COMMONWEALTH AIRCRAFT CORPORATION CAC-25 WINJEEL

Introduction

Thank you for purchasing this virtual replication of the CAC-25 Winjeel.

The Winjeel is a two-three seat, low wing, fixed undercarriage tail dragger. Construction is all metal with fabric covered control surfaces. Power is provided by a 450hp Pratt & Whitney Wasp Junior seven cylinder radial engine driving a two bladed Hamilton Standard variable pitch propeller.

The Winjeel was the Royal Australian Air Force's primary piston trainer from 1955 to 1975. The Winjeel replaced the Tiger Moth and Wackett aircraft and was itself replaced by the NZAI CT-4 Airtrainer.

During the Vietnam war America's use of Forward Air Control (FAC) aircraft had proved to be a great asset so in 1969 four Winjeel's were modified for use in this role by the addition of a smoke grenade dispenser and upgraded communications equipment. FAC Winjeel's were not used in combat but were used in training. Finally in 1994 the FAC Winjeel's were replaced by Pilatus PC-9 turboprops which brought an end to the Winjeel's nearly 40 years of service.

A total of 62 Winjeels were produced from 1954 to 1958 and delivered to the RAAF. 2 prototype aircraft (CAC-22) were produced in 1951. Extensive testing and modifications of the prototypes were required.

Original plans called for the prototypes to be fitted with Pratt & Whitney Wasps and CAC's own engine design in the production aircraft. This engine was a seven cylinder radial called the R-795 Cicada. In 1951 the Cicada program was scrapped and Winjeels were all fitted with Pratt & Whitney Wasp Junior engines (the same engine used in De Havilland Beavers).

Interestingly, for a trainer, there were three seats in the Winjeels. Both the RAF and RAAF had specified three seats for their post WWII trainers. The theory being it would be possible to train two pilots at once, one being instructed whilst the other watched. This theory did not last long.

According to the Australian civil aircraft register there are 30 Winjeels currently registered.

This software version is based on VH-OPJ (serial no A85-429) which is operated by Classic Aero Adventure Flights in Ballina NSW (http://www.classicaero.com.au). This particular aircraft has been modified to fit an additional seat to make it a four seater aircraft.

There are two basic variants supplied. The original trainer aircraft and the FAC version. Each variant comes in two versions, a modern version and a vintage version. The modern versions contain modern avionics and some gauge upgrades while the vintage versions uses original

avionics and instrumentation.

System Requirements

Requires Microsoft Flight Simulator 2020.

This software is not compatible with earlier flight simulators such as FSX or Prepar3D.

Support

If you are having problems with the operation of the aircraft please email me at support@antsairplanes.com. Problems with downloading the package should be directed to the retailer as they are responsible for delivery of the download and will be best able to assist you.

What's in this manual

This manual provides information on the operation of the Winjeel.

Firstly it describes the installation and selection of the Winjeel.

A Things To Know Before Flying section describes some of the functions and systems that are unique to the Winjeel and it is strongly recommended that you read this before flying.

A labeled picture of the Cockpit shows the various controls.

The operation of the Tablet for setting various in-game preferences is described next.

Systems and Flying Notes provides detailed descriptions of the aircraft systems and is largely copied and modified from the actual Pilot's Handbook.

Finally, Normal and Emergency checklists are provided. These are also in-game using the checklists option.

Installation (non Marketplace version)

This aircraft is designed for Microsoft's Flight Simulator 2020 (including the Steam edition). Installation is handled by an installer program which places the files into the correct location. Simply click on the installer to start the process. The installer will ask you to enter your registration code which you should have received via email after purchase.

Features

- There are two basic models, Normal and Forward Air Control (FAC). Each model comes in vintage and modern versions.

- A pop-up tablet is available which allows the user to set preferences and operate a simple autopilot (not a standard feature on the real aircraft).

- A pop-up GPS is available to aid in navigation

- Persistent fuel and oil settings. When set the fuel and oil levels from the last flight will automatically be loaded into the next flight.

- Three custom pilots are available, vintage male RAAF pilot and modern male and female pilots. Default MSFS pilot and copilot can be selected with the Tablet.

- The mixture control has four settings only, Idle/Cutoff, Auto Lean, Auto Rich and Full Rich. When set to Auto Lean or Auto Rich the mixture is automatically adjusted to provide the best air fuel mixture ratio. Use Auto Rich when power settings are above 70% normal rated power and use Auto Lean for cruise power for best fuel economy and lower CHT.

- Engine starter realism

  EASY - Simple engine operation which doesn't require engine priming. Use this setting for simple, no worries flying.

  MED - Requires engine priming but the engine cannot be flooded

  HARD - Requires engine priming and correct engine operation to avoid flooding

- Engine oil consumption realism. The Winjeel simulates oil consumption and can simulate engine failure if the oil level gets too low (can be set on or off in the Tablet)

- Sparkplug carbon fouling realism. The Winjeel can simulate sparkplug fouling created with too low an engine RPM (can be set on or off in the Tablet)

Selecting the Winjeel and the various models available

Once the aircraft has been installed start MSFS and select the World Map to select a free flight. Click on the aircraft in the top left to display the Aircraft Selection screen.

The Winjeel will appear alphabetically under Commonwealth Aircraft Corporation - CAC25 Winjeel.

Select the LIVERIES tab to choose one of the various models or liveries.

There are four different models available.

Vintage - period correct aircraft.

Modern - the right panel has been replaced with modern intercom, comms and transponder. The vintage radio unit is non-functional. A modern exterior beacon light is installed.

FAC Vintage - period correct aircraft. The right panel has been replaced by vintage communications units (which do not function in MSFS as they do not use the same frequencies as modern aircraft). The rear aerial has been replaced with an aerial fin. A smoke grenade dispenser is attached to the belly of the aircraft and a control panel attached above the glareshield (non-functional in MSFS due to game ratings)

FAC Modern - as for FAC vintage but the right panel has modern intercom, comms and transponder. A modern exterior beacon light is installed.

Things you need to know before flying

Once the aircraft has been installed start MSFS and select the World Map to select a free flight. Click on the aircraft in the top left to display the Aircraft Selection screen.

Tablet and GPS

A computer tablet and the default Aera GPS unit are stowed in the map case in the lower left of cockpit. Clicking on either of these will move them into position within the cockpit. The Tablet can be used to set various user prefences, has a checklist to assist engine starting, and access to a rudimentary autopilot and radio/transponder. The Tablet and GPS can be moved to various positions in front of the glareshield.

See the Tablet and GPS section later in the manual for more information.

Mixture lever

The mixture lever in the Winjeel has 4 preset positions, Idle cutoff, Auto lean, Auto rich and Full rich. Adjusting the mixture lever will normally switch between one of these four positions.

However, some users may have a controller which does not send the usual commands to control the mixture (for example, using FSUIPC to remap the mixture control). If users are having difficulty controlling the mixture lever they should open the Tablet and on the Cockpit Preferences page set the Mixture lever to "continuous". The mixture lever will then function as a typical mixture lever found in most other aircraft (engine oil and sparkplug realism are set to easy when the continuous mixture lever option is selected).

Realism settings

Engine realism settings can be set in the Tablet on the Cockpit Preferences page. By default they are all set to easy.

Engine start: Cycles between easy, medium and hard engine start modes (see the next section for the differences in the engine start realism settings)

Engine oil: Toggles between easy and hard oil simulation. Oil will always be consumed by the engine. In easy mode there is no effect for low oil levels. In hard mode the engine can fail with low oil levels.

Sparkplug fouling: Toggles between easy and hard mode. In easy mode sparkplug fouling does not occur. In hard mode extended periods of engine idling can lead to carbon buildup on the sparkplugs which can stop the engine.

Tail wheel

The Winjeel tail wheel can be set to a free swivelling or a steerable system (+/- 8 deg using the rudder pedals). The mode of operation is set by moving the control column either fully forward (free swivelling) or fully back (steerable). Pushing the stick forward to set free swivelling only works when the aircraft is on the ground.

Use of the MSFS tail wheel lock key command will also set the tail wheel mode between free swivelling (unlocked) and steerable (locked).

By default the aircraft is set to load with the tail wheel steering locked in the steerable setting.

Taxi with the steering engaged. For short radius turns disengage the steering by moving the stick

fully forward and use differential braking to turn the aircraft. Ensure the steering is locked before take-off.

Gyro Instruments power

The artificial horizon and gyro compass operate on a separate AC circuit which is switched on with the gyro insts. switch on the centre panel.

Imperial vs US Gallons

The Winjeel uses Imperial gallons in the Pilot's Handbook and on such as things as the fuel level gauge. One Imperial gallon is equal to 1.2 US gallons. For example, as the Winjeel fuel tanks hold 69 Imperial gallons this is 82.87 US gallons.

Engine start procedure

The Winjeel allows the user to set the realism of the engine start procedure. Note: The starter switch is located on the centre console below the throttle quadrant and above the flaps lever. It is a guarded switch. Clicking on the guard will lift the guard and you then need to click below the guard to activate the starter switch. Closing the guard will turn off the starter.

The Tablet Engine Start page shows the status of the various systems during the engine start.

Auto-start

Using the auto-start key command or clicking on "Click to quick start" on the Engine Start page of the Tablet will auto start the engine regardless of the engine start realism. As long as there is fuel and battery power the engine should start.

Easy mode

In easy mode you do not need to worry about priming the engine. Here is a simplified procedure for starting the engine in Easy mode:

Master battery	ON
Parking brake	ON
Fuel cock	ON
Ignition switches	ON
Mixture	AUTO RICH
Starter	Engage

Medium mode

In Medium mode the engine needs to be primed correctly. You cannot flood the engine in easy mode and you do not need to move the mixture control from Idle Cutoff to Full Rich when the starter is operating. Here is a simplified procedure for starting the engine in Medium mode:

Master battery	ON
Parking brake	ON
Fuel cock	ON
Boost pump	ON, press 2-4 psi
Primer	Cold engine - 6-8 strokes
	Hot engine - 1-4 strokes

NOTE: The engine is considered warm if oil temp is above 25C and CHT is above 60C.

Ignition switches	ON
Mixture	AUTO RICH
Starter	Engage
Throttle	Set 800 rpm

Hard mode

In Hard mode the engine needs to be primed correctly and there is a risk of engine flooding if you run the boost pump for more than 1 minute. Moving the mixture lever from Idle Cutoff to Auto Rich too soon may delay the engine start.

Master battery	ON
Parking brake	ON
Fuel cock	ON
Mixture	IDLE CUTOFF
Boost pump	ON, press 2-4 psi

Operating the boost pump charges the carburetor. If the boost pump is run for a prolonged period (more than 1 minute) it will flood the carburetor and the MIS-START procedure should be followed.

Primer	Cold engine - 6-8 strokes
	Hot engine - 1-4 strokes

The primer distributes fuel from the carburetor to the top 5 cylinders of the engine.

NOTE: The engine is considered warm if oil temp is above 25C and CHT is above 60C.

Check clear to start with ground crew

Ignition switches	ON
Starter	Engage
Mixture	AUTO RICH

The starter should initially run for a couple of seconds with the Mixture lever in the IDLE CUTOFF position before moving it to the AUTO RICH position. If the mixture lever is moved too soon it will delay engine priming and the starter may cut-out before the engine can start.

Oil pressure	Rising within 10 secs
Starter	Release at 500 rpm
Throttle	Set 800 rpm

NOTES:

1. If engine backfires throttle back until backfiring stops.

2. If engine does not for within 10 secs carry out mis-start.

3. If engine is correctly primed it should start within 5 secs.

CAUTION: The starter should only be used for 10 secs, followed by a 20 second break

MSFS NOTE: Starter will automatically release when the engine starts.

MIS-START Procedure

If the engine is flooded do the following before attempting to restart:

Mixture	IDLE CUT OFF
Boost pump	OFF
Ignition	OFF
Throttle	Full open
Starter	Engage - turn 4-5 revs
Throttle	Reset 1" open

Spinning

To enter a power off spin it is necessary to apply full rudder, full outspin aileron and full back stick at or just prior to the stall. The aircraft will roll in the direction of the spin and after completing one roll it will enter a spin. Hold controls fully applied thoughout the roll and until at least one rotation of the spin to enter a stable spin. Maintain rudder and elevator input but centre the aileron input to maintain the spin once established.

Outspin aileron is aileron input opposite to the direction of spin. For example, if you are trying to spin to the left you would apply left rudder input and right aileron input. Applying right aileron increases the angle of attack of the left wing which causes that wing to stall before the right wing leading to a left turning spin.

Cockpit

1 G-meter - reset button on the lower left

2 Airspeed indicator (knots)

3 Altimeter - clicking in the centre of the knob will set the altimeter to the current pressure.

4 Attitude indicator - powered by the gyro insts switch

5 Gyrosyn compass

6 Vertical speed indicator (1,000's feet per minute)

7 Turn slip indicator

8 Manifold pressure

9 Oil temperature

10 Cylinder head temperature

11 Carburetor air temperature (pressing the button to the left will show the outside air temperature)

12 Engine RPM (100's rpm)

13 Oil pressure

14 Fuel pressure

15 Fuel quantity (Imperial gallons)

16 Landing light (off, low and high settings)

17 Taxi lights

18 left UV light intensity (see notes on lights)

19 Engine primer
20 Cockpit light intensity (see notes on lights)
21 Fire indicator and test switch
22 Red cockpit light intensity (see notes on lights)
23 Beacon light
24 Navigation lights
25 Radio (see notes on radios)
26 Ground/Flight switch (master battery switch)
27 Magneto switches
28 Generator warning light
29 Switches (from left to right)
- Emergency light
- Generator
- Gyro Instruments
- Pitot hear
- Windscreen wiper
- Fuel aux. (inoperative)
- Fuel boost pump
30 Ammeter
31 Control lock
32 Throttle quadrant
33 Carburetor air lever
34 Engine starter (guarded switch)
35 Wing flaps (switches are on the left and centre)
36 Elevator trim (wheels are on the left and centre)
37 Rudder trim (knobs are on the left and centre)
38 Right UV light intensity (see notes on lights)
39 Right panel (there are different panels for FAC, vintage and modern models. See next page)
40 Smoke grenade dispenser panel (FAC models only)
41 Whiskey compass
42 Tablet storage
43 GPS storage
44 Canopy lock lever
45 Canopy handle (off screen)
46 Window slider
47 UV lights position clickspot (see notes on lights)

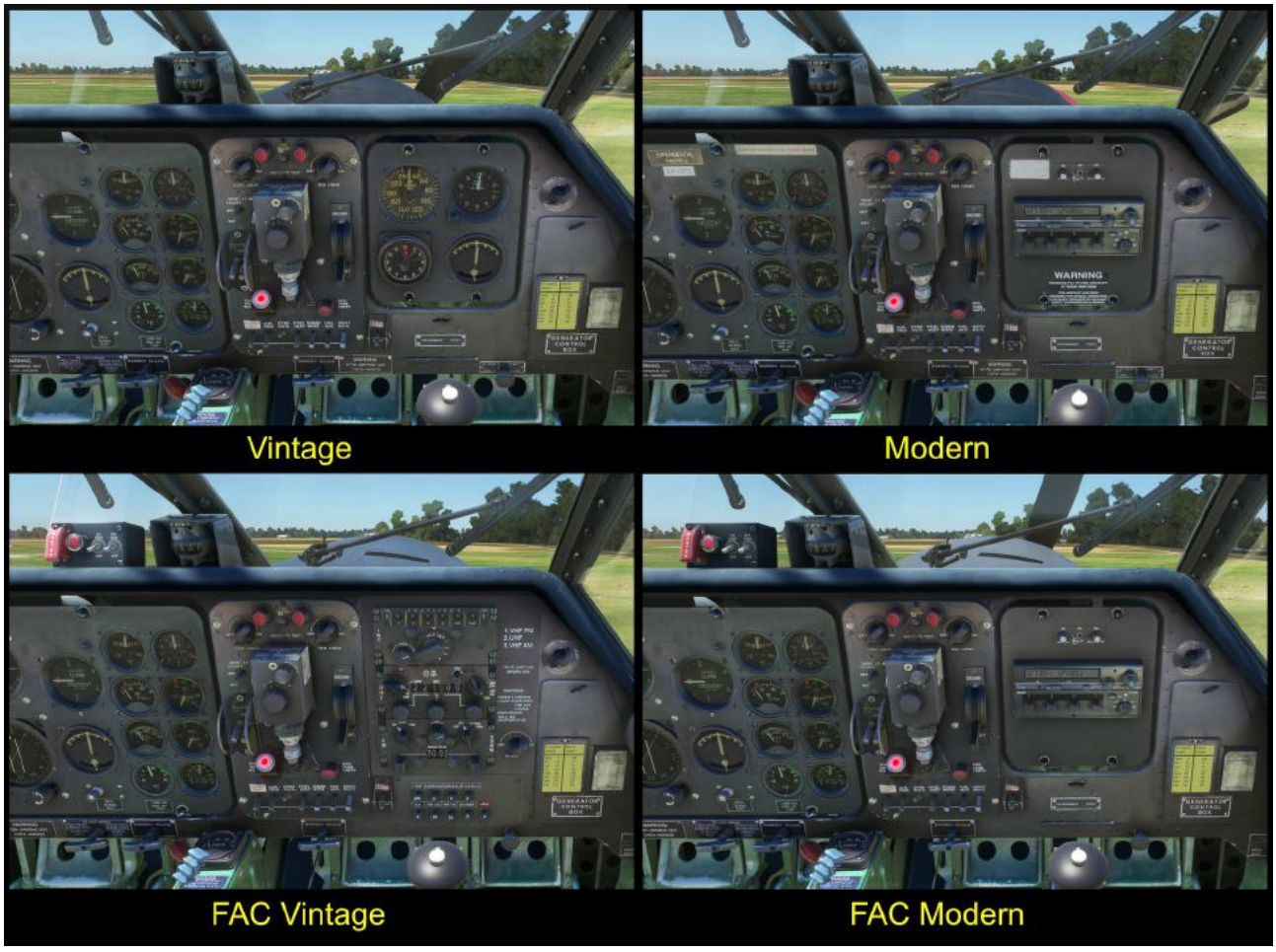
48 Parking brake

49 Ident switch (see notes on lights)

50 Canopy latch (see notes on canopy)

51 Windscreen demister (no effect in MSFS)

Right panels



Key commands

The following is a list of the key commands assigned to the cockpit controls of the Winjeel.

Ground/Flight switch - Master battery

Show/Hide Tablet - Decrease Nav4 volume

Show/Hide GPS - Increase Nav4 volume

Canopy - Spoilers toggle will fully open/close the canopy

Landing Lights - landing light. landing light tilt up and down will switch between OFF - LOW - HIGH

Carburettor Air Heat Control - Cowl flaps commands adjust lever position. Carb heat/engine anti-ice toggles between RAM AIR and the HOT AIR positions.

Boost main - fuel pump

NOTE: Some hardware switch controllers write directly into MSFS variables instead of using key commands. As the Winjeel uses the new MSFS fuel system the Fuel Pump switch on these hardware controllers may not work with the Winjeel.

Pitot heat - pitot heat

Gen field - generator on/off

Artificial Horizon fast erection button - attitude cage

Heading Indicator - VOR OBS setting

The aircraft lights are assigned as follows. Note that MSFS doesn't have key commands for many of the internal lights.

UV lights - Panel lights

Cockpit light - Cabin lights

Red light - Pedestral lights

Emerg. Light - Glareshield lights

Taxi Lights - Taxi lights

Landing Lights - Landing light. landing light tilt up and down will switch between OFF - LOW - HIGH

Identification Lights - Strobe lights

Navigation Lights - Nav lights

Pilot and Passenger visibility

By default a custom designed pilot is used in the Winjeel.

Using the Tablet the pilot model can be changed as well as the visibility of the pilot.

The available pilot models are:

Male - Custom male model

Female - Custom female model

RAAF - Custom RAAF model

MSFS default - Uses one of the MSFS characters instead of the custom model

The visibility options are:

Smart - The pilot will usually be shown in the exterior view but will be hidden if the aircraft is on the ground with the wheel chocks or parking brake engaged and the engine and battery are both off.

Show - The pilot will always be shown in the exterior view

Hide - The pilot will not be visible at all

Note: The pilot will never be shown in the interior view.

A passenger model is available for the right front seat. The passenger uses one of the MSFS characters and is not a custom model. By default this passenger is not visible (but their weight is entered into the weights and balances).

Using the Tablet the passenger can be set to three levels of visibility.

Hide - The passenger will always be hidden

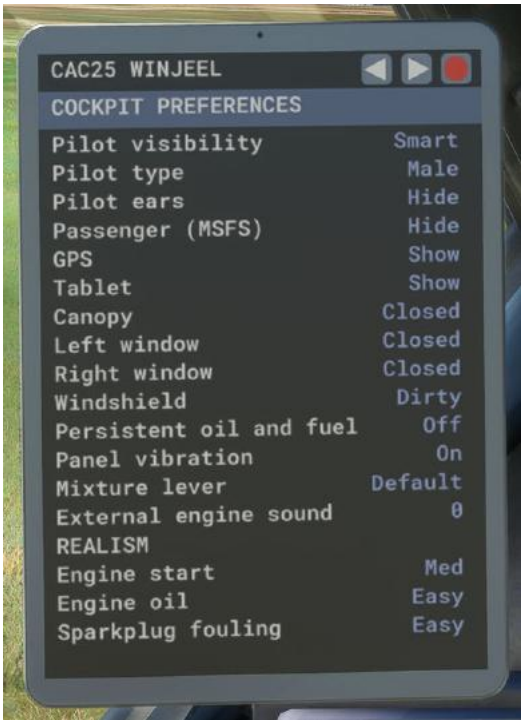
Show - The passenger will always be shown in both the interior and exterior views. However, if the the pilot visibility is set to Smart and the pilot is not visible in the exterior view then the passenger will be hidden in both the interior and exterior views.

TABLET and GPS

A computer tablet and the default Aera GPS unit are stowed in the map case in the lower left of cockpit. Clicking on either of these will move them into position within the cockpit. The Tablet can be used to set various user prefences, has a checklist to assist engine starting, and access to a rudimentary autopilot and radio/transponder. The Tablet and GPS can be moved to various positions in front of the glareshield.

The Tablet can be swapped between the stowed and glareshield positions by using the Decrease Nav4 volume key command. The GPS can be stowed/shown with the Increase Nav4 volume key command.

COCKPIT PREFERENCES



Pilot visibility: Shows/hides the pilot model in the external views. In internal views the pilot is always hidden.

Pilot type: Provides 4 options for the pilot model

- Male: Displays a male pilot model

- Female: Displays a female pilot model

- RAAF: Displays a vintage military pilot wearing a helmet

- MSFS default: Displays one of the default MSFS pilot models. The user can select the pilot model in the MSFS menu system

Of the four pilot models the first 3 have animated arm movements to control the throttle and control stick. The MSFS default model does not have arm animations because that is the way it is.

Passenger (MSFS): Shows/hides one of the MSFS default pilot models in the passenger. By default the passenger is hidden. Note that the passenger weight is set to 200 pounds by default.

GPS: Will switch the GPS unit between the map case (hide) and the glareshield (show).

Tablet: Will switch the Tablet unit between the map case (hide) and the glareshield (show).

Canopy: Will toggle the canopy between fully open and closed.

Left window: Will toggle the left window between fully open and closed.

Right windows: Will toggle the right window between fully open and closed.

Windshield: Will toggle the aircraft windows between dirty with high reflections and a clean window with less reflections.

Persistent oil and fuel: When set to On the oil and fuel levels will be saved at the end of each flight and reloaded on the next flight.

Mixture lever: Toggles between default and continuous. The mixture lever in the Winjeel has 4 different preset positions, Idle cutoff, Auto lean, Auto rich and Full rich. Adjusting the mixture lever will normally switch between one of these four positions. However, some users may have a controller which does not send the usual commands to control the mixture (for example, using FSUIPC to remap the mixture control). If users are having difficulty controlling the mixture lever they should set this option to "continuous". The mixture lever will then function as a typical mixture lever found in most other aircraft (engine oil and sparkplug realism are set to easy when the

continuous mixture lever option is selected).

External engine sound: Blends in some of the external engine sound into the internal engine sound. Opening the windows or canopy will also blend in some of the external engine sound.

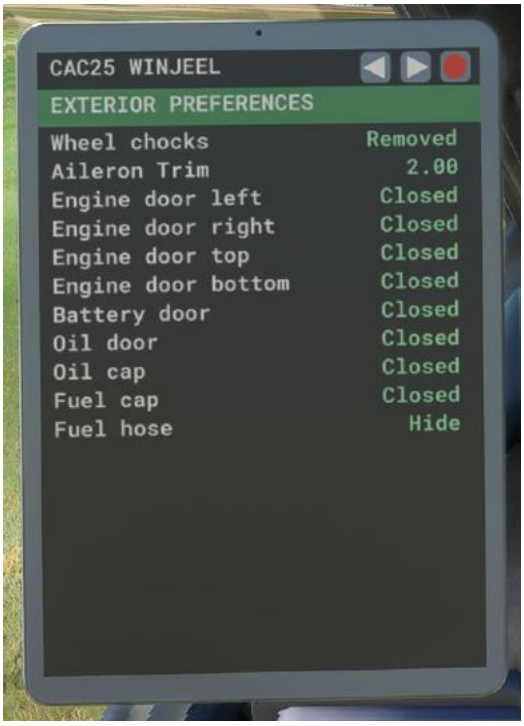
REALISM

Engine start: Cycles between easy, medium and hard engine start modes

Engine oil: Toggles between easy and hard oil simulation. Oil will always be consumed by the engine. In easy mode there is no effect for low oil levels. In hard mode the engine can fail with low oil levels.

Sparkplug fouling: Toggles between easy and hard mode. In easy mode sparkplug fouling does not occur. In hard mode extended periods of engine idling can lead to carbon buildup on the sparkplugs which can stop the engine.

EXTERIOR PREFERENCES



Sets some of the exterior animations. None of these settings (except for Aileron Trim) are stored and will be reset at the start of the next flight (unless you save the flight in which case they will be reloaded as part of the flight)

Wheel chocks: Places wheel chocks under the main wheels. The wheel chocks will lock the aircraft in place and the parking brake can be released.

Aileron Trim: Provides a small amount of aileron trim to counteract prop forces. By default this 2 degrees to the right. The aileron in the real aircraft can be adjusted only on the ground but in MSFS it can adjusted at any time.

Engine doors: Opens/Closes the engine doors. These can only be opened when the aircraft is on the ground. Due to the way the doors latch onto each other the top and bottom doors can only be opened after the left and right doors have been opened. For the same reason the left and right doors can only be closed when the top and bottom doors have been closed.

Battery door: Will open/close the battery door which is located underneath the aircraft. The opening animation will insert a crank arm is into the left side of the fuselage, near the fuel cap, and it will rotate lowering the battery compartment. The Battery door can only be opened/closed when the left engine door is closed as it interferes with the crank arm.

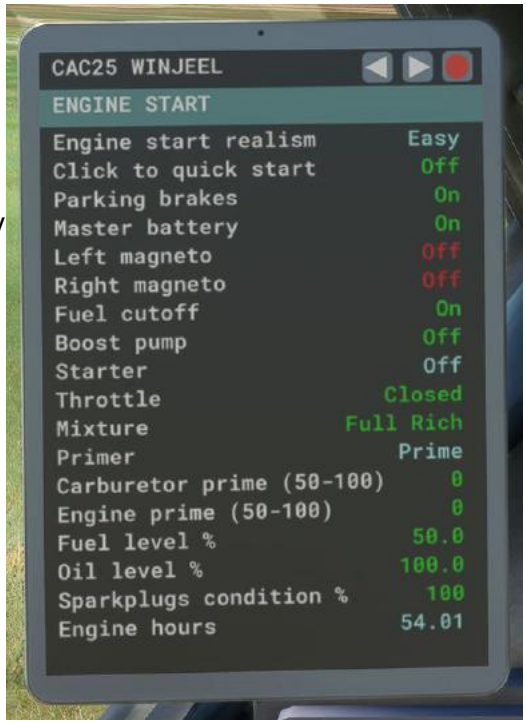
Oil door: Will open/close the oil access panel which is located on the left side of the top engine door.

Oil cap: Will open/close the oil cap

Fuel cap: Will open/close the fuel cap which is located on the left side of the fuselage

Fuel hose: Will show/hide a fuel hose on the left side of the aircraft. The fuel hose will automatically be shown if the MSFS fuel truck is called.

ENGINE START



This screen provides an overall view of the engine start parameters. Any parameter in red indicates it is not set correctly. Green indicates it is set.

Engine start realism: Will cycle between easy, medium and hard start options.

Click to quick start: Clicking on this option will automatically set the parameters correctly and start the engine.

Parking brakes: Toggles the parking brake

Master battery: Toggle the Ground/Flight switch which is effectively the master battery switch

Left magneto: Toggles the left magneto

Right magneto: Toggles the right magneto

Fuel cutoff: Toggles the fuel cutoff lever

Boost pump: Toggles the fuel boost pump

Starter: Toggles the engine starter. The starter switch will automatically switch off when the engine starts or after 10 seconds if the engine fails to start.

Throttle: Indicates the position of the throttle and if it is set correctly for engine start (1" open)

Mixture: Indicates the position of the mixture lever and if it is set correctly.

Primer: Operates the hand primer pump which draws fuel from the carburetor and distributes it to the top five cylinders of the engine. The carburetor needs to be filled by running the Boost pump before operating the primer.

Carburetor prime: Shows the level of carburetor priming. Operating the boost pump primes the carburetor but it should not be run for prolonged periods of time without running the engine as it can lead to flooding.

Engine prime: Shows the engine prime level. Operating the primer pump will prime the engine.

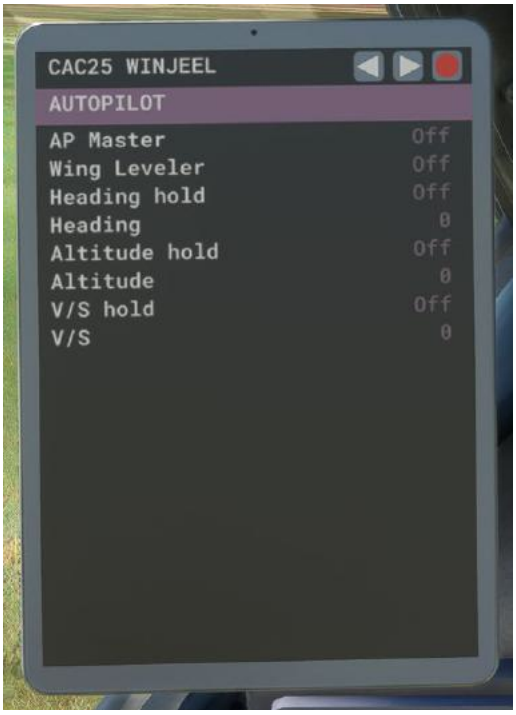
Fuel level: Shows the current fuel level.

Oil level: Shows the current oil level.

Sparkplugs condition: Shows the condition of the sparkplugs. Prolonged running of the engine at idle leads to carbon buildup on the sparkplugs which can lead to the engine stopping. Clicking here will clean the sparkplugs.

Engine hours: Shows how many hours the engine has run for in it's life.

AUTOPILOT



A simple autopilot is available on this page. An autopilot in a Winjeel is very unrealistic but some users may like to do long flights unattended so one is available here.

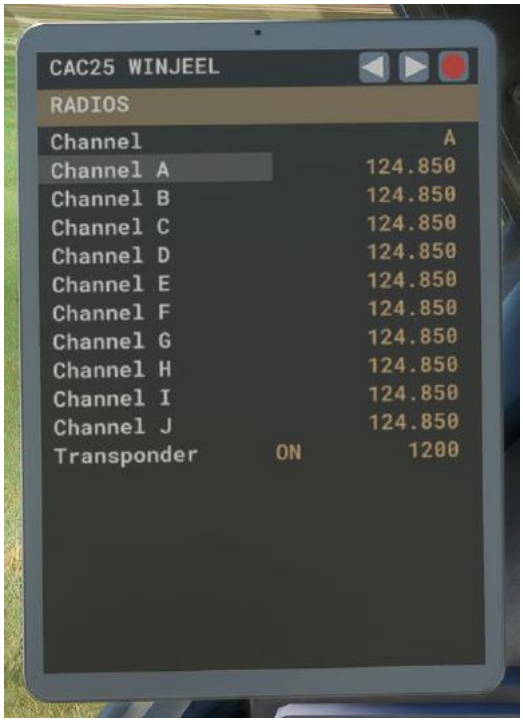
Clicking on Heading hold or Altitude hold to turn on the autopilot and hold either the current Heading or Altitude respectively.

Click on the far left and right (over the arrows) of the Heading setting to change the heading by 10 degrees. Clicking closer to the centre will change the heading by 1 degree.

Click on the far left and right (over the arrows) of the Altitude setting to change the altitude by 1000 feet. Clicking closer to the centre will change the altitude by 100 feet.

The vertical speed will only change by 100 feet.

RADIOS



Provides access to the radio memory channels and transponder (not available in the real aircraft).

Each frequency has 4 mouse zones. To decrease the whole number part of the frequency click on the left side of the whole number. To increase click on the right side.

To decrease the decimal part of the frequency click on the left side of the decimal number. To increase click on the right side.

The decimal part changes by 0.005 each time you click.

To change the transponder frequency click on each individual frequency. The digit will increase from 0 through to 7. There is no option to decrease the digits (the mouse zones would be too small to use effectively). You may only cycle up through the digits.

SYSTEMS AND FLYING NOTES

1 General Description

The Winjeel is a 3 seat low wing basic training aircraft powered by a Pratt and Whitney Wasp Jr radial engine. The aircraft has fixed undercarriage with a steerable tail wheel. The aircraft was developed for the Royal Australian Air Force as a replacement for the Tiger Moth and Wirraway trainers. 62 production aircraft were made with the first delivered in 1955. 1976 saw the end of the Winjeel as a trainer as it was replaced by the CT-4 Airtrainer. Winjeels were still in service up to 1994 in the role of Forward Air Control aircraft.

GENERAL	
Span	38'7.5"
Length	28'0.5"
Height (tail on ground)	9'1"
Height (fuselage level)	11'11"
Aspect Ratio	6.03
Max weight	4,600lb
ENGINE	
Manufacturer	Pratt and Whitney
Type	9 cylinder radial
Designation	R985 - AN1
Gear Ratio	Direct
Fuel	AVGAS 80/87
Oil	OMD-370
PROPELLER	
Manufacturer	Hamilton Standard
Type	Two blade,variable pitch
Diameter	8'3"
Fine (low) pitch	12 deg
Coarse (high) pitch	25 deg
ENGINE ACCESSORIES	
Carburettor	Bendix Stromberg NA-R9C-2
Fuel Pump	Pesco 2P-R400-BRD 4
Magnetos	Scintilla SB-9RN
Generator	Bendix 30E01-1
Starter	Eclipse E160
Constant Speed Unit	Hamilton 1E2-G5
TANK CAPACITIES	
Fuel cells (2), total	69 imp. gals
Oil Tank	9.75 imp. gals

Normal contents	5.5 imp. gals
Travel Flights, up to	7 imp. gals

2 Flight controls

The aircraft features interconnected dual control joysticks.

CONTROL LOCK

The controls can be locked internally by a lever on the port side of the centre pedestal. It is necessary to close the throttle and centralise the controls before engaging the control lock.

TRIM TAB CONTROLS

Trim controls are provided for the rudder and elevator tabs on the port side of each seat. The right elevator trim tab is controlled by the trim tab controls while the left elevator trim tab is a servo tab and automatically adjusts depending on the elevator position.

The aileron has fixed trim tab that can be set on the ground. In MSFS this is set through the Tablet - Exterior Preferences page,=.

FLAP CONTROL

The Winjeel has 3 electrically operated flaps, one on each wing and one under the fuselage. The flap positions are:

UP	0 deg down
TAKE-OFF	12 deg down
LAND	36 deg down
FULL	50 deg down

3 Engine controls

Dual interconnect engine controls are located to the left of each pilot.

THROTTLE CONTROL

Moves in a quadrant marked OPEN-CLOSED. The port throttle lever is gated at the standard sea level take-off setting of 33 in Hg MAP. Only the port throttle can be advanced through the gate.

MIXTURE CONTROL

The carburettor provides automatic compensation of fuel/air ratio with variation of altitude. The four

positions of the mixture control are:

IDLE CUT OFF - Fuel cut off at carburettor.

AUTO LEAN - Automatic fuel/air ratio for economical cruising.

AUTO RICH - Automatic fuel/air ratio for higher powers.

FULL RICH - Overrides the automatic barometric control. Used during takeoff and landing.

PROPELLER CONTROL

Control propeller and engine rpm. The constant speed propeller has a nominal governed speed range from 1,480 rpm to 2,300 rpm.

MAGNETOS

Individual switches are provided for the left and right engine magnetos on the centre panel.

CARBURETTOR AIR HEAT CONTROL

Selects one of 3 sources of carburettor air:

RAM AIR is selected by pushing the control forward. Air is taken from the top half of the airscoop in the lower cowl and directly into the carburettor.

HOT-WARM AIR is selected by pulling the control back into one of the ten indented positions to control the temperature of the air. Air is taken from the bottom half of the airscoop, run through a muff around the exhaust and mixed with ram air before entering the carburettor.

FILTERED AIR is taken from the vent in the top cowl. The control is moved from the RAM AIR position down and then backwards into the FILTERED AIR position. Use filtered air in dusty conditions to avoid engine wear.

Carburettor air temperature should be maintained between 30-45 deg C in icing conditions.

The Carburettor air control can be controlled by the MSFS cowl flaps key command or axis for slider control. The Carb Heat/Engine Anti-Ice MSFS key command will toggle between RAM AIR and HOT AIR.

4 Tail wheel

The tail wheel can be set to either a free swivelling or a steerable system (+/- 8 deg using the rudder pedals). The mode of operation is set by moving the control column either fully forward (free swivelling) or fully back (steerable). Normal elevator movement in flight will not operate the mechanism except perhaps during aerobatics.

MSFS note: pushing the stick forward to set free swivelling only works when the aircraft is on the ground.

Use of the MSFS tail wheel lock key command will also set the tail wheel mode between free swivelling (unlocked) and steerable (locked).

By default the aircraft is set to load with the tail wheel steering locked in the steerable setting.

Taxi with the steering engaged. For short radius turns disengage the steering by moving the stick fully forward and use differential braking to turn the aircraft. Do not use differential braking with the steering engaged due to the excessive loads on the tailwheel.

5 Fuel

FUEL TANK

The main fuel tank comprises two interconnects fuels cells fitted in the centre section below the pilot's seats. The capacity is 69 Imperial Gallons. The fuel filler cap is located on the left side of the fuselage before the wing leading edge.

FUEL COCK

The fuel cock control lever is at the base of the centre pedestal and has two positions - ON and OFF.

FUEL PUMPS

A Main Fuel Boost Pump will supply fuel if the engine driven pump fails. A pressure regulator controls the pressure to 3 psi. Engine Driven Pump will supply fuel to the engine between 4 and 6 psi.

MSFS note: The fuel pump will respond to standard MSFS key commands however, switch panels (such as the Logitech switch panel) may not work. These panels write directly into MSFS variables but as the Winjeel uses the new MSFS fuel system these panels do not write into the MSFS new fuel system variables.

PRIMER

A hand primer is located on the left of the cockpit and withdraws fuel from the carburettor and distributes it to the top five engine cylinders.

AUX TANK EMPTY and AUX FUEL switch

Although a warning light and switch are fitted to the centre panel there is no auxilary fuel tank installed in Winjeel aircraft so these items are not functional.

To change the fuel level use MSFS Fuel and weights option.

Note: If you have set persistent fuel and oil levels then you should make any fuel changes after you have loaded the flight as the persistent fuel and oil option will override any settings shortly after the flight has loaded.

6 Oil system

The oil tank is located in the top rear of the engine bay. Access to the oil filler cap is via a hinged flap in the top engine petal. The oil tank has a capacity of 9.75 gallons. For normal operation the oil level should be maintained at a maximum of six gallons (7.2 US gallons, this is the maximum that can be set in MSFS). If more than six gallons are in the tank during aerobatics then excess spillage may occur through the crankcase vent on the starboard side of the fuselage.

To change the oil level use MSFS Fuel and weights option.

Note: If you have set persistent fuel and oil levels then you should make any fuel changes after you have loaded the flight as the persistent fuel and oil option will override any settings shortly after the flight has loaded.

7 Electrical system

DC electrical power is supplied by a generator (1.5KW and 30V) to a 24 volt system incorporating a 24 volt 36 amp/hour accumulator. AC power for the artificial horizon and gyro compass is supplied by a three phase inverter at 115 volts

AMMETER

Mounted on the centre pedestal indicates the charging rate of the generator and a warning light illuminates when the generator is inoperative.

GENERATOR

Cuts in at 26.5 volts and is regulated at 28.5 volts. The generator will only be online when the engine rpm is above 1,100. The generator may be turned off in an emergency by turning OFF the generator field switch on the centre panel. This switch should be left ON during flight.

GROUND/FLIGHT SWITCH

Isolates the aircraft battery from the general service circuits and generator when placed in the GROUND position. In the FLIGHT position the aircraft battery is the sole source of power until the generator cuts in. In MSFS this switch is effectively the master battery switch.

BATTERY

The battery is stored in a bay underneath the cockpit.

To open the battery door either:

1. Open the Tablet and on the Exterior Preferences page select Battery door.

2. Use the Checklists window, Pre-Flight 1 and click on the camera icon to the right of Battery door security. Click on the battery door to raise and lower the battery.

The battery door cannot be opened or closed while the left engine door is open (the crank hits the door).

8 Brakes

The brake system supplies differential braking action using toe operated pedals. A parking brake is operated by a spring loaded control handle marked PARK BRAKE below the left instrument panel.

MSFS NOTE: Installing the wheel chocks will lock the aircraft in position and the parking brake can be released.

9 Canopy

CANOPY LOCKING LEVER

Located on the left side of the cockpit below the canopy rail and has 3 positions - FREE - LATCHED - LOCKED. In the FREE position the canopy can be freely moved using the handles on the front of the canopy. In the LATCHED position the canopy can be freely moved but if it is moved to the forward position it will be LATCHED until the lever is moved to the FREE position.

To lock the canopy pull the canopy fully forward and move the lever into the LOCKED position. The canopy will open half way. A latch on the inner right side of canopy needs to be raised to allow the canopy to slide fully open for entry to the rear seat.

Using the MSFS spoilers key command will open and close the canopy. Unfortunately there still isn't a key command for doors in MSFS.

WINDOWS

The sliding windows can be moved as required.

WINDOW LOCK

Setting the lock will hold the sliding windows in their current position.

CANOPY JETTISON

The canopy can be jettisoned by pulling the the lever in the rear section of the centre console. The canopy side panels can each be jettisoned by operation of the release handle under each panel.

Note: Canopy and side panel jettisoning is not modeled.

10 internal lighting

UV LIGHTS

Operates ultra violet lights which light the luminescent paint on the panel instruments. The lights controls need to be turned fully clockwise to start.

In MSFS if the light is off clicking on the knob will automatically move the knob to the start position. Dragging the knob to the left can then lower the intensity.

The UV lights may be stowed by clicking on the base of each UV light. The MSFS panel light switch controls the UV lights.

COCKPIT LIGHT

Operates a red flood lamp mounted on the rollover truss. The intensity of the cockpit light is not variable. The MSFS cabin light switch command controls the cockpit light.

RED LIGHT

Operates small red lights above the left engine control box and each trim panel. The intensity of the red lights are not variable. The MSFS Pedestal lights switch command controls the red lights.

EMERGENCY LIGHTS

Two emergency lights are provided for instrument lighting in the event of a general electrical failure. These are mounted on the side windscreen frames and are powered by a separate battery. The switch is located on the centre panel and is spotted with luminous paint. The MSFS Glareshield light switch controls the emergency lights.

11 external lighting

TAXI LIGHTS

Controls the taxi lights in the leading edge of each wing.

IDENTIFICATION LIGHTS (vintage/FAC models)

Operates an identificaction light on the underside of the aircraft. In the up position the light will be only constantly. In the down position the light will only come on when the keying switch is pushed in. The keying switch is located on the centre console beside the trim controls.

STROBE LIGHTS (modern model)

Operates a flashing strobe light on the underside of the aircraft. The strobe lights will turn on when the switch is in the up (strobe) position and will turn off in the middle (off) or down(key) positions.

The MSFS strobe light switch controls the identification and strobe lights.

NAVIGATION LIGHTS

Operates wing and tail navigation lights. The MSFS nav light switch controls these lights.

LANDING LIGHT

Type J 24V retractable landing light in the bottom of the left wing. The lamp has three positions, OFF, LOW and HIGH:

OFF retracts the lamp into the wing.

LOW extends the lamp 79 degrees and is for recon and misty landings.

HIGH extends the lamp 88 degrees and is used for landing in clear conditions.

It will take a few seconds for the light to move from the OFF position to the LOW position. Only

when the light is in the LOW position will it illuminate the ground.

Using the MSFS key command toggles between OFF and the last used extended position.

Note that the left UV light in stowed position will partially obscure the landing light switch.

12 Windscreen

WINDSCREEN WIPERS

A control switch for the windscreen wipers is located on the centre electrical panel. Select Rain effects in the Preferences section to see rain drops on the windscreen during rainy or snowy weather.

WINDSCREEN DEMISTER

The demister switch is located below the right panel. Pull the switch out to turn off window demisting.

This switch has no effect in MSFS.

13 Instrument panels

There are a number of panels in the cockpit of the Winjeel

LEFT PANEL

Contains the main flight and engine instruments.

CENTRE PANEL

Contains radio control unit (vintage/FAC models) and switches for electrical systems and lighting.

RIGHT PANEL

In the modern model contains radios.

In the vintage model contains airspeed, altimeter and clock.

In the FAC model contains Intercom, UHF and FM radio control units.

QUADRANT

Contains the pilot's throttle, propeller and mixture controls

LEFT CONSOLE

To the left of the pilot and contains rudder and elevator trim controls.

CENTRE CONSOLE

Runs between the front seats and includes the copilot's quadrant, flaps, trim controls.

ARMAMENT PANEL

Located on the instrument coaming provides control for the grenade launchers in the FAC model.

14 Instruments

AIRSPEED INDICATOR

Displays current airspeed. Max airspeed should not exceed 220 knots. The Vintage model does not have speed markings.

ALTIMETER CALIBRATION KNOB

Adjusts the Kohlsman setting. The Vintage model uses an older style altimeter. The Kohlsman display can be switched between mb and inHg in the Preferences section.

RATE OF CLIMB

A Smiths rate-of-climb indicator shows the current rate of climb/descent in feet per minute.

TURN AND SLIP INDICATOR (modern)

A 24 volt DC turn and slip indicator. Emergency power is available from a standby battery.

TURN AND SLIP INDICATOR (vintage)

A Pullin Mk2A indicator which uses a bob in place of the conventional ball in tube for the slip indicator. An OFF flag appears when there is no power or a failure. The turn indicators are calibrated for rate 1, 2 and 3 turns.

RIGHT SIDE PANEL (Vintage model only)

Contains duplicate airspeed, altimeter and turn and slip indicator and a Smiths Mk2 clock.

GYRO INSTRUMENTS

The artificial horizon and gyro compass operate on a separate AC circuit which is switched on with the gyro insts. switch on the centre panel.

ARTIFICIAL HORIZON

Uses 120V AC power and requires the GYRO INSTS. switch in the centre panel to be turned ON to supply power. If the horizon bar swings in a random manner there is a fault in the unit and it should be switched OFF immediately. It will take 3 minutes from turning on for the instrument to be ready.

FAST ERECTION BUTTON

Operation of the fast erection button increases the erection rate. If the bank pointer is more than 10 deg from the vertical at the time of starting the gyro will not erect unless the fast erection button is pressed.

Fast erection will erect the gyro in a few seconds however, reliable indications will not be given until the 3 minute readiness time is complete.

To avoid damage:

- Wait at least 15 seconds after switching on using the fast erection button.

- Release the button as soon as the horizon has erected.

- During flight do not press the button in non level flight otherwise the instrument will give false indications.

The MSFS key command attitude cage button can be used to control the fast erection button.

Note: Fast erection should not be mistaken for a cage button.

GYROSYN COMPASS

The compass is a magnetically corrected gyro instrument permitting magnetic slaved or free gyro headings. The instrument comprises an adjustable compass card, heading pointer, fixed lubber and pointer grid lines, two control knobs, one switch (top left) and annunciator flag (top right).

The gyro rotor is started when the GYRO INSTS. switch is ON. It takes one to two minutes for the rotor to obtain normal speed.

GYRO MODE SWITCH

Selects magnetic slaving or free gyro operation. In magnetic slave mode the compass will automatically correct any gyro drift errors. A cross and dot will appear in the annunciator flag when slaved.

In free gyro mode D.G. will appear in the annunciator flag. The pilot will need to correct any gyro drift error at regular intervals by comparing the gyro heading against the standby compass heading.

SET COURSE (HEADING INDICATOR) KNOB

Turns the pointer around the compass card. If the compass card also rotates then it indicates that the gyro compass has not started. If the gyro compass is on then this indicates a problem with the gyro.

SYNC KNOB

Can be used for initial alignment and re-synchronization during unaccelerated flight. Turning the knob rotates the compass card and pointer. The annunciator will indicate which direction to turn the knob. The compass is synchronized when the annunciator is between the cross and dot.

As the maximum rate of magnetic slaving synchronisation is low (less than 10 deg per minute) the pilot should manually sync the heading by referring to the standby compass on the top of the glareshield before flight.

15 Engine instruments

AIR TEMPERATURE

Indicates carburettor air temperature. Pressing the button to the left of the gauge will show the outside air temperature.

CYLINDER HEAD TEMPERATURE

Shows the cylinder temperature of the hottest cylinder (no 1).

Green: 150 - 230

Red: above 230

FUEL PRESSURE

Indicates fuel pressure to the carburettor.

Green: 4 - 6 PSI

MANIFOLD PRESSURE

Shows the engine manifold pressure.

Green: 26.5 - 33.5 InHg

Red: above 33.5 InHg

OIL TEMPERATURE

Shows oil temperature in the oil inlet line.

Green: 60 - 70

Red: below 40 or above 85

OIL PRESSURE

Shows oil pressure.

Green: 60 - 80 PSI

Red: below 50 PSI

TACHOMETER

Shows engine speed.

Red: above 2650 rpm

FUEL CONTENTS

Displays fuel level in gallons (max 69 gallons).

Experience has shown that the gauge behaves in the following manner:

In flight the gauge will show full until approx. 15 gallons have been used when the gauge will suddenly drop to the correct reading. It will continue to read accurately until about 10 to 15 gallons remain where it will remain until the tank is empty. The gauge will then suddenly drop to empty.

With the tail on the ground the gauge over reads the contents by 5 gallons. At FULL it over reads by 8 gallons.

16 Misc Instruments

ACCELEROMETER

Located on the port side of the main instrument panel. It increases flying safety by giving pilot trainees a visual indication of the G loading on the aircraft as well as being an instructional aid.

There are three pointers. The first shows the highest G loading achieved, the second shows the lowest G loading achieved and the third shows the current G loading. Pushing the knob will reset the high and low G pointers.

E2A STANDBY COMPASS

A standby wiskey compass is mounted centrally on the windscreen coaming.

PITOT HEAT SWITCH

Heats the pitot tube located under the left wing to prevent blockage from ice buildup. The switch is located on the centre panel.

CLOCK (Vintage)

A Smiths MkII clock is on the right panel of the vintage model. The clock will show the local time when the aircraft is first loaded. Rotating the outer bezel will adjust the time that the clock displays. Clicking on the 12 hour mark at the top of the clock will reset the clock to the local time.

The red hands are used to set a target time such as a departure or arrival time. To set the red hands rotate the centre knob.

AUTOPILOT

A fictional autopilot is available as a 2D popup (shift+4). It contains a display, 3 knobs and 6 buttons.

The knobs, from left to rate adjust the following:

Heading.

Altitude.

Climb/descent rate.

The buttons control the following:

AP - Turns on/off autopilot control

HDG - Turns on/off heading tracking

NAV - Turns on/off GPS tracking

ALT - Turns on/off altitude control

W/L - Turns on/off wing leveller

PWR - Turns on/off the autopilot unit

GPS

The default 295 GPS is available as a 2D popup (shift+2).

17 Comms

RADIO CONTROL UNIT (vintage/FAC models)

A T/R 1936 VHF radio set is fitted behind the rear seat. The control box with 12 preset comms channels is located on the centre panel. Press to transmit buttons are incorporated in the throttles.

The preset channels may be set using the Preferences section.

Using FSX key commands for the COM2 radio frequency will select preset radio channels if you have “Use radio frequency key commands” set to YES on page 2 of the Preferences section. As these key commands may cause interference with other radio controls they are turned off by default.

INT (FAC model)

A C1611D/AIC inter communication system is the top unit of the three control panels on the right panel.

UHF (FAC model)

A AN/ARC-51BX ultra high frequency transmitter/receiver operates on frequencies 220.00 to 399.95 MHz.

FM (FAC model)

A AN/ARC-54 VHF/FM radio set operates on frequencies from 30.00 to 69.95 MHz.

The FAC radios operate outside the normal frequencies used in FSX so they are only useful for show. Only the VHF/AM unit (T/R 1936) operates on FSX frequencies.

A rheostat control provides internal illumination for the FAC radios. The VHF/AM control has it's own DIM control.

INTERCOM (modern model)

A control panel for communication between the occupants is located on the right panel. This panel has no effect on operation of the Winjeel in FSX.

ICOM IC-A200 COMMS (modern)

A modern comms radio with programmable channels. USE frequency is displayed on the left side and the STBY frequency on the right. Memory channel is indicated on the far right.

The following key commands will work with the comms radio if you have “Use radio frequency key commands” set to YES on page 2 of the Preferences section. As these key commands may cause interference with other radio controls they are turned off by default.

ICOM Radio - COM frequency change commands adjust the large and small knobs.

ICOM Channel button - COM radio (select)

ICOM Swap button - Standby frequency (swap)

Due to the nature of FSX key commands you must quickly double press (less than half a second) the key commands to simulate the push and hold of the channel and swap buttons.

VOLUME CONTROL

Turns the power ON and adjust the audio level (not modeled).

LARGE TUNING KNOB

Changes the STBY or USE frequency in 1MHz.

SMALL TUNING KNOB

Changes the STBY or USE frequency in 25kHz steps.

CHANNEL SWITCH

Recalls a memory channel in the STBY window

SWAP SWITCH

Swaps the USE frequency for the SYBY frequency and vice versa

FREQUENCY SELECTION

Use the large and small tuning knobs to select the desired STBY frequency.

USE FREQUENCY SELECTION

The USE frequency can be selected directly by pushing and holding the SWAP button until the STBY frequency is hidden.

Push the SWAP button to restore the STBY frequency.

HOW TO PROGRAM A CHANNEL

- Push and hold CH button until PG appears and memory channel flashes.

- Select memory channel (1 to 9) using tuning knob

- Push SWAP (do not hold) and STBY frequency will blink

- Select desired frequency using tuning knob

- Push CH (do not hold) to store frequency.

MEMORY RECALL IN STBY FREQUENCY

- Push CH (do not hold)

- Rotate tuning knob to select memory channel. After 5 seconds the memory channel content is transferred into the STBY window.

MEMORY RECALL IN USE FREQUENCY

- Push CH (do not hold)

- Rotate tuning knob to select memory channel.

- Push SWAP and memory channel is copied to USE frequency while previous USE frequency is transferred to the STBY frequency.

Memory frequencies can also be edited using the Preferences section.

GARMIN GTX320 TRANSPONDER (modern)

Allows selection of a transponder code for use in controlled airspace.

CODE SELECTION KNOBS

4 knobs used for setting the transponder code.

IDENT BUTTON

Pressing the IDENT button activates the Special Position Identification Pulse for approx. 20 seconds identifying your transponder from other aircraft on the controller's scope.

MODE KNOB

Five position rotary switch that selects either:

OFF-Turns off all power (to avoid damage the GTX320 should be off before starting the aircraft engine).

SBY-Turns the unit on but will not reply to ground interrogations.

ON-Places the unit in Mode A identification mode.

ALT-Will respond to ATC altitude interrogations.

TST-Test the reply indicator. Position is spring loaded and when released it will return to the ALT position.

Select ON or ALT as late as practical prior to takeoff and switch to OFF or SBY as soon as practical after completing landing roll.

REPLY LIGHT

The reply light will blink each time the transponder replies to ground interrogation (in FSX it will blink at random intervals). The reply light remains lit during the IDENT time interval.

18 engine doors

The engine doors (or petals) can be opened to show the engine. There are 4 hinged petals which provide excellent access. On the top petal there is an access door to the oil tank.

The side petals are latched to the top and bottom petals which are, in turn, latched to the engine. Both side petals must therefore be opened first before the top and bottom petals can be opened. Likewise, the top and bottom petals must be closed before the side petals can be closed. The simulation will automatically prevent incorrect opening or closing.

The engine should not be run while any of the petals are open. If the battery crank door is open the left petal will temporarily close.

There are a number of ways to open and close the petals and oil tank access door.

a. The FSX exit/door commands (note the spoiler key command is used to open and close the canopy).

b. Page 1 of the Preferences section.

c. By mouse clicking directly on the doors when in one of the external camera views accessed in the Normal Procedures - Pre Flight section (not available in P3D).

19 Fire

The fire warning system consists of nine Graviner resetting flame detector switches mounted on the engine firewall and around the dishpan. Two warning lights are located on the centre panel along with a test switch. With battery power on, both lights should illuminate when the test switch is in the up position. Rotate the lights to adjust their brightness.

A sudden rise in engine compartment temperature or an abnormally high temperature will cause the warning lights to illuminate. Should the temperature decrease the lights will go out.

Two hand fire extinguishers are fitted as part of the aircraft loose equipment. One extinguisher is mounted inside the cockpit on the aft section of the centre console. The second is installed in a compartment in the rear section of the left wing fuselage fillet and is accessible only from the

outside.

An axe mounted on the turnover truss is provided to get clear of the cockpit should normal emergency exit be impossible. A second axe for entry to the cockpit is stowed in the fuselage radio bay above the trailing edge of the right wing.

20 Smoke grenade system

The Smoke Grenade Installation fitted to Forward Air Command aircraft (FAC) is used to release grenades that create a smoke cloud suitable for spotting and identifying a target. The smoke cloud can also be utilized to identify landing zones and to provide smoke screens in rescue operations.

The Type 525 dispenser is bolted to a mounting adaptor which in turn is bolted to the undersurface of the aircraft. The dispenser is connected electrically to the aircraft by a connector which passes into the fuselage via a cutout in the auxiliary fuel tank piping access panel.

The dispenser has two launchers, each holding six M8 or M18 grenades (only white M8 grenades are simulated in FSX). The launchers are designated left or right as viewed from the rear of the aircraft.

Each grenade is retained in the launcher by a latch. When a launcher is fired 28 volt DC power actuates a solenoid. This permits the spring loaded control rod to move forward and trips each latch. The grenade is then ejected.

An Armament Panel located above the left panel controls the launcher. This panel has 4 controls. The Master switch provides power. Click on the guard to raise it and then click on the switch below. A red, press-to-test warning light will illuminate when power is supplied. Shutting the guard will turn off the power. LH Arm and RH Arm switches will arm the left and right launchers individually. Grenades are launched by depressing either of the Release Buttons on the control columns. In FSX launching will also occur by activating the brakes or using a key assigned to Fuel Dump Toggle. In Prepar3D the Weapon System (fire down) key will launch a grenade.

A joystick button can be set to launch the grenades. Open the Flight Manual and select Preferences - Control Calibration. Click on CLICK HERE TO START and then press the joystick button you wish to use as the fire button. The number of the joystick and the number of the button should then appear. Using this method only joysticks 0 and 1 and buttons 0 to 29 are recognised. If your button is outside this range use the arrows to select from joystick 0 to 9 and button 0 to 99. If the fire button becomes stuck for any reason click on FIRE BUTTON to clear it.

21 Engine start and taxi

ENGINE START

The engine starting procedure is listed in the NORMAL PROCEDURES under the PRE-START and START checklists. The PRE-START checklist is self explanatory.

The ENGINE REALISM settings can affect how easy it is to start the engine. With the setting at EASY the only things you need to do are ensure the fuel cock is open and set the mixture lever to AUTO RICH. At all other realism settings the START checklist will need to be followed correctly as follows:

CARBURETTOR AIR CONTROL - Ensure this is in the RAM air position.

BOOST PUMP - Engage the boost pump until the fuel pressure is between 2 and 4 psi. This will pressurise the fuel lines. Do not leave the fuel pump on for more than 1 minute. Doing so will risk flooding the engine (HARD mode only). Follow the MIS-START checklist to clear any flooding.

PRIMER - Pull the primer. The checklist item will turn green when sufficient priming has been done (from 1-8 strokes depending on conditions).

IGNITION SWITCHES - Set both to ON.

STARTER - Click on the starter guard to show the starter switch and then click on the starter switch. Or use the MSFS engine start key command to engage the starter.

The starter will automatically turn off and the guard close after 10 seconds or when the engine starts.

MIXTURE - 3 seconds after engaging the starter you should start to hear the engine firing. Move the mixture lever to the AUTO RICH position and the engine should start shortly.

With ENGINE REALISM at HARD the mixture lever must be in IDLE CUTOFF when you engage the starter and only moved to AUTO RICH after engaging the starter.

TAXI

Apply sufficient power to start rolling (700rpm). Taxi with the tailwheel steering engaged. Either use FSX tailwheel lock key command or pull back fully on the control stick. For tight radius turns you can disengage the tailwheel steering (FSX tailwheel key or push the control stick fully forward) and use differential braking to turn the aircraft.

RUNUP

Apply the parking brakes. Ensure CHT is above 130 deg, oil temp above 30 deg and oil press above 40 psi.

Follow the runup checklist and ensure that the engine operation is within the required parameters. If any parameters are outside the normal range then it indicates a possible engine problem and you should use the Maintenance section to check the engine status.

22 Takeoff and climb

TAKEOFF

Align the aircraft with the runway and ensure the tailwheel steering is engaged (pull back fully on the control stick). Smoothly open the throttle to the indent position which should produce 33 inches MAP. Keep the aircraft straight with the tailwheel steering. At 40 kts move the control stick forward to raise the tail and take off at 55-60 kts.

Allow the aircraft to accelerate to 85 kts and reduce power to 30 inches MAP, 2000 RPM.

When at a safe height perform the after take-off checks. If FILTERED air has been used select RAM. If WARM air has been used adjust the carburettor air control to maintain the desired carburettor air temperature.

For a short take-off follow the normal take-off except:

a. Select TAKE-OFF flap

b. hold the aircraft on the brakes until power is increased to 36 inches MAP

c. fly the aircraft off at 50 kts and climb at 65 kts until clear of obstacles

d. at a safe height raise the flaps, increase speed to 85 kts and reduce power to 30 inches MAP, 2000 RPM.

CLIMB

The normal rate of climbing is between 600 and 800 fpm from sea level to 10,000 feet.

The recommended normal climbing speed is 85 kts with 30 inches MAP and 2000 RPM. The maximum rate is 75 kts with 33 inches MAP and 2200 RPM. Maintain MAP during the climb by

manual adjustment of the throttle.

23 Cruise and descent

CRUISE

Normal cruise power is 1800 RPM and 26 inches MAP.

High cruise power is 2000 RPM and 28 inches MAP.

The maximum still air range of 630NM is obtained at

10,000 feet, mixture AUTO LEAN and 1500 RPM. The maximum range speed may be considered to be 90 kts at all heights.

DESCENT

The following speeds and power settings are recommended:

Glide descent - 85 kts

Cruise descent - 115 kts, 12 to 15 inches MAP

Bad visibility - 100 kts, TAKE-OFF flap, 12 to 15 inches MAP, 2000 RPM.

24 Landing and Shutdown

LANDING

Powered approach flap down - Maintain 85 kts, lower flap as required. Reduce speed to not less than 70 kts crossing the runway threshold.

Powered approach flap up - Maintain 85 kts, reduce speed to not less than 70 kts crossing the threshold.

Glide approach flap down - Maintain 85 kts, lower flap as required. Reduce speed to not less than 75 kts crossing the runway threshold.

Short landing - Maintain 85 kts until the turn onto final then reduce to 75kts. Lower flap when required and reduce speed to not less than 55 kts crossing the threshold.

SHUT DOWN

Ensure the CHT is below 200 deg. Shutting down a warm engine results in excessive heat stored in the engine with no means of conducting it away. Move the mixture control to idle cut-off to stop the engine. When the engine stops rotating turn off the ignition switches.

25 Aerobatics and spinning

STALLING

The power off stalling speeds at different flap settings are:

UP	55 Kts
TAKE-OFF	53 Kts
LAND	51 Kts
FULL	49 Kts

There is little warning of the approach to the stall. At the stall there is a tendency for a wing to drop and with flaps down the wing drop can be more severe. To recover from the stall:

CONTROL COLUMN	FORWARD
THROTTLE	FULL POWER
RUDDER	OPPOSITE TO YAW
AILERONS	LEVEL WINGS
EASE OUT OF DIVE	

AEROBATICS

The recommended entry speeds for aerobatics are:

Loop	160 Kts
Half roll off top of loop	170 Kts
Slow roll	150 Kts
Barrel roll	150 Kts
Stall turn	140 Kts
Inverted gliding	100 Kts

The aircraft is capable of prolonged inverted flight with power on but is limited by oil pressure. Recovery should be effected before oil pressure drops to 10 psi.

Maximum rate of roll is 100 deg/sec at 120 kts.

SPINNING

To enter a power off spin it is necessary to apply full rudder, full outspin aileron and full back stick at or just prior to the stall. The aircraft will roll in the direction of the spin and after completing one roll it will enter a spin. Hold controls fully applied thoughout the roll and until at least one rotation of the spin to enter a stable spin. Maintain rudder and elevator input but centre the aileron input to maintain the spin once established.

Outspin aileron is aileron input opposite to the direction of spin. For example, if you are trying to spin to the left you would apply left rudder input and right aileron input. Applying right aileron increases the angle of attack of the left wing which causes that wing to stall before the right wing leading to a left turning spin.

Speed is about 72 Kts when spinning to the left and about 84 kts to the right with each rotation taking about 2-2.5 seconds with a steep nose down attitude.

Standard recovery procedure is:

THROTTLE	CLOSED
AILERONS	NEUTRAL
RUDDER	FULL OPPOSITE
CONTROL COLUMN	MOVE FORWARD UNTIL SPIN STOPS
ALL CONTROLS	NEUTRAL

Recovery is not immediate and the aircraft may spin for a few more turns before unstalling.

MSFS NOTE: After entering the spin the controls maintain full rudder and elevator inputs.

26 Icing

CARBURETTOR ICING

Carburettor icing conditions may occur if the carburettor air temperature is the 5 deg C to 27 deg C range. The desired carburettor air temperature range to prevent icing is 30-35 deg C.

The symptoms of carburettor icing may include decreasing MP. Should icing be experienced apply HOT AIR immediately. When flying in conditions which are likely to result in the formation of carburettor ice the carburettor heat control should be used in the following manner:

a. Prior to runup set the lever in the lowest notch of WARM AIR and at static MAP readjust to give a CAT of 38-45.

b. During pre-take off vital actions the heat control is to be left in the position found in step a.

c. For operation outside the circuit use carburettor heat control to maintain CAT 30-45 deg C.

d. Before commencing practice forced landings place the control in the take-off position and leave it there for the descent and overshoot. Adjust the control as required after the overshoot.

e. Never exceed 45 deg C carburettor air temperature.

MSFS key commands can be used to alter the carburettor air control. Cowl flap key commands will move the air control lever. The Carb. Heat/Engine Anti-Ice key command will switch between RAM AIR and HOT AIR settings.

AIRFRAME ICING

In airframe icing conditions you may be able to see ice forming on the windscreen and leading edges of the wings, tail and horizontal stabilisers.

Ice may form on the air intake screen and at the elbow of the air intake duct which can lead to an engine stoppage.

Symptoms of air intake icing are:

a. High oil temperature without an increase in CHT.

b. Increasing carburettor air temperature with a constant control setting.

c. Reduction in MAP.

If airframe icing conditions are encountered immediate action should be taken to clear the icing region. Pitot heat should be applied to prevent blockage of the pitot tube.

If screen blockage occurs FILTERED AIR will provide an alternative air intake. If carburettor throat ice is suspected FULL HOT AIR should be selected.

27 Sparkplug fouling

If Sparkplug fouling realism is turned on then caution will need to exercised to avoid fouling the spark plugs with excessive carbon buildup. The causes of fouling are prolonged running at low rpm (such as ground idling) and the ingestion of dust.

Sparkplug fouling can cause a loss of power and eventual engine shut down.

If fouling is suspected a clean out should be carried out whenever possible.

a. Check Prop - Full INC and Mixture AUTO RICH.

b. Slowly increase power to static boost and hold for one minute.

Fouling caused by dust cannot be cleaned out so FILTERED AIR should be used as much as possible in dusty areas. For MSFS this means taxiing on any unsealed surface.

28 Operating limits

Aircraft operating limits are set out on the first page of the Reference section. This section will go into more detail about how best to maintain the aircraft within its operating limits. If engine realism is at any setting other than OFF then the performance of the engine will be affected by abnormal operation of the engine.

CYLINDER HEAD TEMPERATURE

Min 130 for run up, 140 for takeoff

Max 230 desired (260 max)

The cylinder heads are made from an aluminium alloy. The strength of this alloy is closely related to its temperature and if it exceeds the usual limits of 230-260 deg then the material will be seriously weakened. This can lead to warping of the valves and valves seats, failure of the valve stem and rocker arm lubrication and breakdown of the oil film between the piston and cylinder with the possibility of scoring and even seizure.

It is sound practice to hold the CHT 30 deg below the lower limiting temperature (ie 200 deg) to keep the cylinder head materials at high operating strength.

As the engine is air cooled the most effective method of cooling is by maintaining air flow over the engine. Increasing the airspeed while maintaining the same power will produce a lower CHT. For example, decreasing the rate of climb will increase the airspeed and thus lower the CHT.

For ground operation care should be taken as there is no air flow. Operating the engine at 1000 rpm will provide some prop cooling and engine runups should be done into the wind. During the take-off run the CHT can increase by 30 deg very quickly so ensure the CHT before the take-off is started is low enough.

The fuel-air ratio will also affect CHT. Above 70% normal rated power the mixture control should be at FULL RICH or AUTO RICH. At cruising speeds the mixture control should be AUTO LEAN. A reduction in power will cause a drop in CHT. Reducing the RPM will be reflected in a lower CHT.

OIL PRESSURE

Min oil pressure 55 psi for in flight, 10 psi for idling. Normal oil pressure 70 - 110 psi. Proper lubrication of the engine is vital for correct operation of the engine. Not only does the oil system lubricate the engine but it also provides cooling to those parts that cannot be cooled by air. The oil system also provides oil for the constant speed propeller mechanism. A failure in the oil seals of the prop can compromise the oil system of the engine.

The oil pressure gauge is perhaps the most important of the various aircraft gauges. A loss of oil pressure indicates a failure of the oil supply and this can lead to an engine failure within seconds. Be aware that low oil temps will tend to produce higher oil pressure levels as cold oil does not flow as well. A relief valve will limit oil pressure to a maximum of around 110 psi.

OIL TEMPERATURE

Min oil temp 30 for run up, 40 for take-off

Max oil temp 85

If the oil temperature is too low then the oil will not flow freely and will not provide sufficient lubrication. A low oil temp will limit the amount of power available from the engine. Take-off should not be done with an oil temp below 40 deg.

If the oil is too hot it cannot carry away enough heat and may cause leaks in the oil seals which will increase oil consumption.

As oil is heated by the friction of the engine parts the most effective method of reducing oil temperature is by reducing engine RPM.

Normal Checklists

The following procedures have been adapted from the real world procedures and modified for use in MSFS. THEY SHOULD NOT BE USED FOR REAL WORLD AVIATION.

Interactive checklists are available in the Animation Manager (shift+3).

NORMAL PROCEDURES

1:PRE-FLIGHT 1

2:PRE-FLIGHT 2

3:PRE-START

4:START

5:MIS-START

6:AFTER-START

7:TAXI

8:RUN UP

9:PRE TAKE-OFF

10:AFTER TAKE-OFF

11:PERIODIC

12:PRE-MANOEUVRE

13:LOW FLYING

14:REJOIN

15:DOWNWIND

16:AFTER LANDING

17:SHUTDOWN

EXTERIOR INSPECTION

PRE-FLIGHT 1

Pitot and static covers	Removed and Stowed
Wheel chocks	Removed
Ignition switches	OFF
Flying controls	Unlocked
Trims	Check, set zero
Equipment	Secure
Canopy	Clean and secure

Oil Tank	Cap and cover closed
External fire extinguisher	Secure and closed
Left flap	Condition
Left aileron	Condition and freedom
Wing surfaces and Tip	Condition
Left navigation light	Condition
Pitot head	Security and alignment
Landing light	Condition
Left taxi light	Condition
Left tyre	Inflation, creep, cuts
Left brake line	Condition, security
Left brake disc	Condition, scoring
Left oleo leg	Extension - 4" approx
Wing centre section	Condition
Fuel tank drain cover	Security
Battery door and handle	Secure and pinned
Battery crank	Secure
Fuel filler cap	Secure
Fuselage access panels	Secure
Left ext. cowl locks	Latched
Left engine vent	Condition
Int. cowl locks	Latched
Lower cowl	Free from foreign matter
Engine	Condition, leaks
Propeller	Damage, hub for leaks
Air Intake	Condition, grill clear

2:PRE FLIGHT 2

Right engine vent	Condition
Right ext. cowl locks	Latched
Fuselage access panels	Secure
Right oleo leg	Extension - 4" approx
Right disc brake	Condition, scoring
Right brake line	Condition
Right tyre	Inflation, creep, cuts
Right taxi light	Condition

Right navigation light	Condition
Wing surface and tip	Condition
Right aileron	Condition and freedom
Right flap	Condition
Radio access panel	Security
Fuselage access panel	Security
Right static vent	Clean, undamaged
Rudder control cable	Security
Rear fuselage access panels	Security
Right tailplane	Security, condition
Right elevator	Condition, freedom
Tailwheel tyre	Inflation, creep, cuts
Tailwheel oleo	Extension - 2" approx
Tail navigation light	Condition
Rudder	Condition, freedom
Fin	Condition
Left tailplane	Condition
Left elevator	Condition, freedom
Rear fuselage access panels	Security
Rudder control cable	Security
Left static vent	Clean, undamaged
Canopy jettison handle	Security

3:PRE-START

Adjust seat, pedals and harness	Connect radio lead
Brakes	Parked
Ground/Flight switch	Ext power - GROUND
	No ext power - FLIGHT
Throttle	Set 1" open
Propeller control	Set full INCREASE
Mixture control	Set IDLE CUT OFF
Carburettor air control	Set RAM AIR
Left UV light	As required
Landing and taxi lights	OFF
Accelerometer	within limits, RESET

Instruments:	
Airspeed	reading zero
Artificial	horizonoff flag visible
Vertical speed	+/- 200'/min
Altimeter	Set
Gyrosyn compass	condition
Turn/Bank	off flag visible
Cockpit lights	As required
Fire warning lights	Test
Ident lights	As required
Navigation lights	As required
Generator field switch	ON
Other switches	OFF
Right hand instruments	As for left panel
Right UV lights	As required
Fuel cock	ON
Canopy jettison lever	Secure

4:START

Boost pump	ON, press 2-4 psi

NOTES:

1. Prolonged running of the boost pump with the engine stationary may cause carburetor fuel pressure to rise to pump discharge pressure with possible resultant flooding.

2. While the Pilot's Handbook calls for the the Boost pump to be ON during the engine start some pilot's turn the Boost pump OFF after priming.

Primer	Cold engine - 6-8 strokes
	Hot engine - 1-4 strokes
Priming pump	locked (right click primer to lock)

NOTE: The engine is considered warm if oil temp is above 25C and CHT is above 60C.

Check clear to start with ground crew

Ignition switches	ON
Starter	Engage
Mixture	AUTO RICH
when engine fires	
Oil pressure	Rising within 10 secs
Starter	Release at 500 rpm
Throttle	Set 800 rpm

NOTES:

1. If engine backfires throttle back until backfiring stops.
2. If engine does not for within 10 secs carry out mis-start.
3. If engine is correctly primed it should start within 5 secs.

CAUTION: The starter should only be used for 10 secs, followed by a 20 second break

MSFS NOTE: Starter will automatically release when the engine starts.

5:MIS-START	
Mixture	IDLE CUT OFF
Boost pump	OFF
Ignition	OFF
Throttle	Full open
Starter	Engage - turn 4-5 revs
Throttle	Reset 1" open
RETURN TO START CHECKLIST	

6:AFTER START	
Ground/Flight	FLIGHT
Boost pump	OFF, pressure 4-6 psi
Gyro instruments	ON
	A/H flag off, erecting
	G4F card steady
Radio	ON
Ext power and chocks	Removed
Generator	On line (1100 RPM)
Flaps	Check each position Select up
Carburettor air control	FILTERED
	If CAT more 45C - RAM
Taxi lights	As required
Artificial Horizon	Erect
Gyrosyn compass	Synchronized. Compare with standby compass
Turn and bank	OFF flags away
Ignition switches	Check for dead cut
Radio	Taxi clearance
Altimeter	Set QNH

NOTE: Bring the generator on line whenever the aircraft is stationary.

7:TAXI	
Gyro instruments	Functional check
8:RUN UP	
Brakes	Parked
Mixture control	AUTO RICH
Carburettor air control	As required
Propeller control	Full INCREASE
Temps and pressures	CHT min 130C
	Oil temp min 30C
	Oil press min 40 psi
Check clear behind aircraft	
Throttle	1600 RPM
Propeller	Twice through range
	Min RPM drop 200
Throttle	Static MAP
RPM	1950-2100
Ignition switches	Check for RPM drop
	Max drop 100 RPM
	Max differential 40 RPM
Oil pressure	70-110 psi
Fuel pressure	4-6 psi
Ammeter	5-50 amps
Carburettor air temp	Adjust control to achieve required range.
Throttle	Closed. Idling 500-750rpm
9:PRE TAKEOFF	
Trims	Rudder 5 right
	Elevator zero
Friction nuts	As required
Mixture	AUTO RICH
Carburettor air temp	Below 45C (note setting)
Propeller	Full INCREASE
Fuel	Pressure 4-6 psi

	Contents
	Boost pump ON
	Cock ON
Flaps	As required
Switches	
Ignition	ON
Ground/Flight	FLIGHT
Generator field	ON
Gyro instruments	ON
Taxi lights	As required
Others	As required
Instruments	Checked taxiing
	OFF flags away
Canopy	Closed and locked
Side panels	Closed and locked
Harness	Locked and tight
Controls	Full and free movement
Temps and pressures	CHT min 140C
	Oil temp min 40C
	Oil press min 40 psi

10:AFTER TAKEOFF

Flap	UP
At 500' if departing the circuit	
Boost pump	OFF, press 4-6 psi
Carburettor air control	As required

11:PERIODIC

At regular intervals during the climb and every 20 mins on cruise.

Engine instruments	Within limits
Fuel	Contents

12:PRE MANOEUVRE

Height	Sufficient to recover by
	4000' AGL and clear of cloud.
Harness	Locked and tight

Equipment	Secure
Locality	Over suitable area
Mixture	AUTO RICH
Power	28" MAP 2000 RPM
Trims	Set for straight and level
Lookout	Check clear

13:LOW FLYING

Harness	Locked and tight
Mixture	AUTO RICH
Fuel	Pressure 4-6 psi
	Contents
	Boost pump ON
Instruments	G4F sycnronized

14:REJOIN

Harness	Locked and tight
Mixture	AUTO RICH
Fuel	Contents
Instruments	G4F sycnronized
A/H erect	

15:DOWNWIND

Brakes	ON-OFF
Mixture	AUTO RICH
Carburettor air control	T/O setting
Fuel	Pressure 4-6 psi
	Contents
	Boost pump ON
	Cock ON

NOTE:Propeller set to full increase after the initial power reduction.

16:AFTER LANDING

Flaps	UP
Carburettor air control	FILTERED
	If CAT more 40C - RAM

Pitot heat	OFF
Boost pump	OFF

17:SHUTDOWN

Brakes	Parked (after chocks in place)
Carburettor air control	RAM
Check clear behind aircraft	
Throttle	Set 1600 RPM
Ignition switches	Check for live magneto
Propeller	Full DECREASE
Mixture	IDLE CUT OFF
Throttle	Open fully as engine runs down
Ignition	OFF, when engine stops
Radio	OFF
Gyros	OFF
Generator field	OFF
Lights	OFF
Fuel cock	OFF when pressure zero
Ground/flight	GROUND
Throttle	Closed
Controls	Locked
Park brakes	Released if chocks in

EMERGENCY PROCEDURES

1. EMERGENCY SHUTDOWN

Should an immediate engine shutdown be required, the following actions are recommended:

MIXTURE	IDLE CUT OFF
FUEL COCK	OFF
BOOST PUMP	OFF
IGNITION SWITCHES	OFF

2. SAFETY CHECKS

During airborne emergencies requiring engine shutdown and a forced landing the following checks should be carried out:

MIXTURE	IDLE CUT OFF
CANOPY	JETTISON

FUEL COCK	OFF
BOOST PUMP	OFF
IGNITION SWITCHES	OFF

If the forced landing is on a recognised airfield there is no requirement to jettison the canopy.

3. ENGINE FAILURE - DURING TAKE OFF

If a loss of power is experienced during take off and before becoming airborne the following actions are recommended:

THROTTLE	CLOSED
BRAKES	APPLY

EMERGENCY SHUTDOWN

If necessary, ground loop to stop on the runway.

4. ENGINE FAILURE - AFTER TAKE OFF

Should the loss of power occur after becoming airborne the following actions are recommended:

LOWER NOSE	MAINTAIN 85kts

SELECT FIELD*

FLAP	AS REQUIRED

SAFETY CHECKS

GROUND/FLIGHT**	GROUND

* At night - LANDING LIGHT ON

** At night - OMIT

This procedure may have to be modified according to circumstances. A turn-back forced landing below 500 feet AGL is not recommended as the aircraft loses approximately 400 feet in a 180 gliding turn. If time permits a distress call should be made.

5. ENGINE FAILURE - LOW LEVEL

If the engine fails during flight at low level adopt the following procedure:

THROTTLE	CLOSED
CONVERT SPEED TO HEIGHT	TRIM FOR 85 KTS
CARBURETTOR AIR	HOT

SELECT FIELD

FLAP	AS REQUIRED

SAFETY CHECKS

GROUND/FLIGHT	GROUND

(when flap is in desired position)

NOTE: A distress call should be transmitted as soon as possible.

The above procedures may have to be modified if insufficient time is available for completion.

6. ENGINE FAILURE - HIGH LEVEL

If the engine fails during flight at high level adopt the following procedure:

INITIAL ACTIONS

THROTTLE	CLOSED
CONVERT SPEED TO HEIGHT	TRIM FOR 85 KTS

CHECK FOR FIRE

NOTE: For practice forced landings set 11" MAP and take off flap after initial actions to maintain engine temperatures.

PLAN

SELECT FIELD

ASSESS WING

CHOOSE LANDING PATH

MAYDAY

Transmit a MAYDAY call.

TROUBLE CHECKS

FUEL	PRESSURE, CONTENTS
BOOST PUMP	ON
FUEL COCK	ON
MIXTURE	TRY ALTERNATE SETTINGS
CARBURETTOR AIR	TRY ALTERNATE SOURCE
PRIMING PUMP	LOCKED
IGNITION SWITCHES	ON

CHECK ENGINE INSTRUMENTS

THROTTLE	CHECK FOR AVAILABLE POWER

DECISION

HARNESS	LOCKED

SAFETY CHECKS

GROUND/FLIGHT	GROUND

7. FIRE WARNING - DURING START

If a fire occurs during the starting sequence the following action should be taken:

CONTINUE TURNING THE ENGINE WITH THE STARTER

EMERGENCY SHUTDOWN

RELEASE THE BRAKES

ABANDON THE AIRCRAFT

8. FIRE WARNING - DURING TAXI

If a fire occurs while taxiing the following action should be taken:

TAXI TO A CLEAR AREA

EMERGENCY SHUTDOWN

ADVISE TOWER

ABANDON THE AIRCRAFT

9. FIRE WARNING - IN FLIGHT

In the event of a fire while airborne proceed as follows:

THROTTLE CLOSED (approx 10 secs)

CONVERT SPEED TO HEIGHT

If the lights go out:

a. Watch for symptoms of fire

b. apply the minimum practical power

c. transit to the nearest airfield

d. land as soon as possible from a forced
landing pattern

If the lights remain on with symptoms of fire:

Below 1500 feet AGL

Captain's decision: either climb to 1500 feet and abandon or emergency shutdown and forced landing.

Above 1500 feet AGL

Emergency shutdown. If the fire is extinguished captain's decision: either forced landing or abandon.

If the lights remain on with no symptoms of fire:

Climb to or remain above 2000 feet AGL. Captain's decision:

either abandon or transit to a suitable forced landing area.

When landing is assured carry out emergency shutdown.

NOTE: Transmit a MAYDAY call when the decision is made.

10. COCKPIT ELECTRICAL FIRE

If a cockpit fire occurs carry out the following procedure immediately:

DISTRESS CALL

GROUND/FLIGHT	GROUND
GENERATOR FIELD	OFF

VENTS AND PANELS OPEN

OPERATE EXTINGUISHER AT SEAT OF FIRE

If the fire is extinguished do not turn on the electrical power. Land as soon as possible. Should the fire continue abandon the aircraft.

11. COLLISION

In the event of an airborne collision proceed as follows:

MAINTAIN AIRSPEED (if practicable)

DECISION - ABANDON OR LAND

IF LANDING - CONTROLLABILITY CHECK (MIN 70 KTS

4000 FEET AGL)

MAINTAIN SPEED 5 KTS IN EXCESS OF

MINIMUM CONTROL SPEED

While manoeuvring employ gentle turns. Carry out a wheel landing 5 kts above the minimum control speed.

12. ABANDONING THE AIRCRAFT

To abandon the aircraft:

MIXTURE IDLE CUT OFF

CANOPY JETTISON

ABANDON HEAD FIRST OVER THE WING TRAILING EDGE

If time permits, tri the aircraft to glide towards a clear area. The aircraft may be abandoned from the inverted attitude.

WARNING: If the aircraft is spinning leave from the outside of the spin. The minimum decision height for abandoning is 1500 feet AGL under control and 4000 AGL feet in a spin or out of control.

13. CANOPY JETTISON

To jettison the canopy hold the head well forward and down and pull the canopy jettison handle located between the two front seats. The canopy may be jettisoned without lowering the seat or unlocking the harness.

MSFS NOTE: canopy jettison is not simulated.

14. CANOPY SIDE PANEL JETTISON

To jettison the side panels pull up the release handle beneath the panels and push the bottoms of the panels clear of the frames.

MSFS NOTE: side panel jettison is not simulated.

15. PROPELLER OIL SEAL FAILURE

Under normal engine operating conditions, engine oil is contained under pressure in the propeller cylinder assembly. The pressure varies between 180 psi on the ground and 100 psi in flight.

Should propeller seal failure occur during flight:

PROPELLER CONTROL	FULL DECREASE
SELECT MAP	15" MIN 26" MAX

Engine speed should stabilize at 1350-1450 RPM and airpseed approximately 95 kts.

Oil loss can be prevented with reduction in boost down to 15" MAP but below this setting oil will begin to escape again.

Establish an approach to land so that with LAND flap lowered, at least 15" MAP can be used until low over the runway.

To jettison the side panels pull up the release handle beneath the panels and push the bottoms of the panels clear of the frames.

16. AIR INTAKE ICING

If air intake icing occurs:

SELECT FILTERED AIR

CLEAR ICING REGION

(by climb, descent or 180 turn)

The symptoms of air intake icing are:

a. an increase in carburettor air temperature

b. an increase in oil temperature

c. a reduction in MAP

Air frame icing is the most likely indication that intake icing will occur.

17. GENERATOR FAILURE

Indication of generator failure will be given by the generator warning light and the ammeter which should show zero charging rate. In the event of generator failure:

Generator field	OFF
Non-essential electrics	OFF

Battery power should be conserved but, if necessary, a well charged battery should permit operation of instruments, radio, pitot heat and essential lights for one hour.

18. EXCESSIVE CHARGE RATE

If the charge rate is excessive proceed as follows:

GENERATOR FIELD	OFF

Turn off all non-essential electrics. If the battery fails prematurely and electrical power is essential:

GENERATOR FIELD	ON
GROUND/FLIGHT	GROUND

19. BATTERY BOILING

Battery boiling may be experienced with an excessive charge rate. If this occurs proceed as for "Excessive charge rate" and open all vents and side panels.

20. FLAP MALFUNCTIONS

There is no emergency method of lowering or raising the flap.

If flap failure occurs:

Reselect

If no effect return lever to original setting

Should flap cycling occur:

Reselect

If no effect return lever to original setting

If cycling continues:

Generator Field	OFF
Ground/Flight	GROUND

when Flap is in desired position.

21. INSTRUMENT FAILURE

For the artifical horizon, G4F and both turn and balance indicators check the fuse boxes. Spare fuses are carried inside the covers. Before changing the fuses for the artifical horizon switch off the gyro instruments switch.

FSX NOTE: Fuses are not simulated.

22. RADIO FAILURE

In case of radio failure with no side tone:

Check the mic-tel connection, try the mic-tel in the other socket, and check that the mic-cord is connected.

For a failure with sidetone still available:

Reselect the channel, check that the mic-cord is connect, try the other transmit button, and attempt contact on another channel.

NOTE: If no click is heard while trying the other transmit button, transmissions may be continuous. Therefore, transmit intentions and switch the radio off.

FAQs and Known Issues

Boost Pump

The fuel boost pump will respond to standard MSFS key commands however, switch panels (such as the Logitech switch panel) may not work. These panels write directly into MSFS variables but as the Winjeel uses the new MSFS fuel system these panels do not write into the MSFS new fuel system variables.

Mixture Control

The mixture lever in the Winjeel has 4 preset positions, Idle cutoff, Auto lean, Auto rich and Full rich. Adjusting the mixture lever will normally switch between one of these four positions.

However, some users may have a controller which does not send the usual commands to control the mixture (for example, using FSUIPC to remap the mixture control). If users are having difficulty controlling the mixture lever they should open the Tablet and on the Cockpit Preferences page set the Mixture lever to "continuous". The mixture lever will then function as a typical mixture lever found in most other aircraft (engine oil and sparkplug realism are set to easy when the continuous mixture lever option is selected).

Smoke grenades

Due to the requirements of MSFS to have a G rating the depiction of actual weapons in MSFS is not permitted. Therefore the smoke grenades are not depicted in the FAC versions in MSFS.

Installed files

The following files are installed by this package. No default files are altered or deleted by this package.

Community/antsairplanes-winjeel

A shortcut to the Winjeel Pilot's Handbook is placed on your desktop (this does not happen for products purchased through the MSFS Market Place).

Preferences are saved to the state.cfg file which can be found in either:

C:\Users\[username]\AppData\Local\Packages\
Microsoft.FlightSimulator_8wekyb3d8bbwe\LocalCache\SimObjects\Airplanes\
antsairplanes-winjeel
or
C:\Users\[USERNAME]\AppData\Roaming\Microsoft Flight Simulator\SimObjects\
Airplanes\antsairplanes-winjeel\states.cfg

In my case it's the first location. The SDK says it should be the second location.

To uninstall simply delete the antsairplanes-winjeel folder from the Community folder. If the Winjeel was bought through the MSFS Market Place then the aircraft can be deleted with the MSFS Content Manager.

Credits

Modeling, sounds, textures, flight dynamics, manuals by **Anthony Lynch.** Visit my website at www.antsairplanes.com to download some free scenery and aircraft.

Thanks to all the beta testers.

Copyright

Sources

The aircraft used as a model is VH-OBJ from Classic Aero, Ballina, NSW. Mark from Classic Aero offers a range of flights in the Winjeel from scenic cruises to aerobatics. Next time you are visiting the Byron Bay/Ballina/Northern NSW area check them out at http://www.classicaero.com.au/.