# PA-28-161 WARRIOR II

## OPERATIONS MANUAL

Just Flight™

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# PA-28-161 WARRIOR II

## Operations Manual

Please note that Microsoft Flight Simulator must be correctly installed on your PC prior to the installation and use of this PA-28-161 Warrior II simulation.

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# INTRODUCTION

The PA-28-161 Warrior II is a four-seat, piston-engine aircraft equipped with fixed tricycle landing gear and a fixed-pitch propeller – ideal for touring and flight training.

The origins of the Warrior start with the Piper Cherokee, production of which began 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, renaming the Cherokee 150 as the Cherokee Warrior in 1974.

The PA-28-161 Warrior II was first certified in 1976 and features a more powerful engine than the original Warrior (the 160 HP Lycoming 0-320) and a semi-tapered wing.

Over 5,000 PA-28 Warriors have been built and they continue to be flown all around the world.


## Aircraft specifications

### Dimensions

| | |
|---|---|
| Length | 7.3 m (23.8 ft) |
| Wingspan | 10.7 m (35 ft) |
| Height (to top of tail) | 2.2 m (7.3 ft) |
| Wing area | 15.8 m2 (170 $ft^2$) |

### Engine

| | |
|---|---|
| Type | Lycoming O-320 four-cylinder, horizontally opposed, air-cooled piston |
| Power | 160 horsepower at 2,700 RPM |
| Propeller | Two-blade, fixed-pitch |

## Weights

| | |
|---|---|
| Empty weight | 1,353 lb (821 kg) |
| Maximum take-off/landing weight | 2,325 lb (1,055 kg) |
| Maximum baggage weight | 200 lb (91 kg) |
| Maximum useful load | 972 lb (441 kg) |

## Fuel and oil

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

## Performance

| | |
|---|---|
| VNE (never exceed speed) | 160 KIAS |
| VNO (max. cruising speed) | 126 KIAS |
| VA (manoeuvring speed) | 111 KIAS (at 2,325 lb)<br>88 KIAS (at 1,531 lb) |
| VFE (max. flap speeds) | 103 KIAS |
| VSO (stall speed) | 44 KIAS (landing configuration) |
| Service ceiling | 13,000 ft |
| Range (max. payload) | 637 nautical miles |

# Paint schemes

The Warrior II is supplied in the following eight paint schemes:

- G-BOZI (UK)
- G-OPTI (UK)
- G-SIXT (UK)
- N8289A (USA)
- D-EIIT (Germany)
- F-GEDO (France)
- C-FOEC (Canada)
- VH-BVM (Australia)

# Cockpit textures

This simulation of the Warrior II is an exact likeness of the real-life G-BOZI, including the wear and tear in the cockpit from decades of use as a training aircraft. For those who would prefer a less worn cockpit, we have included a set of alternative ‘clean’ textures.

Both texture sets can be found in the ‘\justflight-aircraft-pa28-warrior-ii\Cockpit\’ folder and replace the files found in ‘\justflight-aircraft-pa28-warrior-ii\SimObjects\Airplanes\JF_PA28_Warrior\TEXTURE.VC’ folder.

# INSTALLATION, UPDATES AND SUPPORT

You can install this Warrior II software as often as you like on the same computer system:

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

## Accessing the aircraft

To access the aircraft:

1. Click on 'World Map'.
2. Open the aircraft selection menu by clicking on the aircraft thumbnail in the top left.
3. Use the search feature or scroll through the available aircraft to find the 'Piper PA28 Warrior'.
4. After selecting the aircraft, use the 'Liveries' menu to choose your livery.

## Uninstalling

To uninstall this product from your system, use one of the Windows App management features:

**Control Panel > Programs and Features**

or

**Settings > Apps > Apps & features**

Select the product you want to uninstall, choose the 'Uninstall' option and follow the on-screen instructions.

*Uninstalling or deleting this product in any other way may cause problems when using this product in the future or with your Windows set-up.*

## Updates and Technical Support

For technical support (in English) please visit the Support pages on the Just Flight website.

As a Just Flight customer, you can get free technical support for any Just Flight or Just Trains product.

If an update becomes available for this aircraft, we will post details on the Support page and we will also send a notification email about the update to all buyers who are currently subscribed to Just Flight emails.

## Regular News

To get all the latest news about Just Flight products, special offers and projects in development, subscribe to our regular emails.

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# SYSTEMS GUIDE

## Airframe

The Warrior II is a single-engine, all-metal aircraft with fixed landing gear. The aircraft has seating for up to four occupants, a 200-pound luggage compartment and a 160 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 to the leading edge of the wing with screws 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 located in 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

All switches are grouped in a switch panel 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.

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

The annunciator panel includes alternator, low oil pressure and low vacuum 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 they should check and monitor the applicable system gauge to determine when, or if, action is required.

The primary electrical power source is a 14-volt, 60-amp alternator which is protected by an alternator control unit that incorporates a voltage regulator and an over-voltage relay. 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 12-volt, 35-ampere-hour battery. The ammeter, as installed, does not show battery discharge; rather, 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 30 amperes. The 30-ampere value plus two amperes for charging the battery will then show on the ammeter, indicating that the alternator is functioning properly.

An avionics power switch is located above the circuit breaker panel. It controls the power to the avionics through the battery master switch. An emergency bus switch is also provided to supply auxiliary power to the avionics bus in the event of an avionics power switch circuit failure.

## 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 right 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 to 5.1 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. Push-button-type pitot and static drains are located on the lower left sidewall of the cockpit.

## Lighting system

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

The navigation lights are controlled by a rocker switch on the main switch panel.

Radio, panel and switch lights are controlled by rheostat switches located below and to the right of the pilot's yoke, adjacent to the engine instruments.

A light mounted in the overhead panel provides instrument and cockpit lighting for night flying. The light is controlled by a rheostat switch adjacent to the light.

The anti-collision and landing lights are controlled by rocker switches on the main switch panel.

# Instrument markings

## Airspeed indicator markings

| MARKING | KIAS VALUE OR RANGE | SIGNIFICANCE |
|---|---|---|
| White arc | 44-103 | Full flap operating range. Lower limit is maximum weight VSO in landing configuration. Upper limit is maximum speed permissible with flaps extended. |
| Green arc | 50-126 | Normal operating range. Lower limit is maximum weight VS1 with flaps retracted. Upper limit is maximum structural cruising speed. |
| Yellow arc | 126-160 | Operations must be conducted with caution and only in smooth air. |
| Red line | 160 | Maximum speed for all operations. |

## Engine indicator markings

| INSTRUMENT | Red line or arc | Yellow arc | Green arc | Red line |
|---|---|---|---|---|
| | Minimum limit | Caution range | Normal operating | Maximum limit |
| Tachometer | ---------- | ---------- | 500-2,700 RPM | 2,700 RPM |
| Oil temperature | ---------- | ---------- | 75-245°F (24-118°C) | 245°F (118°C) |
| Fuel pressure | ---------- | ---------- | 0.5-8 PSI | 8 PSI |
| Oil pressure | 25 PSI | 25-60 PSI (idle) and 90-100 PSI (start/warm-up) | 60-90 PSI | 100 PSI |
| Vacuum gauge | ---------- | ---------- | 4.8-5.1 inHg | 6.0 inHg |

# Limits

## Weight limits

Maximum weight: 2,325 lb (1,055 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 |
|---|---|---|
| 2,325 | 87.0 | 93.0 |
| 1,950 and below | 83.0 | 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 certificated in the Normal category. The Normal category 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

This simulation includes support for the MSFS visual icing system. Ice build-up will be visible on the windows, propeller, engine cowling and leading-edge surfaces. Take immediate action in the event of 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 Warrior II 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 on the door armrest to push it open. It can be closed by clicking on the door armrest to pull it closed and then clicking on the two door latches to rotate them to the LATCH position.

***Note:*** *If both latches are not rotated to the LATCH position, the passenger door will not be fully shut and significant wind noise will enter the cabin at higher airspeeds.*

The passenger and baggage doors can be opened/closed using the 'Doors' controls on the Electronic Flight Bag (EFB).

## 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 a rudder trim. The trim mechanism is a spring-loaded recentring device. The trim control is 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 by either stabilator trim or 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 Warrior II is powered by a four-cylinder, horizontally opposed engine rated at 160 horsepower at 2,700 RPM. It is equipped with a starter, a 60-ampere 14-volt alternator, two magnetos, a vacuum pump drive and a fuel pump.

The aircraft is equipped with a fixed-pitch propeller, with a 74-inch diameter and a 60-inch pitch, determined at 75% of the diameter.

An oil cooler is located on the left rear of the engine, with an air inlet for the cooler in the nose section of the engine cowling.

## 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 located on the upper, mid and lower portions of the left panel.

## Ignition and starter system

Engine ignition is provided by a dual magneto on two spark plugs per cylinder. Ignition is controlled by a key-operated rotating selector on the lower left portion of the left panel. The selector operates clockwise, with Right, Left, Left/Right and Start positions.

# Stall warning system

An approaching stall is indicated by a stall warning horn which is activated between five and ten 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 included with this software.

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 power plant instruments.

The altitude and directional gyros, in the centre of the left-hand instrument panel, are vacuum-operated. The vacuum gauge is located on the right-hand instrument panel. The turn indicator on the left side is electrically operated.

The radios are located 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.

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

The cabin door is double-locked. To close the cabin door, hold the door closed with the armrest while moving the side door latch to the LATCHED position, then engage the top latch. Both latches must be secured before flight.

A large baggage area 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. Exhaust gas temperature (EGT) indicator
2. 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 located 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.
3. Attitude indicator (AI) – a pitch reference knob allows for the pitch bars (aircraft symbol) position to be adjusted nose-up or nose-down
4. Altimeter – a barometric pressure scale is provided for hPa/mb or inHg, depending on which unit of measurement is currently active in the simulator settings
5. Annunciator press-to-test button – press to test annunciator lights
6. Annunciator lights
7. VOR 1 / ILS indicator – driven by KX 170B (or GNS 530 / GTN 750 if installed)
8. ADF indicator – driven by KR 85 ADF system. The HDG knob controls rotation of the compass card.
9. Turn and bank indicator
10. Direction indicator or horizontal situation indicator
11. Vertical speed indicator (VSI)
12. VOR 2 indicator – driven by KX 175B (or GNS 430 / GTN 650 if installed)
13. NAV/GPS source switch – controls which source is used by the HSI, VOR 1 / ILS indicator and autopilot
14. Low voltage warning light

## Direction indicator


The caging knob (bottom left) controls the rotation of the compass card. The HDG knob (bottom right) controls the heading bug.

## Horizontal situation indicator

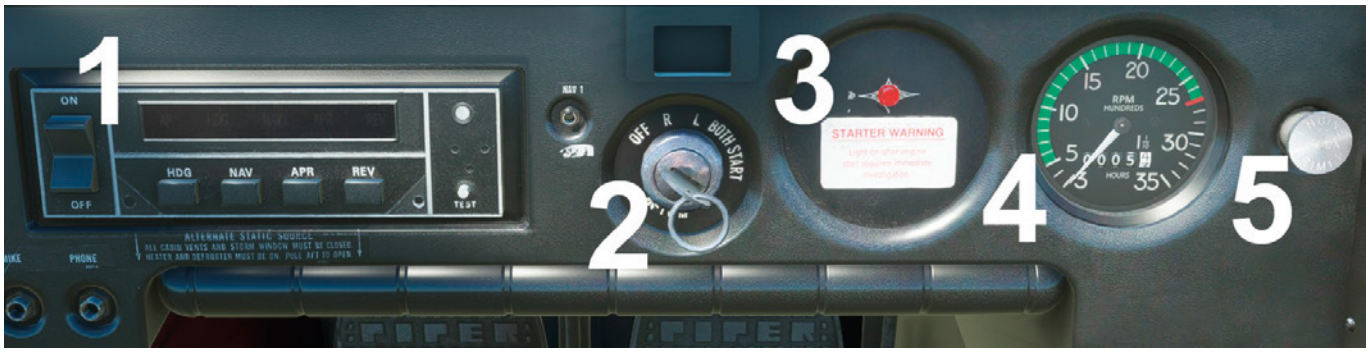

This is driven by the KX 170B (or GNS 530 / GTN 750 if installed).

The course knob (bottom left) controls the rotation of the course pointer. The HDG knob (bottom right) controls the heading bug.

## Left mid panel

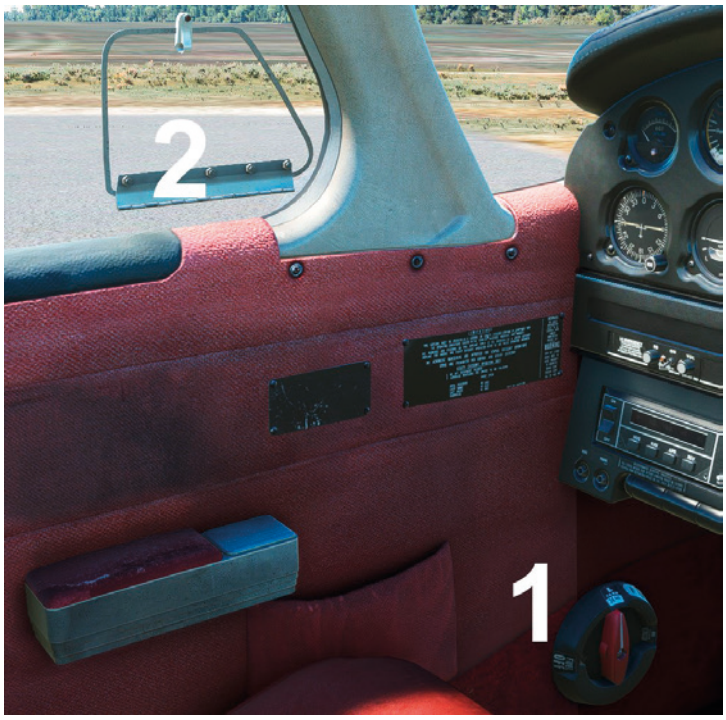

1. Intercom controls
2. Left fuel tank quantity indicator
3. Oil temperature indicator
4. Fuel pressure indicator
5. Oil pressure indicator
6. Right fuel tank quantity indicator
7. Yoke toggle clickspot (same location on right yoke)

## Left lower panel



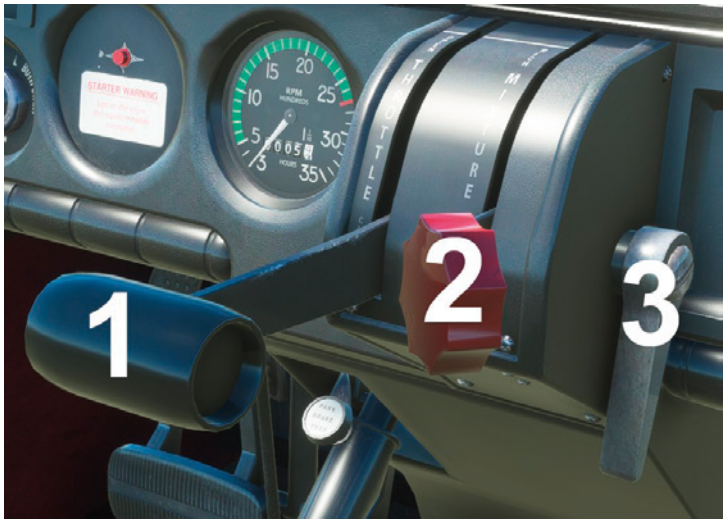

1. Autopilot controls – refer to the AUTOPILOT section for more information.
2. Magneto/start selector
3. Starter engaged light
4. Tachometer (RPM)
5. Primer control

## Left sidewall




1. Fuel tank selector
2. Storm window (note that the latch must be moved prior to opening/closing the window)

## Throttle quadrant

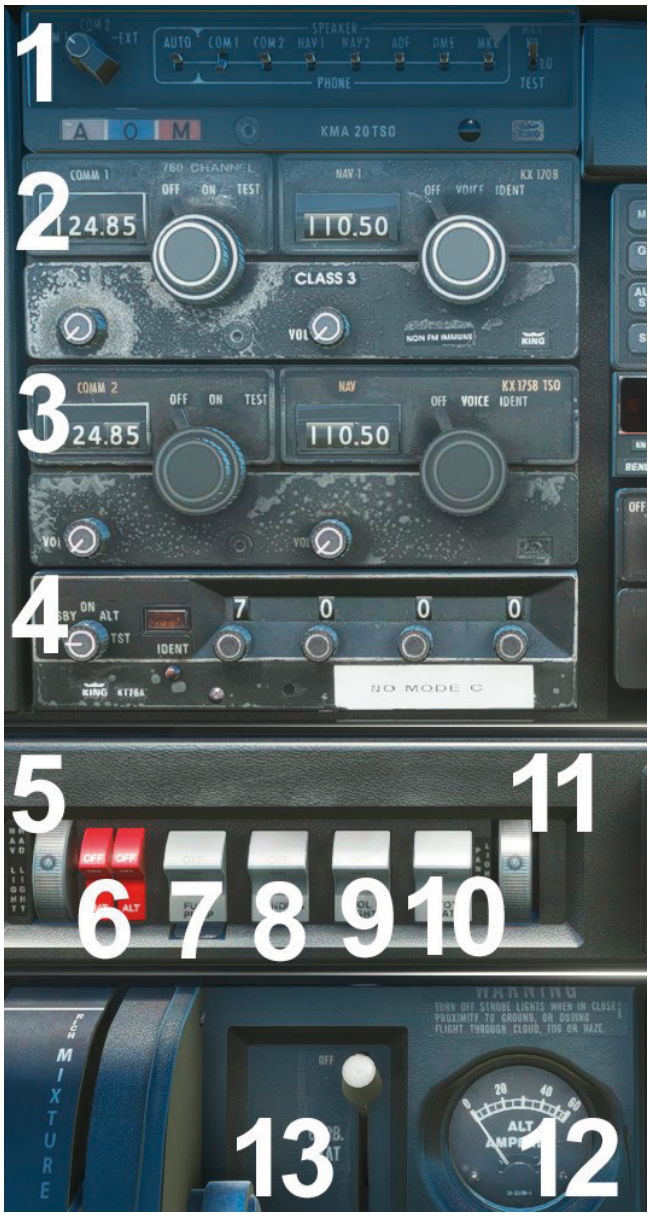



1. Throttle lever
2. Mixture lever
3. Friction control

# Right panel

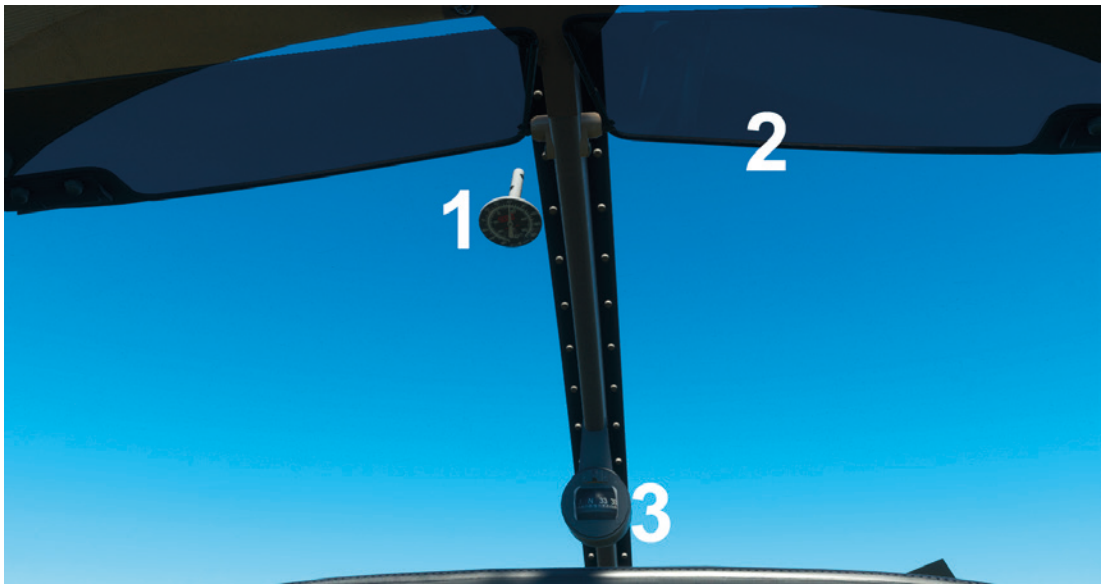

1. Intercom switch – controls visibility of the EFB
2. DME selector switch – selects whether the KX 170B (or GNS 530 / GTN 750 if installed) or KX 175B is used as the input to the KN 62
3. GPS 100
4. KN 62A DME
5. KR 85 ADF
6. Vacuum gauge
7. DATCON hour meter
8. Heating control levers
9. Emergency bus switch (guarded)
10. Fan control switch
11. Avionics master switch
12. Circuit breaker panel

# Centre panel



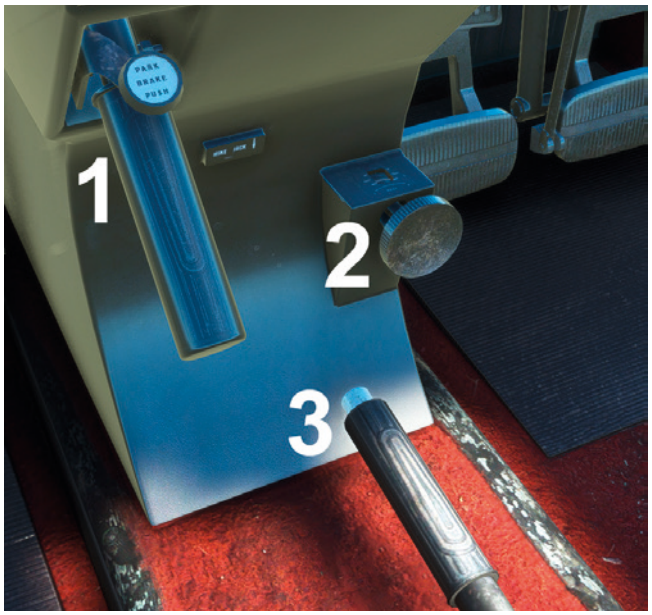

1. KMA 20 audio selector
2. KX 170B COM 1 / NAV 1 radio
3. KX 175B COM 2 / NAV 2 radio
4. KT 76A transponder
5. Navigation and radio light switch
6. Battery master and alternator switches
7. Fuel pump switch
8. Landing light switch
9. Anti-collision lights switch
10. Pitot heat switch
11. Panel lights switch
12. Ammeter
13. Carburettor heat control lever

## Upper cockpit




1. Outside air temperature indicator
2. Sun visors
3. Whiskey compass

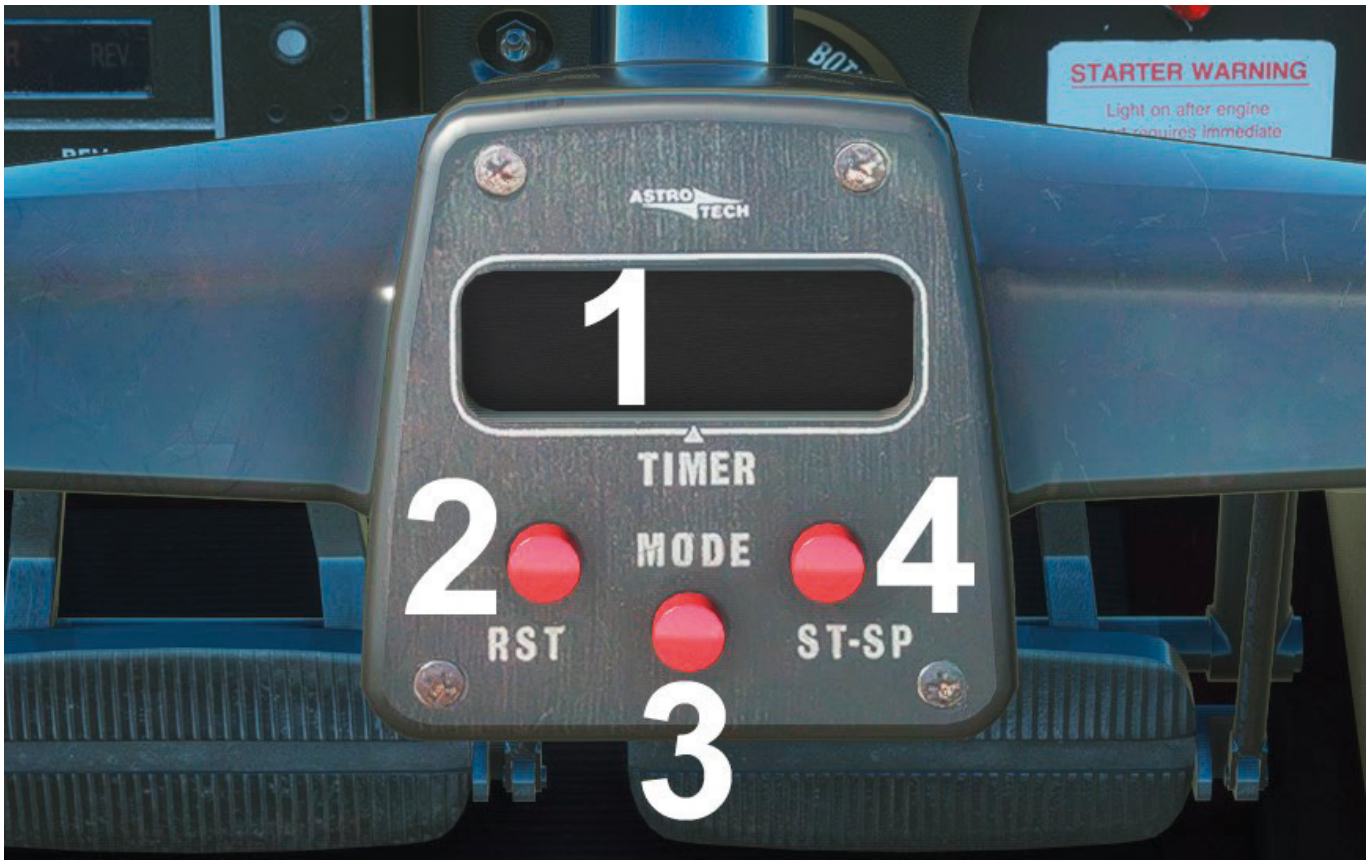
## Lower cockpit





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

# Yoke timer




1. Timer display
2. Reset button
3. Mode button
4. Start/Stop button

The yoke is fitted with a digital chronometer. The mode button allows you to toggle between either clock mode or timer mode.

With timer mode selected, the start/stop and reset buttons can be used to control the timer. Press the reset (RST) button so that the time reads zero and then press the start/stop (ST-SP) button to start and stop the timer. The timer will count in minutes and seconds until 59 minutes and 59 seconds, at which point the timer will change to count in hours and minutes.

With clock mode selected, the current local time will be shown in hours and minutes.

# KMA 20 – audio selector


1. Microphone selector switch
2. AUTO switch
3. Receiver selector switches
4. Marker beacon sensitivity and lamp test switch
5. Marker beacon lights

The KMA 20 is an audio control system which provides control over transceiver and receiver outputs through the use of selector switches.

The COM 1 and COM 2 switches 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 sources to monitor.

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

When the AUTO switch is placed in either the SPEAKER or PHONE position, the unit will automatically match the corresponding receiver audio with the selected transmitter. For example, with COM 1 selected on the microphone selector knob, the COM 1 audio source will be automatically enabled.

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

# KX 170B – COM 1 / NAV 1 radio


1. COM 1 frequency display
2. COM 1 power/test switch
3. COM 1 frequency selector knobs
4. COM 1 volume knob
5. NAV 1 frequency display
6. NAV 1 power/mode switch
7. NAV 1 frequency selector knobs
8. NAV 1 volume knob

The KX 170B is a very simple COM/NAV radio and acts as COM 1 / NAV 1 in the Warrior.

## COM controls

Rotate the power/test switch to the ON position. Turn up the volume with the volume knob and then rotate the concentric selector knobs to tune in a COM frequency.

The COM radio will operate with either ON or TEST selected.

## NAV controls

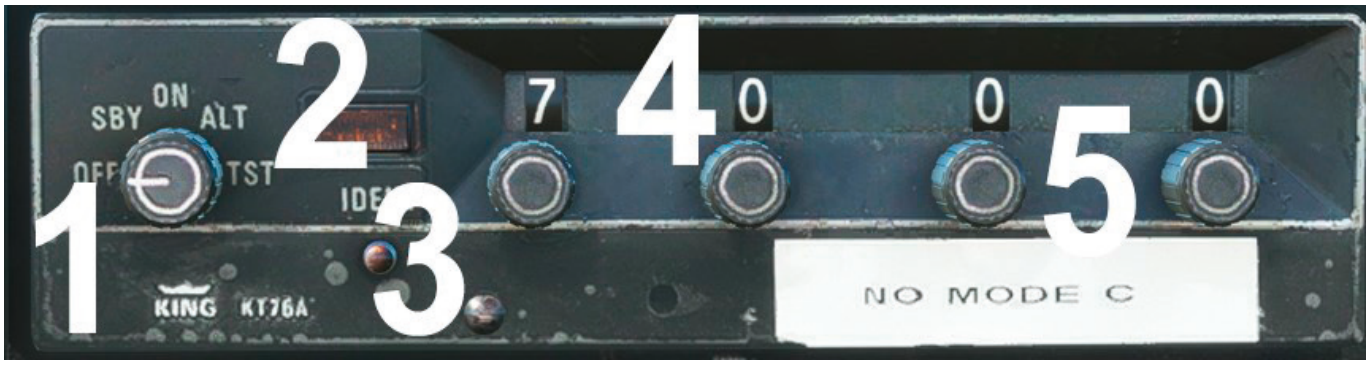
Rotate the power/mode switch to the VOICE position. Turn up the volume with the volume knob and then rotate the concentric selector knobs to tune in a NAV frequency.

Rotate the power/mode switch to the IDENT position to hear the audio identifier.

# KX 175B – COM 2 / NAV 2 radio

The KX 175B is identical in operation to the KX 170B and acts as COM 2 / NAV 2 in the Warrior.

# KT 76A – transponder




1. Function selector knob
2. Reply light
3. Identification push-button
4. Code windows
5. Code knobs

## Operating the KT 76A

The function selector knob should be in the OFF position before starting the aircraft's engine. Select the required reply code by rotating the four code knobs (one per code digit). The code will be displayed in the four code windows.

After starting the engine, turn the function selector to standby (SBY). The transponder will take approximately 45-50 seconds to become operational. Once airborne, turn the function selector to ON, enabling normal Mode A operation.

Turn the function selector to the altitude (ALT) position for altitude reporting (Mode C) to ATC.

## Important codes

7700: Emergency

7600: Communications failure

7500: Hijacking

0000: Reserved for military aircraft

## Squawk ident

When you are asked to ident by ATC, press and release the ident push-button. Your aircraft will be positively identified to the air traffic controller.

## Reply light

During normal operation, the reply light will flash to indicate that the KT 76A is functioning properly and replying to interrogations from ground radar. Interrogations occur at 10-15 second intervals, corresponding to each radar sweep.

# GPS 100 – GPS unit


1. MSG – selects the messages page
2. GOTO key – selects the go-to page
3. ON/OFF key – controls power to the unit
4. RTE key – selects the active route page
5. WPT key – cycles through the nearest pages (intersection, airport, VOR and NDB)
6. NAV key – cycles through the navigation pages (CDI, present position, density altitude/TAS, winds aloft and fuel plan)
7. Arrow keys
8. CLR key
9. ENT key

The GPS 100 unit is a basic unit by modern standards. This simulation features several 'pages' which display a range of information related to your aircraft's position and GPS flight plan, if loaded.

The front panel consists of a 3-line, 22-character LCD display.

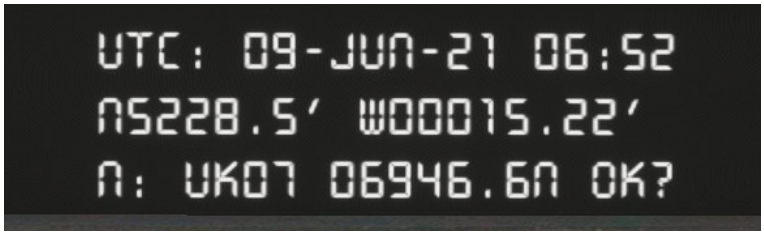
The GPS can be turned on/off using the ON/OFF key.

## Self-test page


The first page to be displayed is the self-test page. The unit will carry out a self-test, which should take a couple of seconds.

The initialisation page will then be displayed.

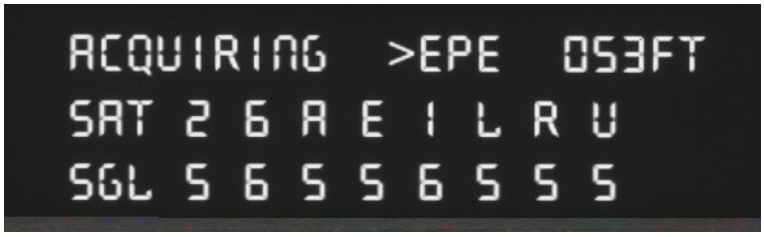
## Initialisation page




The initialisation page shows the current UTC time and date, latitude and longitude, nearest airport and the bearing and distance (in nautical miles) to that airport.

## Satellite status page

Press the ENT (enter) key to bring up the satellite status page. The GPS will go through the process of acquiring satellites.




The receiver status is shown in the top left of the page:

**SEARCH SKY** – the GPS 100 is in the process of searching the sky for visible satellites.

**ACQUIRING** – the GPS 100 is in the process of acquiring visible satellites.

**3D NAV** – the GPS 100 is acquiring enough satellites to begin navigation.

***Note:*** *The GPS 100 will only display navigation information when the status is 3D NAV.*

The estimated position error (in feet) is shown in the top right of the page and this will decrease as more satellites are acquired.

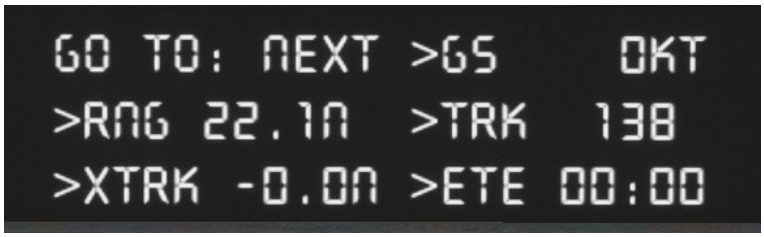
The unique ID character for each of the satellites is shown on the second line and the signal strength (from 0 to 9) is shown on the third line.

## Active route page


The active route page shows information regarding the GPS flight plan (if one is loaded):

- Distance (nautical miles) and estimated time en route to the next flight plan waypoint
- Distance (nautical miles) and estimated time en route to destination

## Go-to page



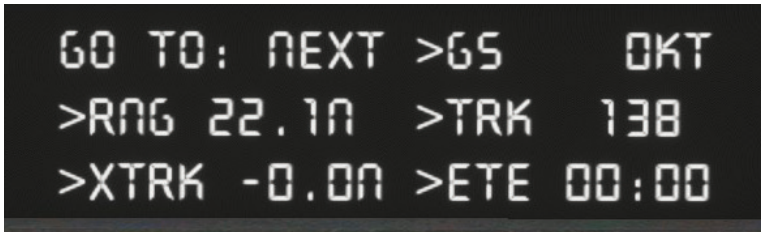

The go-to page shows you information related to the next waypoint in your flight plan:

- Groundspeed (knots)
- Distance to next waypoint (nautical miles)
- Desired track to next waypoint
- Cross-track distance (nautical miles)
- Estimated time en route (hours/minutes)

## Nearest intersection page


The nearest intersection page shows the closest waypoints: intersections, airports, VORs and NDBs. The name, bearing and distance (in nautical miles) to each waypoint is shown. Use the arrow keys to scroll through the list of waypoints and press the WPT key to cycle through the waypoint types (intersections, airports etc.).

## CDI page




The CDI page shows you information related to the current leg of your flight plan:

- Groundspeed (knots)
- Distance to next waypoint (nautical miles)
- Desired track to next waypoint
- Cross-track distance (nautical miles)
- Estimated time en route (hours/minutes)

## Present position page


The present position page shows you information related to your current position:

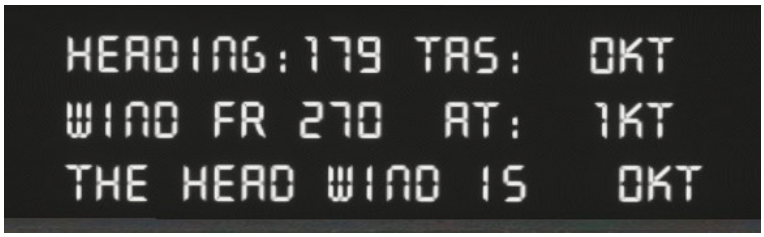
- Current altitude (feet)
- Estimated position error (in feet)
- Current latitude/longitude
- Groundspeed (knots)
- Current track (magnetic)

## Density altitude and TAS page


The density altitude and TAS page displays critical aircraft performance data:

- Indicated altitude (feet)
- Calibrated airspeed (knots)
- Barometric pressure setting (inHg)
- Total air temperature (Celsius)
- Density altitude (feet)
- True airspeed (knots)

## Wind aloft page




The wind aloft page displays information related to the current wind conditions:

- Current aircraft heading
- True airspeed (knots)
- Wind direction
- Wind speed
- Head or tail wind component

## Fuel planning page

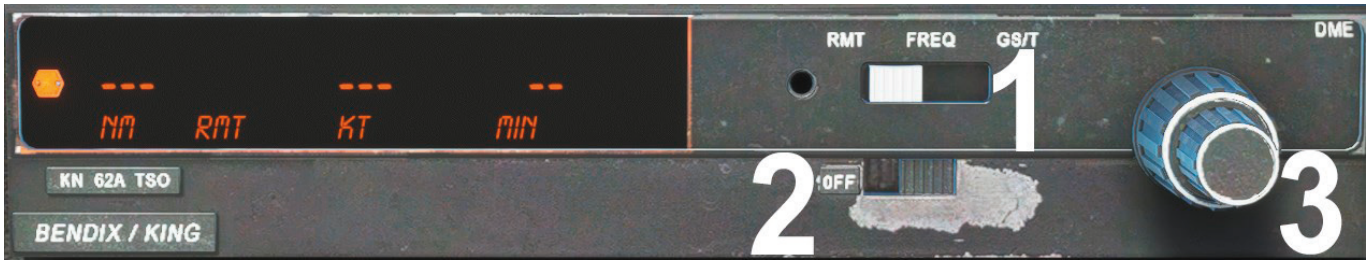

The fuel planning page calculates fuel requirements for the GPS flight plan:

- Current airspeed
- Estimated time en route for current leg
- Current fuel flow (US gallons per hour)
- Fuel required for the leg (US gallons)

## Message page


This page is not simulated and NO MESSAGES will be displayed.

# 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 (KX 170) and displays distance, groundspeed and time-to-station.

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

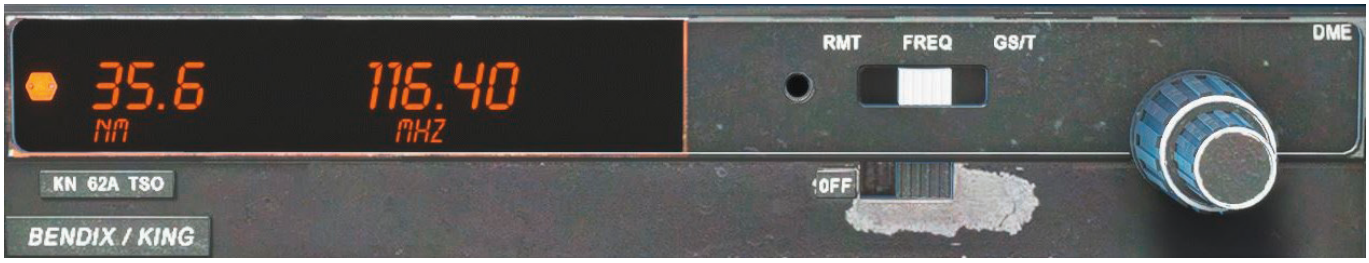
   The KN 62A should be powered on only after engine start-up and should be turned off prior to engine shutdown.

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

   With the inner knob pushed in, it changes the 0.1 MHz digit (0.0, 0.1, 0.2 etc.). With the inner knob pulled out, it adds 0.05 MHz to the frequency and tunes the frequency in 0.1 MHz steps (0.05, 0.15, 0.25 etc.). Turning the outer knob changes the larger digits (1 MHz, 10 MHz etc.).

The KN 62A is a Distance Measuring Equipment (DME) system. It can be channelled remotely through the NAV 1 receiver (KX 170) or the NAV 2 receiver (KX 175), 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 with the frequency knobs.

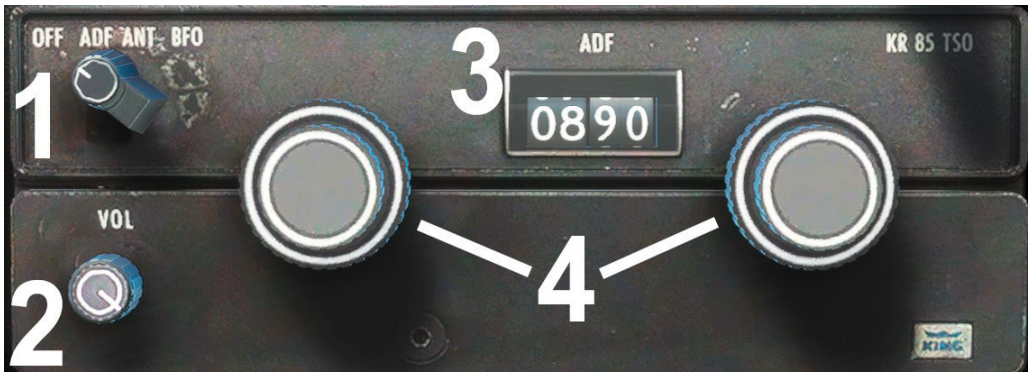
## Groundspeed/time-to-station mode


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 (KX 170) or the NAV 2 receiver (KX 175), 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 85 – ADF




1. Power/mode selector knob – selects ADF, ANT or BFO mode
2. Volume knob
3. Frequency display
4. Frequency select knobs – tune the ADF frequency

## Frequency selection

The ADF frequency is displayed on three counters.

The frequency is selected using the frequency select knobs which are rotated either clockwise or anti-clockwise. The right inner knob tunes the 1s. The right outer knob tunes the 10s. The left knob tunes the 100s and the 1,000s.

The KR85 has no controls for the fractional part of the ADF frequency. In the real world, selecting a frequency of 383 kHz would allow for reception of an NDB with a frequency of 383.5 kHz but that isn't simulated in MSFS. We have therefore added our own simulation of this. If there is no valid NDB signal on the selected frequency, it will search through all the fractional frequencies until one is found, e.g. 383.1, 383.2 etc. A tooltip on the right inner selector knob indicates the currently selected frequency.

## Operating modes

**ANT** mode provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer on the ADF indicator will be deactivated and immediately turn to the 90° relative position and remain there during ANT reception.

**ADF** mode activates the bearing pointer on the ADF indicator, causing it to point in the direction of the station relative to the aircraft heading.

**BFO** mode permits the carrier wave and the associated Morse code identifier broadcast on the carrier wave to be heard.

## ADF test

Select ANT mode and confirm that the bearing pointer moves directly to the parked 90° position. Make sure that the unit is tuned to a usable frequency and then select ADF mode. Confirm that the needle moves to the station bearing.

# AUTOPILOT


1. Autopilot engage rocker switch
2. Mode push-buttons
3. Mode annunciators – left-click to toggle altitude hold mode
4. Test push-button
5. Vertical speed hold clickspot – left-click the blank area between the test push-button and altitude hold button to toggle the vertical speed hold mode. Once engaged, vertical speed can be adjusted by moving your mouse over the vertical speed hold clickspot and rotating your mouse wheel.
6. Altitude hold clickspot
7. Coupler radio selector switch

By modern standards the Century 21 is quite a primitive autopilot. It controls the roll axis of the aircraft but is not equipped to control the pitch axis.

## Controls

The Century 21 autopilot is activated with the battery master switch and operates in a low power state until autopilot operation is desired. Mode selection is made by pushing the desired mode switch and the selected mode will be illuminated on the annunciator. A test push-button is provided to check the valid operation of the annunciator lights.

Autopilot engagement is accomplished by left-clicking on the top half of the momentary engage rocker switch. The autopilot may be engaged in any pre-selected mode.

In HDG (heading) mode the aircraft will track the heading selected on the direction indicator. In NAV, APR or REV mode, the aircraft will intercept and track any valid radio-defined course.

The autopilot can be disengaged by left-clicking on the lower half of the momentary engage rocker switch or by interrupting power using the battery master switch or circuit breaker(s). Disengagement causes the AP annunciator to flash for five seconds.

If the radio navigation information becomes invalid during an intercept, or at any time after the selected radio course has been intercepted, the appropriate NAV/APR/REV annunciator will flash, but the system will remain in the original radio mode.

An altitude hold clickspot is located on the ambient light sensor. The real Century 21 isn't equipped with pitch modes but we've included this hidden clickspot for convenience on longer flights.

## Coupler radio selector switch

This switch connects the autopilot to either the NAV 1 or the NAV 2 radio. It can also be placed in the OFF position to disconnect the autopilot from both radios.

# Lateral operating modes

## Heading (HDG) mode

In HDG mode the autopilot will capture and hold the heading selected on the direction indicator. The HDG annunciator will illuminate when HDG mode is engaged.

The heading bug becomes the primary control of the aircraft around the roll axis. When the heading of the aircraft matches the heading bug, the autopilot will maintain the heading. To turn to a new heading, rotate the heading bug to the desired heading and the aircraft will turn to the newly selected heading.

## Navigation (NAV) mode

NAV mode has an automatic 45° VOR-LOC intercept angle. The NAV annunciator will illuminate when NAV mode is engaged. When executing an intercept, the rate at which the aircraft is closing upon the selected radial is determined by the computer and at the proper time an on-course turn is initiated. The autopilot will automatically intercept, capture, track and correct for crosswind on any desired VOR radial the pilot selects.

The autopilot heading bug should be set to match the selected VOR radial.

## Approach (APR) mode

APR mode has an automatic 45° VOR-LOC intercept angle. The APR annunciator will illuminate when APR mode is engaged. The autopilot will automatically intercept, capture, track and correct for crosswind conditions during ILS approach work. This mode automatically adjusts for the increased sensitivity that accompanies the ILS system.

## Reverse/back course (REV) mode

REV mode is for use in tracking the localiser back course inbound and front course outbound. 45° automatic intercepts, crosswind correction and tracking are as described in the APR mode section above, except that response to radio signals is reversed.

# Operation

## Ground check – HDG mode

To ground check the autopilot:

1. Engage the autopilot using the rocker switch.
2. Engage HDG mode by pressing the HDG push-button.
3. Rotate the heading bug to the right – observe that the yoke moves right.
4. Rotate the heading bug to the left – observe that the yoke moves left.
5. Centre the heading bug until the yoke ceases to turn to either side.

## Ground check – NAV mode

1. Tune in an available VOR station on the NAV 1 radio.
2. Centre the VOR 1 CDI needle with a 'TO' flag using the OBS knob.
3. Set the heading bug to match the selected OBS value.
4. Place the coupler selector switch in the NAV 1 position.
5. Engage NAV mode by pressing the NAV push-button.
6. Rotate the OBS knob to swing the CDI needle to full right deflection – observe that the yoke moves right.
7. Rotate the OBS knob to swing the CDI needle to full left deflection – observe that the yoke moves left.
8. Disengage the autopilot – this completes the ground checks.

## Engaging the autopilot in flight

Before engaging the autopilot, make certain the aircraft is trimmed for hands-off level flight with the slip-ball centred.

## Override

Applying a large control input will override the autopilot when it is engaged.

The override should be checked prior to each flight:

1. Engage the autopilot.
2. Engage HDG mode.
3. While the heading bug is set for a left turn, apply a large right input to the yoke.
4. While the heading bug is set for a right turn, apply a large left input to the yoke.
5. Disengage the autopilot.

# Procedures

## Intercepting VOR radials

1. While flying with the autopilot engaged and operating in the heading (HDG) mode, tune in a VOR and set the OBS to the desired radial.
2. Rotate the heading bug to align with the selected OBS.
3. Engage navigation (NAV) mode.
4. The aircraft will turn to intercept the desired radial at an angle not exceeding 45°.
5. The autopilot will roll the aircraft onto the selected radial and will establish a crosswind-corrected heading.

***Note:*** *When flying with a crosswind, the heading bug will not align with the course flown by the autopilot. The difference between the two is the wind correction (crab) angle.*

## VOR navigation

1. The aircraft is inbound and coupled to the 045° radial to VOR ‘A’.
2. When flying over VOR ‘A’, the autopilot will bank the aircraft left and right to indicate passage over the station. At this point, select the desired outbound radial (140° in this example) using the OBS knob and align the heading bug to the same course.
3. The autopilot will bank the aircraft left to intercept the 140° radial of VOR ‘A’, compensating for any crosswind.
4. As the aircraft moves out of range of VOR ‘A’, tune VOR ‘B’ into the KX 175B (NAV 2) radio and rotate the OBS knob to select the desired inbound radial.
5. Move the coupler radio selector switch to the NAV 2 position.
6. The autopilot will continue to bank the aircraft to maintain the radial to VOR ‘B’.
7. This procedure is repeated, as described, from VOR to VOR as the aircraft progresses along its route.

***Note:*** *If you wish to use the same VOR receiver for navigating to VOR ‘B’, heading (HDG) mode should be used while VOR ‘B’ is tuned in.*

## ILS approach

1. When receiving vectors to the localiser, engage heading (HDG) mode and use the heading bug to maintain the provided headings.
2. When the aircraft is in a position for the localiser intercept, select the inbound heading of the localiser with the heading bug before engaging navigation (NAV) mode.
3. The autopilot will intercept the localiser and correct for crosswinds.
4. It is important to note that the autopilot only controls the heading of the aircraft and cannot adjust the rate of descent for the glideslope. You must make pitch changes to maintain the glideslope.
5. When passing over the middle marker, disengage the autopilot and take over control of the aircraft. Pre-select heading (HDG) mode on the autopilot in case of a go-around.

***Note:*** *The heading bug must be set to the inbound heading of the localiser.*

## ILS back course approach

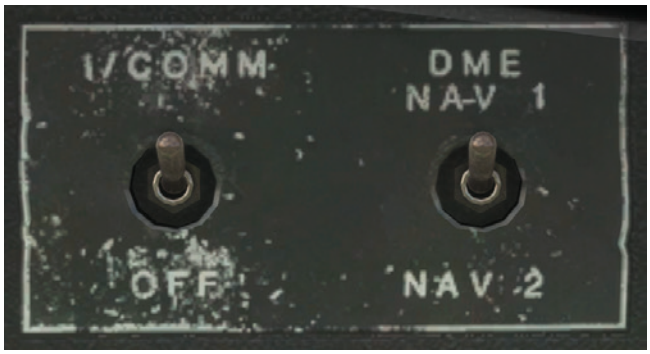
1. When receiving vectors to the back course of the localiser, engage heading (HDG) mode and use the heading bug to maintain the provided headings.
2. Set the inbound heading of the back course with the heading bug and engage reverse (REV) mode.
3. The autopilot will intercept the back course and track inbound on the localiser, correcting for crosswinds.

# ELECTRONIC FLIGHT BAG (EFB)

The aircraft is equipped with a tablet computer which is divided into two main areas:

1. An 'Electronic Flight Bag' (EFB) which can be used for viewing your simBrief operational flight plan (OFP), monitoring your position on a moving map, viewing your Navigraph charts and making notes.
2. An Aircraft screen for controlling various aircraft options and payload.

The tablet can be powered on/off with the physical 'Home' button on its right bezel. The 'Home' button can also be used to return to the EFB menu from the Aircraft screen. The EFB can be hidden by moving the I/COMM switch to the OFF position.

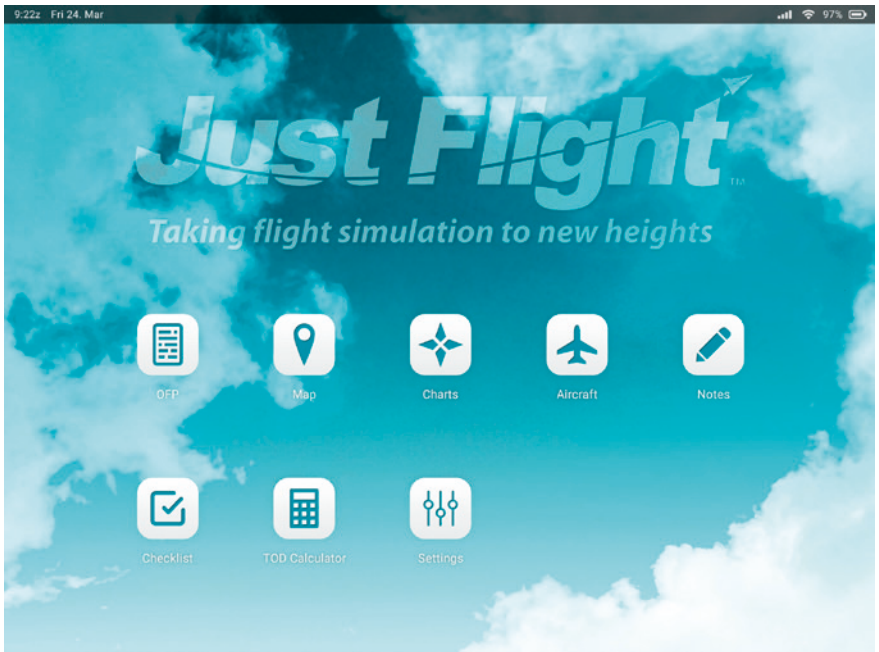



The Home screen of the EFB shows the icons of the various applications that are available to use. Pressing one of these icons will open the respective application.

The top bar of the EFB shows the current simulator time and date in the top left corner, as well as the current battery status of the tablet in the top right corner. The battery will drain over time if the aircraft's electrical power is switched off and will recharge once it is powered on again.

The tablet can be rotated left/right and up/down using the clickspots on the outer edge (bezel) of the EFB tablet.

The background on the EFB can be changed to an image of your choice by replacing the wallpaper.jpg file in the following file directory: …\Community\justflight-aircraft-pa28-warrior-ii\html_ui\Pages\VCockpit\Instruments\Airliners\JF_PA28A\EFB\img

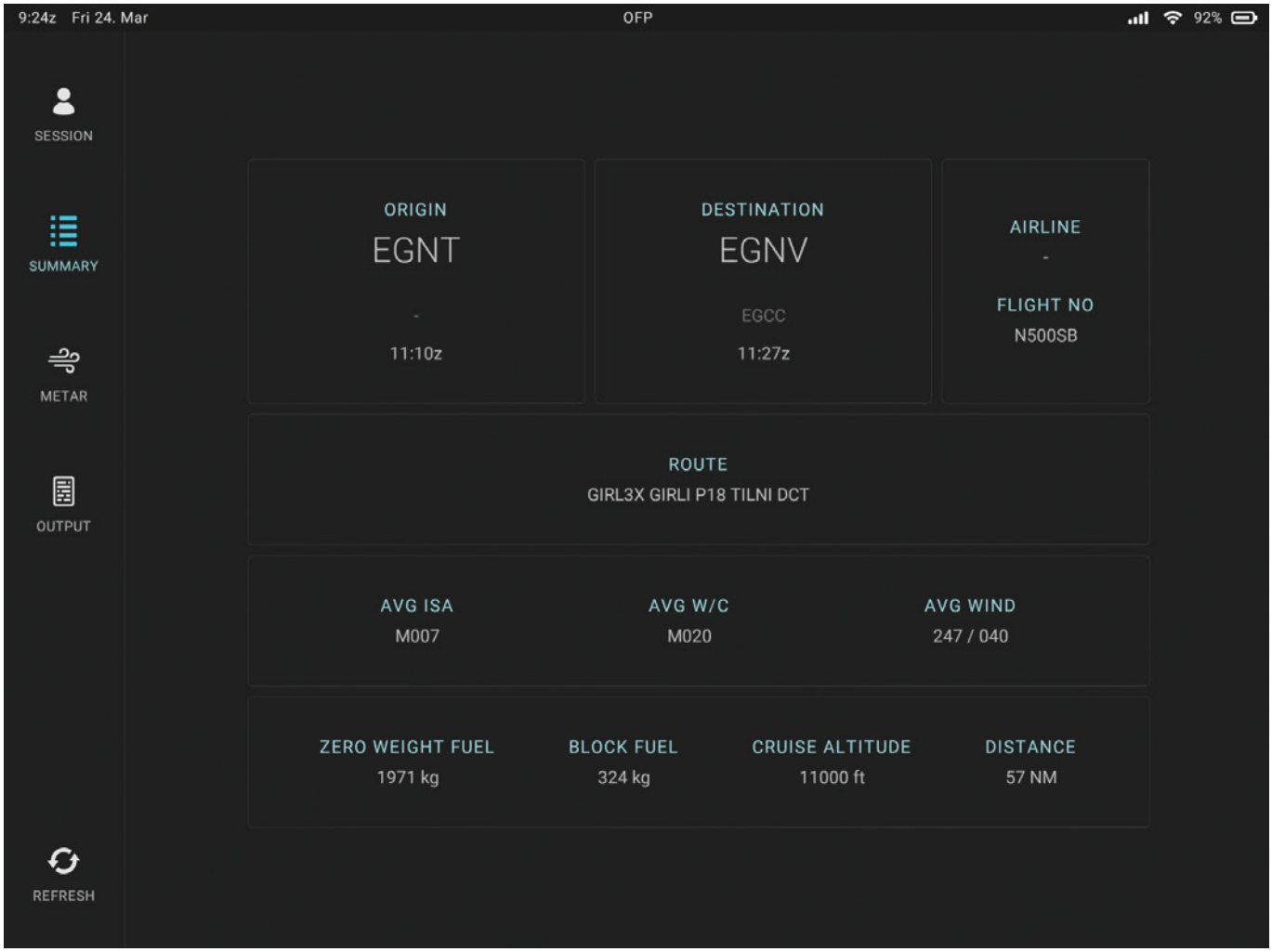


# Operational Flight Plan (OFP)

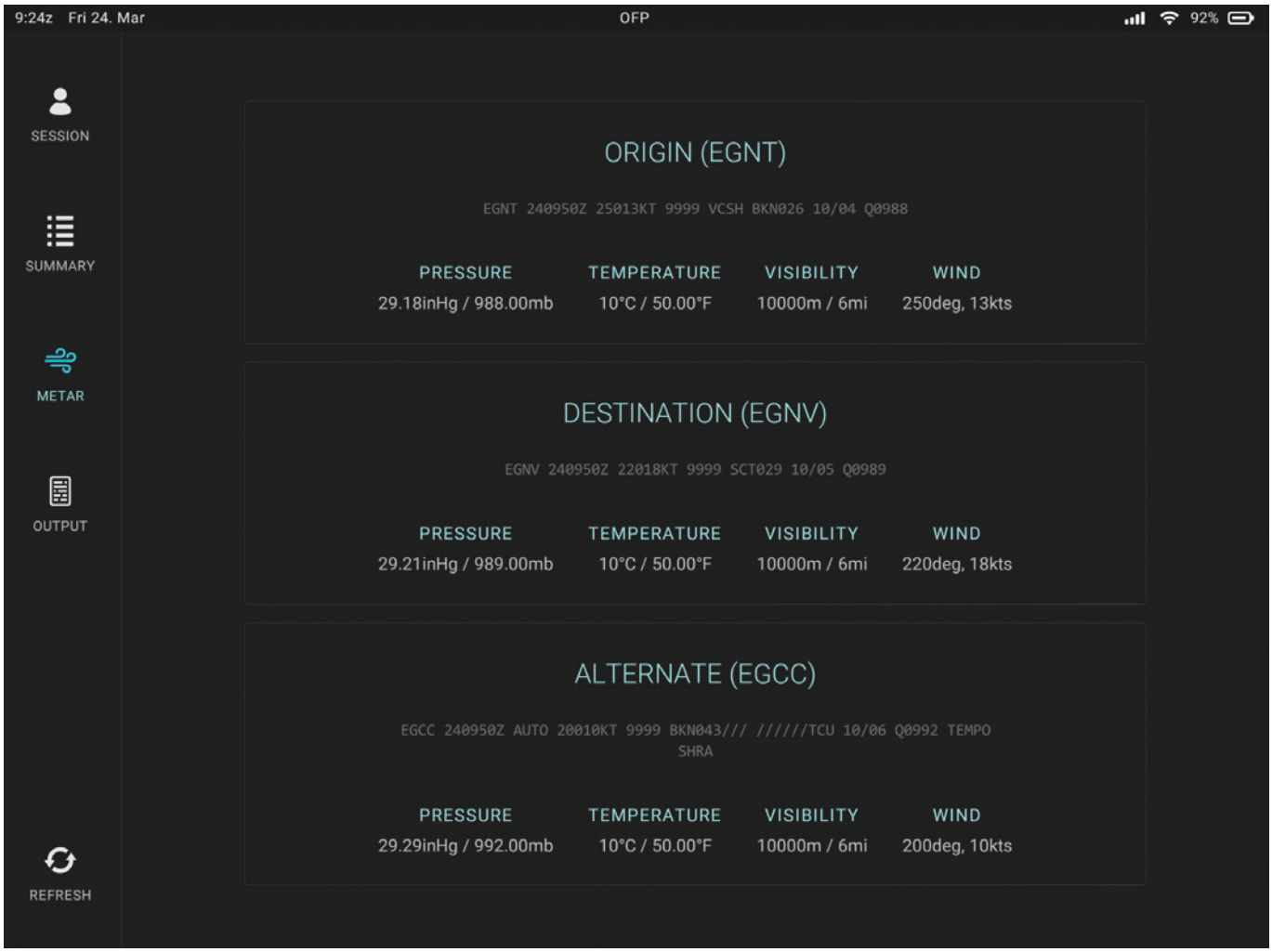
The OFP app allows you to view your latest simBrief OFP and display its information conveniently within the simulator.

On selecting the simBrief screen you will be prompted to enter your simBrief pilot ID to access your data. Alternatively, you can choose to identify yourself via your simBrief username by enabling the 'simBrief Username Login' setting in the EFB settings.

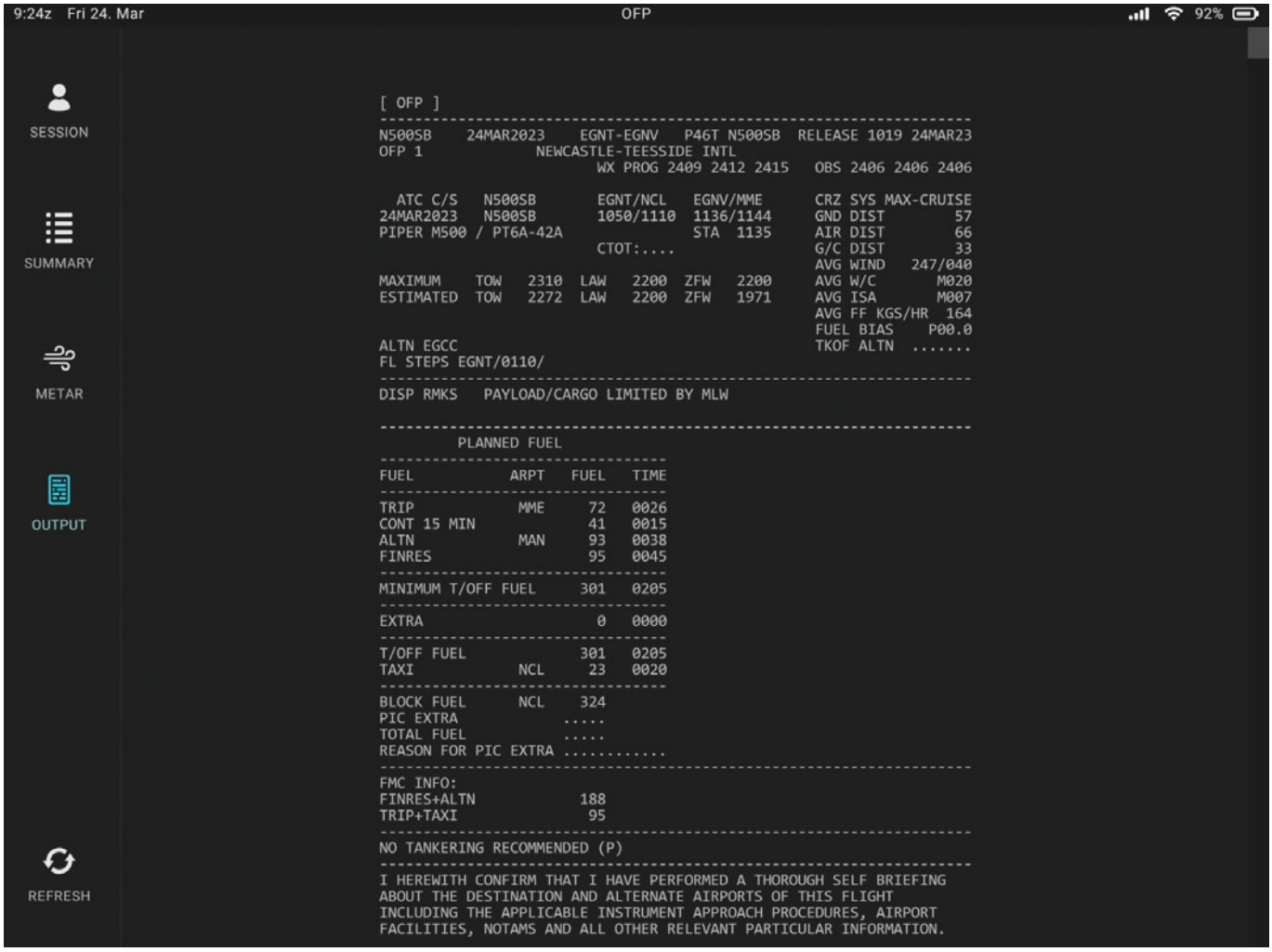
Once you have entered your simBrief identification and pressed the 'Continue' button, you are presented with a summary of your active OFP, including airport codes, times, route information, fuel weight etc.



Pressing the ‘METAR’ button allows you to view the wind information for your origin, destination and alternate airports. This information is shown in both raw and simplified forms.



To view the full OFP, press the ‘Output’ button. Your entire flight plan will then be shown in text form, which can be scrolled as desired by using the scrollbar to the right of the OFP output area.




The OFP data can be refreshed at any time by pressing the ‘Refresh’ button in the left sidebar; this will update the data to your latest simBrief flight plan.

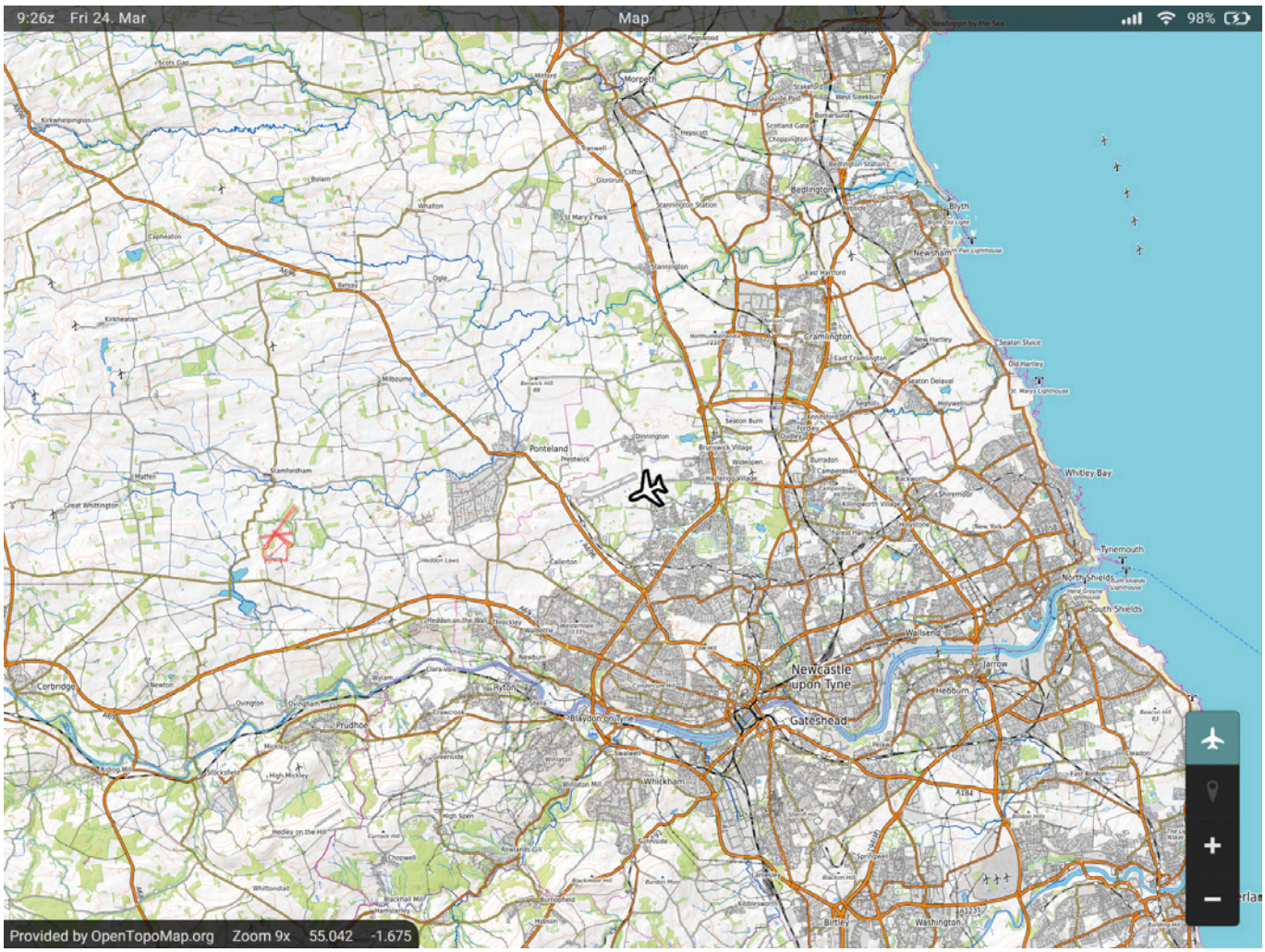
***Note:*** *A simBrief account is required for this functionality.*

# Map

The Map app provides you with a moving map based on visual data from OpenTopoMap.org.

By default, the map is set to track the aircraft's current position (displayed in the bottom right corner). It is also possible, however, to move the map manually by pressing the aircraft icon in the bottom right corner of the display and then simply clicking and dragging anywhere on the map. Pressing the location pointer icon will centre the view back to the aircraft's current position.

The map's zoom level can be adjusted via the '+' and '-' buttons.



# Charts

The Charts app allows you to browse aviation charts provided by Navigraph as part of an active Navigraph subscription. A login (via external link or QR code) is required to link the EFB to your Navigraph account. Follow the instructions on the EFB and your external internet browser to complete the linking process.

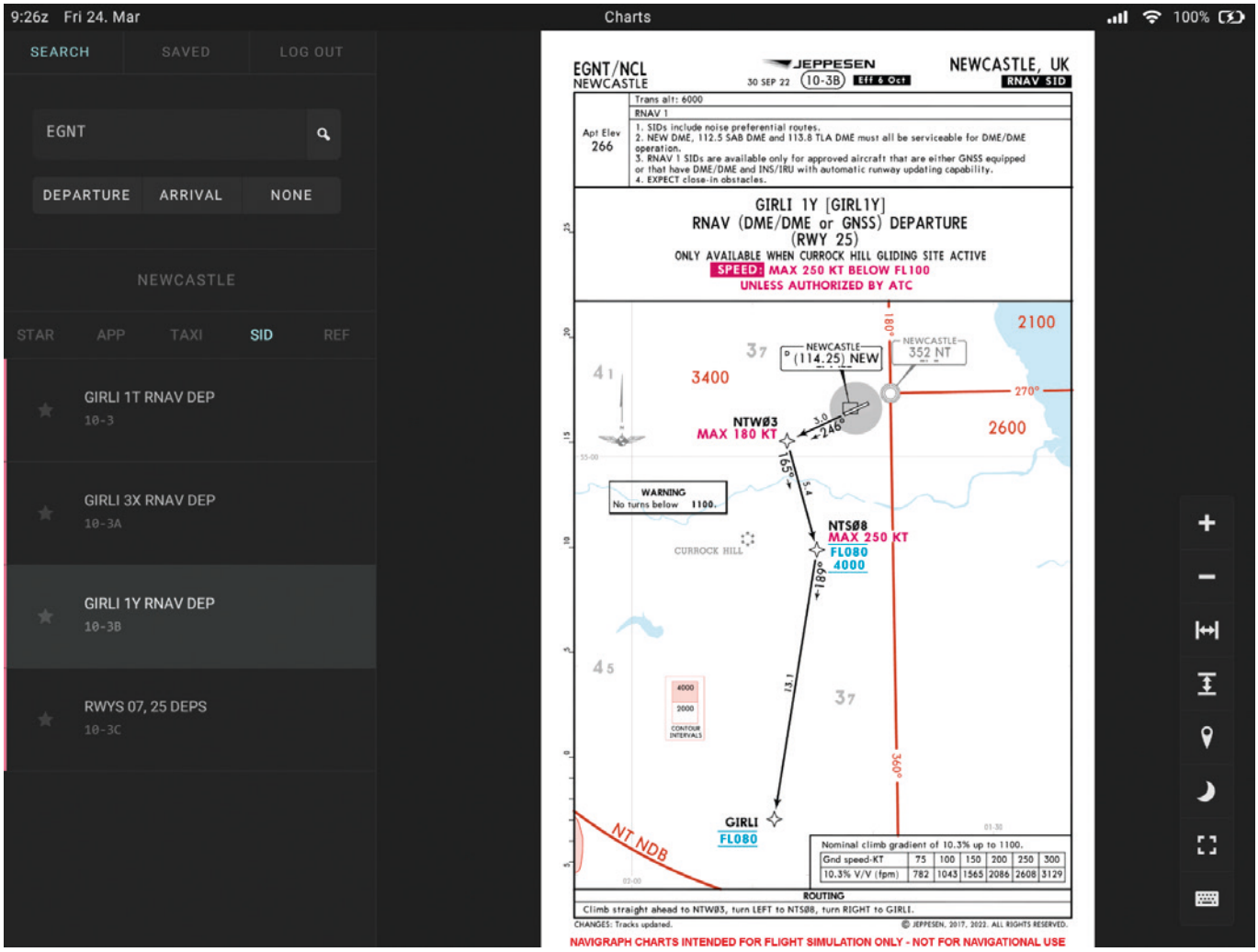
With your Navigraph account linked, you can enter an ICAO code in the 'ICAO Code' search field to view the various associated STAR/APP/TAXI/SID/REF charts for that airport.

If you have a simBrief OFP loaded on the OFP page, you can quickly access the charts for the departure and arrival airports simply by pressing the respective 'Departure' and 'Arrival' tabs. This will list all relevant charts for that airport under the STAR/APP/TAXI/SID/REF headings.

To view a chart, simply press the relevant tab and the chart will appear on the right side of the page. The active chart can be moved/resized/fitted as required by using the controls at the right of the document window. Charts that provide georeferenced data may additionally display the aircraft's current position as an overlay icon if applicable.

Charts can be saved for quick reference by pressing the star icon to the left of the chart's name. You can quickly access all of your saved charts by pressing the 'Saved' button at the top of the page.

To unlink your Navigraph account from the EFB, press the 'Log Out' button at the top of the page.

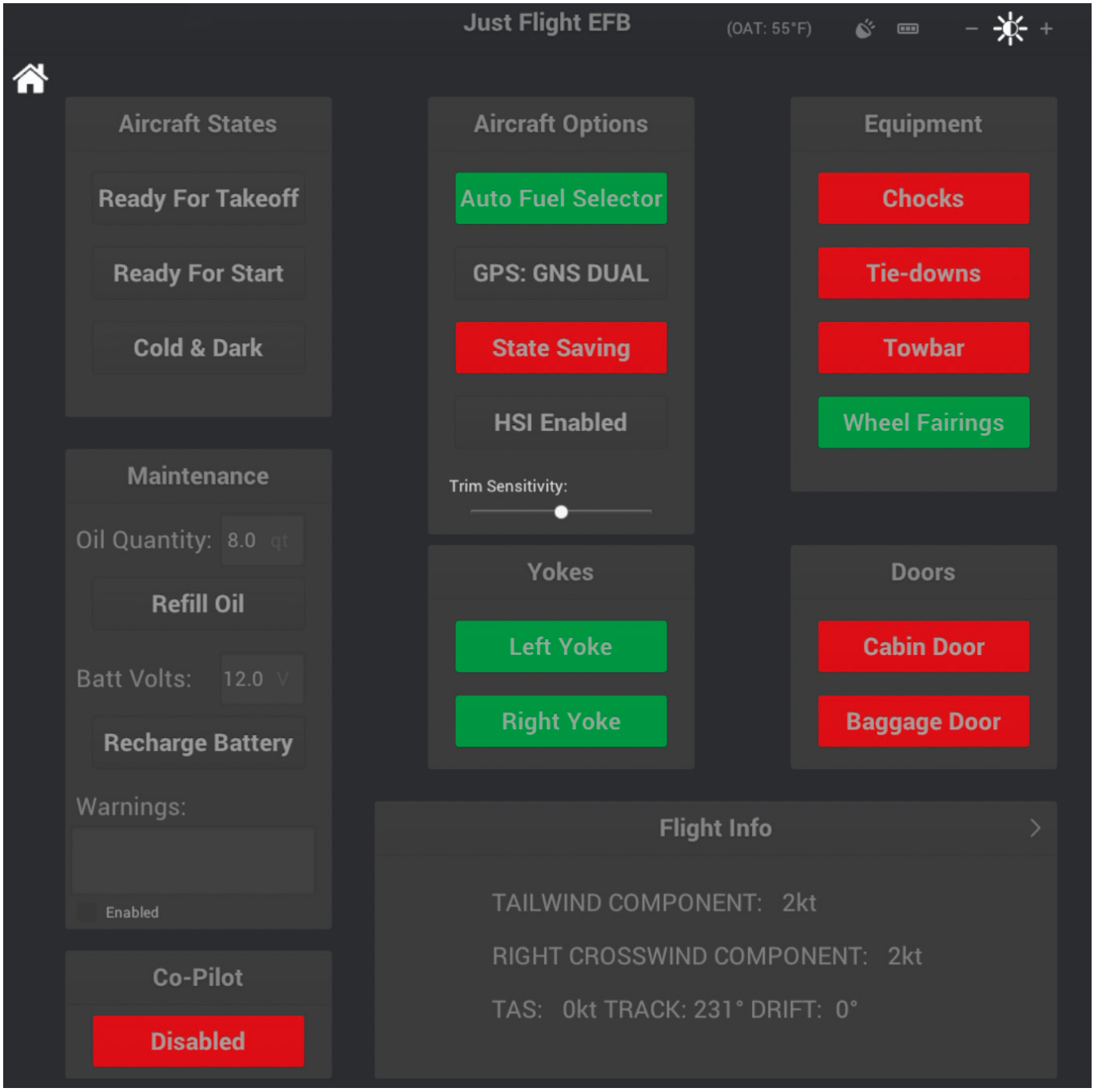



***Note:*** *A Navigraph account is required for this functionality.*

# Aircraft

Selecting the Aircraft app from the Home page will launch the Aircraft screen, which allows you to control various aircraft options and payload.

Please refer to the sections below for further information on the individual functions of the Aircraft page. You can return to the EFB from the Aircraft screen by either clicking the 'Home' icon or the physical 'Home' button.



## Aircraft States

Three aircraft states can be selected:

**Ready For Takeoff** – engine and electrical power on, flaps up, lights on and parking brake off.

**Ready For Start** – electrical power on and ready for engine start, flaps up, lights on and parking brake on.

**Cold & Dark** – engine and electrical power off, flaps up, lights off and parking brake on.

The aircraft will automatically be configured in the 'Ready For Takeoff' state when a flight is started.

## Aircraft Options

### Auto Fuel Selector

Enables or disables the automatic fuel selector.

The Warrior II is capable of long-range flight so we have included an automatic fuel selector switcher, allowing you to leave the simulator for prolonged periods without risking a fuel imbalance.

This system will automatically switch selected fuel tanks every twenty minutes or if the fuel imbalance is greater than five gallons.

### GPS

Toggles which GPS unit is fitted. There are five options:

- GPS 100
- Dual GNS 530 (COM/NAV 1) and GNS 430 (COM/NAV 2)
- GNS 530
- GTNXi 650/750 (requires the payware TDS GTNXi)
- GTN 650/750 (requires the freeware PMS50 GTN)

***Note 1:*** *The two GTN options will not be shown if the required software is not detected.*

***Note 2:*** *Toggling GPS options during flight is not recommended. If you are using a flight plan set in the MSFS main menu, we recommend restarting the flight after toggling GPS options to ensure that the flight plan in correctly displayed on the chosen GPS unit.*

### State Saving

Enables or disables aircraft state saving.

The aircraft state can be saved and reloaded automatically between flights, allowing you to always return to your cockpit in the same state that you last left it.

### HSI/DI

Toggles whether the left instrument panel is equipped with a direction indicator (DI) or horizontal situation indicator (HSI).

### Trim Sensitivity

A slider controls the sensitivity of the elevator trim. Moving the slider left will decrease the trim sensitivity and moving the slider right will increase the trim sensitivity.

## Equipment

Enables or disables exterior aircraft equipment:

- Wheel chocks
- Wing tie-downs
- Nose-wheel towbar

### Wheel fairings

The Warrior II has the option of being fitted with wheel fairings. These are fitted to decrease drag around the fixed landing gear.


## Maintenance

In addition to supporting the host simulator's own failures system, this 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.
- **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.
- **Engine failure caused by low oil quantity** – over time the engine will consume oil. The current oil quantity can be checked and refilled using the Refill Menu. If the engine consumes all the oil, the engine will eventually fail.
- **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.

These failures are disabled by default and can be enabled/disabled using the 'Enabled' tick-box.

Indications of any issues are shown in the 'Warnings' area.

The current oil quantity (in quarts) and battery voltage are shown and controls are provided for refilling the oil and recharging the battery.

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 for more information.

**Vapour lock** – Fuel 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.

**Oil quantity** – Make sure that you have sufficient engine oil before attempting to start the engine, otherwise engine failure may occur.

You can also start the engine using the 'Ready For Takeoff' aircraft state option.

A 'Priming/Fuel Flow Required' warning message will appear if priming is required before engine start can be achieved.

## Yokes

Hide or show the left and right yokes for better visibility and access to the lower instrument panel controls.

## Doors

Open or close the passenger (cabin) or baggage doors.

The passenger door upper and lower latches are automatically controlled when you use this option.

## Flight Info

The flight info section provides a variety of information:

- Outside air temperature (OAT) – Celsius and Fahrenheit
- Groundspeed (GS) – nautical miles per hour, statute miles per hour and kilometres per hour
- Endurance – hours and minutes
- Range – nautical miles, statute miles, kilometres
- Nautical miles per gallon and statute miles per gallon
- Density altitude and pressure altitude (feet)
- True airspeed (knots), track (degrees) and drift (degrees)
- Fuel flow – gallons and litres
- Fuel used – total fuel burn for this flight (gallons)
- Crosswind component (knots)
- Headwind/tailwind component (knots)

This information is divided into several pages which can be navigated through by using the left and right arrow buttons.

The total fuel burn can be reset by clicking on the 'Reset' button.

## Co-Pilot

This option allows you to enable or disable the co-pilot model. When enabled, the co-pilot will be visible in both cockpit and exterior views and their weight will be automatically added to the aircraft payload. The co-pilot model style can be selected via the ‘Misc’ section of the Flight Simulator menu.

# Notes

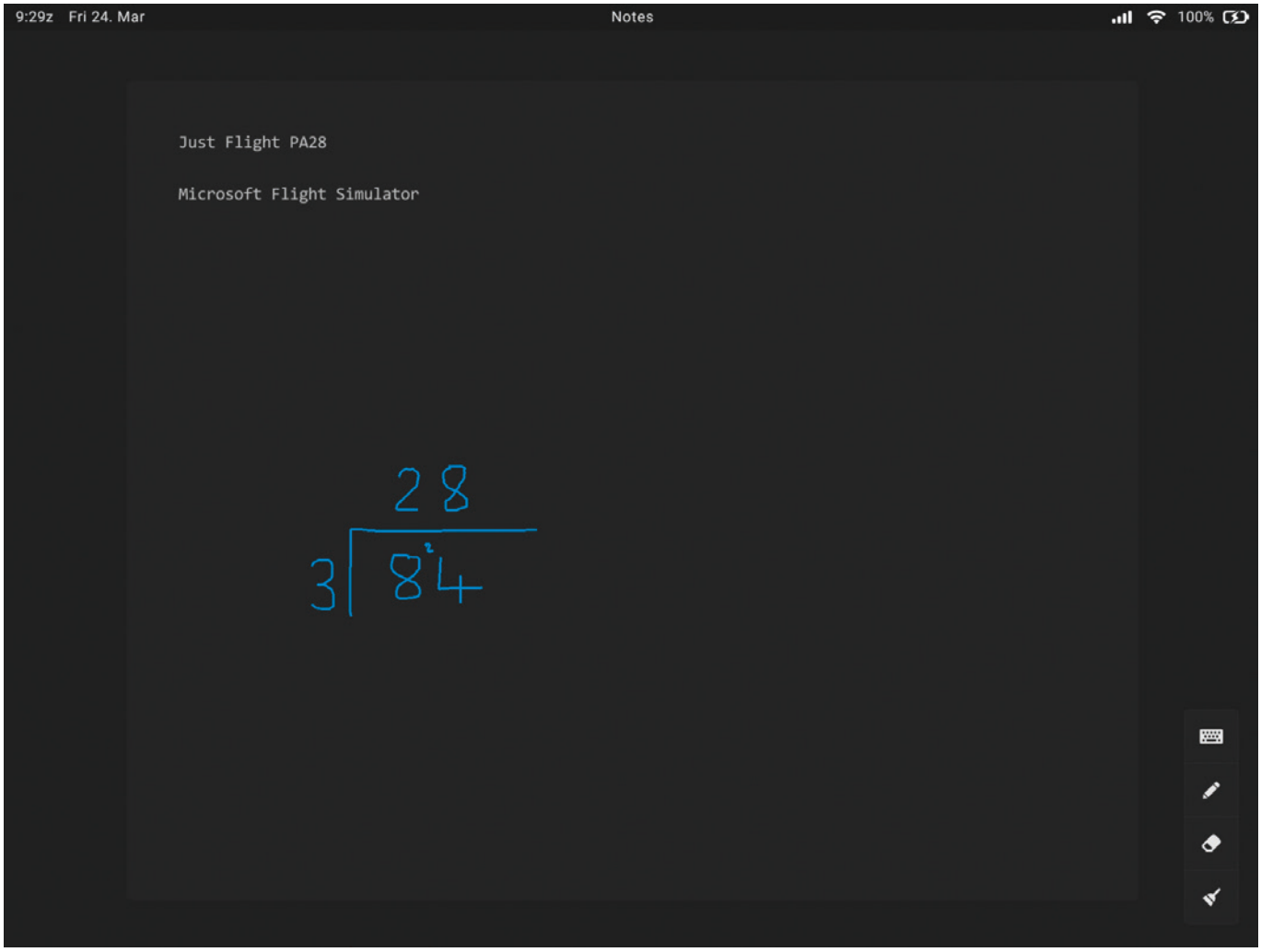
The Notes app acts as a virtual notepad for the pilot, allowing you to take text-based and handwritten notes on the fly (particularly useful for noting clearances and taxi instructions).

The Notes app supports standard keyboard inputs and will automatically display a scrollbar once the content exceeds the height of the input area.

An on-screen keyboard is also available. This can be toggled on/off by pressing the keyboard icon at the bottom right of the page. Once open, the keyboard can be moved freely to any position on the display by pressing and holding the top bar of the keyboard. To hide the keyboard, simply press the keyboard icon again. (This feature is particularly useful for VR users.)

To write handwritten notes, press the pen icon at the bottom right of the page and then left-click with your mouse and drag the pen to write on the screen. To erase text, press the eraser icon and, again with your mouse, left-click and drag to erase what you have written.

To erase all handwritten notes from the page, simply press the paintbrush icon at the bottom right of the page.



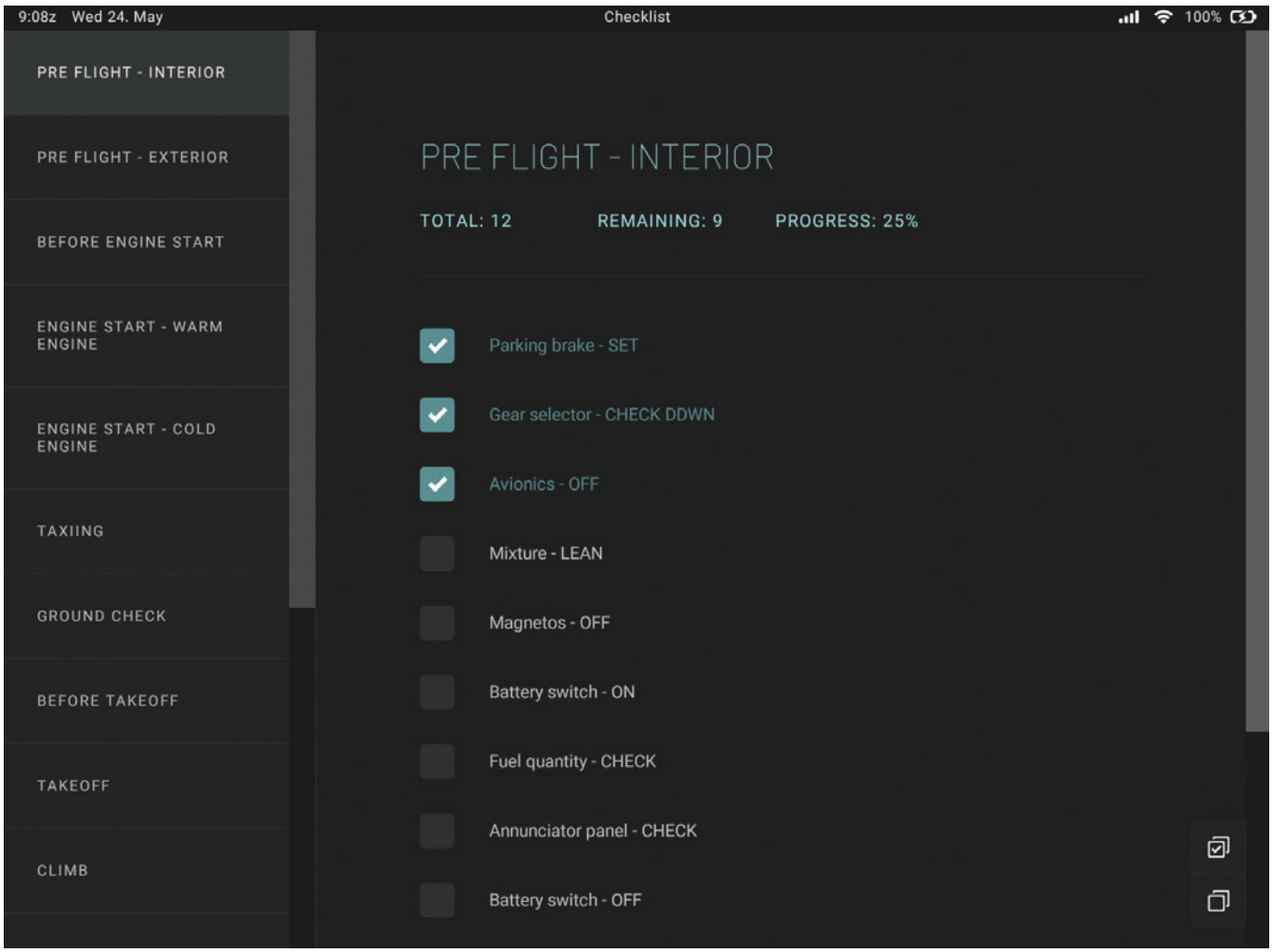
# Checklist

The Checklist app allows you to view all the aircraft's checklists on one easy-to-navigate page. The title of each checklist is shown on the left side of the page. Pressing the title of a checklist will open the respective checklist on the right side of the page.

Each step of a checklist has an item, an action and a tickbox which can be manually ticked to allow you to keep track of your progress. You can see your progress through the checklist at the top of the page.

Two controls at the bottom right of the page allow you to tick all boxes on the page or to untick all boxes.

***Note:*** *The Checklist page on the EFB is intended to be used as a guide only. For automated checklists please use the interactive checklist menu within MSFS.*



# TOD Calculator

The Top Of Descent Calculator is a useful tool which allows you to calculate and view the exact point at which you should begin your descent.

The distance of your descent can be calculated based on the following four factors:

- Current altitude (feet)
- Ground speed (knots)
- Target altitude (feet)
- Desired angle (degrees)

Each of these factors is shown on this page, where text can be entered into each of these fields either via an external keyboard or via the on-screen keyboard which can be toggled from the lower right corner of the page.

Once values have been entered into each of these four fields, the calculator will then produce two outputs:

- Desired TOD distance – the ground distance covered between the start of your descent and your target altitude.
- Desired vertical speed – the vertical speed that the aircraft will have to descend at to meet the distance stated.

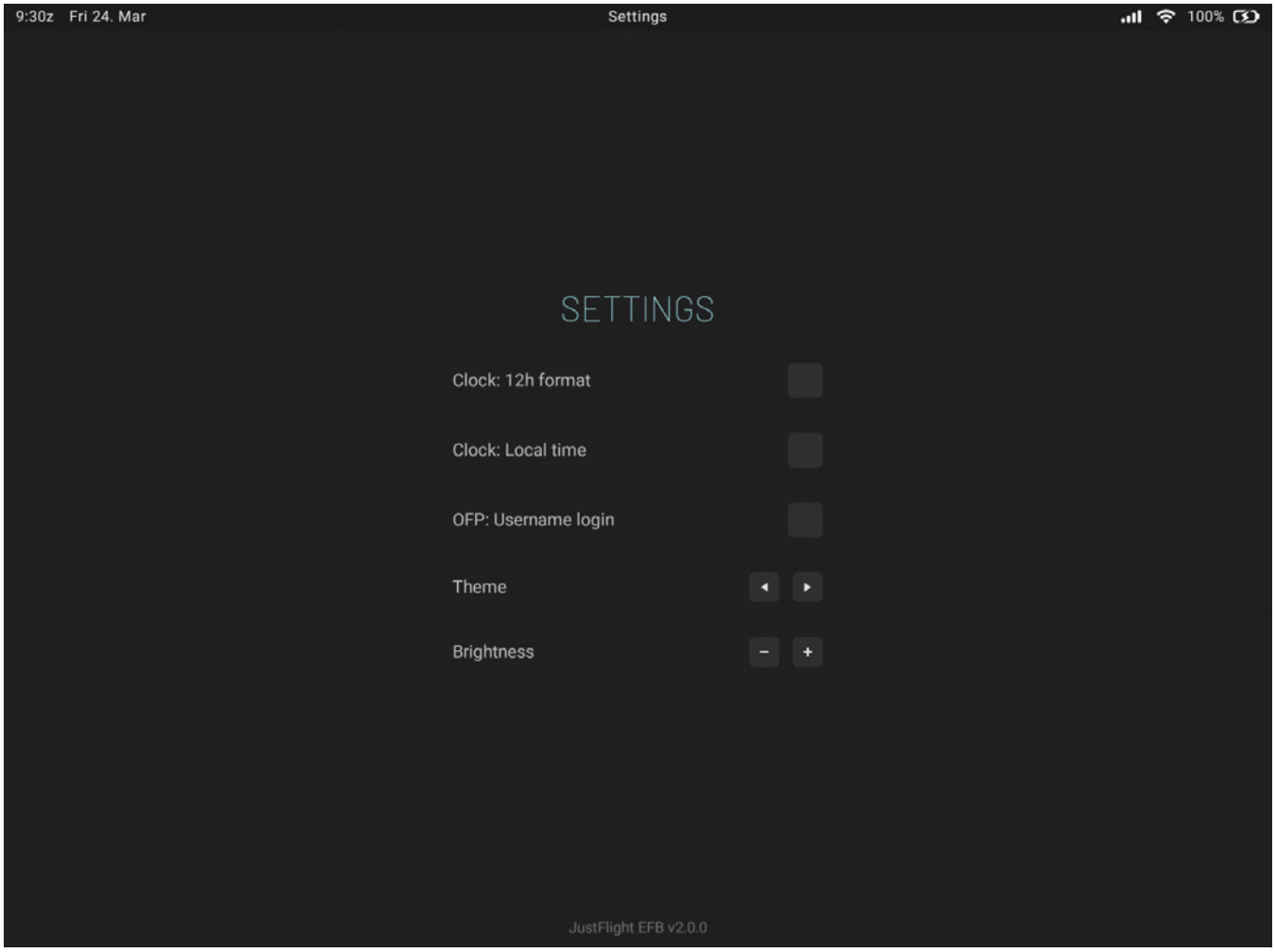
***Note:*** *Desired distance, Desired vertical speed and Desired angle are all interchangeable values and can be toggled by pressing the arrows in the fourth field.*

For ease of use, the 'Current altitude' and 'Ground speed' fields both have a 'SYNC' feature; once active, this continuously inputs the aircraft's current altitude and ground speed into their respective fields. With this feature active, the calculator's outputs will be constantly updated as the aircraft's altitude and speed change during its descent.

# Settings

The Settings screen offers several options to adjust the look and behaviour of the EFB:

- **Clock: 12h format** – toggles the 12/24-hour format of the top bar clock.
- **Clock: Local time** – toggles between UTC and local time on the top bar clock.
- **OFP: Username login** – allows simBrief identification via username instead of pilot ID.
- **Theme** – switches the EFB's colour scheme.
- **Brightness** – increases/decreases the EFB's brightness.

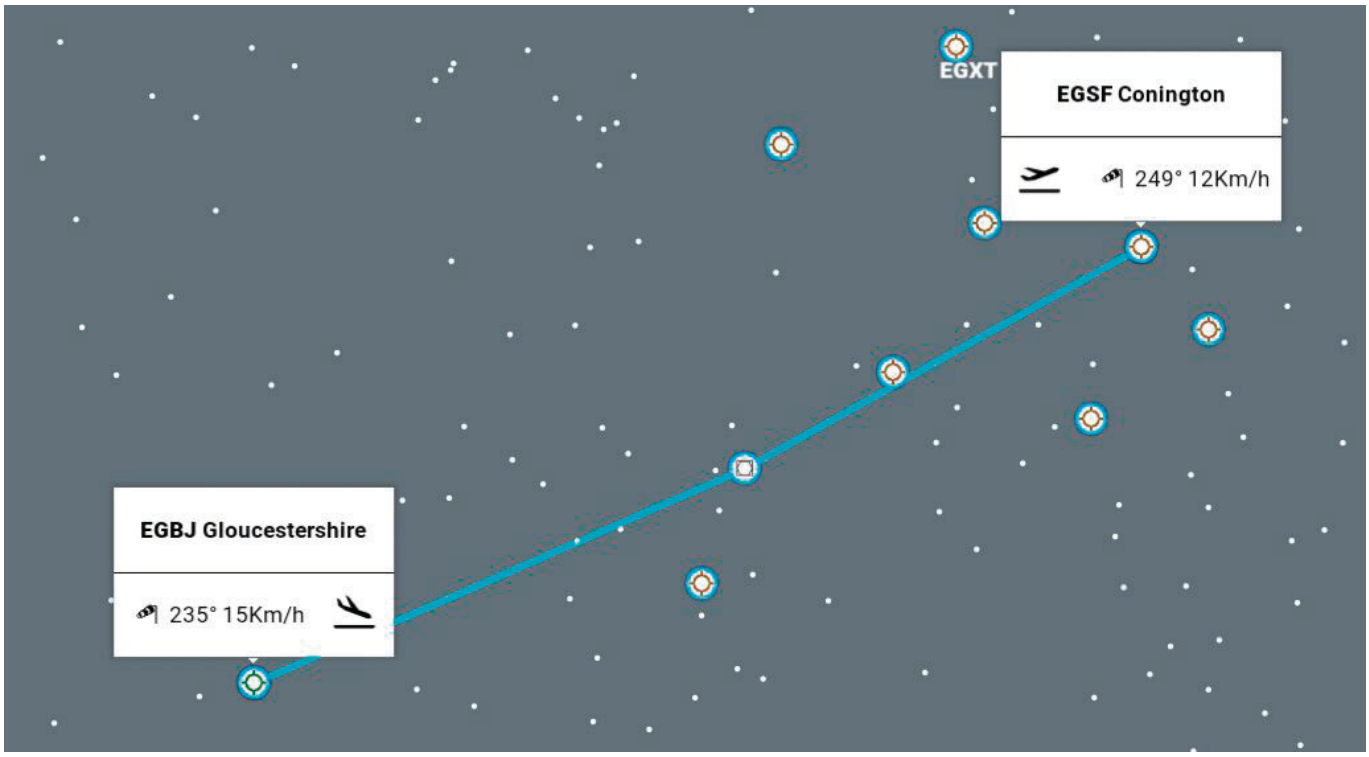


# FLYING THE WARRIOR

In this tutorial flight we will be departing from Conington airfield, located six miles south of Peterborough and 20 miles north-west of Cambridge, UK. We will be heading west, passing over Sywell Aerodrome in Northamptonshire and south of Birmingham before approaching Gloucestershire Airport from the east. Covering approximately 79 nautical miles, this short flight is the ideal length for learning about the essential systems on board the PA-28 Warrior II.

Here are the details for today's flight:

**EGSF – DTY (116.40) – GST (331.0) – EGBJ**




**Estimated time en route:** 40 minutes

**Route distance:** 79 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 Warrior II tutorial flight, follow these steps:

1. Start Microsoft Flight Simulator.
2. Select the **World Map** menu.
3. Choose **Load/Save** and then **Load**.
4. Browse to the **Documents** folder within the PA28 Warrior II aircraft folder (located in the **Packages/ Community/** folder) and select the **Just Flight PA-28 Warrior II** tutorial flight file.
5. Click on **Fly**.

You should now find yourself sitting in the cockpit at Conington airfield. Before we continue, we need to configure the aircraft 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.

Use the EFB to configure the aircraft in a 'cold and dark' state. The engine will shut down and the electrical power will be switched off.


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

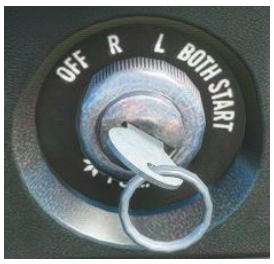
The first step is to open the door to allow entry into the cockpit. In the virtual cockpit, click on the upper and lower door latches to rotate them to the **OPEN** position and then click on the door handle to push it open.

Use the EFB to open the baggage door before switching to the exterior view to confirm that the baggage door has opened. 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, or by using the EFB.


Check that the magneto selector is set to **OFF** (rotated fully anti-clockwise).



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


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



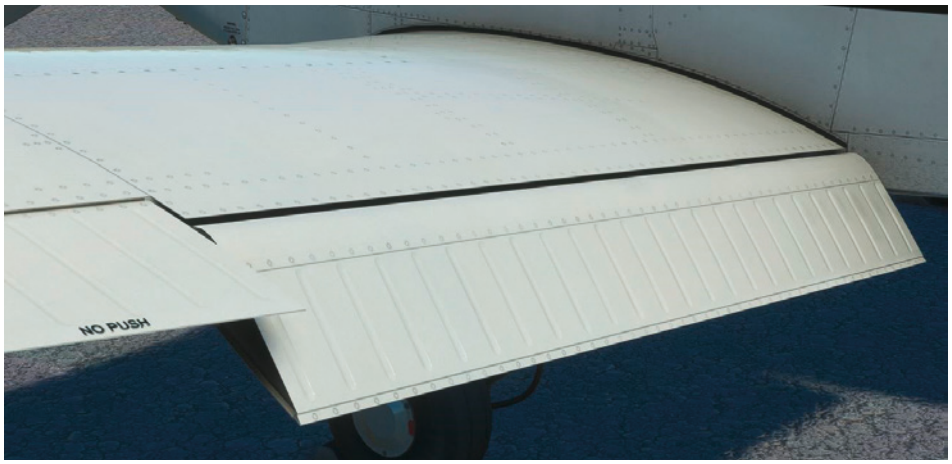
Check the left and right fuel quantity gauges to confirm that we have full tanks (25 gallons per tank).

Switch **ON** the navigation, anti-collision and landing lights.

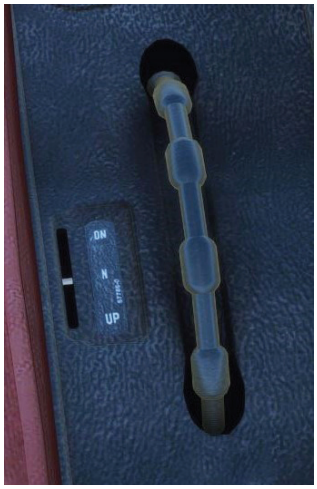

Switch to the exterior view and confirm that all of the lights are illuminated before returning to the cockpit and switching them all **OFF**.

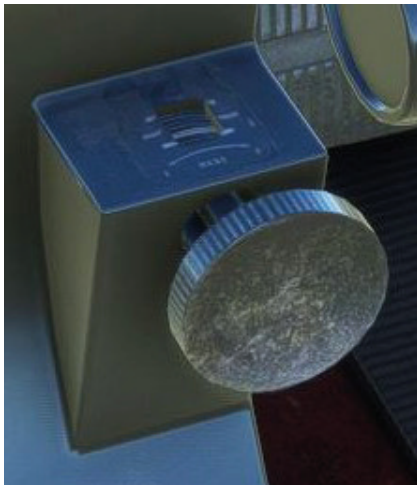
Confirm that all annunciator lights and the low voltage light are illuminated and then switch **OFF** the BATT MASTR.

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




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



Switch to the external 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.

Use the EFB to recharge the battery in case it has discharged while you've been finding your way around the cockpit and then check the oil quantity. If the oil quantity displayed is less than 8 quarts, use the 'Refill Oil' option to top up the engine oil.


## Starting the engine

Using the tablet EFB, remove the chocks and tie-downs.

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

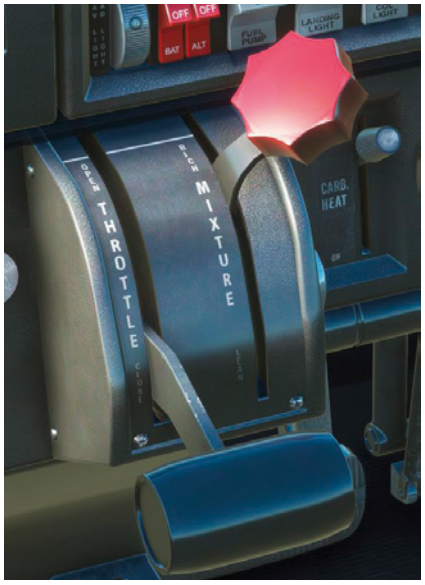
Close the baggage door, using the EFB, and then close the passenger door by first clicking on the door to pull it shut and then clicking on the door latches to rotate them to the **LATCH** position.

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** and that all avionics are still **OFF**.

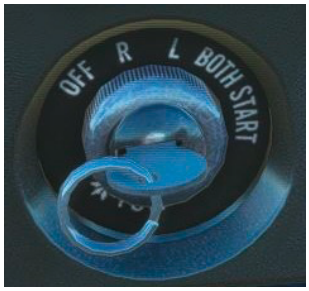


Switch **ON** the battery master to provide electrical power to the aircraft.

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.

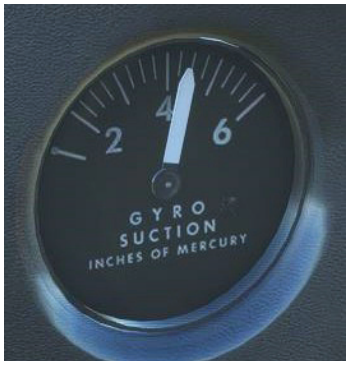

Check that the area surrounding the aircraft is clear of obstructions and then rotate the magneto/start selector to the **START** (fully clockwise) position.




When the engine starts, release the magneto/start selector and it will return to the BOTH position. Check that the oil pressure and temperature are rising.

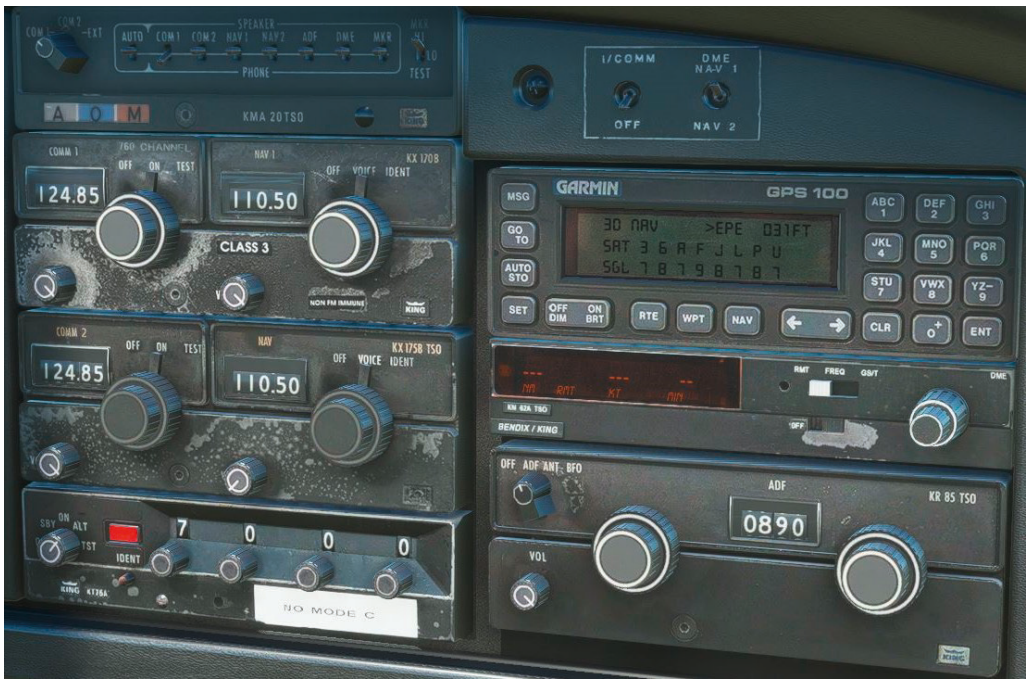
Switch **ON** the ALT (alternator) and confirm that the associated warning light on the annunciator panel extinguishes.


Adjust the throttle to maintain approximately **1,000 RPM** and check that the vacuum gauge shows suction within the given limits. You can hide the EFB with the I/COMM switch to make it easier to see the vacuum gauge.




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

Starting at the top of the centre panel and working down, switch on the KX 170B, KX 175B, KT 76A, GPS 100 (or GNS 430 / GNS 530 / GTN 650 / GTN 750 if installed), KN 62A and KR 85 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 from runway 28 and for the initial climb we are going to maintain the runway heading, so rotate the heading bug on the horizontal situation indicator to **276 degrees**.


Once we are settled into our climb to the west we will make a turn to fly towards the first waypoint on the route, Daventry VOR. In preparation, tune the VOR frequency (**116.40**) into the KX 170B (NAV 1) unit.


Rotate the course knob on the horizontal situation indicator to select **243 degrees**. This is the course inbound to the Daventry VOR from Conington.

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 GPS 100 unit, is set to **NAV 1**.

Selecting the remote function allows the KN 62A to display DME information from either NAV 1 (the KX 170B) or NAV 2 (the KX 175B), 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 KX 170B, which we have just tuned to the Daventry VOR.


## 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 your taxi to the threshold of runway 28.

Steering the aircraft with the rudder pedals only is generally sufficient. 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 28. We can carry out the power (ground) checks here.

Set the parking brake and advance the throttle lever to obtain **2,000 RPM**. Rotate the magneto selector to the **LEFT** position, note the RPM drop and then rotate it back to the **BOTH** position. Repeat the process for the right magneto.

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

Use the PRESS-TO-TEST button to confirm that all the annunciator lights illuminate.


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


To carry out a carburettor heat check, pull the carburettor heat lever to **ON** and check for a small drop in RPM, then push the carburettor heat lever to **OFF**. If the RPM increases to significantly more than the original 2,000 RPM, icing conditions are likely to be present. With clear skies and moderate temperatures for our flight, however, 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 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 the magneto selector is in the **BOTH** position and the primer is pushed in and locked, and then switch **ON** the landing and anti-collision lights.

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 **55 knots** start to raise the nose of the aircraft.

Make elevator inputs as required to maintain an initial climb speed of approximately **70 knots**, holding the runway heading (276 degrees).

# Climb

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

As you climb through 1,500 feet, the Daventry VOR should be within range of the aircraft. The NAV flag on the HSI and VOR 1 indicator will disappear to indicate that a valid signal is being received and the KN 62A will display the DME distance (nautical miles), groundspeed (knots) and time-to-station (minutes).

Rotate the course knob on the HSI until the CDI needle centres with a TO flag visible – approximately 240 degrees.

Bank the aircraft left to bring it onto the selected course, so that you are tracking inbound to the VOR.

To reduce your workload, we will now engage the autopilot and command it to maintain the course to the VOR.

Check that the coupler radio selector switch is set to **NAV 1**. This switch connects the coupler to either the NAV 1 or the NAV 2 radio and, as we have tuned the Daventry VOR into the NAV 1 radio, we need to couple the autopilot to that same radio.


Confirm that the NAV/GPS switch is set to the **NAV** position and then press the **NAV** button on the autopilot to engage navigation mode.

Now engage the autopilot by left-clicking on the top half of the autopilot engage rocker switch

The autopilot will now control the heading and maintain our course to the VOR.

***Note:*** *The autopilot is not controlling aircraft pitch, so continue to make pitch and elevator trim changes as required to continue climbing at 70 KIAS.*

## Cruise

As you approach 4,000ft, left-click on the altitude hold clickspot, which is located on the autopilot panel. Alternatively, you can use the default key assignment **[Ctrl]+[Z]**.

This toggles altitude hold mode. The autopilot will capture and hold the current altitude (rounded to the nearest hundred feet). A tooltip indicates whether altitude hold mode is engaged.

The real-world Century 21 autopilot doesn't feature altitude hold mode but it has been included for convenience.

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, so the quantity of 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 via the EFB.

You can now relax for a while as the autopilot takes care of controlling the aircraft. At a range of approximately 20 miles from the Daventry VOR (as indicated by the KN 62A DME), Sywell Aerodrome should be visible over the nose of the aircraft.

This is the ideal opportunity to take a quick look at some of the features of the aircraft.

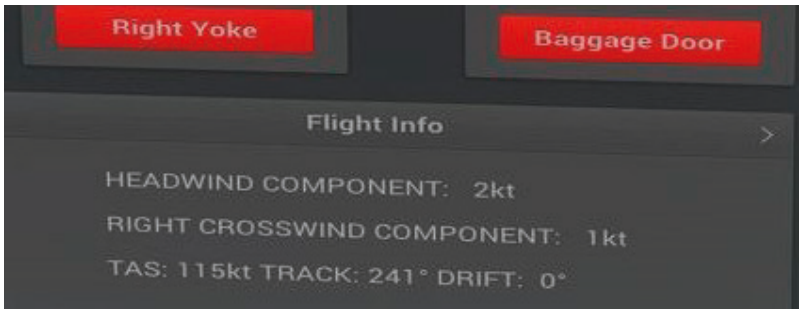
The Warrior has some very useful IFR-capable avionics. We'll take a quick look at some of the features of those avionics. Make sure you keep an eye on the distance remaining to the Daventry VOR, as we will need to return to navigating the aircraft once we are five miles from the VOR.

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).

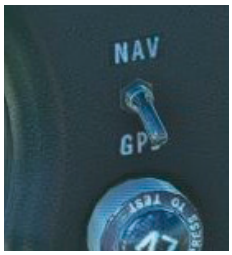
Rotate the frequency selector knobs to tune in **114.35**, the frequency for the Compton VOR/DME which is commonly used by airliners transiting the London airspace. The DME distance (nautical miles) to the VOR will be shown on the left of the display. Move the function switch to the **GS/T** (groundspeed/time) position to show the DME distance (nautical miles), groundspeed (knots) and time-to-station (minutes) to the London 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 – KX 170, or NAV 2 – KX 175).


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

Another useful feature for navigation is the Flight Info section of the EFB. This shows a variety of real-time information related to everything from speed to fuel burn/flow and range/endurance.




With five miles to run to the Daventry VOR, we are going to practise some GPS navigation. Move the NAV/GPS switch to the **GPS** position. As navigation mode is already engaged on the autopilot, it will switch from tracking towards the VOR to following the flight plan that is active in the GPS. After passing overhead the VOR, it will turn onto a direct course towards Gloucestershire Airport.



Unfortunately Gloucestershire Airport no longer has a dedicated DME but we can continue to use the Daventry VOR/DME to monitor the distance to our destination. According to our navigation log, the airport is approximately 43 nautical miles from the Daventry VOR.

You can also use the RTE page of the GPS 100 to check the remaining distance, or the GNS 430 / GNS 530 if enabled.


The airport does have an NDB. Tune it into the KR 85 (**331.0**) and make sure that the mode knob is set to **ADF**. Once the NDB is within range, the ADF indicator can then be used as another method for checking that we are on the correct heading.


The ADF indicator's compass card is not controlled by a directional gyro and it won't therefore rotate automatically as the aircraft changes heading. Instead, rotate the compass card with 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.

With approximately twenty minutes to run until we reach the destination, take the opportunity to explore the cockpit using the PANEL GUIDE for reference.

## Descent

We need to begin our descent when we are approximately ten miles from the airport (33 miles from the Daventry VOR based on the KN62 reading).

Reduce the throttle to obtain **2,000 RPM** and once the airspeed has reduced to 100 knots, start the descent by disengaging altitude hold mode and then pitching down to obtain a **-500ft/min** descent rate.

As the aircraft stabilises in its descent, adjust the throttle to maintain **100 knots**.

We are going to fly a visual approach for runway 27 but an ILS approach is available and we can tune that for additional situational awareness. Tune the ILS frequency (**109.95**) into the KX 170B (NAV 1) unit and select the ILS course (**265 degrees**) on the HSI.


Once within range, the KN62 will now display the distance to the ILS DME, giving us the remaining distance to the airport. Note that the HSI will not currently indicate glideslope or localiser deviation because the NAV/GPS switch is still set to GPS for the autopilot.

## Approach and landing

As Gloucestershire Airport comes into view, engage heading mode on the autopilot and set the NAV/GPS switch to **NAV**.

Position the aircraft to join on a long final for runway 27, using the heading bug to turn the aircraft left, towards the extended centreline. You can use the HSI glideslope and localiser deviation indicators for guidance.

As you approach **2,000ft**, disengage the autopilot by left-clicking on the lower half of the autopilot engage rocker switch and continue descending towards the runway, using the PAPI lights for guidance.

Switch **ON** the landing light and fuel pump.


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

Once established on final for runway 27, begin to reduce your airspeed to **70 knots** and extend the flaps to the **25°** position.

Keep an eye out for the famous doughnut-shaped GCHQ building!

Passing through 1,000ft, extend the flaps to the **40°** (fully down) position. Reduce power to begin slowing to a touchdown speed of approximately **63 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 throttles 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 anti-collision 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.

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, rotate the magneto selector 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 Warrior tutorial flight!

# NORMAL PROCEDURES

## Airspeed (IAS) for safe operations

| | |
|---|---|
| Best rate of climb | **79 KIAS** |
| Best angle of climb | **63 KIAS** |
| Operating speed in turbulent air | **111 KIAS** |
| Maximum flap speed | **103 KIAS** |
| Final approach speed (flaps 40) | **63 KIAS** |
| Maximum demonstrated crosswind | **17 KIAS** |

## Pre-flight

### Cockpit

| | |
|---|---|
| Parking brake | **SET** |
| Avionics | **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** |
| Avionics | **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** |
| 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:**

| | |
|---|---|
| Magneto selector | **BOTH** |
| Throttle | **ADJUST** |
| Oil pressure | **CHECK** |
| Throttle | **800-1,200 RPM** |

## Hot engine

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

**When the engine starts:**

| | |
|---|---|
| Magneto selector | **BOTH** |
| Throttle | **ADJUST** |
| Oil pressure | **CHECK** |
| Throttle | **800-1,200 RPM** |

# Taxiing

| | |
|---|---|
| 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 | **4.8-5.1 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** |
| Flight instruments | **CHECK** |
| Fuel selector | **AS REQUIRED** |
| Fuel pump | **ON** |
| Engine gauges | **CHECK** |
| Carburettor heat | **OFF** |
| Mixture | **SET** |
| Primer | **LOCKED** |
| Flaps | **SET** |
| Trim | **SET** |
| Controls | **FREE** |
| Doors | **LATCHED** |

## Take-off

| | |
|---|---|
| Lined up on runway | **CHECK COMPASS** |

### Normal technique

| | |
|---|---|
| Flaps | **SET** |
| Trim | **SET** |
| Accelerate to 40-55 KIAS. | |
| Yoke | **Back pressure to rotate smoothly to climb attitude** |

### Short field / obstacle clearance technique

| | |
|---|---|
| Flaps | **25° (second notch)** |
| Accelerate to 52 KIAS. | |
| Yoke | **Back pressure to rotate smoothly to climb attitude** |
| Maintain 52 KIAS until obstacle is cleared then accelerate to 79 KIAS. | |
| Flaps | **Retract slowly** |

## Climb

| | |
|---|---|
| Best rate (flaps up) | **79 KIAS** |
| Best angle (flaps up) | **63 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 | **2,000 RPM** |
| Airspeed | **100 KIAS** |
| Mixture | **FULL RICH** |
| Carburettor heat | **ON if required** |

## Power off

| | |
|---|---|
| Carburettor heat | **ON if required** |
| Throttle | **CLOSED** |
| Airspeed | **AS REQUIRED** |
| Mixture | **AS 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 (103 KIAS max.)** |
| Trim to 70 KIAS. | |
| Final approach speed (flaps 40°) | **63 KIAS** |

# Shutdown

| | |
|---|---|
| Flaps | **RETRACT** |
| Fuel pump | **OFF** |

| | |
|---|---|
| Avionics | **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 Warrior are conventional. An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling speed of the Warrior with power off and full flaps is 44 KIAS. With the flaps up, this speed is increased. Loss of altitude during stalls varies from 100 to 275 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 (2,325 lb, flaps full) | **44 KIAS** |
| Manoeuvring speed (2,325 lb) | **111 KIAS** |
| Manoeuvring speed (1,531 lb) | **88 KIAS** |
| Never exceed speed | **160 KIAS** |
| Power off glide speed (2,325 lb, flaps 0) | **73 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-off

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 | **63 KIAS minimum** |

Prepare for power off landing.

**If altitude permits:**

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

If no fuel pressure is indicated, check the 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 73 KIAS.

# Power off landing

Trim for 73 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 63 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 annunciator light | **ON** |
| Pressure indicator | **IN LOW SECTOR** |
| Throttle | **REDUCE AS FAR AS POSSIBLE** |
| Oil temperature | **CHECKED** |
| If oil temperature in red 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.

**ALT annunciator light illuminated:**

| | |
|---|---|
| Ammeter | **Check to verify inoperative alternator** |

**If ammeter shows zero:**

| | |
|---|---|
| ALTR switch | **OFF** |

**Reduce electrical loads to minimum:**

| | |
|---|---|
| ALNTR. 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 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

| | |
|---|---|
| Project management | Martyn Northall |
| Aircraft modelling and design | Mark Griffiths |
| Aircraft systems and cockpit programming | Martyn Northall |
| Aircraft liveries | David Sweetman |
| Flight dynamics | Paul Frimston |
| Sounds | SimAcoustics |
| Manual | Martyn Northall, Mark Allison |
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| Design | Fink Creative |

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