# Virtavia

## Short Stirling

## *for Microsoft Flight Simulator*

## USER MANUAL

# Introduction

The Short Stirling was the RAF's first operational four-engined bomber of the second World War and in its day it was reputed as an advanced and formidable aircraft.

The Short Stirling was initially conceived in 1936 in reply to advances made by the Americans and Russians in the area of quadri-motor bomber technology. The first Stirling prototype was designed in 1938 and it eventually flew for the first time on 14th May 1939 but suffered a hard landing due to collapsed undercarriage, writing off the airframe and forcing a redesign in that area. Despite being hampered by a poor choice of wing design (too-short span) which limited the aircraft to medium altitude only, the Stirling went onto to play a major part in RAF Bomber Command's strategic air offensive until 1943, when it was switched to transport duties. Even then Stirling crews valiantly played a major role in the Arnhem landing after towing gliders to Normandy, and again during the Rhine crossing. Sadly, no Stirlings have survived to the present day.

# Support

Should you experience difficulties or require extra information about the Virtavia Short Stirling, please e-mail our technical support on
[tech.support@virtavia.com](mailto:tech.support@virtavia.com)

# Copyright Information

*A Mk.3 Stirling, 1942.*

# Exterior Model

About this model

This model is unique to MSFS (2020/24 version).

The package contains the three main wartime variants of the Stirling, the Mk.1, Mk3 and Mk.4 :

***Stirling Mk.1*** *: W7451. 7 Squadron, RAF Oakington, Cambridgeshire, England, early 1941. Manufactured by Austin Motors, Longbridge, Birmingham, England.*

**Stirling Mk.1** : EF361G. 7 Squadron, RAF Oakington, Cambridgeshire, England, May1943. Manufactured by Short Bros., Rochester, Kent.



**Main features** : *FN.5 front turret, FN.7 mid-upper turret, FN.4 tail turret.*

*Engines have smaller type intakes, no lower oil cooler intakes. No cowl exhaust ring covers, shorter-type exhausts on outer engines.*

*High number of fuselage portholes. This was due to the original design brief requirement for use as a troop transport, which was not realised in the production variants until the later post-war Mk.5.*

*The EF316G variant depicts an early 'Pathfinder' aircraft which carried the new H2S radar unit, a ground-scanning radar system, which can be seen underneath the rear fuselage.This particular aircraft has a special and tragic history. Short Stirling Mk.I EF361G MG-B 'Ale Itler' of No.7 Squadron, based at Oakington, 1943. It took off from Oakington at 23.57 on 25 May 1943 on a bombing mission to Düsseldorf, and was flying near Aachen when it was caught in the blast from the exploding Halifax bomber KN-D at an approximate height of 15,400ft (4,700m). It crashed about a mile south of Jülich. German sources indicate that the wreckage of the aircraft was discovered on the L253 Jülich to Aachen Highway near the old manor house at Lorsbeck and the Jülich Railway*

*Ausbesserungswerk (Repair Works). Its crew, consisting of Walter Denham, William Hills, Noel Lagna, Joseph Berthiaume, Alwyn Brotherton, Albert Fisher and Eric Broadhead perished in the crash.*

**Stirling Mk.3** : EF411. 149 Squadron, RAF Mildenhall, Suffolk, England, late 1942. Manufactured by Short Bros., Rochester, Kent.



**Main features** : FN.5 front turret, FN.50 mid-upper turret, FN.20 tail turret.

Engines have larger type intakes above, with circular oil cooler intakes underneath the cowl. Cowl exhaust ring covers commonly fitted, longer-type exhausts on all engines. Reduced number of fuselage portholes.

The Mk.3 was the main variant of the Stirling, many earlier Mk.1 airframes were later converted to Mk.3 and Mk.4 variants. The rear windows of the main canopy and the fuselage portholes were partially painted over to reduce interior light visibilty to enemy aircraft. The porthole vertical stripe is often misinterpreted as a physical divider, whereas it was actually a stripe of black paint.

The Mk.3 also had more powerful Bristol Hercules XI 14-cyl. radial engines, these being the 1,650 hp improved version over the original Hercules II units which produced 1,375 hp. Most Mk.1 Stirlings were eventually upgraded with the XI engine and this simulation assumes this engine in all variants.

***Stirling Mk.4*** *: LK117 (as flown by Flight Officer David Campbell during  the Arnhem operation) 570 Squadron, RAF Harwell, Oxfordshire, England, 17 September 1944. Manufactured by Short & Harland,  Queen's Island, Belfast, Northern Ireland.*



**Main features** *: Plexiglass fairing in place of  front turret, no mid-upper turret, FN.20 tail turret.*

*Engines/cowls/intakes same as Mk.3. Front set of fuselage windows faired over, 'bubble' type window employed each side. 'Rebecca' aerials mounted on front fuselage.*

*Number of fuselage portholes depended on whether the airframe was a conversion from a Mk.1 or Mk.3, or a new-build Mk.4. Fitted with glider towing bridle and hinged stop guard frame aft of the ventral supply drop hatch, used to prevent the attached parachute lanyards of dropped canisters from whipping and damaging the aircraft.*

# Quick Start

Once you have clicked on 'Ready to Fly', the Stirling will load in, on the runway with flaps already set to 15 degrees. You will need to turn the flaps indicator ON before it will operate. Release the parking brake.




Advance throttle levers to FULL :

**CAUTION !**

As a taildragger aircraft, in MSFS the Stirling will have a tendency to turn off the runway when the tail starts to get light at about 50 kts.

This effect is neutralized by holding the joystick/yoke controller fully back, this will hold the tail down sufficiently to enable a normal straight take-off run. The joystick/yoke can be released as soon as the aircraft lifts off.
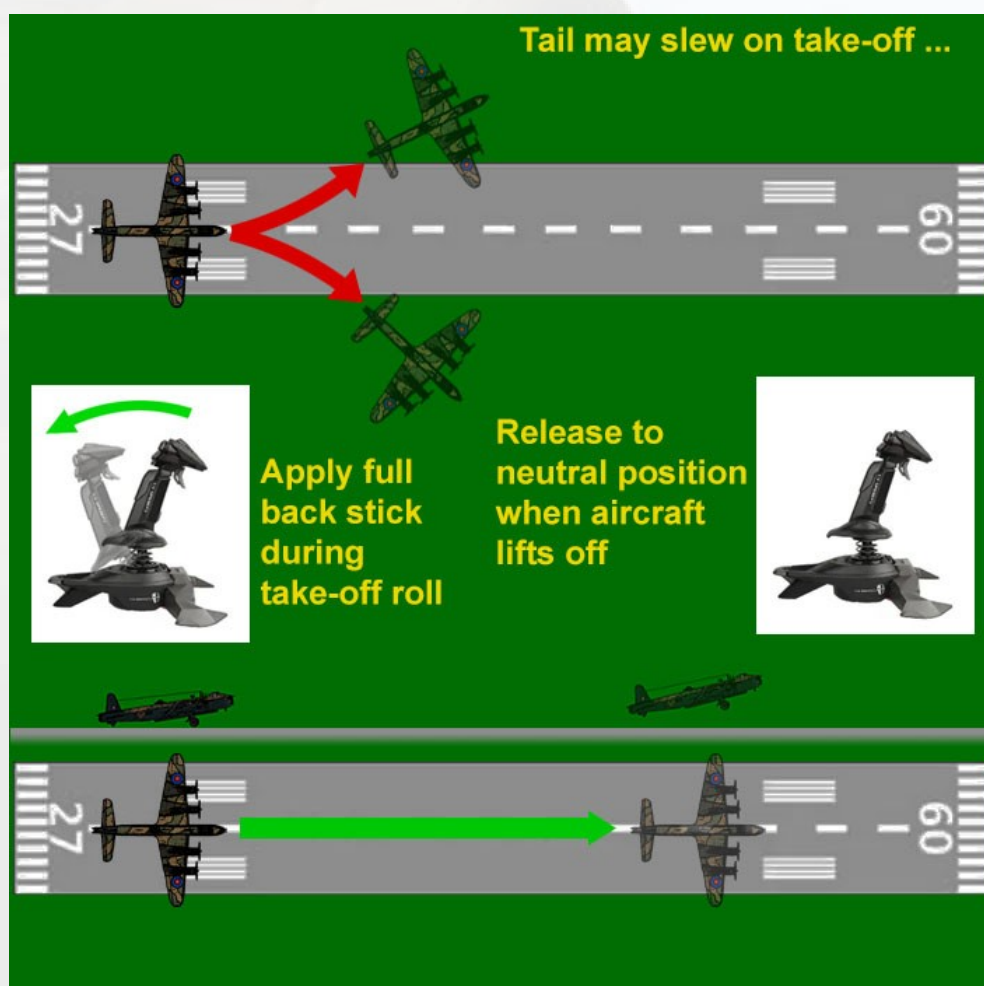
Raise the landing gear and maintain a climb rate of **1,000ft/min** :
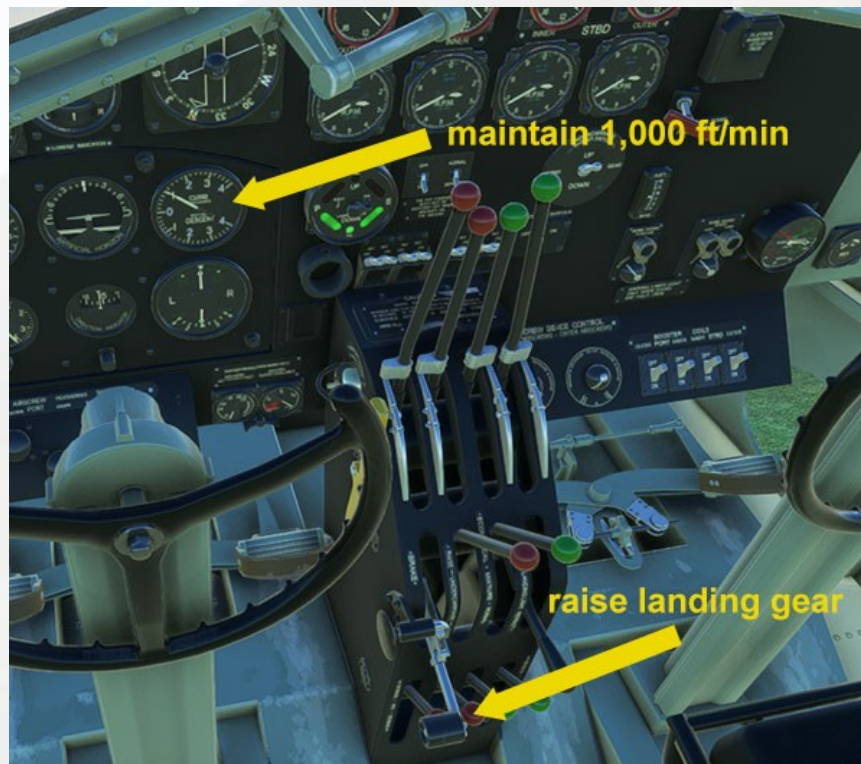


Retract flaps :

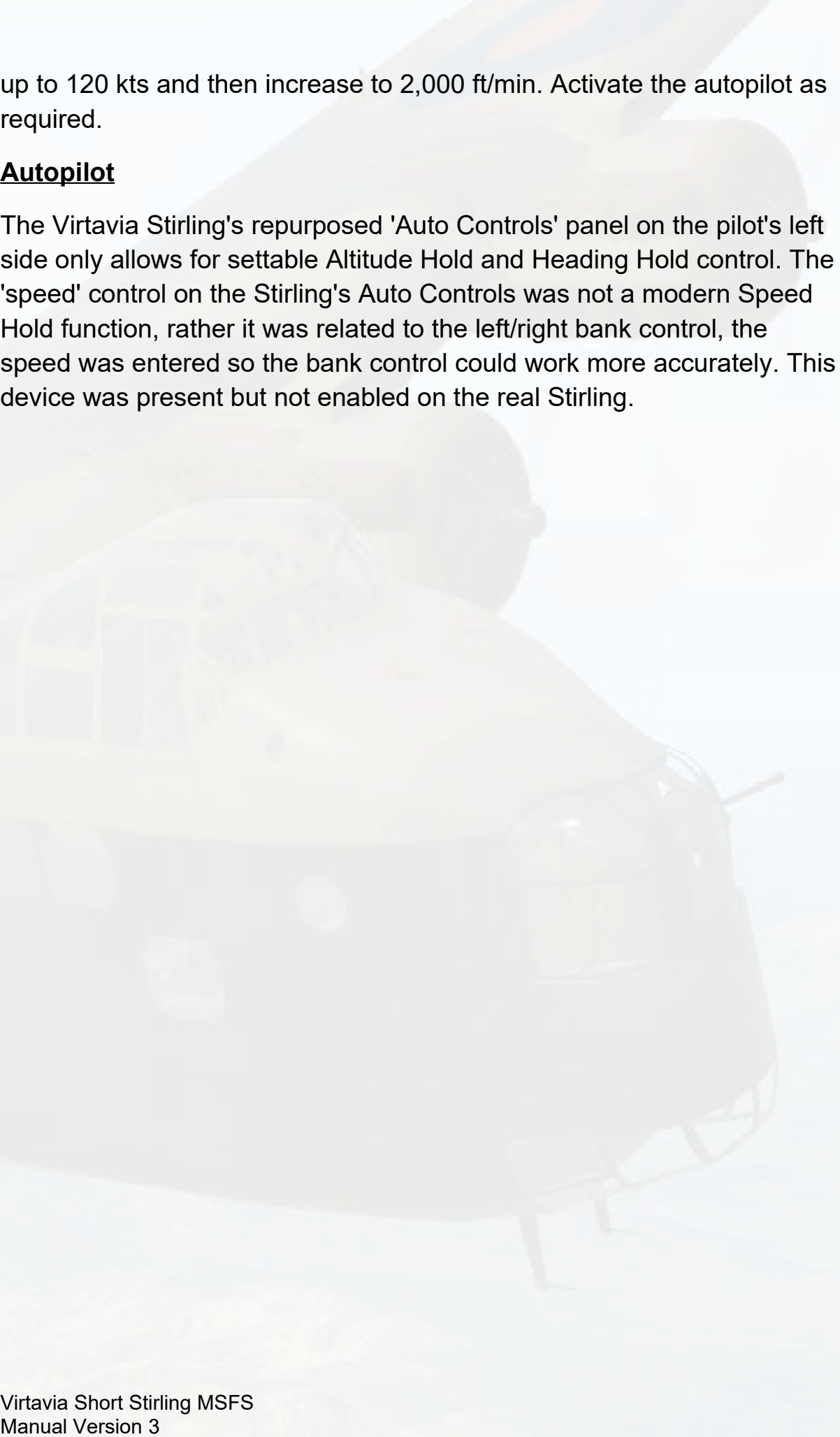At **120 knots** the rate of climb can safely be increased :



At low altitude, maintain around **180 knots** cruise speed. This will ensure a level pitch attitude is maintained :

**Starting from cold** – The Stirling package contains a saved flight with the aircraft in the 'cold, dark' state. This 'Hangar.flt' file will present the aircraft in the fully shut down state with all switches and levers are in their usual OFF position. Follow the procedure below or alternatively follow the checklist, which is shown at the end of this manual, as well as in .pdf form in the Stirling's folder, found in the MSFS Comunity folder.

Check bomb doors are closed, flaps up, park brake is on (the yellow lever on the pilot's right). Now set the 4 **propeller pitch levers** at the bottom of the pedestal upwards to the maximum pitch setting, ready for flight. Set the red-handled **fuel cock** for engine 1 on the overhead console to ON (forward position). Back on the centre pedestal, set the two **mixture levers** up to the fully RICH position, the left (red) lever controls the mixture for both left side engines, the right (green) lever controls the mixture for both right side engines. The **master battery** switch (normally controlled by the Flight Engineer in the real Stirling) is marked 'DR Compass' and sits to the right side of the undercarriage warning lamps instrument in the centre of the panel. Turn this ON. Set the four Booster Coil switches to ON (right side lower panel) - these are actually non-functional so can, if desired, be ignored. Now set the left and right **engine 1 magneto switches** to ON then flip up the switchcover on the top of the throttles console to expose the **starter buttons**. Press and hold the first button on the left and engine 1 (port outer) will start. Repeat the Fuel Cock, Magneto Switches, Starter Switch sequence for the remaining three engines. Close the starter switchcover.

**Take-Off** - turn on the **Flaps Indicator** using the black toggle switch in the centre of the flaps panel, a wanring light will come on. Using the **Flaps Knob** on the flaps panel, set one notch of flaps (15 deg.), the red warning lamp under the flaps gauge will illuminate when flaps are at 15 degrees. Release the yellow **parking brake lever** by clicking it (mounted on the throttles console) and advance throttles to full. Hold your joystick or yoke fully back until take off. This is important as it will hold the tail down and prevent a possible ground loop, an undesirable feaure of large taildraggers. The tail will lift at around 80 kts, release pressure on the stick/yoke and the aircraft will start to lift off. Retract the gear immediately to reduce drag, then retract the flaps.Maintain 1,000 ft/min

up to 120 kts and then increase to 2,000 ft/min. Activate the autopilot as required.

## Autopilot

The Virtavia Stirling's repurposed 'Auto Controls' panel on the pilot's left side only allows for settable Altitude Hold and Heading Hold control. The 'speed' control on the Stirling's Auto Controls was not a modern Speed Hold function, rather it was related to the left/right bank control, the speed was entered so the bank control could work more accurately. This device was present but not enabled on the real Stirling.
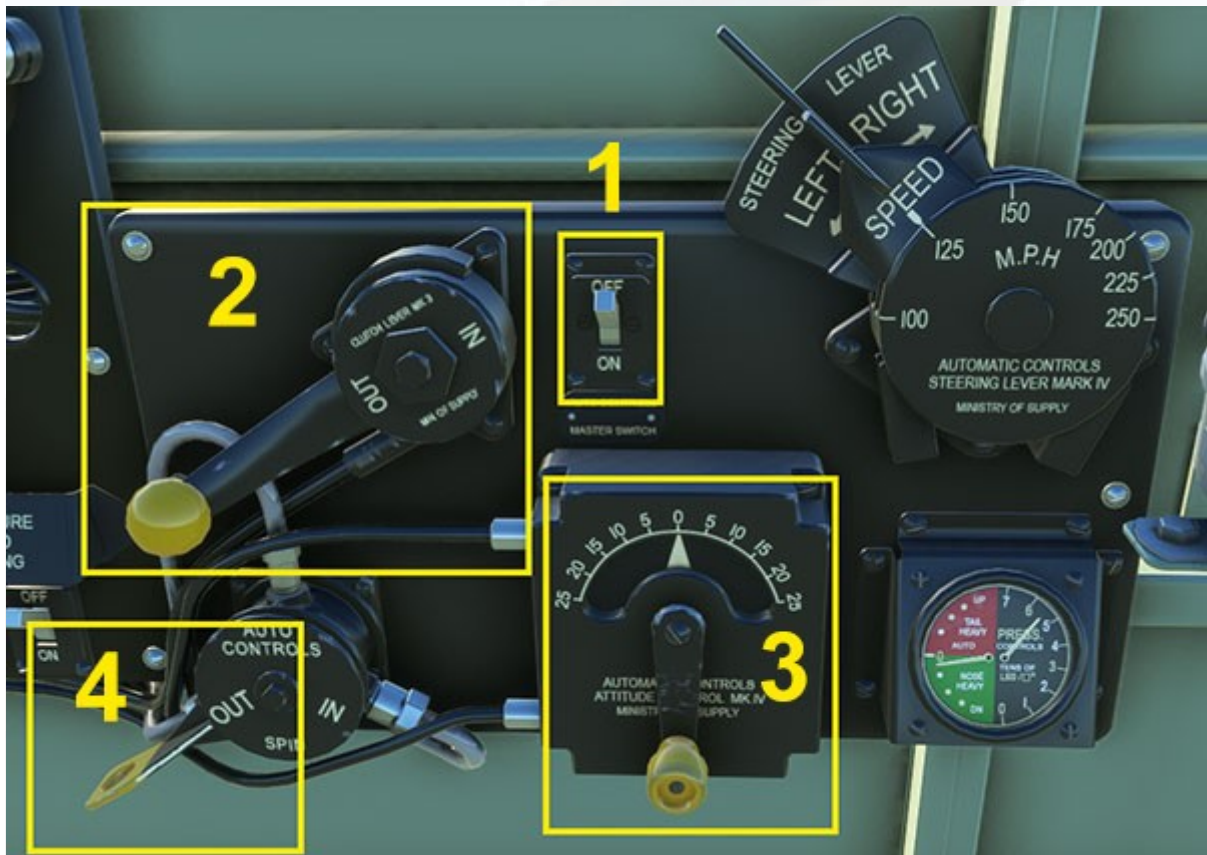
1 - Auto Controls Master Switch

2 - Altitude Hold on/off toggle lever

3 - Altitude Hold setting lever

4 - Heading Hold on/off lever

## Using Altitude Hold

To set the Auto Controls for altitude hold, the aircraft must already be in flight, it is not possible to set an altitude value before take-off, as would be normal with a modern airliner system.So take off first. Once the speed and climb rate are stable, click on the small Auto Controls Master Switch on the upper part of the Auto Controls panel (No.1 in the image above). This activates the autopilot system.

Click on the Altitude Hold lever (with the yellow knob, No.2 in the image above) and the system will 'grab' the current alitiude, the aircraft will now maintain level flight. Note - Altitude Hold can NOT be disengaged by clicking the yellow-knob control lever again, it will be necessary to switch off the autopilot system using the Master Switch.

CAUTION - after take-off, if the Master Switch is OFF and the Altitude Hold lever is inadvertently set to ON, and this is the first use of the system since take-off (ie. no ALT value has yet been set), both the lever and the Master Switch will now set to ON, BUT the Altitude Hold will still be set to GROUND LEVEL. The autopilot will then oblige by descending the aircraft at 1,000 ft/min to the ground - not recommended. If this occurs, it can be countered by :

a) turn off Altitude Hold using the Master Switch, or

b) set the desired alititude using the Altitude Set Lever (see below)
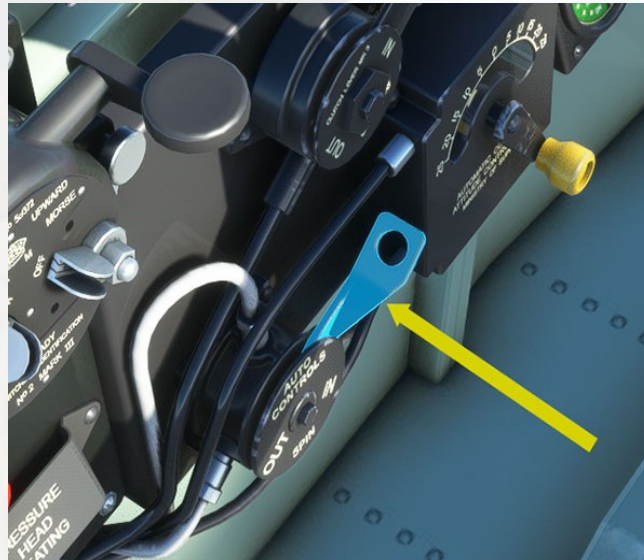
## Set The Altitude
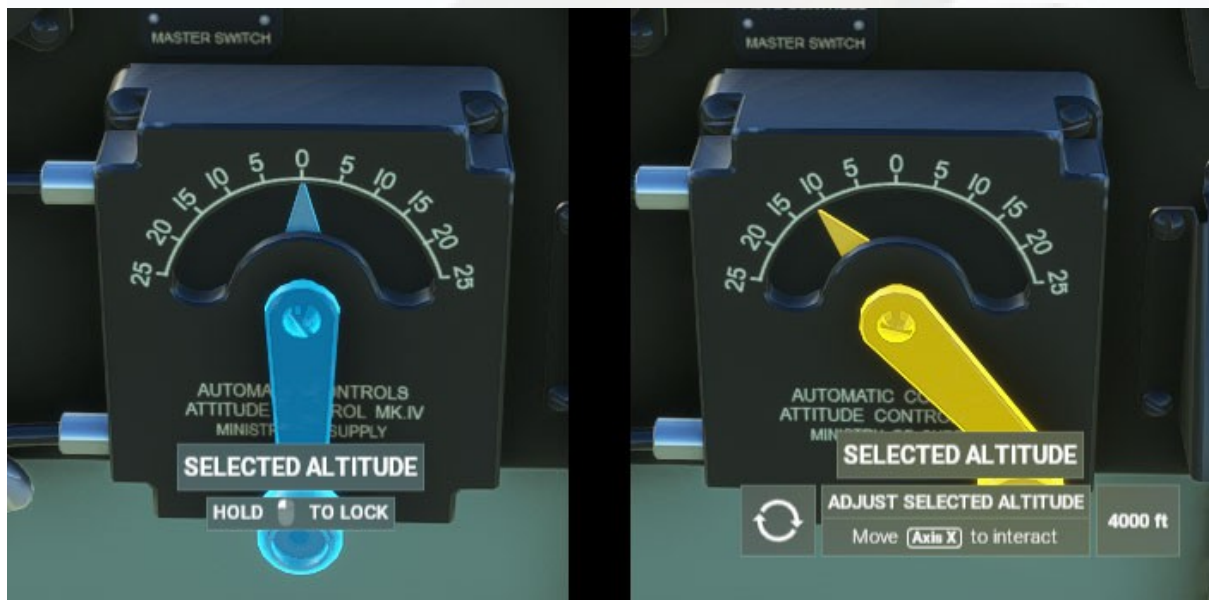


The rotary lever is used to set the altitude value for the autopilot. As usual, the lever will illuminate blue under the cursor, indicating it can be used. Click and hold the left mouse button and the lever becomes active (now yellow). The current altitude setting will show on the right side of the displayed graphic. Whilst it is possible to drag the lever to adjust the setting, the rotation animation and view angle makes this rather cumbersome, it is better to place the mouse cursor directly over the pivot of the lever (ie. the centre of rotation), now the mousewheel can be used to easily and accurately set the required alitude for the autopilot. The lever will rotate as the mousewheel is turned. The real lever would be rotated quickly, multiple times, and the pointer would creep around its arc. In this simulation the numeric arc scale can be ignored.

## Set The Heading

The smaller lever low down on the auto controls panel controls Heading Hold on/off. It is partially painted yellow for easier identification. Like the Altitude Hold lever, it requires that the autopilot Master Switch is ON before it can be used. When the Heading Hold lever is turned on, the aircraft will 'grab' and hold the current heading. Only then is it possible to set the desired autopilot heading using the compass on the main panel :



Place the mouse cusror over the knob at the centre of the compass. Like the altitude lever, it will illuminate blue, then yellow when the left mouse button is held down. The current selected heading will be shown on the right side of the displayed graphic. Drag the cursor or use the mousewheel to adjust the heading.The heading can not be set in advance of switching the Heading Hold on, any setting will be replaced by the current heading at switch-on.

**Approach & Landing** –

*Approach* : The aircraft has no speedbrakes so merely throttling back will allow the considerable frontal drag to slow the aircraft down. Reduce speed until 130 kts is reached and you can enter the pattern.

*Final* : Turn on the flaps indicator. Lower the undercarriage and set flaps to position 1. This is the 15 degrees position and the red annunciator will show it is set. At 110 kts extend the flaps to position 2 (30 degrees). Reduce throttle until a steady rate of descent of around 300 ft/min is achieved and speed is 90 kts.

*Landing* : When the runway threshold is visible, set full flap and hold speed at 80 kts. Once over the runway at 10-20 ft, cut throttles and pull the control yoke back to bleed off speed to 70 kts. Attempt to alight on all three wheels. CAUTION - Brake immediately to prevent the tail swinging to the side, do not make any large rudder inputs. It is safe to taxi once speed is below 40 kts.

# Cockpit

Some of the more important instruments and manipulatable parts are shown below. The control yokes can be toggled off by clicking on the circular watch holder below the landing gear indicator.



The 'Blind Landing Indicator', also know as the Lorentz Indicator is set up in this simulation as a NAV1/ILS LOC/DME indicator.
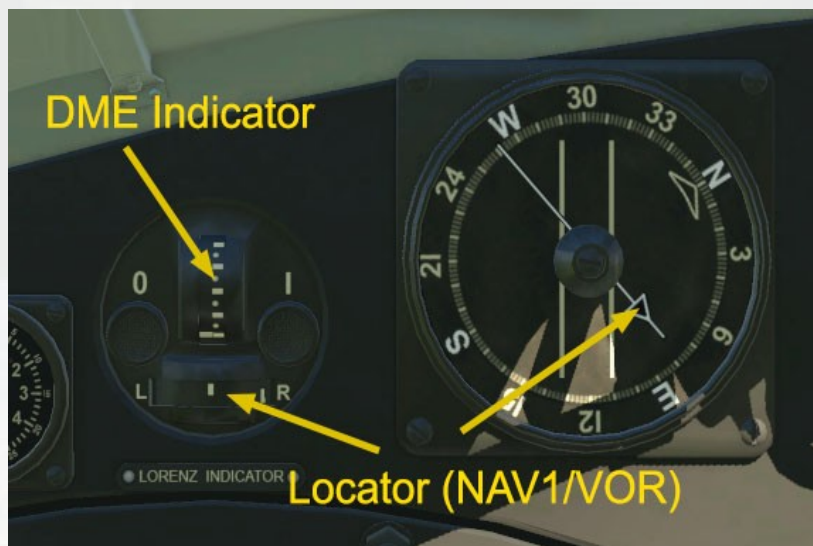
The upper instrument measures distance in nautical miles to the presently tuned NAV1 or ILS locator. The increments are 5 nm each, the needle will move downwards the closer the aircraft is to the station.

The lower instrument acts as locator needle which shows the left and right deviation from the presently tuned NAV1 or ILS locator.

The gauge on the right is the Compass Repeater. It is a normal compass with a single needle (not authentic) which points to the currently tuned NAV1 station or ILS locator. On the lower left of the panel is the Beam Approach Indicator , this fulfils the same Locator function as the lower part of the Lorenz Indicator, showing the direction of the NAV1 or ILS locator where the needles cross. Steer to towards the 'X' to find the 'beam'.



**Lights Switches**

Gauges and Text

The Gauges Lamp switch has three positions - Off, Dim and On. This switch controls the lighting of all gauges and text on all panels as well as the nearby lamp also illuminates the main compass beneath it.
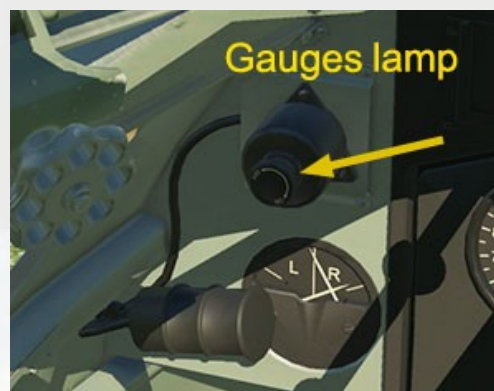
## Red Flood

There are two Flood Lamps, they are located on the roof of the cockpit, behind the pilots. Each switch has three positions - Off, Dim and On. Each side can be operated independently.
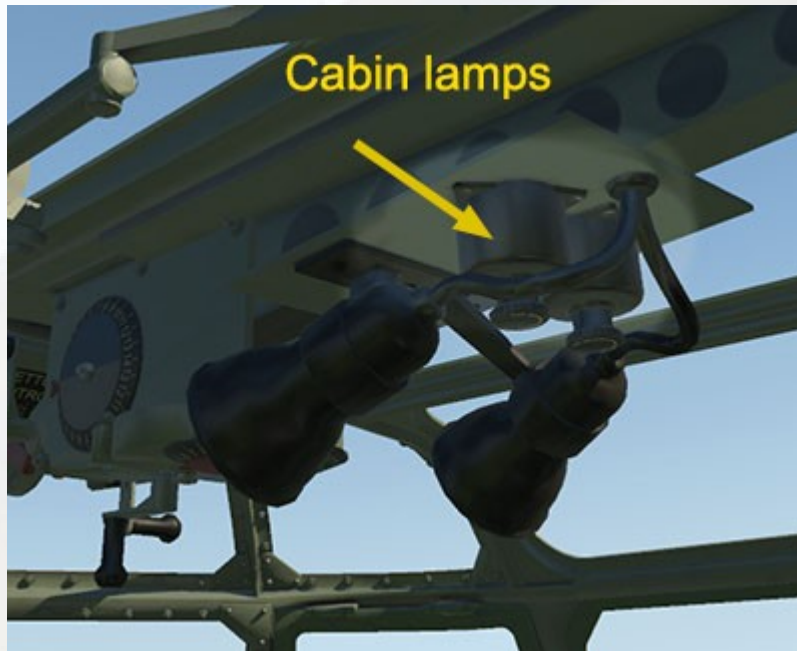
Navigator's Lamp



The Navigator's Lamp switch has three positions - Off, Dim and On. It casts a small spot onto the map table.
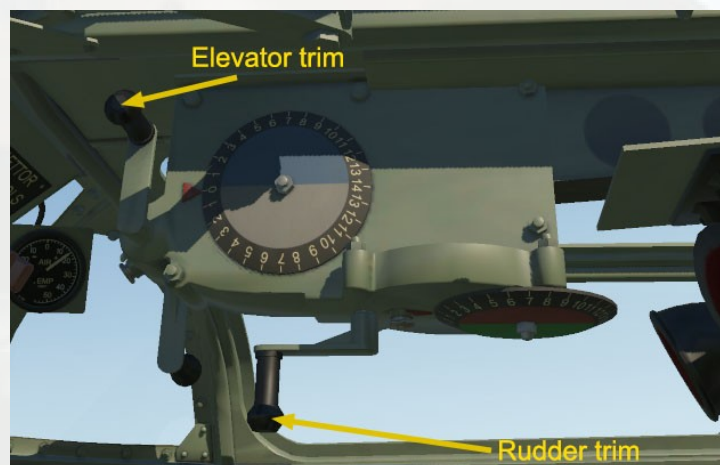
Landing Lamps

The landing lights are mounted in a compressed air-powered retractable pod in the port wing leading edge. The pod can be extended/retracted using a lever on the throttles console left side :
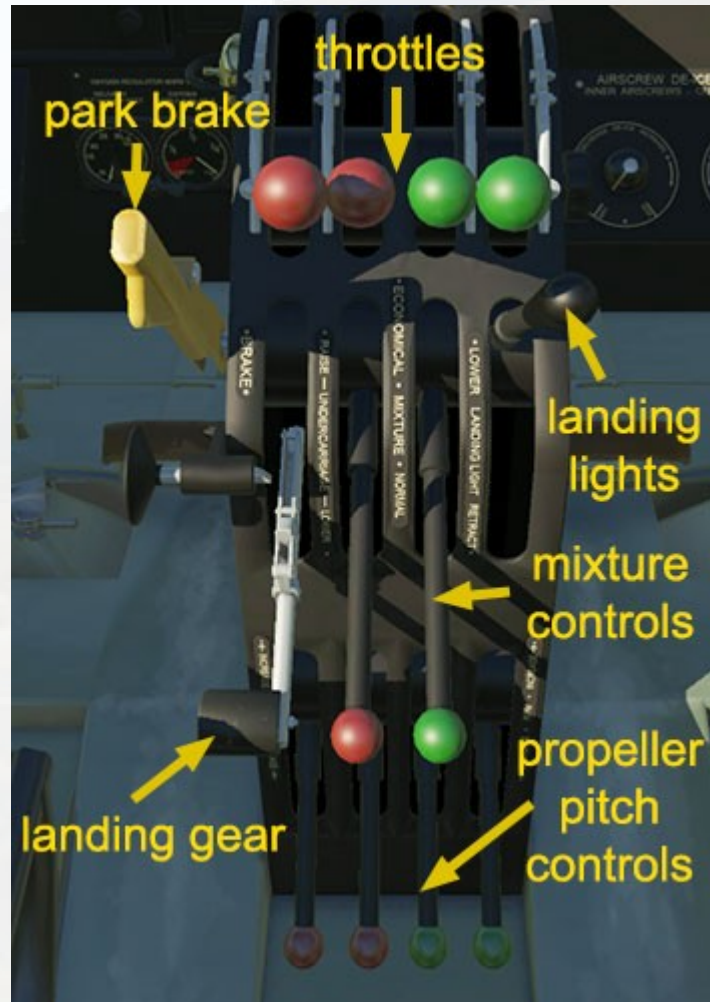
## Trim Controls

The next image shows the trim controls and their indicators :



The trim handles can be moved with the mouse pointer but it is easier to use a button on your controller. There is no aileron trim on the Stirling, the aircraft uses an aileron spring tab.

## Throttles Console

Self-explanatory, however the small plunger object on the left side is a safety device for the landing gear lever, preventing retraction when the plunger is pushed across. This part does not actually prevent the lever moving and was included for the purpose of authenticity.

Engine Cooling Gills - these are animated, although there is not any lever or switch which can control them (the Flight Engineer operated them). If desired, key presses can be set to move the gills (cowl flaps). A short electric motor sound will be heard when they are activated.
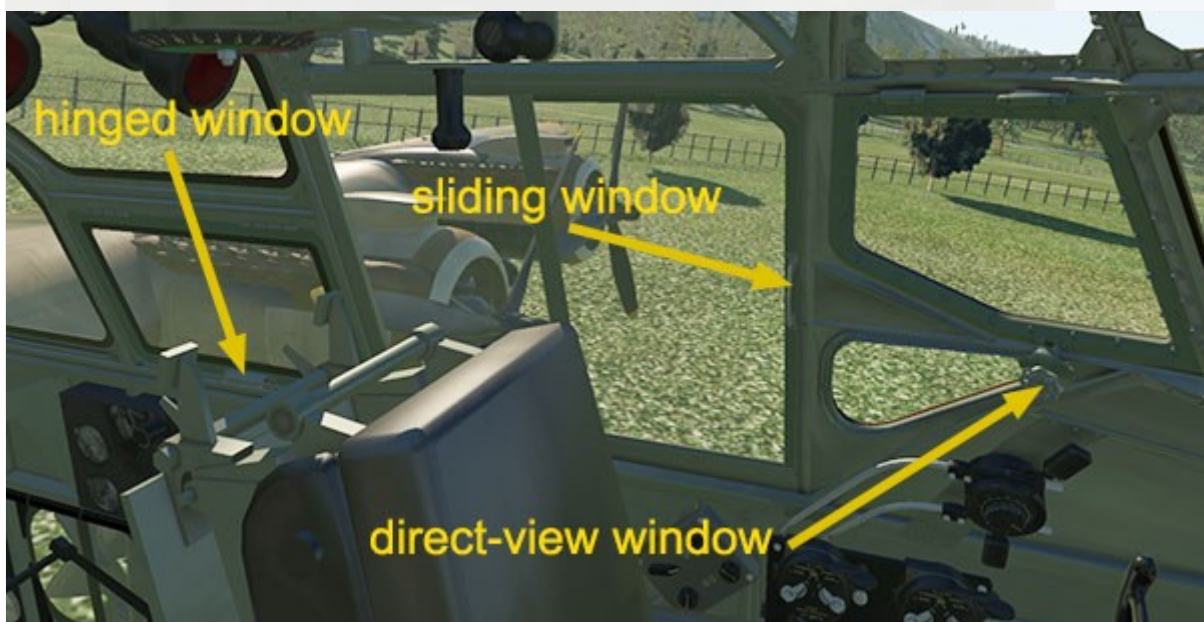
## Cockpit Cameras

There are five selectable viewpoints in the cockpit : Pilot, Copilot, Navigator's station, Bomb Aimer's position and a view from the rear of the cockpit cabin, near the entrance.



## Other Cockpit Functions

There are three animated windows each side :

The arrows in the image point to the handles which are the hotspots for the mouse pointer.
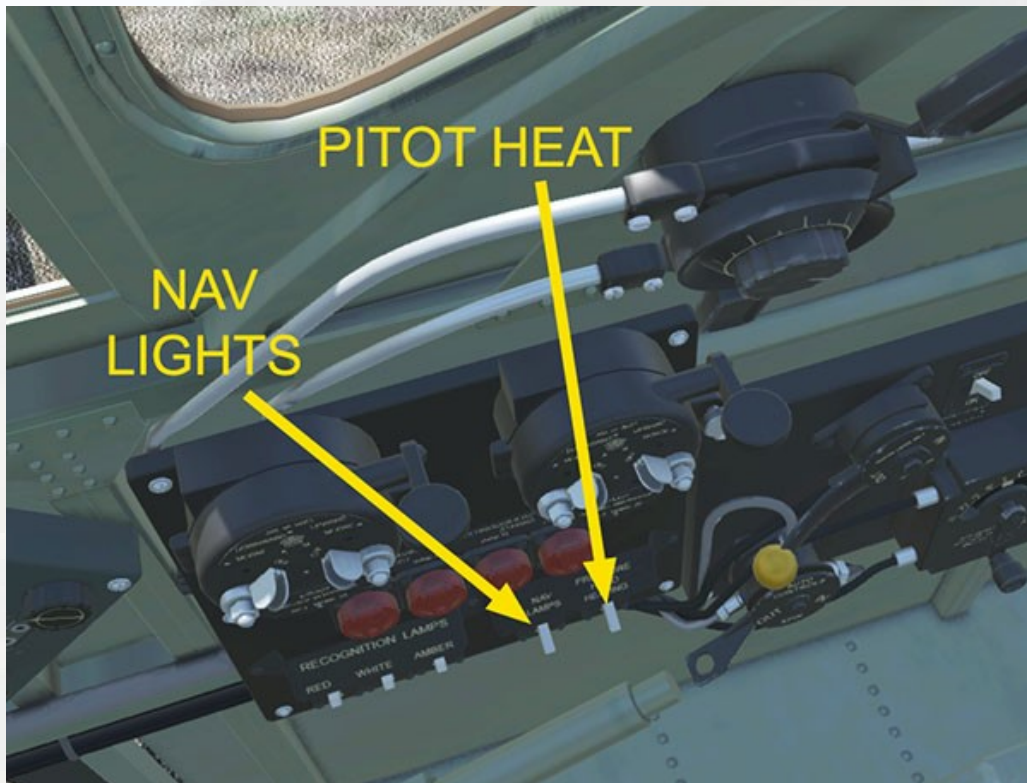
The armrests on both pilots' seats can be raised and lowered :



The Booster Coil switches are animated but presently have no function. An authentic start-up would need these in the ON position and they would be turned off once the engines were running.

It is easier to access the switches for Navigation Lights and Pitot Heaters if the pilot's armrests are raised first.

The lever of the TR.9 remote radio controller is used to toggle the 3D pop-up radios :

## Crew Visibility, Crew Door & Ladder

Several switches have been repurposed to allow easier operation of the model's features :
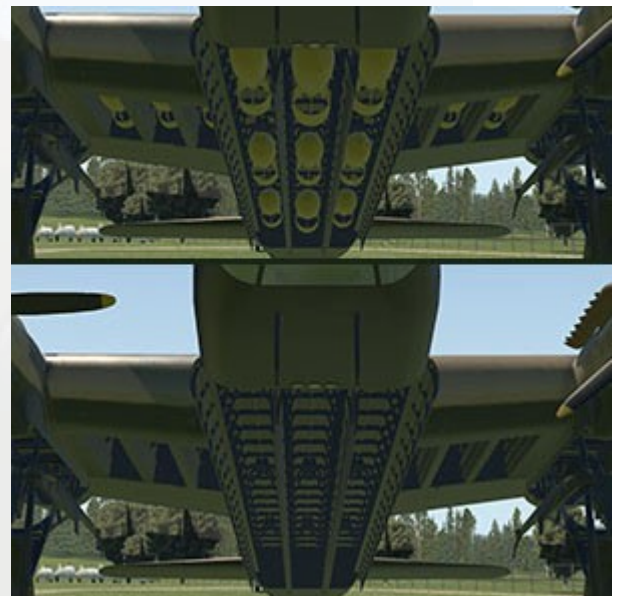


Crew Toggle and Crew Door :

## Bomb bays





The bombs can be toggled off if desired -

# Stirling Specifications

## Specifications

- Manufacturers: Short Brothers at Rochester, Swindon and Brockworth; Short & Harland at Queen's Island, Belfast; Austin Motors at Longbridge, Birmingham.
- Type: Mid-wing four-engined all-metal stressed-skin cantilever monoplane.
- Crew: Pilot, 2nd Pilot/Bomb Aimer, Navigator, Wireless Operator, Flight Engineer and two or three Gunners
- Engines: Four Bristol Hercules XI 14-cylinder sleeve valve supercharged dual-row air-cooled radials
- Power: 1,650 h.p. each.
- Maximum speed: 270 mph / 235 knots at 14,000 feet (189 kts IAS)
- Cruise speed: 165 mph / 143 knots at 10,000 feet
- Service ceiling: 17,000 feet
- Combat radius: 2,010 miles
- Wingspan: 99 feet 1 inch
- Length: 87 feet 3 inches
- Height: 22 feet 9 inches
- Wing area: 1,460 square feet.
- Empty Weight: 46,900 pounds
- Maximum Weight: 70,000 pounds
- Armament: Three power-operated Fraser Nash type gun turrets. Two guns in FN5 front turret; two in FN7 (Mk.1) or FN50 (Mk.3) mid-upper gun turret; four guns in FN4 (Mk.1) or FN20 (Mk.3) rear gun turret.
- Maximum bombload: 17,000 pounds of general-purpose bombs.

## Speed Limitations

- Full Flaps: 126 knots
- Landing Gear: 135 knots
- Landing Lamp extended: 135 knots
- Maximum indicated speed (diving): 282 knots

# Stirling Procedures

## Engine Start / Preliminaries

1. Check Parking Brake ON
2. Set Master Battery switch ON.
3. Set Nav lights ON.
4. Set Cooling Gills to fully OPEN. (Flight Engineer)
5. Set Engine 1 Fuel Cock Lever to ON.
6. Set Engine 1 Booster Coil switch to ON.
7. Set Engine 1 Magneto Switches to ON.
8. Starter Button Engine 1 PRESS.
9. Repeat steps 5-8 for remaining engines.
10. Set all Booster Coil switches to OFF.
11. Brake Air Pressure 120 lbs CHECK.
12. Altimeter set to ZERO.
13. Fuel Quantity Status CHECK. (Flight Engineer)
14. Landing Lights Lever ON (as required).
15. Set Pitot Heat Switch to ON (as required).

## Taking Off

1. Set Parking Brake OFF.
2. Set Cooling Gills fully CLOSED. (Flight Engineer)
3. Landing Flaps to one notch down (15 deg.) SET.
4. Set Prop. Pitch levers to maximum (fully UP).
5. 100% power smoothly APPLY.
6. Brakes RELEASE.
7. Accelerate to full power.
8. At 70 kts tail will lift, 80 kts aircraft lifts off.

## After Take- Off

1. Landing Gear RAISE.
2. Landing Flaps RAISE.
3. Landing Lights Lever OFF (as required).

## Approach and Landing

1. Approach airfield at 180 kts.
2. Retard throttles to idle, raise nose to lose speed to under 150 kts.
3. Landing Lights Lever ON (as required).
4. Extend Landing Gear at 130 kts.
5. Extend Landing Flaps 1 notch (15 deg.) at 120 kts.
6. Apply power to maintain 100 kts.
7. Extend Landing Flaps 2nd notch (30 deg.).
8. Limit descent rate to 100 fpm.
9. At 90kts extend full flaps.
10. Raise nose to lose speed at 10 ft.
11. Make 3-point Touchdown at 70 kts.

## After Landing

1. Landing Flaps RAISE.
2. Set Cooling Gills fully OPEN. (Flight Engineer)
3. Taxy to parking area.
4. Set Prop. Pitch Levers to minimum (fully DOWN).
5. Set Parking Brake ON.
6. Set Landing Lights to OFF (as required).
7. Set Pitot Heat Switch to OFF (as required).

## Shutdown

1. Set all Engines' Magneto Switches to OFF.
2. Set all Fuel Cock Levers to OFF.
3. Set Mixture Levers to SHUT (fully down).
4. Set Nav Lights to OFF.
5. Set Master Battery switch to OFF.
6. Exit aircraft.