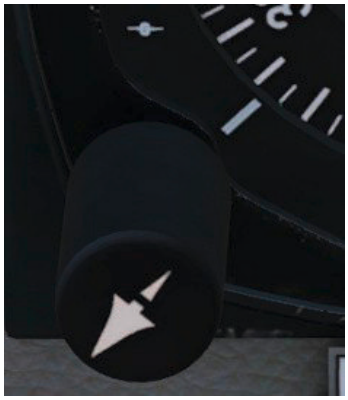
Configuring the avionics

We now need to configure the avionics for our departure.

We are going to take off on runway 09 and for the initial climb we are going to maintain the runway heading, so rotate the heading bug on the HSI to **090 degrees**.

Once we are settled into our climb to the east we will make a left turn to fly towards the first waypoint on the route, Daventry VOR (**116.40**). In preparation, tune the VOR frequency into the GNS 530 (NAV 1) unit and make sure it is set to VLOC mode.

Rotate the course knob on the HSI to select **356 degrees**. This is the course inbound to the Daventry VOR from Turweston.



Tune the second waypoint on our route, Leicester NDB (**383.0**), into the KR 87 ADF unit.

Check that the function switch on the KN 62A is set to the **RMT** (remote) position and that the DME selector switch, located above the throttle quadrant on the centre panel, is set to **DME NAV 1**.

Selecting the remote function allows the KN 62A to display DME information from either NAV 1 (the GNS 530) or NAV 2 (the GNC 255), rather than from its own internal NAV receiver. The DME selector switch controls which of the two radio units the KN 62A receives its DME information from – in this case the GNS 530, which we have just tuned to the Daventry VOR.

We should also take this time to enter our waypoints into the GNS 530's flight plan.

Taxi

We can now taxi to the runway. Check that the area around the aircraft is clear of obstacles and then release the parking brake. Apply power slowly to get the aircraft rolling and then start the short taxi to the threshold of runway 09.

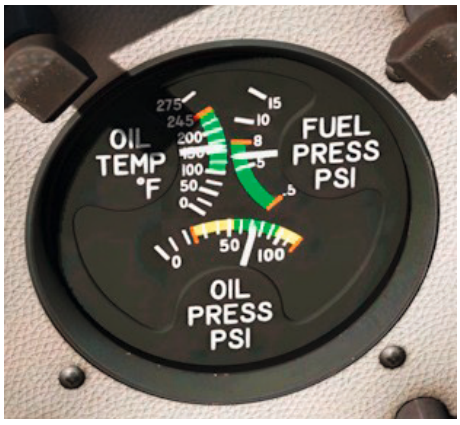
Steering the aircraft with the rudder pedals only is generally sufficient. The combined use of the rudder pedals and the brakes permits, if necessary, tight turns.

Check the operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

Stop at the holding point just short of runway 09. We can carry out the power (ground) checks here.

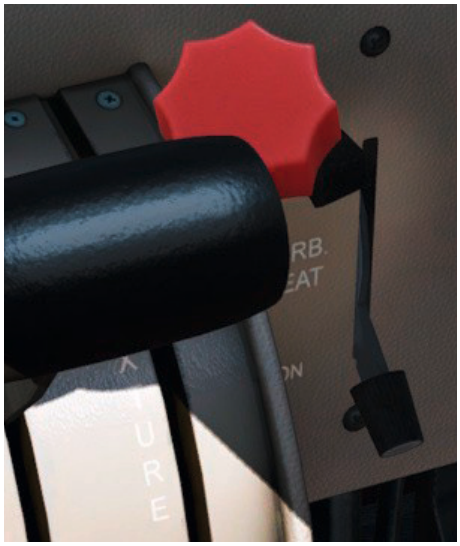
Set the parking brake and advance the throttle lever to obtain 2,000 RPM. Switch **OFF** the left magneto, note the RPM drop and then switch it back **ON**. Repeat the process for the right magneto.

Check that the vacuum, oil temperature, oil pressure and ammeter readings are within limits.



Make sure that the mixture lever is set to **FULL RICH** (fully forward) and that the fuel selector is set to the fullest tank.

To carry out a carburettor heat check, pull the carburettor heat lever to **ON** (down) and check for a small drop in RPM, then push the lever back to **OFF** (up). If the RPM increases to significantly more than the original 2,000 RPM, it is likely that icing conditions are present. With clear skies and moderate temperatures for our flight, that shouldn't be an issue.



Check the operation of the fuel system by switching the fuel pump **OFF** and confirming that the fuel pressure falls but is still within the green sector.

Finally, reduce the throttle to idle and check for rough running.

We can now run through the before take-off checks.

Confirm that the battery master and alternator switches are both set to **ON**.

Rotate the fuel selector to the fullest tank and switch the fuel pump back **ON**.

Check that the carburettor heat lever is set to **OFF** and that the mixture lever is in the **FULL FORWARD** position.

Confirm that both magneto switches are **ON** and then switch **ON** the landing and strobe lights.

Rotate the pitch trim wheel until the indicator sits in the neutral/centre position.

Confirm that both doors are **LOCKED** and that you have full and free movement of the flying controls.

Finally, switch **ON** the PITOT HEAT switch.

With the before take-off checks complete, have a look left and right, verify that nothing is on approach and that the runway is clear, and then taxi onto the runway.

Take-off

Line up with the runway centre line and then come to a stop. Smoothly apply full power and, as the aircraft starts to gather speed, keep it running down the centre line with rudder inputs. As you approach **60 knots** start to raise the nose of the aircraft.

Make elevator inputs as required to maintain an initial climb speed of approximately **76 knots**, holding the runway heading (090 degrees).

Climb

Switch **OFF** the fuel pump and landing light on reaching 1,000 feet.

We can now begin a left turn towards the first waypoint, Daventry (DTY) VOR. With the VOR now in range, the CDI needle on the HSI will indicate our deviation from the selected course. Use the needle deflection to judge a suitable heading for intercepting the course towards the VOR – approximately **330 degrees** in this case.

As the needle returns to the centre position, turn right onto **356 degrees** to intercept the course (there is zero wind, so no heading correction is required).

We will now reduce our workload by utilising the autopilot for the remainder of the climb and cruise.

Press the **NAV** button on the autopilot unit once to engage navigation hold mode and power on the autopilot by moving the power switch to the ON (up) position. The NAV annunciator will appear, and the autopilot will steer the aircraft to maintain the course towards the Daventry VOR.

Press the **VS** button to engage vertical speed hold mode. The autopilot will control the pitch of the aircraft to maintain your current vertical speed (in hundreds of feet per minute). It is important to note that this mode offers no speed or stall protection, therefore you will need to use the VS knob to increase/decrease the selected vertical speed to maintain our climb speed – **76 knots**.

Cruise

As you approach 4,000ft, use the VS knob to reduce your vertical speed and, once the altitude is reached, press the ALT button on the autopilot to engage altitude hold mode. The autopilot will capture and hold the current altitude.

As the aircraft levels out and begins to accelerate, reduce the throttle to obtain approximately **2,400 RPM**. This is a typical cruise power setting.

It is important to remember that the engine is only being fed with fuel from a single tank at any given time, therefore the fuel quantity in each tank should be carefully monitored. It is recommended that you change fuel tanks every half hour and do not exceed a fuel imbalance of five US gallons.

If you want to avoid worrying about switching fuel tanks, enable the automatic fuel selector from the Configuration menu in the EFB.

With the aircraft stabilised in cruise and at a range of approximately 5 miles from the Daventry VOR (as indicated by the KN 62A DME), press the **CDI** button on the GPS to change the NAV source to GPS, then press the **NAV** button on the autopilot unit once more to engage GPS navigation hold mode. The NAV and GPS annunciations will appear and the autopilot will steer the aircraft to maintain the GPS course.

The direction to the Leicester NDB will be indicated by the yellow needle on the ADF indicator when it is within range of the aircraft. The ADF indicator's compass card is not controlled by a directional gyro, therefore it won't rotate automatically as the aircraft changes heading. Instead, rotate the compass card using the heading knob until your current magnetic heading is at the top of the gauge and then check the needle to get the relative bearing to the NDB.

You can now relax for a while as the autopilot takes care of controlling the aircraft. The Gamston VOR (**112.80**) can be tuned into the GNS 530 (NAV 1) after passing Daventry VOR. The KN 62A can then be used to monitor the progress of the flight. This is also the ideal opportunity to take a quick look at some of the features of the aircraft.

The Archer has some very useful IFR-capable avionics. We'll take a quick look at some of the features of those avionics. Make sure you keep an eye on the distance remaining to the Gamston VOR, as we'll need to return to navigating the aircraft once we are five miles from it.

Sliding over to the KN 62A unit, move the function switch to the **FREQ** (frequency) position. With this function selected we can tune the KN 62A's internal receiver (NAV 3).

Rotate the frequency selector knobs to tune in **115.70**, the frequency for the Trent (TNT) VOR/DME which is commonly used by airliners transiting the East Midlands airspace. The DME distance (nautical miles) to the VOR will be shown on the left of the display. Move the function switch to the **GS/T** (groundspeed/time) position to show the DME distance (nautical miles), groundspeed (knots) and time-to-station (minutes) to the VOR. Note that the display is identical to that shown with RMT (remote) selected, but this display shows the information for the internally tuned frequency rather than the remote frequency (NAV 1 – GNS 530, or NAV 2 – GNC 255).

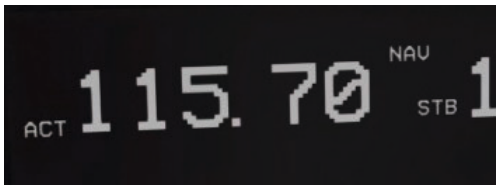
Return the function switch to the **RMT** (remote) position so we can continue to monitor the distance to the Gamston VOR.

Another useful feature for navigation is the Flight Computer panel, which can be opened from the EFB. The flight computer shows a variety of real-time information related to everything from speed to fuel burn/flow and range/endurance.

Move over to the right panel and focus on the GNC 255 which is just above the KN 62A. The GNC 255 acts as a COM 2 / NAV 2 radio but has many other features, including the ability to save and recall commonly used or recent frequencies and count-down and count-up timers. The GNC 255 can also display useful navigation information.

Press the **C/N** button to switch to NAV mode. Use the outer and inner knobs on the right side of the unit to select the Trent VOR frequency (**115.70**) and then press the flip/flop button to move the frequency into the active position.

When a valid NAV frequency is tuned into the active position, the identifier for that navigation aid will be displayed below the frequency. In this case the words 'TNT VOR' will appear, showing the navigation aid identifier and type.



Once you have passed overhead the Leicester NDB, you can tune in the NDB located on Doncaster Sheffield Airport, Finningley (FNY) NDB – **331.0**. The ADF indicator can now be used as another method for checking that we are on the correct heading and will also provide a good way of visually identifying the airport.

With the remaining time in the cruise, take the opportunity to explore the cockpit using the EFB Manual for reference.

Descent

We will begin our descent as we pass overhead Gamston VOR, with approximately 11 miles to run until the destination airport. The distance from the DME is available on the KN 62 and GNS 530.

Reduce the throttle to obtain **2,000 RPM** and once the airspeed has reduced to 90 knots, start the descent by engaging vertical speed (VS) hold mode and then selecting a descent rate of **-500ft/min**.

As the aircraft stabilises in its descent, adjust the throttle to maintain **90 knots**.

Approach and landing

We will carry out a visual approach to Runway 02 into Doncaster Sheffield Airport. To prepare for arrival, switch ON the fuel pump and landing light.

To prepare for a turn onto base leg, rotate the heading selector to 290 degrees.

When the distance to EGCN reads 5 nautical miles on the GNS530, press the HDG button on the autopilot. The aircraft will now turn left to the selected heading.

As the aircraft reaches 1,000 ft, select ALT mode on the autopilot.

Confirm that the mixture lever is fully forward and that the fuel selector is set to the fullest tank.

Begin to reduce your airspeed to **75 knots** and extend the flaps to the **25°** position.

Looking out of the right hand window, as we approach the runway centreline disengage the autopilot and turn the aircraft onto runway heading of 030 degrees.

Maintain 1,000 ft at 75 knots until the PAPI lights show two white and two red. At this point we can reduce power to maintain 75 knots and descent at around 500 ft/min to maintain the glideslope.

Passing through 500ft, extend the flaps to the **40°** (fully down) position. Reduce power to begin slowing to a touchdown speed of approximately **66 knots**.

As the aircraft arrives over the runway, start to bring the aircraft into a flare, gently raising the nose just above the horizon. Reduce the throttle to idle and the aircraft should touch down smoothly.

Apply gentle braking and once the aircraft has slowed to a fast walking pace, turn left off the runway. When you are safely off the runway, raise the flaps and switch **OFF** the landing and strobe lights.

You can also switch **OFF** the fuel pump and pitot heat.

Shutdown

Begin your taxi to the nearest available parking spot.

Once you have come to a stop at your chosen parking spot, engage the parking brake and switch **OFF** the avionics and radio master.

Bring the throttle lever back to **IDLE** and then bring the mixture lever back to **IDLE CUT-OFF** to shut down the engine.

Once the engine comes to a stop, set both magneto switches to the **OFF** position, switch **OFF** the navigation lights and then switch **OFF** the alternator and battery to disconnect the electrical power.

Rotate the fuel selector to the **FUEL OFF** position and and open the passenger and baggage doors.

Congratulations – you have completed the Archer tutorial flight!

NORMAL PROCEDURES

Airspeed (IAS) for safe operations

Best rate of climb	**76 KIAS**
Best angle of climb	**64 KIAS**
Operating speed in turbulent air	**113 KIAS**
Maximum flap speed	**102 KIAS**
Final approach speed (flaps 40)	**66 KIAS**
Maximum demonstrated crosswind	**17 KIAS**

Pre-flight

Cockpit

Parking brake	**SET**
Radio master	**OFF**
Mixture	**IDLE CUT-OFF**
Magneto switch	**OFF**
BATT MASTR switch	**ON**
Fuel gauges	**CHECK QUANTITY**
Annunciator panel	**CHECK**
BATT MASTR switch	**OFF**
Primary flight controls	**CHECK OPERATION**
Flaps	**CHECK OPERATION**
Trim	**NEUTRAL**
Baggage door	**CLOSED**

Left/right wing

Flap and aileron	**CHECK**
Wing tip and lights	**UNDAMAGED**
Tie-down	**REMOVED**
Fuel tank	**CHECK LEVEL**

Nose section

Chocks	**REMOVED**
Towbar	**REMOVED (NOSE GEAR)**
Oil	**CHECK LEVEL**

Propeller	**GOOD CONDITION**
Air inlets	**CLEAR**
Landing light	**CHECK**

Tail section

Fin	**CHECK CONDITION**
Rudder	**CHECK CONTROLS**
Stabilator and trim tab	**CHECK CONTROLS**
Tail cone	**CHECK CONDITION**

Before starting engine

Brakes	**SET**
Circuit breakers	**IN**
Carburettor heat	**OFF**
Radio master	**OFF**
Fuel selector	**DESIRED TANK**

Engine starting

Caution: *If a positive oil pressure is not indicated within 30 seconds after an engine start, stop the engine and determine the cause of the trouble. In cold weather it will take a few seconds longer to get a positive oil pressure indication.*

Cold engine

Throttle	**¼ INCH OPEN**
ALTR switch	**ON**
BATT MASTR switch	**ON**
Left magneto switch	**ON**
Fuel pump	**ON**
Mixture	**FULL RICH**
Propeller	**CLEAR**
Starter	**ENGAGE**

If engine does not start within 10 seconds, prime and repeat starting procedure.

When the engine starts:

Right magneto switch	**ON**
Throttle	**ADJUST**
Oil pressure	**CHECK**
Throttle	**800-1,200 RPM**

Hot engine

Throttle	**½ INCH OPEN**
ALTR switch	**ON**
BATT MASTR switch	**ON**
Left magneto switch	**ON**
Fuel pump	**ON**
Mixture	**FULL RICH**
Propeller	**CLEAR**
Starter	**ENGAGE**

When the engine starts:

Right magneto switch	**ON**
Throttle	**ADJUST**
Oil pressure	**CHECK**
Throttle	**800-1,200 RPM**

Taxiing

Radio master	**ON**
Taxi area	**CLEAR**
Parking brake	**RELEASE**
Throttle	**APPLY SLOWLY**
Brakes	**CHECK**
Steering	**CHECK**

Steering the aircraft with the rudder pedals only is generally sufficient. The combined use of rudder pedals and brakes permits, if necessary, tight turns.

Check the operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

Ground check

Parking brake	**SET**
Throttle	**2,000 RPM**
Magnetos	**CHECK (max. drop 175 RPM)**
Vacuum	**4.8-5.2 inHg**
Oil temperature	**CHECK**
Oil pressure	**CHECK**
Ammeter	**CHECK**
Annunciator panel	**PRESS-TO-TEST**
Carburettor heat	**CHECK**
Fuel pump	**OFF**

Fuel pressure	**CHECK**
Throttle	**RETARD**

Before take-off

BATT MASTR switch	**ON**
ALTR switch	**ON**
Magnetos	**ON**
Flight instruments	**CHECK**
Fuel selector	**AS REQUIRED**
Fuel pump	**ON**
Engine gauges	**CHECK**
Carburettor heat	**OFF**
Mixture	**SET**
Flaps	**SET**
Trim	**SET**
Controls	**FREE**
Doors	**LATCHED**

Take-off

Lined up on runway	**CHECK COMPASS**

Normal technique

Flaps	**SET**
Trim	**SET**
Accelerate to 60 KIAS.	
Yoke	**Back pressure to rotate smoothly to climb attitude**

Short field/obstacle clearance technique

Flaps	**25° (second notch)**
Accelerate to 55 KIAS.	
Yoke	**Back pressure to rotate smoothly to climb attitude**

Maintain 60 KIAS until obstacle is cleared then accelerate to 76 KIAS.

Flaps	**Retract slowly**

Climb

Best rate (flaps up)	**76 KIAS**
Best angle (flaps up)	**64 KIAS**
En route	**87 KIAS**
Fuel pump	**OFF**

Cruise

Refer to the OPERATING DATA MANUAL for cruise power settings.

The normal maximum cruising power is 75% of the rated horsepower of the engine.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising operation when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the FULL RICH position for all operations.

The pilot should monitor weather conditions while flying and should be alert to conditions which might lead to icing. If icing is expected, place the carburettor heat control in the **ON** position.

To keep the aircraft in best lateral trim during cruise flight, fuel should be used alternately from each tank at 15-minute intervals. Always remember that the electric fuel pump should be set to **ON** before switching tanks and should be left on for a short period thereafter.

Descent

Normal

Throttle	**2,500 RPM**
Airspeed	**122 KIAS**
Mixture	**FULL RICH**
Carburettor heat	**ON if required**

Power off

Throttle	**CLOSED**
Airspeed	**AS REQUIRED**
Mixture	**AS REQUIRED**
Carburettor heat	**ON if required**

Apply engine power every 1,500ft to prevent excess engine cooling and spark plug fouling.

Approach and landing

Fuel selector	**FULLEST TANK**
Fuel pump	**ON**
Mixture	**SET**
Flaps	**SET (102 KIAS max.)**

Trim to 75 KIAS.

Final approach speed (flaps 40°)	**66 KIAS**

Shutdown

Flaps	**RETRACT**
Fuel pump	**OFF**
Radio master	**OFF**
Electrical switches	**OFF**
Throttle	**CLOSED**
Mixture	**IDLE CUT-OFF**
Magnetos	**OFF**
ALTR switch	**OFF**
BATT MASTR switch	**OFF**
Parking brake	**SET**

Stalls

The stall characteristics of the Archer are conventional. An approaching stall is indicated by a stall warning horn which is activated between 5-10 knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling speed of the Archer with power off and full flaps is 45 KIAS. With the flaps up, this speed is increased by 5 knots. Loss of altitude during stalls varies from 100 to 350 feet, depending on configuration and power.

Note: *The stall warning system is inoperative with the battery master switch OFF.*

EMERGENCY PROCEDURES

Airspeed (IAS) for safe operations

Stall speed (2,550 lb, flaps 0)	**50 KIAS**
Stall speed (2,550 lb, flaps full)	**45 KIAS**
Manoeuvring speed (2,550 lb)	**113 KIAS**
Manoeuvring speed (1,634 lb)	**89 KIAS**
Never exceed speed	**154 KIAS**
Power off glide speed (2,550 lb, flaps 0)	**76 KIAS**

Engine failures

Engine failure during start

Starter	**CRANK ENGINE**
Mixture	**IDLE CUT-OFF**
Throttle	**OPEN**
Fuel pump	**OFF**
Fuel selector	**OFF**

Engine failure during take-of

If sufficient runway remains for a normal landing, land straight ahead.

If sufficient altitude has been gained to attempt a restart:

Fuel selector	**SET TO FULLEST TANK**
Fuel pump	**ON**
Mixture	**CHECK RICH**
Carburettor heat	**ON**

If power is not regained, proceed with power-off landing.

Engine failure in flight

If at low altitude:

Airspeed	**76 KIAS minimum**

Prepare for power-off landing.

If altitude permits:

Fuel selector	**SWITCH TO FULLEST TANK**
Fuel pump	**ON**
Mixture	**RICH**
Carburettor heat	**ON**
Engine gauges	**Check for indication of cause**

If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:

Carburettor heat	**OFF**
Fuel pump	**OFF**

If power is not restored, prepare for power-off landing. Trim for 76 KIAS.

Power-off landing

Trim for 76 KIAS. Locate suitable field and establish spiral pattern 1,000ft above field at downwind position for normal landing approach.

When field can be easily reached, slow to 66 KIAS for shortest landing.

Fires

Engine fire in flight

Fuel selector	**OFF**
Throttle	**CLOSED**
Mixture	**IDLE CUT-OFF**
Fuel pump	**OFF**
Cabin heat	**OFF**

Proceed with power-off landing procedure.

Electrical fire

BATT MASTR switch	**OFF**
ALTR switch	**OFF**
Cabin heat	**OFF**

Land as soon as possible.

Low oil pressure

Oil pressure annunciator light	**ON**
Pressure indicator	**IN YELLOW SECTOR**
Throttle	**REDUCE AS FAR AS POSSIBLE**

Oil temperature	**CHECKED**
If oil temperature in yellow sector	**REDUCE THROTTLE**

Prepare for a forced landing and land as soon as possible.

Low fuel pressure

Fuel pump	**ON**
Fuel quantity	**CHECKED**
Fuel selector	**SWITCH TANKS**

Electrical failures

Check the circuit breakers panel. If the circuit breaker is open, close it only once. If it opens again do not try to close the circuit breaker as the equipment has failed.

Alternator annunciator light illuminated:

Ammeter	**Check to verify inoperative alternator**

If ammeter shows zero:

ALTR switch	**OFF**

Reduce electrical loads to minimum:

ALT FIELD circuit breaker	**Check and reset as required**
ALTR switch	**ON**

If power is not restored:

ALTR switch	**OFF**

If alternator output cannot be restored, reduce electrical loads and land as soon as it is practical. The battery is the only remaining source of electrical power.

Icing

IMPORTANT! *Flight into known icing conditions is prohibited.*

Carburettor heat	**ON**
Cabin heat	**FULL HOT**
Pitot heat	**ON**
Engine	**MAX. POWER/RPM**

Adjust course and/or altitude to obtain best outside air conditions. Divert to nearest airport.

Spin recovery

Intentional spins are prohibited, but if an inadvertent spin does occur, the following recovery procedure is recommended:

Rudder	**HOLD OPPOSITE DIRECTION OF ROTATION**
Yoke	**FULL FORWARD, AILERONS NEUTRAL**
Throttle	**IDLE**

When spinning stops, centralise rudder, level the wings and ease out of the dive.

Airspeed indicating system failure

In case of erroneous indications in flight:

Pitot heat	**ON**

If erroneous indications persist, carry out a precautionary approach, maintaining an adequate airspeed margin above stall warning activation speed.

CREDITS

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