Curtiss C-46 Commando

Operations Manual

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Please note that Flight Simulator X Steam be correctly installed on your PC prior to the installation and use of this C-46 Commando simulation.

INTRODUCTION

Drawn up in 1937 by George A. Page Jnr., Chief Designer at Curtiss-Wright, the C-46's design was first called the CW20. Designed to compete with the DC-4, the Curtiss design incorporated a 'double bubble' cross-section fuselage which could withstand the pressure differential at altitude. Another benefit of the design was that the wing spar passed through the fuselage, beneath the passenger compartment, thus creating more room and a level floor for passengers and freight.

Originally designed with twin vertical tails and four engines, many modifications were made after the test flights. The twin tails were replaced by a single large fin and twin Wright Cyclone radials were used instead of the intended four.

It was General Henry 'Hap' Arnold who saw the potential in the aeroplane for use as a military transport and in 1940 an order was placed by the US Army Air Forces. More changes followed, including the incorporation of large cargo doors, with perhaps the most critical being the adoption of the more powerful Pratt & Whitney R-2800 Double Wasp engine which producing 2,000 HP. This was the engine that powered several of the current batch of fighters and ground attack aircraft in front-line service in WWII. The big radials gave the now renamed C-46 the power to haul large amounts of cargo and troops over long distances. It could fly well on one engine and when nearly empty could even climb on one engine at a rate of 200-300 feet per minute.

Unfortunately the design was plagued by maintenance problems and in-flight engine fires were not uncommon.

The 'Commando' dropped airborne troops during Operation Varsity, the push to cross the Rhine in 1945, but the absence of self-sealing fuel tanks meant the aircraft suffered at the hands of anti-aircraft batteries and many were lost. As a result, they were never again used in combat but continued to provide exemplary service in a military transport role.

The aircraft's major claim to fame was its wartime career in the Pacific Theatre on the China-Burma-India route, transporting large freight loads from Indian bases over the Himalayas to relieve troops in China. Nicknamed 'The Hump', the route was extremely challenging for both men and aircraft, but despite this the C-46 did the job well – it was able to carry more freight and fly higher and farther than any other Allied transport aircraft.

After WWII the C-46 continued to fly commercial routes as a dual passenger and freight hauler in the hands of many smaller air carriers and carried out covert operations for the CIA. The Commando served in the Korean and Vietnam conflicts and was the last fixed-wing aircraft to be flown out of Vietnam at the end of hostilities.

The People's Republic of China operated the C-46 until 1982 and several private ventures continue to operate airworthy examples, including Buffalo Airways, stars of

the TV show 'Ice Pilots', and Everts Air Cargo, hauling up to 12,000lb per flight on a daily basis.

Several examples fly the display circuit, including the restored 'The Tinker Belle' and ‘China Doll'.

The Curtiss C-46 may well be an unsung hero but it deservedly takes its place in aviation history alongside more illustrious aircraft.

Aircraft specifications

Dimensions

Length	23.27m (76ft 4in)
Wingspan	32.91m (108ft)
Height	6.62m (21ft 9in)
Wing area	126.3m^2 (1360ft^2)

Engine

Type	2 x Pratt & Whitney R-2800 twin-row, 18-cylinder radial
Power	2,000 horsepower
Propeller	Four-blade Curtiss electric propellers or three-blade Hamilton standard propellers

Weights

Empty weight	30,669lb (14,700kg)
Maximum take-off weight	45,000lb (20,412kg)
Maximum useful load	14,331lb (5,712kg)

Performance

Maximum speed	235 KIAS (270 MPH)
Cruise speed	150 KIAS (173 MPH)
Range	2,739 NM (5,069km)
Rate of climb	1,175 ft/min

Aircraft in this simulation

C-46F ‘China Doll’

Built in 1945, construction number 22486, serial no. 44-78663. In military service until the early 1950s. Acquired by the Commemorative Air Force of Southern California, USA, in 1978 and now flown regularly at air shows.

C-46F ‘The Tinker Belle’

Serial no. 44-78774, delivered to USAAF in 1945. Sold to Pan American World Airways in September 1948. Acquired in 1978 by the Commemorative Air Force and operated out of Midland, Texas. Now assigned to the Southern California Wing and a sister ship to ‘China Doll’.

US Navy R5C-1 (Navy designation) build no. 39507

Based at NAS Corpus Christi in Texas in the late 1940s. In 1953 this aircraft was used as a support machine for the Blue Angels display team. It went on to serve in covert operations for the CIA and has not been seen since the 1980s.

US Navy R5C-1 serial LH/14

Served with VMR-252 of the US Marine Corps based at MCAS Cherry Point in the late 1940s.

N67984

HK-815

Services began with this aircraft in 1957, flying cargo. The airframes were later converted to passenger use and were eventually replaced by Douglas DC-4s and DC-6s.

N4086A

C46-C serial no. 44-78019

Operated by the US Air Force in Alaska in the early 1950s. The red tail and wing-tips aided visibility in snowy conditions.

3821

N9891Z

51-1101

N54514

YV-C-AVK

C-favo

N74171

N10427

HS-SKO

Air National Guard

Curtiss C-46D 44-77619 belonging to the 130th Troop Carrier Squadron of the West Virginia Air National Guard during the late 1950s.

PP-VCM

INSTALLATION, UPDATES AND SUPPORT

Installation is handled by Steam after purchase of the product. After purchasing the product the files will be downloaded and installation into the Scenery Library will be automatic

Accessing the aircraft

To access the aircraft in FSX:

1. Click on 'Free Flight'.

2. Select 'Just Flight' from the 'Publisher' drop-down menu.

3. Select 'Curtiss' from the Manufacturer drop-down and choose one of the schemes.

Tick the 'Show all variations' box to see all the available paint schemes.

Updates

Updates to the product will automatically be deployed, downloaded and installed via Steam to all users who own the product

Technical Support

To obtain technical support (in English) please visit the Support pages at justflight.com. As a Just Flight customer you can obtain free technical support for any Just Flight or Just Trains product. For support specifically on the Steam version of the add-on please contact Dovetail Games. https://dovetailgames.kayako.com/

Regular News

To get the latest news about Just Flight products, sign up for our Newsletter [http://http://www.justflight.com/newsletter] and regular emails.

PANEL GUIDE

The C-46 Commando cockpit can be divided into five areas:

- Main panel (military and modern variants)
- Pilot side panel
- Co-pilot side panel
- Overhead panel
- Pedestal panel

The following pages will guide you through these areas.

Moving around the cockpit

You can use the hat switch on your joystick to move around the cockpit, hold down the [Space] bar on your keyboard whilst moving your mouse around, and also use your keyboard keys.

Virtual Cockpit views

Press the [A] key to cycle through the various preset views and the [+] and [-] keys to zoom in and out. Pressing the [Backspace] key will reset the zoom level to the default setting.

You can also alter your viewpoint using these keys:

[Ctrl]+[Shift]+[Backspace]	Left
[Ctrl]+[Shift]+[Enter] (return key)	Right
[Ctrl]+[Backspace]	Forward
[Ctrl]+[Enter] (return key)	Back
[Shift]+[Backspace]	Down
[Shift]+[Enter] (Return key)	Up

Main panel – military cockpit

1. Whiskey compass
2. Airspeed indicator
3. Turn/Slip indicator
4. Vertical speed indicator (VSI)
5. Centre altimeter
6. Left altimeter
7. Gyro compass

8. Artificial horizon indicator (AHI)
9. Front fuel quantity gauge
10. Centre fuel quantity gauge
11. Rear fuel quantity gauge
12. Glideslope/localiser indicator
13. Sperry gyropilot
14. Co-pilot airspeed indicator
15. Fuel flow meter
16. Carburettor air temperature indicator
17. Outside air temperature (OAT) indicator
18. Oil temperature indicator
19. Oil pressure indicator
20. Fuel pressure indicator and warning lights
21. Cylinder head temperature indicator
22. Cabin temperature indicator
23. Suction (vacuum) gauge
24. Radio-magnetic indicator (RMI)
25. Autopilot master switch
26. Manifold pressure indicator
27. Tachometer
28. Chronometer
29. Flap position indicator
30. Hydraulic pressure indicators
31. Voltmeter
32. Oxygen flow indicator
33. Oxygen pressure indicator
34. Oil quantity indicator
35. Fire extinguisher handles
36. Main compass

Main panel – modern cockpit

1. Whiskey compass
2. GNS 430 – COM 1 / NAV 1 / GPS
3. Stall warning light
4. COM 1 / NAV 1 radio
5. Audio panel
6. COM 2 / NAV 2 radio
7. KR87 DME
8. Transponder
9. Autopilot
10. DME read-out
11. Fire test switches and lights
12. Chronometer
13. Airspeed indicator (with true airspeed scale)
14. Artificial horizon indicator (AHI)
15. Altimeter
16. Turn/Slip gauge
17. Horizontal situation indicator (HSI)
18. VOR indicator (NAV 2)
19. Vertical speed indicator (VSI)
20. Cabin temperature indicator
21. Suction (vacuum) gauge
22. ADF indicator
23. VOR indicator (NAV 1)
24. Oxygen flow indicator
25. Oxygen pressure indicator
26. Oil quantity indicator
27. Voltmeter
28. Manifold pressure indicator
29. Tachometers
30. Marker lights

31. Oil pressure indicator
32. Fuel pressure indicator
33. Cylinder head temperature indicator
34. Carburettor air temperature indicator
35. Oil temperature indicator
36. Fuel flow meter
37. Front fuel quantity gauge
38. Centre fuel quantity gauge
39. Rear fuel quantity gauge
40. Landing gear indicator lights
41. Hydraulic pressure indicators
42. Flap position indicator
43. Oxygen flow indicator
44. Tail gear indicator
45. Oxygen pressure indicator

GNS 430

1. Power and COM volume knob – left-click to select off, right-click to select on
2. VLOC volume knob – left-click to select off, right-click to select on
3. Left outer and inner knobs
4. COM frequency transfer button
5. VLOC frequency transfer button
6. CDI button
7. OBS button
8. MSG button
9. Flight plan (FPL) button
10. Procedures (PROC) button
11. Range buttons

12. Direct-to button
13. Clear button
14. Menu button
15. Enter button
16. Right outer and inner knobs

Right-click the power knob to switch on the GNS 430 unit.

Rotate the left outer knob to change the frequency in 1MHz increments and rotate the left inner knob to change the values in 25kHz increments. Toggle between the COM and VLOC (NAV) standby frequency by pressing the centre of the left inner knob.

Swap the COM active and standby frequency by pressing the COM frequency transfer button, and swap the VLOC (NAV) active and standby frequency by pressing the VLOC frequency transfer button.

The GNS 430 is a customised version of the default GPS unit. Please refer to the Learning Center in the host simulator for extensive documentation regarding its use.

KR 87

1. Mode selector button – selects ANT mode or ADF mode

2. BFO button – toggles BFO mode

3. Frequency transfer button – displays the standby frequency if the timer is currently shown, or swaps the standby and active frequencies if the standby frequency is already displayed

4. Timer mode button – displays the timer if the standby frequency is currently shown, or swaps between the FLT and ET timers if the timer is already displayed

5. Set/reset timer button – press to reset the elapsed timer (ET) or press and hold to enter countdown mode

6. Power switch – controls power to the unit

7. Frequency select knobs – tune the standby frequency if displayed (FRQ annunication shown) or tune the active frequency if the standby frequency is not displayed. Set the countdown timer value if countdown mode is active.

Power

Rotate the ON/OFF/VOL knob clockwise to switch on the unit. The unit will be activated and will be ready to operate. Rotation of this control also adjusts audio volume.

Frequency selection

The active frequency (to which the ADF is tuned) is displayed on the left side of the window at all times. A standby frequency is displayed in the right side when 'FRQ' is annunciated.

The standby frequency is placed in memory when either FLT (Flight Time) or ET (Elapsed Time) mode is selected.

With 'FRQ' annunciated, the standby frequency is selected using the frequency select knobs, which may be rotated either clockwise or anti-clockwise:

- Left- and right-clicking the smaller knob decrements or increments the read-out fractionally.
- Mouse-wheel the smaller knob upwards and downwards to decrement or increment the read-out in single increments.
- Left- and right-click the larger knob to increase and decrease the 10s.
- Mouse-wheel upwards and downwards to decrement or increment the read-out in 100s.

The standby frequency selected can then be put into the active window by pressing the FRQ button. The standby and active frequencies will be exchanged (flip-flopped) – the new frequency will become active, and the former active frequency will go into standby.

Operating modes

Antenna (ANT) mode is selected and annunciated when the ADF button is in the out position. ANT provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer on the ADF indicator will be deactivated and immediately turn to the 90° relative position and remain there during ANT reception.

ADF mode is selected and annunciated when the ADF button is in the depressed position. ADF activates the bearing pointer on the ADF indicator, causing it to point in the direction of the station relative to the aircraft heading.

BFO mode, activated and annunciated when the BFO button is depressed, permits the carrier wave and the associated Morse code identifier broadcast on the carrier wave to be heard.

Operating the timers

Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button. The flight timer continues to count up until the unit is turned off.

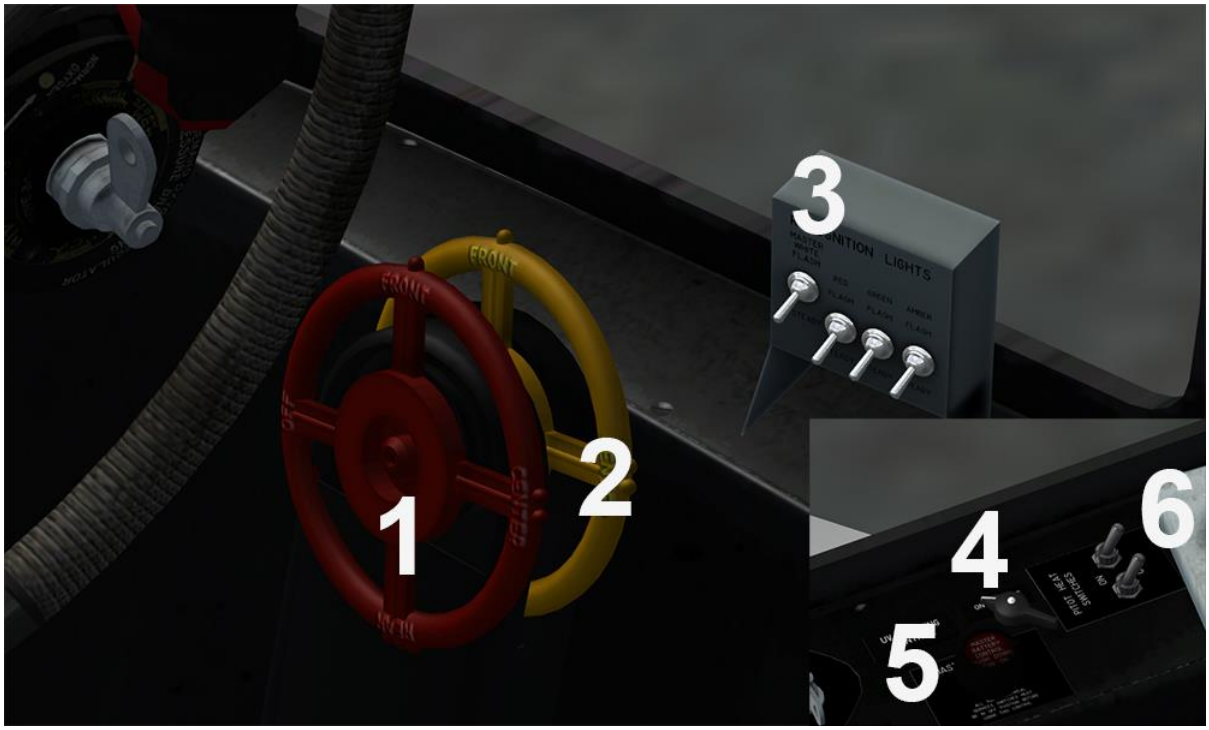
An arrow indicates whether you are in either count up mode or count down mode. The elapsed timer may be reset back to :00 by right-clicking the SET/RST button. Stop and start the elapsed timer by left-clicking the SET/RST button.

The elapsed countdown timer can be set using the ADF tune knobs. The ADF tune knobs only act as countdown knobs in the ET countdown mode. Right-clicking the small knob increases the seconds start time. Right-clicking the larger knob increases the minutes countdown. Left-clicking the small and larger knobs will decrease the start time point.

Pilot side panel

1. Starboard engine fuel tank selector
2. Port engine fuel tank selector
3. UV cockpit lighting switch (military version only)
4. Oxygen controls

Co-pilot side panel



1. Starboard engine fuel tank selector
2. Port engine fuel tank selector
3. Recognition lights switches (military version only)
4. UV cockpit lighting switch (military version only)
5. Battery master switch
6. Pitot heat switches

Overhead panel

1. ‘Cold & Dark’ start selector switch
2. Battery switch
3. Ignition and magneto control
4. Left engine starter switches
5. Right engine starter switches
6. Lighting switches
7. Generator switches
8. Inverter switches
9. Anti-ice switches
10. ADF radio (acts as a standby on modern version)
11. NAV 1 radio (acts as a standby on modern version)
12. COM 1 radio (acts as a standby on modern version)
13. Security switch – toggles wheel chocks, pre-flight flags and boarding steps

Pedestal panel

1. Throttle levers
2. Propeller levers
3. Mixture levers
4. Cowl flap levers
5. Elevator trim controls
6. Left landing light switch
7. Right landing light switch
8. Rudder trim control
9. Left fuel boost switch
10. Right fuel boost switch
11. Left propeller feather switch
12. Right propeller feather switch
13. Aileron trim control
14. Fuel cross-feed control
15. Flap control lever
16. Parking brake lever
17. Supercharger control levers
18. Landing gear lever
19. Carburettor heat levers
20. Tail-wheel lock
21. Tow release (military version only)

DOORS AND EXITS

The aircraft is fitted with passenger doors and a large and small cargo door.

To open the passenger doors, press [Shift]+[E].

To open the large cargo door, press [Shift]+[E] then [2].

To open the small cargo door, press [Shift]+[E] then [3].

FLYING THE C-46 COMMANDO

You can, of course, just hit [Ctrl]+[E] and go flying but you will derive a much higher level of satisfaction if you follow the real-world procedures for starting and handling the C-46 Commando.

Although not installed in the real aircraft, we have incorporated a COLD DARK START switch in the overhead panel. If you use this switch, the aircraft will be placed in a 'Cold & Dark' state. This switch can only be used once per flight and you will need to reset the flight if you wish to use it again.

What follows is a condensed version of the real-world guide to the C-46 which was issued by the United States Army Air Forces when the aircraft was first delivered. This information will guide you through the basics of a flight, from 'Cold & Dark' to landing.

Starting the engines

After using the COLD DARK START switch on the overhead panel, you need to set up the tanks to feed fuel to each engine. Each engine has its own pair of selectors.

These are the red (RH) and yellow (LH) wheels on either side of the cockpit. Right-click to turn each wheel to the desired tank: FRONT, CENTER or REAR. There is also a cross-feed lever on the right side of the pedestal.

With the desired tanks selected, you can start the first engine:

1. Master and ignition (magneto for engine) switch – **ON**
2. Battery switches – **ON**
3. Generators – **ON**
4. Inverters – **ON**
5. Fuel gauges – **sufficient fuel for flight**
6. Booster pumps – **ON**
7. Mixture levers – **RICH (fully forward)**
8. Propeller levers – **FULL FORWARD**
9. Primer – **ON**
10. Engine starter switch – **ON**

11. Switch **ON** the engine mesh switch and hold **ON** until engine starts. It is vital that you 'mesh' the engine whilst the start switch remains ON. The starter switch is on a timer and will shut off after about 45 seconds, preventing you from meshing the engine again.

12. Once the engine is running, adjust the throttle to idle at **800-1,000 RPM**.

13. Watch the oil pressure gauge. If the pressure does not rise within 30 seconds, shut off the engine.

Repeat the procedure for the other engine.

After both engines are running, switch **OFF** the booster pumps.

Engine mesh

The large radial engines fitted to the C-46 have inertial starters; these are essentially electric motors which spin a flywheel up to speed. Then you 'mesh' the engine via a clutch-like mechanism which introduces the momentum of the spinning flywheel to the engine shaft to turn over the motor; this generates sufficient revolutions to get the engine spinning over and then the magnetos will fire the plugs.

So, the switches marked START are energising the inertial starter motors, and the switches marked MESH are used to mesh the starters and engines together. In colder air the oil dilution switch is needed to thin the oil for easier turnover. Sufficient priming is also important to the process.

In the real aircraft you can use one finger to switch on the starter and then two fingers to hold both switches on. As that is not possible within the simulator, we use 'mesh hold' to simulate that.

Taxi

Controls for taxiing

Like most other heavy aircraft, the C-46 gives little or no response to rudder or aileron action during taxiing. The principal controls for taxiing are the engines, brakes and tail-wheel. The throttles should be used for directional control whenever possible, with directional braking used if necessary.

Turns

Turns should not be attempted from a parked or stationary position. Let the aircraft roll forward a few feet first. Pivoting on one wheel wears out the tyre and puts a severe strain on the entire landing gear. For the same reason, don't make your turns too short. Make slow, easy turns with both wheels moving throughout the turn.

Start turns by leading with one throttle well before you reach the turning point. Remember that it takes time for the engine to bring the aircraft into the turn. In the same manner, anticipate with the other throttle well before the turn is completed so that you can straighten out with the minimum use of brakes. Use your brakes when necessary, but use them sparingly.

Return the inside throttle to the closed position so that you can make the turn with the least power possible.

Abrupt use of brakes at low speeds can cause the aeroplane to nose over.

Tail-wheel

The tail-wheel lock is an important aid to taxiing the C-46. The locked tail-wheel helps keep the aircraft taxiing straight, reducing the use of brakes for directional control. Locking the tail-wheel is essential in crosswind taxiing.

Let the aircraft roll forward a few feet before locking the tail-wheel and remember to unlock it before beginning a turn.

Crosswind taxiing

Because of the C-46's large fuselage and tail section, there is a tendency for the aircraft to weathercock in wind as low as 5 MPH. Taxiing in a stiff wind of 20 MPH or more can present challenges. Locking the tail-wheel helps keep the aircraft straight in a crosswind, so it is advisable to keep it locked at all times except when making turns.

Lead with the upwind throttle sufficiently to hold the aircraft straight.

Run-up checks

The run-up checks involve working upwards on the pedestal, checking the various controls for proper engine operation.

Before starting run-up, make sure that you have a minimum cylinder head temperature of 120°C and minimum oil temperature of 40°C, and that all controls are set properly according to the checklist.

To carry out the run-up checks:

1. Advance the throttle to obtain **1,400 RPM**.

2. Shift into **HIGH** blower (supercharger on).

3. Switch **ON** carburettor heat.

4. Advance the throttle to obtain **2,000 RPM**.

5. Note the rise in carburettor intake air temperature and then switch **OFF** carburettor heat.

6. Return to **LOW** blower. Manifold pressure should drop by 1-2".

7. Check engine gauges for within limits readings.

8. Pull the prop control back to obtain **1,800 RPM**. At this setting the governor should hold the engine at a steady speed without surging. Return the prop control to the **full forward** position and note the increase in RPM.

9. Perform the power check. Advance the throttle until you obtain **2,500 RPM**. You will need about 36.5" Hg at sea level with an outside air temperature of 25°C (77°F) . Allowing a tolerance of 2.5" Hg for instrument errors, the maximum permissible manifold pressure is 39" Hg.

10. Reduce power to obtain 30" Hg. Check magneto operation from BOTH to LEFT and BOTH to RIGHT and then return to **BOTH**. Normal loss in RPM when running on one magneto is 50-75 RPM. Maximum allowable loss is 100 RPM.

11. Reduce power to idling speed and repeat the run-up with the other engine.

Before returning power to idling speed on the second engine, check the flaps by fully extending and retracting them.

Take-off

When you have performed your before-take-off check and are cleared by the tower, you are ready to line up on the runway and proceed with the take-off. Let the aircraft roll forward a few feet and then lock the tail-wheel.

The C-46 requires constant attention from the time you start the take-off run until you complete the take-off. Rudder control does not come in until you reach a speed of 45-50 KIAS. The critical period in the take-off run comes just before you reach this speed, at which point it is easy to veer off the runway or even to ground loop the aircraft.

In the first part of the take-off run, before you gain rudder control, you must depend on the ailerons and throttles for directional control. Advance throttles smoothly and not abruptly. Be ready to correct yawing immediately by rolling the ailerons in the

direction of the yaw and by leading with the proper throttle. You can usually gain rudder control more quickly by applying full take-off power early in the run.

When you reach a speed of about 70 KIAS (dependent on weight), the tail starts to come up of its own accord. A little forward pressure on the wheel or trimming nose-down helps the tail get off the ground.

When you have reached a speed of 84 KIAS, depending on load and take-off conditions, back pressure on the wheel produces a clean break from the ground. Use elevator trim at this point to relieve the strain of pulling back the wheel. Properly balanced, the C-46 will lift off by itself but make sure you are ready to correct any yaw or roll tendency.

Once you are airborne, apply the brakes to stop the wheels from spinning and raise the gear. The landing gear lever has an intermediate neutral position. Whilst airborne, always move the lever to this position once it has either been raised or extended.

Hold the aircraft in a shallow climb to attain the safe single-engine speed of 105 KIAS and then climb at take-off power to a safe altitude. Reduce power to intermediate settings and climb to 1,000 feet. At this altitude reduce to normal climb settings and continue the climb at 110-120 KIAS.

Heavily loaded take-offs

In training you make the majority of your take-offs with empty or lightly loaded aircraft and on hard-surface runways. In operational flying, however, you will be confronted at times with heavily loaded aircraft and soft runways, high altitude fields and high outside air temperatures.

Each of these factors adds length to your take-off run and obviously a combination of two or more greatly increases the take-off run.

1. Use maximum allowable take-off power, 2,700 RPM, and as much manifold pressure as required, up to 52" Hg.

2. Advance the throttles to take-off power rapidly but smoothly.

3. Hold the aircraft on the ground until you get ample flying speed. This may be as high as 87 knots under some conditions.

4. Smoothly rotate to lift off and maintain a moderate climb gradient whilst the airspeed increases.

Crosswind take-offs

Crosswind take-offs in the C-46 require practice. This aircraft has a definite tendency

to weather into the wind because of the large fuselage and tail surface areas. Keep the tail on the ground until rudder control becomes effective. The locked tail-wheel is a big help in keeping the aircraft straight. As soon as the tail comes up, use rudder immediately to correct for the crosswind.

Lead with the upwind throttle and roll upwind aileron to correct for the wind. Once you have sufficient rudder control and the tail is up, advance the retarded throttle to match the other for desired take-off power. Leave the ground with the throttles even.

Power settings for take-off and climb

TAKE-OFF (maximum) – 2,700 RPM, 52" Hg manifold pressure

INTERMEDIATE – 2,400 RPM, 41" Hg manifold pressure

CLIMB – 2,300 RPM, 35" Hg manifold pressure

Climb and cruise

To climb the C-46, trim the aircraft for hands-off flight and aim for an indicated airspeed (IAS) of approximately 115 KIAS. The recommended power setting is 2,300 RPM and 35" Hg at sea level.

Unless you need maximum performance, climb with LOW blower selected (supercharger off) if sufficient power is obtainable. Maximum desired cylinder head temperature for the climb is 232°C; the maximum permissible is 260°C. Desired oil temperature is 70°C; the maximum permissible is 90°C.

Start taking corrective measures at the first sign of overheating. The temperature rise may be extremely rapid and it is usually difficult to reduce temperatures to normal limits. The most effective means of reducing operating temperatures is to increase the IAS. You can increase your airspeed by 10-20 KIAS without much loss in your rate of climb. Open the cowl flaps for more effective cooling.

Get on the step

Continue your climb to 300-500 feet above your desired cruising altitude. Then descend gradually, at the same time reducing power to cruise settings. This method allows you to put the aircraft up on its ‘aerodynamic step’. Establishing the aerodynamic step is vital for best performance of the C-46. You can lose as much as 20 KIAS in a heavily loaded aircraft by not keeping on the step.

Give the engines a chance to cool off before closing the cowl flaps and changing the mixtures to AUTO LEAN.

Trimming

In any aircraft, every change of attitude, power setting, or airspeed changes the control pressures required. Unless you apply trim changes, you'll find yourself ‘fighting the aircraft’ in a very short time. This is particularly true of the C-46 because of the size of the aircraft and the heaviness of the controls.

The aircraft is easy to trim and keep trimmed because it is sensitive to the trim tab controls. Even a slight movement of the elevator trim tab wheel produces a definite change of attitude.

Sperry gyropilot

Whilst the modern cockpit is fitted with a fully functional electronic autopilot, the military cockpit is fitted with a Sperry gyropilot, a basic form of autopilot. It will maintain a level attitude, altitude and heading. For ease of operation we have added heading hold, altitude hold and navigation hold controls that can be used in conjunction with the navigation instruments and radios.

It is important to trim the aeroplane for hands-free flight before turning on the Sperry gyropilot.

Landing

The recommended landing technique for a C-46 is power-on, with power gradually reduced throughout the approach until it has dissipated entirely by the time you complete the round-out and just before you reach stalling speed. Make power reductions smoothly and gradually. An abrupt reduction of even 5" Hg causes an appreciable change of attitude. Use elevator trim constantly throughout the pattern and approach.

Start your before-landing check soon after entering the downwind leg. Complete the check before you begin the turn onto the base leg.

Landing speed

Fly the pattern at approximately 112 KIAS until you complete the turn onto the final approach. Final approach speed with a medium load is about 95 KIAS. Bring the aircraft over the threshold at a speed of about 87 KIAS. It stalls at approximately 66 KIAS with full flaps and power off.

Use of flaps

Normally you extend flaps after completing the turn onto final approach. Do not lower them with an airspeed higher than 118 KIAS. For a typical landing (i.e. not short-field), use from half to full flaps.

Flare

The flare, or round-out, requires plenty of room to complete in the C-46. Begin the flare before reaching the runway threshold so that you have time to perform it gradually and smoothly. Reduce your remaining power gradually throughout the flare so that power is at idle when you finish flaring.

Landing technique

It is advisable to start with tail-low wheel landings. You can make a full-stall 3-point landing once you have perfected your landing technique. The weight of this aircraft places too much strain on the structure, even in short drops. Tail-high wheel landings can be made very smoothly, but they are necessarily faster and use up more runway.

Landing roll

The C-46 is an aircraft that you don't stop flying until it comes to a complete stop. When your airspeed drops below 44 KIAS you will lose rudder control, with the result that a violent swerve or even a ground loop can easily happen at that point if you are not quick to correct immediately with aileron and throttle inputs.

Slowing the aircraft

If sufficient runway length is available, do not use brakes to slow down the aircraft. Slow the plane down by intermittent application of brakes if necessary.

Go-around

If it is necessary to go around, ensure that your airspeed remains above 105 KIAS at all times. Raise the gear immediately and apply full power. Raise the flaps at any speed over 105 KIAS and re-trim for the change of attitude.

PERFORMANCE

Airspeed limitations

Glide	235 knots
Level flight	209 knots
Wheels down	130 knots
Flaps down	117 knots
Cowl flaps open	143 knots
Landing lights extended	130 knots

Stalls

The stall characteristics of the C-46 are excellent under all conditions. Normal recovery procedures apply and altitude loss can be minimised if you apply power immediately after the stall begins. Aileron has little effect until you regain flying speed.

The following stalling speeds have been observed (40,000lb gross):

Flaps up, landing gear up, power off	77 knots
Flaps up, landing gear up, power on (2,100 RPM, 25" Hg)	70 knots
Flaps down 35°, landing gear down, power off	66 knots
Flaps down 35°, landing gear down, power on	58 knots

These stall speeds will vary depending on flight conditions, wind and aircraft weight distribution.

Effect of bank

In banked turns, centrifugal force increases the wing loading and therefore the stalling speed is increased.

Loops, rolls, spins, dives, and inverted flight are prohibited in the C-46. Do not exceed 235 knots in glides.

Spins can result in structural failure. If you inadvertently enter a spin, use normal recovery procedures.

Single engine performance

With normal loads, the C-46 gives excellent single engine performance. You can maintain safe airspeed at low altitudes at power settings which are only slightly above normal cruising. Heavier loads require higher power settings.

At 45,000lb an altitude of 9,000ft can be maintained at 100 knots KIAS, which is the safe single engine speed. This requires maximum continuous power for this altitude – 2,400 RPM and full throttle with LOW blower selected.

Minimum speeds

Maintaining a safe airspeed must be your first consideration in single engine operation.

Critical single engine speed is the lowest speed at which the rudder has a safe margin of control over the maximum unbalanced thrust of the good engine. This speed is a variable, dependent on load and flight attitude. With a normal load, when the stalling speed is 70-75 KIAS, the critical single engine speed is approximately 90 KIAS.

Trimming

The aeroplane has good directional stability and requires a minimum amount of rudder trim for single engine operation under most flight conditions. At low speeds the yaw is naturally greater than at cruising speed. Trim the aircraft for hands-off flight. You must re-trim after each change of power because of the unequal thrust forces created. The use of aileron inputs to ‘hold the good engine down’ allows better coordination in directional control and reduces the amount of rudder trim needed.

CHECKLISTS

The following checklists are taken from real-world pilot manuals. They have been modified to suit the characteristics of this simulation.

Before starting engine

Parking brake	ON
Superchargers	LOW BLOWER
Carburettor heat	COLD
Landing gear handle	DOWN/LATCHED
Wing flaps	UP
Tail-wheel	LOCKED
Feather switches	NORMAL
Aileron tabs	NEUTRAL
Rudder tabs	NEUTRAL
Elevator tabs	NEUTRAL
Mixture controls	IDLE CUT-OFF
Prop levers	FULL FORWARD (HIGH RPM)
Throttles	1/2” OPEN
Cowl flaps	OPEN

Pilot side panel:

Fuel selector valves	AS REQUIRED

Instrument panel:

Autopilot	OFF

Co-pilot side panel:

Pitot heat switches	OFF

Overhead panel:

Light switches	OFF
Anti-ice switches	OFF
Radios	OFF

Engine starting

Battery switches	ON
Master and ignition switches	ON
Inverter	ON
Generators	ON
Fuel gauges	Check quantity
Booster pumps	ON
Engine primer	ON
Engine starter	ON
Engine mesh	ON and hold until engine fires

After both engines are running:

Booster pumps	OFF
Battery switches	ON
Lights	AS REQUIRED

Before taxiing

Booster system	750-1,050 PSI
Main system	1,050-1,350 PSI
Radios	ON
Altimeter	SET
Clock	SET
Gyros	SET
Flight controls	FREE
Chocks	REMOVED
Permission from tower to move	RECEIVED
Parking brake	OFF
Tail-wheel	UNLOCKED

Taxiing

Taxi area	CLEAR
Parking brake	RELEASE
Throttles	APPLY SLOWLY
Brakes	CHECK
Steering	CHECK

Check the operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

Engine run-up

Parking brake	ON
Tail-wheel	LOCKED
Fuel booster pumps	OFF
Mixtures	AUTO RICH
Cowl flaps	OPEN
Fuel selector valves	AS REQUIRED
Engine gauges	WITHIN LIMITS
Superchargers	HIGH then return to LOW
Carburettor heat	HOT then return to COLD
Generators	CHECKED
Manual prop controls	CHECKED
Magnetos	CHECKED
Pitot heaters	CHECKED
Suction gauge	CHECKED

Before take-off

Booster pumps	ON
Trim tabs	NEUTRAL
Mixtures	AUTO RICH
Prop controls	FULL FORWARD (HIGH RPM)
Cowl flaps	TRAIL
Fuel selector valves	AS REQUIRED
Gyro instruments	SET/UNCAGED
Engine instruments	WITHIN LIMITS

When lined up:

Tail-wheel	LOCKED
Flight controls	FULL AND FREE MOVEMENT

Climb

Gear	UP
Brakes	ON

Power reductions:

Intermediate	41" Hg / 2,400 RPM
Climb	35" Hg / 2,300 RPM
Airspeed	105-112 KIAS
Booster pumps	OFF

Cruise

Power	Reduced to cruise setting
Mixtures	AUTO LEAN
Cowl flaps	CLOSED if temperatures are below 200°C
Tanks	Use front tanks for 30 minutes

Before landing

Prop levers	2,300 RPM
Airspeed	130 KIAS
Gear	DOWN/LOCKED (NEUTRAL)
Mixtures	AUTO RICH
Fuel selector valves	AS REQUIRED
Booster pumps	ON
Gear	DOWN
Parking brake	OFF
Superchargers	LOW
Carburettor heat	COLD
Tail-wheel	LOCKED
Autopilot	OFF
De-ice	OFF
Brake pressure	1,050-1,350 PSI
Flaps	As required

After landing

Flaps	UP
Cowl flaps	OPEN
Props	FULL FORWARD (HIGH RPM)
Booster pumps	OFF
Trim tabs	NEUTRAL
Tail-wheel	UNLOCKED (not above 10 KIAS)

Shutdown

Mixtures	IDLE CUT-OFF
Throttles	FULLY CLOSED
All switches	OFF
Wheel chocks	IN PLACE
Brakes	OFF
Fuel selector valves	OFF
Tail-wheel	LOCKED
Windows and hatches	CLOSED

CREDITS

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Aircraft modelling and programming	Aeroplane Heaven
Flight dynamics	Aeroplane Heaven
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Special thanks to all the testers.

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