

C-47

COCKPIT GUIDE & FLIGHT MANUAL



Microsoft *Flight*
Simulator

Portions of this manual contain passages and text adapted from original wartime pilot training manuals.



GET TO KNOW THE C-47

The C-47 has no vices. It has been around a long time doing a magnificent job. The only troubles you will have are those you bring on yourself. So get to know your aircraft. When you check it before flight, know enough about it to spot trouble. Know your procedures. Confusion in the cockpit causes far too many accidents. Practice emergency procedures until they are as familiar as normal operational procedures.

Autostart and Auto shutdown.

Due to how the simulator implements Auto-start and Auto-shutdown there are a few minor glitches that will happen if you decide to use an auto start/shutdown method and then decide to manually start/shutdown later.

The 2 options are to reset/reload the flight after an auto start/shutdown or read the following guide.

Auto Start :

If you start the engines using autostart (Cntrl/E) the following items will need to then be set manually if you later want to start/stop the engines manually.

1. Magneto switches should be set to Both.
2. Mixture levers set to auto-rich
3. Fuel tank levers will be using the ALL function if you use Ctrl+E. Set to any tank that actually has fuel.

Auto shutdown :

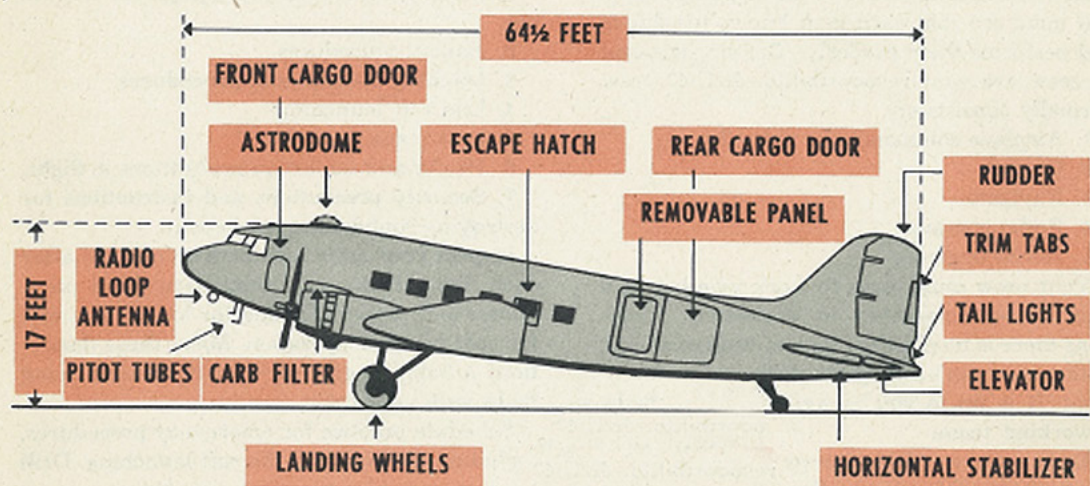
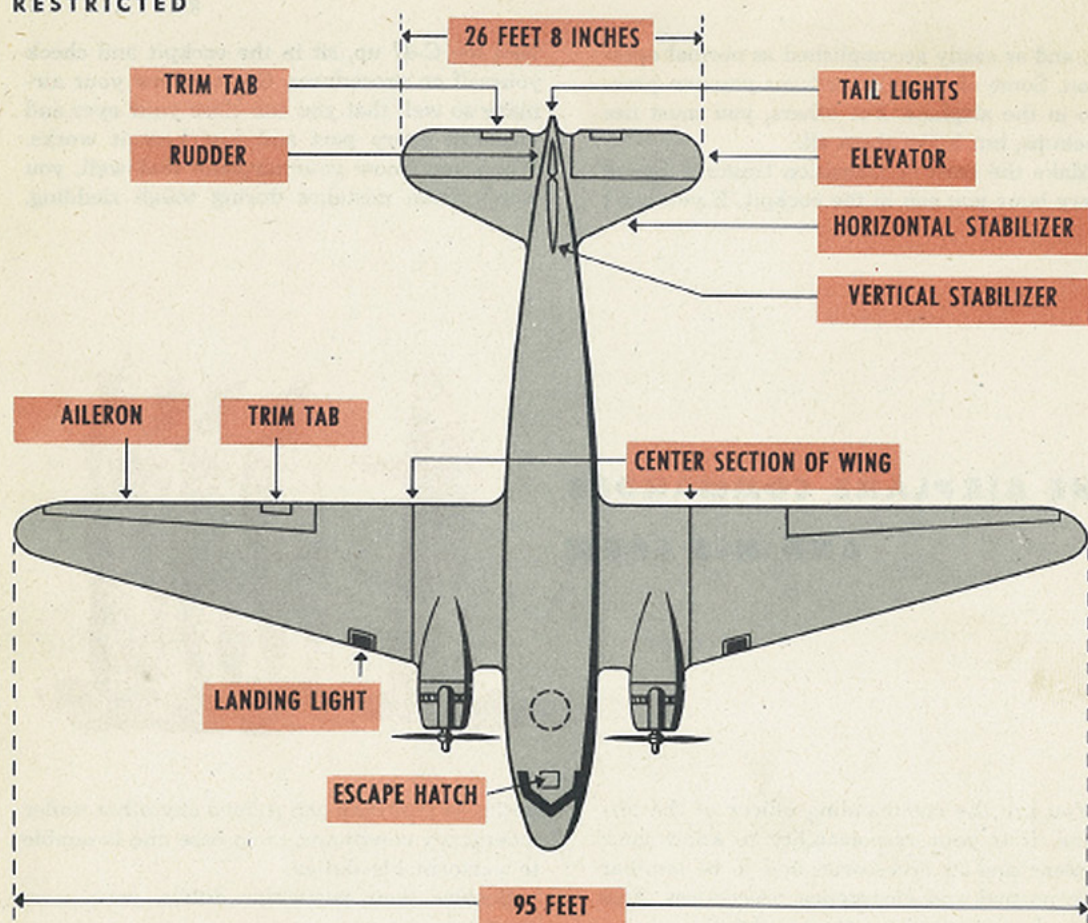
If you have started the engines manually but use auto shutdown you will need to reset the following items:

1. The magneto switches. They will indicate on but they aren't actually on. Either set to off or to the position ready for a manual start.
2. The mixture levers. They will be locked in the position that you had left them in . They will actually be off. Either set to off or to the position ready for a manual start.
3. Fuel tank selectors. They will be indicating the position that you had left them in. They will actually be off. Either set to off or the position ready for a manual start.

IMPORTANT!

If starting manually remember that the Energise and Mesh switches return to their OFF position AUTOMATICALLY once and engine has started.

RESTRICTED



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RESTRICTED

INTRODUCTION

The C-47 and its modified versions, the C47A and C47B is a 2-engine, all-metal, low-wing monoplane used for transport of supplies, paratroop operations, glider towing and evacuation of wounded.

The airplane has two 1200HP Pratt & Whitney, 14-cylinder, R-1830-90, Twin-Wasp engines with Hamilton Standard hydromatic fully feathering 3-bladed propellers. The C-47B is designed for higher altitude flying and has 2-speed internal "blowers" fitted. In this simulation, we feature the twin-blower engine, although not actually fitted to the C-47A.

The hydraulic landing gear is of the conventional type. Main wheels retract vertically into the engine nacelles and extend approximately 11 inches out of the nacelles when fully retracted. In this position they are free to rotate and are subject to normal brake action. This is so, in the event of a wheels-up landing, the aircraft can still steer and brake to get out of trouble.

DIMENSIONS

WingSpan.....95 feet
Length.....64 feet 51/2 inches
Height (at rest).....17 feet

WEIGHT

Empty:
C-47.....17,037 lbs
C-47A..... 17,237 lbs

Basic:
C-47.....17,400lbs
C-47A..... 17,700 lbs
Rec. takeoff, max. gross.....29,300lbs
Restricted T/O max gross.....31,000lbs
Rec.landing, max. gross.....26,000 lbs

The tailwheel is non-retractable and is of the castoring type.

There is a large cargo door at the left of the main cabin and a smaller, removable cargo door forward of this. A small "emergency"/crew door is located at the left of the forward fuselage.

There are four emergency exits, two at the windows over the main wings, an escape hatch in the cockpit roof and a removable door in the centre of the forward cargo door (when fitted).

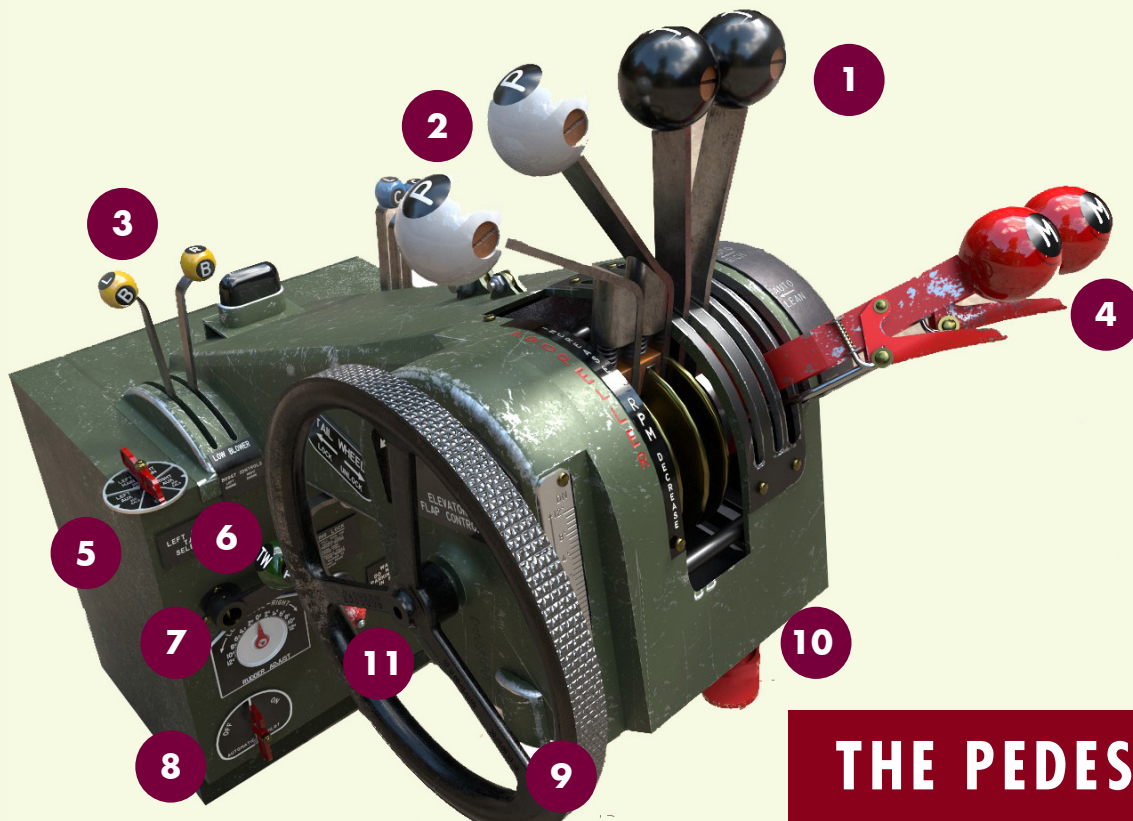
The airplane has two main sections.

In the forward section is the pilots' compartment, radio operator's and navigator's compartments and cargo space and radio racks behind the co-pilot's bulkhead.

The rear section consists of a main cabin which is divided into stations for cargo loading. There are also provisions for two rows of paratrooper seats and a static line for paratroop operations. At times, long-distance fuel tanks can be fitted to the cabin area for long-range missions. We do NOT include these tanks in this simulation, however.

Other figures of interest:

Cruising Speed at 10,000 ft.....approx. 185 mph
Stalling Speed.....67mph
Service Ceiling.....24,100 feet
Wingloading.....25.3lbs per sq foot
Power Loading.....12lbs per HP
Seating capacity.....28 passengers

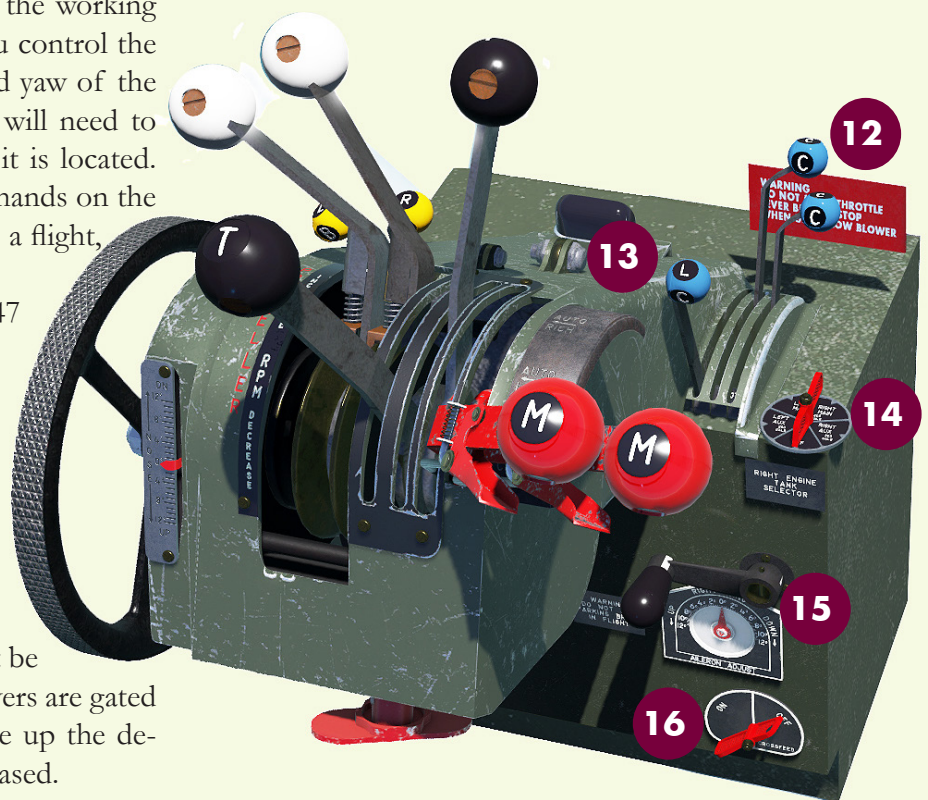


THE PEDESTAL

The Pedestal control unit is the working heart of the C-47. This is where you control the engines and adjust the pitch, roll and yaw of the aircraft as you fly. Learn it all, you will need to know every component and where it is located. A proficient pilot will be able to lay hands on the exact control needed, at any stage of a flight, without looking.

As we stated earlier, your C-47 is fitted with a 2-stage blower (supercharger) for each engine. The controls are the yellow knobs in the left quadrant (3).

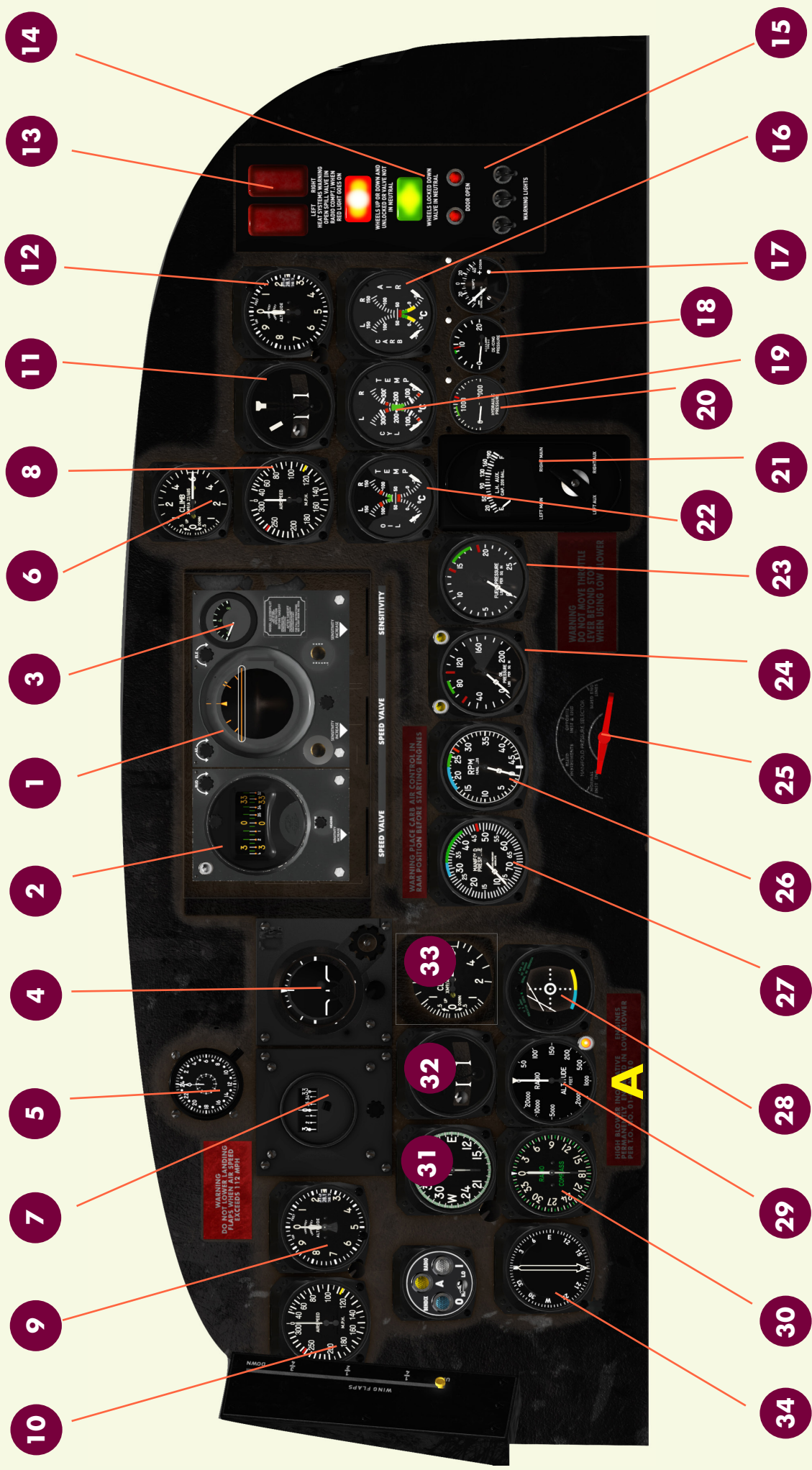
Mixture controls are restricted to AUTO-LEAN and AUTO_RICH with an emergency FULL_RICH position. The controls are fitted with “triggers” which must be pressed to activate the levers. The levers are gated at the pre-set positions and will take up the desired position once the trigger is released.



CONTROL PEDESTAL

1. Throttles
2. Propeller controls
3. 2-stage blower controls
4. Mixture controls
5. Left engine tank selector
6. Tailwheel lock
7. Rudder Trimtab control

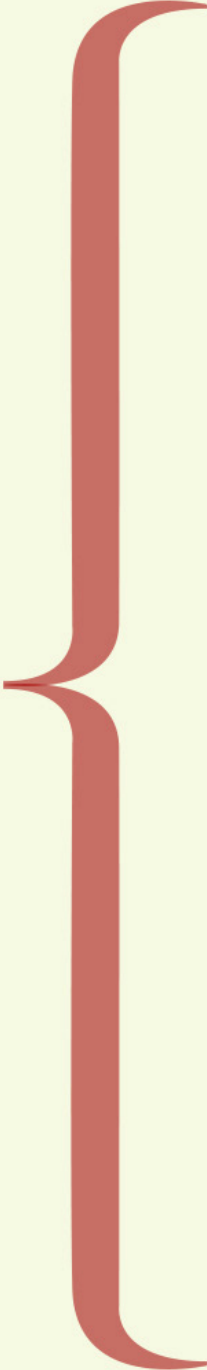
8. GyroPilot master valve
9. Elevator trim adjuster
10. Throttle lever friction control
11. Parking Brake (Pull on)
12. Carburettor Heat controls
13. Carburettor heat control lock
14. Right engine tank selector
15. Aileron trim control
16. Fuel tank cross-feed control



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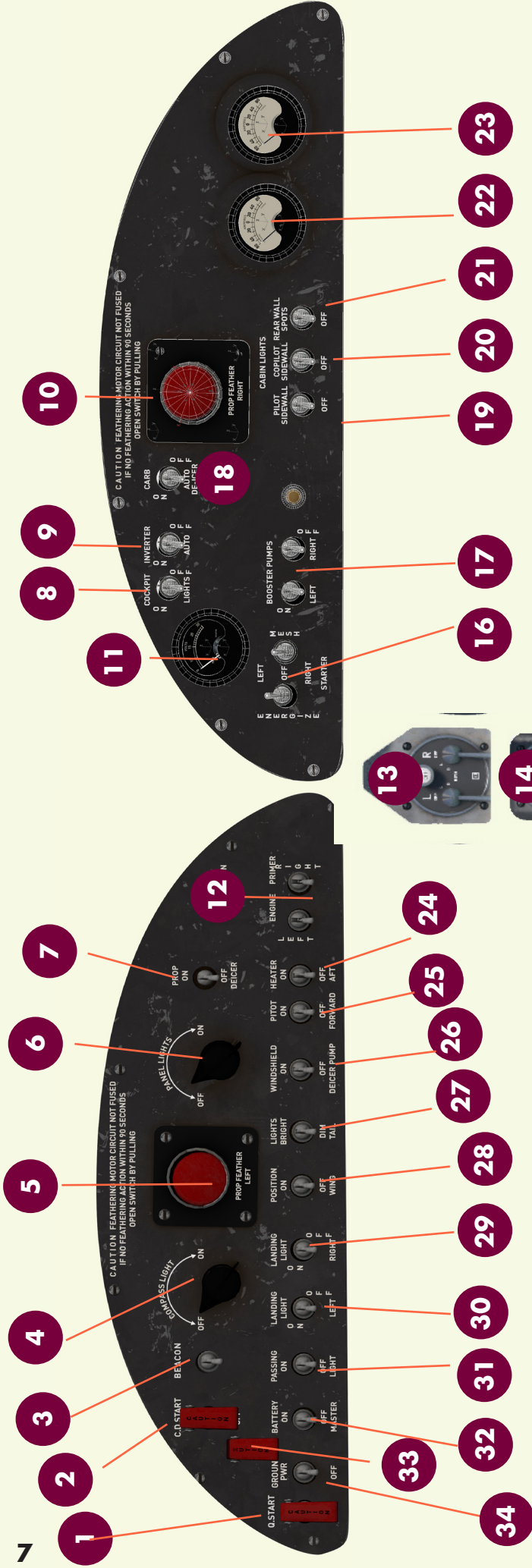
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MAIN INSTRUMENT PANEL

1. Sperry GyroPilot Pitch and Bank
2. Sperry GyroPilot Gyros
3. Sperry GyroPilot suction
4. Artificial Horizon Gauge
5. Chronometer (24hr)
6. CoPilot's VSI
7. Main Gyro Compass
8. CoPilot Airspeed Indicator
9. Altimeter
10. Pilot Airspeed Indicator
11. CoPilot's Turn&Slip Gauge
12. CoPilot's Altimeter
13. Heater Warning lights
14. Landing Gear Warning lights
15. Exit Open Warning lights
16. Carburettor Temp Gauge
17. Outside Air Temp Gauge
18. De-ice pressure
19. Cylinder Temp Gauges
20. Hydraulic Pressure Gauge
21. Four-way Fuel tank gauge selector
22. Oil Temp Gauges
23. Fuel Pressure dual gauge
24. Oil Pressure dual gauge
25. Manifold Pressure selector
26. Tachometer dual gauge
27. Manifold Pressure dual gauge
28. GlideSlope Indicator
29. Radio Altimeter
30. Radio Compass
31. Magnetic Compass
32. Pilot's Turn&Slip gauge
33. Pilot's VSI
34. ADF/VOR

PLEASE NOTE: FOR A BETTER VIEW OF THE PANEL AND WHILST FLYING, YOU CAN TOGGLE THE CONTROL COLUMN AND YOKE OFF BY CLICKING THE RED WARNING PANEL A. CLICKING AGAIN WILL RESTORE THE COLUMN AND YOKE.



1. QuickStart switch
2. ColdDarkStart switch
3. Beacon light switch
4. Compass Light switch
5. Left Propeller Feather switch
6. Panel Lights switch
7. Propeller Delce switch
8. Cockpit Lights switch
9. Inverters switch
10. Right Propeller Feathering switch
11. Voltmeter
12. Engine Primers
13. Ignition Switches
14. Altitude Limit Control
15. Gyro Compass
16. Engine Starters
17. Boost Pump switches

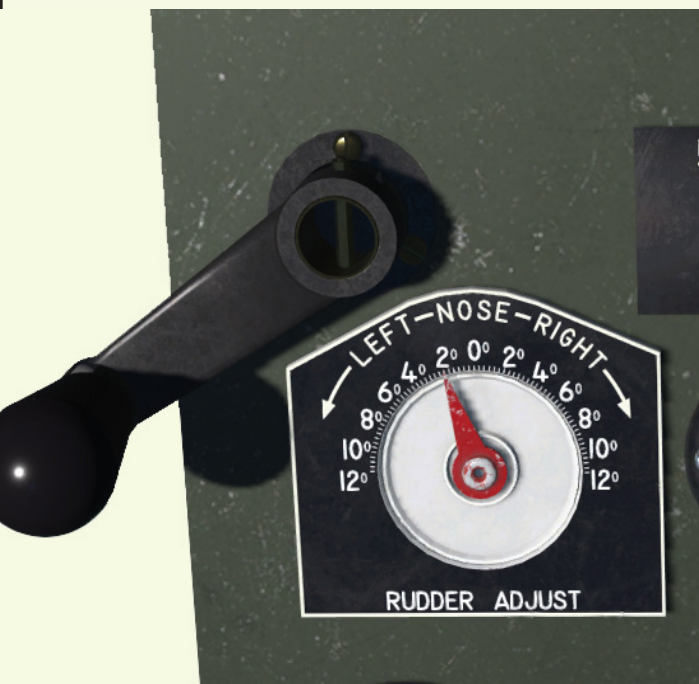
18. Carb Anti-Ice switch
19. Pilot Sidewall Light switch
20. CoPilot Sidewall Light switch
21. Rear Wall Lights switch
22. Left engine Ammeter
23. Right engine Ammeter
24. Aft Pitot Heater switch
25. Forward Pitot Heater switch
26. Windshield Deicing Pump switch
27. Tail Lights Switch
28. Wing Lights (Navigation) Switch
29. Right Landing Light switch
30. Left Landing Light switch
31. Passing Light switch
32. Master Battery switch
33. Jump switch (LEAD SHIP-PARACHUTISTS ONLY)
34. GroundPower switch

OVERHEAD PANELS

SURFACE CONTROL SYSTEM

This system consists of elevators, ailerons and rudder, which are made of metal frames covered with fabric. There are all-metal trim tabs on the elevators, the right aileron and on the rudder.

Operate trim tabs for the elevators by means of a wheel on the left side of the pedestal. Operate trim tabs for the ailerons and rudder by means of hand cranks on the lower part of the pedestal.



HYDRAULIC SYSTEM

The C-47 has a pressure accumulator type hydraulic system. It operates normally, between 675 and 925 psi.

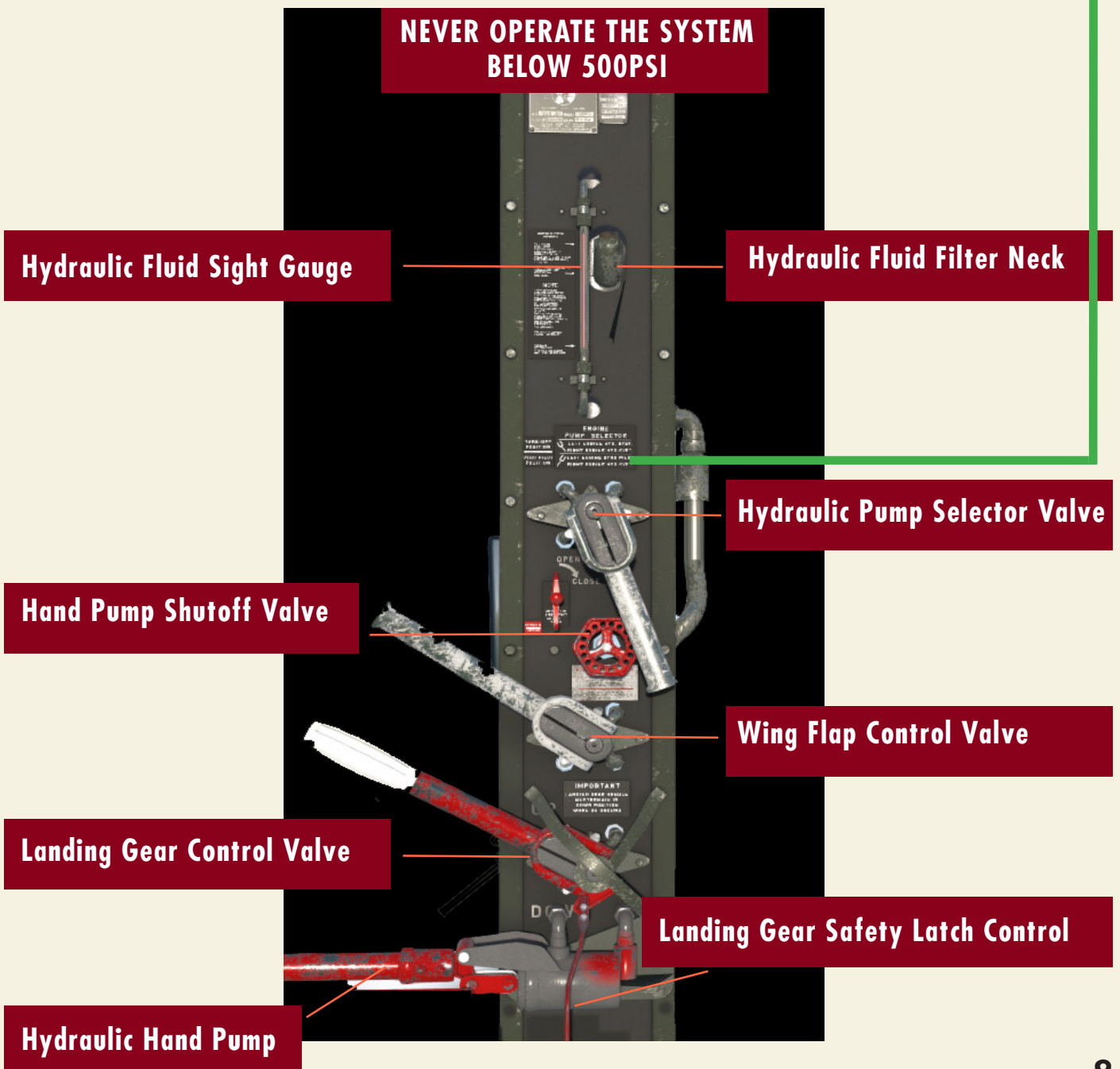
The Hydraulic system operates the landing gear, wing flaps, cowl flaps, windshield wipers, automatic pilot and brakes on all series of the airplane. It operates the non-ram carburettor air-filter mechanism when installed and the blower controls when superchargers are installed.

The control panel is in the center aisle, behind the copilot's seat. The Hydraulic Gauges are at the right of the copilot's seat, housed in their own panel box.

IMPORTANT!! IN ORDER TO USE THE SPERRY GYROPILOT ENSURE YOU MOVE THE HYDRAULIC PUMP SELECTOR VALVE TO THE "GYROPILOT" POSITION. THE SPERRY GYROPILOT WILL NOT OPERATE UNLESS YOU DO THIS.

Two engine-driven pumps supply pressure for the hydraulic system. One supplies pressure for the main hydraulic system; the other, for the automatic pilot. You can select either engine pump by means of a selector valve on the control panel.

There is a hydraulic hand pump between the pilots' seats. A valve on the hydraulic control panel controls flow of pressure from the pump. When you open the valve, pressure is built up in the accumulator. When you close it, the accumulator is separated from the hydraulic system and pressure is applied to the hydraulic lines.



LANDING GEAR

Three controls govern the operation of the C-47 landing gear. A lever on the main hydraulic control panel raises and lowers the two main wheels. A tailwheel lock on the pedestal centers and locks the tailwheel. The tailwheel does not retract but swivels through 360 degrees when not locked. The third control, a safety latch, on the floor by the pilot's seat, controls movement of the safety latch and the landing gear lever.

This latch has three positions: full down, half up and full up. To operate the latch, a locking tab must first be moved from the nose of the lever.

Full down (positive lock) - In this position the latch is locked and can be moved only by the latch control. The landing gear lever cannot be moved with the latch full down.

Half up (spring lock)- In this position the latch is spring-locked. The landing gear lever cannot be moved UP with the latch spring locked.

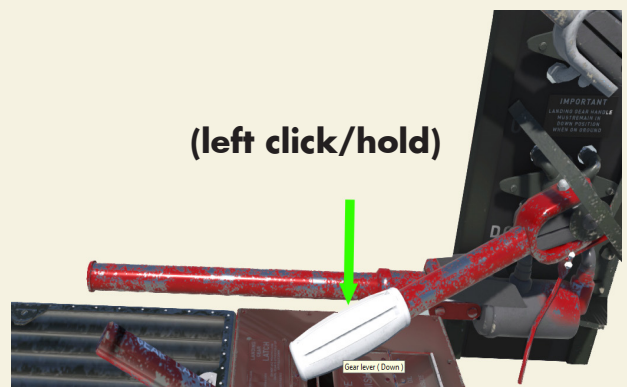
Full up (unlocked) - In this position the latch is unlocked and the gear lever is free to move. With the gear UP, pull the gear lever out toward the center aisle. Now you can push the lever DOWN to lower the gear. Lock the lever and latch the gear using the latch control.

When on the ground ALWAYS leave the gear lever in this DOWN position.

With the gear down, UNLATCH, pull the gear lever out toward the center aisle. and move the gear lever UP. When the gear raises, move the lever to NEUTRAL (mid-position on lever travel) and the latch will automatically move to the spring-lock position and will stay there until you have lowered the gear and are ready to lock it down.

Never move the latch to full down or positive lock until the gear lever is in NEUTRAL

Keep the gear and flap levers in NEUTRAL for normal operation. This traps fluid in the line and holds the gear and flaps in the desired positions.



Warning horn: Horn sounds when the throttles are closed and the gear is retracted.

Warning lights: There are green and red warning lights at the right hand corner of the instrument panel. The green light burns only when the gear is down, locked and latched. Under any other condition, the red light burns.

WING FLAPS

Your C-47 has all-metal wing flaps. A valve lever just above the landing gear lever operates these flaps. To raise or lower the flaps, first clear the slot that holds it in neutral by swinging the lever out toward the center aisle.

Move the lever **DOWN** to lower the flaps or **UP** to raise them. The lever must be click/held in either **UP** or **DOWN** position until the desired flap position is obtained. When the flaps are in the desired position, let go of the lever and it will snap back to **NEUTRAL** and the flaps will remain in the selected position.

There is a flap position indicator to the left of the main instrument panel.



(right click)



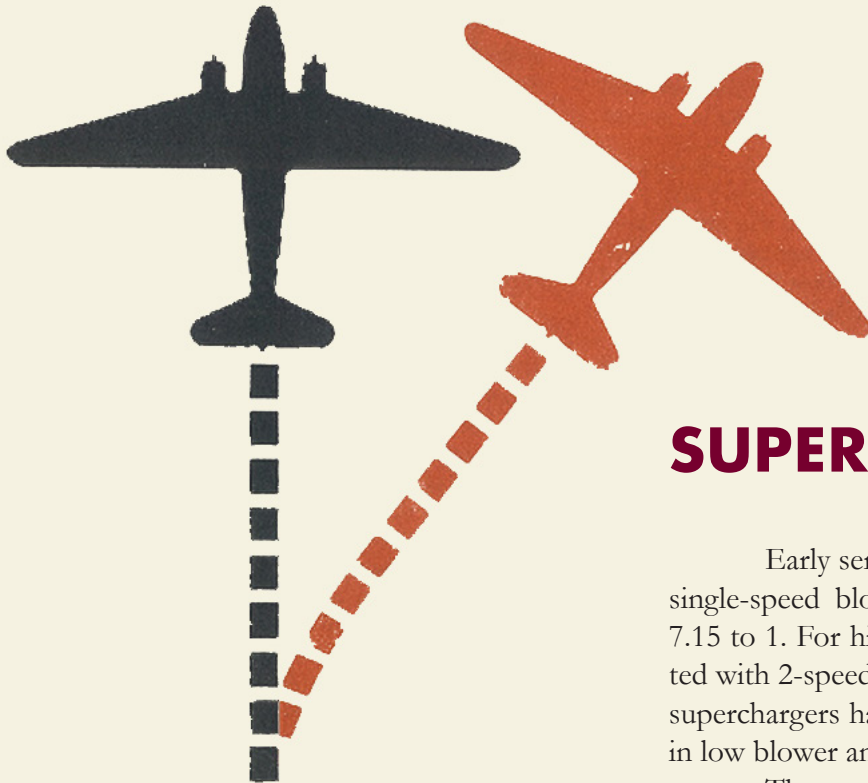
(left click/hold, release when flaps are at the desired position)



BRAKES

Conventional toe-operated brake pedals on the rudder controls give independent braking on each wheel. (Differential Braking)

Since the wheels do not retract fully into the nacelles, you have braking action on the wheel even when retracted. Thus, when the C-47 should make a belly-landing, it can still be steered by the brakes just as if the gear were extended.



AUTOMATIC PILOT

The automatic pilot control box consists of a directional gyro, ball bank indicator, bank and climb gyro, horizon bar and a suction gauge. It is on a panel in the center of the main instrument panel.

The automatic pilot keeps your airplane in straight and level flight by mechanical control of the rudder, ailerons and elevator. Its use is fully described in the section "CRUISE" later in this manual.

A parking brake control is fitted to the lower section of the pedestal.

To apply parking brakes, pull the red knob fully out. DO NOT APPLY THE PARKING BRAKE WHEN ALOFT.



SUPERCHARGERS

Early series of the C-47 have integral single-speed blowers with an impeller ratio of 7.15 to 1. For higher altitudes, later series are fitted with 2-speed, single stage blowers. These superchargers have an impeller ratio of 7.15 to 1 in low blower and 8.47 to 1 in high blower.

The supercharger controls are mounted in a quadrant on the left side of the pedestal. They have yellow knobs.

To check for proper operation:

- 1. Prop controlsINC.RPM
- 2. Throttles.....1700 RPM

A minimum of 45 psi oil pressure is required to operate the blower clutch. If oil pressure is low at 1700RPM, advance the throttles until oil pressure reaches 45 psi.

- 3. Blower control.....HI BLOWER
- 4. Throttles.....30" Hg.
- 5. Blower control.....LOW BLOWER

Watch the manifold pressure. A drop in manifold pressure indicates correct clutch operation.

At low altitudes there will be little gained by using High Blower. As the impeller is engine-driven, it takes more power to drive it in High Blower than you gain in shifting. Use High Blower in climbing and at higher altitudes only.

FUEL SYSTEM

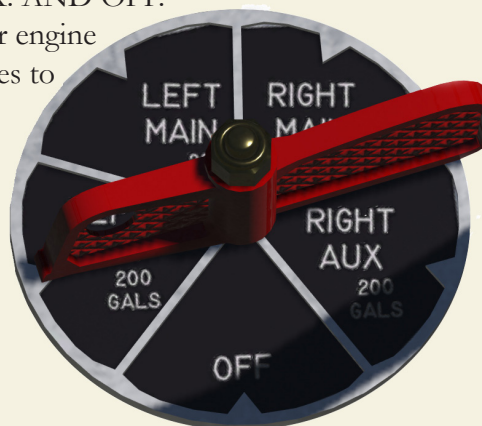
1. Fuel Tanks: The C-47 has four center-section tanks, two on each side of the fuselage. Main tanks are forward; each has a capacity of 202 U.S. gallons. Auxiliary tanks are aft of the main tanks; each has a capacity of 200 U.S. gallons. Each tank is independent of the others.

The tanks are gauged and indicated by a four-way selector gauge on the main instrument panel



2. Fuel selector valves: On each side of the pedestal is a fuel selector valve. The right valve controls flow to the right engine, the left to the left engine. Valves read: LEFT MAIN, RIGHT MAIN, LEFT AUX., RIGHT AUX. AND OFF.

Select fuel for either engine by turning the selector valves to the desired position.



3. Crossfeed or Booster Pumps

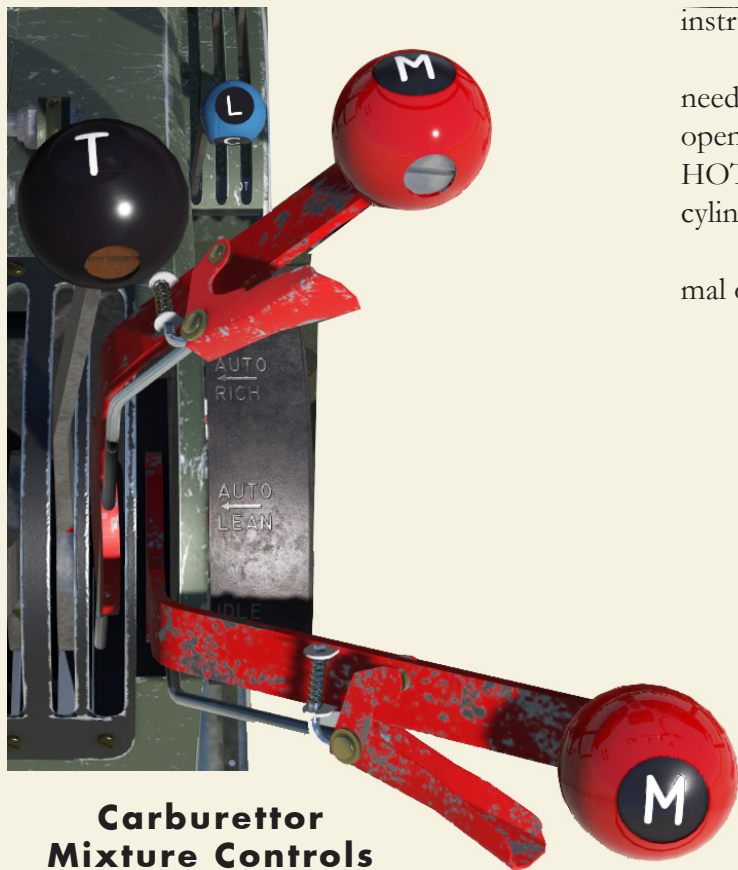
Some C-47s are fitted with a fuel crossfeed system that permits either fuel pump to supply both engines. If one pump fails, you can maintain fuel pressure by turning the crossfeed control ON. It is located at the lower right-hand corner of the pedestal. Unless needed, keep the control in the OFF position.



Later C-47s and converted earlier ones have booster pumps fitted. The switches for these are on the upper right panel. These pumps maintain fuel pressure if an engine pump fails. For normal operations turn them on below 1000 feet and above 10,000 feet.



4. Carburettor mixtures: Carburettor mixtures are controlled automatically for most efficient engine operation at different altitudes. There are four mixture control positions: EMERGENCY, AUTO RICH, AUTO LEAN and IDLE CUT-OFF. The controls are to the right of the throttles on the pedestal.



Carburettor Mixture Controls

To operate the controls, first press the trigger lock fitted to each control and then move the control to the desired position.

Here are the effects which the controls produce at the different positions:

EMERGENCY - full rich mixture. This position overrides any automatic function.

AUTO RICH - rich mixture

AUTO LEAN - lean mixture

An automatic feature of each carburettor functions in either of these positions. This feature is an altitude compensator unit. As the airplane climbs or descends, a diaphragm in this unit measures the outside air pressure. It is very sensitive, reacting to minute changes in pressure and temperature. As the diaphragm expands and contracts, it meters fuel into the induction system

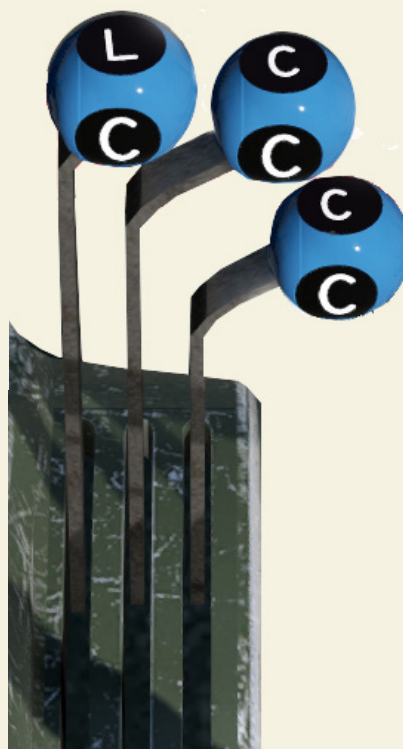
to keep the fuel/air ratio at its most efficient level.

IDLE CUT-OFF - stops the flow of fuel.
Note: AUTO RICH and AUTO LEAN are sometimes referred to as "Takeoff and climb" and "Cruise".

5. Carburettor heat controls: These controls are located in a quadrant just below the main instrument panel on the right side of the pedestal.

Positions: HOT and COLD. When you need carburettor heat to offset icing conditions, open the LOCK lever and move each control to HOT. This brings heated air from the around the cylinder heads into the induction system.

Leave the controls in COLD for all normal operations and ALWAYS LOCK them.



Carburettor Heat Controls

OIL SYSTEM

There are two oil tanks, one in each nacelle with a capacity of 29 gallons each.

Oil temperature and pressure gauges are on the main instrument panel in front of the copilot, together with low pressure warning lights.

Keep oil pressures between 75 and 90 psi in normal flight operation. Don't let them get below 60 or above 100 psi, if you are flying in emergency situations. If pressures drop below 50 psi, the red warning lights will glow.

ELECTRICAL SYSTEM

Two engine-driven generators supply electric current to your airplane and charge two 88-ampere-hour batteries, housed under the nose of the airplane. (The battery compartments are mounted on telescopic arms which extend downwards to enable servicing of the batteries.) In this simulation these are activated when the Ground Power Switch is used. There is a master battery switch mounted on the left upper panel. This should also be on while starting engines using an external power source.

Whenever possible, start engines using an exterior battery cart (sometimes called Ground Power Unit). This saves battery power.

You can start engines on battery power alone. If you are going to use the starting cart, switch ON the Ground Power switch and this will display the GPU outside and lower the battery boxes under the nose.

LIGHTS

Exterior lighting on the C-47 consists of

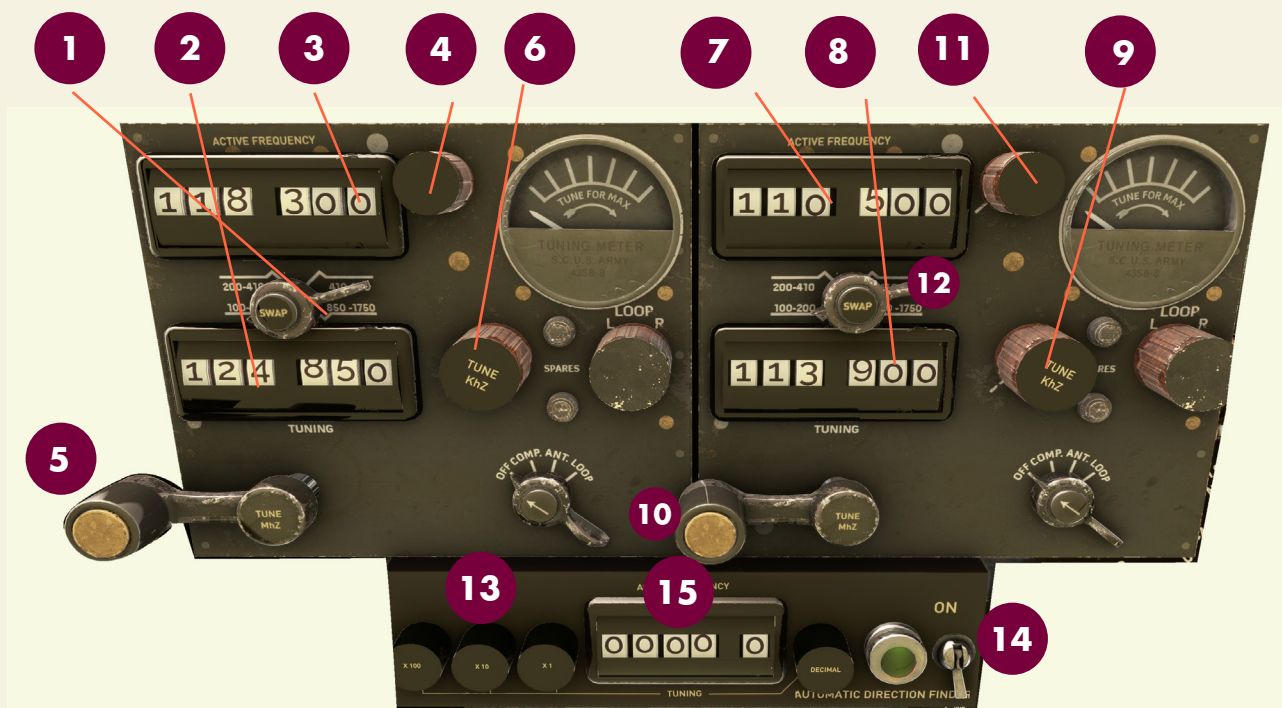
- A. LANDING LIGHTS
- B. PASSING LIGHT (Red, incorporated in the left landing light housing)
- C. NAVIGATION LIGHTS
- D. TAIL LIGHTS (Red and White)

Some lights have dim and bright filaments which can be switched, others have steady and flash states.

All switches for these lights are located on the left upper panel.

RADIO SUITE

- | | |
|-------------------------------|--------------------------------|
| 1. Nav1 Standby-Active switch | 9. Nav1 Fine Tuner (Khz) |
| 2. Com1 Standby Frequency | 10. Nav1 Broad Tuner (Mhz) |
| 3. Com1 Active Frequency | 11. Nav1 ON/OFF |
| 4. Com1 ON/OFF | 12. Com1 Standby-Active switch |
| 5. Com1 Broad Tuner (Mhz) | 13. ADF Tuners |
| 6. Com1 Fine Tuner (Khz) | 14. ADF ON/OFF |
| 7. Nav1 Active Frequency | 15. ADF Frequency |
| 8. Nav1 Standby Frequency | |



Your C-47 is fitted with radio sets for communications with the ground and for navigation when used in conjunction with the navigation instruments.

There is a navigation radio (Nav1), a Comms Radio (Com 1) and an ADF receiver. The radio suite is situated in the roof, centrally above and between the upper panels.

INSTRUMENT

Markings

**C-47B
GRADE 100/130 FUEL**



CYLINDER HEAD TEMPERATURE
 Short Red.....25°C
 Green Arc.....150-232°C
 Short Red.....260°C



MANIFOLD PRESSURE
 Short Red line.....48" Hg.
 Green Arc.....43-32" Hg.
 Blue Arc.....32-28" Hg.



OIL TEMPERATURE
 Short Red.....40°C
 Green Arc.....60-75°C
 Short Red.....100°C



TACHOMETER
 Short Red.....2700rpm
 Green Arc.....2550-2250rpm
 Blue Arc.....2250-1700rpm



CARBURETTOR AIR TEMPERATURE
 Yellow.....-10°C +15°C
 Green.....15-38°C
 Red.....40°C



FUEL PRESSURE

Red.....14 PSI
Green.....16-18PSI
Red.....19PSI



OIL PRESSURE

Red.....60PSI
Green.....75-90PSI
Red.....100PSI



DE-ICER PRESSURE

Green.....7.5"-8.5" Hg.
Red.....9" Hg.



AIR SPEED INDICATOR

Yellow.....112 I.A.S.
Red.....255 I.A.S.



HYDRAULIC PRESSURE

Green.....675-925PSI
Red.....1200PSI

INSTRUMENT

Markings

STARTING

Fuel tank selector.....to choice

Battery Switch.....OFF (see note)

Note: You can start the engines using internal battery power, in which case turn the battery switch ON. OR...

Battery Cart (GPU).....Attached ON

Fuel Booster Pumps ON

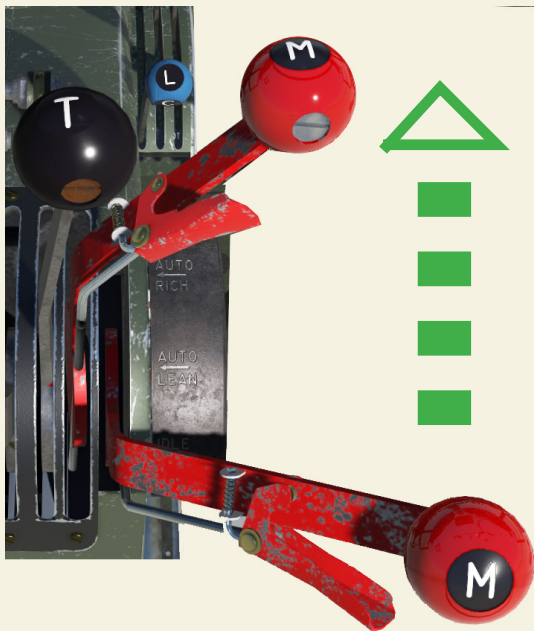
Throttle 1" open

PropellerMAX RPM

Master ignition switch...ON

Right Ignition (Magneto) ...OFF

Mixture control.....AUTO RICH



Note: In the real-world, the mixture controls are left in Idle-Cut-off for starting. This cannot be done in the simulator so that is why they should be in AUTO-RICH.



Full interactive CHECKLISTS are provided with this package.



Right Engine primer.....ON

Right Engine Starter (energise) ... ON

Right Engine MeshON

As the MESH SWITCH is thrown, the propeller will begin to turn - slowly at first and then gathering speed. You should count “15 blades” at least, before meshing the engine. This is equal to approximately 3 -4 seconds before switching mags.

Right Ignition (Magneto) ...BOTH

Once the engine is running, return the GroundPower switch to OFF and close the crew door (shift/E).

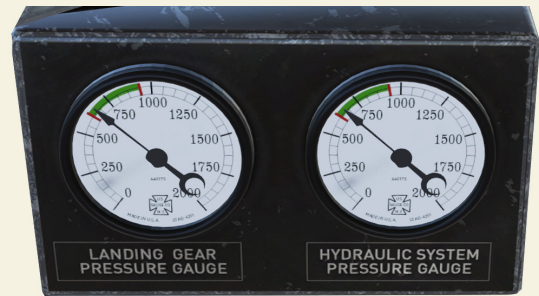
Battery Switch..... ON

Fuel Booster Pumps OFF

- Whilst starting the engine, watch out for:
1. Engine Fire. See that the fire guard’s extinguishers are placed properly at each side of the aircraft, before starting. (these will toggle with the crew door (Shift/E) and crew ladder.)
 2. Do not energise and mesh an engine excessively. If the engine won’t start on your first or second attempt, leave it and start the other engine.
 3. Ensure you have enough (but not too much!) throttle open. (this is required by the special starting code used in this simulation)

BEFORE TAXIING

Crew and Passengers Aboard and Doors Secured
Warm engines. While warming up, keep engines below 1000 rpm until engine instruments indicate within safe operating limits. Whilst warming engines make the following checks:



**Hydraulic Pressure...
675-925 PSI**



**Radio...
On and Checked**

Call the tower to see that your radio is working properly and get Taxi Clearance from Control Tower



Clock...Set



Altimeters...Set



**Gyros...
Set and Uncaged**



**Flight Controls...
Free**

As soon as all instruments and gauges indicate within safe operating limits, obtain taxi clearance from the Tower and taxi to run-up area.

TAXIING

Remember, the C-47 is a large, heavy airplane. Although you taxi like any other 2-engine airplane with conventional landing gear, its size and weight tend to exaggerate its movement in the air and on the ground. You will soon learn its characteristics but until you know the airplane well, handle it with extreme care.

In straight taxiing, keep the tailwheel locked and use throttles as evenly as possible.

In cross-wind taxiing, a locked tailwheel and correct use of throttles help you maintain direction with minimum use of brakes. When you are taxiing cross-wind, use additional power in the upwind engine.

Anticipate your turns. Momentum gathered in straight taxiing is much greater than in a lighter airplane and carries you into turns. Before your turn, slow your airplane down and unlock your tailwheel. In starting or completing turns, use throttles in co-ordination with your brakes. If you use throttles properly, you take a great load off your brakes and thereby increase their life.

Remember you have differential braking in the C-47. But do not rely entirely on it, use throttle control instead. It is kinder on landing gear!

ENGINE RUN-UP

Normally you make your engine run-up in an area just clear of the runway. If traffic permits and you are cleared for takeoff, you can make your run-up on the runway.

The less you idle your engines between run-up and takeoff the better. If there is a delay between run-up and takeoff, keep the engines running at a minimum of 1000 rpm to prevent plug fouling. At the same time, watch cylinder head temperatures to prevent overheating.

Once in position, make your checks:

Parking Brake.....On

Tailwheel.....Locked

Fuel Booster Pumps.....OFF

Mixtures.....Auto Rich

Cowl Flaps.....OPEN

Fuel Selectors.....Main Tanks

PropellersMAX RPM

Carburettor Heat....COLD

Generators.....Check Ammeters



Advance throttles until RPM reaches 1500. Move propeller controls to MIN RPM. This operation checks governor operation and flushes the prop dome with warm, clean oil.

Ignition

Increase one throttle at a time until manifold pressure indicates 30" Hg. Check magnetos by turning the requisite engine magneto switch from BOTH to RIGHT and back. There should be a small drop (no more than 100rpm) in revs. Immediately return the control to BOTH. Do the same for the other engine.

Hydraulic Pumps

Check by using the flaps control lever and selecting DOWN. If all is correct, return the flaps selector to the NEUTRAL position.

Check all instruments for each engine before re-tarding throttles.

COWL FLAPS CONTROLS

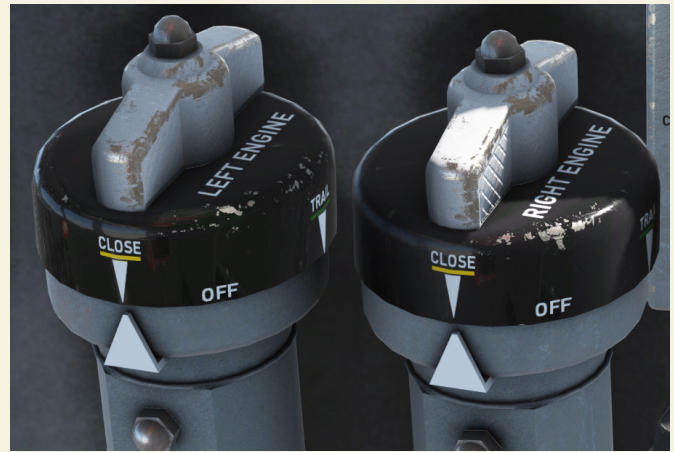
The C-47 (with Pratt&Whitney engines) has cowl flaps around each engine, directly behind the engine cowling. They control engine temperature by regulating air flow through the cowling.

Cowl flap controls are on the right side of the copilot's seat. They are marked: CLOSED, OFF, TRAIL, OFF, OPEN. Operate by moving them using the serrated knob atop each control, clockwise or anti-clockwise.

IMPORTANT!

For all ground operation, the controls MUST be set to OPEN. This maximises the air passing through the engine cowlings and prevents over-heating.

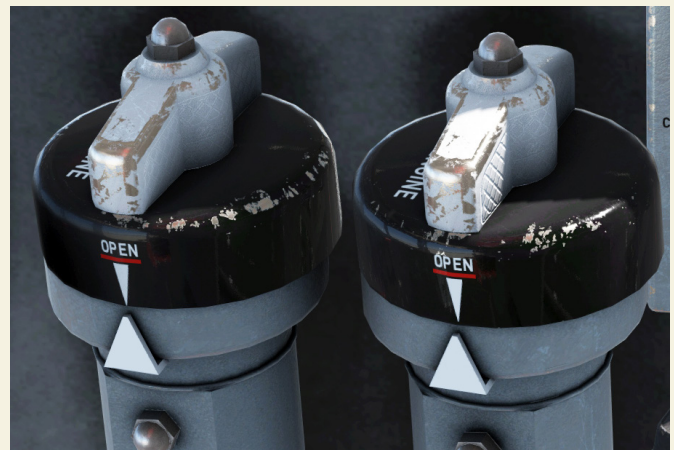
In icy and very cold conditions, you can select CLOSE to assist with engine warming but watch the cylinder head temperature gauge for any signs of overheat and OPEN the cowl flaps immediately.



CLOSED POSITION; In this position the flaps are closed and lay flat against the body of the engine cowling.



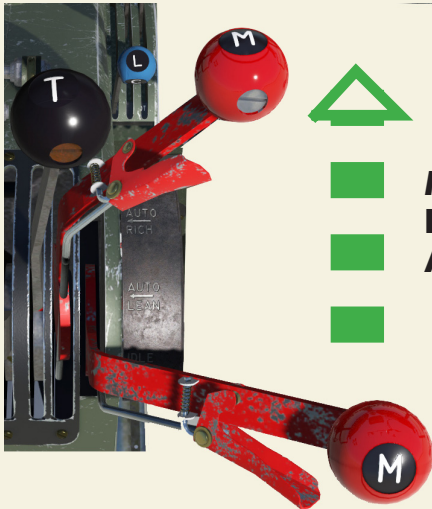
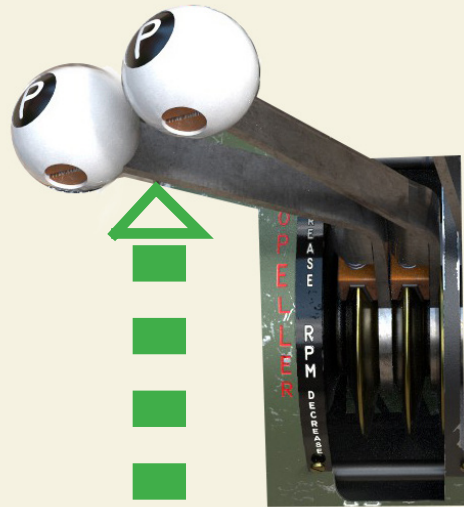
TRAIL POSITION; In this position, the flaps take up an angle dependent on airflow through the cowling. The faster the airflow, the flatter the flaps will lay. Slow speeds will open the flaps to aid engine cooling. This all happens automatically.



OPEN POSITION; In this position the flaps are fully open and remain so until another selection is made. ALWAYS use this position when engines are running on the ground.

**BEFORE
TAKEOFF**

**PROPELLERS
Full Forward
Max RPM**



**MIXTURES
Forward to
AUTO RICH**



**GYROS...
Set and Uncaged**



COWL FLAPS.....TRAIL



BOOSTER PUMPS....ON

Normal Takeoff Power Setting ...46" Hg.

Either before takeoff or before you taxi for takeoff, tighten the friction control to prevent throttles from slipping.

Tailwheel.....locked

Make sure your tailwheel is locked when lined up on runway.

TAKEOFF

Now you are ready to advance your throttles for takeoff. Advance them evenly and steadily until you reach takeoff power. As you do so:

Parking Brakerelease

The throttle movement should take a full 5 seconds.

Maintain takeoff direction by using your rudder and if necessary, your throttles. Rudder control is available directly after you reach takeoff power. Use throttles in cross-winds or to offset swerve of the airplane. As in taxiing, maintain direction in a crosswind by applying additional power to the upwind engine.

In a normally loaded airplane, the tailwheel usually comes up by itself. You can assist tail lift by slight forward pressure on the control column. When the airplane has attained flying speed (85 - 90 mph under normal conditions) you can break the ground using gentle back pressure on the control column.

Heavy load Takeoff: When you are taking off with a heavily loaded airplane, bring the tail up to a straight and level position as soon as possible and while holding the airplane on the ground, allow it to attain safe airspeed according to the load.

Short field Takeoff: In taking off from a short field, hold the airplane with brakes until you have advanced the throttles from 25" to 30" Hg. manifold pressure. Release brakes, raise the tail to straight and level flight position as soon as possible and ease your airplane off the ground as soon as you attain minimum flying speed. Do not allow the airplane to fly itself off the ground.

Use flaps to shorten your takeoff run.



Cross-wind takeoff

When you make a cross-wind takeoff, gain sufficient speed to ensure positive rudder control before lifting the tail. As long as you have rudder control, you can co-ordinate rudder and throttles to maintain a straight takeoff path.

Attain enough speed to remain airborne

once you have broken ground.

Since your airplane begins to drift when it becomes airborne you must crab into the wind to maintain straight flight. Once you have begun to crab, do not allow the landing gear to touch the ground. Damage to the gear or to the airplane may result.

AFTER TAKEOFF (CLIMB)

Landing GearUp

To retract landing gear

1. Pilot signals..... “Gear UP”
2. Release the safety latch from the floor catch
3. Safety latch.....Full up
4. Gear lever.....UP
5. When landing gear is up and locked, return the gear lever to NEUTRAL. The red warning light will burn.

To extend landing gear

1. Airspeed.....160 mph IAS or less
2. Pilot signals..... “Gear DOWN”
3. Safety latch.....Full up
4. Gear lever.....DOWN
5. Gear lever.....NEUTRAL
6. Green light.....ON
7. Safety Latch.....DOWN and LOCKED

Caution

Proper sequence in operation of the latch and gear handle is important. Any operation of the latch out of sequence results in inability to latch gear in down position.

Remedy

If, inadvertently you operate the latch out of sequence, return to normal by the following steps:

1. Pull the latch to the vertical position.
2. Raise the gear handle to UP position.
3. Return the gear handle to NEUTRAL

Wheels...Stop rotation with brakes

As soon as the airplane is clear of the ground, retract the gear. Hold a minimum climb until you get safe single engine speed. This speed varies with gross weight of the airplane but is between 110 mph and 120 mph. IAS

Power reductions

Once you have attained a speed of 120 mph it is safe to make your first power reductions.

Normal Climb Power Setting ...42" Hg.

Note

Maximum cylinder head temperature may exceed 232°C. but only for take-off and climb. At no time allow cylinder head temperatures to exceed 260°C. For all level flight conditions, regardless of altitude or power, keep cylinder head temperatures at or below 232°C

CRUISE POWER SETTINGS

At cruising altitudes reduce power to cruise conditions. For Grade91 fuel, these setting are:

R-1830-90C ENGINES (WITH 2-STAGE BLOWER)

RPM		LOW BLOWER M.P.		MIX.	HIGH BLOWER M.P.		MIX.	MAX CYL. TEMP.
min.	max.	min.	max.		min.	max.		
2450	2550	39"	42"	Auto-Rich	34"	36"	Auto-Rich	232°C
2350	2450	36"	39"	Auto-Rich	32"	34"	Auto-Rich	232°C
2250	2350	32"	36"	Auto-Rich	30"	32"	Auto-Rich	232°C
2000	2250	28"	32"	Auto-Lean	27"	30"	Auto-Rich	232°C
1700	2000	24"	28"	Auto-Lean	24"	27"	Auto-Rich	232°C

Cowl FlapsTrail or Closed

Cowl Flaps can have a buffeting effect if left open. Trail position is normal or Closed if at higher altitudes or operating in cold conditions.

MixturesAuto-Lean

Fuel Selectors.....to Desired Tanks

Adjust power as required to suit altitude and blower settings.

You are now ready to trim your airplane for level flight.



AUTOMATIC PILOT

When you are flying long distances you can keep your airplane in straight-and-level flight by means of the Automatic Pilot. It detects flight deviations the instant they occur and corrects them immediately and with precision. Use this Automatic pilot only in ordinary weather conditions and never in extremely turbulent air. To set the automatic pilot in operation, trim your airplane then

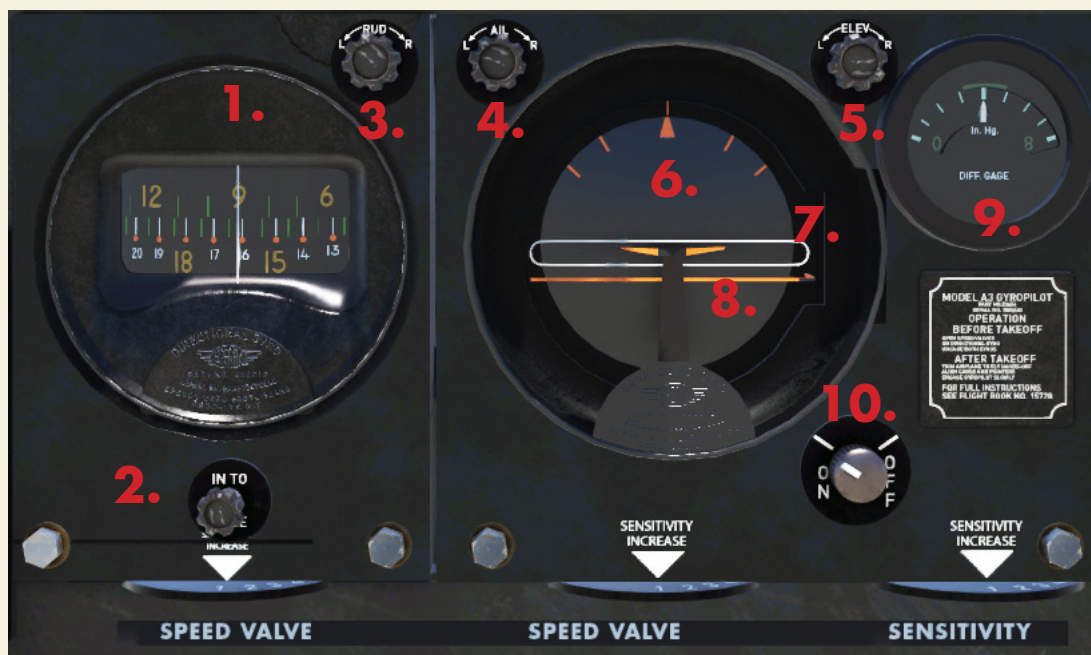
1. Align the adjustable index card with the gyro card in the directional gyro
2. Align the bank and climb indicators with those in your AHI instrument.
3. Check Suction. It should read between 3.75" and 4.25" Hg.
4. Turn the shut-off valve control on the hydraulic panel to the ON position.
5. Turn the ON/OFF control on the Sperry to ON or turn the automatic pilot control on the

pedestal base to ON.

With the airplane trimmed for level flight and the automatic pilot is ON, the airplane will be held in this flight position unless adjusted, using the Sperry controls.

If you wish to enter a climb under automatic pilot or if you need to adjust the pitch angle of the nose, use the knob marked "ELEV" which will adjust the pitch reference. The orange horizon bar will move to maintain its position in the center of the pitch reference bar and the aircraft's nose will rise (or fall). If you wish to alter your heading while under automatic pilot control, turn the knob marked "RUD" to adjust the index (upper) card in the gyro. The aircraft will turn to the new heading and the index and gyro cards will align again, to show your new heading.

NOTE: The servo controls (speed valves) are INOP in this simulation.



1. Index and Gyro cards
2. Cage knob. (push to cage)
3. Heading Adjust
4. Bank Adjust
5. Pitch Adjust
6. Bank indicator
7. Pitch Reference
8. Horizon Bar
9. Suction Gauge
10. On/Off control

Note The Sperry Gyro Pilot is NOT the same as the more modern autopilots you will be used to in flight simulators. It was designed in the late 1930's as a device to maintain an aircraft's flight attitude - that is level flight and direction, once these are set by trimming.

IMPORTANT!! IN ORDER TO USE THE SPERRY GYROPILOT ENSURE YOU MOVE THE HYDRAULIC PUMP SELECTOR VALVE TO THE "GYROPILOT" POSITION. THE SPERRY GYROPILOT WILL NOT OPERATE UNLESS YOU DO THIS.

FLIGHT CHARACTERISTICS AND LIMITATIONS OF YOUR AIRPLANE

Your airplane has the normal flight characteristics of a 2-engine, low-wing monoplane. It has no unusual tendencies.

Manoeuvres: The following manoeuvres are prohibited: loops, Immelmans, spins, dives, rolls, vertical banks, inverted flight and all other aerobatic manoeuvres.

Limit speed and load factors: The C-47 is designed to operate within designated limits under various load conditions. If you exceed these limits, you place undue strain upon the airplane and structural damage or failure results.

These limits are:

Item	26,000lbs. GrossWeight	29,000lbs GrossWeight	31,000lbs GrossWeight
Max. Level Flight (IAS)	204 mph	187 mph	170 mph
Max. Glide (IAS)	255 mph	207 mph	191 mph
Max. for Extending Landing Gear (IAS)	160 mph	160 mph	160 mph
Max. for Extending Wing Flaps (IAS)	112 mph	112 mph	112 mph

Turns: Normal flight characteristics. Remember the size and weight of your airplane.

Stalls and recovery: All stalls give warning of their approach with light buffeting.

Power-off stalls: Power-off stalls give warning sooner than power-on stalls. If gear and flaps are down, this warning is more apparent and the airplane tends to stay in level flight during the stall. If gear and flaps are up, stalls occur with less warning and the airplane has a tendency to fall off on one wing.

Power-on stalls: Power-on stalls occur more suddenly and with less warning than power-off stalls. If your airplane is not in straight and level flight, stalling speed is increased. In steep banks, for example, your down wing stalls and your airplane rolls. Under these conditions the stalling speed of your airplane can reach values of over 100 mph.

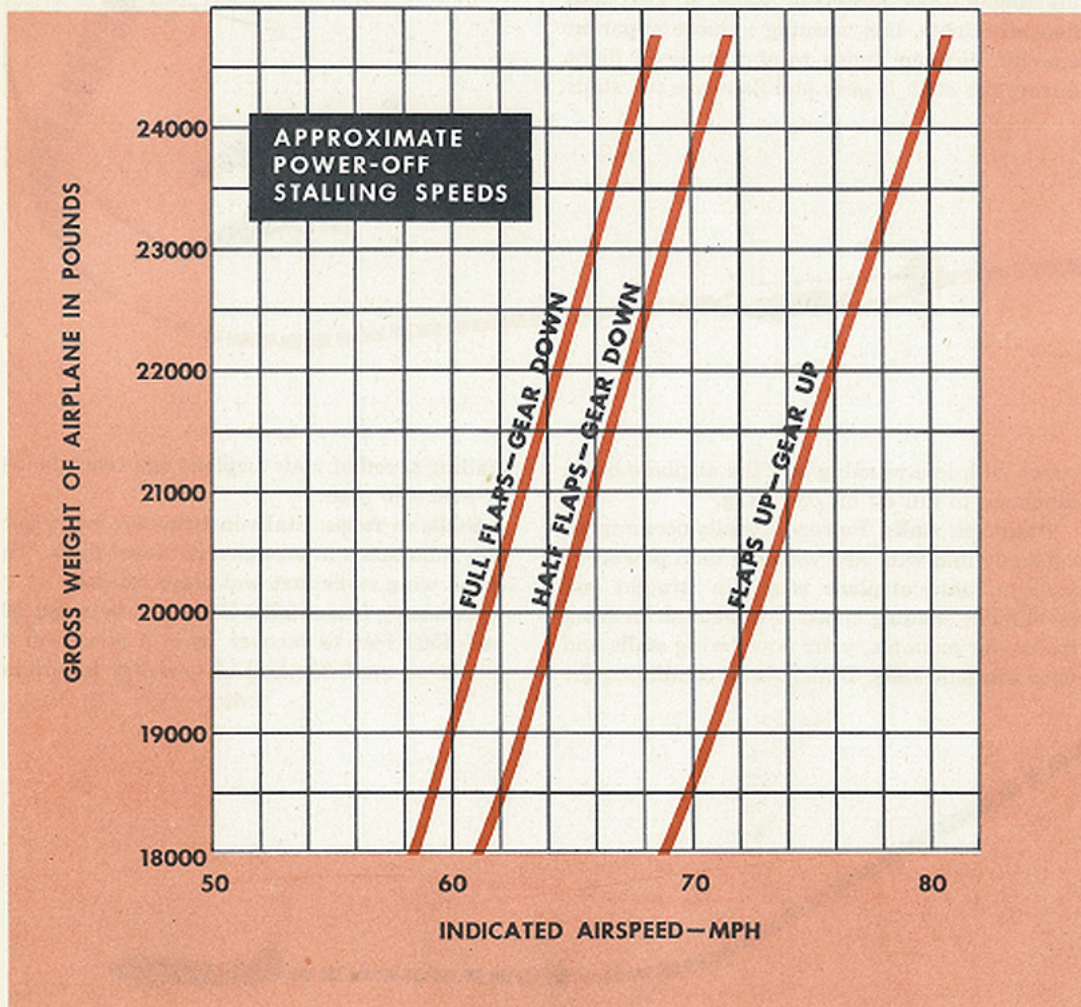
Stalls in turns: Stalls in turns are more sudden than stalls in straight and level flight. The down wing stalls first and drops quickly.

Recovery from stalls: You need between 500 and 1500 feet to recover from a power-off or power-on stall. Method of recovery is normal. However, avoid excessive airspeed when you are recovering from a stall, to keep loss of altitude to a minimum.

STALLING SPEEDS

Stalling speeds of the C-47 vary greatly under different conditions. Changes in load, power, flap and gear position and even slight changes in pressure and temperature affect the stalling speed. Your own technique also affects the stalling speed. If you fly smoothly, with co-ordinated control pressures, you can fly at slower speeds than another pilot who is rougher on the controls.

The following chart of stalling speed tells you approximately when the airplane will stall power-off. Use the chart until you are thoroughly familiar with your airplane.



BEFORE LANDING

Automatic Pilot.....OFF

AltimetersSet

**Fuel Selectors.....Left to Left Main,
right to Right Main**

Mixtures.....Auto Rich

Before you enter the traffic pattern, set mixtures to AUTO RICH and change fuel selectors to the main tanks. It is permissible to land on Auxiliary tanks if they are fuller than the Main tanks.

Carburettor Air.....Cold

Fuel Booster pumps.....ON

Propellers.....Set

**Landing Gear.....Down and latched,
gear handle NEUTRAL, Green light,
check wheels visually.**

When you have turned on the downwind leg and are opposite the runway, extend and lock the landing gear. Check green light and wheels visually. Increase propellers to 2250 rpm.

Tailwheel.....Locked

De-icers.....OFF

Parking Brake...OFF

Flaps.... As desired.

With landing gear extended, reduce power to achieve a descent of 300-400 feet per minute

Once on the base leg make another power reduction and maintain 120 mph until you are straight, on the approach leg. Then make a further power reduction to approach at 85-95 mph.

LANDING

There are three types of landing: (1) A 3-point landing, (2) Tail-low landing (tail approximately 1-2 feet above the ground when main wheels touch) This is actually a wheel landing. (3) Wheel landing (airplane is in a level attitude when main wheels touch).

1. You can make a 3-point landing in a C-47 BUT this type of landing is NOT ADVISED. Reason: Weight of the airplane causes undue stress on the airframe and gear.

2. Normally, make a tail-low landing. You can reduce manifold pressure to a minimum during round-out in this type of landing and cut the engines after making contact with the ground - or you can cut power before round-out and land without power. As speed is dissipated, the tail lowers and contacts the ground by itself. You can aid this by slight back-pressure on the control column providing your roll speed is slow.

3. Although a tail-low landing is desirable under normal conditions, you can make a wheel landing with the C-47. In this type of landing, hold roundout to a minimum and allow the airplane to settle on the main wheels from a level-flight position. Contact the ground approximately 10 - 15 mph faster than with a tail-low landing and hold the main wheels on the ground with slight forward pressure of the control column. As speed decreases, neutralise pressure on the control column or use gentle back pressure to allow the tail to lower to the ground.

CROSSWIND LANDINGS

There are three possible ways to land cross-wind: (1) Hold the airplane straight and level toward the landing strip and drop one wing into the wind, just enough to counteract drift. (2) Head airplane into the wind enough to keep straight (crabbing). (3) Combination of both.

The best method is the third: Head into the wind and lower the upwind wing. This method keeps the bank and crab to a minimum and makes it easier to straighten the airplane when close to the ground. Crab just enough to avoid slipping. Any unco-ordinated movement may raise the stalling speed of the airplane.

In cross-wind landings, correct for drift as soon as possible on the approach. If the airplane

is making a straight path to the landing strip, the only correction needed on actual landing should be the angle of crab.

Use flaps at your own discretion. Less flaps should be used in stronger and more direct cross-winds. In a strong 90 degree wind, or in gusty cross-winds, it is best to use no flaps at all.

As the airplane begins to round out for landing, bring the low wing up and straighten the airplane so there is no side load on the gear as it touches the ground.

In a cross-wind, wheel landings are desirable as direction is easier to maintain. You can hold your airplane on the main wheels by slight forward pressure on the controls.

Once on the ground, maintain directional control by use of rudder, power on the upwind engine and by use of brakes.

Remember, you have not finished flying your airplane until you have come to a complete stop, especially in a cross-wind.

CROSSWIND LANDINGS

Tactical operation of the C-47, especially in combat theatres, often requires you to make short-field landings. Field conditions and approach clearances vary in different parts of the world. Landing fields may be small where little landing space remains.

Runways and fields may be rough making fast wheel landings dangerous or they may be ice-covered making brakes useless. The following landing techniques, however, are designed to get you down safely under all these conditions.

Technique

Set the base leg to establish a normal power approach. Set the glide to undershoot slightly. This is the key to a good short-field landing.

Hold a normal approach speed from the top of the approach to the start of the roundout. Make the roundout in the shortest possible forward distance.

Make corrections early on the approach, if you are undershooting too much. Use power to clear obstructions - don't depend on judgement alone from high on the approach. Correct by varying power and angle of glide to maintain a constant airspeed.

Increase the power slowly and go into an approach to slow flying as the airplane approaches a tail-low attitude. Keep the airplane in this attitude for as short a time as possible. You should be slow flying, at an airspeed at or slightly above power-off stalling speed, just before you touch the ground. Reduce the power completely when you contact the ground.

If you are making an actual short-field landing, use the brakes as much as necessary. For practice, however, let the airplane roll to a stop as you would if the brakes were not functioning.

Tips

Don't undershoot and slow fly long distance to reach the field. This leaves you helpless if an engine fails.

Don't use excessive speed early in the approach. This prevents a low roundout before you reach the field.

Don't drop below a safe airspeed early in the approach.

Don't use excessive power in the last of the roundout. This causes the airplane to balloon and destroys the value of the procedure.

NO-FLAP LANDING

Make your approach to a non-flap landing lower and with speed slightly higher than in an ordinary approach. As you normally approach in a tail-low attitude it is better to make a tail-low landing than a wheel landing.

During the landing roll, pull your flaps up, open the cowl flaps, turn off the booster pumps, place elevator trim in neutral and put the propellers in high rpm.

Rudder control is available for the major part of the roll. Use your rudder rather than the brakes to maintain direction. At the end of the roll, apply brakes evenly.

PARKING

Parking brake.....ON

Cowl Flaps..... as desired

Mixtures.....Idle Cut-off

When you park your airplane, lock the tailwheel, pull the parking brake ON and pull the mixtures back to IDLE CUT-OFF to stop the engines. Once the engines have stopped firing, push the throttles all the way forward to the stops.

Fuel selectors.....OFF

Ignition OFF

Radios..... OFF

Battery Switch.....OFF

Landing Gear HandleDOWN

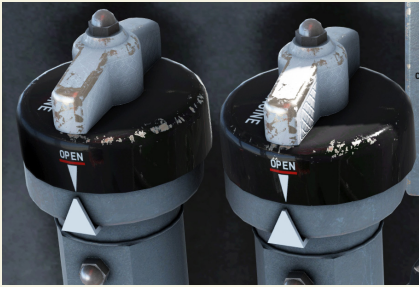
Flap handleUP

Crew DoorOPEN

GPU.....DEPLOYED

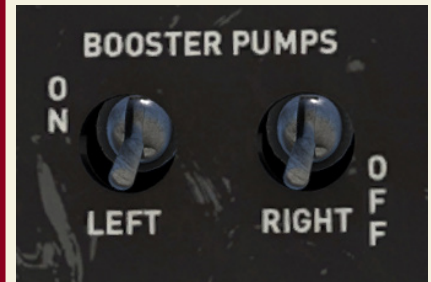
This will leave your airplane with chocks set, battery boxes lowered and crew ladder deployed.

AFTER LANDING



COWL FLAPS.....OPEN

**FLAPS....
UP**



**FUEL BOOSTER PUMPS...
OFF**



**ELEVATOR TRIM TAB....
NEUTRAL**

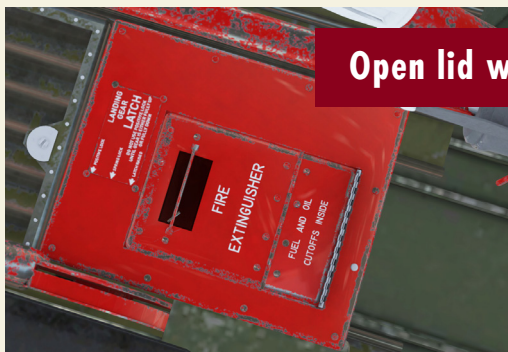
**PROPELLERS
Full Forward
Max RPM**



**UNLOCK THE
TAILWHEEL
NEAR THE END
OF YOUR ROLL**

FIRE CONTROL

The C-47 is equipped with an engine fire control system. A system of valves and pipework enable the system to be operated conveniently from the pilots' seats. A red panel in the floor is lifted to reveal the engine selector and fire extinguisher handle. Hinged to the lid of the fire panel is another compartment containing shut-off valves for fuel and oil.



Open lid with handle



Select affected engine



Pull extinguisher handle



Open rear lid

Turn cut-off valves OFF

Operation With Paratroops

The C-47 is equipped to carry 38 paratroops, including the jump-master. However, the number of paratroops can vary, depending on type and length of mission, equipment carried, any gliders in tow (one or two) and the number of troops carried in gliders.

Under normal conditions, paratroopers jump at an altitude of 800 feet. Again, this can vary depending on terrain, weather and combat conditions.

Operations with paratroops are much the same as any other mission, except for the following procedures;

Setting up the approach run

The most efficient and safest way to set up an accurate jump run approach is to use a combination of the Sperry GyroPilot and the Radio Altimeter.

Under normal conditions you will be dropping at 800 feet. So, set your Radio Altimeter bug to a height of 800 feet and fly the aircraft to that altitude. When you are on course for the target drop zone, set and turn on the Sperry GyroPilot to maintain heading and altitude.

Executing the drop

Using the JUMP SWITCH on the left “eyebrow” panel, lift the red safety cover. This removes the JumpDoor from the exterior and loads up the paratroopers ready to drop. If you check the exterior view, you will see the first paratrooper standing next to the jump-master in the doorway.

Now when you are over the drop zone, click the jump switch which has been revealed by lifting the cover.

If you have followed the procedure properly, you will see the paratroopers fall away from the C-47 and parachutes will open moments later. Static lines will trail from the doorway as the paratroops leave the aircraft.

This is a ONE TIME operation. If you want to drop again, you will need to re-set your flight. So, make sure you get your guys safely to the DZ!



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Checklists

NOTE: These checklists are for simulation purposes ONLY. In no way are they intended for real-world aviation use.

WEIGHT AND BALANCE

It is important to make sure that the configuration of the airplane selected matches the fuel/payload data listed in the simulator drop-down menu. The simulation will react to any changes in the data that you make or enter.

Once you have established your intended flight and have fuel and payload data available, enter these values in the boxes provided. Adjust the payload fore and aft to achieve a good Center-of-Gravity balance as indicated on the plane graphic of the drop-down. Doing this will decrease the amount of time required to trim the aircraft for level and balanced flight.

BEFORE STARTING ENGINES

Hydraulic Pump selector.....LEFT ENGINE

Gear Latch.....Down and Locked

Flap Handle.....Flaps UP and then to Neutral

Gear Handle.....Neutral

Battery Switch.....ON

Battery cart (GPU).....ON

Fuel Gauges.....Check ALL

Cowl Flaps.....OPEN

De-icers.....OFF

Automatic Pilot.....OFF

Lights.....As required

Flight ControlsFREE

Crossfeed.....OFF

Trim Tabs.....Neutral

Parking Brake.....ON

Tailwheel.....Locked

Carburettor Air.....Cold

Fuel Selector Valves
Left.....Left Main
Right.....Right Main

Propellers.....Full Forward High RPM

Throttles.....Cracked (5-10%)

Mixtures.....Full Rich

Pitot Heaters.....OFF

STARTING ENGINES

Inverter.....ON

Fuel Booster pumps.....ON

Master Ignition Switch.....ON

Right Engine Magneto.....OFF

Right Starter (energiser).....ON

Right Engine Mesh.....ON

Right Engine Magneto.....BOTH (after 15 blades)

Starter and Mesh.....OFF (once engine is running)

SECURE FRONT CREW DOOR
RETRACT LADDER

REPEAT PROCEDURE FOR LEFT ENGINE

Battery cart (GPU).....OFF

BEFORE TAXIING

Hydraulic Pressure.....675-925 psi
Radios.....ON and tuned
Altimeters.....Set
Clock.....Set
Gyros.....Set and un-caged
Flight Controls.....Free
Parking BrakeOFF
Tailwheel.....Unlocked

TAXI TO RUN-UP AREA.

ENGINE RUN-UP

Parking Brake.....ON
Tailwheel.....Locked
Fuel Booster Pumps.....OFF
Mixtures.....Auto Rich
Cowl Flaps.....OPEN
Fuel Selectors.....Main Tanks
Propellers.....Through Full Range
Magnetos.....Check

BEFORE TAKEOFF

Mixtures.....Auto Rich
Cowl Flaps.....TRAIL
Propellers.....Inc. RPM
Gyros.....Set and un-caged

Fuel Booster pumps.....ON
Tailwheel.....Locked
(when lined up with runway)

AFTER TAKEOFF

Landing Gear.....UP
Wheels.....Stop rotation with brakes
Power reductions.....as advised
Fuel Booster Pumps.....OFF

CRUISE

Cowl Flaps.....As required
Mixtures.....Auto Lean
Fuel Selector Valves.....Cruise tanks
Power adjustments.....as advised
Automatic Pilot.....as required

BEFORE LANDING

Automatic Pilot.....OFF
Altimeters.....Set
Fuel Selector Valves
Left.....Left Main
Right.....Right Main
Mixtures.....Auto Rich
Carburettor Air.....Cold
Fuel Booster Pumps.....ON
Ignition.....Check
Propellers.....Set

Landing Gear.....Down and latched,
gear handle NEUTRAL, Green light,
check wheels visually.

Tailwheel.....Locked

De-icers.....OFF

Parking BrakeOFF

Flaps.....as desired

AFTER LANDING

Flaps.....UP

Cowl Flaps.....Open

Fuel Booster Pumps.....OFF

Elevator Trim.....Neutral

Propellers.....Full Forward high RPM

Tailwheel.....Unlocked

PARKING

Parking Brake.....ON

Cowl Flaps.....as desired

Tailwheel.....Locked

Mixtures.....Idle cut-off

Fuel Selectors.....OFF

Ignition.....OFF

Radios.....OFF

Battery Switch.....OFF

Landing Gear Handle.....Down

Flap Handle.....UP

For the modern pilot...

The "original" C-47 is fitted with basic navigation equipment in the shape of the Radio suite which provides Nav1 frequency, a Comms Radio with Com1 and an ADF. These when coupled to the RMI (VOR) and GSI (glideslope indicator) gauges on the main panel, provide for basic IFR navigation. The RADIO COMPASS is your ADF indicator.

PLEASE NOTE: To retain authenticity modern avionics are **NOT AVAILABLE** in the "paratroop Skytrains".

The C-47 Skytrains in this simulation are our tribute to the men who flew and flew in these remarkable aeroplanes.

As such, we have attempted to keep this simulation as "pure" as possible.

