

AIR TO AIR SIMULATIONS

**BOEING**  
*StratoCruiser*



PILOT'S HANDBOOK

# PILOT'S HANDBOOK

“Captain of the Ship” Edition

Created for the



Developed and Published by



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## **Chapter 1: Introduction**

This manual comes exclusively with the Captain of the Ship add-on and is updated with the latest information and illustrations.

The Captain of the Ship Stratocruiser is unlike any aircraft you have ever flown in a flight simulator. It places you, the Captain, into the control cabin of the most advanced piston-powered airliner to ever take to the skies. The original A2A Stratocruiser gave birth to our newest, most exciting technology, Accu-Sim. Now almost three years later, we jumped back into our flagship and performed an almost complete overhaul, inside and out.

After just a few flights, you will find yourself doing things you have never done prior, because until now, certain things in flight simulator either didn't exist, or just didn't matter. The end result is you will hopefully become a better pilot because of it. This is perhaps thanks to the heart of this product, a new career module, which holds you (the captain) accountable for all of your actions. We hope when you enter the cockpit, you feel as if you are part of a large crew, taking a flight of first-class passengers on a new adventure. Your crew and all passengers aboard all look to you, their captain, to take them safely higher, faster, and further than ever before.

This manual is designed to assist you in managing every aspect of this aircraft and goes hand-in-hand with the Captain of the Ship Accu-Sim manual, which takes you even deeper into the psychology of being a captain of an aircraft of this stature. Ultimately, we are convinced that in just a few weeks you will be a better pilot (and captain) than you were before, as you will learn through your experiences and mistakes how best to manage and fly such an aircraft with a load of live passengers on board.

Please take a look at some of the new features listed below and take the time to experience every one of them in the simulator. We feel confident that you, like us, will agree that the A2A Wings of Silver Stratocruiser is indeed an amazing aircraft.

Join us and take a few steps into history....



The Air to Air Simulations Team

## Stratocruiser Base Features

**Designed and created by Boeing**, the world's premier large 4-engined aircraft builder.

**Four crew positions:** pilot, co-pilot, flight engineer, and navigator. Fully modelled and functioning positions constructed with down to the rivet detail.

**The 3,500 horsepower Pratt & Whitney R4360**, the world's most powerful piston aircraft engine ever produced.

**Real time Load Manager:** with the ability to load individual passengers, cargo, and fuel or select presets.

**Custom Cockpit Systems and Gauges** for the ultimate in realism taken far beyond what is available by default.

**See the world** like you have never seen it before through 19 cockpit windows for unprecedented visibility.

**Fly high and fast.** Fly above the bad weather and cover the ground at 350 mph.

**Double-Decker airliner** carries almost 100 passengers in first class comfort on a level never seen before or since.

As with every A2A aircraft, it is **gorgeously constructed**, inside and out, down to the last rivet.

Built to be flown "**By The Book.**"

**Fully click-able cockpits:** with authentically working systems and gauges.

The latest wind-tunnel technology creates fluid flying qualities.

**3D Lights 'M'** (built directly into the model.)

- Red, rotating double lamp mechanical beacon.
- Under-wing landing lights than can be turned on, deployed, and retracted.
- Pulsing navigation lights.
- Nose-gear mounted taxi light that even shoots a downward beam from the undercarriage doors as it deploys.

- Red passing light.
- Passenger and cockpit lighting for stunning visuals at dawn, dusk, and night.

**Pure 3D Instrumentation.**

- Natural 3D appearance with exceptional performance.
- Smooth movements.

**Historically accurate Eclipse-Pioneer PB-10 autopilot:** that looks and functions like the original. Twist the hand lever to bank, scroll wheel to adjust pitch, and toggle "Altitude Hold" switch.

**Auto-Mixture:** that actually performs as intended. Now you can set for "auto-rich" or "auto-lean" and the aircraft fuel to air ratio will be automatically determined and set by the carburetor based upon various factors such as altitude.

**Extensive Fire Extinguisher system** with fully functioning overhead panel and controls.

**On-board Auxiliary Power Unit (APU)** to power systems with engines off and not drain the battery.

**Cabin pressurization system controls.** You control the target altitude and the rate of pressure change and the system authentically displays and manages cabin pressure.

**Hydraulic System:** that powers the steerable taxi wheel, brakes, emergency brakes, rudder boost, and windshield wipers.

**Bulging tires:** when placed on the ground with weight.

**Eight different liveries:** including Northwest Airlines, British Overseas Airways Corporation, United Overseas Airlines, Pan American Airlines, Boeing, Air to Air Flagship, and Aero-Spacelines Pregnant Guppy.

**Pregnant Guppy aircraft included** with authentic cockpit, systems, and performance.

**A2A specialized bump mapping and specular lighting** on all models.

**Crew Reports** pop-up 2D panel keeps important information easily available

**Custom Navigator's map:** accessible via keystroke or the Navigators station.

**Authentic A2A Simulations:** 3D engineered sound for FSX.

## Preface

Each airline that flew the Boeing 377 had a different suite of avionics, interior designs, cockpit layout, etc. The Wings of Silver Stratocruiser closely resembles early Stratocruiser variants, featuring four crew stations and a full engineering instrument panel. Some Boeing 377 examples indicated in the manuals were nearly identical in cabin setup and design, while others differed by combining the engineering stations into the overhead and side pilot and co-pilot instrument panels. The engineering station is reminiscent of certain airlines and early Boeing 377 Stratocruiser models and offered the greatest amount of diversity, variety and commonality while giving a very unique experience within the flight simulation community.

We here at Air to Air Simulations spent a considerable amount of time with two military variants of the aircraft (C-97 and KC-97) to gather technical data and get some “hands on” experience. We believe the long process of creating a 'certified' A2A Simulations aircraft will be appreciated by history buffs, pilots, and anyone who loves aircraft. We build our aircraft 'by the book' and test to ensure it is true to the numbers and charts presented in the manuals. Lastly, it has to pass the test of being certified by our own real or former C-97, KC-97 and 377 pilots. Hundreds of hours were spent with our group of specialists and technical advisers to ensure the best and most thorough simulation possible was given to you, our customers.

Our commitment to the product has led to multiple new simulation technologies and sits in a class of its own among classic airliners. The technology pioneered by developing the Stratocruiser gives it the distinction of not only being our first plane in the Wings of Silver classic airliner series of products, but also of it being our flagship aircraft for the series.

While the majority of this manual does apply to the real operation of the aircraft, this manual is written and designed specifically for the Air to Air Simulations Wings of Silver Stratocruiser.

## **Chapter 2: Quick Start Guide**

Chances are if you are reading this manual, you have properly installed the A2A Wings of Silver Stratocruiser. However, in the interest of customer support, here is a brief description of the setup process, system requirements and a quick start guide to get you up quickly and efficiently in your new aircraft.

### **System Requirements**

The Air to Air Simulations Wings of Silver Stratocruiser requires the following to run:

REQUIRES LICENSED COPY OF MICROSOFT FLIGHT SIMULATOR X

SERVICE PACK 2 (SP2) REQUIRED

(Note, while the A2A Wings of Silver Stratocruiser may work with SP1 or earlier, many of the features may not work correctly if at all. We cannot attest to the accuracy of the flight model or aircraft systems under such conditions, as it was built using the Acceleration/SP2 SDK. Acceleration is required for manual turbo control.

OPERATING SYSTEM: Windows XP SP2, Windows Vista, Windows 7

PROCESSOR: 2.0 GHz single core processor (3.0GHz and/or multiple core processor or better recommended)

HARD DRIVE: 250MB of hard drive space or better

VIDEO CARD: DirectX 9 compliant video card with at least 128 MB video ram (512 MB or more recommended)

OTHER: DirectX 9 hardware compatibility and audio card with speakers and/or headphones

### **Installation**

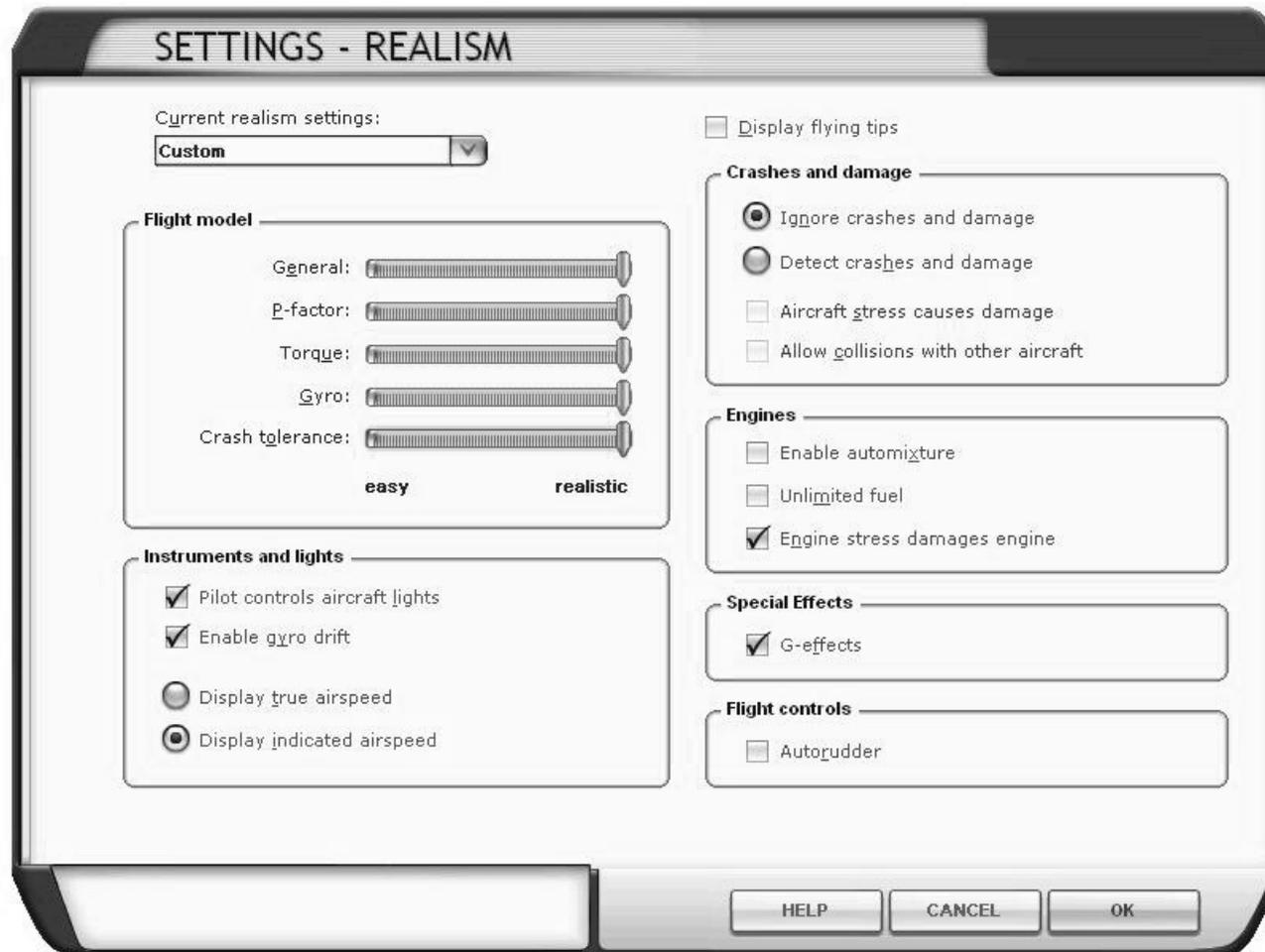
Included in your downloaded zipped (.zip) file, which you should have been given a link to download after purchase, is an executable (.exe) file which when accessed contains the automatic installer for the software.

To install, double click on the executable and follow the steps provided in the installer software. Once complete, you will be prompted that installation is finished.

## Realism Settings

The Air to Air Simulations Wings of Silver Stratocruiser was built to a very high degree of realism and accuracy. Because of this it was developed using the highest realism settings available in Microsoft Flight Simulator X.

The following settings are recommended to provide the most accurate depiction of the flight model. Without these settings certain features may not work correctly and the flight model will not perform accurately. Figure 2-1 depicts the recommended realism settings for the Air to Air Wings of Silver Stratocruiser.



## **Flight Model**

To achieve the highest degree of realism, move all sliders to the right. The model was developed in this manner thus we cannot attest to the accuracy of the model if these sliders are not moved as shown above in figure 2-1. The only exception would be “Crash tolerance.”

## **Instruments and Lights**

Enable “Pilot controls aircraft lights” as the name implies for proper control of lighting. Check “Enable gyro drift” to provide realistic inaccuracies which occur in gyro compasses over time.

“Display indicated airspeed” should be checked to provide a more realistic simulation of the airspeed instruments.

## **Crashes and Damage**

It is recommended that you disable crash detection for maximum effects such as belly landings, etc. Alternatively, you can lower the “Crash tolerance” slider under Flight Model if you so choose to enable crashes. It is our feeling that if you crash, you will certainly know it regardless.

## **Engines**

Ensure “Enable auto-mixture” is not checked. The Stratocruiser has a fully working automatic mixture control and this will interfere with our extensively documented and modelled mixture system.

## **Flight Controls**

It is recommended you have “Auto-rudder” turned off if you have a means of controlling the rudder input, either via side swivel/twist on your specific joystick or rudder pedals.

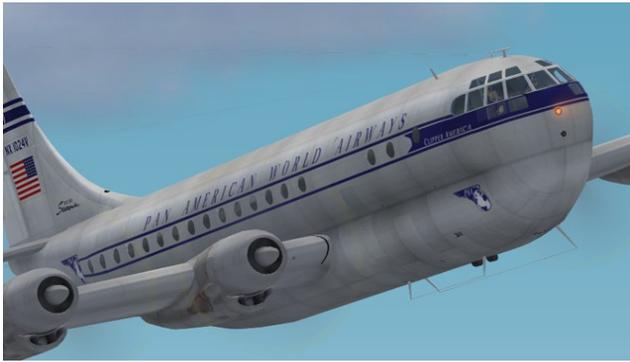
## Quick Flying Tips

- ★ **Keep your Crew Reports up** (SHIFT -2). They will provide you with helpful information.
- ★ To **Change Views** Press A or SHIFT + A.
- ★ **Open your cowl flaps when running engines on the ground** or taxiing to ensure the engines don't overheat. This is especially true on very hot days (80-100 F). You can open them with the switches on the engineering panel or the quick 2D “Controls” panel using SHIFT-3.
- ★ **Keep engines at or above 1,000 RPM.** Failure to do so may cause spark plug fouling. If your plugs do foul, try running the affected engines (you will know by the fluctuating RPM displayed on the gauges) at a higher RPM. You have a good chance of blowing them clear within a few seconds by doing so. If that doesn't work, you will have to wait a little while for them to clear properly.
- ★ **DO NOT apply full power without your ADI ON** (water injection switch located on the upper overhead panel). Applying full takeoff power without ADI may damage your engines.
- ★ **Before takeoff, set flaps to 25 degrees** and raise them SLOWLY after takeoff (use F6 and F7 respectively).
- ★ Operate Landing Gear (press G).
- ★ **REDUCE POWER** after takeoff
- ★ Use your autopilot to reduce workload.
- ★ Use AUTO RICH for TAKEOFF / CLIMB and AUTO LEAN for CRUISE. The aircraft features a fully automatic (and realistic) working mixture system. Simply drag the mixture controls for each engine near the various mixture settings and it will “snap” into place and calculate accordingly. Under AUTO LEAN there is a manual control which allows the user greater freedom of mixture control as desired.
- ★ For approaches reduce power and maintain about a 500 feet / minute descent.
- ★ For landings, take the time to line up and plan your approach. Don't use landing gear or flaps as brakes. Keep your eye on the speed at all times.
- ★ To stop quicker after landing, use REVERSE THRUSTERS, (use F4 and F3 respectively)

## Chapter 3: Stratocruiser Variants

Included in the A2A Wings of Silver Stratocruiser package are 4 period and airline correct liveries along with the famed Pregnant Guppy. Each variant is complete with historically accurate differences such as round or square passenger windows, differing prop blades or other small variations. Each airline fitted the aircraft in differing ways. Some airlines converted their Stratocruisers into extravagant luxury airplanes with gold trimmed interiors and sleeping births while carrying the travelling elite, whilst others were true passenger haulers with seating for over a hundred. Each airplane is unique and has a history of its own.

### **Pan American World Airways NX1024V**



On 28 November 1945 Pan American ordered 20 Stratocruisers. This made PAA the first airline to put the new Boeing Stratocruiser into service. It was hoped to have the B-377s in service by the end of 1946 but a long drawn out certification process held up service entry until 1949. Boeing B-377 NX1024V was the third Stratocruiser prototype, its first flight took place on October 7th, 1948. Although it was named Clipper America it was actually the 2nd Pan American B-377 to be called Clipper America. The first Clipper America was the second Stratocruiser prototype, NX1023V and was later renamed Clipper Golden Gate. NX1024V was delivered to Pan American as Clipper Bald Eagle N1024V on June 12th, 1949. It was later refitted as a Super Stratocruiser, renamed as Clipper Cathay and used for the Pacific routes. It was eventually sold to

Aero-Spacelines and was converted to a Pregnant Guppy (N1024V).

### **British Overseas Airways Corporation G-AKGH**

In October 1946 BOAC placed an order for six Boeing Model 377-10-32 Stratocruisers. This order caused quite a bit of controversy in post war Britain, with questions being asked why domestic British industry was not being supported. The fact of the matter was that there was no viable British built aircraft that could be used on the new transatlantic market. BOAC also did a deal with SAS (Scandinavian Airlines) to purchase four Stratocruisers that had been ordered by SILA. BOAC G-AKGH Caledonia was configured with 40 seats for the 'Monarch' service introduced in early 1950. Caledonia had a rear galley, round upper deck windows and square lower deck windows. In August 1958 Caledonia was sold to Transocean Airlines and was re-registered as N137A.



## American Overseas Airlines N90947



AOA placed an order for ten B-377 Stratocruisers on 1 April 1946 making it the third Stratocruiser customer. AOA was a well-established challenger to Pan American and TWA on the transatlantic routes. AOA holds the distinction of making the first commercial transatlantic flight from the US to Britain. The AOA 377-10-29 Stratocruisers had round upper deck windows, square lower deck windows and Curtiss Electric propellers. On 25 September 1950 AOA was taken over by Pan American and its Stratocruisers were absorbed into the Pan American fleet. Flagship Denmark (N90947) was used by AOA from mid-1949 until September 1950 when it was incorporated into the Pan American fleet. It was later sold to the Israeli Defense Force Air Force (IDF/AF) for conversion to a freighter.

## Northwest Airlines N74603

In March 1946 Northwest Airlines placed an order for ten Model 377-10-30 Stratocruisers. Northwest Stratocruisers had square cabin windows and Hamilton Standard propellers and flew commercial services in the mainland United States and to destinations across the Pacific. Stratocruiser New York N74603 was the third aircraft off the production line from the NWA order. Northwest Airlines operated Stratocruisers until the 15th September 1960. Stratocruiser New York was sold to Aero Spacelines for use in Guppy conversions.



## Aero Spacelines N1024 “Pregnant Guppy”



This unique aircraft is a modification of the Boeing 377. The aircraft, a former passenger liner with Pan-Am, was stripped of all non-essential systems, including the pressurization system. The fuselage was lengthened by 16 feet, 8 inches and a third “bubble” of 18 feet, 6 inches in diameter was added to the upper fuselage structure. The plane was modified so that the entire rear fuselage and tail could be unbolted and carted away from the forward section, to allow for easy loading of the Saturn V S-IVB booster. The plane flew much as a normal Boeing 377, with the exception of some additional drag. Otherwise, the procedures and characteristics are the same as the standard Stratocruiser.

## Air to Air Flagship, “Captain of the Ship”

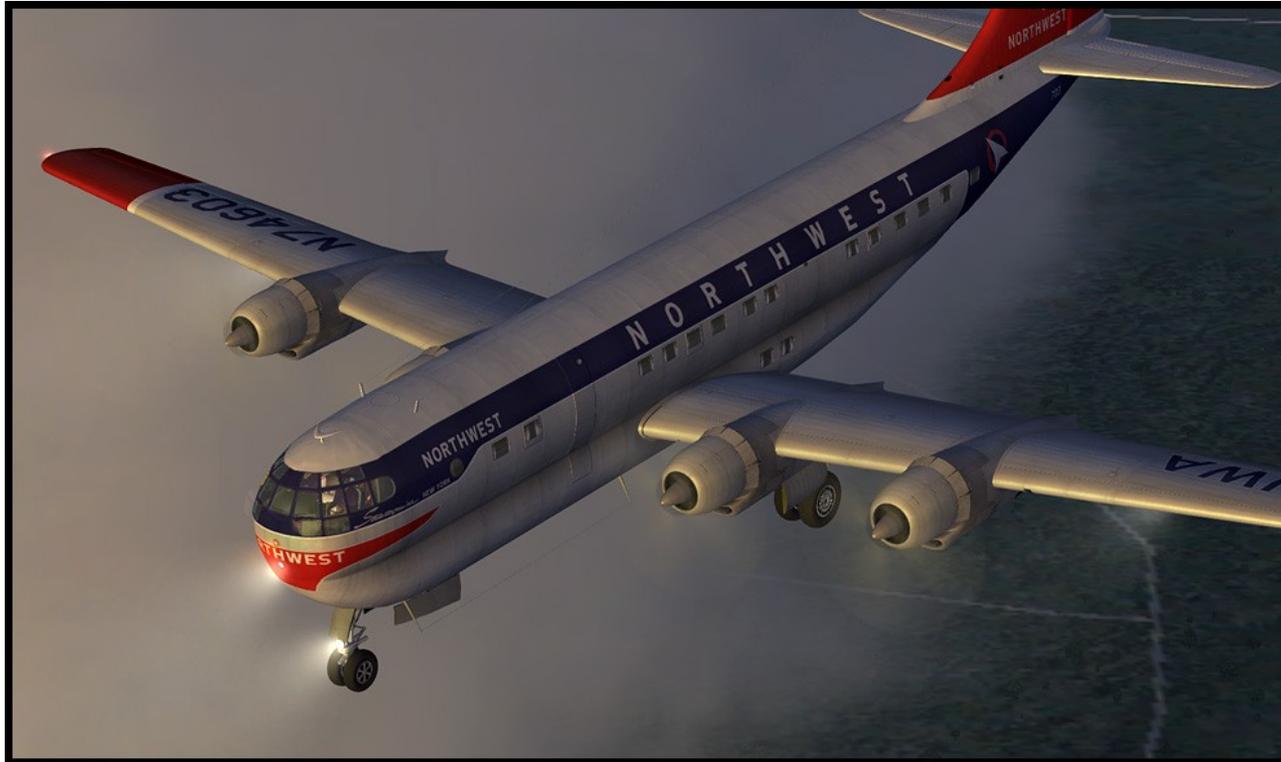
This new livery comes with the new Captain of the Ship Accu-Sim expansion pack, and represents a re-taking of the A2A crown.

With a naturally speaking and active crew, a deep intelligence module monitoring hundreds of operations during the flight, and a persistent captain's career makes this an engaging and immersive package.

The philosophy of our work is you learn the most when you are having fun, and when things work as they should, that IS fun for the true aviator.



## Chapter 4: General Description



The Boeing Stratocruiser is a double-deck, four-engine, medium to long range, high altitude, high speed, commercial transport airplane. The airplane is designed for a gross weight of 147,000 pounds, a high speed of approximately 305 knots, a service ceiling of 34,000 feet and a maximum range of approximately 4,000 miles.

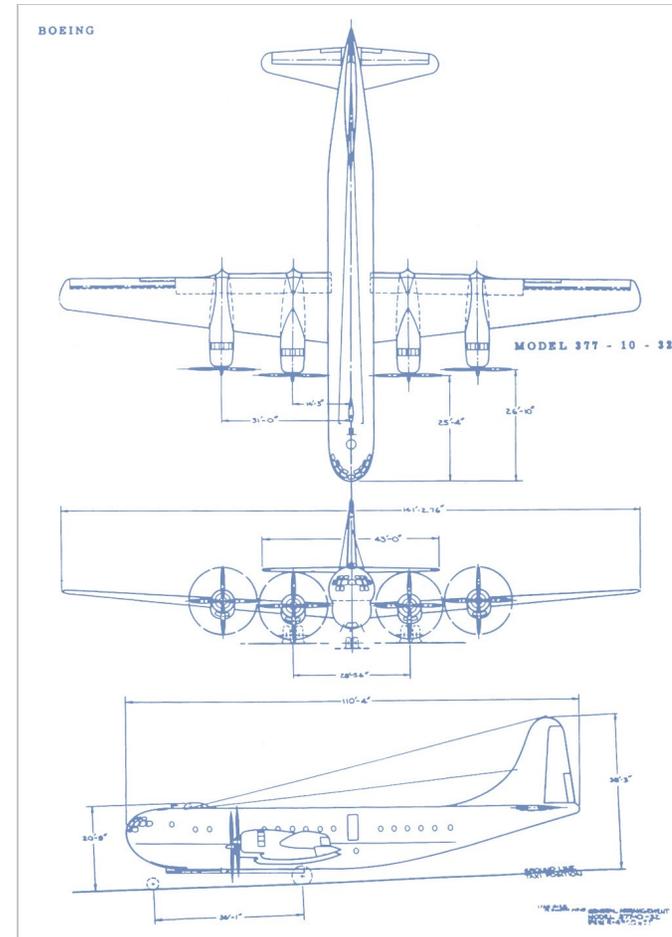
Wings span is 141 feet with a total wing area of 1769 square feet. The airplane is 110 feet long, 20.5 feet high at the nose and 38 feet high at the tail.

The normal crew consists of a pilot, copilot, radio operator/navigator, flight engineer and attendants for the passenger compartments.

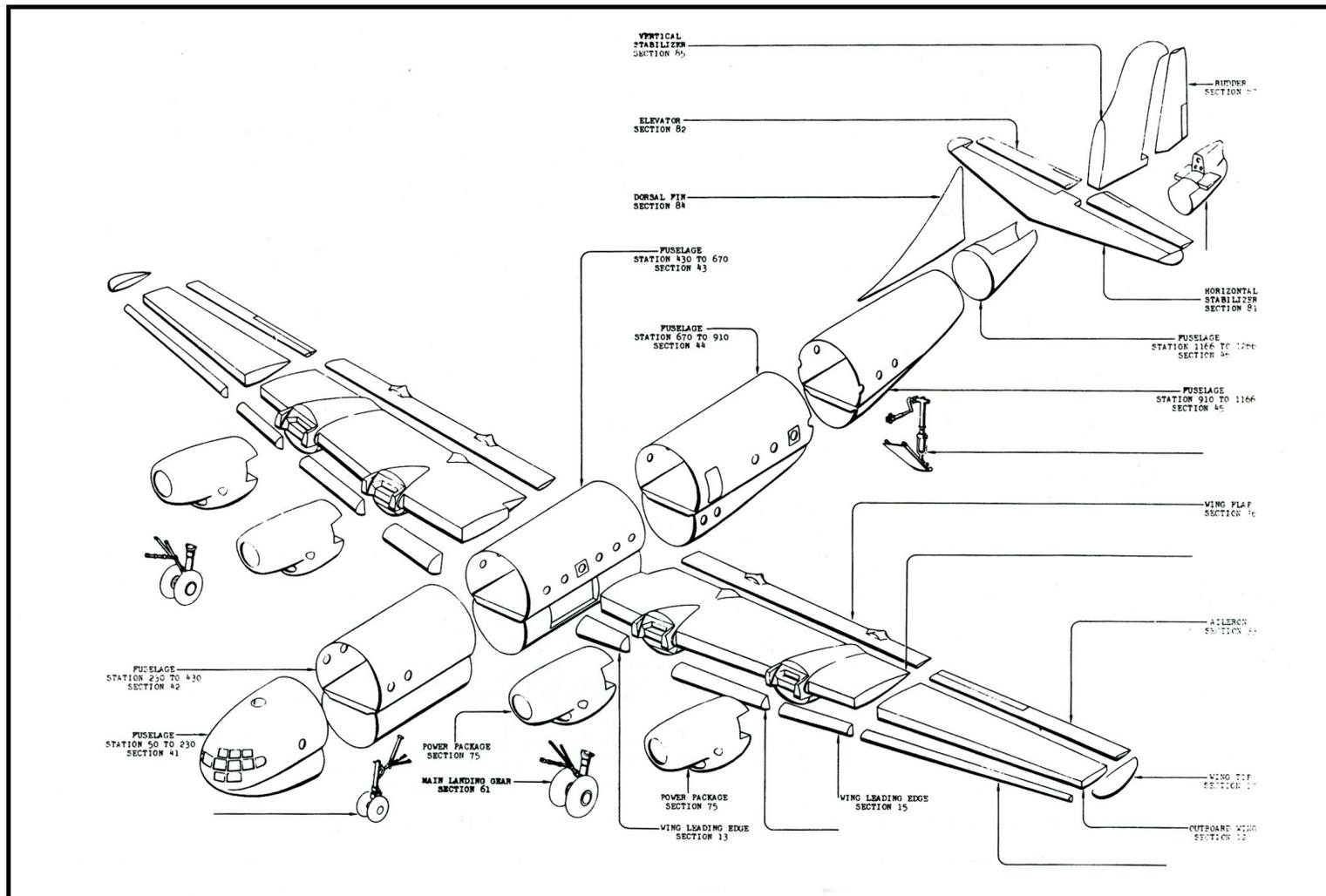
The crew compartment, main cabin, lounge, and both cargo compartments are pressurized and completely air-conditioned, both in flight and on the ground.

## Model 377 Specifications

Wing Span	141 feet, 3 inches
Length	110 feet, 4 inches
Height	38 feet, 3 inches
Powerplant	4 X 3,500 horsepower (takeoff rating with water injection) Pratt & Whitney R-4360 engines equipped with General Electric BH-4 turbo superchargers
Weights	83,500 lbs operating weight 147,000 lbs gross weight
Service Ceiling	33,000 feet at 110,000 lbs gross weight
Speed	300-340 mph cruising at 25,000 feet
Maximum Range	4,600 miles (no wind, no fuel reserves, 10,500 lb. payload)

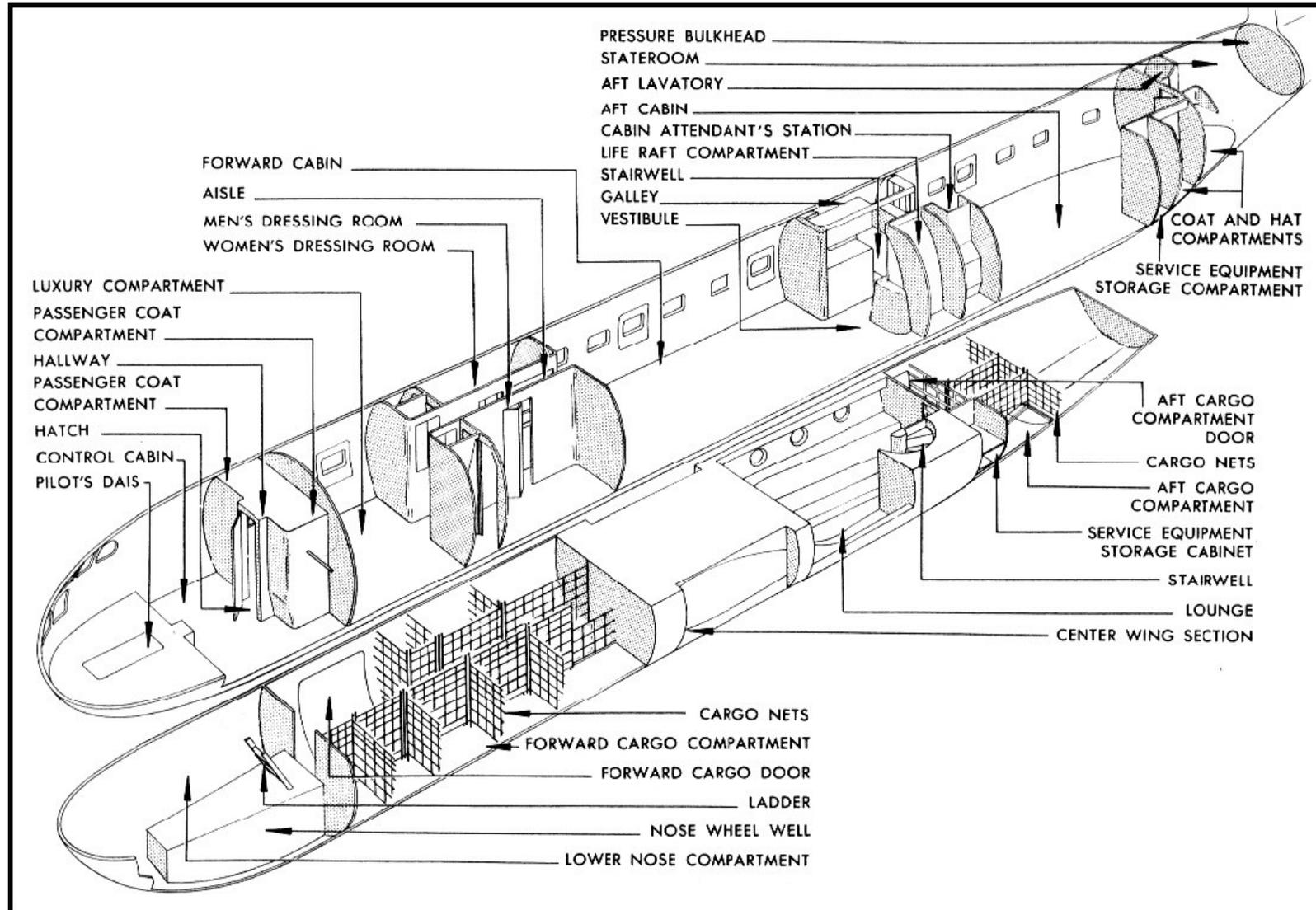


# Structural Breakdown



## Compartment Diagram

(NOTE: Interior and exterior design may differ slightly depending on model)



# Control Cabin



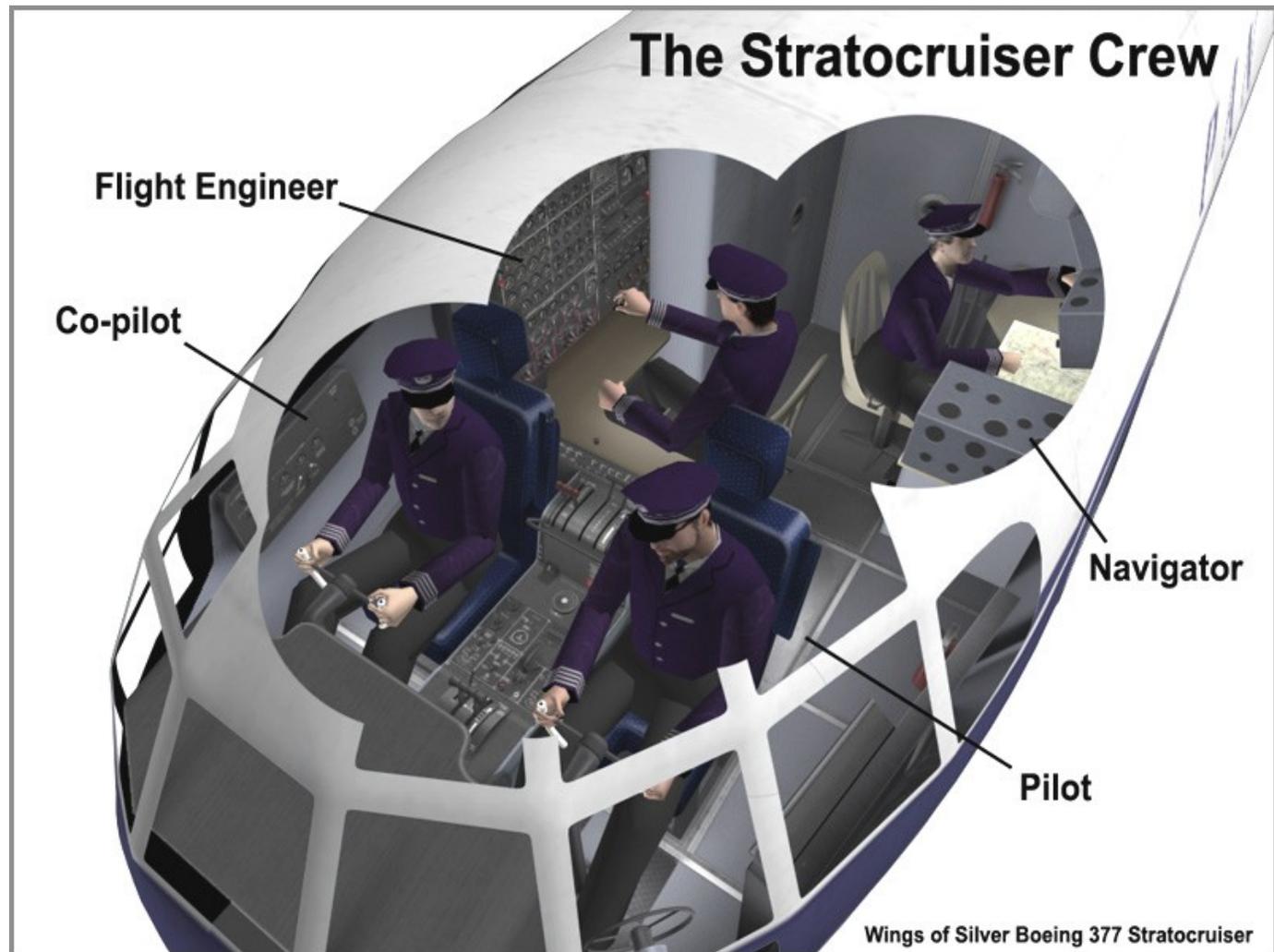
## Chapter 5: Crew Stations

**THE PILOT'S STATION** consists of a forward instrument panel with primary flight instruments, an overhead panel, center console, and a lower-left auxiliary panel.

**THE CO-PILOT'S STATION** shares the forward instrument panel, overhead panel, and center console. Additionally, the co-pilot has an auxiliary panel on the lower right.

**THE ENGINEER'S STATION** consists of the main engineering panel with shared access to the engine starting controls in the upper center console and shared access to mixture, propeller, and throttle controls in the center console.

**THE NAVIGATOR'S STATION** consists of a table with maps, a window, and primary navigation instrumentation.

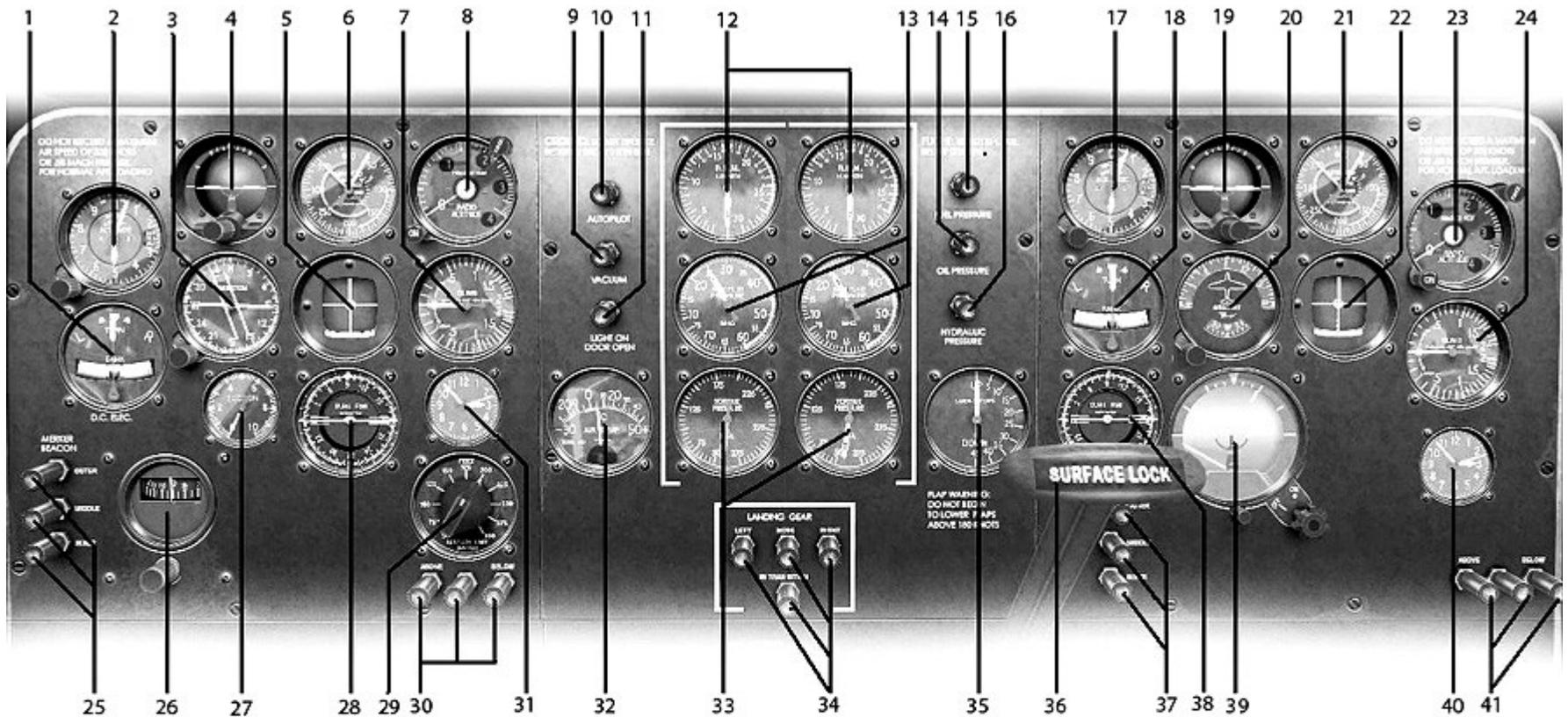


## Pilot's Station



**THE PILOT'S STATION** consists of a forward instrument panel with primary flight instruments, an overhead panel, center console, and a lower-left auxiliary panel.

## Pilot's Instrument Panel

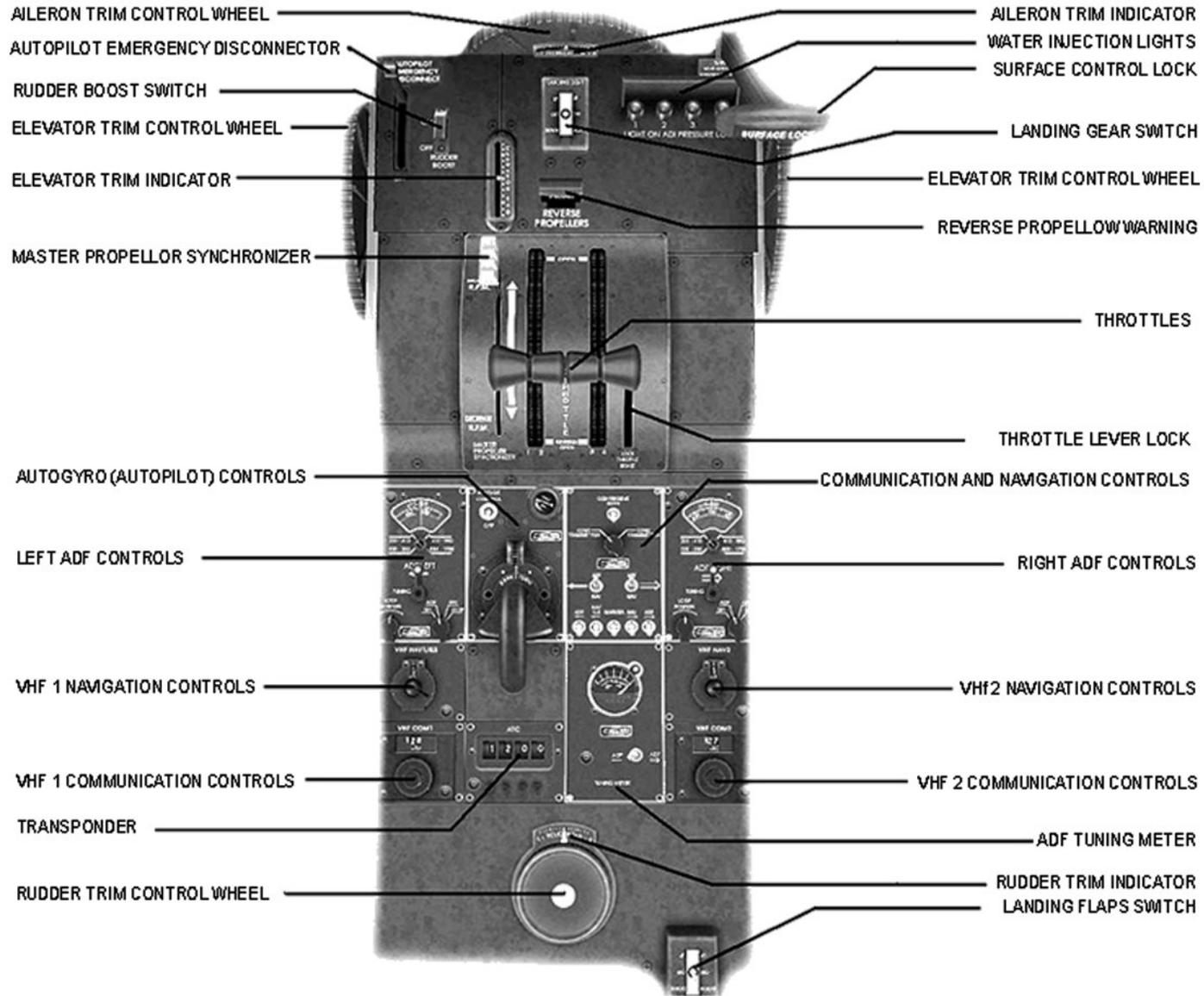


1. TURN AND BANK INDICATOR
2. ALTIMETER
3. COMPASS REPEATER
4. ATTITUDE INDICATOR
5. INSTRUMENT LANDING INDICATOR
6. AIRSPEED INDICATOR
7. VERTICAL SPEED INDICATOR
8. RADIO ALTITUDE INDICATOR
9. SUCTION WARNING LIGHT
10. AUTOPILOT LIGHT
11. OPEN DOOR WARNING LIGHT
12. TACHOMETER
13. MANIFOLD PRESSURE INDICATOR
14. OIL PRESSURE WARNING LIGHT
15. FUEL PRESSURE WARNING LIGHT

16. HYDRAULIC PRESSURE WARNING LIGHT
17. ALTIMETER
18. TURN AND BANK INDICATOR
19. ATTITUDE INDICATOR
20. HEADING INDICATOR
21. AIRSPEED INDICATOR
22. INSTRUMENT LANDING INDICATOR
23. RADIO ALTITUDE INDICATOR
24. VERTICAL SPEED INDICATOR
25. MARKER BEACON LIGHTS
26. HEADING INDICATOR
27. SUCTION INDICATOR
28. DUAL RMI INDICATOR
29. ALTITUDE SELECTOR
30. ALTITUDE SELECTOR INDICATORS

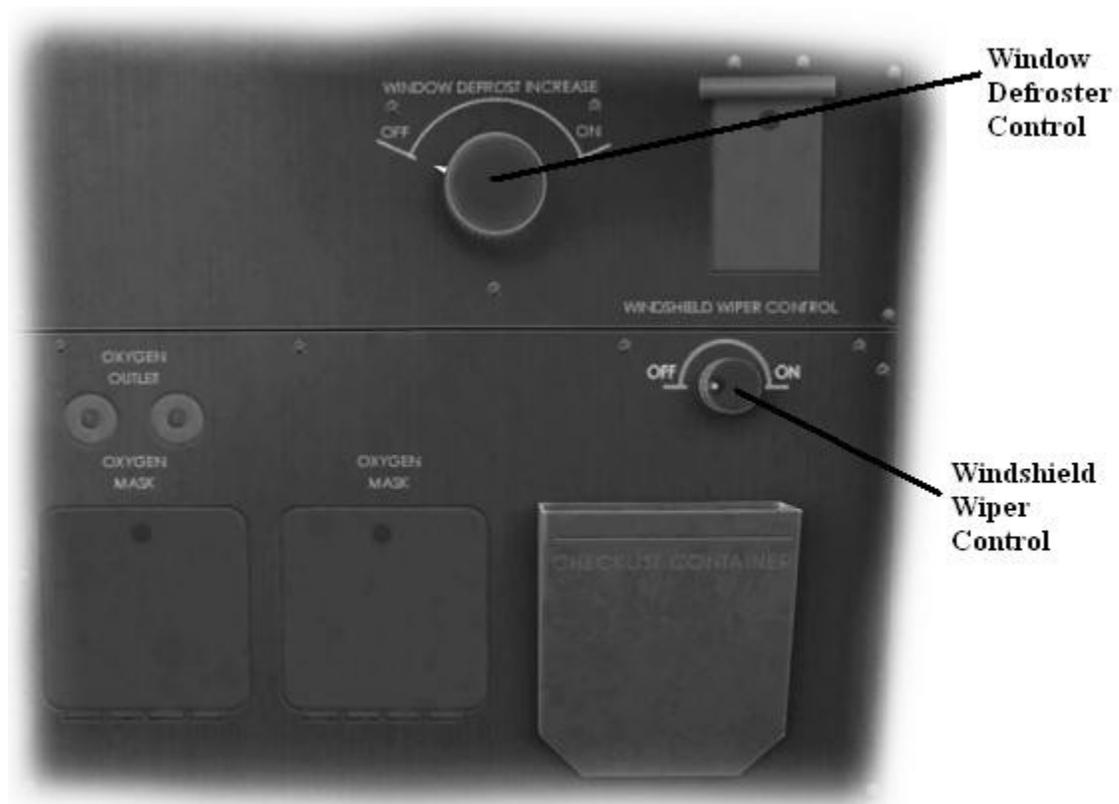
31. CLOCK
32. OUTSIDE AIR TEMP INDICATOR
33. TORQUE PRESSURE INDICATORS
34. LANDING GEAR LIGHT INDICATORS
35. LANDING FLAP INDICATOR
36. SURFACE CONTROL LOCK
37. MARKER BEACON LIGHTS
38. DUAL RMI INDICATOR
39. ATTITUDE INDICATOR
40. CLOCK
41. ALTITUDE SELECTOR INDICATORS

# Center Console





**Pilot's Auxiliary Console (left)**



## **Flight Controls**

### **Surface Controls**

The surface controls are conventional except for the left elevator trim tab. The rudder controls have a hydraulic boost.

### **Control Surface Lock**

The control-surface lock handle is on the forward end of the engine control stand. When the lock handle is in the locked position the ailerons and rudder are in a neutral position and the elevators are in the down position. The aircraft must be on the ground and the control stick pushed fully forward to engage the surface control lock. The control surface locking pins are spring loaded to the unlocked position to prevent accidental locking of the controls.

### **Trim Tabs**

The aileron tabs are conventional. The elevator trim control operates the left elevator trim tab only. The right elevator trim tab is actuated by the flaps. As the flaps are lowered, the trim tab is raised, thus giving a tail high moment to maintain stability. The rudder trim is conventional. Trim controls are on the engine control stand.

### **Rudder Boost**

The airplane is equipped with a hydraulic rudder-boost system to aid in rudder control. When the control surface lock is unlocked the system is in operation. A guarded OFF--ON switch on the engine control stand is used to shut off the system in an emergency and during automatic pilot operation.

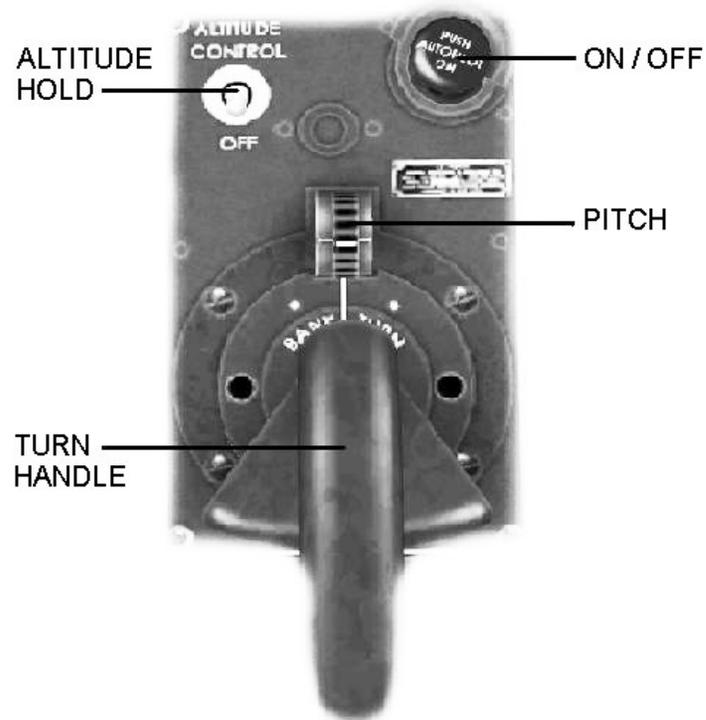
### **Wing Flap Controls**

The flaps are electrically operated by an UP--OFF--DOWN switch on the engine control stand. The switch is spring-loaded to OFF. A flap position indicator is on the instrument panel. A warning sound will be heard on take off if the flaps are not positioned between 20 and 30 degrees when the throttles are three-fourths or more open. Extending the flaps raises the right elevator trim tab proportionally to correct the nose up pitching condition normally caused by lowering the flaps. When the flaps are fully extended the trim tab is fully raised.

## Automatic Pilot

**AUTOMATIC PILOT:** The Eclipse-Pioneer PB-10 automatic pilot is a simple and intuitive device. You turn the handle in the direction you want the aircraft to go, use the scroll knob for pitch, and can switch on altitude hold at any time. There is also an autopilot indicator on the pilot's instrument panel to show you when the auto pilot is turned on. It is recommended that you use the auto pilot to help make climbing, cruising, and descending smoother and easier.

The autopilot has the following features: magnetic directional control of the airplane course, coordinated rudder and aileron turns, climbs and dives, automatic pressure altitude control, positive gentle flight corrections in all weather, and safety interlocks to prevent faulty manual operation of the control.



### Controller

The autopilot controller is a central control unit which reduces the operation of maneuvering the airplane to the manipulation of a knob and a turn handle.

### Turn Handle

The turn handle gives rudder and aileron coordinated turns with enough elevator to maintain altitude. A detent marks the neutral position of the handle. The amount of handle displacement determines the bank angle and rate of turn.

### Pitch

The pitch knob (pitch reference) controls the elevators for climb or dive. Forward rotation from the neutral position results in dive and aft rotation results in climb. The angle of climb or dive is proportional to the knob rotation, but maximum angle is 18 degrees in either direction.

### **On / Off (Clutch Switch)**

The clutch switch is forward of the controller on the engine control stand. The automatic pilot is engaged by pressing the clutch switch. This operates a clutch in each of the servos and in the master direction indicator. After engaging, the PB-10 will keep the airplane in the attitude and heading which it had the instant the switch was pressed. As a safety factor, interlocks prevent the autopilot from being engaged if engine power fails or if any other condition is present that would produce malfunctioning of the automatic control.

### **Altitude Control Switch**

The altitude control switch controls a barometric unit which automatically controls the elevators to maintain the pressure altitude being flown when the switch is turned ON. The altitude control switch is always ready for operation; it is not necessary to center the trim knobs or fly straight and level before moving the switch to ON. The elevator trim should be checked occasionally to prevent excessive servo operation.

### **Autopilot Indicator**

This lamp illuminates when the autopilot clutch switch is engaged. If the clutch or servo disconnect lever is disengaged the light will turn off.

### **Autopilot Emergency Indicator**

This lever, on the forward end of the engine control stand, operates the servo disconnects which mechanically disengage the autopilot from the airplane control surfaces. These clutches (servo disconnects) completely disengage the servo pulleys from the servo drive shaft so that the pulleys are free to turn with control cable movement.

## **Water Injection System (ADI)**

The water injection, known as **ADI** (Anti-Detonation Injection), system has two 30-gallon supply tanks; each tank supplies the two engines on its side of the airplane. The supply has duration capable of approximately 8 minutes at full takeoff power. An ON--OFF pump switch, four ADI override switches, and four pressure lights are on the forward end of the engine control stand. An ADI quantity indicator is on the forward overhead panel.

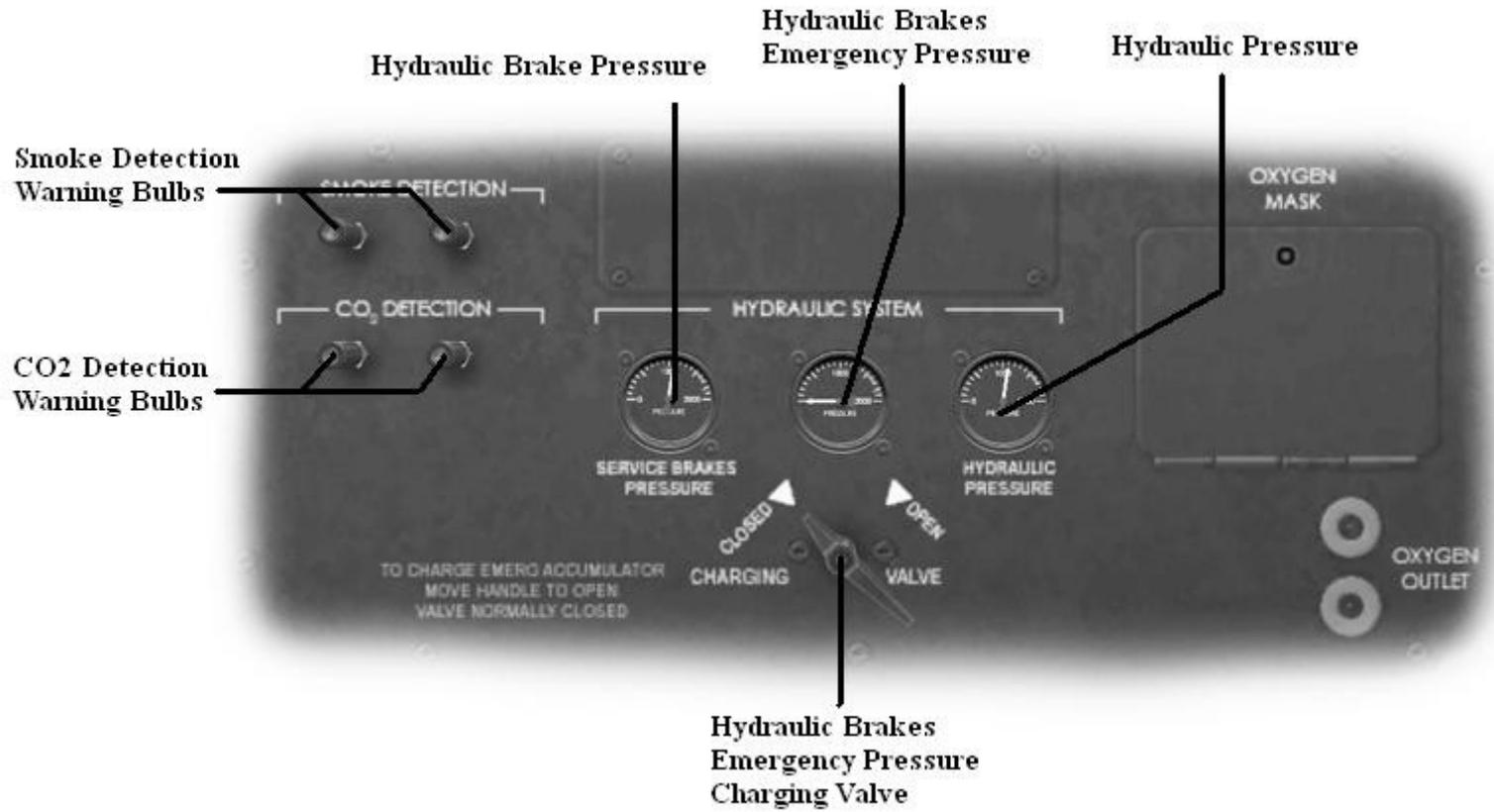
**WATER INJECTION SYSTEM CONTROLS.** An ADI PUMP switch, on the forward overhead panel controls water injection pumps which supply water under pressure to the ADI shutoff valves. When the four ADI VALVE switches, on the engine control stand, are placed in the AUTO position, the shutoff valves are automatically controlled by a manifold pressure switch on each engine. The manifold pressure switches automatically open the shutoff valves when the throttles are advanced to 45 inches of MAP or above. Water is then supplied to the water regulators, carburetor de-enrichment valves, water pressure switches (indicator lights), and subsequently into the engines. The manifold pressure switches automatically close the ADI valves when the manifold pressure is reduced to approximately 41 inches of MAP. The OPEN position of the ADI VALVE switches provides a means of manually opening the shutoff valves in the event of manifold pressure switch malfunction. Four water pressure lights on the engine control stand illuminate when the pumps are turned on and will go out when sufficient water pressure is in the line between the regulator and the engine. Four CLOSE ADI VALVE switches on the fire control panel shut off the fluid flow when placed in the FIRE position.

## Co-Pilot's Station



**THE CO-PILOT'S STATION** shares the forward instrument panel, overhead panel, and center console. Additionally, the co-pilot has an auxiliary panel on the lower right.

**Co-Pilot's Auxiliary Console (right)**



## Engineer's Station



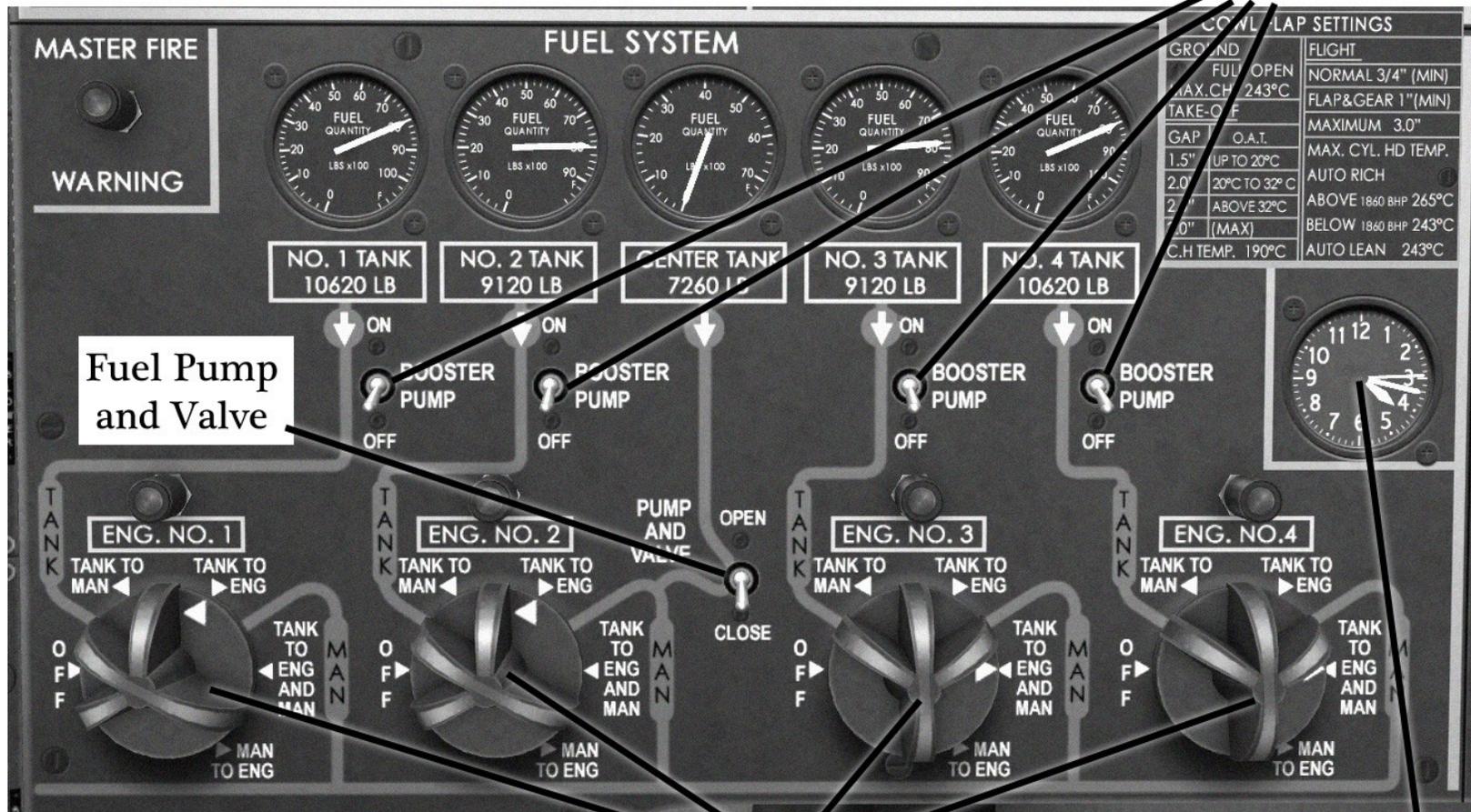
**ENGINE INSTRUMENTS.** The engine instruments on the engineer instrument panel consist of four torque-meters, tachometers, manifold pressure, cylinder head temperature, fuel flow, fuel pressure, oil pressure, oil temperature, and carburetor air temperature. Four indicating turbo bearing temperature and two dual-indicating exhaust back-pressure indicators are mounted in the turbo bearing temperature alarm panel on the engineer instrument panel.

Engineer's Panel (lower)

Master Fire  
Warning

Fuel Quantity

Booster  
Pumps

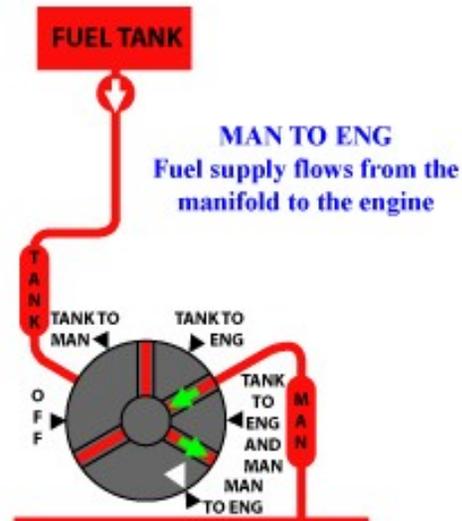
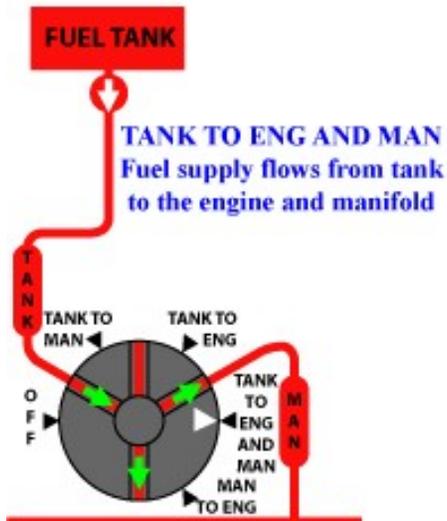
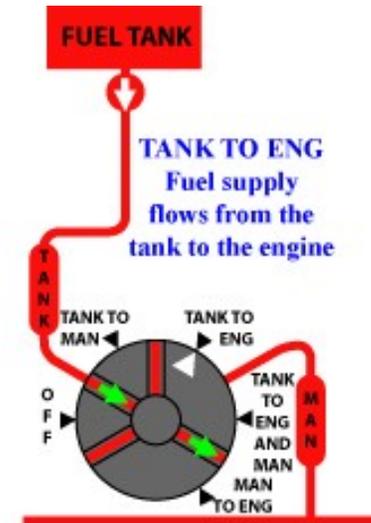


Fuel Pump  
and Valve

Fuel Selectors and Warning Lights

Clock

## Fuel Flow Diagrams



### NOTE

When using CTRL+E to start the engines the fuel selectors will default to 'TANK TO ENG AND MAN' as a safety feature.

When manually starting the engines it is recommended that you use the 'TANK TO ENG' position.

To feed from the central tank to the manifold ensure the pump and valve switch is set to OPEN.

Engineer's Panel (center)

Low Fuel Pressure Indicators

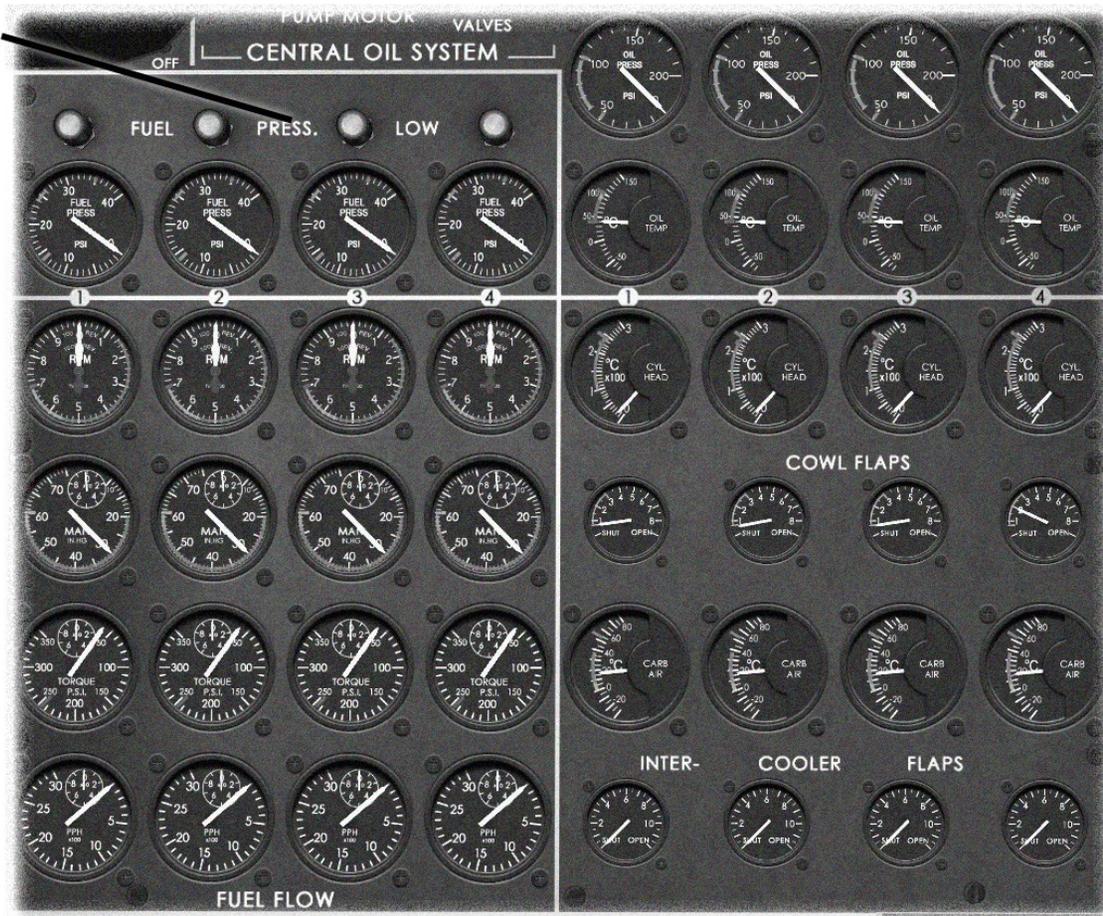
Fuel Pressure

Engine R.P.M.

Manifold Pressure

Engine Torque

Fuel Flow



Oil Pressure

Oil Temp

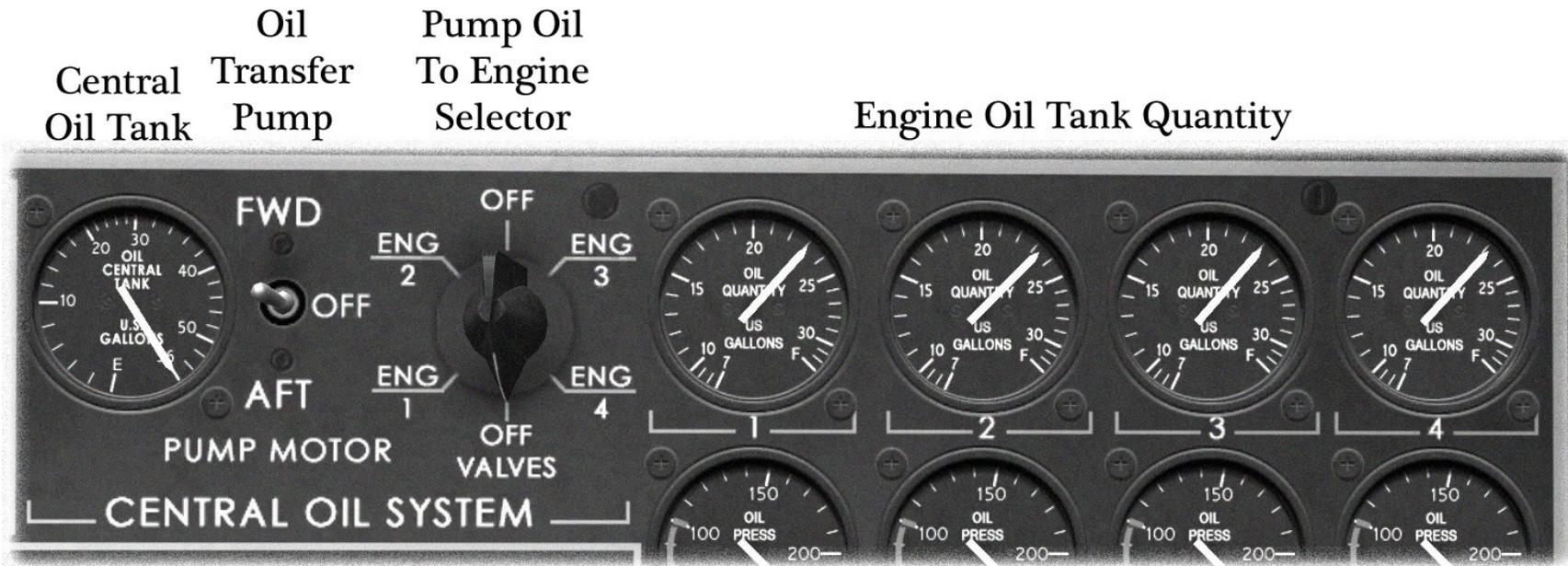
Cylinder Head Temp

Cowl Flaps

Carburetor Air Temp

Intercooler Flaps

## Engineer's Panel (upper center)



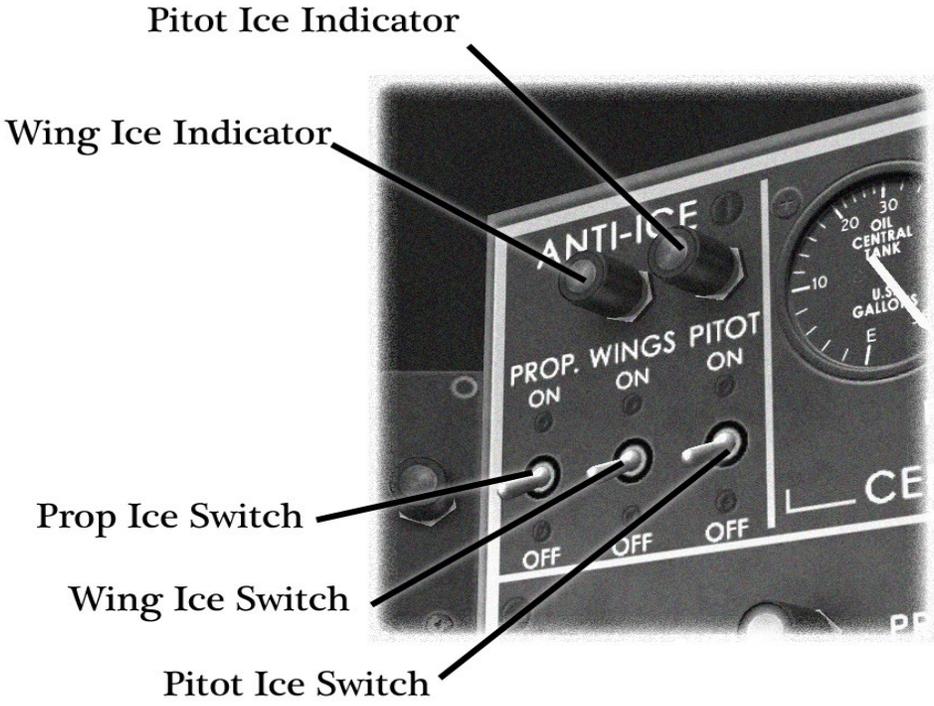
### Central Oil System

The 'Central Oil System' is used to transfer oil from the central tank to the engines.

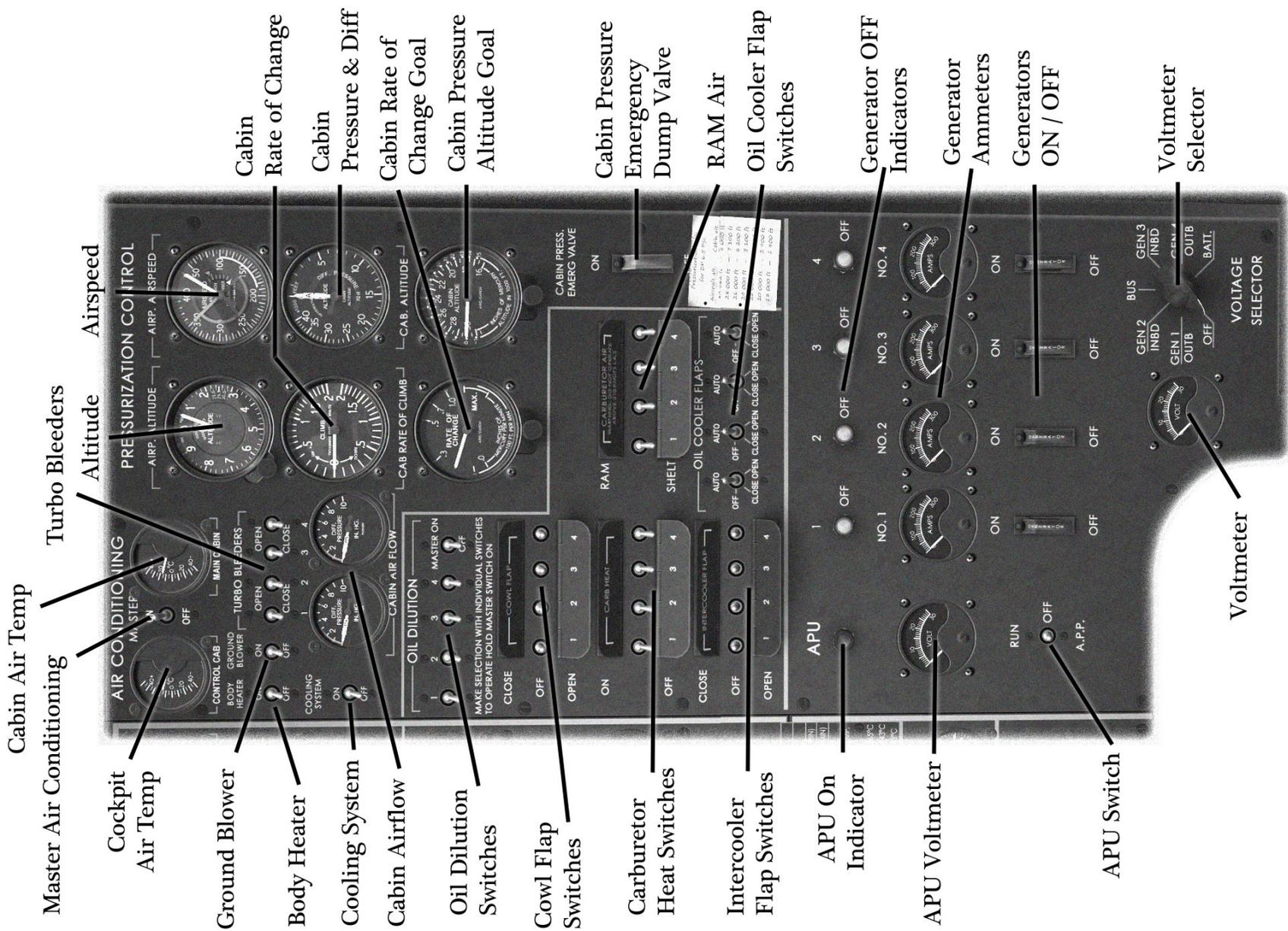
To transfer oil from the central tank to an engine select the required engine using the selector knob and then click and drag the pump motor switch to the '**FWD**' position. Watch the respective gauge(s) and release the switch when you have transferred the required amount of oil. The switch is spring loaded and will return to the 'OFF' position.

The engines will lose oil over time and a serious drop in engine oil level will cause damage with Accu-Sim set to 'ON'. If the oil level in any of the engines goes below it's critical level of 10 gallons, one gallon will be immediately transferred from the central tank to that engine. The Flight Engineer will announce an engine oil shortage when the level in the engine reaches 13 gallons.

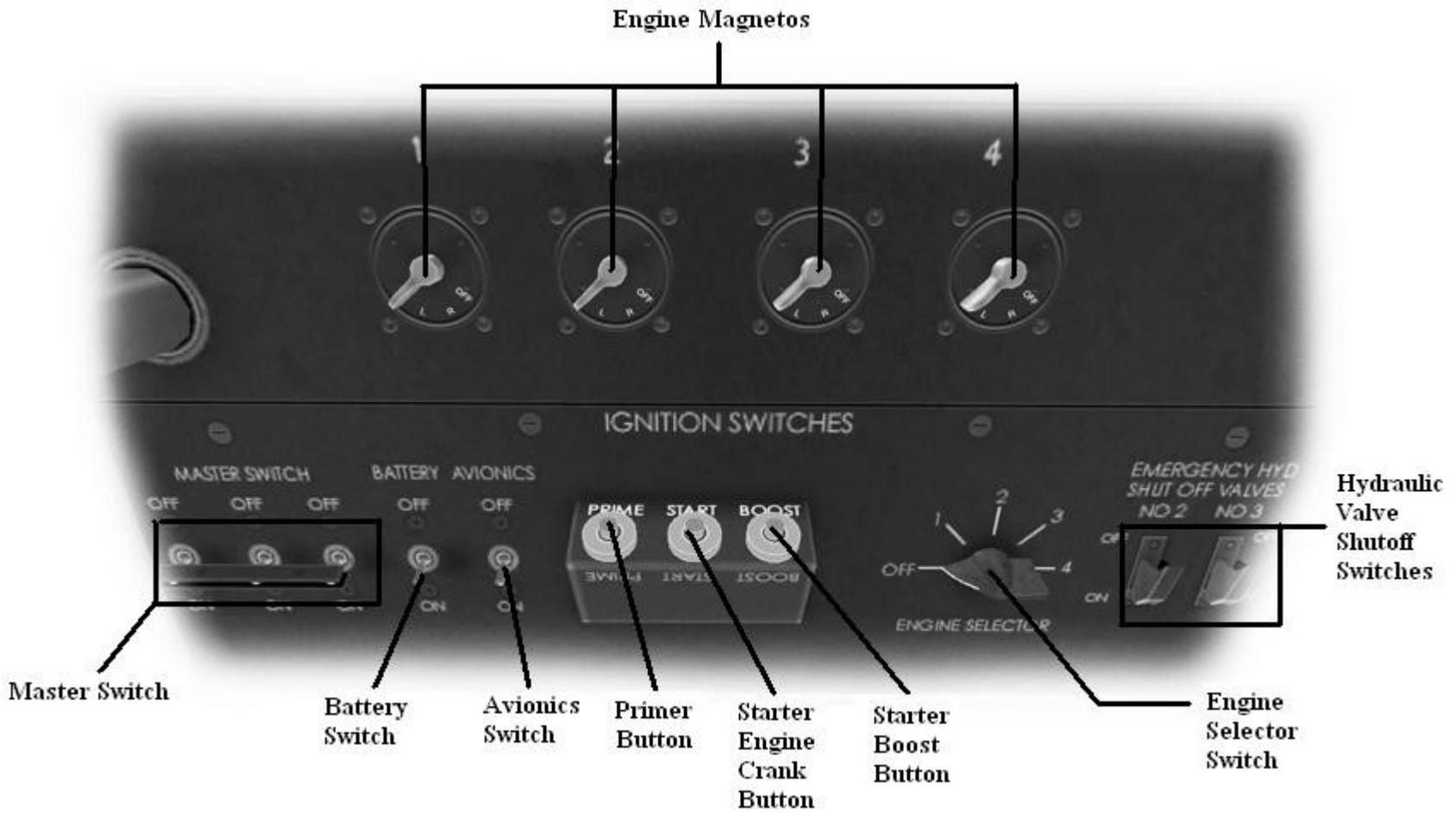
Engineer's Panel (upper left)



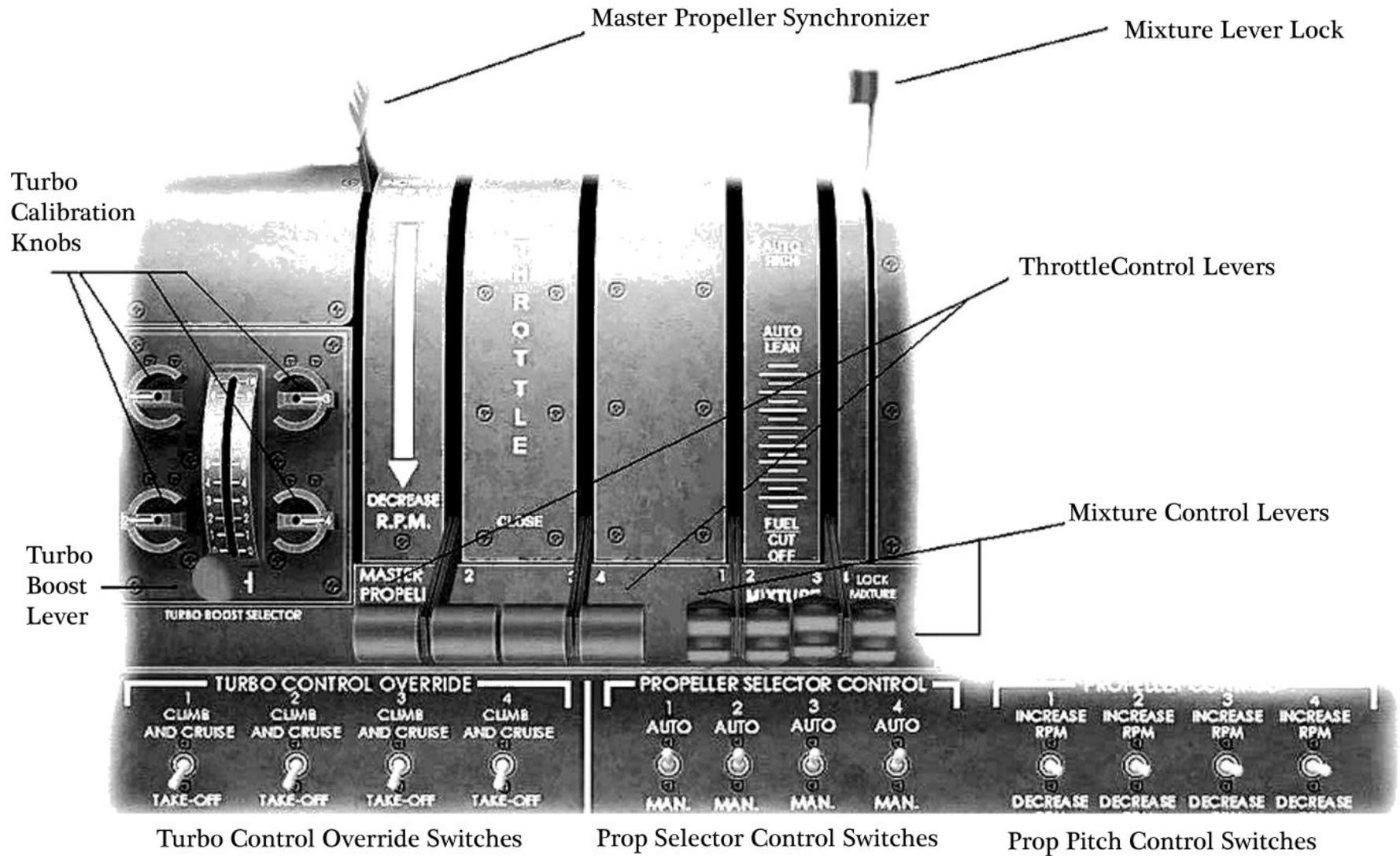
Engineer's Panel (right)



# Upper Console



# Center Console



## **Throttles**

Four throttle levers are installed on the engine control stand. The throttles control engine power for both forward and reverse thrust. Three positions are marked on the throttle quadrant: OPEN, CLOSED, and REVERSE OPEN. Movement of the throttles from CLOSED to OPEN is conventional. Movement of the throttles from CLOSED to REVERSE OPEN, for reverse thrust, is accomplished by raising the throttle levers over the stops and then moving them aft toward REVERSE OPEN. Continued aft movement of the throttles toward REVERSE OPEN increases reverse thrust power. Forward movement of the throttles past the stops toward the OPEN position will return the propellers to normal pitch.

It is not possible to move the throttles to the REVERSE OPEN position while in flight, because of a solenoid-operated catch which stops the throttles at the CLOSED position. The catch releases when any one of the landing gears contacts the ground; therefore, reverse pitch is possible immediately upon landing. A throttle friction brake is at the right of the throttles.

## **Mixture Controls**

Four mixture controls are on the aft end of the control stand. The mixture controls feature five distinct positions: FUEL CUTOFF--AUTO LEAN--AUTO RICH and intermediate positions (exactly the same as the real aircraft, and provide the same change in fuel/air ratio as the real aircraft). Placing a lever in FUEL CUTOFF shuts off fuel flow at the carburetor. The AUTO LEAN and AUTO RICH carburetor mixture settings are obtained by placing the mixture levers in the appropriate detent position.

The fuel/air ratios set by the mixture control were derived through many hours of careful testing after consulting the actual aircraft engine performance charts. These ranges very carefully duplicate the fuel flows and engine powers of the real aircraft. In all cases and at all power settings as specified in the actual manual, the Wings of Silver Stratocruiser will reproduce virtually identical real-world powers and fuel flows using the same mixture, RPM, and torque pressure values specified in the aircraft manual. Thus, as with other Wings of Power and A2A aircraft, the actual aircraft manual can be used for flight planning.

## **Propeller Controls**

The propeller controls consist of the master synchronizer lever, four propeller selector levers, the auto-feathering system, and the reverse pitch throttle lock on the engine control stand. Two dual-indicating tachometers are on the pilot's instrument panel. See the PROPELLORS section below for more detail.

## **Manifold Pressure Gauges**

Four manifold pressure gauges are on both the pilot's and engineer's instrument panel. These gauges represent the air pressure being fed to the carburetor, and give indication of the amount of power being produced. The manifold pressure gauges give a direct reading of manifold pressure in inches of Hg.

## **Torquemeters**

The torque meter was introduced to complex piston engine aircraft shortly after World War II. Four individual torquemeters are on both the pilot's and the engineer's instrumentation panels. They indicate torque pressure in psi and are used as a direct means of measuring the twisting force the engine is outputting. Keep in mind that total torque does not equal total engine power output (horsepower). However, horsepower is directly created when you combine torque and engine RPM.

However, the torque reading, and not the manifold pressure, is the final value to be used in setting power. All manifold pressure (boost pressure) values are therefore approximate and should be used to set initial power. Then, fine-tune your engines so that the torque value is as specified in the power chart provided in the checklists in this manual.

If you have a copy of the actual B377 flight manual, you will find that the torque values specified in the engine power schedule produce precisely the same horsepower in the Wings of Silver Stratocruiser as specified in the actual manual when engine RPM and torque settings are followed. For example, the manual calls for 3500 HP at 2700 RPM when the engine is at 247 PSI of torque at 60" of manifold pressure (boost pressure). The shaft horsepower of the A2A B377 is 3500 HP with those power settings. This accuracy is completely consistent across the entire range of possible power settings for the R-4360 engines modeled in the Wings of Silver Stratocruiser, whether they are in manual lean at very low cruise power settings or at maximum climb power, or any setting in between.

A second example is in the 1200 HP maximum range cruise setting. The mixture control can be set to either AUTO RICH, AUTO LEAN, or to a manual lean setting as desired. The engine is set to 1450 RPM and the torque is set to 158 PSI. The engines will produce 1200 HP at this setting. The manifold pressures required to achieve the correct torque value will vary with the mixture setting and with altitude just as in the real aircraft.

The actual manifold pressures needed to achieve the rated powers will vary slightly from those specified as these are just approximate values and will vary with air temperature, relative humidity, and altitude.

### **Tachometers**

Four single-indicating engine tachometers are on both the pilot's and the engineer's instrumentation panels. The tachometers are generator motor units. Each tachometer generator is engine-driven and generates its own current which controls the indicator motor at a synchronized speed. The pilot's tachometers measure engine speeds in increments of 100 rpm and the engineer's tachometers measure engine speeds in increments of 20 rpm.

### **Cylinder Head Temperature Gauges**

Four cylinder head temperature gauges of the direct current type are on the engineer's instrument panel. The cylinder head temperature gauges are resistance bulb type units and indicate cylinder head temperature in degrees Centigrade.

### **Fuel Flow Meters**

Each engine has a fuel flowmeter, located on the engineer's instrument panel. The flowmeters show rate of fuel flow in hundreds of pounds per hour.

### **Fuel Pressure Gauges**

Four fuel pressure gauges on the engineer's instrument panel indicate fuel pressure in psi for each engine.

### **Fuel Low Pressure Warning Lights**

A fuel low pressure warning light adjacent to each fuel pressure gauge, illuminates when fuel pressure is low.

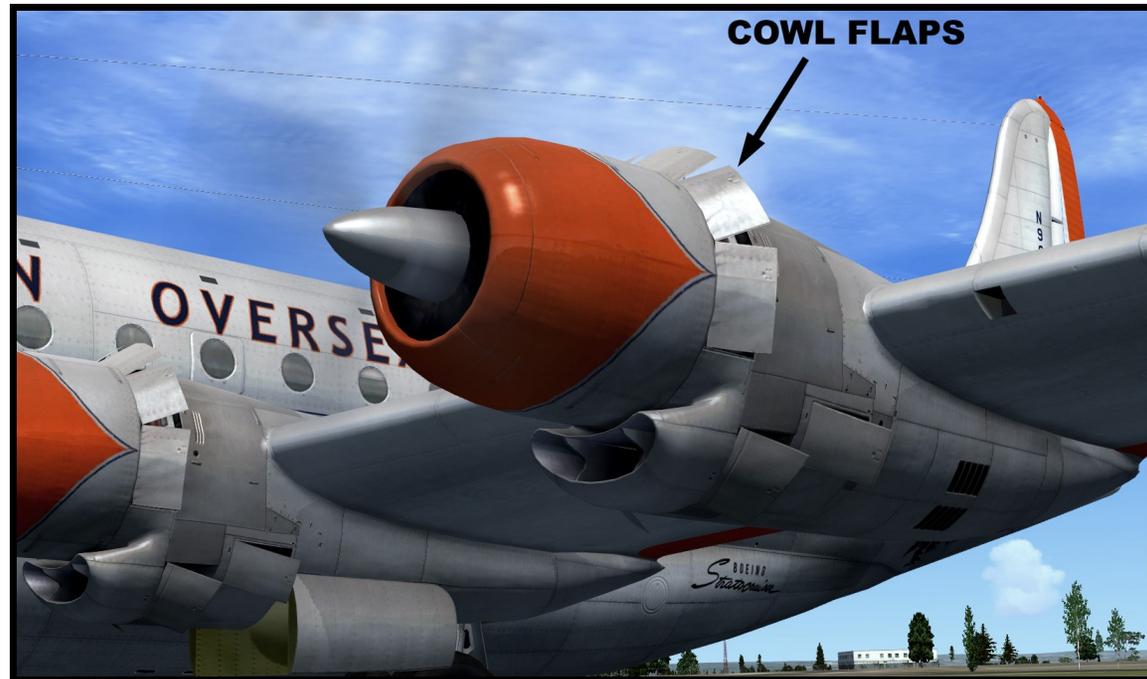
## Engine Cooling System

### Cowl Flaps

The flow of cooling air for each engine is controlled by two ground-adjustable and seven electrically operated, flight adjustable, cowl flaps. The cowl flaps are actuated by seven jackscrews driven by a single electric motor through a flexible drive shaft system.

### Cowl Flap Switches

Four cowl flap switches, one for each engine, are on the engineer's instrument panel. These switches electrically control the opening and closing of the cowl flaps. The switches have OPEN--OFF--CLOSE positions and are spring-loaded from the OPEN and CLOSE positions to the OFF position. Gang flappers permit simultaneous actuation of all four switches to either position. The cowl flaps will remain stationary when the switch is released to OFF.



### Cowl Flap Position Indicators

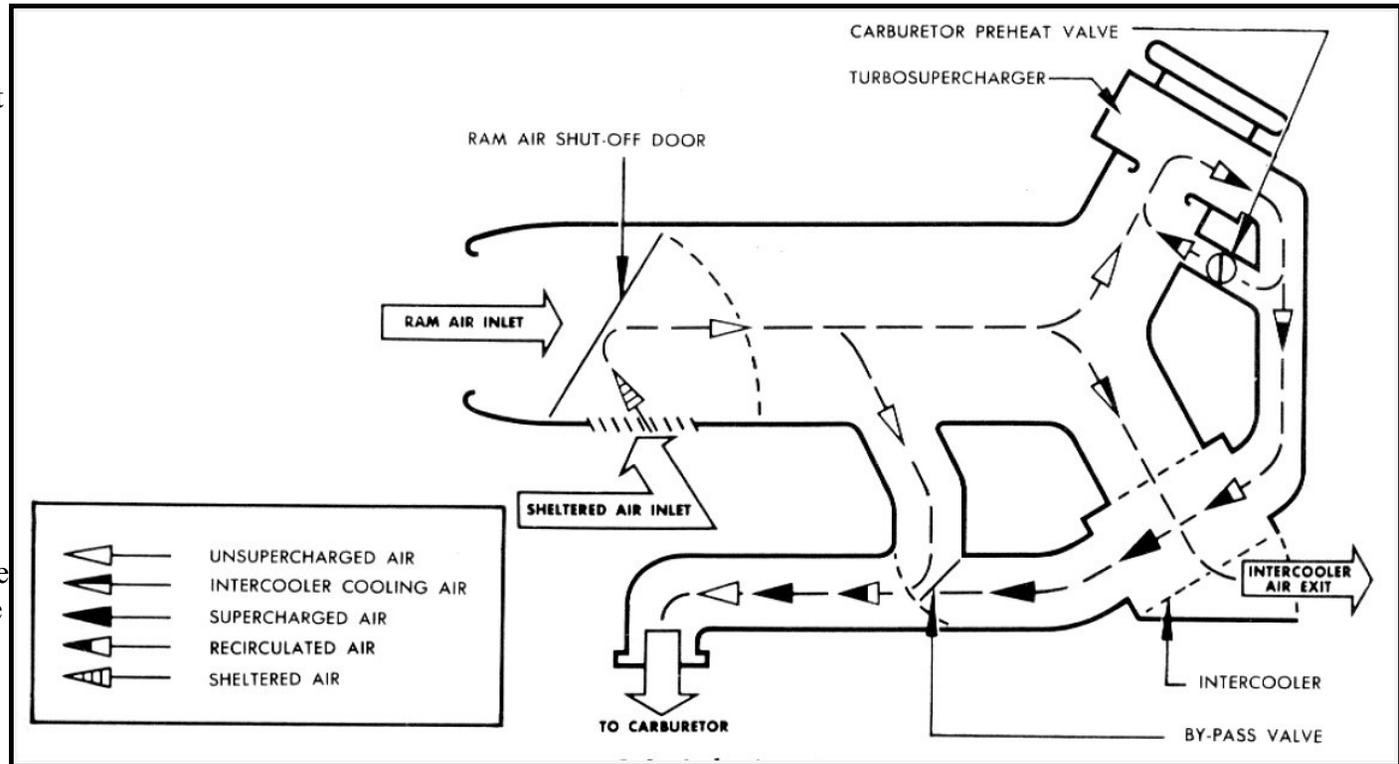
The position of the cowl flaps is indicated in inches of opening by four cowl flap position indicators on the engineer's instrument panel. The reading is taken from the flap screw driving mechanism.

## The Induction System

The induction system consists of an entry scoop, a sheltered air door and sheltered air inlet assembly, turbo-supercharger, intercooler, carburetor preheat valve, and connecting ducting. Either ram air or supercharged air may be supplied to the carburetor through a bypass door controlled by differential pressure. Supercharged carburetor air temperature is controlled by positioning of the carburetor preheat valve and intercooler flap. For details on turbo-supercharger and turbo-supercharger controls, see TURBO-SUPERCHARGERS Sections below.

### Carburetor Heat Controls

Four ON--OFF switches on the engineer's instrument panel control the carburetor preheat valves. A spring loaded gang switch simultaneously operates all four switches. Opening the valve allows recirculation of a portion of the pressurized air through the supercharger. The use of the valves must be in conjunction with carburetor air temperature and manifold pressure indicators. The supercharger must be operating before preheat is possible. Circuit breakers for the system are on the overhead electrical panel.

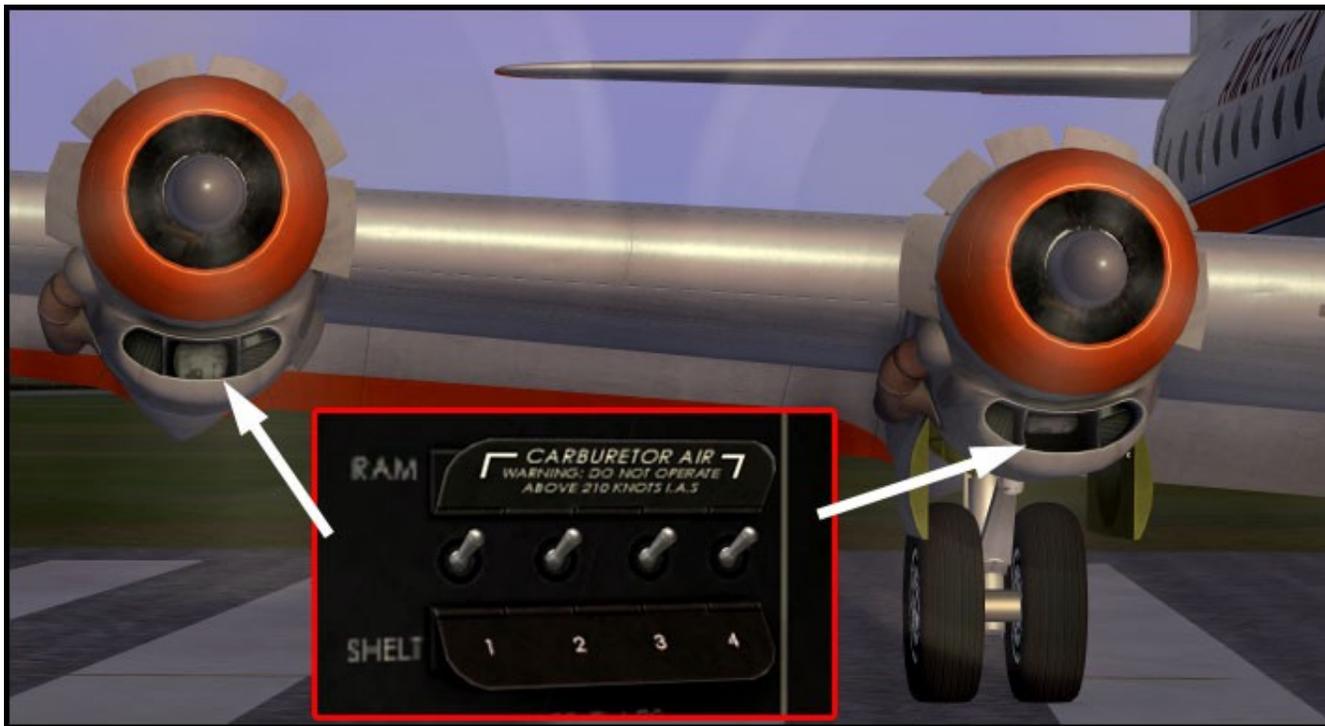


## Carburetor Air Controls

The RAM--SHELTERED switches, on the overhead instrument panel, control the ram air shutoff door. In the RAM position, air enters the air scoop and passes directly into the induction system. In the SHELTERED position, the shutoff door closes the air intake scoop and allows air to enter the induction system from the bottom of the air scoop. Moisture is partially eliminated from the carburetor air by this method. Four fire switches on the overhead electrical fire panel close the ram air door when the fire switches are placed in the FIRE position.

## Ram Air

Using RAM AIR ensures a nice flow of air into your engines and actually adds power when the aircraft is in flight. If RAM AIR is OFF, your turbo charger will have to work harder to produce the same power. If you are operating in icing conditions, you may want to turn your RAM AIR OFF at least until your CAT is in the green.

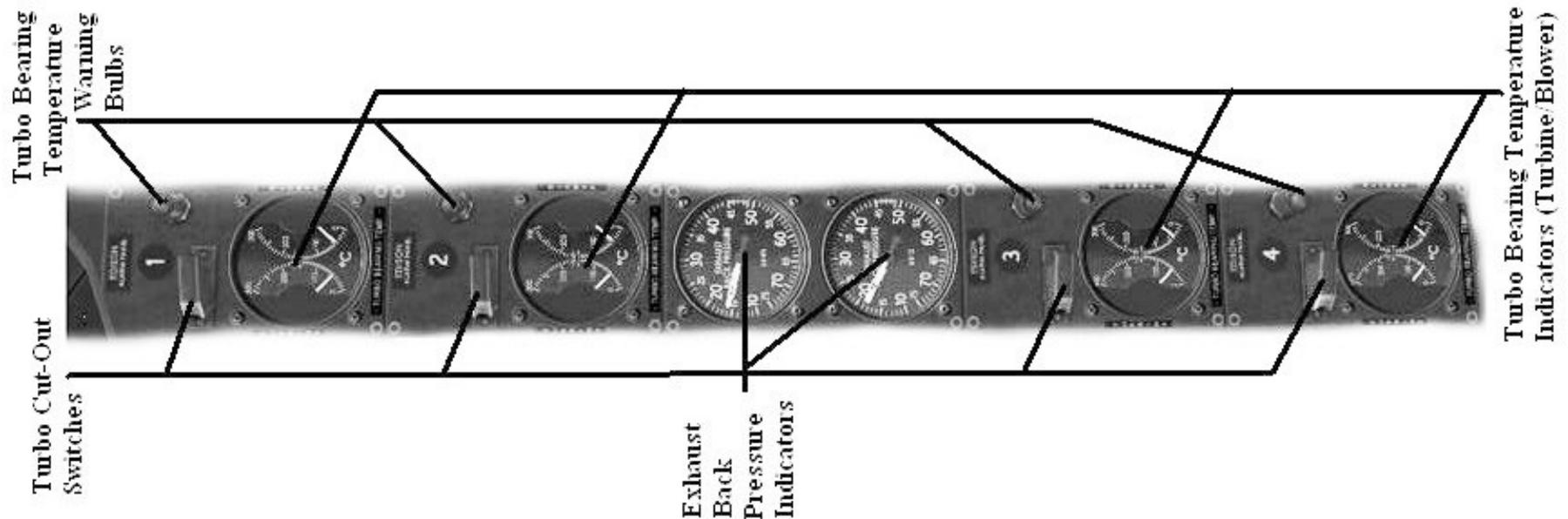


## Turbo-Superchargers

The engine exhaust-driven turbo-superchargers are used for altitude power and cabin pressurization but are not used for takeoff and landing. The turbo controls consist of a turbo selector lever, four calibrating potentiometers (grouped around the selector lever), and four turbo control override switches all on the engine control stand.

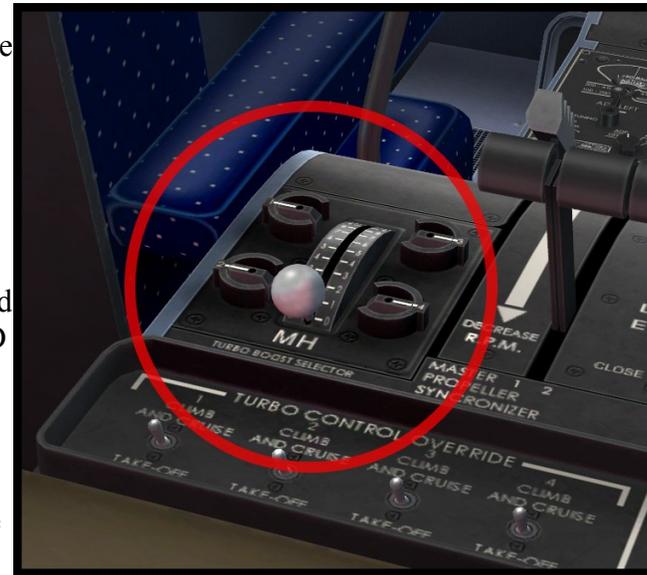
The turbo instruments consist of the manifold pressure gauges on the pilot's instrument panel and engineer instrument panel, two dual indicating exhaust back-pressure indicators and four Edison alarm panels. Each Edison panel has a dual indicating turbine bearing and blower bearing temperature indicator, a warning light, and a master fire warning system cut-out switch. When either of the maximum allowable bearing temperatures is exceeded, the warning light will illuminate.

### Engineer's Panel (left) Turbo Gauges



### **Turbo-Supercharger Selector Lever (TBS)**

The turbo-supercharger selector lever is in the center console within the reach of the pilot and the engineer. This lever is calibrated from 0 to 10. Movement of the lever from the 0 position applies turbo in proportion to the number selected. The four calibrating potentiometers provide a means of setting a uniform manifold pressure on all engines. The four turbo control override switches have a TAKE-OFF position and a CLIMB AND CRUISE position. When the switches are in the TAKE-OFF position, the normal turbo control system is overridden and the waste gates move open. When the switches are in the CLIMB AND CRUISE position, the normal TBS control system functions; however, an automatic pressure switch (actuated by exhaust back-pressure) will override the normal control system and open the waste gate to prevent the exhaust back-pressure from exceeding 49 inches of mercury. The automatic override system incorporates a transformer which boosts the voltage supplied to the waste gate motor. This provides for faster and more positive action in opening the waste gate.



### **Turbo-Supercharger Over-Boost Limiting System**

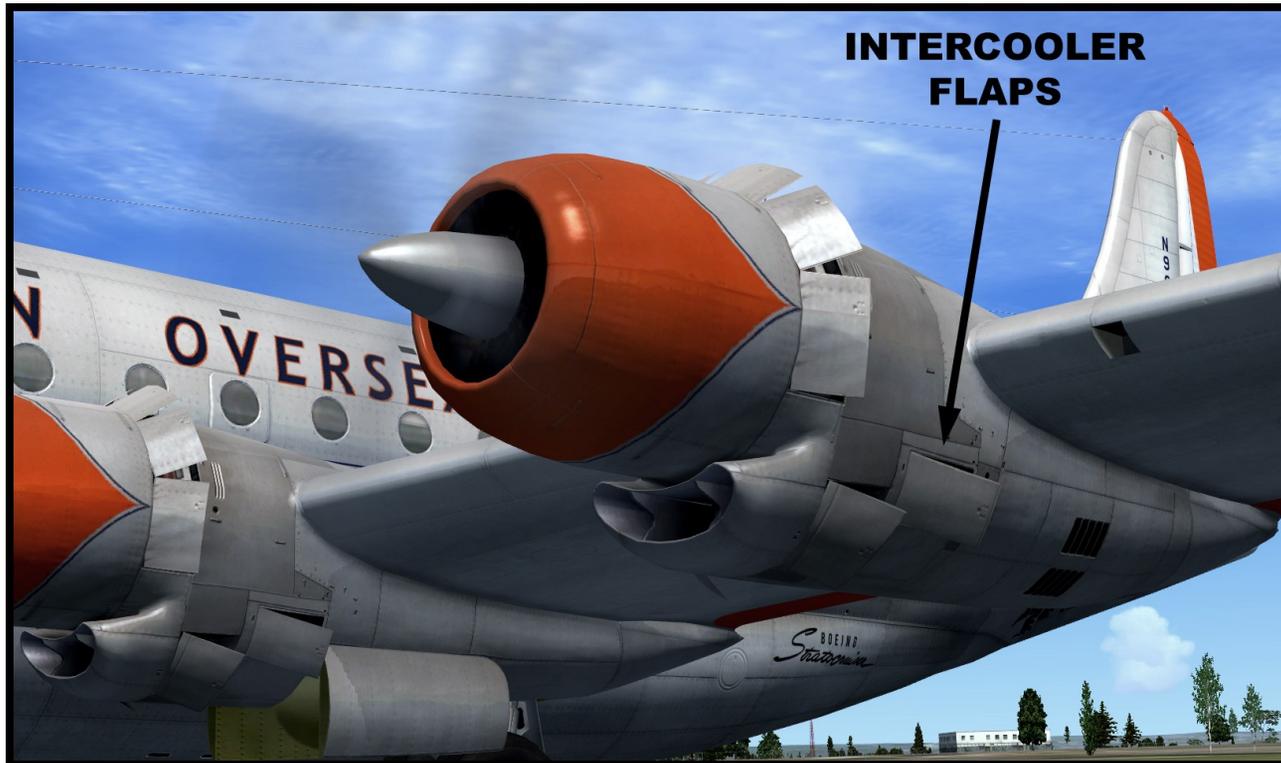
The over-boost limiting system is a safety device to protect the power plant from the effects of accidental overboost or malfunction. The system consists of an exhaust back-pressure sensing switch and a relay for each engine. The exhaust back-pressure sensing switch, sensing an exhaust back-pressure in excess of the maximum operating pressure will cause the wastegate to be driven open. However, engine damage is still possible by over-working the turbo system.

### **Turbo Calibration Knobs**

Each of the four calibrating knobs permits adjustment of its wastegate control bridge circuit to set a uniform manifold pressure for all engines. They provide a means of compensating for small variations in the individual engine and turbo-supercharger control characteristics.

## Intercoolers

An intercooler, located downstream from the turbo-compressor, is used to provide cooling of supercharged air to the carburetor. Intercooler operation is controlled electrically by positioning of the intercooler flap, which limits the amount of ram air passing through the intercooler.



## Intercooler Flaps

Four OPEN--OFF--CLOSE switches, on the engineer's instrument panel, control the intercooler flaps. The switches are spring-loaded to the OFF position. The intercooler flaps are positioned for carburetor air cooling by moving the switches in the desired direction. The intercooler flaps automatically close when the fire switch is actuated and when the carburetor air switches are placed in the SHELTERED position. Four flap position indicators, on the engineer's instrument panel, show intercooler flap position in inches of opening.

## Engine Starting Controls

### Magnets

Four rotary-type engine magneto switches are on the overhead electrical panel. Each ignition lever selects RIGHT, LEFT, BOTH, and OFF positions for all magnetos.

### Engine Select

Use the Engine Selector to choose which engines the PRIME, START, and BOOST buttons operate.



### Prime

The PRIME push button on the left electrically controls engine priming which is accomplished by injecting fuel through the carburetor acceleration pump nozzles.

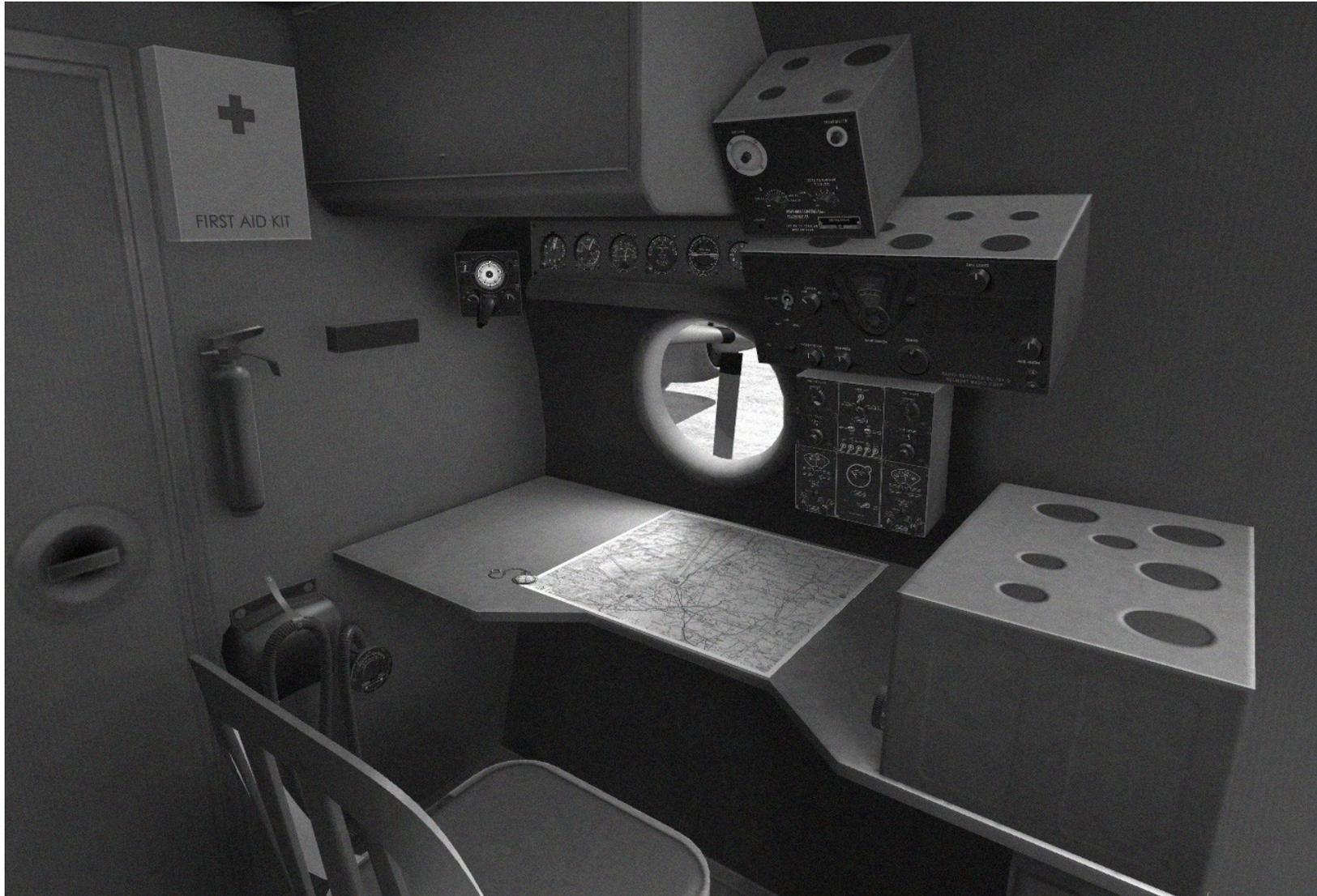
### Starter

The START button controls the direct cranking starter.

### Boost

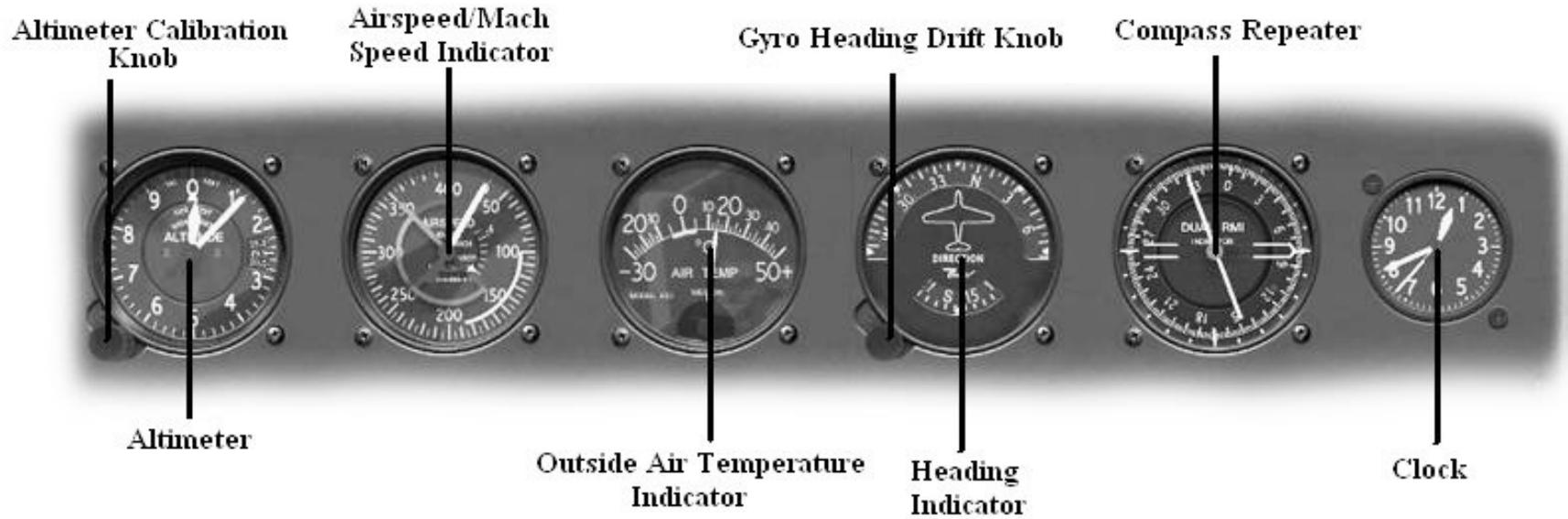
The BOOST push button gives extra ignition spark for engine starts.

## Navigator's Station

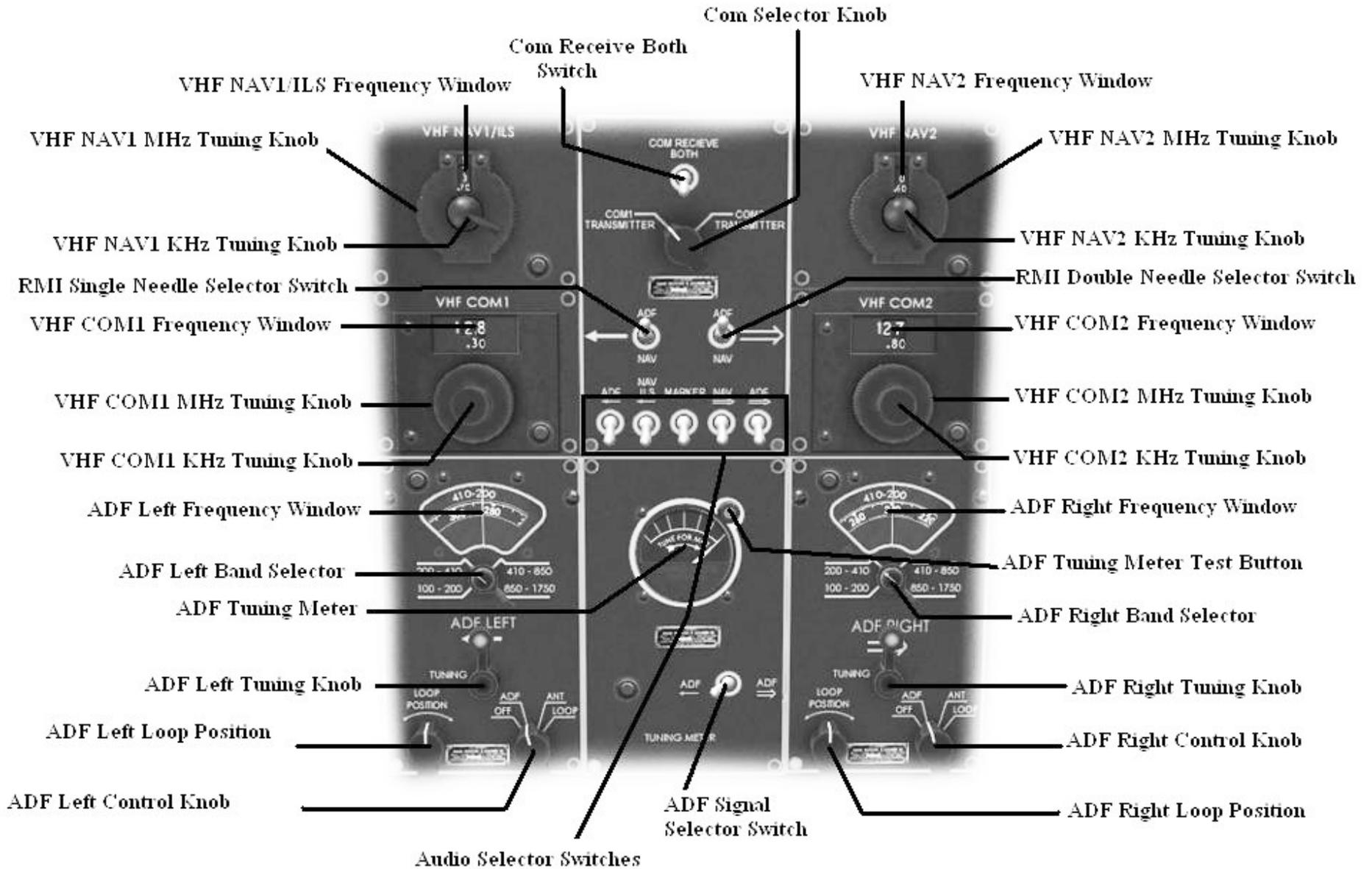


THE NAVIGATOR'S STATION consists of a table with maps, a window, and primary navigation instrumentation.

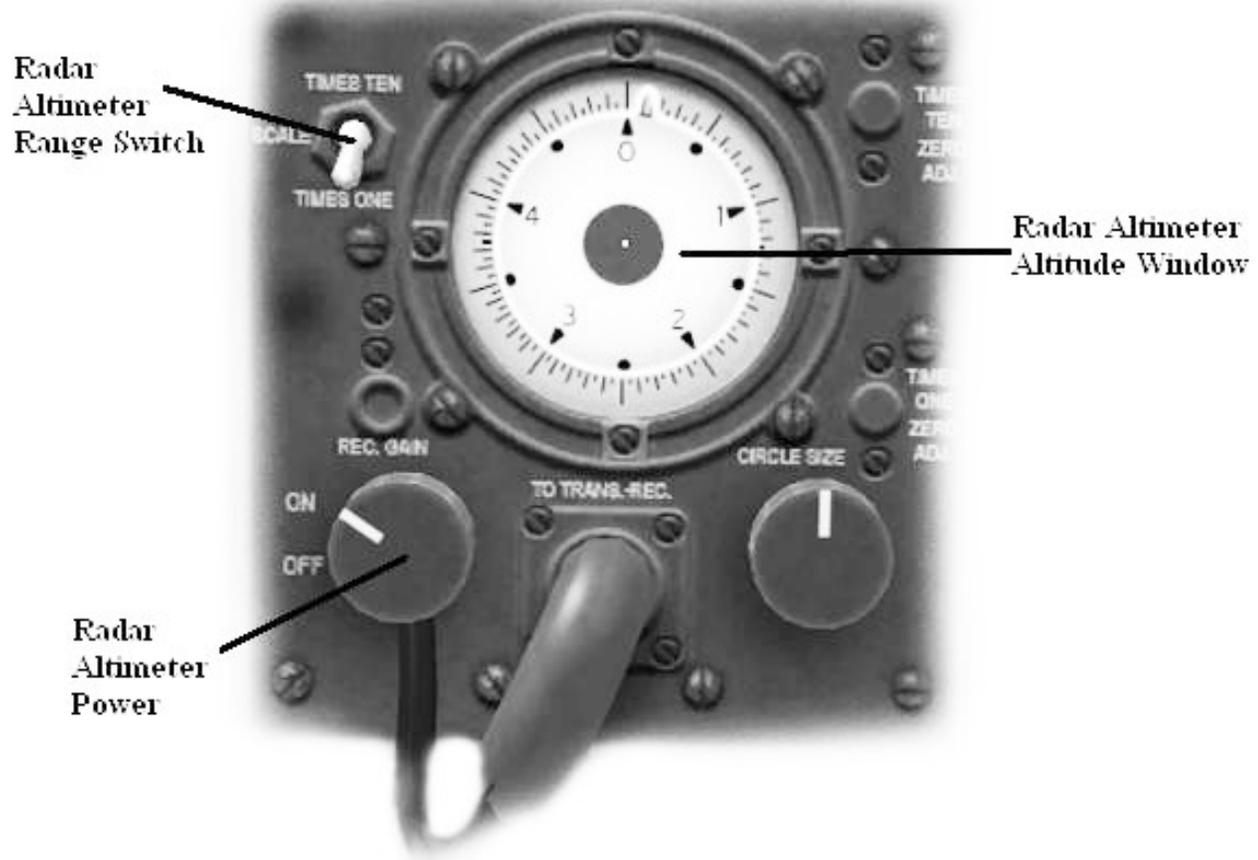
# Navigator's Main Instrument Panel



# Navigator's Radios

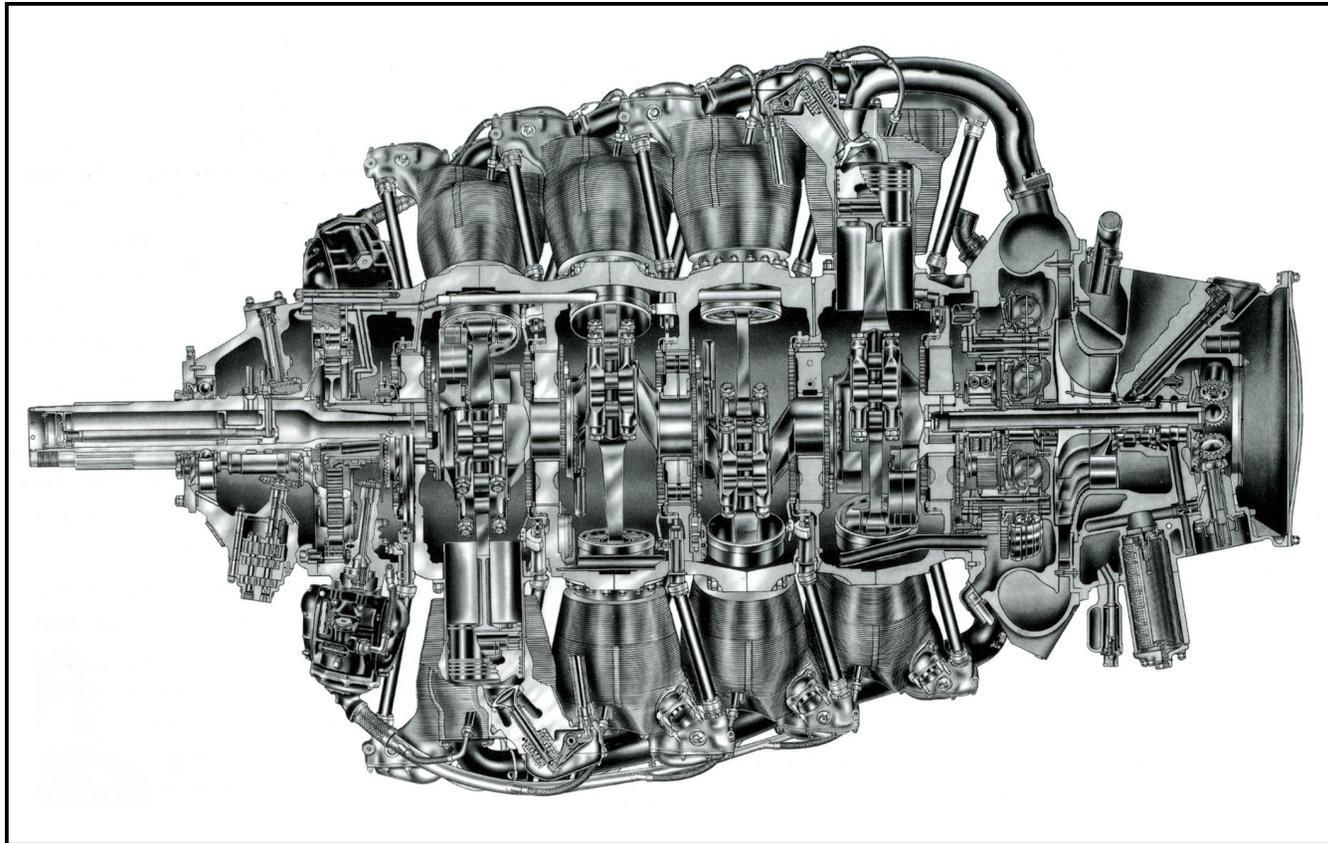


**Navigator's Radar Alt**



## Power Plant

The Stratocruiser is powered with four Pratt and Whitney R-4360, four row, 28-cylinder Wasp Major radial engines. The engines are equipped with a low tension ignition system and a torquemeter indicating system. Each engine is equipped with a single stage, single speed internal supercharger, and an exhaust-driven turbo-supercharger. Water injection is provided for high power settings. Each engine is capable of developing a maximum (at sea level) of 3250 BHP dry (without water injection) or 3500 BHP wet (with water injection).



*Pratt & Whitney R4360 Cutaway*  
(United Technologies Archive)

## **Chapter 6: Propellers**

Each engine drives a four-bladed propeller with full feathering and reverse pitch features. The propeller reduction gearing ratio is .375 to 1.

### **Propeller Control**

The propeller controls consist of the master synchronizer lever, four propeller selector levers, the auto-feathering system, and the reverse pitch throttle lock on the engine control stand. Two dual-indicating tachometers are on the pilot's instrument panel.

### **Master Synchronizer Lever**

The master synchronizer lever, when moved from the full DECREASE RPM position with the propeller selector switches in the AUTO positions, energizes the master synchronizer motor. The master synchronizer motor then provides synchronized constant speed governing of the engines through the complete operating range and simultaneous selection of identical RPM of all propellers. The RPM is determined by the relative position of the master synchronizer lever in the graduated scale between INCREASE RPM and DECREASE RPM positions.



### **Propeller Selector Controls**

The four individual selector switches provide a means of selecting automatic or manual operation of each propeller. The Propeller selector switches have two positions, AUTO and MAN (manual). The propeller control switches have three positions, INCREASE R.P.M., NEUTRAL and DECREASE R.P.M. The propeller control switches are spring-loaded to NEUTRAL.

### **Propeller Feathering Controls**

The propellers may be feathered by actuating the FEATHER PROP switch in the fire control section of the overhead panel.

## **Reverse Pitch Throttle Lock**

The throttles are prevented from entering the reverse pitch range by oleo-operated solenoid locks. A red flag forward of the throttles shows the state of the pitch throttle lock. If the flag is marked LOCKED it indicates the reverse pitch lock is on and reverse pitch is not possible. The flag changes to UNLOCKED when any one of the landing gears contacts the ground, thus indicating the solenoid-operated lock is unlocked and reverse pitch is possible.

## **Chapter 7: Oil System**

Each engine has an individual oil system which includes an engine oil tank, two oil coolers, and an oil control thermostat. The engine oil tank has a capacity of 32.5 U.S. gallons and an expansion space of 7 US gallons. Oil cooler flap switches, when in the AUTO position, cause the thermostat to automatically regulate oil temperature by operating the oil cooler flaps to allow the proper amount of cooling air to flow through the oil coolers. An oil dilution system is incorporated into the oil system to aid in cold weather starting.

### **Oil Cooler Flap Switches**

The oil cooler flaps for each engine are operated by OPEN--OFF--AUTO--CLOSE switches. The switches are spring loaded from the OPEN and CLOSE positions to the OFF position. When a switch is in the AUTO position, the oil coolers automatically maintain oil temperature within the normal operating range. If extreme operating conditions exist and failure of the automatic circuit causes abnormal oil temperatures, the oil cooler flaps can be operated by the manual OPEN or CLOSE positions. The flaps are held in any desired position by positioning the switches to OFF. Approximately 15 seconds are required to fully open or close the oil cooler flaps when the manual switch positions are used.

### **Oil Dilution Controls**

Oil dilution is controlled by foil oil dilution ON--OFF selector switches and a master ON--OFF switch on the engineer's instrument panel. Oil dilution is accomplished by placing the desired selector switches in the ON positions and setting the master switch to ON.

### Oil Quantity Indicators

Oil quantity indicators for each engine oil tank on the engineer's instrument panel; indicate oil quantity in U.S. Gallons.

### Oil Pressure Warning Light

A warning light on the pilot's instrument panel will illuminate when the oil pressure falls below 60 PSI.

## Chapter 8: Fuel System

The fuel system has four internal main fuel tanks. The main fuel system is arranged so that the engines may be supplied directly from the main fuel tanks, from the main fuel manifold or any combination of tanks. Each main tank contains a submerged fuel boost pump.

The auxiliary fuel system consists of the center wing tank. This tank contains a submerged fuel boost pump. Flow from the center wing tank is controlled by the center tank line valve and may be isolated from the main fuel manifold.

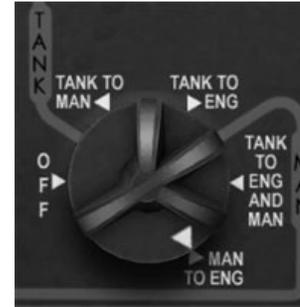
The boost pumps are installed in such a manner that the amount of unavailable fuel in extreme flight attitudes is minimized. The boost pumps are controlled by switches on the engineer's instrument panel. Check valves in the boost pump lines prevent transfer of fuel between tanks. Individual fuel tank capacities are shown below.

TANK	NO OF TANKS	USABLE FUEL (LEVEL FLIGHT)		FULLY SERVICED		
		GAL	Li	GAL	LB	
NO. 1	1	1770	10,620	1779	10,674	
NO. 2	1	1520	9120	1534	9204	NOTE:
NO. 3	1	1520	9120	1534	9204	
NO. 4	1	1770	10,620	1779	10,674	To convert gallons to pounds multiply by 6.0 (standard day only).
CENTER	1	1210	7260	1218	7308	Data Basis: Flight test
<b>USABLE FUEL TOTALS</b>				GAL	LB	
Tanks No. 1, 2, 3, and 4				6580	39,480	
Tanks No. 1, 2, 3, 4, and Center				7790	46,740	

## Fuel Selector Knobs

Four rotary type selector knobs on the engineer's instrument panel control the fuel selector valves for the four main fuel tanks. The switches have five positions as follows:

1. OFF
2. TANK TO MANIFOLD
3. TANK TO ENGINE
4. TANK TO ENGINE AND MANIFOLD
5. MANIFOLD TO ENGINE



Shutoff switches for each engine are on the overhead panel. These switches override normal control of fuel selector valves to shut off fuel to the engines.

## Fuel Tank Quantity Indicators

Five indicators on the engineer's instrument panel show the quantity of fuel in pounds x100 for the main tanks and the center tank.

## Center Tank Line Pump and Valve Switch

An OPEN--CLOSE switch on the engineer's instrument panel controls the center tank pump and valve. With the switch open, the fuel will flow from the tank into the manifold system. With the switch in the CLOSE position, fuel cannot be drawn from the center tank.

## Fuel Boost Pump Switches

Each fuel tank has a fuel pump. These pumps are controlled individually by ON--OFF switches on the engineer's instrument panel.

## Fuel System Management

### RESTRICTIONS / RULES:

1. For takeoff and landing the fuel selector valves must be in the TANK TO ENG position and booster pumps ON.
2. Do not connect more than two engines to the manifold system.
3. Turn on the buster pump if a tank feeds the manifold (positions: TANK TO MAN or TANK TO ENG AND MAN).

### Starting, Takeoff, and Landing

Set the fuel selectors to TANK TO ENG position and turn booster pump switches ON for each of the main tanks. Set the center tank PUMP AND VALVE switch to CLOSE position. Each engine tank feeds its engine directly with the booster pumps on to maintain the pressure.



ENGINES STARTING, TAKEOFF AND LANDING

## Fuel Balancing Operations

After the takeoff use the fuel from the center tank first then from the inner tanks (2 and 3) until they reach 2000 lbs, next the fuel from the outer tanks (1 and 4) also up to 2000 lbs. Then feed each engine with its tank. Balance uneven fuel quantities in the tanks so that tanks No.1 and 4 are either full or their quantities exceed tanks No.2 and 3. respectively. DO NOT reduce fuel in tanks 1 and 4 below that in tanks 2 and 3 respectively.

(1) During a flight operate the center tank first: open the PUMP AND VALVE switch. Set the outer engines fuel selectors to MAN TO ENG position, turn their booster pumps OFF. Set the inner engines fuel selectors to TANK TO ENG position, turn their booster pumps OFF.

(2) The center tank feeds the manifold while the inner tanks feed the inner engines respectively. The outer tanks remain intact. The inner engines drain the inner tanks respectively. The outer engines are connected to the manifold (center tank).

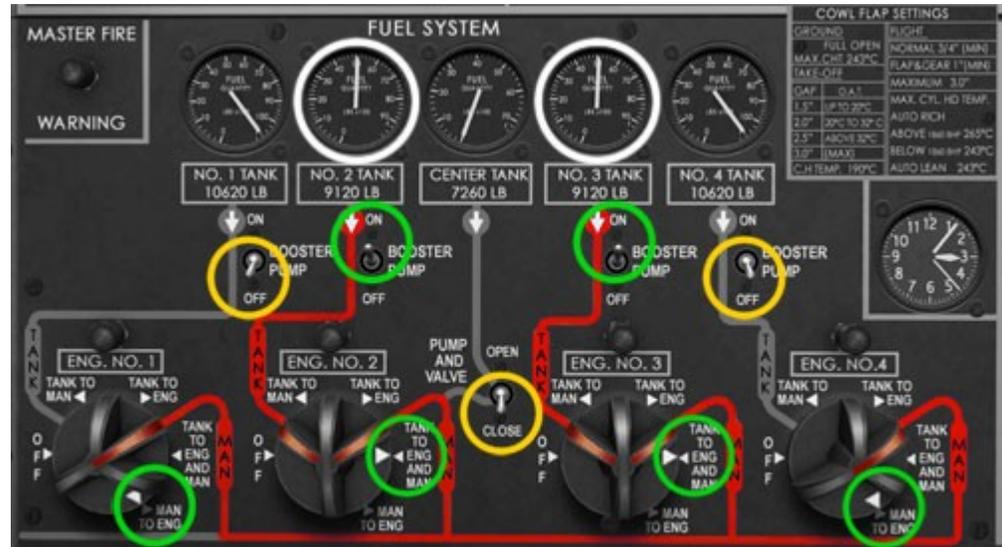


FUEL BALANCING (1)

(3) After the center tank is empty, set the inner engines fuel selectors to TANK TO ENG AND MAN position, turn their booster pumps ON. Set the outer engines fuel selectors to MAN TO ENG position, turn their booster pumps OFF.

The inner tanks feed the inner engines respectively and the manifold system. The outer tanks remain intact.

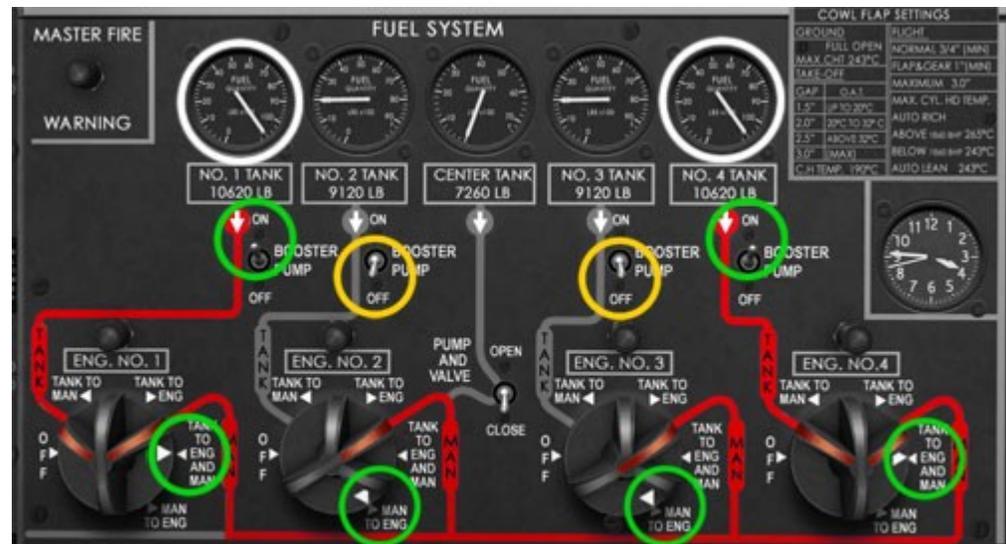
The inner engines drain the inner tanks respectively. The outer engines are connected to the manifold (inner tanks).



FUEL BALANCING (2)

(4) When the inner tanks reach 2000 lbs, set the outer engine fuel selectors TANK TO ENG AND MAN position, turn their booster pumps ON. The inner engines fuel selectors set to MAN TO ENG position, turn their booster pumps OFF.

The inner engines are connected to the manifold (outer tanks). The outer engines drain the outer tanks respectively.



FUEL BALANCING (3)

(5) When the outer tanks reach 2000 lbs, set the outer engines fuel selectors to TANK TO ENG position, turn their booster pumps OFF. The inner engines fuel selectors set to TANK TO ENG position, turn their booster pumps OFF. Turn all the booster pumps ON for the landing.

The inner engines drain the fuel from inner tanks respectively. The outer engines drain the fuel from the outer tanks respectively.

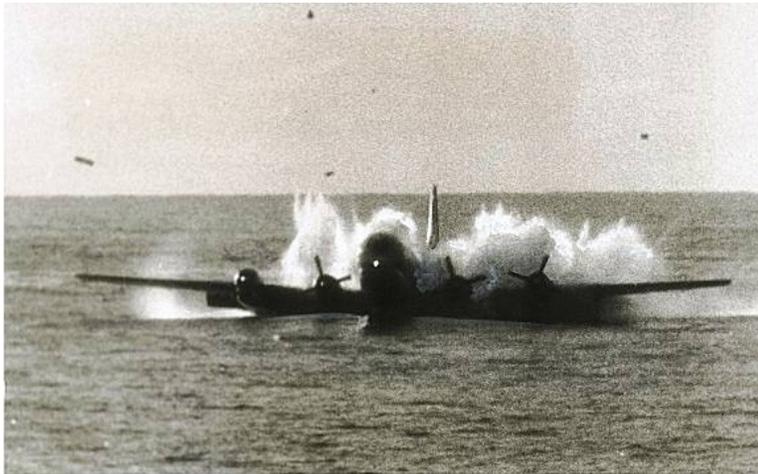


FUEL BALANCING (4)

## Fuel Dumping

Fuel may be dumped in climb, level flight, or glide. Fuel may be dumped from any of the selected tank or all tanks simultaneously. If an emergency arises and it is necessary to dump fuel to decrease the airplane gross weight, the following procedure is recommended:

- a. Airspeed of approximately 190 MPH (165 knots) IAS
- b. Do not operate radio transmitters.
- c. Avoid changing power during fuel dumping.
- d. Dump fuel as desired.
- e. After the desired amount has been dumped, move the switches to CLOSED and visually check stoppage of flow.
- f. Fuel quantities should be observed during dumping



## Crash Landings

The center tank valve must be closed before making a crash or belly landing.

## **Chapter 9: Electrical System**

### **DC Power System**

Twenty-eight volt DC power is supplied to the DC distribution system by six engine-driven generators and by an auxiliary power unit. Parallel operation on the DC system is accomplished by an equalizing circuit. This circuit is common to all generators operating in parallel and is designed to cause all generators to take an equivalent share of the load. If an unbalance occurs such that one generator has high voltage with respect to the other generators, a current flow will result in the equalizer circuit to cause the generator with high voltage to be lowered and the generator with low voltage to be raised. A battery in the lower forward compartment is provided as an emergency source of direct current power. An external power supply may be connected to the direct-current distribution system through an external power receptacle. Circuit breakers and fuses provide circuit protection for all direct-current operated equipment.

### **Battery**

The airplane is equipped with a 24-volt, 36 ampere-hour nickel-cadmium battery. The battery is in the lower forward compartment of the airplane. Use of battery current is controlled by a switch on the overhead panel. The battery is used for emergencies as a source of power for the flight instrument spare inverter and for the turn-and-slip indicator. The battery may be connected to the airplane bus on the ground only; however, the battery is connected to the emergency (battery) bus at all times regardless of the battery switch position. The nickel-cadmium battery differs from a lead-acid battery in both principle and operation. The electrolyte in a nickel-cadmium battery is a potassium hydroxide solution. During charging and discharging, the specific gravity of the electrolyte does not change; therefore, specific gravity measurements cannot be used to determine the state of charge of the battery.

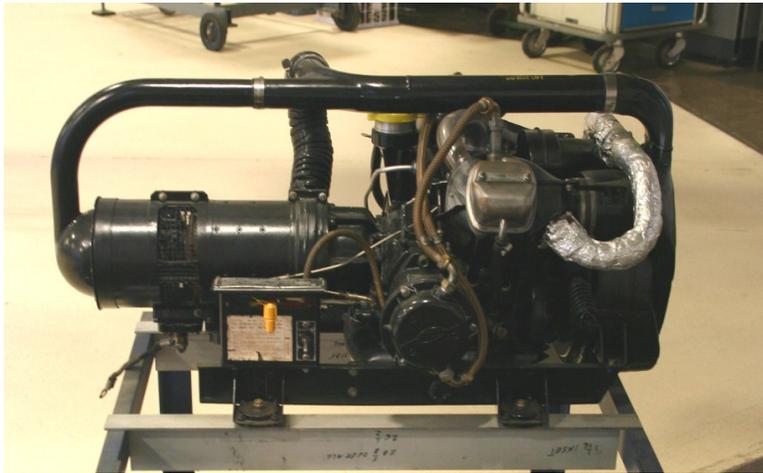
### **Generators**

Each of the six 28-volt, 300 ampere, engine driven generators is connected to the main power panel through a current limiter. The current limiter protects the bus against a generator failure or reverse current relay failure. The voltage is regulated automatically by carbon-pile type regulators. Each generator has an overvoltage control unit which will disconnect the generator from the direct-current distribution system in the event of high generator voltage. Two generators are mounted on the accessory section of each outboard engine and one generator is mounted on the accessory section of each inboard engine. The generators normally supply all of the power required for operation of direct-current operated equipment in the airplane, and also supply direct-current power to the inverters.

## Electrical Master Switch

The electrical master switch on the center overhead panel completes the control circuit for the battery and generators. This ON--OFF switch must be ON to supply power to the DC power distribution system. If the master switch is off, the circuits to the field coils of the generators are broken and there is no output from the generators. This switch must be on to connect external power to the airplane buses.

## Auxiliary Power Unit (APU)



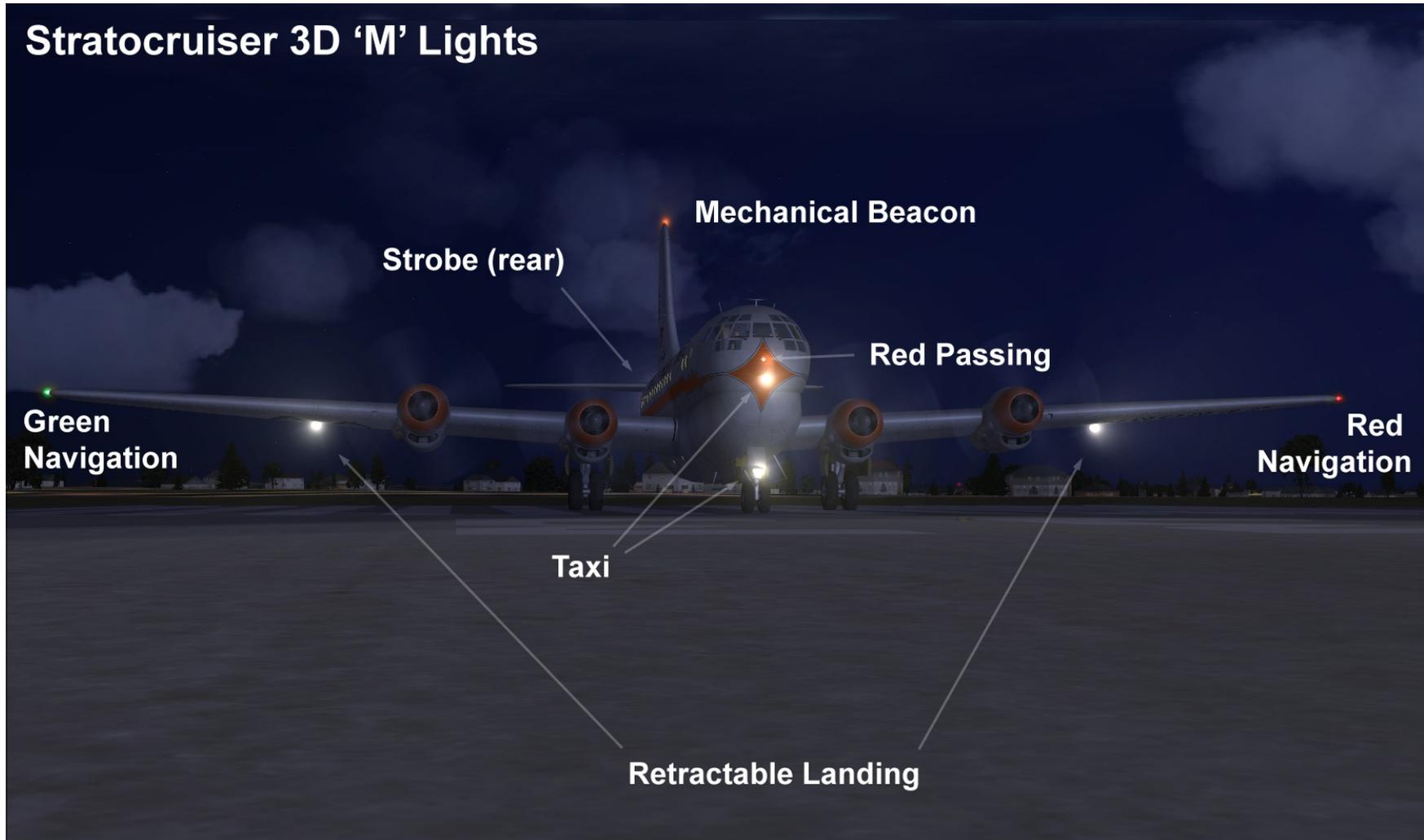
An on-board APU provides electrical power while engines are off, and also for engine starting. The APU drives a 28-volt, 500-ampere, direct current generator which is also used as a starting motor. The APU will operate to altitudes of 20,000 feet with generator output of 14 kilowatts at 28 volt DC. At altitudes under 10,000 feet, the generator can provide a five minute supply of 17.4 kilowatts at 28 volt DC (approximately 620 amp). Fuel is supplied from the tank No. 2 or from the fuel manifold and is automatically shut off whenever the APU is not operating. The APU has a self-contained oil supply. An air intake duct allows air to flow to the turbine compressor, while an exhaust duct provides means for exhausting products of combustion. A valve in each duct is connected by a rod and linkage to operate together (open or close) from a manual control handle next to APU. The handle is spring-loaded to the OPEN or to the CLOSED position to prevent valve gates from creeping. The intake duct valve actuates a micro-switch in the control circuit to prevent APU operation with the intake and exhaust ducts closed.

The APU can also be used as a standby electrical power source for takeoff and landing, or as an emergency power source during flights up to 20,000 feet (cabin must be de-pressurized). A blower is installed in the airplane to pressurize the turbine compartment. The turbine compartment is pressurized to prevent exhaust fumes from entering the control cabin. The blower also aids in cooling the APU compartment. The blower is operable in flight or on the ground. The APU generator will continuously deliver 500 amps.



## Lighting

Your Stratocruiser is equipped with the finest 3D Lights technology, as the lighting effects are built into the model, creating highly realistic visuals. The underwing landing lights can be retracted and extended independently of being turned on or off, the mechanical beacon actually rotates and casts a 3D beam at the appropriate angle and speed. The red passing light is a carryover from military use, and yes, the navigation lights are actually supposed to pulse.



## Interior Lights

The Stratocruiser has a large cabin and requires a sophisticated lighting system for night time operations. We installed forward overhead flood lights for the Pilot and Co-pilot, low-light red and a white flood light for the Flight Engineer, and a floodlight for the Navigator's station.

It is in the interest of the pilots to have the cabin lighting as low as possible to maximize night time visibility. In the real aircraft, the lighting is quite dim and the crew can use flashlights to shine in areas that may not have enough light.

We spent time in a real Stratocruiser in the dark with the lights on and matched our interior lighting to the real thing.



## **Chapter 10: Landing Gear System**

The fully retractable tricycle landing gear is electrically operated and consists of two main dual-wheel landing gears and a steerable dual-wheel nose gear. The landing gear is exceptionally friction-free in operation and extends fully in approximately 4 seconds and retracts fully in approximately 10 seconds. The main and nose landing gears are mechanically locked in the up and down positions.

### **Landing Gear Switch**

A DOWN--OFF--UP switch controls normal landing gear extension or retraction. When the switch is in the UP position, the landing gear will retract provided all wheels are off the ground; when in the DOWN position, the landing gear will extend; and when in the OFF position, the landing gear actuation circuits are de-energized.

### **Takeoff Flap Warning Horn**

The warning horn will sound when flaps are not set to the proper takeoff position (20-30 degrees) and when any combination of two throttles for engines on opposite sides of the airplane are advanced more than three-fourths open with the weight of the airplane on the landing gear.

### **Landing Gear Position Indicators**

Three tab-window type indicators on the pilot's instrument panel show, by changeable tabs, the positions of the main and nose gears. When any gear is up and locked, the corresponding UP tab will appear in the window; a landing gear in an intermediate position will be indicated by a tab with slanting alternate red and white stripes; and a down and locked gear will be indicated by a tab showing a symbol of a wheel. When power is off, a slanting red and



white stripe tab will show in the window.

### **Nose Wheel Steering System**

The nose wheels are steerable to 68° each side of center through hydraulically-operated cylinders while the airplane is on the ground. When the nose wheel leaves the ground, hydraulic pressure is shut off by an oleo-actuated valve, and the nose wheel centers itself. In the event of hydraulic pressure failure, the nose gear has a conventional caster action allowing directional control of the airplane by engine and brake operation.

### **Nose Steering Wheel**

Nose gear steering is controlled by a steering wheel mounted on a pedestal forward and to the left of the pilot's control column. An arrow on the wheel and a mark on the pedestal indicate when the nose wheel is centered. The nose wheel turns in the direction selected by the steering wheel and remains in that position until the steering wheel is returned to center. A cable follow-up system will return the nose wheel to its original course should the wheel be deflected momentarily by some obstacle. Nose wheel must be centered before gear will retract.

## **Chapter 11: Emergency Equipment**

### **Fire Detector System**

An automatic fire detector system is provided to detect a fire condition in any of the power packages or combustion heater areas. The system illuminates red master fire warning lights on the pilot's and engineer's instrument panels if a fire condition exists. The exact area which has a fire condition is indicated by fire warning lights located on the overhead panel. Fire sensing units located behind the exhaust collector ring, around the turbo-supercharger, on the engine oil tank, in the accessory section of the power package, in the wing D ducts, in the combustion heater cavities, around the APU and overheat sensing units in the main landing gear wells, cause the fire warning or overheat warning lights to illuminate during a sudden overheat condition such as a fire would cause. The battery switch must be ON BUS. The electrical master switch must be ON.

## **Fire Detector System Test Buttons**

There are three fire detector system push-to-test buttons on the fire section of the overhead panel to test the continuity and operation of the three circuits making up the fire detector system. Pushing either circuit 1 or circuit 2 button will illuminate the power package fire warning lights on the fire section of the overhead panel and the master fire warning lights on the pilot's and engineer's instrument panels. Pushing circuit 3 button will illuminate all four power package fire warning lights, the master fire warning lights, the heater fire warning lights, and the main landing gear wheel well warning lights.

## **Master Fire Warning Lights**

Two red push-to-test master fire warning lights are provided: one on the pilot's instrument panel and the other on the engineer's instrument panel. Both lights will illuminate in case of a sudden increase in temperature in engine or anti-icing and body heater areas.

## **Fire Extinguisher System**

A CO<sub>2</sub> fire extinguisher system is provided to supply two separate charges of CO<sub>2</sub> to the power packages, wing anti-icing heaters, or empennage anti-icing heaters. The CO<sub>2</sub> is stored in two jets of four bottles, each set located in a main landing gear wheel well. Each set of bottles will furnish one complete charge of CO<sub>2</sub>. The two upper bottles in each set are fitted with solenoid-actuated valves to release the CO<sub>2</sub> charge. The CO<sub>2</sub> charge released from the upper bottles actuates the release valves on the lower bottles through tubing connecting the two bottles. The upper bottles are also connected with tubing so that if one of the solenoids fails to operate, the other solenoid-actuated valve will release the entire charge of CO<sub>2</sub> in the set of four bottles. Actuation of the CO<sub>2</sub> release switch in either direction will release the charge from one set of bottles. CO<sub>2</sub> is then directed through tubing to a common manifold line which serves most probable fire areas. Select direction switches open directional control valves located in the lines between the manifold and fire areas. These valves direct the CO<sub>2</sub> charge to be dispersed in the selected fire area through perforated runs of tubing or directly into the equipment. A CO<sub>2</sub> bottle is also located adjacent to the APU. Actuation of the APU CO<sub>2</sub> release switch will discharge the entire bottle into the turbine cover.

## **Fire Switch Gang Plates**

A switch gang plate is located aft of each group of power package and surface anti-icing heater fire switches on the overhead panel. When a power package switch gang plate is positioned to FIRE, it will actuate the select direction valve switch, the sheltered air door

switch, the fuel valve switch, the fuel, oil, hydraulic fluid and cabin air bleed switch, and the propeller feathering switch. When the surface anti-icing heater switch gang plate is positioned to FIRE, it will actuate the surface anti-icing heater select direction valve fire switch and the heater shutoff switch. Each gang plate is spring-loaded from the FIRE position to the NORMAL position.

### **Sheltered Air Door Switches**

The NORMAL--FIRE positions of these switches control the operation of the sheltered air door. When the switch is placed in FIRE, the sheltered air door stops ram air from entering the induction system. One switch is provided for each power package.

### **Fuel Valve Switches**

A fuel valve switch with NORMAL--FIRE positions is provided for each power package. When the switch is placed in FIRE, the fuel selector valve is turned to the TANK TO MANIFOLD position. When the switch is returned to NORMAL, the fuel selector valve will return to its originally selected position.

### **Fuel, Oil, Hydraulic Fluid and Cabin Air Bleed Switches**

One switch with NORMAL--FIRE positions, is provided for each power package. When the switch is placed in FIRE, fuel, oil, and hydraulic fluid are shut off from the power package and the cabin pressurizing air supply from that power package is shut off.

### **Propeller Feathering Switches**

The NORMAL--FIRE positions of these switches control the propellers. The propeller feathers when the switch is placed in FIRE position. This switch is spring-loaded to the NORMAL position and will return to NORMAL when released. However, the propeller will feather in the same manner as if the pilot's propeller feathering button were pressed.

## Fire Extinguisher System

### CO<sub>2</sub> Release Switch

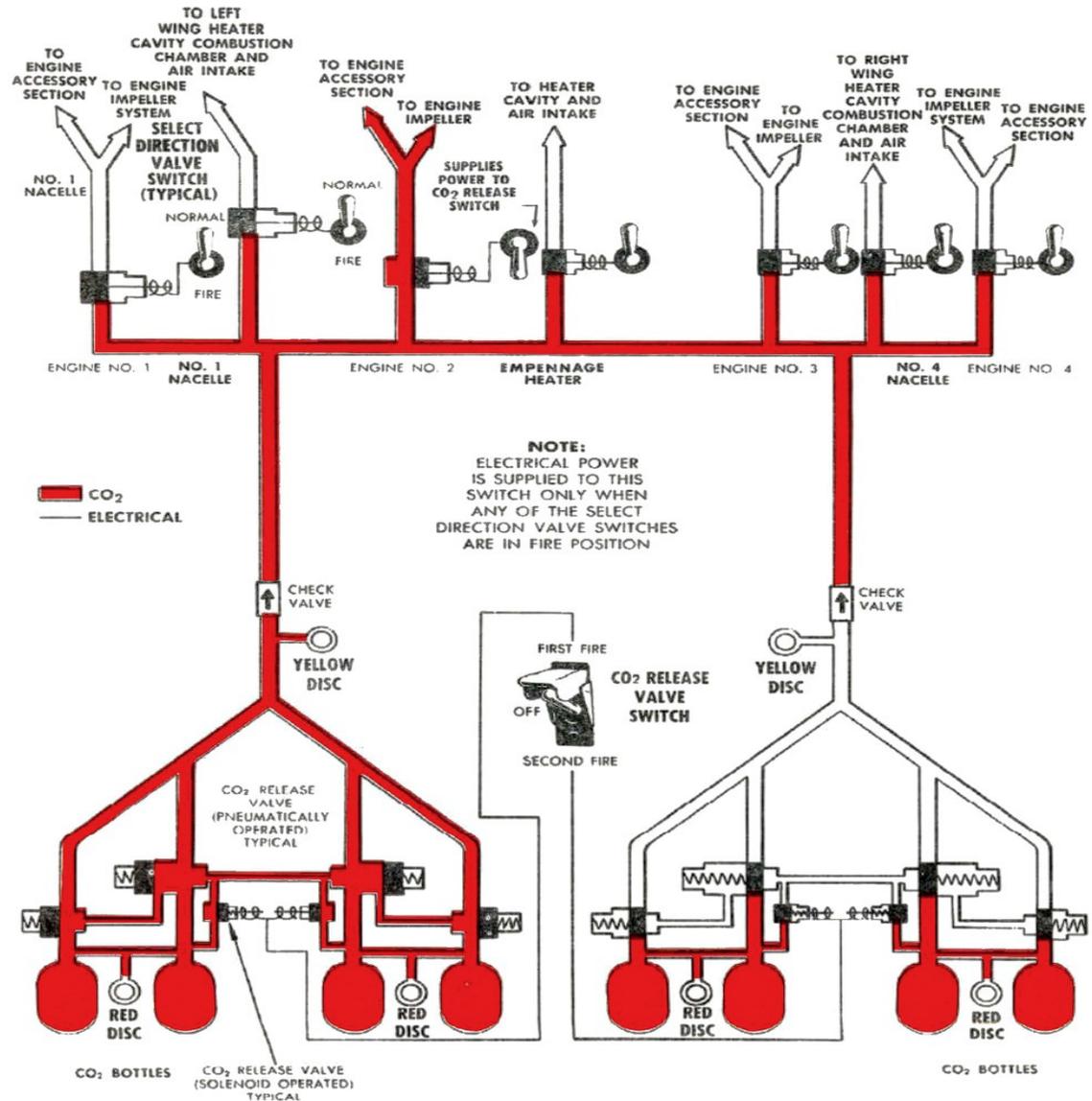
This guarded switch on the fire section of the overhead panel, releases the two charges of CO<sub>2</sub> when one or more select direction valve switches are positioned to FIRE. It has three positions, FIRST FIRE--OFF--SECOND FIRE. By moving and holding the switch to FIRST FIRE position, the charge of CO<sub>2</sub> from the left set of the CO<sub>2</sub> bottles will be released to the predetermined fire area. By moving and holding the switch to SECOND FIRE position the remaining charge of CO<sub>2</sub> will be released.

**NOTE:** The select direction valve switches must be ON to release the CO<sub>2</sub> charges.

In order to use battery power to release the CO<sub>2</sub> charges, the electrical master switch must be ON.

### APU CO<sub>2</sub> Release Switch

An on-off toggle switch marked AUX POWER UNIT CO<sub>2</sub> RELEASE when positioned to ON will release the contents of a CO<sub>2</sub> bottle into the turbine cover. The switch is spring-loaded and guarded to the OFF position, and when operated, must be held ON. There is also a CO<sub>2</sub> release switch on the APU control panel.



## Chapter 12: Normal Operations Checklists

The checklists below are meant to be read from left to right, top to bottom.

### Entering the Control Cabin (Power Off)

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Overhead light switches as desired.			1. Check passenger and crew system oxygen pressure
2. Battery switch OFF			2. Generator Switches OFF
3. Master switch OFF			3. Pitot heaters OFF
4. Avionics switch OFF	4. Emergency hydraulic pressure valve CLOSED	4. Radar altimeter switch OFF	4. Magneto switches OFF
5. Autopilot disengaged and OFF	5. Emergency exit lights switch ARMED		5. Engine selector switch OFF
6. Landing lights retracted and OFF			6. Carburetor preheat OFF
7. Wing flap switch OFF			7. Intercooler flap switches CLOSED
8. Propeller auto-feathering switches OFF	8. Fuel dump switches CLOSED/OFF		8. Oil dilution switches OFF
9. Rudder boost switch ON	9. Fire control switches OFF		9. Turbo-override switches TAKE-OFF

10. Throttle brake as required	10. Aux power unit CO2 release switch OFF		10. Turbo control 0 (zero)
11. Master propeller synchronizer DECREASE R.P.M.			11. Propeller selector control switches AUTO
12. Propeller reverse pitch indicator UNLOCKED			12. Air conditioning master switch OFF
13. Landing gear switch DOWN for several seconds and ensure it returns to neutral			13. Cabin altitude selector set at 1000 feet above field altitude
14. ADI pumps switch OFF			14. Rate-of-change selector MAX

15. ADI valve override switches AUTO			15. Fuel selector valves OFF
16. Aileron, elevator, and rudder trim tabs free and zeroed			16. Booster pumps OFF
17. Altimeters and flight instruments checked and set			17. DC Voltmeter selector switch on BUS
18. Parking brakes set			18. APU switch to OFF (neutral)
19. Windshield wiper OFF	15. Surface control lock UNLOCKED for pilot check		

20. Check controls for freedom of movement	16. If gustiness prevails , surface control lock to LOCKED		
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**Before Starting Engines (Power On)**

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Power off check complete and obtain crew reports	1. Turn master switch ON		
	2. Turn battery switch ON		2. Read indicated BUS voltage
			3. DC Voltmeter selector switch on BAT and read indicated voltage
4. Test fire detection system and ensure fire warning lights illuminate when pressed and extinguish when depressed		4. Check gyro heading indicator against pilots magnetic compass	4. Rotate fuel selector valves to TANK-TO-ENG
5. Check instruments	5. Check instruments	5. Check instruments	5. If required set APU switch to RUN and confirm illumination of APU light
6. Avionics switch ON and radios as required	6. Radios as required	6. Set radios and navigation equipment as desired based on flight plan	6. Check turbo bearing temperature alarm panel
7. Check ADI quantity	7. No smoking and fasten seat belts switches ON		7. Hold propeller switches to INCREASE RPM for a few

			seconds and release to neutral
			8. Turbo-boost lever 0 (zero)
			9. Turbo-override switches TAKE-OFF
10. Move propeller master synchronizer to full INCREASE R.P.M.			10. Cowl flaps open
11. Passengers aboard and seated			11. Oil cooler switches AUTO
12. Doors closed and locked			12. Carburetor heat switches OFF

## Starting Engines

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Note manifold pressure for power check reference			1. Mixture FUEL CUTOFF
2. Crack throttles approximately 1 inch	2. Rotating beacon switch ON		2. Check magnetos switches OFF
	3. Exterior lights as required		3. Fuel selector TANK-TO-ENGINE position and turn on booster switch for each main tank to ON, leave center tank switch to CLOSED
	4. Check fireguard for all clear on No. 3 engine		4. Engine starting sequence 3, 4, 2, 1
	5. Place fire extinguisher valve selector switch for engine No.3 to FIRE position		5. Set engine starting selector to 3
			6. Move mixture lever on No.3 engine to AUTO RICH.
			7. Press PRIME button 2 to 4 times ABOVE 0°C and 4 to 6 times when BELOW 0°C or as required

			8. Press START button and after propeller has turned approximately three blades turn the magneto switch for No.3 engine to BOTH, then press and hold BOOST
			9. Watch for oil pressure rise and when definite indication of starting is observed release the START and BOOST switches

PILOT	COPILOT	NAVIGATOR	ENGINEER
10. Adjust throttle to 1,000 R.P.M. for engine warm-up and to keep plugs from fouling	10. Place fire extinguisher valve selector switch for No.3 to NORMAL/OFF		10. When engine is running smoothly, place the generator switch for No.3 engine to ON.
			11. Turn off booster pump
12. Repeat procedure for remaining engines (Steps 4 to 10)	12. Repeat procedure for remaining engines(Steps 4 to 10)		12. Repeat starting procedure for remaining engines. (Steps 4 to 10)
	13. Check all fire control switches NORMAL/OFF	13. Check all instruments for error	13. Turn starter selector OFF

## Warm-Up and Taxi

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Warm up engines at 1000 R.P.M.	1. Check hydraulic pressures within limits; if emergency pressure is low, open the charging valve until the pressure is equal to the main pressure, then return charging valve to CLOSED		1. Check booster pumps OFF
			2. Turn OFF APU if required
	3. Lock mixture controls		3. Air conditioning master switch ON
4. Check instruments and gyro erection	4. Check instruments and gyro erection	4. Check instruments and gyro erection	4. Check instruments and gyro erection
			5. Check AC voltage by turning AC voltmeter selector switch through all positions then returning voltmeter selector to BUS position
6. Obtain cabin and crew report	6. Door warning light out		6. Check ignition for safety grounding at warm-up R.P.M. by momentarily turning each ignition switch from BOTH to RIGHT and back to BOTH, then to LEFT and back to BOTH; a slight R.P.M. drop when on each

			magneto bank indicates a safe ignition system and the engine can be operated for a power check
7. Obtain taxi clearance	7. Have chocks removed		7. Report to pilot ready to taxi
8. Taxi to run-up area	8. Check wing flap operation; lower the flaps to approximately 10° and then return them to up		8. Set rate-of-change selector to 0 (zero) and cabin altitude selector to desired value

## Ground Test

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Turn airplane into the wind for ground test		1. Turn on radio altimeter and check for correct operation; leave on for the duration of the flight	1. When the engine oil temperatures are above 40° C, notify the pilot that engines are ready for ground check
2. Advance all throttles to 1500 R.P.M.			2. With engines at 1500 R.P.M., check generator load
3. Turn autopilot on			3. Place all four engine propeller selector control switches in MAN (manual) and hold each propeller control switch in DECREASE RPM until 1300 R.P.M. is indicated (takes approximately 52 seconds per engine), then move

			and hold each switch in INCREASE RPM until 1500 is indicated; then place the propeller control switches back to AUTO
			4. Move the master synchronizer lever toward DECREASE RPM until 1200 R.P.M. is indicated
5. Return throttles to idle R.P.M. after the synchronizer lever reached full INCREASE RPM			5. Return master synchronizer lever to the full INCREASE RPM position with a rapid movement; the engines should return to 1500 RPM
6. With turbo-override switches in TAKE-OFF, advance one throttle at a time to a manifold pressure equal to the field barometric pressure; engine R.P.M. should be approximately 2050			6. Check magnetos and superchargers when pilot sets power condition; switch magnetos to RIGHT and LEFT and back to BOTH while noting R.P.M. drop; maximum drop should not exceed 100 R.P.M.

PILOT

COPILOT

NAVIGATOR

ENGINEER

			7. Place the turbo selector lever to 0 (zero), the respective turbo control override switch to CLIMB & CRUISE; move turbo boost lever to 7 and align the calibrating potentiometers; check for a manifold pressure increase
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			of 2 inches plus 1.5 inches for each 1000 feet of field altitude above sea level; place the turbo control override switch to TAKE-OFF and note that exhaust back pressure and manifold pressure return to their original values; then move the turbo-boost lever to 0
8. Return the throttle to idle and repeat step 6 for the remaining engines			8. Repeat steps 6 and 7 for the remaining engines
9. Check autopilot operation			9. Check oil temperature
10. Turn ADI pumps on, check ADI pressure lights on and then turn pumps off			10. Check oil pressure

## Before Take-Off

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Before taxiing onto the runway, turn the airplane into the wind and ground test the engines if not done previously			
2. Set trim tabs as desired for take-off	2. Check doors and windows and ensure the DOOR OPEN bulb is extinguished	2. Check heading indicator against pilot's magnetic compass	
3. Set altimeter and flight instruments	3. Set altimeter	3. Set altimeter	
4. Check gyro erection	4. Check gyro erection	4. Check gyro erection	4. Check gyro erection
5. Autopilot OFF	5. Radios checked	5. Radios cross checked and navigation radios tuned and tested as necessary	
6. Check rudder boost ON	6. Move wing flap switch to DOWN until 25 degrees is reached		6. Pitot heaters as required
7. ADI override switches AUTO, ADI pumps switch ON (pressure lights illuminated)			7. Propeller control levers AUTO
8. Master synchronizer lever full INCREASE RPM			8. Oil cooler flaps switches AUTO

9. Mixture AUTO RICH			9. Carburetor air RAM
10. Turbo-boost lever 0 (zero)			10. Carburetor heat OFF
11. Turbo-override switches TAKE-OFF			11. Intercooler flaps CLOSED
12. Check engine instruments within limits			12. Check generator switches set ON

			13. Check cylinder heat temperature below 170° C
			14. Cowl flaps set for take-off
			15. Turn booster pump switches for each main tank to ON; check fuel selectors set to TANK-TO-ENG position and center tank switch OFF
	16. Control surface lock UNLOCKED if not done previously		
17. Controls tested for freedom of movement	17. Obtain take-off clearance		
18. Release brakes and taxi into take-off position			

## Take-Off

PILOT	COPILOT	NAVIGATOR	ENGINEER
	1. Position lights, landing lights, beacon light and strobe light on as necessary		
2. Advance throttle to take-off power; do not exceed 60 inches of manifold pressure, 247 PSI torque, and 2700 R.P.M.	2. Check wing flaps at 25 degrees; when manifold pressure exceeds 45 inches, check water-pressure lights out		
3. Control the airplane direction with steering wheel until rudder becomes effective	3. Check propeller levers in AUTO, mixture control AUTO RICH, turbo-boost lever 0, turbo-override switches TAKE-OFF		3. Check boost pumps ON and intercooler flaps closed
4. At 78 knots (90 PMH) IAS ease the control column back to lift the nose wheel off; the airplane will leave the ground between 100 and 113 knots (115 and 130 MPH) IAS depending on gross weight	4. Check instruments during takeoff		4. Check engine instruments during takeoff
5. When airplane leaves the ground apply the brakes and signal copilot to raise the gear	5. On signal from pilot move landing-gear switch UP and confirm red warning light goes out		
6. Reduce manifold pressure to 50 inches, maximum torque 198 PSI, and move synchronizer lever	6. When power is reduced by pilot turn ADI pump switch OFF		6. Place turbo-override switches to CLIMB AND CRUISE and advance turbo-boost lever to

to 2550 R.P.M.			increase and maintain 50 inches manifold pressure for climb
7. When sufficient altitude and air speed are gained signal copilot to raise flaps	7. On signal from pilot, move wing-flap switch UP until wing flaps are fully retracted		7. Apply intercoolers as required to maintain carburetor air temperature within limits

### Engine Failure On Take-Off

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Close throttles and apply brakes if sufficient runway remains and/or if below safe three-engine speed			
2. Use propeller reverse thrust on all available engines to aid in stopping	2. Check that propellers reverse		
3. If a safe three-engine speed is reached and the airplane is off the ground, maintain directional control with rudder and ailerons	3. On signal from pilot, move landing-gear switch to UP		
4. Close throttle on failed engine	4. Move mixture to FUEL CUTOFF on failed engine if ordered by pilot		

5. If feathering is desired turn ON the feather switch located on the overhead panel for the appropriate engine			
6. Climb only as necessary to clear obstructions until the air speed builds up	6. On signal from pilot move wing-flap switch to UP when a safe air speed and altitude are reached		6. Set failed engine fuel selector OFF and turn the respective booster pump OFF
			7. Close cowl flaps on failed engine
8. When engine stops turning place the feather switch OFF			8. Turn the failed engine magneto OFF
9. Adjust power on remaining engines			9. Close intercooler flap on failed engine
10. Trim airplane for three-engine operation			10. Turn failed engine generator off and monitor electrical loads

## Climb

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Climb only as necessary to clear obstacles until 170 kts IAS is reached, then continue to climb at this air speed; MP: 50” and 2550 R.P.M.		1. Check over instruments and give radio altimeter readouts as necessary or as instructed by the pilot	1. Adjust cowl flaps to maintain normal cylinder head temperatures
2. Alternate Power Setting – 46” MP, 2350 PRM, 197 PSI torque			2. Advance turbo-boost lever as needed to maintain power and cabin air flow
3. Adjust propeller R.P.M. as desired with master synch lever			3. Adjust intercooler flaps. Carb Air Temp below 38° C
	4. Turn off NO SMOKING, FASTEN BELT signs		4. Booster pumps OFF (above 10,00 feet turn one booster pump for each main tank ON)
			5. After climb power has been established and a safe altitude has been reached, use the fuel in the center tank

Climb performance to 30,000 feet (142,000 lbs.)

Torque PSI	RPM	Elapsed Time	Distance
197	2350	67 minutes	230 nautical miles

## During Flight

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. At completion of climb, reduce manifold pressure and R.P.M. until desired cruising power is reached			
2. Trim airplane for hands off flight			2. Move mixture to AUTO LEAN after engine has cooled to normal temperature
3. Turn rudder boost OFF before and during autopilot operation			3. Adjust intercooler flaps to maintain 30 to 38° C CAT and use carburetor heat if required for anti-icing
4. Engage autopilot		4. Set radios as desired per flight plan	4. Adjust cowl flaps
		5. Every few minutes check gyro heading indicator against pilot's magnetic compass and adjust for gyroscopic drift	5. Decrease cabin pressurization with cabin altitude and rate-of-change selectors in accordance with the flight plan

### **Cruise Settings: Getting on the “Step”**

The “Step” is that range of the plane’s angle of attack where the plane is at its most efficient lift/drag ratio. With this plane it is about two degrees angle of attack or “alpha”. Exceeding two degrees will cause a large increase in the wing’s induced drag and a rapid decay of speed, with the need for a lot more thrust to maintain level flight. The cardinal rule when cruising is to always fly at a speed that maintains an angle of attack of two degrees or less. The more weight you carry; the more power you’ll need to get on, and stay on, the step.

To get on the step, climb to a few hundred feet above the desired cruising altitude. Level out and then descend to your desired height, maintaining climb power or a little less. Accelerate to a few knots above your desired cruising speed, establish level flight, and throttle back to your desired cruise power. If the plane will not maintain two degrees or less of alpha (check your artificial horizon), then increase the cruising power slightly, in stages, until the aircraft is cruising in the proper attitude. It is best to start out faster and then gradually reduce power until you’ve achieved optimum cruise.

### **Cruise Power Settings: The Torque Meter**

The torque meter was introduced to complex piston engine aircraft shortly after World War II. It provides a direct reading of brake mean effective pressure (BMEP) in pounds per square inch (PSI). The torque reading, and not the manifold pressure, is the final value to be used in setting power. All manifold pressure (boost pressure) values are approximate and should be used to set initial power. Then, fine-tune your engines so that the torque value is as specified in the chart.

### **Cruise Power: Mixture Control Adjustment**

For the first time in Flight Simulator history, realistic mixture control is now available on the complex engines of a piston-powered aircraft from the Golden Age of aviation. The mixture controls for the Wings of Power Boeing 377 Stratocruiser work just as they do on the real aircraft, and provide realistic fuel flow and power settings that match the actual aircraft’s performance charts. The mixture controls have the following positions:

**FULL RICH:** Provides maximum fuel flow for cylinder cooling, emergencies, and taxi operations. This position is with the mixture lever fully forward.

**Auto-Rich:** Provides a rich cruising and climbing mixture for higher power settings. Use the mouse to pull the lever back a bit; it will “snap” into this position.

**Auto-lean:** Provides an optimal mixture for best power. Use the mouse to pull the lever back a bit further; it will “snap” into this position.

### **Manual Lean**

This allows for manual mixture adjustment for maximum range. This position is infinitely adjustable and the fuel/air ratio achieved can be seen in the tooltip, making precise adjustments easy. Use the mouse to pull the lever back beyond the “auto lean” position. It will stay wherever you put it. Occasionally the fuel flows for each of the four engines will not match, even if a single throttle and propeller control are used to set identical throttle and prop settings. If this is the case, advance the mixture controls back to AUTO LEAN and reset the manual setting. While this is not a problem and in fact mimics the real aircraft, for those who like everything to be exactly the same, this technique will allow uniform fuel flows, provided throttle and prop settings are exactly the same for each engine. The reason for this is because the mixture setting displayed when in the manual range reads to only two decimal places. The actual mixture can vary slightly from this figure. For example, if you had the manual mixture set to 0.066, the actual fuel/air ratio is actually somewhere between 0.065 and 0.067. This technique will allow you to get exactly the same fuel flows for each engine, but keep in mind the real aircraft could not achieve anything like this kind of precision.

The power required for cruise will vary substantially with weight. Cruising speeds range from about 170 KIAS to 200 KIAS depending upon the weight and power setting. The Pregnant Guppy will cruise several knots slower than the Stratocruiser due to higher drag.

### Cruise Control Schedule

135,000 pounds, AUTO RICH

Altitude	KIAS	Approximate Boost Pressure	Torque PSI	RPM	KTAS	PPH/Engine	Specific Range
10,000	207	39	158	2350	240	1080	0.056 nm/lb
25,000	190	37	158	2350	281	1072	0.065 nm/lb

115,000 pounds, MANUAL LEAN at 0.066

Altitude	KIAS	Approximate Boost Pressure	Torque PSI	RPM	KTAS	PPH/Engine	Specific Range
10,000	178	31.3	158	1450	208	565	0.091 nm/lb
25,000	205	36.6	158	2100	302	824	0.091 nm/lb

Pregnant Guppy: 125,000 pounds, AUTO LEAN

Altitude	KIAS	Approximate Boost Pressure	Torque PSI	RPM	KTAS	PPH/Engine	Specific Range
10,000	185	36.4	158	2100	216	900	0.060 nm/lb
25,000	177	34.9	158	2100	263	910	0.072 nm/lb

## Engine Failure in Flight

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Close throttle on failed engine			
2. Feather the failed engine by setting the feather switch OFF on the overhead panel			2. Move the failed engine mixture control to FUEL CUTOFF
3. Trim airplane for three-engine operation			3. Close cowl flaps on failed engine
4. Adjust power and R.P.M. on remaining engines as required			4. Close intercooler flaps on failed engine
			5. Turn engine magneto OFF on failed engine
			6. Place the turbo control override switch in the TAKE-OFF position on the failed engine
			7. Close the booster pump off on failed engine
			8. Set the engine fuel selector on failed engine to TANK-TO-MAN position and balance fuel quantity
			9. Turn generator off on failed engine and monitor electrical loads.

## Crash Landings

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Order crew to jettison all cargo and loose gear if time permits			
2. Check that passengers are in the main cabin and secure in the best means possible; no persons should be in the lounge in an emergency	2. Check emergency exits light switch is ARMED and step lights switch ON		2. Close center tank pump and valve
3. Signal copilot to lower wing flaps	3. On pilot's signal move wing flap switch DOWN and hold until flaps are fully extended		
4. Land with as slow a forward speed as possible with a normal nose-high attitude			4. Turn off air conditioning and anti-icing equipment
5. On impact, move mixture control to FUEL CUTOFF, move magneto switches OFF, and 5 seconds after CO2 bottles have been discharged, move the master switch to OFF	5. On impact place gang fire switches to FIRE position and discharge all CO2 bottles		5. On impact, shut off all fuel valves

## Approach

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Notify crew to prepare for landing		1. Check gyro heading indicator against pilot's magnetic compass to adjust for gyroscopic drift	1. Start cabin depressurization sufficiently early to allow the cabin to reach field altitude prior to landing
2. Check weight and CG limits	2. Apply brakes and check hydraulic pressure and fluid quantity		
3. Altimeter set, radio altimeter on and set	3. Altimeter set, radio altimeter on and set to pilot's settings	3. Altimeter set, radio altimeter on and set	
4. Autopilot as required	4. Check ADI quantity		4. Check fuel quantity
			5. Set fuel selectors to TANK-TO-ENG and turn booster pumps for each main tank ON; check center tank pump and valve switch OFF
6. Move master synchronizer to 2300 R.P.M.	6. Turn on NO SMOKING, FASTEN BELTS signs		
7. Mixture AUTO RICH		7. If available set appropriate ILS frequency for landing on NAV1 radio	7. Check magnetos
			8. Anti-ice switches OFF

			9. If preheat is desired on final approach check the turbo control override switches to CLIMB & CRUISE, the turbo-boost lever to 0 (zero), and place the carburetor air switch to SHELTERS; if more heat is necessary, place carburetor heat switches ON until carburetor air temperature meets acceptable levels
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PILOT

COPILOT

NAVIGATOR

ENGINEER

			10. If preheat is not desired on final approach, place the turbo-control override switches to TAKE-OFF, the turbo-boost lever to 0 (zero), and check carburetor air to RAM and carburetor heat switches OFF
			11. Intercooler flaps CLOSED
12. Signal copilot to extend landing gear when air speed is reduced below 200 knots (230 MPH) IAS	12. On pilot's signal move landing gear switch to DOWN and check green position lights on		

13. Signal copilot for wing-flap extension and amount when air speed is reduced below 188 knots (217 MPH) IAS	13. On pilot's signal move wing-flap switch to DOWN until desired amount is reached		
14. After extending full flaps, make approach at 25 knots (30 MPH) above power-off stalling speed			14. Cabin depressurizing complete
15. Autopilot OFF	15. ADI valves AUTO, ADI pumps ON, lights on		
16. Rudder boost switch ON			16. If preheat is being used, move turbo boost lever to 0 (zero) at approximately 200 feet

## Go-Around

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Advance throttles smoothly, do not exceed 50 inches MAP; signal copilot to raise the landing gear	1. On pilot's signal move landing gear switch to UP		
			2. Check turbo-boost lever to 0 (zero) and turbo control override switches in TAKE-OFF
3. Advance to 2700 R.P.M. and advance throttle as required but do not exceed 60 inches MAP	3. Check ADI indicator lights out as power is increased		3. Check temperatures and pressures within limits
4. Signal copilot to raise the flaps to 25 degrees	4. On pilot's signal, move wing-flap switch to UP until 25 degrees is reached		
5. Check rudder boost ON	5. Check landing-gear red warning light off		
6. Reduce power to 50 inches manifold pressure and 2550 R.P.M. when a safe speed is reached, at least 131 knots (150 MPH) IAS			6. Adjust cowl flaps as required
7. Signal copilot to raise the wing flap when sufficient air speed and altitude have been gained	7. On pilot's signal move wing-flap switch to UP until flaps are fully retracted	7. Set radios as required	

## Landings

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Contact the ground with the main gear first, keep the nose up for a time then ease the nose down; if landing is made in a cross-wind lower the upwind wing and crab into the wind with some rudder; just before ground contact, level the wings and correct the airplane direction	1. Check hydraulic pressures up and landing gear switch DOWN		1. If reverse thrust is to be used, shut off all anti-icing heaters
2. Immediately after ground contact, close throttles	2. ADI pumps OFF		2. Cowl flaps OPEN when ground contact is made
3. If desired, use reverse thrust to slow the airplane roll; immediately upon contact with the ground place engines in reverse thrust; listen for reversal cycle; make a gradual and continual application of thrust and apply sufficient power to obtain the desired reverse thrust			
4. Return the propellers to normal pitch			
5. Move master synchronizer to full INCREASE RPM			5. Anti-icing may be turned back on if desired

			6. Turn booster pumps OFF
	7. When power is applied to the engines for taxiing off the runway, move the wing-flap switch to UP until flaps are fully retracted		
8. Trim tabs zeroed			8. If oil is to be diluted on shut-down, open oil cooler flaps for taxi

### Landing Tips

Calculate the power-off stalling speed based on the aircraft weight. Set engines to 2300 RPM and adjust power as required to achieve an airspeed of 190 KIAS. Landing gear may be lowered below 200 KIAS. Begin lowering flaps at 188 KIAS. Enter the pattern at either the crosswind or downwind leg at an indicated airspeed of 170 KIAS and 1,500 feet AGL, depending on clearance and type of approach. If possible, enter the pattern on the crosswind leg and fly 2-3 miles out from the runway. This will provide ample room to maneuver the aircraft. Fly the downwind leg at 165 KIAS, lowering flaps to 25 degrees abeam the runway threshold and reducing speed to 150 KIAS. Turn base 2-3 miles beyond the runway threshold at 150 KIAS and reduce speed on the base leg to 140 KIAS. Allow the aircraft to descend to 1,000 feet AGL on the base leg, turning to final at 140 KIAS. Do not lower the flaps fully until the runway is made, and maintain a speed of at least 25 KIAS above the calculated power-off stalling speed until the runway threshold is crossed. A normal final approach at 100,000 pounds is made with full flaps, propellers at 2300 RPM, and about 20" of power at a speed of 120 KIAS. Do not chop the power at any time. Reduce power and land smoothly, holding the nose off as long as possible. To reduce landing roll, engage reverse by pulling throttles back beyond the stop (F1 command).

## Landing With Landing Gear Failure

PILOT	COPILOT	NAVIGATOR	ENGINEERR
1. Land with as light a gross weight as possible and after every effort has been made to lower the landing gear	1. Turn off all equipment not necessary for flight	1. Turn off all equipment not necessary for flight	1. Turn off all equipment not necessary for flight
2. Check that all passengers and crew in lower compartments are moved to the main cabin and braced for crash landing	2. Check emergency exits light switch is ARMED and step lights switch ON		3. Turn booster pumps OFF
3. Signal copilot to lower wing flaps	3. On pilot's signal, move wing-flap switch DOWN until desired amount of flaps is reached		
4. Land in a normal nose-high attitude			
5. On contact with the ground, close throttles, move mixture control to FUEL CUTOFF, turn magneto switches OFF and turn OFF master switch 5 seconds after CO2 has been discharged	5. On contact, place fire gang switches in the FIRE position and discharge all CO2 bottles		5. On contact shut off all fuel valves

## Landing Without Brakes

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Land with as slow a forward speed as possible	1. Check wing flaps fully extended		
2. Land as short on the runway as possible	2. Check emergency hydraulic pressure and if required charge the system		2. Check all anti-icing heaters are off
3. Make contact with the main gear first then ease the nose down	3. Check emergency exits light switch is ARMED and step lights switch ON		3. Open cowl flaps on contact with ground
4. As soon as the nose gear makes contact, move all four throttles to REVERSE OPEN			
5. If necessary for stopping use the overhead emergency brake levers			
6. After airplane slows down, reduce reverse thrust and follow emergency taxiing instructions if necessary			

## Stopping Engines

PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Check parking brake on			
2. If oil dilution is desired, and when required temperatures are established, adjust throttles to obtain 1000 R.P.M.			
			3. When cylinder head temperatures are below 190° C, move mixture control to FUEL CUTOFF while idling between 800 and 1000 R.P.M.
4. Close throttles			4. Turn magneto switches OFF when engines stop turning
			5. Turn APU on if desired
			6. Leave cowl flaps open for at least 15 minutes after engines are stopped

## Before Leaving the Airplane

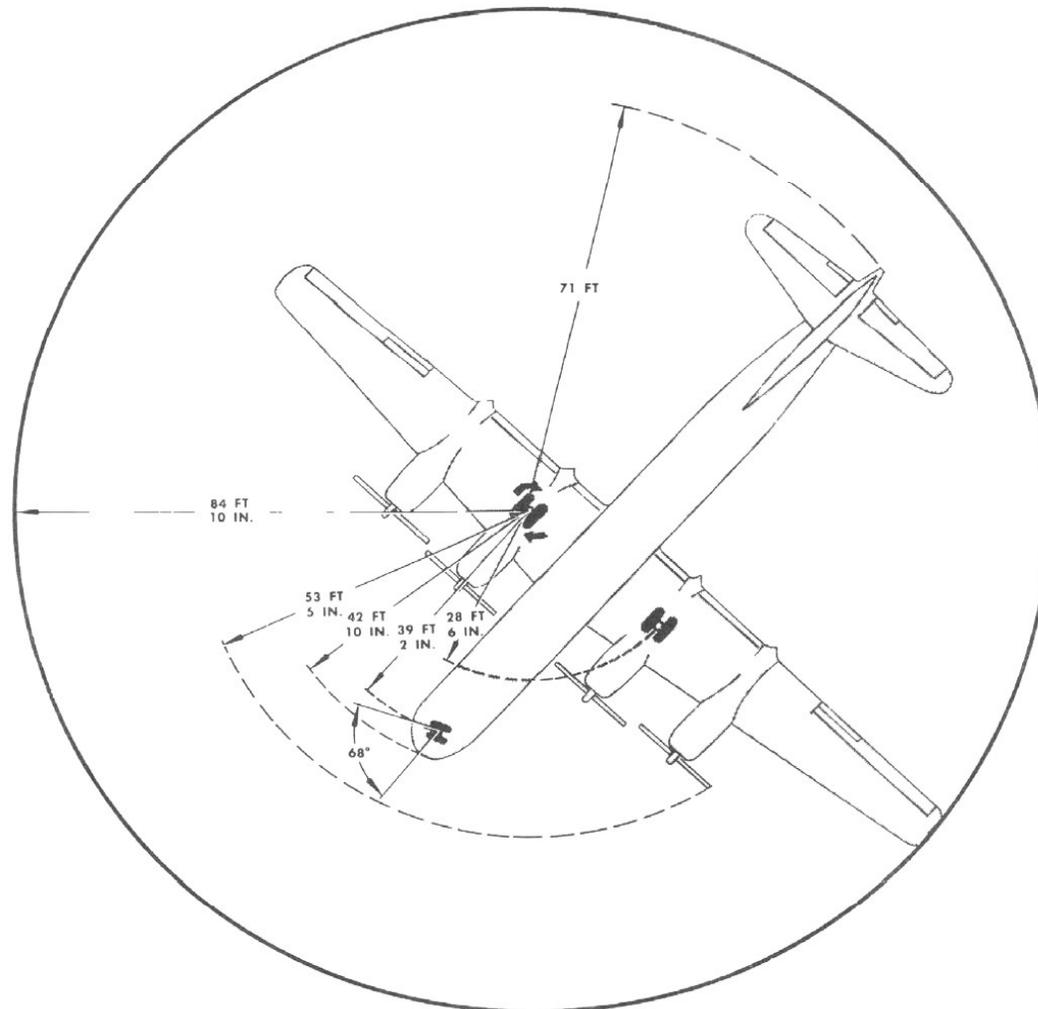
PILOT	COPILOT	NAVIGATOR	ENGINEER
1. Parking brakes ON			
2. Master synchronizer lever to full DECREASE RPM	2. Control surface lock LOCKED (press yoke fully forward before engaging lock)		
3. Avionics switch OFF		3. Radios and navigational equipment set as necessary	3. Turbo boost 0 (zero)
4. Trim tabs zeroed			4. Fuel selectors OFF
			5. Cowl flaps CLOSED
			6. Intercooler flaps CLOSED
7. All switches OFF except rudder boost switch	7. All switches OFF	7. All switches OFF	7. All switches OFF

## Engine Limitations and Characteristics

The R-4360 Wasp Major is the most powerful engine ever fitted to a production piston aircraft. It produces 3,500 HP with water injection. It has both a gear-driven supercharger and an exhaust-driven turbo-supercharger. The two systems worked together automatically to produce the power needed for flight, up to altitudes above 30,000 feet. The characteristics of the boost systems will require slight adjustments to the throttles as the aircraft climbs or descends to maintain the desired manifold pressure.

ENGINE POWER CHART	TAKEOFF MAXIMUM	MAXIMUM CLIMB POWER	ALTERNATE CLIMB POWER	MAXIMUM CRUISE	NORMAL CRUISE
Torque PSI	247	198	197	172	158
MP	60"	50.4"	45"	43"	37"
RPM	2700	2550	2350	2350	2100

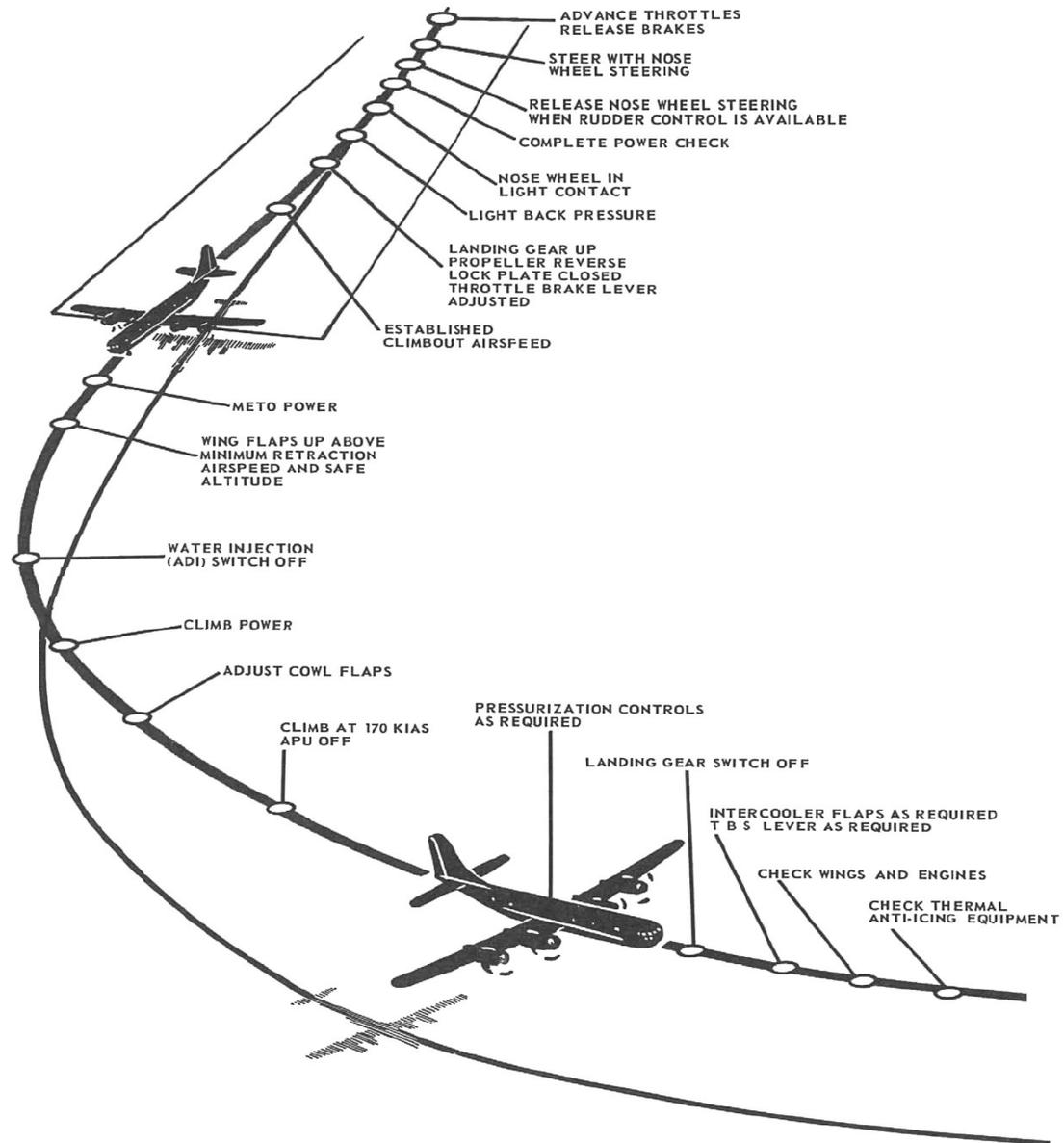
# Minimum Turning Radius (Typical)



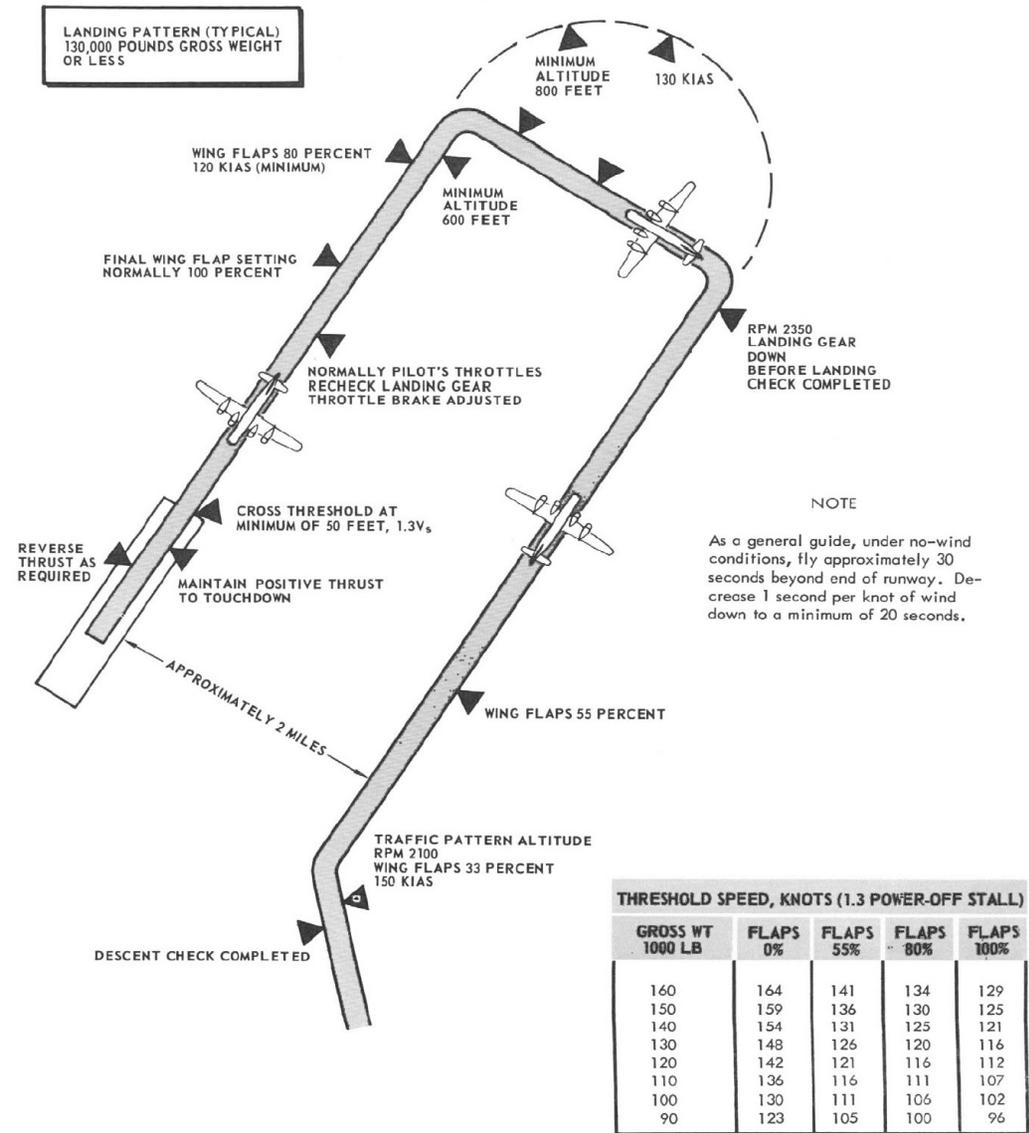
**NOTE**  
**AVERAGE GROUND CLEARANCE**

INBOARD PROPELLERS	1 FOOT 5 INCHES
OUTBOARD PROPELLERS	2 FEET 7 INCHES
FUSELAGE	2 FEET 9 INCHES

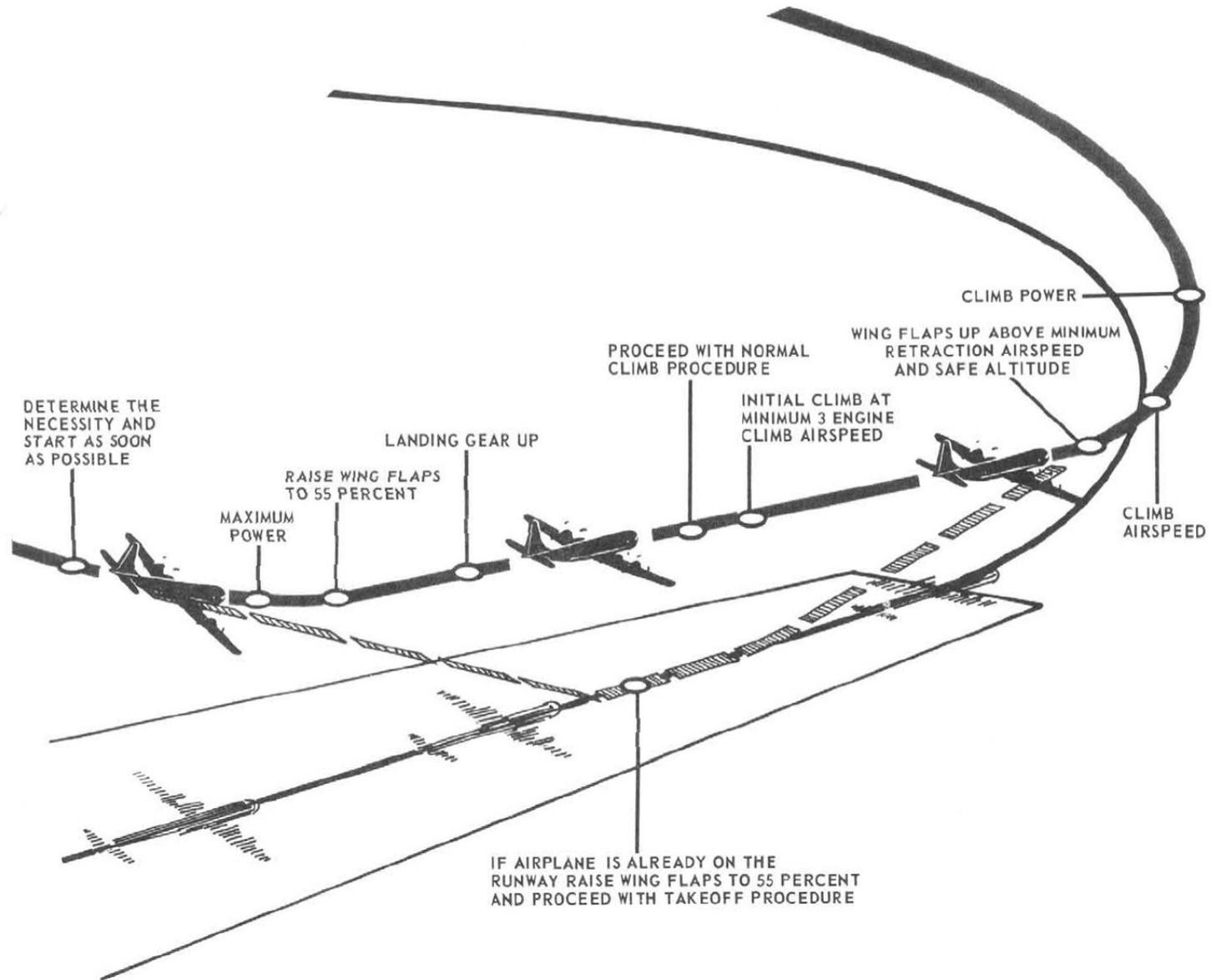
# Takeoff and Climb (Typical)



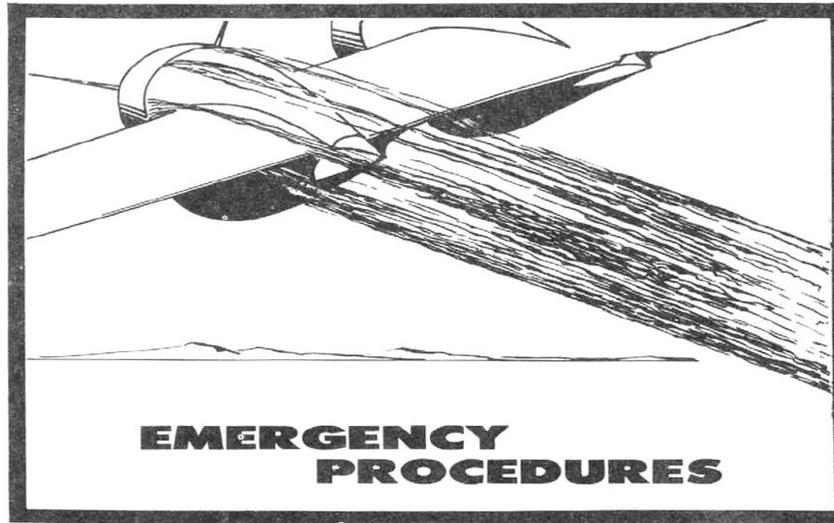
# Landing Pattern



# Go Around



## Chapter 13: Emergency Procedures



### **Engine Failure / Fire During Flight**

#### **IMPORTANT:**

In order to avoid compounding the emergency, carefully select the correct engine controls.

As a result of recent tests, special emphasis has been placed on feathering the propeller of an engine prior to accomplishing other engine fire procedures. In view of these tests, the fire switch gang bar of the engine on fire must be placed to the FIRE position as soon as the fire is detected. When the engine stops or when it is obvious that the engine will not slow down any further, the fire extinguisher system may be utilized as necessary.

#### **CAUTION:**

**DO NOT** feather the propeller when all available power is needed, unless absolutely necessary. If torque pressure is above 65 psi, usable thrust is being delivered.

During takeoff or while airborne, **DO NOT** except in an emergency and then only with extreme caution, move any throttle back into the idle range unless the propeller reverse warning flag shows the word LOCKED and the propeller reverse lock plate is closed.

In case of engine failure/fire during takeoff, immediately apply full power.

## ENGINE FAILURE / FIRE DURING FLIGHT (CONT)

1. **IF FIRE IS PRESENT**, POSITION FIRE SWITCH GANG BAR TO FIRE. When the engine will not slow down any further and indications of fire continue to exist, position the CO2 fire extinguisher switch to FIRST FIRE position and hold. If fire is not extinguished in 10 seconds, hold switch to SECOND FIRE position. SKIP TO PROCEDURE #5
2. SHUT DOWN ENGINE
3. Close throttle on failed engine
4. FEATHER propeller on failed engine
5. AUTOPILOT AND RUDDER BOOST-DISENGAGE
6. Set POWER as required on remaining engines

PERFORM STEPS 7 through 15 on the FAILED Engine:

7. MIXTURE LEVER- FUEL CUTOFF
8. MIXTURE LEVERS (ALL OTHER ENGINES) -AUTO RICH
9. Cowl Flap Switch - 3/4 INCH
10. Intercooler Flap Switch – CLOSED
11. Oil Cooler Flap Switch – CLOSED
12. Fuel Boost Pump Switch – OFF
13. Fuel Selector Valve Switch - TANK TO MANIFOLD
14. Ignition Switch – OFF
15. Turbo Switch - TAKEOFF (bypasses Turbo)

## **Restarting Engine During Flight**

### **CAUTION:**

**DO NOT** restart an engine unless it can be determined that it will be reasonably safe to do so.

1. Airspeed - "160 KIAS MAXIMUM"
2. Power Package Fire Switches – NORMAL
3. Throttle – CLOSE
4. Turbo Switch - CLIMB / CRUISE
5. Fuel Selector Valve Switch - AS REQUIRED
6. Oil Cooler Flap Switch - AS REQUIRED
7. Cowl Flap Switch - 3/4 INCH
8. Verify Prop feathering switch is OFF
9. Ignition Switch – BOTH
10. Mixture Lever - AUTO RICH
11. Slightly move PROP PITCH lever and verify propeller is no longer feathered
12. Press START
13. Hold BOOST button until Oil Pressure rises
14. Engine – WARMUP
15. Throttle - AS REQUIRED

## **Emergency Descent**

1. Throttles – CLOSE
2. Landing Gear Switch – DOWN
3. Wing Flap Switch – DOWN
4. Airspeed - 155 KIAS

### **NOTE:**

Landing gear and wing flaps can be started down immediately after closing throttles from normal cruising airspeed. Airspeed will be down to wing flaps extension airspeed by the time wing flaps are fully extended.

### **CAUTION:**

In an extreme emergency, where engine damage is not a factor, a faster rate of descent may be obtained by using 2700 rpm with the throttles closed.

## **Crash Landings**

### 1. Landing Gear - AS REQUIRED

#### **NOTE:**

On hard or soft flat terrain, landing should be made with the landing gear fully extended. Extended landing gear will absorb some of the initial impact loads of crash landings in rough terrain. However, roughness of terrain, power requirements, gear down drag, and other pilot judgment factors should be considered prior to electing to crash land with gear up or down.

### 2. Wing Flaps - DOWN

### 3. Throttles - CLOSE

### 4. Fuel Boost Pump Switches - OFF

### 5. Battery Switch - OFF

### 6. Mixture Levers - FUEL CUTOFF

### 7. Ignition Switches - OFF

### 8. Master Switch - OFF

With no nose gear extended:

**TOUCH DOWN ON MAIN LANDING GEAR AND HOLD NOSE UP AS LONG AS POSSIBLE**

With nose and a single landing gear extended:

**TOUCH DOWN ON NOSE GEAR AND EXTENDED MAIN LANDING GEAR AND HOLD WING UP AS LONG AS POSSIBLE**

With one main landing gear retracted, make contact on the nose gear and extended main landing gear simultaneously; hold control column forward and use aileron to hold wing tip off the ground as long as possible. Be prepared for a ground loop.

## **Chapter 14: Anti-Icing**

### **Pitot Head Anti-Icing System**

Ice formation on the pitot heads is prevented or removed electrically by 28V DC heating elements in each of the two pitot heads.

#### **Pitot Heat Switches**

A single switch on the engineer's panel operates the pitot heaters. Power is supplied from the 28 volt DC bus. Operation of the pitot heaters should be limited to brief maintenance checks and extreme cold weather ground operation.

### **Carburetor Icing In Flight**

#### **Indications of Carburetor Icing**

Under conditions of high atmospheric humidity, carburetor icing can occur with carburetor air temperature between -10°C and 7°C. If icing does occur it will be indicated by one or more of the following:

1. Change in fuel flow and change in torquemeter pressure
2. Intercoolers - Close

If Necessary:

3. TBS setting – Increase
4. Throttle - Retard (to maintain manifold pressure within limits)

As Ice is Removed:

5. Engine Instruments - Monitor (carefully)
6. Engine Controls - Adjust

## Prevention of Carburetor Icing

Sheltered air is used if icing is anticipated on takeoff. In flight icing may be prevented with the turbo on by maintaining a carburetor air temperature of 15°C. If the icing conditions are extreme the carburetor air temperatures may, if desired, be maintained between 35°C and 38°C.

## Window Defogging

The Stratocruiser has 19 cockpit windows which provide exceptional visibility, however, with a crew in the one area, moisture can cause the windows to fog up.

### Window Defogging Control Knob

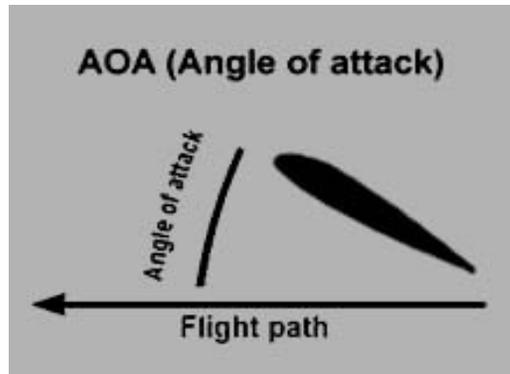
A single knob on the pilot's auxiliary panel controls the window defrosting valves and air is directed through tubes and onto the upper and lower windows.



## Chapter 15: Stalls

### What is a Stall?

In order for a wing to produce efficient lift, the air must flow completely around the leading (front) edge of the wing, following the contours of the wing. At too large an angle of attack, the air cannot follow the contour the wing. When this happens, the wing is in a “stall.”

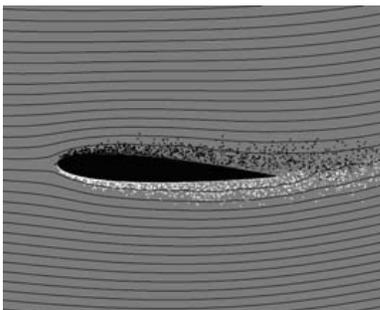


Typically, stalls in civilian aircraft occur when an airplane loses too much airspeed to create a sufficient amount of lift. A typical stall exercise would be to put your aircraft into a climb, cut the throttle, and try and maintain the climb as long as possible. You will have to gradually pull back harder on the stick to maintain your climb pitch, and as speed decreases, the angle of attack increases. At some point, the angle of attack will become so great, that the wing will stall (the nose will drop).

Below are some graphical representations of a wing traveling through the air in various conditions:

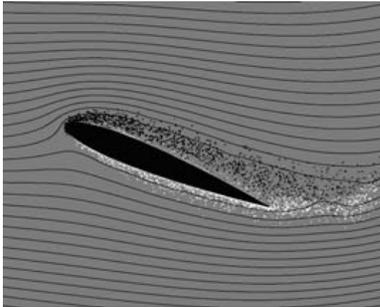
### Level Flight

A wing creating moderate lift. Air vortices (lines) stay close to the wing.



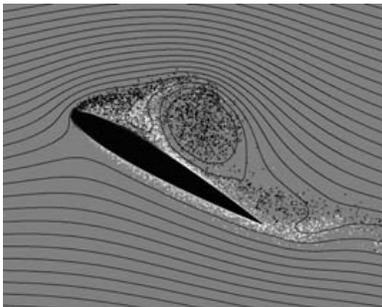
### **Climb**

Wing creating significant lift force. Air vortices are still close to the wing.



### **Stall**

The angle of attack has become too large. The boundary layer vortices have separated from the top surface of the wing, and the incoming flow no longer bends completely around the leading edge. The wing is stalled, not only creating little lift, but significant drag.



## Stalling the Stratocruiser



### Stall Characteristics

The stall characteristics of the airplane are good. Recovery from stalls should present no problem to the average pilot provided the recommended recovery procedures are followed and the proper cautions are observed. The stalling speed increases with the angle of bank. Therefore, care must be exercised in banking the airplane at low airspeeds or with a nose-high attitude. The extended landing gear has no appreciable effect on the stalling speeds.

#### **NOTE:**

During stalls, at a medium gross weight, the airplane can be expected to lose at least 750 feet of altitude before being returned to level flight, if the proper recovery procedures are begun immediately after the complete stall has been reached.

## **Stall Warning**

Warning of the impending power-on or power-off stall comes in the form of a comparatively mild buffeting of the horizontal stabilizer and elevator and occasional light buffeting of the ailerons.

### **NOTE:**

Stall speed is not affected by landing gear position. Power-on stall speeds are 5 to 10 knots lower.

Should stall warning occur during flight, act immediately to avoid completely stalling the airplane. If in level flight increase the airspeed; in a turn, decrease the angle of bank.

## **In the Stall**

At the full and complete stall, if a rapid roll occurs, the control wheel may momentarily move hard over, placing the ailerons in their maximum travel position, and remain there until flying speed is regained. A reversal of elevator force may take place during a complete stall, but the force tending to keep the control column back is usually comparatively light and should present no problem to the pilot in pushing the control column forward to recover from the stall. However, with a deliberate attempt by the pilot to obtain a very high angle of attack, and under an abnormal combination of conditions, such as a rearward center of gravity, power on the engines, and wing flaps up, it might be possible to encounter a somewhat high elevator force reversal, which would require considerable force by the pilot to push the control column forward during stall recovery. A combination of these conditions, which might induce a high elevator force, is considered to be far out of the normal operating range. Normally no abrupt rolling action either precedes or accompanies a power-off or low power-on stall. However, as in the case of most 4-engine airplanes, stalls encountered with unsymmetrical or high power on the engines will result in an abrupt roll either just before or at the stall.

### **WARNING:**

Never use power and a nose-high approach to reduce the landing speed, except when required in emergency procedures. Under these conditions sufficient power should be used to maintain a safe airspeed above the stall warning speed.

The ailerons are effective up to the point of stall. Use of the ailerons in the stall will not aggravate the stall as is experienced in some types of airplanes. With boost on, rudder control is effective through the stall range even with one engine out, since the minimum directional control speed is below the stall speeds except at weights below approximately 100,000 pounds. With boost off, rudder control is similar to that of large airplanes with conventional or unboosted controls.

## Stall Recovery

When the airplane is stalled, recovery should always be made by nosing the airplane down sufficiently to regain flying speed with minimum loss of altitude. In general, recovery from stalls at safe altitudes with low cruise powers should be made by leaving the power unchanged or by closing the throttles if serious difficulty is encountered. If the airplane is stalled with a large amount of power on, the power should be chopped immediately to prevent roll and an excessive loss of altitude during recovery. A stall with unbalanced power could cause a rapid roll; under this condition the power should be chopped immediately. If power is required for recovery, use symmetrical power. Only at lower altitudes when recovery with a safe altitude margin is questionable, should power be applied during recovery. Avoid excess airspeeds, abrupt pullouts and rough handling of controls during recovery; any or all may result in an accelerated secondary stall.

## Practice Stalls

For both power-on and power-off stalls, set propellers at 2100 rpm with landing gear up, and 2350 rpm with landing gear down, and manifold pressure necessary to produce a stall. **DO NOT** allow stall to progress beyond the buffeting stage. Practice all stalls with and without rudder boost operating and conduct all practice at least 5000 feet above terrain altitude. Monitor CHT closely since low airspeeds and turbulent airflow will hinder proper engine cooling.

### **WARNING:**

Stall characteristics are greatly affected by center of gravity (or c-of-g) position and gross weight. **DO NOT** practice stalls when the center of gravity is near the aft limit or when the gross weight is over 130,000 pounds.

To become completely familiar with the stalling characteristics of the airplane, practice stalls may be made with the wing flaps up, wing flaps full or partially down, landing gear up, landing gear down, power on, power off, or any combination of the above configurations. When making power-on stalls avoid abrupt pull outs. To minimize rolling tendencies avoid excessively nose high attitudes during the approach to the stall. Since the rolling tendency is most pronounced in a turn, it is recommended that all stall practice be conducted in straight and level flight.

## Spins

Spins are a prohibited maneuver and must not be done intentionally. However, if a spin is entered accidentally and the landing gear and wing flaps are down, **DO NOT** attempt to raise them. While rotating, the airspeed indicator may indicate a much higher airspeed than the actual indication should be. A spin might occur if a stall is allowed to progress into heavy buffeting. A spin might result from asymmetrical power at low airspeeds, such as one engine out or reduced power on both engines on one side. Always eliminate the asymmetrical power condition. If a spin begins to develop with one engine out, reduce power to idle on the opposite engine. If power has been reduced on both engines on one side, reduce power on the other engines. **DO NOT** attempt to bring up power on retarded engines; engine acceleration is too slow and the increased power may aggravate a full spin condition. Lower the nose and level the wings to place the airplane in a streamlined flight attitude (a spin is a stalled condition). Make a normal recovery from the dive. If a fully developed spin occurs, use normal recovery techniques, i.e. reduce all power to idle, apply full opposite rudder followed after a two-second interval by forward control column. Full forward column may be necessary to streamline the airplane. When rotation stops, center the rudder and pull out of the dive. **DO NOT** make an abrupt pull up as this may over-stress the airplane or produce a secondary stall. Avoid violent control movements at all times.

## Flight Controls

The flight controls enable the airplane to be controlled without undue effort by the pilot under any reasonable load, flap and power combination. No unusual reactions of any controls will be experienced except for possible light elevator reversal during power-on stalls. The rudder is effective with or without rudder boost on. However, with rudder boost off considerably higher rudder pedal forces will be required. Wing flap position changes have little effect on the trim requirements of the airplane, since the left hand elevator tab is used to provide automatic trimming during changes in flap position. Trim requirements on all controls are slight during normal operation of the airplane. To properly trim, set up the flight attitude, power and airspeed desired, relieve all elevator pressure first, then rudder pressure and finally aileron pressure. Minimize the use of aileron trim; use it only when elevator and rudder trim are not completely effective.

### **WARNING:**

Use of excessive trim during letdowns or approaches is dangerous, since power changes result in high control forces until the airplane is re-trimmed.

## **Chapter 16: Level Flight Characteristics**

### **General Flight Characteristics**

The flight characteristics are excellent for a heavy airplane. Maneuvering and control of the airplane do not require undue force by the pilot. The airplane is very stable and trims out very easily. Up to four units of aileron trim may be required for some off-center fuel loadings; this trim may be rolled in easily during takeoff and climbout. Only small changes in trim are required for normal operation to maintain the desired airplane attitude. Rudder control is excellent with the rudder boost switch ON. Response to power changes is immediate and positive.

### **Slow Flying**

No control abnormalities will be discovered during low speed flight. Maintain a close watch on engine CHT due to poor cooling air flow and be alert for possible engine malfunction, since engine failure during low speed flight will result in a dangerous condition. Turns at low speeds are critical and controls should be well coordinated at all times.

### **Cruising Flight**

No control or other flight peculiarities are evident during cruising flight. Avoid abrupt control movements at all times. Lowering the landing gear will increase the airplane drag and should be accompanied by a symmetrical increase in power to counteract this effect. Slight nose up trim will also be required. Wing flap position will have little effect on trim, but will greatly increase the airplane drag when between the 55% and 100% down positions. Oil cooler flap, intercooler flap and cowl flap position affect airplane performance, resulting in a loss of airspeed when open. Cowl flap drag is very apparent and non-symmetrical cowl flap operation will require changes in airplane trim. Cowl flap opening in flight is limited to a maximum of three inches due to excessive buffeting at larger openings.

### **Diving**

Diving is prohibited. If the airplane inadvertently enters a dive, extreme caution should be used during recovery when at or near the limiting airspeed. Avoid abrupt pull-outs at any time.

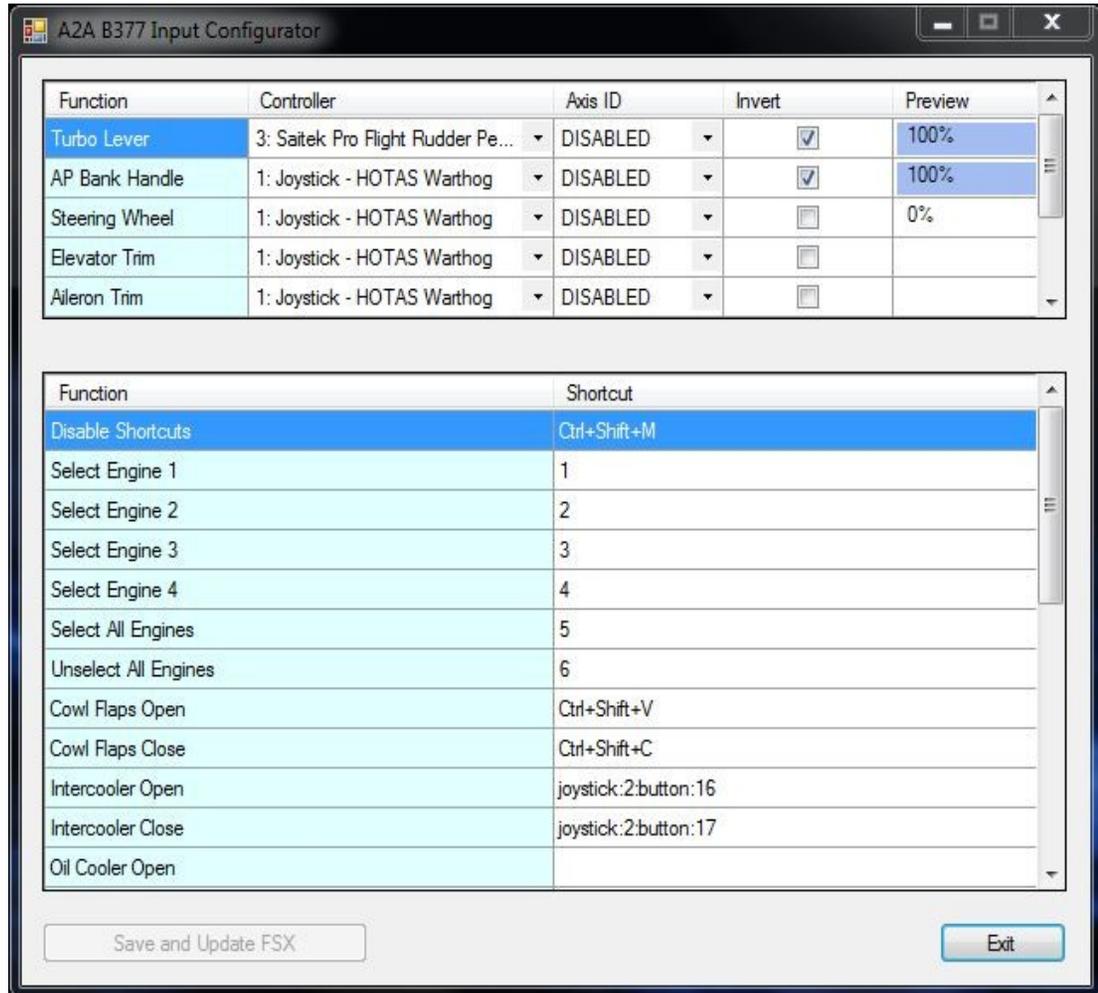
## Chapter 17: Control Mapper

The B377 Input Configurator is a small utility that allows users to assign keyboard or joystick mappings to many custom B-377 functions that can't be found in FSX controls assignments menu. It can be found in the A2A/B377/Tools folder inside your FSX installation directory.

The upper table is the axis assignment menu. From the drop down list, select joystick and axis you want to assign to each function and verify its operation in the 'preview' column. Mark the 'invert' checkbox if needed.

The lower table is the shortcuts menu. Hover over function name to bring up tooltip with additional information. To make a new shortcut, double click on a selected row to bring assignment window. Then press the keyboard key or joystick button you want to assign to this function. For keyboard it's also possible to use modifier keys (Ctrl, Shift, Alt).

When done with the assignments, press "Save and update FSX" button. This will instantly update shortcuts for B-377. There is no need to restart FSX or even reset flight for the changes to take effect, you can adjust shortcuts on the fly.



**Shortcut tips:**

*Disable (custom) shortcuts* - All shortcuts and axes assignments made with this utility have higher priority than FSX ones, so they will mask identical shortcuts made inside FSX if they exist. Use this function to access the original FSX assignments.

*Engine selection* shortcuts can be used to quickly select one or more engines. They can be extremely useful. Some custom shortcuts like engine starters will work only when a single engine is selected.

If you have split throttle, then you may consider assigning left and right engines to separate axes (*Throttles Left* and *Throttles Right*).

To get the proper simulation of spring loaded switches that control the engines cowl flaps, you have to map them in the Input Configurator. You can simply assign the same combination that is used in FSX for Cowl Flaps (as shown on the picture above) or a custom one.

## Chapter 18: Key Assignments

The B377 Input Configurator described in the previous chapter is the preferred way to assign keyboard shortcuts to various aircraft functions. However, we have kept the predefined shortcuts from 377 SP1 for those who are already used to them. These shortcuts are listed in the following tables.

### **ADI System**

B377 System	FSX Event	Suggested Key Binding
Master On (Accel)	Anti-Detonation Tank Valve Toggle	Shift + Q
Master On (SP2)	Tail Hook (up/down)	Shift + Q

### **Autopilot**

B377 System	FSX Event	Suggested Key Binding
On	Autopilot Master (on/off)	Z
Altitude Hold	Autopilot Altitude (on/off)	CTRL + Z
Pitch Wheel Down	Autopilot Pitch Ref (down)	Down Arrow Key
Pitch Wheel Up	Autopilot Pitch Ref (up)	Up Arrow Key
Turn Handle Left	Autopilot (decrease max bank)	Left Arrow Key
Turn Handle Right	Autopilot (increase max bank)	Right Arrow Key

## Propeller Reverse

B377 System	FSX Event	Suggested Key Binding
Increase	Throttle (decrease quickly)	F2
Decrease	Throttle (increase)	F3

## Steering Wheel

B377 System	FSX Event	Suggested Key Binding
Steer Left	Floats (extend)	END
Steer Right	Floats (retract)	PAGE DOWN

## Turbo Lever

B377 System	FSX Event	Suggested Key Binding
Increase	Autobrake (increase)	INSERT
Decrease	Autobrake (decrease)	DELETE

## Chapter 19: 2D Panels

### **Crew Reports (SHIFT-2)**

Important information is readily available with the Crew Reports screen.

#### **Flight Stages**

Your crew observes the aircraft and detects the phase of flight based on conditions and reports them here. The flight stages are listed below:

##### Flight Stages

#### **Preparing for boarding**

Loading passengers

Passengers Loaded

Taxi

Takeoff

Liftoff

Climb

Cruise

Descend

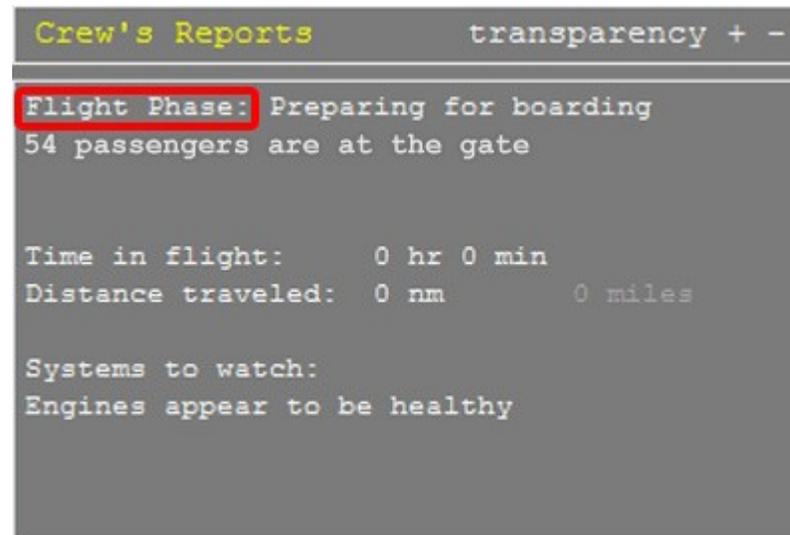
On Final

Touchdown

Taxi to parking

Unloading Passengers

Flight End



At the start of a new flight, once you initiate the loading, passengers gather at the gate.

## Flight Stages

Preparing for boarding

**Loading passengers**

Passengers Loaded

Taxi

Takeoff

Liftoff

Climb

Cruise

Descend

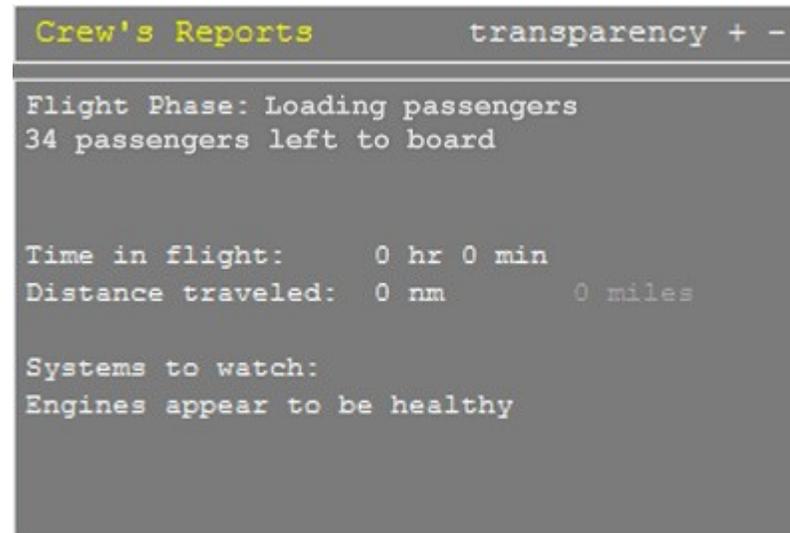
On Final

Touchdown

Taxi to parking

Unloading Passengers

Flight End



Once loading starts, the air stairs move into position and the flight attendant (Heidi) greets them as they walk in. From the cockpit, you can actually hear passengers come on board and listen to Heidi as she welcomes them and helps them get settled in.

While Heidi will let you know when the loading is complete and the cabin is sealed, you can always get a quick look here to see how many passengers are left to board.

You can also see a detailed, real-time look at where the passengers are being seated and where the luggage is being loaded. Your ground crew will let you know when they begin loading the aircraft, and they will do their best to place the luggage in either the front or rear for the best balance. Be aware, during cold / bad weather, passengers tend to carry more luggage (clothes, umbrellas, etc.) so your aircraft will tend to be a few hundred pounds heavier during these times. Also, do not be alarmed if the aircraft shakes and bucks a bit while loading, this is simply the forces of the luggage and people as they step on and off the aircraft at various locations.

Flight Stages

Preparing for boarding

Loading passengers

**Passengers Loaded**

Taxi

Takeoff

Liftoff

Climb

Cruise

Descend

On Final

Touchdown

Taxi to parking

Unloading Passengers

Flight End

```
Crew's Reports      transparency + -
-----
Flight Phase: Passengers Loaded
54 passengers are on board

Time in flight:      0 hr 0 min
Distance traveled:  0 nm      0 miles

Systems to watch:
Engines appear to be healthy
```

Both the ground crew and Heidi will confirm when loading is complete, doors are shut, and the cabin is sealed. Heidi will then start preparing the cabin and give the required safety announcements.

## Flight Stages

Preparing for boarding  
Loading passengers  
Passengers Loaded  
Taxi  
**Takeoff**  
Liftoff  
Climb  
Cruise  
Descend  
On Final  
Touchdown  
Taxi to parking  
Unloading Passengers  
Flight End  
Flight Stages

```
Crew's Reports      transparency + -  
-----  
Flight Phase: Takeoff  
54 passengers are on board  
  
Time in flight:      0 hr 0 min  
Distance traveled:  0 nm      0 miles  
  
Systems to watch:  
Engines appear to be healthy
```



Heidi will let you know when the passengers are all settled and have been read their safety instructions. You can also get confirmation of a healthy set of engines at the bottom of this screen. The captain will then greet the passengers, and once flaps are lowered, he will notify the crew to prepare for takeoff.

## Flight Stages

Preparing for boarding  
Loading passengers  
Passengers Loaded  
Taxi  
Takeoff  
Liftoff  
Climb  
**Cruise**  
Descend  
On Final  
Touchdown  
Taxi to parking  
Unloading Passengers  
Flight End

```
Crew's Reports      transparency + -
-----
Flight Phase: Cruise
54 passengers are on board
Preparing breakfast

Time in flight:      1 hr 14 min
Distance traveled    223 nm      256 miles

Systems to watch:
Engine 2 is 255°C

Engines appear to be healthy
```

The Boeing 377 Stratocruiser could be configured for first-class luxury from the nose to the tail, and this included two full course meals in a single flight. Meals are prepared by an on-board chef, served, and cleaned up. During this time there is a lot of equipment, food, trays, silverware, cups, etc. throughout the cabin, so it is especially important that you, as captain, make sure the flight is as smooth as humanly possible. You can see here when meals are being prepared, eating, and cleaned up. Typically you can expect a full hour to prepare and serve breakfast and, seventy-five minutes for lunch, and ninety minutes for dinner.

For overnight flights, the cabin will quiet down and the passengers will sleep. Heidi will still make it into the cabin, serving drinks and snacks for you during this time.

Additionally, engine status can be monitored here too. Also, should there be a failure or in-flight emergency, it will also be reported in this screen.

## Flight Stages

Preparing for boarding

Loading passengers

Passengers Loaded

Taxi

Takeoff

Liftoff

Climb

Cruise

Descend

On Final

Touchdown

Taxi to parking

**Unloading Passengers**

Flight End



During descent, the crew will prepare the cabin for landing. After touchdown and your taxi to the ramp, you can initiate the real-time unloading of passengers. You will again hear Heidi speaking with the passengers as she assists them off the plane. **If you listen closely**, you can also get clues about how happy the passengers were on the flight based on her reactions.

If your flight engineer (Larry) is in control of the engineer's panel, at this time he will start to prepare the plane for shutdown. Once all passengers have left the plane, Heidi will say her goodbye and the flight will be recorded in your Captain's Log.

## Power Settings

Power Settings represent your clipboard showing you important info to quickly establish a proper takeoff, climb, and cruise. Note that “wet” means “ADI-ON” and “dry” means “ADI-OFF.”

```
POWER SETTINGS
Take Off:
  60"MP, 2700 RPM, 247 PSI, Auto-Rich (wet)
  54"MP, 2700 RPM, 218 PSI, Auto-Rich (dry)
Max Climb (170kts IAS):
  46-51"MP, 2550 RPM, 195 PSI, Auto-Rich
Cruise:
  40"MP, 2100 RPM, 168 PSI, Auto-Lean
```

## IMPORTANT

Manifold pressure is not a direct indication of power, but rather an indication of potential power. ALWAYS use your torque-meters as the FINAL determination for power because, you can easily over-torque your engines in cold weather or have too little power in hot weather. So as you apply takeoff power, even though 60” is listed, try slowly moving your throttles to 55”, then look to your torque gauges for final adjustments.

Also, be sure your props are running at high speed before applying takeoff power, otherwise you can damage your engines with too much torque at too low RPM's

## Additional Crew Comments

Systems to Watch displays the hottest engine, hottest turbo bearing temp, and carb air temp warnings. This is vital information especially during takeoff, when temps are racing upwards. Keep an eye on this, as it simulates your crew keeping you updated to the second.

Engine Condition is also reported in general terms. If your engineer suspects an issue, he will list it here.

Emergencies are also reported here like an engine failure, engine fire, turbo failure, heating, air conditioning, or pressurization issues. Also, should a passenger become injured, it will be reported here as well.

## Controls (SHIFT-3)

This control panel was initially created to allow you to operate systems like lights, doors, and engine flaps while in the external view. It soon became a nice little place where we could put anything we wanted to have quick access to.

### Upper Section

**LIGHTS:** All aircraft lights

**ELECTRIC:** Battery, generators, ignition, avionics, and APU

**MISC:** Doors, parking brake, and tail.

**Auto-start** quickly starts all engines.

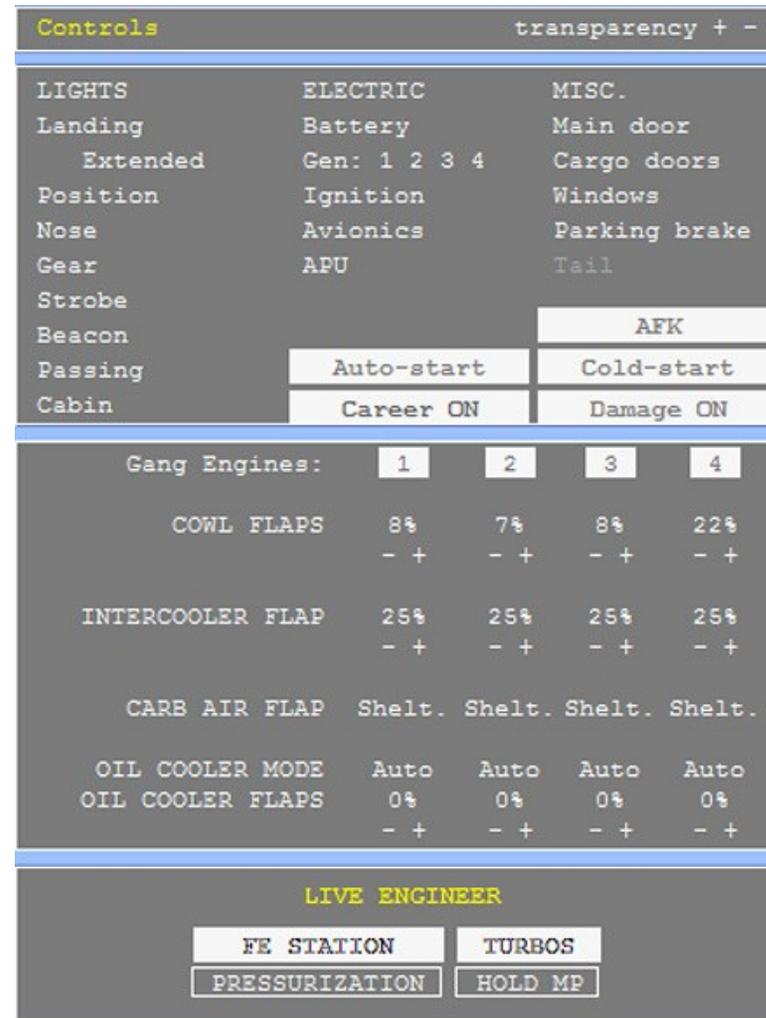
**Career ON** turns the Career Mode ON or OFF.

**NOTE:** Career Mode can only be turned ON or OFF when the aircraft is on the ground with no passengers loaded.

**AFK** is a separate panel that will pause the game when you are “Away From the Keyboard” based on various conditions.

**Cold-start** simulates the aircraft state after sitting for 12+ hours

**Damage ON** enables or disables engine damage



Middle Section

You can manually control all cowl, intercooler, carb-air, and oil cooler flaps either individually or together, by clicking on the **Gang Engines** above.

Lower Section (Live Engineer)

You now have a live engineer who can manage the entire engineer's panel on his own, which allows you to do other things, like fly the plane and manage your crew.

**FE STATION** gives control of the entire engineer's panel except the pressurization section.

**PRESSURIZATION** gives control of the pressurization controls, including rate of change, altitude goal, and turbo bleeders.

**TURBOS** gives control of the turbocharger.

**HOLD MP** is an expansion of the turbo control, essentially telling your engineer to use the turbos to maintain a constant manifold pressure. This allows you to not have to constantly adjust the throttle to maintain a constant power during climb and / or descent. Simply move the throttles to the desired manifold pressure and click the HOLD MP button.

This can also be helpful if you wish to drive the turbos hard (to raise carb temp during icing conditions), drive the turbos lightly (to lower carb temp in hot conditions).

The screenshot displays a multi-panel control interface for an aircraft engine. At the top, a 'Controls' panel lists various systems like LIGHTS, Landing, Position, etc., with sub-panels for ELECTRIC and MISC. Below this is a 'Gang Engines' section with a table showing parameters for four engines (1-4). At the bottom, a 'LIVE ENGINEER' section contains buttons for FE STATION, TURBOS, PRESSURIZATION, and HOLD MP, along with a numerical display showing '33.5"'. The interface uses a dark grey background with yellow and white text and buttons.

Controls		transparency + -			
LIGHTS	ELECTRIC	MISC.			
Landing	Battery	Main door			
Extended	Gen: 1 2 3 4	Cargo doors			
Position	Ignition	Windows			
Nose	Avionics	Parking brake			
Gear	APU	Tail			
Strobe		AFK			
Beacon					
Passing	Auto-start	Cold-start			
Cabin	Career ON	Damage ON			

Gang Engines:	1	2	3	4
COWL FLAPS	33%	16%	8%	22%
	- +	- +	- +	- +
INTERCOOLER FLAP	25%	25%	25%	25%
	- +	- +	- +	- +
CARB AIR FLAP	Ram	Ram	Ram	Ram
OIL COOLER MODE	Auto	Auto	Auto	Auto
OIL COOLER FLAPS	0%	0%	0%	0%
	- +	- +	- +	- +

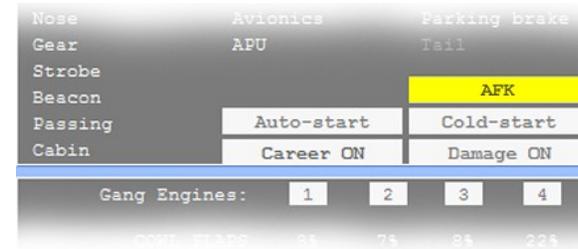
LIVE ENGINEER

FE STATION	TURBOS
PRESSURIZATION	HOLD MP 33.5"

## AFK (Away From Keyboard)

Accessed from CONTROLS (SHIFT-3)

We do live in the real world and sometimes it is impossible to avoid interruptions. But also, when part of a large crew, you are allowed and even encouraged to leave the cockpit to stretch out or rest when things are calm and in control. We created the AFK panel for both of the reasons above.



You can set the flight simulation to pause based on four criteria:

### 1. Emergency

If the crew detects an emergency ranging from engine trouble to problems with the heat, the simulation will pause.

### 2. Altitude

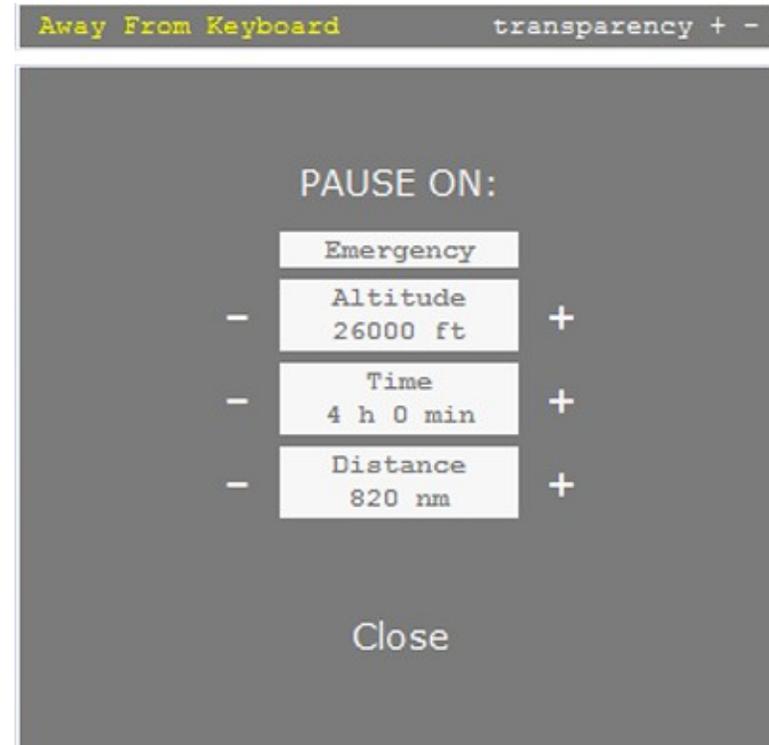
The simulation will pause when the aircraft reaches the selected altitude

### 3. Time

The simulation will pause at the selected time. NOTE: The countdown time will be shown.

### 4. Distance

The simulation will pause when the selected ground distance will be covered. NOTE: The remaining distance until pause will be shown.



## Payload and Fuel Manager (SHIFT-4)

While the Stratocruiser was custom built for many different configurations, below is the setup we created for the Wings of Silver Stratocruiser. This shows you just how luxurious an aircraft this was with both a men's and women's dressing room that could fit three at a time, sleeper berths, stateroom, downstairs lounge, spiral staircase, and even the crew had a little place below with a table and bed to get some rest. Yes, Boeing set a standard for first class travel that the world had never seen before or since.

A new feature to Captain of the Ship is real-time loading and unloading.

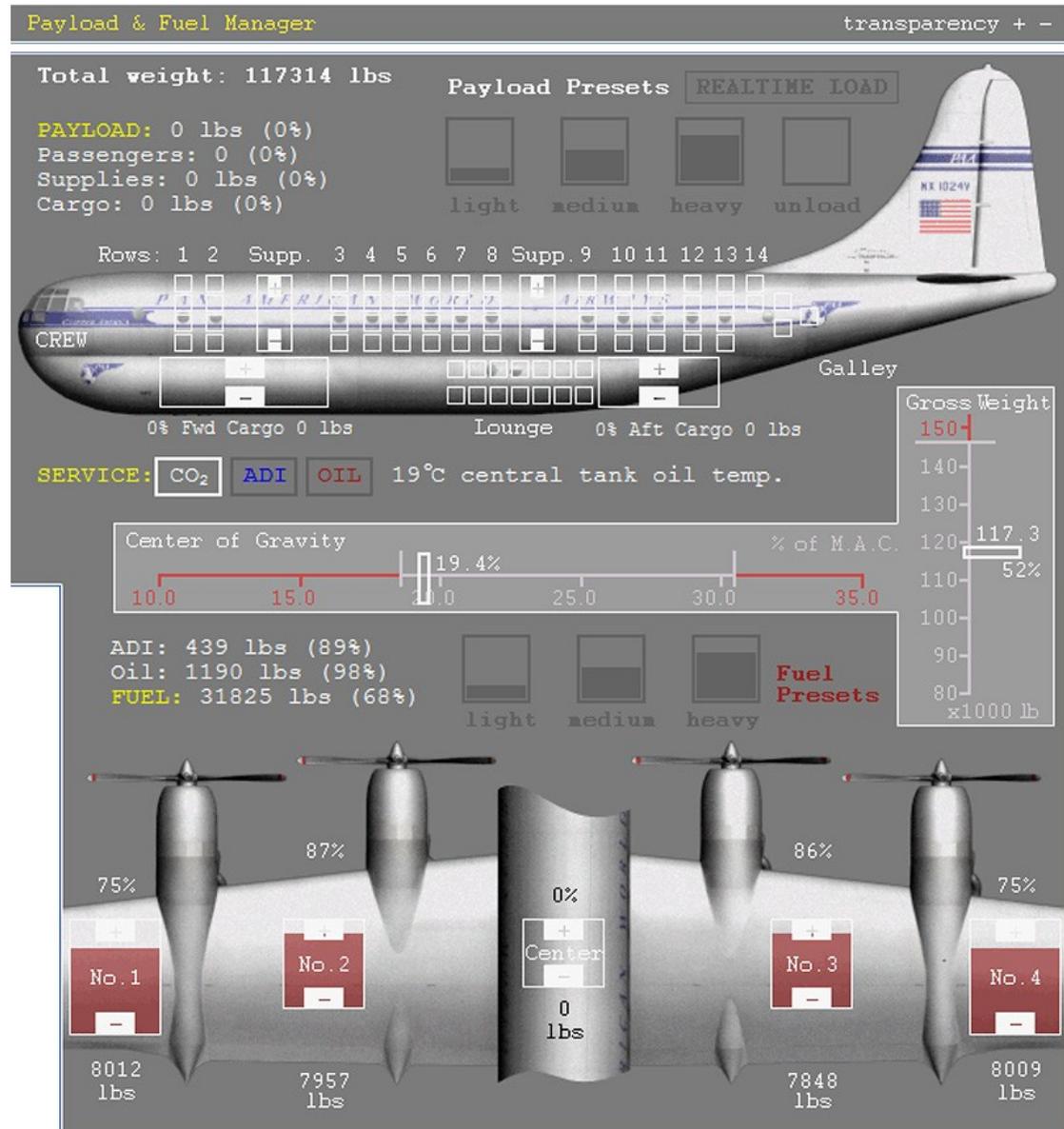
**Payload Presets** initiates a real-time load or unload of the aircraft.

**REALTIME / FAST LOAD** will allow either real-time or accelerated time loading / unloading.

You can also click on individual rows to add / remove passengers, manage cargo, and fuel.

### IMPORTANT

Loading and unloading should only be carried out when on the ground. If you try to access this screen in the air, you will get a warning screen letting you know that Career Mode will be disabled if you change your load while in flight.



**CO<sub>2</sub>** tops off the fire extinguishers

**ADI** fills the Anti-Detonation fluid that keeps engines cool during high power operations

**OIL** fills the central oil tank and all engine oil tanks with clean oil.

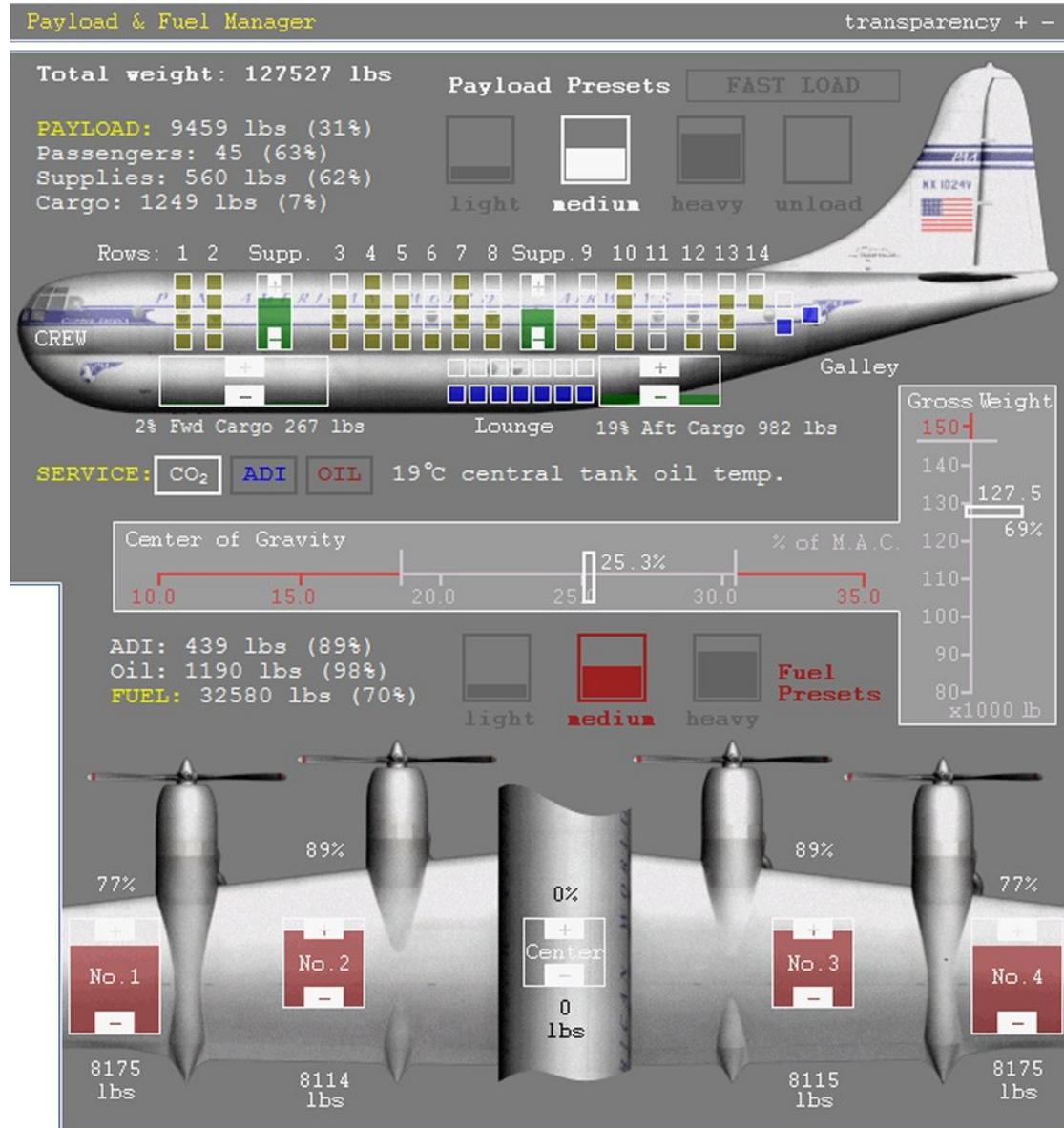
**Center of Gravity** is calculated in real time. If your center of gravity is too far forward, you will have to use extra back pressure on takeoff to lift the nose. If it is too far back, the aircraft may fly itself off the ground. The more rearward the center of gravity, the less stable (more maneuverable) the aircraft is.

**Gross Weight** is also calculated in real time. If you exceed 147,000lbs, the scale will turn red. It is not recommended to fly an aircraft that is over the gross weight limit.

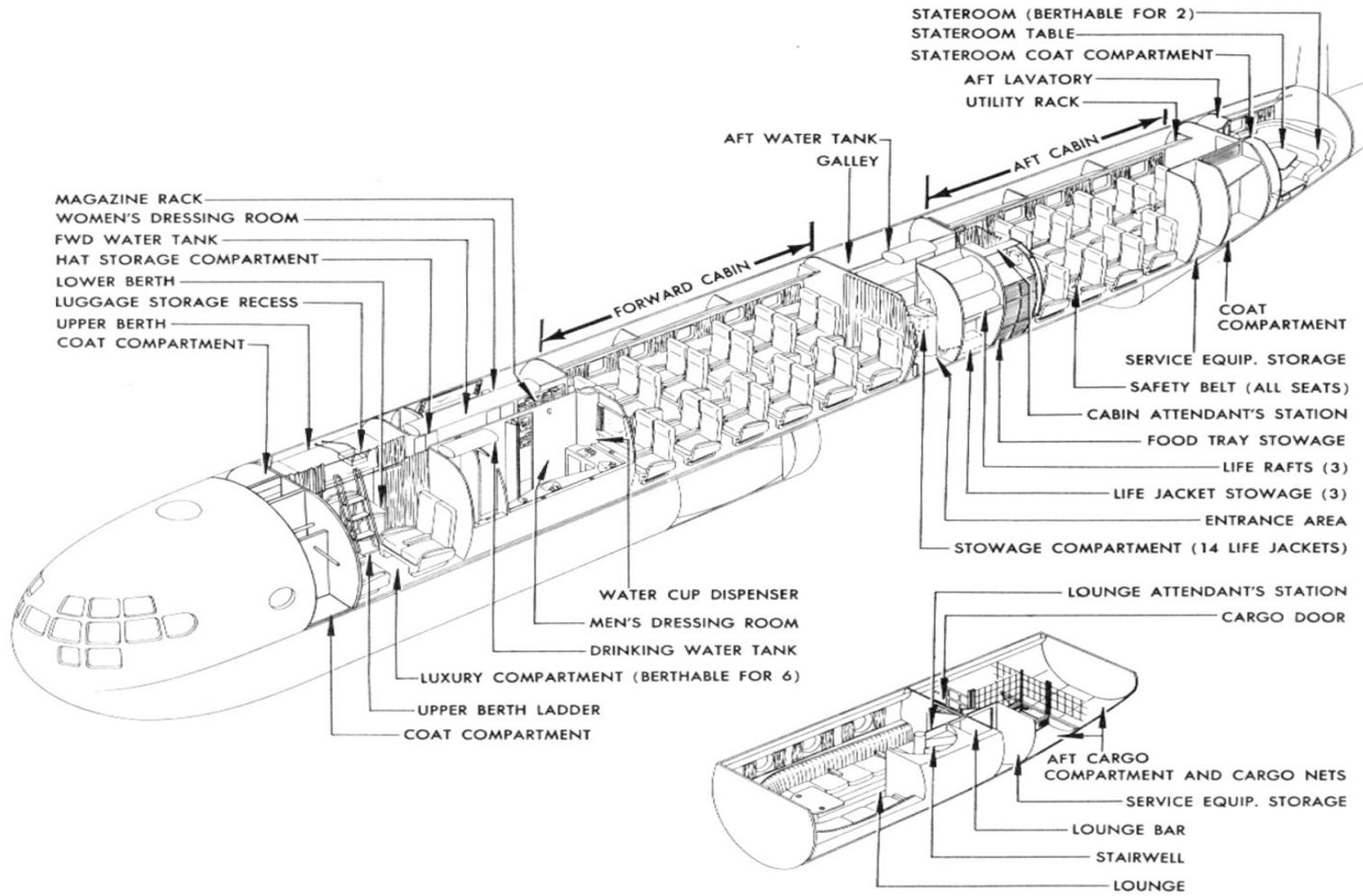
Fuel can be loaded into individual tanks.

Presets are available for your convenience.

NOTE: Passengers tend to carry more luggage during cold or inclement weather. Also, your ground crew do a pretty good job of balancing the airplane using the forward and aft cargo areas.



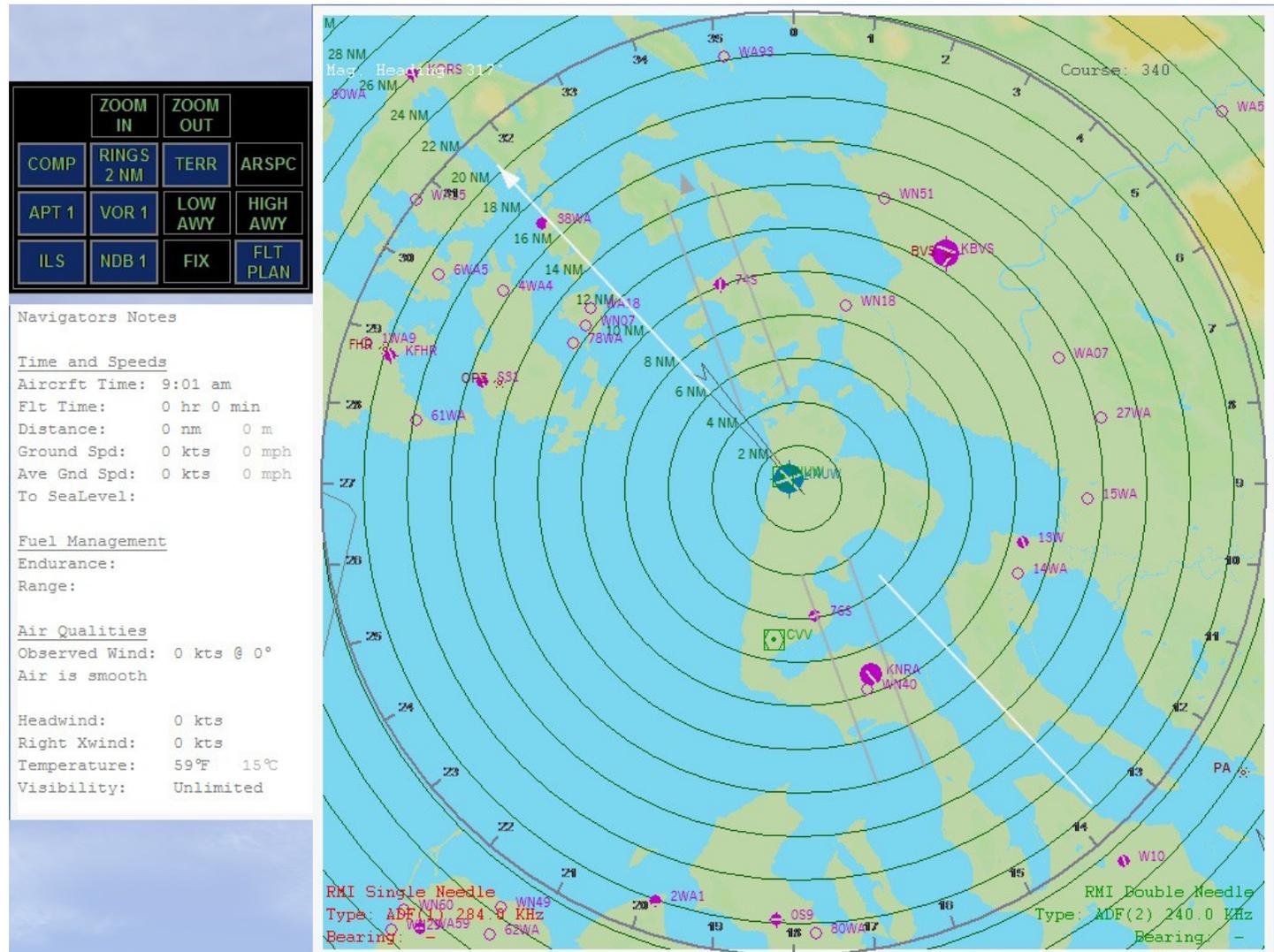
# Passenger Accomodations



## Navigator's Map (SHIFT-5)

This map gives full access rather than have to use the default map from the upper menus. This is a period aircraft, so we tried to create this in the true light of a navigator needing to still use visualization or VOR to know precisely where the aircraft is over the map, hence, we did not include the little aircraft icon in the middle.

You can access this map by clicking on the map sitting on the navigator's table.



## Map Controls

**ZOOM IN / ZOOM OUT.** These buttons allow the user to zoom the map in or out.

**COMP.** This button toggles the compass rose on or off.

**RINGS.** This button sets the increments of the distance rings on the map. Available distances are 2Nm, 5 Nm, 10 Nm and 20 Nm. Rings can also be turned off using the 'RING' setting.

**TERR.** This button toggles the terrain on or off.

**ARSPC.** This button toggles the controlled airspace indicator on or off.

**APT.** This button increments the level of airport information available on the map from minimal information at the 'APT 1' setting to full details at the 'APT 4' setting. Airport information can also be turned off using the 'APT' setting.

**VOR.** This button increments the level of VOR information available on the map from minimal information at the 'VOR 1' setting to full details at the 'VOR 3' setting. VOR information can also be turned off using the 'VOR' setting.

**LOW AWY.** This button increments the level of low level airway information available on the map from minimal information at the 'LOW AWY 1' setting to full details at the 'LOW AWY 2' setting. Airway information can also be turned off using the 'LOW AWY' setting.

**HIGH AWY.** This button increments the level of high level airway information available on the map from minimal information at the 'HIGH AWY 1' setting to full details at the 'HIGH AWY 2' setting. Airway information can also be turned off using the 'HIGH AWY' setting.

**ILS.** This button toggles the ILS 'feathers' on or off.

**NDB (Non Directional Beacon).** This button increments the level of NDB information available on the map from minimal information at the 'NDB 1' setting to full details at the 'NDB 3' setting. NDB information can also be turned off using the 'NDB' setting.

**FIX.** This button increments the level of fix information available on the map from minimal information at the 'FIX 1' setting to full details at the 'FIX 2' setting. Fix information can also be turned off using the 'FIX' setting.



**FLT PLAN.** This button toggles the flight plan on or off (only works if a flight plan is active).

In addition to the above the map also displays the following information:

#### Aircraft Heading

A white line on the map shows the aircraft's current heading and a numerical reading is provided by the white text in the upper left corner.

#### Course

The course set by the pilot on his compass repeater is displayed as a grey double line on the map and grey text in the upper right corner.

#### Tuned ADF or NAV Stations

Tuned ADF or NAV stations are displayed by red and green arrows and red and green text in the lower corners of the map. This is the same data as displayed on the RMI Indicators. The green arrow is double to match the double needle of the RMI Indicator.

**NOTE:** Stations must be tuned on the radios before they appear on the map.

#### GPS Track

A dashed grey line on the map shows the GPS track taken from the flight plan information (if one is active).

## Navigator's Notes

Captain of the Ship includes a vastly expanded section, showing the types of notes the navigator would be taking while in flight.

**Aircraft Time** can be thought of as "passenger time." For example, if you take off at 8am and travel west, you may pass several time zones, setting the time back one hour for each pass. However, the passengers will still be on the time of their departure. This is important as meals and sleep is based on this time. You can also see aircraft time in 3d, on the navigator's table in the form of a gold pocket watch.

**Flt Time** is the time the aircraft has been in flight

**Distance** is the ground distance traveled during the flight

**Ground Spd** is the current ground speed of the aircraft in kts and mph.

**Ave Gnd Spd** is the average speed based on total time and total distance

**To Sea Level** is only displayed when your aircraft is in a descent. This can help you establish a steady descent. For example, if you are 100 miles out from your destination, you would descend at a rate that would put you on the ground at 100 miles. This is a sea level calculation, so take into account your airfield height when using this calculation.

**Endurance** is the amount of time your aircraft can fly at the current rate of fuel consumption. Take into account, as you are climbing to your cruise altitude, this estimated endurance will be less once you level off, throttle back, and settle into a cruise.

**Range** is the distance your aircraft will fly at the current speed and rate of fuel consumption. Again, take into account this will change based on climb, cruise, and descent operations.

Navigators Notes	
<u>Time and Speeds</u>	
Aircraft Time:	12:19 am
Flt Time:	1 hr 14 min
Distance:	343 nm 394 m
Ground Spd:	323 kts 371 mph
Ave Gnd Spd:	286 kts 323 mph
To SeaLevel:	30 nm 8 min
<u>Fuel Management</u>	
Endurance:	8 hr 1 min
Range:	1737 nm
<u>Air Qualities</u>	
Observed Wind:	30 kts @ 300°
Light chop	
Gusting to:	35 kts
Headwind:	21 kts
Left Xwind:	15 kts
Temperature:	47°F 8°C
Visibility:	10 miles

Navigators Notes Cont

**Observed Wind** is the actual wind the aircraft is experiencing

**Turbulence** is reported based on your navigator's real-time observations (separate from FSX's reporting). Turbulence is reported as smooth, light chop, moderate, heavy, or severe.

**Gusting to** is another real-time observation of the max estimated wind gusts over the past several minutes. NOTE: FSX real-time weather does not simulate wind gusts.

**Headwind / Tailwind** is the real-time calculated speed of the wind as it may be either speeding up or slowing down your ground speed.

**Left / Right Xwind** is the real-time calculated cross wind.

**Temperature** is the air temperature outside the aircraft in both Fahrenheit and Celsius.

**Visibility** is the current visibility in statute miles

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## Engine Control Selection (SHIFT-6)

This is a priceless little utility that allows those with a single throttle to select and control a specific engine or group of engines. To use, click on the engine number (here shown after clicking on the #4 engine), then click on the “Click to Select” bar below to activate. Once activated, in this example, moving your throttle would control engine #4.



## Radios (Shift-7)

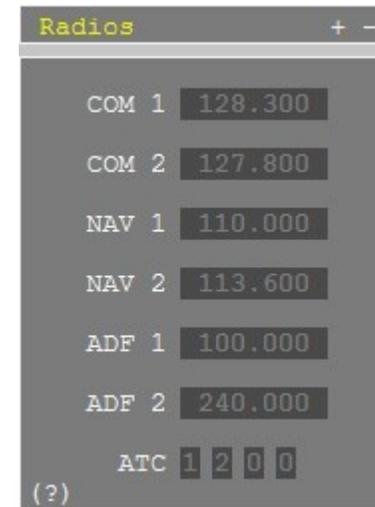
The radio pop-up panel provides easy access to all the available radio frequencies. Changes can be made using single clicks with the mouse, clicking and holding causing the frequencies to 'spin' or by rolling the mouse wheel. A left click will decrease the frequency while a right click will increase the frequency. Clicking or 'hovering' to the left of the decimal point changes the frequency in 1 Mhz steps while clicking or 'hovering' to the right of the decimal point changes the frequency as follows:

COM 1/2 = 25 Khz steps

NAV 1/2 = 50 Khz steps

ADF 1/2 = 0.5 Khz steps

ATC = 1 unit per box



## Maintenance Hangar (Shift-8)

The Maintenance Hangar displays the total airframe hours, the engine hours since the last overhaul and the general engine condition for each engine. Clicking on each 'OVERHAUL' area will 'overhaul' that specific engine and return it to 'as new' condition.

The screenshot shows a dark-themed interface titled "Maintenance Hangar" with a "transparency + -" control in the top right. The main content area displays the following information:

- AIRFRAME HOURS:** 162.7      **Air conditioning repaired**
- ENGINE 1**      **OVERHAUL No.1**  
Engine-Hours: 38.6 since overhaul  
Condition: Excellent
- ENGINE 2**      **OVERHAUL No.2**  
Engine-Hours: 38.6 since overhaul  
Condition: Good  
Mechanics's notes: There are signs of detonation damage.
- ENGINE 3**      **OVERHAUL No.3**  
Engine-Hours: 38.6 since overhaul  
Condition: Excellent
- ENGINE 4**      **OVERHAUL No.4**  
Engine-Hours: 38.6 since overhaul  
Condition: Excellent

## Captain's Log (SHIFT-9)

The Captain's Log component as it looks deeply into the new Career Module, which is the heart of Captain of the Ship. This is where all of your flights and performance is remembered and gives you hints about how you are regarded by others, and yourself.

### My Career

Your entire career as a captain accumulates here, including an approximate salary based on your experience and performance. Additionally, there is a small comment about how others, including your crew, view you. Reset will start a brand new career.

### Last Flight

This section includes the details of your previously completed flight including the cost of fuel that was used and any direct and estimated costs of repairs and maintenance. Both are used to calculate a "Cost Per Mile" which means a lot to the airline that has invested over a million dollars into this aircraft. Ideally you never want to exceed \$2 per mile (remember, these are 1950's dollars), and only the most capable captains can get at or even below \$1 per mile. As you improve as a pilot, so does the airline's expectations.

Also, passenger comments and / or major events on that flight will be listed here as well. If you have a good or bad flight, these comments can help you to determine why you did well, or not so well.

### Personal Notes

Here is where you can get an idea of your own personal performance based on your own experiences along with the airline's opinion of how well their 'investment' is paying off.

The screenshot shows a user interface for 'Captain's Log' with a 'transparency + -' toggle. The main content is divided into sections: 'My Career' with a 'Reset' button, 'Last Flight' details, 'Passenger Comments', and 'Personal notes'. At the bottom, there is a '50's era \$' toggle.

My Career	
Total Flights:	7
Total Time:	37 h, 16 min
Grnd Dist:	12,580 miles
Air Dist:	13,623 miles
Passenger Miles:	591,260
Salary:	\$10,238

You are a captain  
You crew respects your decisions

---

Last Flight	
Time in flight:	6 h, 28 min
Grnd / Air Dist:	2,242 / 2,413 miles
Fuel Cost:	\$1,351
Maintenance Cost:	\$1,427
Cost Per Mile:	\$1.15

Passenger Comments:  
"My ears were popping on that flight..."

---

Personal notes:  
No excuse for that lousy landing...  
We have a pretty good crew...

50's era \$

50's era \$ can be clicked to cycle the above dollar amounts between 1950's costs and today's costs.

## **Credits**

**Microsoft:** Creators of Microsoft Flight Simulator X

**Project Management:** Scott Gentile

**Lead Artist (3D modeling, texturing, gauges):** Robert Rogalski

**Aircraft Painting:** Martin Catney

**Programming:** Robert Rogalski, Michal Krawczyk

**Flight Dynamics:** SD Research

**Visual Effects and Audio:** Scott Gentile

**Public Relations, Web Design:** Lewis Bloomfield

**Manual:** Scott Gentile, SD Research, Cody Bergland

**Manual Editing and Proofreading:** Forest "FAC257" Crooke, Glenn Cummings (GlennC), and the beta team

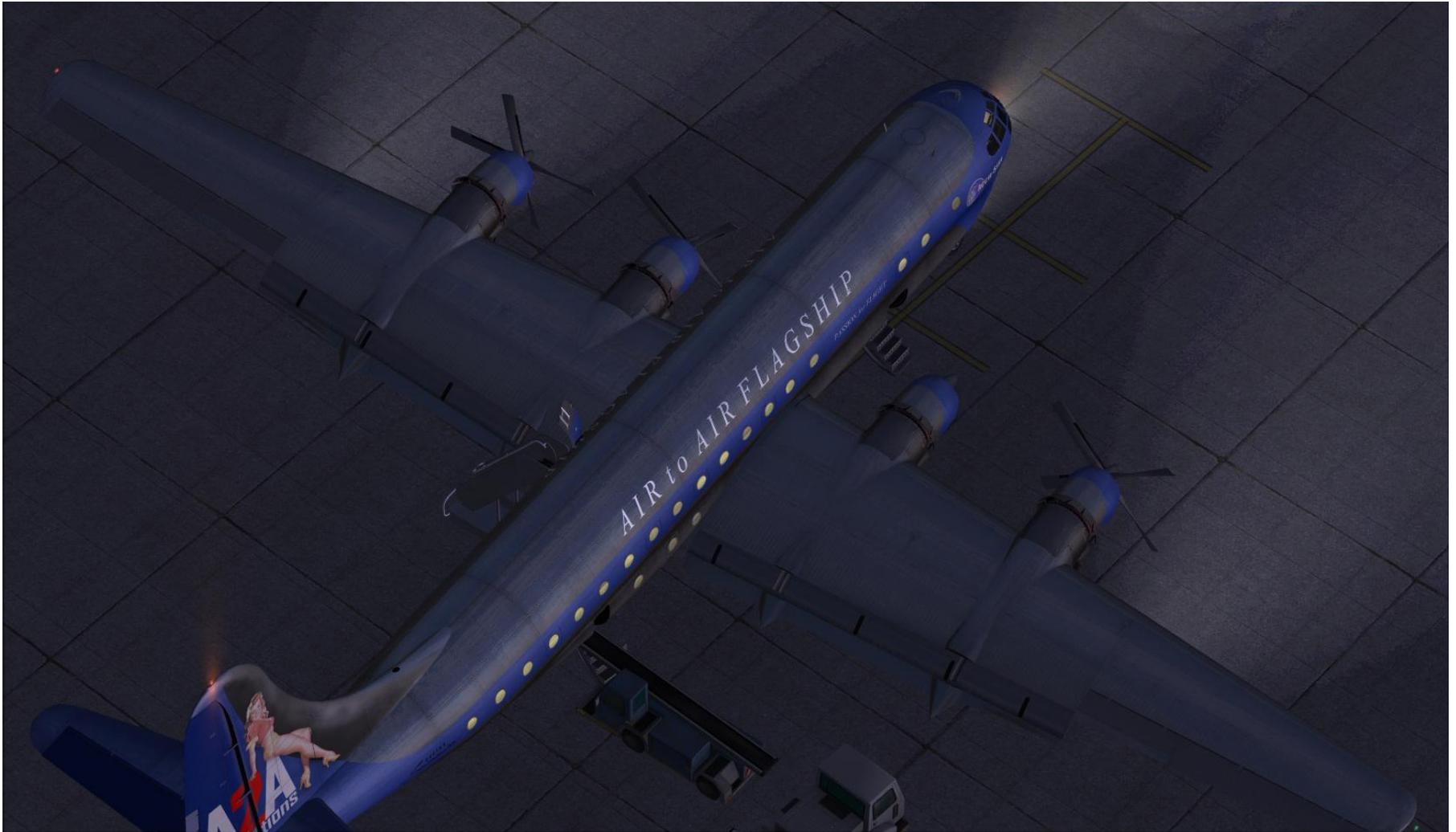
**Quality Control Beta Team:** The world's most effective and knowledgeable flight simulation beta team, including Cody Bergland, Forest "FAC257" Crooke, Glenn Cummings (GlennC), Ryan "Hog Driver" Gann, Mitchell Glicksman, Captain Jakey, Erwin Schultze (dutch506), Guenter Steiner, Paul "Gypsy Baron" Stroger, Oskar Wagner.

**Special Thanks to:** Tim Chopp of the Berlin Airlift for granting us unlimited access to his C-97, the Dover Airbase and all their friendly staff, and our friends and families who stuck by us and worked hard to support our efforts

**Very Special Thanks to our friends and families who stuck by us and worked hard to support our efforts.**

What an amazing aircraft this was, and still is...

This aircraft shows that nothing is impossible if you put your mind to it.



From all of us at A2A Simulations, thank you.