Pilot's notes

Expansion for Microsoft Flight Simulator X Steam Edition

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CONTENTS

INTRODUCTION

It was General, later President, Dwight D. Eisenhower who said, “Four things won the Second World War – the bazooka, the Jeep, the atom bomb, and the C-47.”

Such was the impact of this remarkable aero plane, and the C-47 was to go on to have an illustrious career around the world, both in military and civilian service, long after the end of the War.

No other aircraft has ever come close to replicating the sheer versatility of this Douglas design, even to this day. This is why so many are still in active service and why the popular saying exists: “The only aircraft to replace a DC-3™ is another DC-3.”

The DC-3 Dakota airliner was a development of the earlier Douglas DC-1 and DC-2 designs, and the original C-47 was a military adaption of the DC-3. The prototype DC-3 airliner first flew on the 17th of December, 1935, and in June of the following year carried its first fare-paying passengers on an American Airlines flight from New York to Chicago.

With the advent of World War II, the US Military placed orders for a multi-purpose variant of the airliner that could not only carry freight and troops but also deliver airborne troops to invasion zones and behind enemy lines, tow gliders and evacuate wounded troops.

The first C-47s, as they were designated, were converted DC-3s but it did not take long to exhaust the existing supply of DC-3 airframes and production was quickly transferred to manufacture of the purpose-built C-47 ‘Skytrain’.

By the end of 1947, Douglas had built and delivered no less than 10,654 airframes. Today nearly 1,000 of these are still in service around the globe.

Powered initially by 9-cylinder Wright Cyclone engines, the design was soon upgraded with more powerful 14-cylinder Pratt & Whitney R-1830, ‘Twin Wasp engines to improve performance and reliability. These same engines powered a variety of machines such as the B-17 bomber and the mighty P-47 fighter, to name but two, so the supplies of spares and servicing was standardized across the military.

In this simulation we have included a range of models which cover the many diverse roles of this enduring design, from popular passenger airliner to reliable and essential military transport – we hope you enjoy flying them!

INSTALLATION

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

Go to FREE FLIGHT, look at the CURRENT AIRCRAFT box and press the CHANGE button. The Aircraft Manufacturer is ‘Douglas’. The Publisher is ‘Just Flight Ltd’ and the aircraft type is ‘Twin Engine Prop’.

Ensure you tick the ‘Show all variations’ tick box at the bottom of the page.

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 at www.justflight.com/subscribe.asp

AIRCRAFT IN THIS SIMULATION

Please note that the following section also includes those aircraft which are not included in this simulation but in Just Flight's DC-3 Legends of Flight Expansion Pack, which is available to buy separately. The aircraft which are only available in the Expansion Pack are marked accordingly.

DOUGLAS DC-3™

At the end of the war, the idea of fast, comfortable air travel had really taken off and aircraft like the Lockheed Constellation were already being reconfigured for luxury commercial airliner use. The DC-3 was originally designed with a right entry passenger door and a cargo hatch in the port side aft. Powered by Wright Cyclone nine-cylinder radial engines, these DC-3s were snapped up by the great US airlines such as American Airlines, Capital and Eastern, to name just a few.

American Airlines operated their DC-3s as flagships of the fleet, highly polished with a minimal painted livery and a company pennant flown from the cockpit when on the ground (hence the name).

The DC-3 was also powered by the more powerful Pratt & Whitney ‘Twin Wasp’ 14-cylinder radial engine – the same power plant that was perfected in the majority of US fighter and bomber aircraft during the war. Several airlines ordered their DC-3s with port-side passenger entry and cargo storage, while some retained the twin cargo doors of the military C-47. In fact the variety of configurations and fit-outs is quite bewildering!

The British airlines ordered Pratt & Whitney-powered machines, usually with the left passenger door. Some bought converted C-47s with the military configuration intact. At some stage a drop-down door arrangement became standard and had an integral stairway and handrails. This did away with the need for any extra steps. A streamlined tail cone was also added to some DC-3s.

In this simulation you will find at least one example of each of the major versions of the DC-3. In each case, we have added a suitable diorama of a support vehicle and steps (where necessary) and a stewardess in period uniform. These animations can be activated using the ground cart switch in the cockpit (see the Left Panel section in the Cockpit Guide).

The airliner cockpits are very way similar to their military counterparts. Back in the passenger compartment, however, it’s a very different story!

Here you’ll find comfortable passenger accommodation with upholstered seats, headrest covers and contrasting piping. Reading lights and fresh air vents (air conditioning was a thing of the future!) populate the side rails and there are curtains at the windows, carpet on the floor and a galley at the rear.

In the seatbacks you’ll find period magazines which for some of us will bring a few memories back!

Views are preconfigured so you can easily experience life in a period DC-3 cabin. Once in VC mode, just cycle through the views using your preconfigured keystroke.

Included aircraft

NC21798 – a Wright-powered classic, now fully restored to her original glory. Notice that the Wrights had no cowling flaps and different exhaust arrangements. This aeroplane is as the original factory order with side-opening passenger door on the starboard side and a cargo hatch to port.

NC28340 – Wright-powered, but having the passenger door on the port side, alongside the cargo hatch. Delta operated polished alloy DC-3s and were the talk of the day.

N25689 – a major operator of the DC-3, again using standard right-door Wright-powered aircraft to compete with the likes of Continental and American.

D-CADE – Pratt & Whitney-powered DC-3 with twin cargo doors. The colourful Lufthansa livery set off the lines of the DC-3 beautifully and a Lufthansa DC-3 was a very smart unit on any airport apron.

NC16063 - An airline which embraced the US Mail carrier status to the full. These aircraft are among the most colourful DC-3s of the period. Designs changed a little as time went by but the ‘Mainliners’ were much loved by all who flew them. This one is an original 1940s model before military requisition.

G-AGHL – An early adopter of the DC-3, BEA ordered several different versions, including this Pratt & Whitney-powered machine. It is fitted with the left-hand, drop-down passenger door with integral stairway. The hinges on these doors were a little suspect if overloaded, so it was always advisable to board one passenger at a time on the steps!

G-ALCC – The Welsh airline operating from Cardiff's Rhoose airport in the 1950s and 1960s. Pratt & Whitney power, left drop-down door, and typical of many of the British short-haul operators of the period, with flights to the Channel Islands and France on offer.

C-47 & RAF DAKOTA

As we mentioned earlier, the C-47 started life as a commercial airliner, designed to carry a maximum of 32 passengers across the USA and other continents in comfort, quickly and in complete safety.

The military expressed an interest in the design from a very early stage as it appeared to meet their specification for a fast, capacious and rugged transport.

During the war, most of the original DC-3 orders were converted to military C-47 specification and delivered to the US Air Force.

C-47s in British and Commonwealth service took the name Dakota, which is actually an acronym ‘DACoTA’, standing for Douglas Aircraft Company Transport Aircraft.

Included aircraft

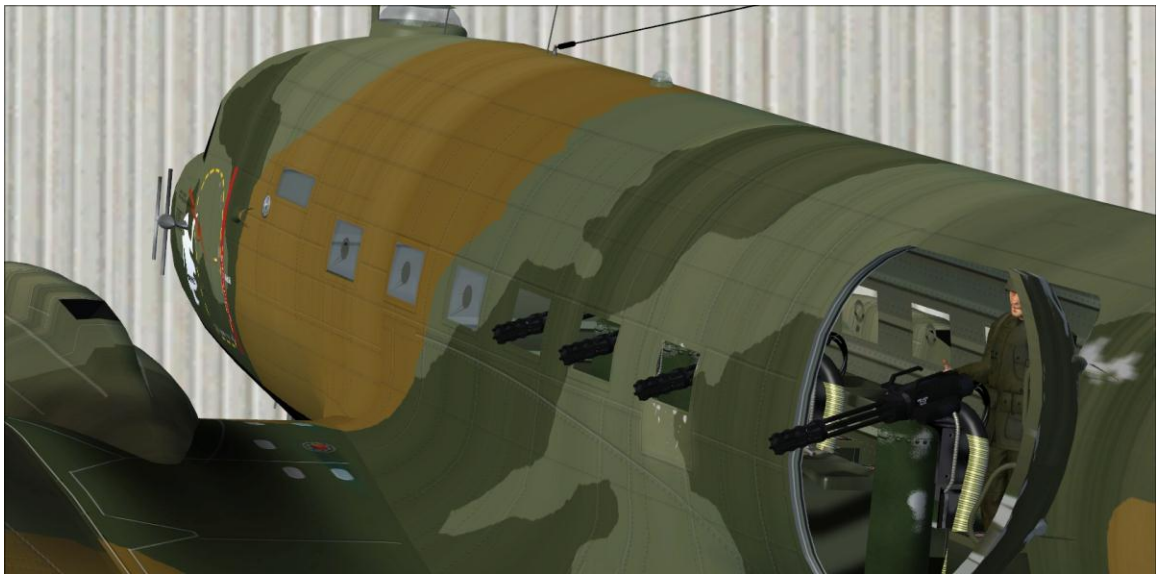
‘Y-SL’ – A Dakota with a cargo payload flown by Flt. Lt. D.S.A. Lord VC. The RAF used Dakotas in all theatres, including the Middle East and Far East campaigns. The type continued in RAF service until well after the war and many were passed on to other Commonwealth air forces.

C-47 D8 'The Argonia' paradrop version – Flew with the US 94th TCS and was a lead ship on D-Day, June 6th 1944, being one of the first to drop her Airborne Division troops into Normandy.

C-47 D8 'The Argonia' US Army payload version – The Argonia also towed gliders and carried all manner of freight, such as the Jeep loaded on this version.

AC-47 GUNSHIP

The AC-47 was used extensively in the Vietnam War and was a direct conversion of the original C-47. The rear forward door was removed and a Gatling mini-gun installed in the open doorway, and two or three more angled through the side windows on the port side. Thus the C-47 became a gunship boasting formidable firepower.



The guns were set up for a 12-degree deflection and angled rearward. Mounted on sturdy pylons and fed through motorised shell feeders, the guns were in all senses ‘automatic’ and designed to be fired from the cockpit by the pilot.

To this end, a gunsight similar to those fitted to the Douglas Skyraider was mounted in the pilot's side window. The sight was preconfigured, like the guns, to be on target when the aircraft was banked 30 degrees to port. The pilot required exceptional skill to hold his aeroplane at a 30-degree bank and still fly straight ahead. If ever there was a time to learn how to use the Turn/Slip gauge properly, this would be it!

The AC-47 carried a crew of five or six – pilot, co-pilot, navigator, radio operator and one or two weapons personnel to load and service the guns. Usually, however, one of the gunners actually stood in the doorway and hand-fired the mini-gun for greater accuracy.

Included aircraft

AC-47 'Puff' – named after the 'Magic Dragon' of the popular song. The aircraft has the unusual (and short-lived) base aluminium and white scheme of a standard transport aircraft in Far East operations. This later changed to the more regular tri-colour camouflage as operations became more intense in the jungle regions of Vietnam.

GETTING TO KNOW THE DC-3/C-47

Let's go for a walk around a typical C-47 Skytrain. Load up The Argonia (US Army payload version) C-47 aircraft at your favourite airfield.

From the front, the characteristic 'eyebrow' look of the cockpit area is apparent. This is an instantly recognisable feature of any DC-3/C-47. The cockpit is extremely high off the ground because the C-47 is a 'tail dragger' – it sits on the main wheels and a tail wheel at the back with a steep angled stance.

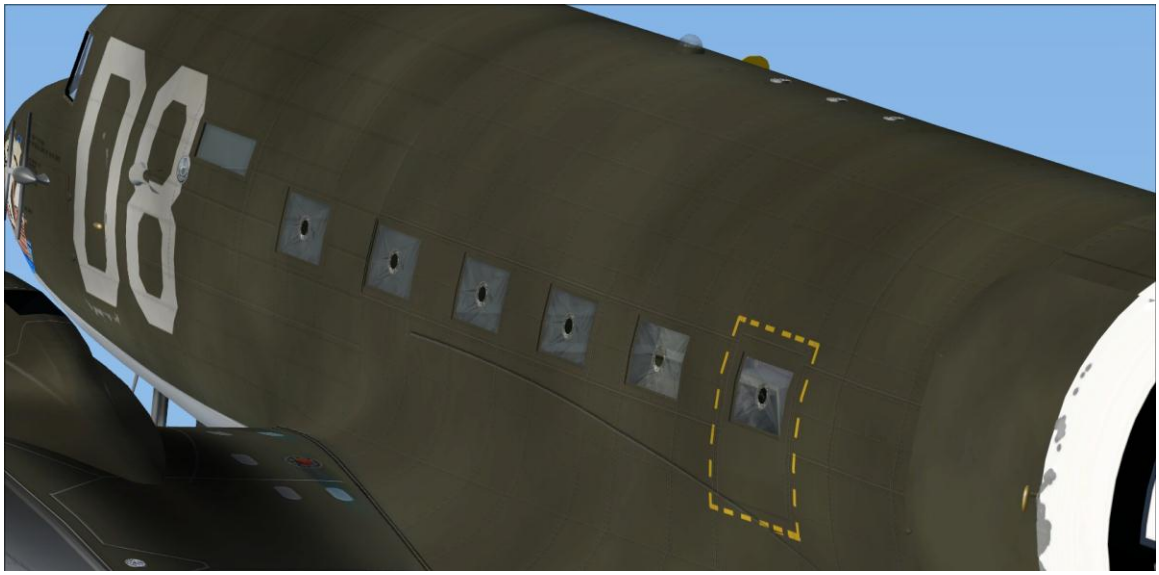
A service and access door is placed immediately behind the cockpit area - look how close it is to those massive three-blade props! You will usually find warning signs all over this area to ensure nobody opens this door when the engines are running. The door opens outward, giving access to an area between the cockpit and the navigator's station. This door was nicknamed 'the mail door'.

The simple shape and layout of the cockpit windows became a hallmark of Douglas design and was used on a multitude of designs, from the propliner age right through to the era of modern jets.

Immediately behind the access door and high up on the side of the fuselage is a Venturi tube feeding the instrumentation. A small adjacent window serves the navigator's station.

When the DC-3 was in full swing as an airliner, more of these slit windows were incorporated down the length of the fuselage, signifying the Sleeper version which had sleeping berths mounted above the seating areas.

Down the length of the round-section fuselage, simple, square windows are cut into the hull. In the C-47 Skytrain, these windows have a hole cut in the centre of the perspex with a reinforcing ring mounted in the middle. This enabled troops to poke the muzzles of their guns through and fire on the enemy from inside the aircraft before landing. When not in use these holes were plugged with a translucent plug. No doubt these gun positions also came in handy for warding off marauding fighters!



The centre wing section is huge and extremely strong – it had to be to carry the payloads that the aircraft would be expected to carry during numerous combat and delivery missions. The C-47 was capable of carrying 28 fully equipped troops and their equipment, 6,000lbs of freight and even Jeeps and small combat vehicles.

To enable fast loading and delivery, two big cargo doors were cut into the rear port fuselage. These doors opened wide and flat against the fuselage sides, revealing a gaping opening which was big enough to drive a jeep through. If troops were carried, the rear cargo door would be locked and the forward cargo door either removed for airborne parachute missions or completely closed to seal the compartment.

A clever arrangement of a third door cut into the forward cargo door allowed access by passengers using a lightweight ladder. Later versions had a stairway

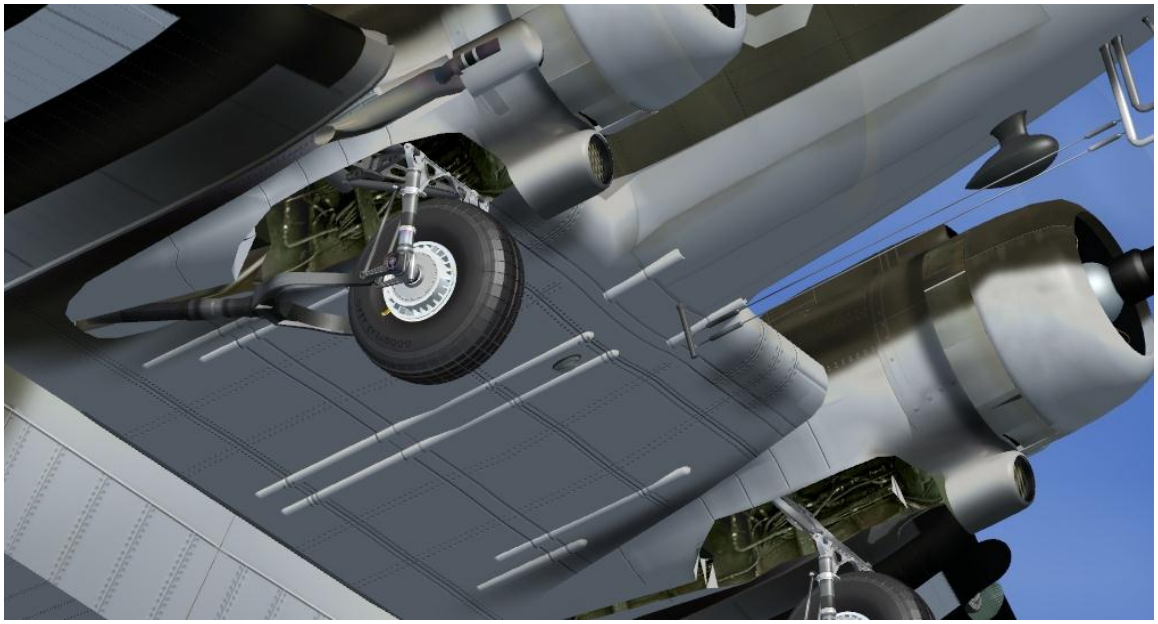
incorporated into this smaller door which swung down on integral hinges at the base. Such was the versatility of the C-47/DC-3.

The wing is fitted with massive ‘split’ flaps housed underneath the trailing edges and travelling right across the underside of the fuselage mid-section. This provided an immense flap area for ultimate low-speed control and increased lift when carrying large, heavy loads. Equally large ailerons are fitted to the slender outer wing trailing edges.

These large control surfaces give the C-47 surprising agility for such a big aeroplane. The wings also carry large landing lights in their leading edges.

De-icing boots are fitted to the entire length of the leading edges. On the military C-47 you will notice recognition/formation lights mounted in the top skins of each wing, three per wing. These, together with another three lights atop the fuselage midsection, form a ‘cross’ of blue lights on lead ships on which other aircraft could formate when the huge armadas of invasion ships would assemble before setting course for their destination.

Cavernous wells beneath each wing, incorporated into the engine nacelles, accommodate the large main landing gear. There are no doors, as the wheels protrude below the nacelles when retracted, nestled just behind the oil coolers for aerodynamic efficiency. The landing gear is quite simple but extremely rugged, and employs two strong ladder-form struts which ‘bend at the knees’ to retract the wheels into the wells.



The airframe is incredibly strong and built with numerous alloy ribs and stringers, skinned in aluminium. Bulkheads were installed at various points to create the various compartments required by the many different layout schemes of airliners and military transports; moving these bulkheads meant that it was a relatively easy task to design any number of layouts to suit the requirements of a customer.

The cockpit is of a standardised design, with instruments and panels laid out in a logical and simple manner. A large pedestal carrying the essential controls such as throttles, mixture and propeller levers, trim controls and suchlike dominates the centre of the cockpit. This is the heart of DC-3 operations and everything that controls the welfare of the aircraft is located here. As you get to know your DC-3, you will spend most of your time with this central pedestal.

Instruments and panels varied immensely between aircraft and it is said that no two DC-3/C-47/ cockpits are the same!

For the purposes of this simulation we have chosen an ‘average’ fit-out, incorporating most of the equipment and features found in the cockpits of the time.

Directly in front of the pilots’ positions, mounted centrally, is the directional compass. This is a typical instrument of the period, mounted in a rugged housing.

The main panel carries all the vital instruments and gauges necessary to fly the aircraft, along with some navigation instruments and, of course, the signature Sperry Gyro Pilot slap bang in the middle. The Sperry unit is not strictly an autopilot, but more of a position hold system that will ‘set’ your aircraft’s direction and height if activated. Small adjustments can be made using the knobs provided – more on this later.

COCKPIT GUIDE

As already mentioned, no two DC-3/C-47 aircraft were ever exactly the same, so we have chosen what we feel to be a good mix of fittings and equipment that best illustrates a working aircraft.

Pilot’s side

1) Radio Altimeter
2) Airspeed Indicator (ASI)
3) Altimeter
4) ILS Guidance Display
5) Turn/Slip gauge
6) Vertical Speed Indicator (VSI)
7) Radio Compass
8) Omnibearing/Nav Compass
9) Decision Height control
10) Clock
11) Artificial Horizon Indicator (AHI)

Notes
The ILS Guidance Display instrument (4) guides the pilot to the glideslope in conjunction with the Navigation radio setting and the radio compass (8).
The clock (10) has another set of hands in red. These can be set using the central knob to show the projected time of arrival, and a quick glance at the clock will give the pilot an immediate update on progress and schedule timing.

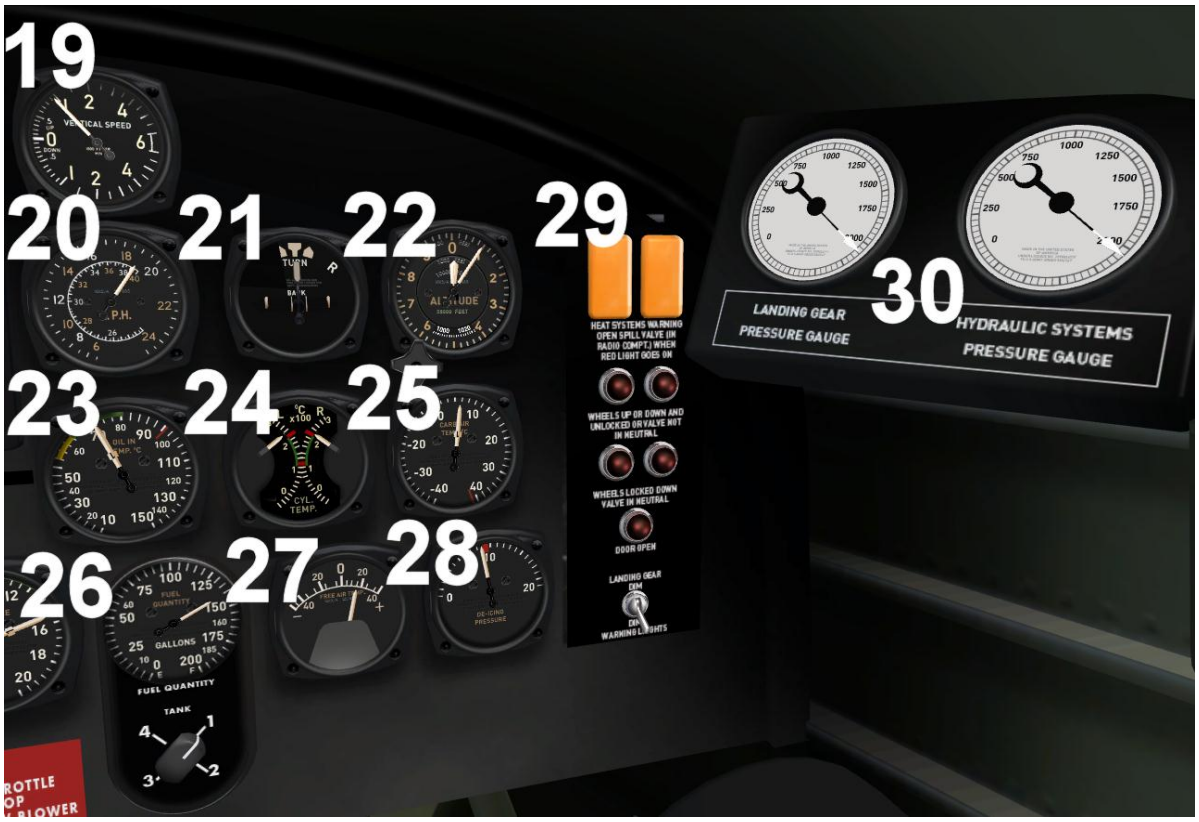
The Decision Height control (9) allows the setting of the altitude at which the automatic glideslope gauge begins reading the glideslope. It is not functional in this simulation but does operate to show it in use.

Mounted in the centre panel

12) Manifold pressure (dual)
13) Tachometer (dual)
14) Oil pressure (dual)
15) Fuel pressure (dual)
16) Sperry Gyro Compass and Heading Indicator
17) Sperry Attitude Indicator and setting control
18) Suction gauge

Note
The Artificial Horizon Indicator (11) cage knob can be pulled and turned to ‘cage’ the display. This prevents the delicate parts of the instrument being damaged in turbulence. The same caging is carried out for the Sperry Gyro unit.

Co-pilot’s panel



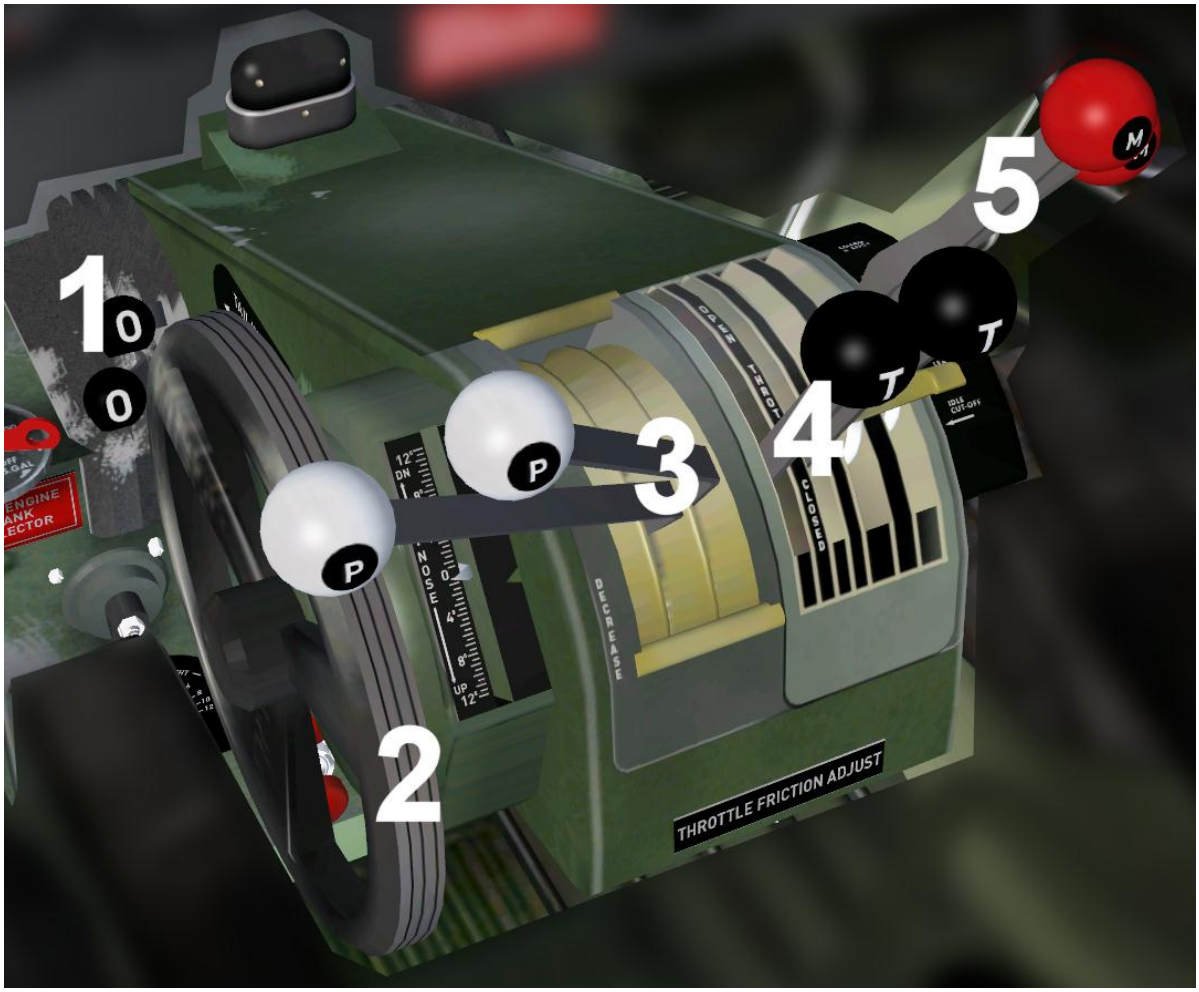
19) Vertical Speed Indicator (VSI)
20) Airspeed Indicator (ASI)
21) Turn/Slip gauge
22) Altimeter
23) Oil temperature (dual)
24) Cylinder temperature (dual)
25) Carburetor air temperature (dual)
26) Multi-function fuel contents gauge
27) External air temperature
28) De-icer pump pressure
29) Door and gear warning lights system
30) Hydraulic pressure panel for landing gear and hydraulic system

Notes
To operate the fuel contents gauge (26), select the desired tank (there are four in total) and the gauge will switch to that tank's supply scale. Remember that this is not a tank selector – you use the tank cock controls on the pedestal for that.

The door and gear warning lights system (29) warns of the landing gear lever not being in the positive locked position. If the lights glow red, check that the lever is down and the lock is across the shaft of the lever. The door light will glow if the 'mail door' is open, which is extremely dangerous due to its proximity to the propeller.

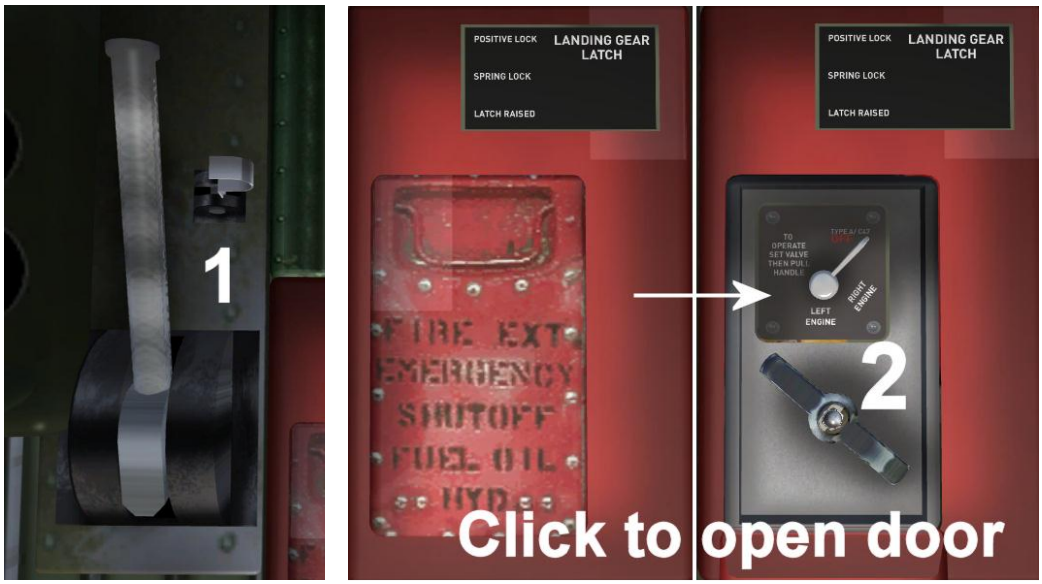
Central pedestal

Dominating the pilot's compartment is the central mounted pedestal, on which all of the engine, flying surface and fuel systems management controls are located.



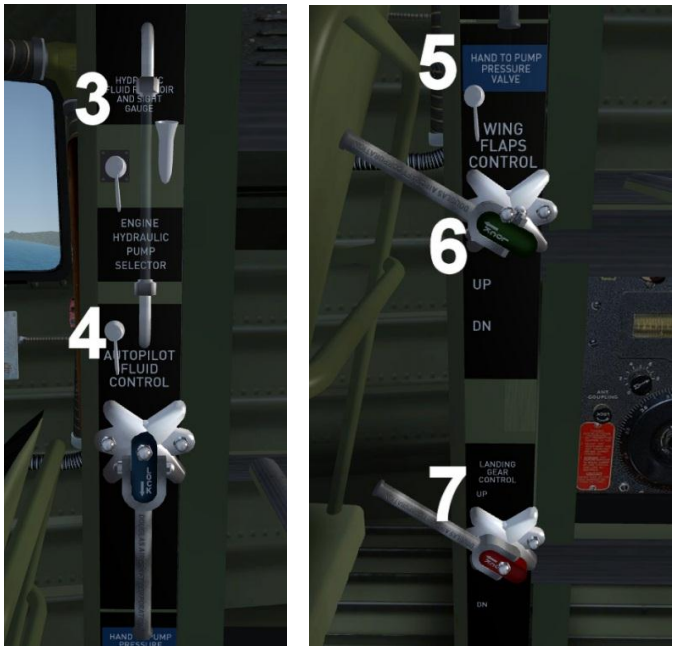
1) Oil radiator door controls (non-functional in this simulation)
2) Elevator trim control
3) Propeller pitch controls
4) Throttles
5) Mixture controls

6) Left engine fuel tank selector
7) Right engine fuel tank selector
8) Rudder trim control
9) Autopilot master switch
10) Carburetor heat controls and lock
11) Aileron trimming control
12) Parking brake push button
13) Tail wheel lock push button
14) Fuel tank cross-feed switch



On the floor immediately aft of the pedestal is another group of controls:

1) Landing gear positive lock system
2) Fire control system (beneath cover)



Just behind the co-pilot's seat, mounted on the doorframe:

3) Hydraulic fluid sight gauge (non-functional)
4) Autopilot fluid control (non-functional)

5) Pressure valve and hand pump (non-functional)
6) Wing flaps control
7) Secondary landing gear control

Back up to the pilots' stations. Here on the forward structure of the cockpit are the windscreen wiper units and controls (22)

Note: You will notice that when it rains or snows the windows become clouded and vision can be cleared by using the windscreen wipers. In the roof are the electric switch panels and radio(s).

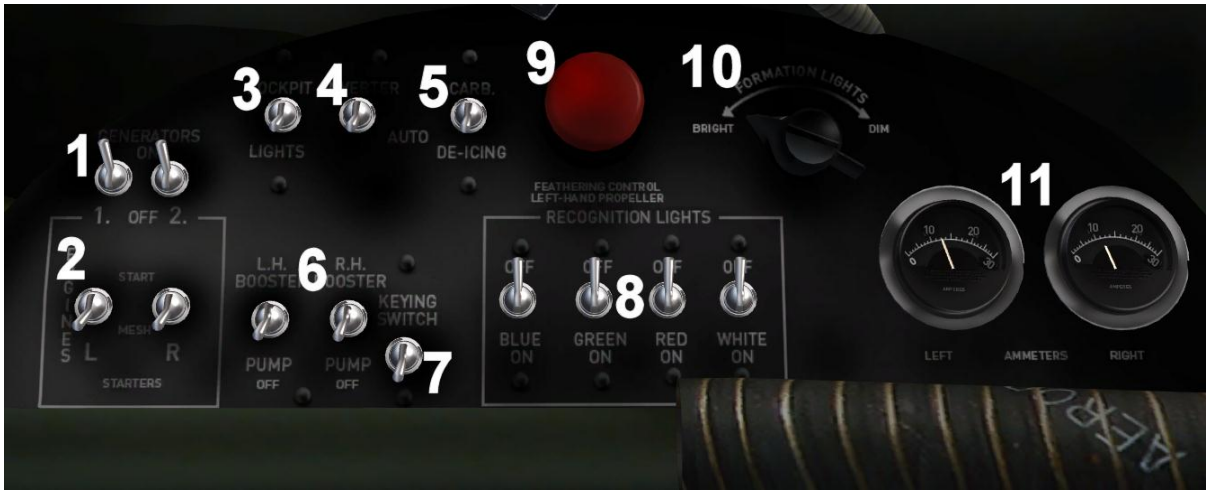
Left panel

1) Switch for tow release (glider-tug versions) – lift cover first
2) Switch for toggling the ground support vehicles, cargo and other dioramas (model dependent)
3) Compass light rheostat (non-functional)
4) Panel light switch
5) Propeller de-icing switch
6) Wing inspection light switch (ice check)
7) Master battery switch
8) Passing light switch (non-functional)
9) Landing light switches
10) Position light switch (Wing)
11) Position light switch (Tail)
12) De-icing pump switch
13) Pitot heater switches
14) Engine primer/oil dilution switches
15) Left engine propeller feathering control

Centre of the roof

1) Ignition and magneto switches
2) Navigation and Communications radio set

Right panel



1) Engine generator switches
2) Engine starter switches
3) Cockpit lights switch
4) Inverter switch
5) Carb de-icer switch
6) Fuel booster pump switches
7) Keying switch (non-functional)
8) No-smoking lights control (if civilian DC-3) OR recognition lights control (if military C-47)
9 Right engine propeller feathering control
10) Formation lights control (military versions only) (non-functional)
11) Ammeters

Inside the cargo hold

Moving back from the cockpit area and to the right, you will find the crew entrance door. Note the warning signs. This door is perilously close to the arc of a spinning propeller and so it was not advisable to open the door when the engines were running!

Further aft, you will also find a detailed Navigator/Radio Operator's station. This is fitted with a swing-out seat and drop-leaf navigator's table (these operate with the door keystroke).

The Navigator's panel is fitted with repeater gauges from the cockpit and an identical radio set. To the right are the radio racks with a selection of period equipment which varied considerably depending on the intended use of the airframe.

Moving back through the access doorway, you will find yourself in the main cargo area of the aeroplane. In the DC-3 this would be fitted out with comfortable seating and upholstery. In the paradrop versions of the C-47, though, are molded metal seat pans mounted on lockers and incorporating safety harnesses and clip rings for parachute personnel.

Running the length of the compartment in the roof is the launch wire for the parachutist to clip onto. This would capture his automatic release mechanism so that when he exited the doorway the pull cord would snag on the end of the wire and release his ‘chute as he fell. Systems like this are still used today.

At the rear bulkhead you will see two large ‘Ready’ and ‘Jump’ lights which are operated from both cockpit and navigation station switches. When over the drop zone, the navigator or pilot would flick the jump switches to turn the lights from red to green to indicate that it was safe to jump. This system works in this simulation.

Two combat Airborne Division troops are rendered in the compartment to add atmosphere to the simulation. In the RAF aircraft these men are depicted as Commando troops.

The cargo versions of the US aircraft are loaded with a detailed Jeep and crew in the main compartment, and the Dakota is loaded with an aircraft engine, tyres and crates.

The C-47 was a very versatile machine and could be very quickly altered in the field to various configurations, including heavy cargo operations. Jeeps and lightweight tanks, tracked vehicles and heavy weapons could all be transported by the C-47, and were loaded through the two large rear doors.

FLYING THE DC-3/C-47

For the purposes of this manual we are assuming that you will begin your flight with a ‘cold and dark’ cockpit, i.e. everything off, including the battery master switch, all levers and knobs zeroed and simulation realism set to Hard.

Pre-start, start and warm-up

Once in the cockpit of your chosen DC-3 or C-47, close all doors. The warning light in front of the co-pilot should go out.

Turn the master battery switch ON.

Ensure that the master ignition and magneto switches are OFF.

Turn both engine generator switches ON

Ensure inverter switch is OFF.

The Sperry Gyro system should also be OFF.

On the floor, next to the fire panel, ensure the gear operation lever is in positive lock with the retaining lock clip firmly over the handle of the lever. This is most important, as otherwise the undercarriage could collapse when you move forward.

Turn the Port (left) engine fuel cock to LEFT MAIN.

Turn the Starboard (right) engine fuel cock to RIGHT MAIN.

'Crack' the left engine throttle lever approximately 1" forward from its stop.

The mixture levers should be at idle cut-off.

Propeller control lever FULLY FORWARD to maximum RPM setting.

Carburettor heat levers FORWARD (on the centre pedestal).

Carburettor De-icer switch OFF (on the right panel).

Cowl gills (cowl flaps) OPEN.

With the main ignition switch OFF hit the starter for the left engine and turn over for 2-3 seconds.

Switch the left boost pump ON.

Flick the primer/oil dilution switch four times to prime the engine.

Turn the master ignition switch ON.

Left magneto switch to BOTH/ON.

Switch left starter ON until engine fires.

Increase left throttle slowly to achieve 1,000 RPM.

Start right engine as per the left.

Check all temperatures and pressures and the operation of the flaps.

Check the propeller control by moving the levers back and check for a drop in RPM.

Check the generators by switching and noting changes on the ammeter readouts.

Increase throttles to give take-off power – 47 on the Manifold Pressure gauge at 2,500 RPM.

Note: *you should experience different readings depending on the engine type being operated.*

Taxi

Now you are ready to taxi to the runway or strip.

Your flaps should be UP unless you are towing, in which case use the first notch.

All trim tabs should be set to NEUTRAL.

Unlock the tail wheel, using the control at the back of the pedestal.

The DC-3/C-47 has differential braking which, together with that big rudder blade, makes for excellent ground handling and a tight turning circle.

Before moving off, check all doors are closed and that the warning light is OFF.

Release the brakes and taxi to the take-off point.

Take-off

Lock the tail wheel.

Increase power to take-off (47 on the Manifold Pressure gauge) and hold her on the brakes until the power evens out on both engines.

Release the brakes and keep the aircraft straight with rudder input where necessary.

As you gather speed the tail will lift first.

At 90 MPH pull back on the stick and lift off. Do not climb sharply as the airspeed needs to build up.

Unlock the landing gear positive lock system and raise the gear.

Return the handle to positive lock position and ensure the locking tab is engaged.

Recommended climb speed is 120 mph indicated.

Close cowl flaps in the climb.

Cruising

To use the Sperry Gyro Pilot, ensure that your aircraft is on course and at the desired height. Set the same course into the Sperry Gyro direction scale and make sure both scales match up. Slowly turn on the Sperry unit and adjust using the small adjustment knobs provided. To climb, turn the elevator adjustment knob. To turn, use the rudder adjustment knob.

Note: *In real life the Sperry unit did not adjust bank angle. It was really an automatic rudder and elevator trim unit and as such was not a true autopilot. Think of it more as a 'cruise control' and you will get the idea.*

As you climb, the air gets much colder. Do not forget to switch on carburettor heat or your engines will lose power and eventually stall.

If you encounter rain or snow your windscreen clarity will reduce considerably. Turn on the wipers to clear the screen.

Approach and landing

Turn off the Gyro Pilot if it is being used.

On approach, adjust throttle and propellers to give 160 MPH indicated airspeed.

As you lose altitude, turn the carburetor heat switches OFF and open the cowling flaps.

Switch the fuel boost pumps ON (if you had switched them off in the cruise).

Closer to the glideslope, reduce speed to 120 MPH indicated and go to first notch on the flaps.

Unlock the positive lock gear system and lower the gear. Ensure the lever is returned to positive lock to guard against gear collapse on landing (yes, it did happen!).

Lock the tail wheel.

Lower full flaps and aim to reach the runway threshold at 95 MPH indicated.

Close the throttles and land at 80-85 MPH indicated, main wheels first.

Allow the tail to sink before braking.

Unlock the tail wheel and taxi to your parking point.

Raise flaps while taxiing

Shutdown

Run engines up to 800 RPM for 20 seconds and then back to idle.

Propeller levers back to minimum RPM.

Turn off fuel boost pumps.

Cut the engines by pulling the mixture levers back to auto cut-off position.

Open doors and check warning light.

Use the ground cart switch to activate the exterior animation.

Turn main ignition switches OFF.

Turn fuel cocks to OFF.

Turn OFF all electrical switches and finally the battery switch.

GLIDER OPERATIONS

This simulation includes a fully functional flyable model of the famous American Waco CG-4A troop glider, which was known as the ‘Hadrian’ in the RAF.

The glider itself is a relatively simple design of box fuselage and broad chord wings. The undercarriage was fitted with large shock absorber-style main oleos that were mounted to take the weight of the machine and its payload. Heavily braced on the fuselage and the wings, it was designed to withstand the severe shocks imposed on the undercarriage in less than desirable landing conditions. Even so, many of these gliders were completely written off in landings on fields, beaches and rock-strewn farm paddocks all over Normandy.

The fabric-covered airframe was reinforced with plywood and the entire cockpit area would swing up and out of the way to allow the loading of vehicles and troops through the front. The cable for this operation was usually attached to a winch on a jeep.

Troops sat on rudimentary plywood seats, and a reinforced floor carried the weight of a Jeep or light gun.

The fuselage is also fitted with ‘skis’ for landings in snow and mud. The wings have integral spoilers, or airbrakes, which when deployed would rapidly reduce the forward speed of the glider to enable it to land quickly once a suitable field had been selected by the pilot. Competent pilots could land a Waco anywhere they wished, in very short fields and right in amongst other gliders on the ground.

The cockpit is a simple affair with a basic instrument panel containing an Altimeter, Vertical Speed Indicator, Artificial Horizon and Compass. There are switches for the landing lights which are mounted on each wing strut. Centrally mounted switches turn on the various formation and recognition lights and the wing navigation lights – these were only used over friendly soil.

Above the pilot’s line of sight are mounted the trim controls for rudder, elevator and ailerons. These were vital to trim the heavily laden machine to fly comfortably, just above the slipstream of the towing aircraft.

With these controls is a small panel containing a switch for the ‘Ready’ light and the tow release lever itself. This released the shackle of the towline from the hook in the nose of the glider. The pilot signals the towing aircraft with a brief light signal to indicate that he is ready to be released. He then pulls down on the release lever to separate from the tow line.

As soon as this happens, the pilot must be ready to adjust the trim of the glider to set it up for a long, controllable and flat glide. This was necessary to allow the crew sufficient time to pick a suitable landing site. Once this was chosen, however, the glider could be put into a steep, fast glide to get down to tree height quickly and avoid ground fire. Using the speed brakes, the speed of the glider could be brought under control for a measured, slow landing.

The handle for the speed brakes is located next to the parking brake lever on the floor of the glider, adjacent to the co-pilot's seat. A basic intercom-style radio set (non-functional in this simulation) is mounted on the cockpit wall next to the co-pilot, but this was rarely used in combat as radio silence was of paramount importance. Simple rudder bars and car-style steering wheels take care of the flying controls.

Flying the Waco CG-4A Glider

Once you have selected the Waco from the aircraft selection menu, you will find yourself sitting in the very sparsely furnished and equipped cockpit.

The Waco was designed to be an inexpensive and disposable aircraft, and it shows! The basic design is a simple box-shaped fuselage with large broad chord wings set high for maximum lift. With a full complement of troops or equipment such as a Jeep or a small armored vehicle aboard, there is very little room left for creature comforts. If you turn in your seat, you will be immediately aware of the close proximity of your cargo.

In front of you is a ‘glass house’ framework of wood and Perspex, affording excellent all-round vision. This will become useful as you near your landing site.

The flying controls of the Waco consist of a system of pulleys, wheels and columns. The car-like steering wheel turns the glider left and right via cable control to the ailerons in the wings. Pushing and pulling the wheel forwards and backwards operates the elevator. Rudimentary rudder bars operate the rudder in a similar fashion to a WWI type.

Trimming the glider is essential for controlled sustained gliding. Aileron, elevator and rudder trim controls are mounted centrally in the cockpit roof, ahead of the pilots.

Immediately below these are the controls for tow release and signaling to the towing aircraft.

A basic instrument panel is mounted in the centre of the cockpit screen; there you will find an altimeter, compass, VSI and AHI. By clicking on the panel itself you can load in the exterior diorama of troops and a Jeep.

To the right of this panel are mounted the switches for the landing lights, which are mounted on the main wing struts on each side of the glider. These are to be used with caution and only in difficult conditions of limited visibility. So too are the navigation lights, which are controlled from a switch on the recognition lights console below the instrument panel.

To the left of the co-pilot's seat are the hand brake and speed brake levers. Speed brakes are mounted in each wing and can reduce the forward controllable speed of the glider to as little as 30 knots. You will learn to use these in conjunction with trimming controls to position the glider exactly where you want it on landing.

The entire cockpit section of the Waco C4G is designed to rise up to allow the forward loading of payloads and personnel. A cable to a tow winch on a Jeep was normally used to raise the cockpit.

A Shift-E keystroke will open the cockpit and the pilots will disappear.

Note

FSX:SE is not configured to provide flight plans for tow planes so the C47 will just fly straight ahead in a climb. This is unfortunate but unavoidable so you will be flying above the realistic levels for the glider. However, this simulation still brings the thrill of reaching your destination and then, once cut loose, putting you in complete control to land it as you would in real life. Quite a challenge!

With the above in mind, you will need to 'slew' your glider (before ordering up the tow plane) on a field or strip to put you in the direction in which you want to travel to your chosen drop zone. Care must thus be taken to select an airfield with sufficient space to enable you to do this. More often than not you will probably choose an area of open field or countryside to operate from. For Normandy landings, anywhere along the south coast of Britain is OK. Just point your glider

in the direction of the beaches before selecting your tow plane. Once the C47 has got you there, you can cut loose and glide to your final destination.

Setting the C-47 as the towing aircraft

Ensure that Flight Simulator X is NOT running, and open the FSX:SE Tow aircraft selector tool from Steam > Library > Tools > FSX Douglas DC-3 Tow Vehicle Configuration Tool.

To use a C-47 to tow you in the Waco glider, use the drop-down menu to select 'Use C-47 Tow Aircraft' and press the OK button. Start FSX:SE, select the Waco as the aircraft you wish to fly.

Note

When the C-47 is selected as the towing aircraft, the default Flight Simulator Maule tow aircraft is not available. Until you reset the Maule as the default towing aircraft, the C-47 will remain as the tow aircraft in FSX:SE. To return that function to the Maule just select 'Use default Tow aircraft (Maule)' in the FSX:SE Tow aircraft selector tool and press OK.

Flying procedures

Ensure the parking brake is ON.

Speed brakes in the CLOSED position.

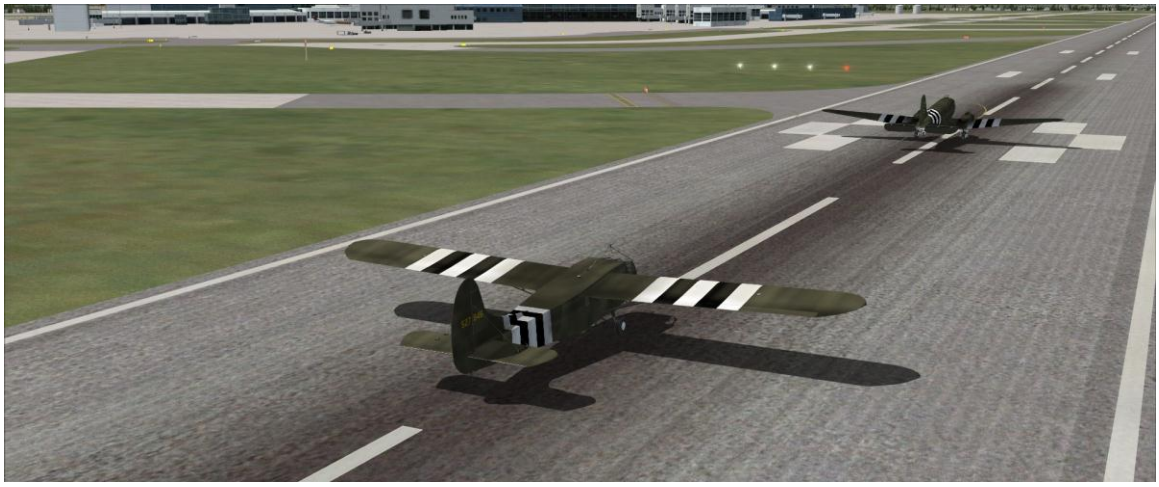
All trim controls set to NEUTRAL.

Exterior diorama is unselected (click the panel).

Navigation lights ON.

Press the CTRL + SHIFT + Y keys and the C-47 tow aircraft will appear in front of you and begin your tow.

The tow aircraft will appear and its engines will start. As you see the props turn, release the handbrake. The tow aircraft will begin to move forward and take up the slack in the towline.



You will quickly be under way and rolling forward. Do NOT be tempted to steer the glider left or right. Just allow the C-47 to pick up speed. As you reach flying speed – around 40-50 MPH – gently pull back on the wheel and lift off. Do not fly higher than the C-47! Try to maintain a position behind the tow aircraft which is SLIGHTLY above its center line.

As you leave friendly territory, turn the navigation lights OFF. If you are flying with company, select the appropriate recognition lights to aid formation.

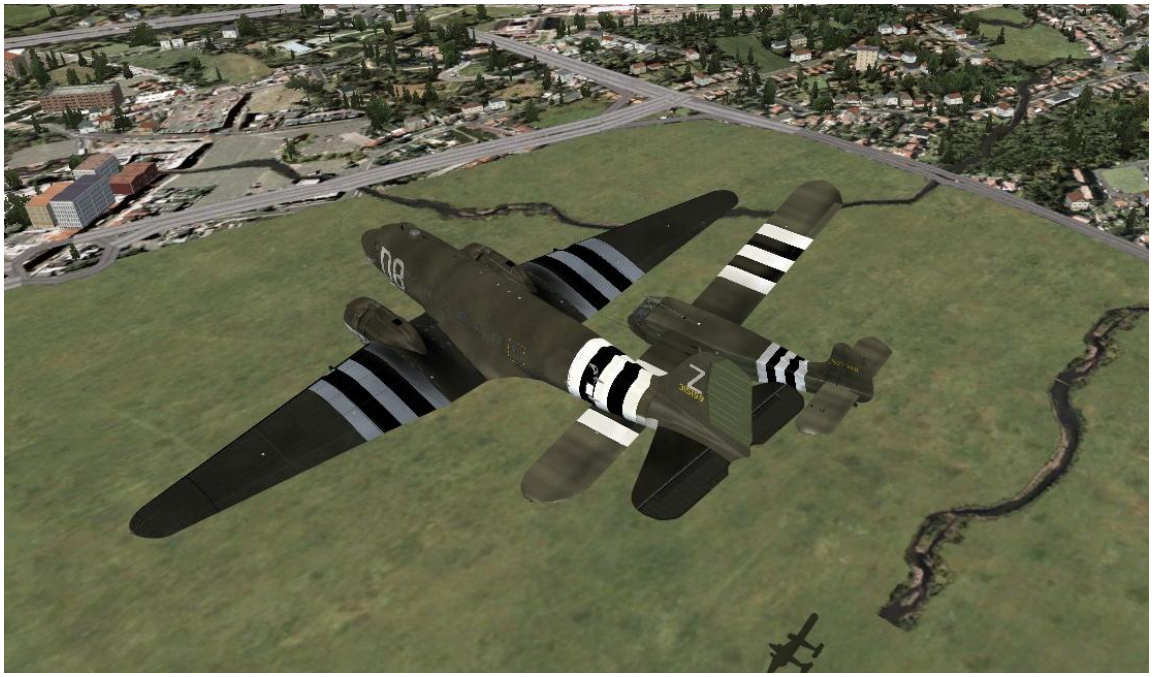
Depending on the wind and weather conditions, you may need to trim the glider to stay on course with the C-47, but be careful not to get into a ‘dance’ with it, swinging back and forth, as you will certainly snap the tow rope.

Try to relax and let the C-47 do the work. Watch for turbulence in the climb and always keep an eye on the towing aircraft and try to guess its next move. A fairly

long trip, say from Exeter to Normandy, is quite difficult to fly without severing the towline, especially in poor weather or at night. If this happens, remember, you are on your own! You will need to decide which is preferable – to press on and try to reach the French coast or to turn back and hope you are not too far from England.

As you near your destination, prepare to release the towline. Using the centrally mounted switch, signal the towing aircraft with three short flashes of the Ready light. Allow a couple of seconds to settle yourself and then pull down on the tow release lever.

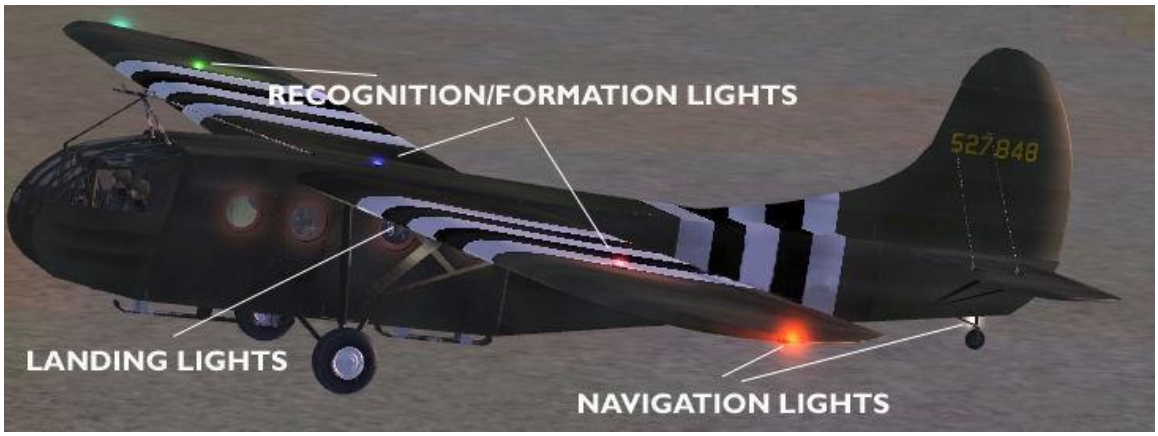
The towing aircraft will immediately bank away and down, leaving the way clear for you to set up the Waco for the glide down to the landing zone.



The Waco was capable of very slow controlled flight, but it had its limits so watch for the stall and try to keep your airspeed around the 50-70 knots range while in a controlled descent. Look for your target or select a suitable landing site and put the glider into a controlled easy-turning descent. Control your speed with the airbrakes and try to come in over your imaginary ‘threshold’ at around 40 knots. Selecting the airbrakes will slow the glider further for a touchdown at around 30 knots or less. Applying brake will pull up the Waco in a very short space.

Lights

The Waco glider is fitted with navigation lights in the wingtips and a set of different-coloured recognition lights for formation use. There are also two powerful landing lights on the main strut of each wing and a Ready light in the nose to signal to the towing aircraft.



Navigation lights are only used over friendly territory to assist ground spotters with recognition. Once the towing aircraft had left friendly shores, these lights were turned off.

The recognition lights were only used in formation work and in times of exceptional difficulty where friendly ground personnel had to be signaled.

Landing lights were only used in difficult circumstances where visibility was impaired.

Following these simple rules, make the lights part of your flight and landing checklists and you'll be fine - leave them on and we won't be responsible for the consequences!

C-47 glider tug

Note: This feature is only available in the DC-3 Legends of Flight Expansion Pack.

An exciting addition to this C-47 simulation is a depiction of ‘The Argonia’ C-47 in its role as a glider tug. The C-47 was used to tow troop gliders such as the Waco CG-4A and sometimes the British Horsa. Waco gliders could carry a variety of troops and heavy equipment, cargo and supplies. Behind the venerable C-47 they could be delivered right over the field of battle or behind enemy lines, to be released to glide down to a suitable landing field chosen by the pilot.

In this simulation we have a typical Waco glider, carrying a Jeep and invasion troops. The simulated tow needs care to handle properly but is very convincing when you get it right. When you reach your destination, hit the tow release switch in the cockpit and the glider will detach and glide away. The flight dynamics of this part of the simulation accurately demonstrate the performance sacrifices the C-47 had to make to carry that weight.

Glider towing procedures

In wartime operations the C-47 could be deployed to tow single gliders or a pair. We have simulated a single glider set-up for ease of operation.

In real life, the tow lines were 350 feet long. Ours is a little shorter, as finding suitable take-off fields in FSX:SE is difficult at the full length! However, a reasonably realistic look and feel for glider towing can be achieved with this simulation.

Note

Because FSX:SE is not designed for this kind of operation you need to slew the C-47 / glider model combination to a desirable position on the chosen field to give you the longest take-off run possible.

Set fuel cocks to the main tanks for both engines, with a minimum of 90 gallons in each.

Start engines as normal.

Lock the tail wheel.

Use one notch of flaps.

Arm the tow release switch by raising the red cover. Do NOT operate the switch!

When ready to begin the tow, release the brakes and open the throttles slowly to give 12-15” manifold pressure.

As you move forward, open the throttles to full power – 47 on the Manifold Pressure gauge – and keep the aircraft straight.

Hold the tail down until 50 MPH is reached. This avoids prop wash for the glider pilot. Not a very pleasant experience!

At 50-60 MPH release the back pressure from the tail. The glider will lift first as it reaches airspeed, quickly followed by your tail.

Slowly pull back on the stick with minimum pressure. This will keep your glider in line with the C47 and avoid stress on the tow rope.

Lift off at 85 MPH and not before 80 MPH.

When you are certain that you are airborne, retract the landing gear as soon as possible.

Hold in a slight climb until 100mph is reached.

On reaching 100 MPH, reduce power to 39” manifold pressure @ 2,500

Continue the climb to a ‘tactical altitude’ of 400 feet.

When you reach 250 feet, reduce power further to 30-32 on the Manifold Pressure gauge @ 2300 RPM or just enough to maintain airspeed of 100 MPH.

When levelled off at 400 feet (yes, 400!) restrict airspeed to 120 MPH maximum.

Remember the Waco C4 glider behind you is designed for speeds up to this but not a lot more. Try to think of the glider pilots and the passengers they carry!

If you need to turn to correct course, use no more than 30 degrees of bank.

Use the cowl flaps and carburettor de-ice switches to control engine temperatures.

Use of flaps will stabilise the flight, but watch your airspeed! A stall spells catastrophe. When you are ready to release the glider, signal with flashes of your red recognition light and flick the tow release switch.

As soon as the glider separates from the tow line, bank away and into a shallow dive to avoid collision with the glider which will now manoeuvre on its own.

Using normal flight procedures, climb to your normal operating service altitude and return to base.

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