DC Designs

Northrop P-61C *Black Widow*

Pilot's Operating Manual

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Pilot Briefing

You're new to this bird, so we'll start with the basics. She may look big, but the *Black Widow* handles like a fighter half her size. Those two Pratt & Whitney R2800-73 engines can hurl her around the sky like a meteor!

First things first. Take your time to get familiarised with the cockpit. For the most part it's a place you know and understand from your training, but this is a bird that can reach 600mph in a dive, so you need to know your cockpit inside out or that dive will end in a short, sharp argument with the ground.

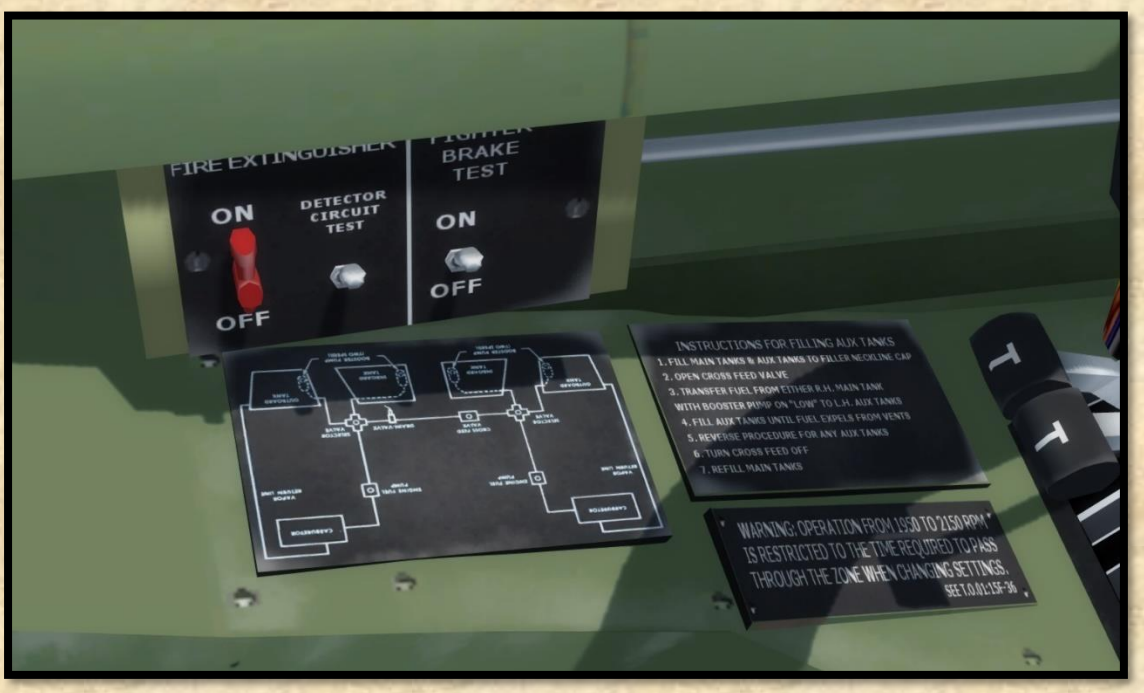
On the left are maintenance switches, used to open the port engine access panel from within the cockpit and also activate the fuel truck model. Below them are the trim wheels, to the left of the pilot's seat. Forward of those are the throttle banks, and those red, side-mounted switches below the throttles control fuel flow and fuel cut-off for the engines. Up front of the throttles are your magneto controls, and above those are switches for batteries, avionics, fuel pumps, pitot heat, landing lights and other vital systems that are clearly marked on the panel. Switching off the battery master will also remove the pilots from the cockpit when the airplane is on the ground. Above and to the left of the switch panel is the flap lever, and in front of that the speed-brake lever.

Your main instrument panel is right in front of you and contains all of the instruments necessary for the safe operation of the P-61C. Below the main panel are your controls for cowl flaps, carb heat and oil pressure. Each are tool-tipped for easy identification. The parking brake is the black and yellow chevroned lever just below the cowl flap switches – pull and turn to safely secure the airplane when on the ground. The metal-surrounded panel is the radar screen.

Moving across to the right, your autopilot stack stands before you, and closer still are your communication and navigation radio controls and light switches. Over your right shoulder you'll see the aircraft's generator switches (LH switch controls both generators).

Finally, select Views>Instrument Panel>Radios from the drop-down menus to access a more comprehensive radio panel window that will allow you to select more radio frequencies.

(***NOTE***: The elevator and aileron trim, along with fuel tank selector, are replicated on the main instrument panel for ease of use).



The fuel truck and engine access panel can be opened via the DETECTOR CIRCUIT TEST switch.

In addition to the pilot's position, there are also positions for the gunner and the Radar Operator in the rear of the aircraft. Use SHIFT-A to move between various available views.

Gunner's seat: this has no functional purpose within the simulator.

Radar Operator's seat: this has a functional radio suite either side of a radar repeater for the pilot's station. Navigation and intercepts can, if you wish, be performed from this position if using Flight Simulator's multiplayer system or third-party software.

Radar & Radios

The P-61C is equipped with a basic, boresight-mode radar which allows for targeting of enemy aircraft at night for gun attacks. The radar will detect anything that comes within a certain range, allowing the pilot to close to guns range before making a kill.

The radar display includes boresight reticule, gunsight, horizon, airspeed and altitude. Here, a target ahead of the P-61C is boxed in the radar, with a red circle and a "SHOOT" symbol telling the pilot the target is in range and aligned with the Widow's guns. (Tacpack required for shoot symbol).

Targeting can also be performed through the pilot's own glass gunsight. The radar has a repeater screen in the Radio Operator's station.

Guns, guns, guns!!

The P-61C comes equipped with gun effects. To activate these, ensure that you have copied and pasted the **fx_Wing_Guns.fx** file in the airplane's root directory into your Simulator>Effects master folder. The guns operate using the Strobe light command – slave your joystick to this light and squeeze the trigger to fire a hail of lead at your enemy. Squeeze again to cut off the gunfire.

Those who wish to modify the P-61C for use with TacPack or vACMI are welcome to do so, as long as the modification is distributed as freeware.

Navigation

The RO station is where navigational duties are carried out in the P-61C *Black Widow*. In the rear main panels you will find a pair of radio boxes, through which can be selected a number of radio-navigation aids. The most often used of these in the Widow is the radio compass. Simply dial in the frequency of the VOR station you wish to navigate to or from, and then use the radio compass in the pilot's station to direct your airplane.

The RO station right-hand radio suite, with radar repeated screen on the left of the image.

To operate, select the upper left-hand dial and input the frequency of your required VOR beacon (117.30 in the image). Select the NAV 1 switch to active. Now, the radio compass in the pilot's cockpit will point to the beacon.

The pilot's radio compass display. Dial the compass heading to match the airplane's heading, then turn towards or away from the VOR. The below image reveals the selected VOR station to be 20 degrees to the right of the airplane's nose.

As a night-fighter, being able to navigate your way around in the dark is a skill that must be learned. With no visual references and often in poor weather conditions or without a horizon, accurate pathfinding can mean the difference between life and death in a combat theatre.

Take the time to learn how to use the radio suite to locate local VOR references. With practice, you should be able to find your way home in the dark, above solid cloud cover with pin-point accuracy.

The pilot's cockpit instruments can be altered to suit your own preference, and there are often alternative panel layouts uploaded to various sites. Pick the one that suits you best and learn it from top to bottom…

Project Thunderstorm P-61C Black Widow earning its pay alongside a major storm cell. Without good navigation skills, operating in this kind of environment will be impossible for you.

Moonlight Serenade prowling around at dusk.

Aircraft Handling

The Widow's performance should leave you with a grin on your face, no doubt about that, but for all their performance those engines will bite the hand that treats them poorly. Power should never exceed 2,700 RPM, so keep an eye on those levers. Military power will give the Black Widow a maximum airspeed of 400MPH; add in the water-injection and you'll get 450MPH or so for twenty minutes before WEP is lost. To add WEP, select in Flight Sim Settings>Controls> and scroll down the list to "*War Emergency Power*" and assign a key or stick toggle for it.

The Widow's take-off run is approximately 1,400 feet in normal conditions, usually conducted with two stages of flap and full power.

She likes plenty of elevator trim due to her center of gravity being well forward and will rotate as low as 90MPH – although 100MPH is more normal.

The speed builds quickly so get the gear tucked away and hold her nose down. Gear must be retracted before 150MPH and flaps must be retracted before 175MPH. Trim as she climbs. You're looking for around 180MPH in the climb with trim set and mixture semi-lean – even then it's possible to see several thousand feet per minute on the dials!

For landing, you'll need to slow her down using the airbrakes. Ease the throttles back and draw off the power while extending the airbrakes and watch the airspeed carefully.

Approach speed for landing is around 120MPH, with three stages of flap and around 2,400 RPM depending on the conditions. If you're into a heavy crosswind, use the rudder trim to counter it. Those twin

tails provide good rudder authority down to low speeds, especially under higher power settings.

The Widow will feel “wallowy” on approach, those big wings with their low loading and the huge flaps giving tremendous amounts of lift. Don’t sweat it. Set her in the landing configuration at 120MPH and use the below power settings for the following critical flight phases:

Take off: 2,700RPM / 63In/HG MP

Climb out: 2,700 RPM / 54In/HG MP

Cruise: 2,450 RPM / 45In /HG MP

Approach: 2,300 RPM / 20-30 In/HG MP

For aerobatics, watch the throttle settings on the way up and the way down. The Widow rolls well, those spoilers on the wings helping her over, but like all big airplanes she wants to drop her nose on the way out. Enter barrel rolls with the nose up at around 30 degrees and with a little back-stick. Rudder opposite the roll on the way in, ease the stick forward through the inverted, and apply opposite rudder on the way out.

For loops, you’ll want full power and at least 300MPH on the way in. Don’t pull too hard on the way up, let her zoom-climb before easing the stick back further as you cross the vertical. Throttles to

idle across the top – you're looking for about 120MPH, and then down and out for recovery by 300MPH.

Stall turns are possible, especially if you're quick with your hands on the outside engine's throttle and power levers, but the rudders struggle to tip her over when the speed drops below 80MPH – kick her over as soon as you can and she'll drop cleanly away.

High altitude cruise is excellent, and your crew will don their oxygen masks automatically when passing through 10,000ft altitude. Draw the mixture back, settle the power and throttles and your airplane will eat up the miles!

SPECIAL CONTROLS

Battery off: Remove crew from cockpit.

You can also access the radio suite screen from the pilot's seat by selecting Views>Instruments>*Radios* from the drop-down menu.

AIRPLANE HISTORY

The Northrop P-61C was the final production version of the *Black Widow* night-fighter, and differed from earlier aircraft in having more powerful turbo-supercharged engines. The first few production aircraft entered service just before the end of the Second World War, but the end of the war also saw the end of the contract, and none were used in their intended role.

The P-61C was developed because the USAAF felt that the standard P-61A/ P-61B lacked speed and didn't have a high enough service ceiling. Both of these faults could be traced back to the decision not to use a turbo-supercharged engine in the P-61, and at the end of 1943 the Army asked Northrop to develop a more

powerful version of the P-61, using turbo-supercharged Pratt & Whitney R-2800-73 engines.

Northrop didn't have the spare development capacity to work on this project, and so Goodyear was given the job. The new engines caused most of the problems with the project. The -73 engines weren't available, and so Goodyear had to use Naval -14W engines instead. These were then replaced by -57 engines, and the two prototypes were re-designated as XP-61Ds. Finally the -73 engines arrived, and the prototypes were tested with their intended engines.

As expected the XP-61D was significantly faster than the P-61A/B, with a top speed of 430mph and a service ceiling of 41,000 feet, improvements of 60mph and 8,000ft respectively. The new aircraft also had a tighter turning circle, thanks to the use of 'fighter brakes' – air brakes fitted to the wings. The army placed a contract for 207 P-61Cs, and the first production aircraft was completed in July 1945.

The end of the war meant that this contract was cancelled after only 54 aircraft had been constructed, thirteen of which were immediately scrapped. The remaining aircraft were used for a variety of purposes, with the largest number going to Project *THUNDERSTORM*, which saw aircraft deliberately fly into thunderstorms to record the conditions within the clouds. Despite their impressive performance, all 41 surviving P-61Cs had been stricken from the Air Force inventory by April 1949.

- **Crew:** 2–3 (pilot, radar operator, optional gunner)
- **Length:** 49 ft 7 in (15.11 m)
- **Wingspan:** 66 ft 0 in (20.12 m)
- **Height:** 14 ft 8 in (4.47 m)

- **Wing area:** 662.36 ft^2 (61.53 m^2)
- **Empty weight:** 24,000 lb
- **Loaded weight:** 29,208 lb (13,471 kg)
- **Max. takeoff weight:** 36,200 lb (16,420 kg)
- **Fuel capacity:**
  - **Internal:** 640 gal (2,423 L) of AN-F-48 100/130-octane rating gasoline
  - **External:** Up to four 165 gal (625 L) or 310 gal (1,173 L) tanks under the wings
- **Powerplant:** 2 × Pratt & Whitney R-2800-73W Double Wasp radial engines, 2,800 hp each
- **Propellers:** four-bladed Curtiss Electric hollow steel paddle propeller, 1 per engine
  - **Propeller diameter:** 146 in (3.72 m)

Performance

- **Maximum speed:** 430 mph at 30,000 ft
- **Combat range:** 610 mi (520 nmi, 982 km)
- **Ferry range:** 1,725 nmi with four external fuel tanks
- **Service ceiling:** 41,100 ft
- **Rate of climb:** 2,540 ft/min (12.9 m/s)
- **Wing loading:** 45 lb/ft^2 (219 kg/m^2)
- **Power/mass:** 0.15 hp/lb (250 W/kg)
- **Time to altitude:** 15 min to 30,000 ft (2,000 ft/min)

Armament

- **Guns:**
  - 4 × 20 mm (.79 in) Hispano AN/M2 cannon in ventral fuselage, 200 rounds per gun
  - 4 × .50 in (12.7 mm) M2 Browning machine guns in remotely operated, full-traverse upper turret, 560 rpg
- **Bombs:** for ground attack, four bombs of up to 1,600 lb (726 kg) each or six 5 in (127 mm) HVAR unguided rockets could be carried under the wings. Some aircraft could also carry one 1,000 lb (454 kg) bomb under the fuselage.

Avionics

- SCR-720 (AI Mk.X) search radar
- SCR-695 tail warning radar