P-38L Pilot Handbook

BY FLYINGIRON SIMULATIONS

For Microsoft Flight Simulator

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Foreword

Greetings Pilots,

Thank you for purchasing the P-38L Lightning! We sincerely hope that you enjoy the experience of flying this beautiful American icon, it has been an honour & a privilege to bring this amazing warbird to life inside MSFS.

Firstly, we strongly recommend reading or skimming through the real-world P-38 Training Manual, which provides an excellent and enjoyable overview of the P-38 lightning, its core systems and flight procedures. Our simulation of the '38 is based largely on the official training manual & Pilot Flight Operating Instructions, both of which are available online for free. Many images & notes in this manual are references directly from either of these manuals, and almost all procedures from the real-world manual apply in our sim.

We'd also like to make a special thank you here to **GotGravel** , who joined our team just prior to starting development of the P-38 and has been instrumental in creating the Flight-Model, Tablet and various other aspects of development.

Throughout the manual, essential information is highlighted in quotation formatting like this. Pay special attention to these excerpts!

If you're itching to get flying right away, try starting a flight using the interactive checklist in-sim to get airborne!

Installation Procedure

We recommend installing the P-38L via the provided exe installer, as this will provide the smoothest and simplest experience.

To install via the exe:

1. Download the latest exe file from our website if you haven't already – you may get a warning that the file is not safe on the computer. You can safely ignore this – it is a standard Windows feature due to the installer drivers being unsigned. (To keep the file, click the 3 dots for more options and choose 'keep anyway'.
2. Run the exe file to begin installation. If you receive an admin prompt, press YES to allow installation to run. Ensure that MSFS is not running.
3. The installer will by default show the path of your MSFS community folder. You should leave this as it is, as the files must be installed into your 'Community' folder for the aircraft to show in-game.
4. Begin the installation. When it is complete, press finish.
5. Enjoy flying when you launch MSFS!

In some cases, it may be necessary to do a manual installation if you are having issues with the installer. If this applies to you, please contact us via our website contact page and request a download link for the manual installation files.

Unfortunately, the exe installer is not available for version 1.0 and a manual installation is required. You can find detailed instructions on how to manually install our MSFS aircraft here

For our website customers, updates will be available from our website via your account page. You will receive an email notification each time a new update is available.

For MSFS Marketplace customers, updates are handled automatically by the marketplace and no further action is required from you!

Quick start Notes

- Don't forget to try the interactive checklists if you are stuck!
- To achieve a successful engine start, ensure you get 3 things right – sufficient engine priming, energize the starter for long enough (until prop speed is no longer increasing) and make sure you engage the starter immediately after releasing the energizer.
- The fuel pumps should be always on, and set to EMERGENCY mode for take-off, landing and high altitude flying above 10,000 ft. Failure to do so can result in engine failure.
- The engines need to be managed correctly to avoid overheating problems. Manage your engine cooling system correctly to ensure that temperatures stay below maximums. Engine smoke is a good indication you are close to an overheat and need to reduce power & open the cooling vents.
- Engine damage can be disabled via the UI Tablet
- Pilots require oxygen to breathe too! Don't forget to turn on the oxygen system when flying above 12,000 ft. Failure to do so may result in a blackout!
- The aircraft features 'dive flaps' that can be used to safely reduce speed in a dive. The aircraft has a strong nose down tendency & becomes uncontrollable when over speeding in a dive. Combat this with dive flaps and pitch trim.

History & Design of the P-38 Lightning

The Lockheed P-38 Lightning is a World War II–era American piston-engine fighter aircraft. Developed for the United States Army Air Corps, the P-38 had distinctive twin booms and a central nacelle containing the cockpit and armament. Allied propaganda claimed it had been nicknamed the fork-tailed devil by the Luftwaffe and "two planes, one pilot" by the Japanese. Along with its use as a general fighter, the P-38 was utilized in various aerial combat roles including as a highly effective fighter-bomber, a night fighter, and as a long-range escort fighter when equipped with drop tanks. The P-38 was also used as a bomber- pathfinder, guiding streams of medium and heavy bombers; or even other P-38s, equipped with bombs, to their targets. Used in the aerial reconnaissance role, the P-38 accounted for 90 percent of the aerial film captured over Europe.

The P-38 was used most successfully in the Pacific Theater of Operations and the China-Burma-India Theater of Operations as the aircraft of America's top aces, Richard Bong (40 victories), Thomas McGuire (38 victories) and Charles H. MacDonald (27 victories). In the South West Pacific theater, the P-38 was the primary long-range fighter of United States Army Air Forces until the introduction of large numbers of P-51D Mustangs toward the end of the war.

Unusual for a fighter of this time, the exhaust was muffled by the turbo-superchargers, making the P-38's operation relatively quiet. The two turbo-superchargers also provided the P-38 with good high-altitude performance, making it one of the earliest Allied fighters capable of performing at such altitudes. It was extremely forgiving and could be mishandled in many ways, but the rate of roll in the early versions was too low for it to excel as a dogfighter. The P-38 was the only American fighter aircraft in large-scale production throughout American involvement in the war, from Pearl Harbor to Victory over Japan Day. At the end of the war, orders for 1,887 more were cancelled.

The P-38 was one of the first aircraft to encounter buffeting caused by shock waves that formed in high-altitude dives when local airflow approached the speed of sound. It was first committed to combat in North Africa in tactical support of ground forces, where it was forced to fight at low altitudes and, out of its element, suffered at the hands of more-nimble German Me 109s and Fw 190s. Partly in consequence and partly because many fighter pilots were intimidated by the Lightning's size and complexity, the Army Air Forces were ambivalent about the P-38 and failed to exploit aggressively its superior range and high-altitude performance when it was the only fighter in Europe capable of escorting bombers deep into Germany. Conversely, Air Force leaders in the Pacific theatre seized on the decisive altitude advantage over Japanese fighters that was gained by the Lightning's turbo-supercharged engines. A substantial proportion of P-38 production was committed to the Pacific, where its exceptional range was particularly valuable. Most of the top Army aces in the Pacific flew Lightnings.

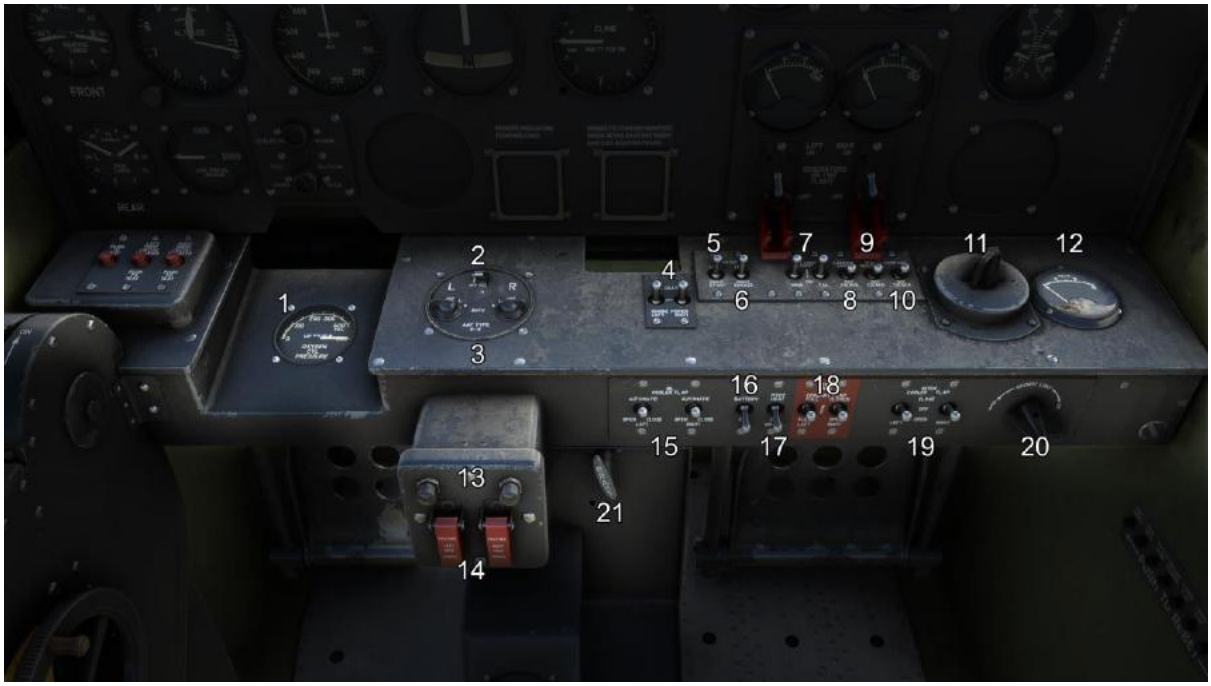
-Paraphrased from Wikipedia & Britannica

Cockpit Familiarisation

Instrument Panel

1. Standby Magnetic Compass
2. Suction Gauge
3. Clock
4. Remote Indicating Compass
5. Directional Gyro
6. Gyro Horizon
7. Gyro Horizon Cage/Uncage
8. Manifold Pressure (Left & Right Needles)
9. RPM (Left & Right Needles)
10. Engine Gauges (Oil Temp & Pressure, Fuel Pressure)
11. Coolant Temperature Gauge
12. Front (Reserve) Fuel Tank Quantity Gauge
13. Altimeter
14. Airspeed Indicator
15. Bank & Turn Indicator
16. Rate of Climb Indicator
17. Ammeters
18. Carburetor Air Temperature Gauge
19. Rear (Main) Fuel Tanks Quantity Gauge
20. Hydraulic Pressure Gauge
21. Landing Gear Warning Panel
22. Generator Switches

Centre Dash Panel

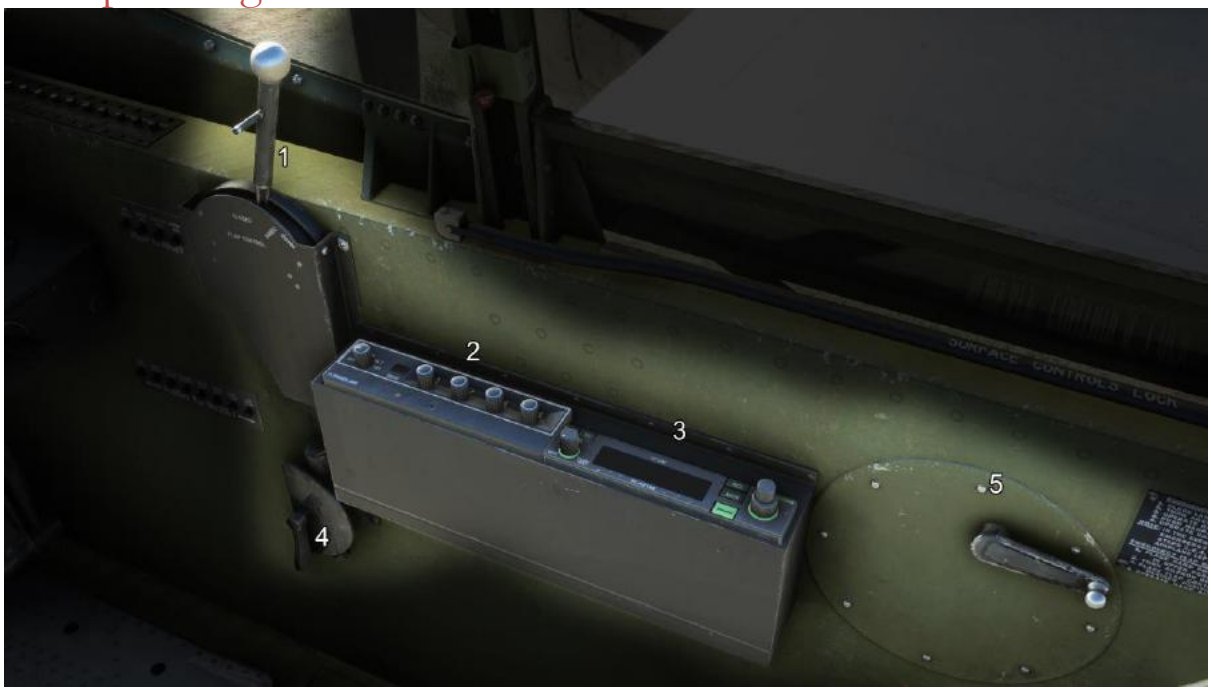


1. Oxygen Cylinder Pressure Gauge
2. Magnetos Master Switch
3. Magnetos (Left and Right)
4. Oil Dilution & Engine Primer Switches
5. Starter Switch
6. Engage Switch
7. Wing & Tail Position Light Switches
8. Landing Light Switch
9. Gun Heater Switch
10. Compass Switch
11. Instrument Light Rheostat
12. Voltmeter
13. Prop Feathering Lights
14. Prop Feathering Switches
15. Oil Cooler Flap Switches
16. Battery Switch
17. Pitot Heat Switch
18. Coolant Flap Override Switches
19. Intercooler Flap Switches
20. Cockpit Light Rheostat
21. Parking Brake

Cockpit – Left Side

1. Left Window Handle
2. Bomb-drop Tank Master Switch
3. Bomb-drop Tank Selector and Arming Switches
4. Throttles
5. Propeller Governor Controls
6. Propeller Selector Switches (Inop)
7. Mixture Controls
8. Air Filter Control
9. Elevator Trim Tab Control
10. Landing Gear Control Handle
11. Fuel Tank Selectors
12. Fuel Pump Selectors
13. Tablet Clickspot
14. Oxygen Flow Indicator
15. Oxygen Knob
16. Rudder Trim Tab Control

Cockpit – Right Side



1. Flap Lever Control
2. Transponder
3. Radio
4. Aileron Boost Control Lever
5. Right Window Handle

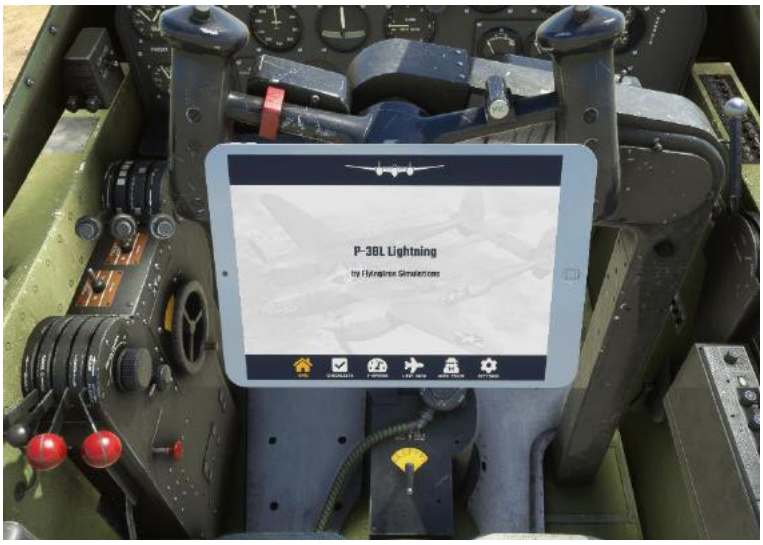
Yoke

1. Dive Flap Control
2. Bomb-rocket Selector Switch (inop)
3. Gun-camera Selector Switch (inop)
4. Gunsight light rheostat (inop)

Canopy Frame

1. Canopy Handle
2. Canopy Locks

FlyingIron UI Tablet



The tablet is a handy companion on your journeys. With a simple touch you'll have access to quality-of-life improvements like Checklists, V-Speeds, Live Data (including remaining range and time), a Loudout manager, a friendly Auto Pilot and various Aircraft Settings (including a pushback service).

By default, the tablet is stowed to the left of your seat. Click on it and it will move to in front of the yoke. To stow, simply click the tablet power button.

Aircraft Systems

Fuel, hydraulics, Oxygen, Engine, Cooling, Prop, Electrical, Gear/Flaps

Fuel Systems

The aircraft is equipped with 2 Main tanks, 2 Reserve Tanks, 2 Outer Wing Tanks and can carry up to 2 Drop Tanks. Fuel Quantities are as follows:

Main Tanks: 93 US Gal Each
Reserve Tanks: 60 US Gal Each
Wing Tanks: 55 US Gal Each
Drop Tanks: 165 US Gal Each

The P-38L features a pressurized fuel system, which means fuel is pumped from the tanks & flows under pressure to the engine driven pumps. Fuel is controlled in the aircraft by several key controls:

FUEL SELECTOR

Located on the left of the pilot seat towards the ground, this is the main control for selecting a fuel source. It has 5 options:

1. Drop Tanks (if no drop tanks installed, this will shutoff fuel flow
2. Outer Wing Tanks
3. Main Tanks
4. Cross Suction (Crossfeed – draws fuel from the opposite side)
5. Reserve Tanks

Note that there is no OFF option with drop tanks installed. To shutdown fuel flow with drop tanks installed, the pilot can either use the mixture lever, set to Wing Tanks and turn the booster pump OFF, or set both selectors to Cross Suction.

FUEL PUMPS

Located aft of the fuel selectors, this panel controls the power and operating mode of the electric fuel pumps. The electric fuel pumps provide additional pressurisation to the fuel lines, providing a reliable flow of pressurized fuel during the most intensive sections of flight.

The Booster Pumps should be ON at all times.

The fuel pumps should be set to EMERGENCY mode in the following conditions:

- Takeoff
- Initial climb-out
- Flying above 10,000 ft

- Landing

Wing Tanks cannot be used with the Booster Pumps set to OFF.

FUEL PRIMER / OIL DILUTION

Located on the main switch panel, these switches are used to either prime the engine with fuel or dilute the fuel with oil. Check the fuel pressure indicator gauge to ensure priming is working & providing sufficient fuel pressure to the engine.
Fuel priming is required, hold switch between 2 to 4 seconds before an engine can be started.
The current prime status is on the mouse over label as well as the Tablet's Live Data page.

Note that oil dilution is not functional in v1.0.0 of our simulation.

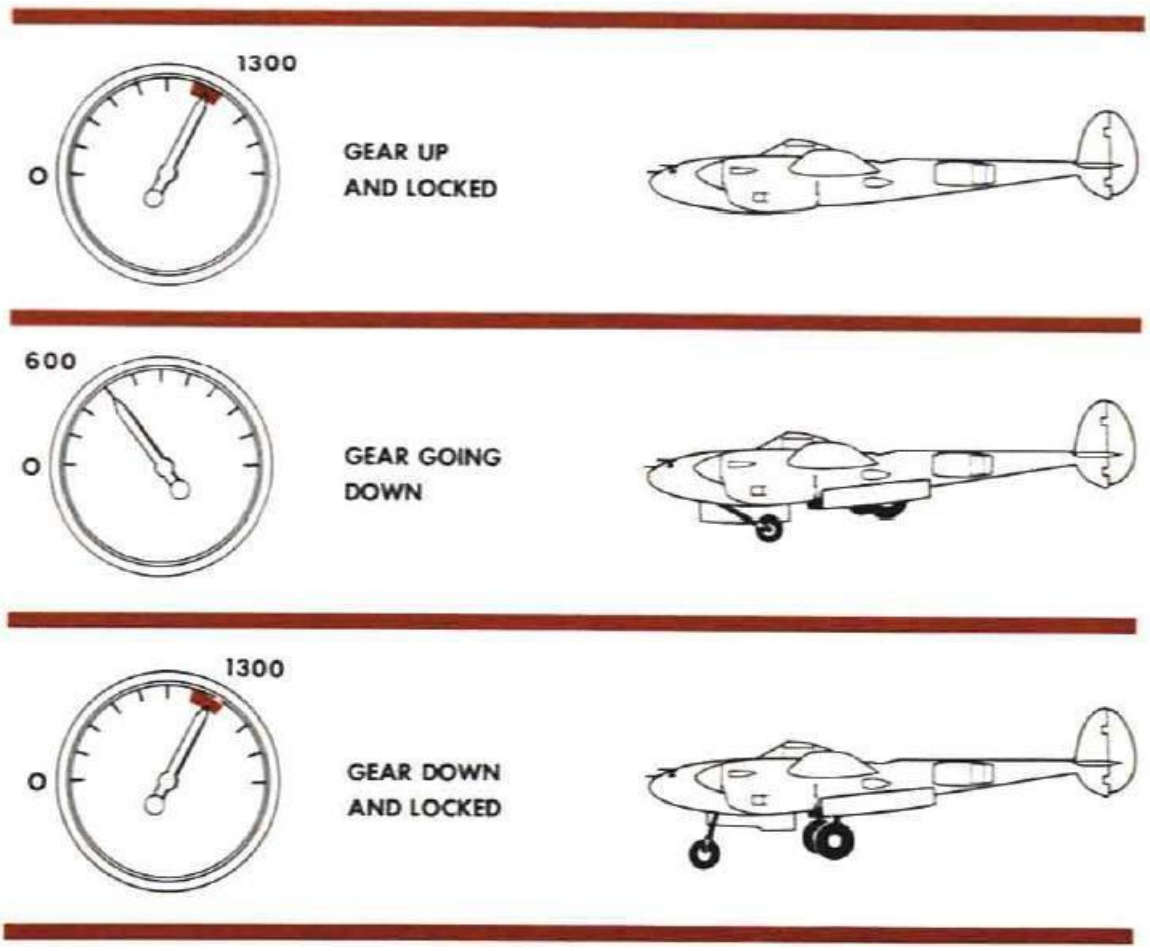
FUEL PRESSURE GAUGE

The fuel pressure gauge is shared with the oil pressure (left) and oil temperature (top of gauge). All pressure units are indicated in pounds per square inch, and temperatures are indicated in degrees Celsius.

Hydraulic System

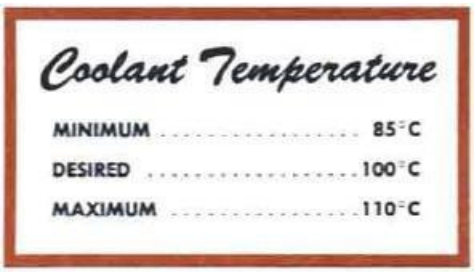
The hydraulic system operates the landing gear & bay doors, wing flaps, coolant shutters and brake lines. Hydraulic pressure is maintained by engine-driven pumps mounted in each engine.

Normal hydraulic pressure is between 1100-1400 PSI, although will indicate drops in pressure when the hydraulic system is in use. The hydraulic pressure gauge is located on the front dash, left side. The system will respond to any hydraulic interactions like gear, flaps and aileron boosters.



Coolant & Oil Systems

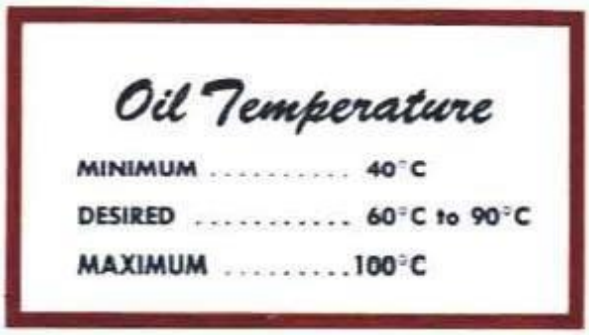
The engines are liquid cooled with a separate cooling system for each engine; the coolant being ethylene glycol. The coolant absorbs excess heat and dissipates it through radiators on the tail boom.



The coolant system is controlled by the pilot via 2 override switches, located on the front dash. With the switch in the OFF position, the coolant flaps are operated automatically via thermostat. Setting to FULL CLOSED or FULL OPEN will override the regulator and manually set the coolant flaps to either full open or closed.

Note that the automatic operation of the coolant flaps requires electrical power.

Oil temperature is regulated similarly by 2 oil cooler shutters, which can either operate automatically or manually via momentary switches controlled by the pilot (shown above). The position of the oil shutters can be determined by the pilot by looking out the window at the engine nacelles and confirming the position of the shutters.



The intercoolers are discussed in more detail in Engine Management

Failing to respect oil temperature limits will result in the engine overheating & failing.

Note this is optional and can be disabled via the UI Tablet.

Prop

The engines each drive a Curtiss Electric, constant speed propeller. The desired prop RPM is selected by the pilot via the Prop Levers, and a governor adjusts the pitch of the propeller blades in order to achieve the desired RPM.

The props on the P-38L are counter-rotating, essentially eliminating P-factor that plagues single engine aircraft. This means the aircraft has no yaw or roll tendencies, flying & taxiing smoothly and easily.

Remember, the props require electricity to operate correctly. Ensure the generators are on & working.

FEATHERING

Feathering a propeller means to rotate the blades to face into the airstream, minimising drag. It is used when an engine has failed, to provide better performance flying on a single engine (or when gliding).

Feathering in the P-38L is easy and controlled by a single switch for each prop. Leave the switch in NORMAL for all normal operations and set to FEATHER to feather the prop.

Hydraulically Boosted Ailerons

The P-38 set many firsts and records in its time, one of them being the introduction of **hydraulically boosted ailerons** in a fighter. The P-38 truly was at the forefront of technology.

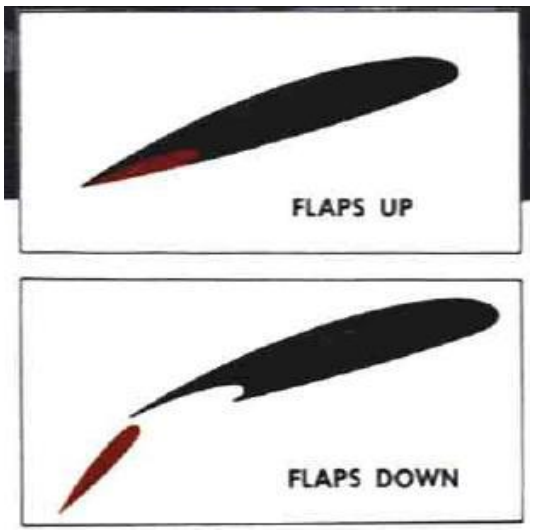
Normally, at high speed, a pilot would only be able to deflect control surfaces perhaps 20 to 25% - no matter how strong the pilot - due to the enormous aerodynamic forces at work here. As you can imagine that would severely limit roll rates in a dogfight and the P-38 was already a heavy weight. With the added hydraulic boost however a P-38 could out-roll even the nimblest fighters of its day, especially when you added some rudder.

Boosted ailerons were first installed in later P-38J models and were standard on all P-38L models and onwards. They made the P-38 a force to be reckoned with in dogfights, too.

Disable the aileron booster if you have a failed engine in order to conserve hydraulic pressure. In all other cases, leave it on. If the booster is disabled you will roll slower when at high speeds.

Wing Flaps

The P-38 is equipped with trailing edge Fowler Flaps, which are flaps that slide back as well as rotating down, thereby extending the wing area as well as increasing local Angle of Attack at the wing flaps.



The flaps are operated by a hydraulic motor. The flap control lever is located on the right side of the cockpit.

When operated at the first setting, the wing flaps are in the 'Manoeuvre' Setting, serving to increase the lift and general manoeuvrability of the aircraft.

When using half or more flap extension, the flaps provide a dramatic increase in aircraft lift, whilst also acting as airbrakes, slowing the aircraft down via increased drag.

On most runways, the wing flaps are not needed for takeoff; they are however used for landing to reduce landing speed.

Dive Recovery Flaps

Later models of the P-38, including the L version, come with special **dive recovery flaps** installed. They are nothing like regular flaps but instead are located below the wings, deploy in "V" shape form, are electrically actuated, and extend their full 35 degrees in just 1.5 seconds. They can be activated at any speed but ideally are deployed at the beginning of a typical 45° high speed dive run from altitude.

They do not act as speed brakes, although there naturally is some drag. They rather help to create a pitch up force by shifting the centre of lift. Without them the P-38 is likely to enter a dangerous and often fatal compressibility stall at 435 mph (380 knots) or so. Such a stall essentially means you lose all pitch control and will be unable to pull up from a dive. The control column will be locked solid due to the compressibility stall. A little elevator trim authority remains.

Many pilots and aircraft were lost during WWII until these recovery flaps were installed as the solution, and they were standard feature in all later P-38 models.

Here is an original article from Lockheed on the topic:

coolers were housed in the leading edge of the wing, which now carries fuel cells.

A flush type leading edge light is incorporated in the left side. The skin, of .040 gage, 24ST Alclad, is flush riveted and butt jointed.

Main beam of the outer wing panel consists of upper and lower beam caps which are 24ST aluminum alloy extrusions, tapering out from the center until a heavier, reinforcing section disappears and the extrusion becomes a plain angle of sheet metal. The lower cap tapers faster than the upper and is finally replaced by a pair of sheet metal angles.

One of the interesting new cases of P-38 pioneering is the use of recently added dive flaps to offset compressibility effect which shifted center of lift from fore to aft portions of wing. Due to the unusually high speeds attained by the heavy P-38 in power dives, shifting of the center of lift caused loss of normal control above the "hydrodynamic" speeds—where air reacts much like water—with a resulting tendency of the plane to go into an outside loop. Since installation of the flaps this characteristic has been overcome.

The flaps are fabricated of three layers of aluminum alloy sheet, flush riveted. They attach, by means of a piano-type hinge, along the same line at which the leading edge of the wing is joined to the outer panel. Actuation is electrical, with a high speed electric motor driving actuating screw mechanisms connected to a curved arm hinged to a fitting on the brace or rearmost of the two panels of the flap assembly. When lowered, the flap stands at an angle of 40 deg. from the lower skin surface line, and at its farthest point is 5½ in. from the wing to the piano hinge by which it is attached to the brace panel. Two actuating mechanisms, side by side at the center, operate each flap, the actuating arms swinging downward through an opening in the wing skin. The flap and brace panels have a combined chord of 15½ in., divided 8½ in. to the flap itself and 7 in. to the brace. Length is 58 in. The mechanism is bolted to a heavy casting anchored to the lower skin structure and two wing ribs between which it is located.

The wing tips are made up of smooth

The **dive recovery flaps** are operated from a switch on the pilot's control wheel (*Spoiler keybind*):

Electrical System

The P-38L is powered primarily by two 28-volt generators: one for each engine. The generators are the beating hearts of the electrical system, providing a constant flow of electricity to the buses and the P-38's single battery, maintaining it's charge. A voltage regulator keeps the generator voltage constant at 28 volts and a reverse current relay automatically cuts out the generators below the required 1600 rpm.

It is important to note that the battery in the P-38 is only relatively small and is intended as a source of power for starting up and emergencies only. It is NOT intended to be the only nor primary source of power for the aircraft – consequently it will only provide power to the aircraft without generators for approximately 30 minutes.

The electrical system can be monitored by 3 gauges – the left & right generator ammeters, as well as the aircraft voltmeter gauge. The generator ammeters display the ampere load upon each generator and therefore indicate the total loads placed on the aircraft electrical systems. Note that when not in operation, the generator ammeters will show 0 – this can be an important indication of generator failure.

The voltmeter gauge displays a combined voltage reading of the aircraft battery AND generators, it is therefore unreliable on its own as an indication of a single generator failure. The voltmeter should be monitored however as an indication of the overall charge available in the electrical system. Any deviation of +- 0.5v from 28 is cause for concern and the generators should be immediately inspected for correct operation.

The aircraft also has an inverter, although in the P-38L the inverter is only used to power the remote compass.

Oxygen System

Oxygen to the pilot can be switched on the via the red shutoff valve, located on the floor aft of the control column.

Movement of the blinker indicates oxygen is flowing to the pilot.

The available supply of Oxygen can be seen on the Oxygen Pressure Gauge, located on the Main Panel.

Flying above 14,000ft without Oxygen will cause hypoxia symptoms, including muffled hearing. If your engines are very quiet at high altitude check that your Oxygen is on!

Flight Procedures

Starting the Engines

Starting up the massive Alison V-1710 Engines requires an element of precision from pilots, with several elements needing to be done correctly in order to get a good engine start.

FUEL PRIMING

When starting the engines from cold, it is necessary to use the fuel primers in order to manual feed some fuel into the engine to get a good start. This is not needed when the engines are hot or have been used recently. More extensive priming is required in colder weather and less priming in warm weather.

Do not overprime! Once you have over primed an engine you cannot start it and it will have to be de-primed. Do so by shutting down and open the throttle fully so fuel fumes can escape. Depending on how much you over primed, this may take up to 10 minutes. Check the priming level in the Tablet's Live Data page or the prime switch mouse-over label.

Pilots should respect the guide below in order to achieve a successful engine start:

<0 °C	0 – 10 °C	10 – 20 °C	20 – 30 °C	30+ °C
5 seconds	4 seconds	3 seconds	2 seconds	1 second

ENERGIZERS

For all engine starts except for an in-flight windmilling start, the engine needs to be manually cranked via the inertial flywheel before engaging the starter. Failure to do so will result in the starters not firing at all, as the torque load is too much for the starters to overcome.

To start the engines correctly, pilots should:

1. Press & hold the STARTER switch. Observe the prop and listen to the flywheel. The prop will NOT rotate during this process.
2. Once audio pitch of the flywheel is no longer rising pilots should immediately move the switch to the ENGAGE position. This will couple the prop to the fly wheel.
3. Hold the switch in ENGAGE until the starter is heard and the engine starts successfully.

Failure to hit the ENGAGE switch quickly enough will result in a failed start. The prop must not slow down too much, otherwise the torque load will be too high for the starter/flywheel. Remember you also need fuel pressure, and priming needs to be correct.

Tip: If you are struggling to start the engines and want to get flying in a hurry, you can use Auto-start to get fired up quickly! The default keybind is **Lctrl + E**

Fuel Management

The pilot has several controls available to him to control and manage the aircraft fuel systems during all stages of flight. These include (one for each engine):

1. Fuel Selector Knob
2. Fuel Booster Pumps
3. Fuel Primers
4. External Tank Jettison Controls

The functionality and operation of each control is discussed in more detail in the Aircraft Fuel System section.

Fuel Consumption P-38H, P-38J, and P-38L

GRADE 100

POWER SETTINGS	RPM	HG.	MIXTURE	CONSUMPTION/HR./ENGINE
TAKEOFF AND MILITARY	3000	54"	AUTO RICH	162 GALS.
WAR EMERGENCY	3000	60"	AUTO RICH	180 GALS.
NORMAL RATED	2600	44"	AUTO RICH	115 GALS.
MAXIMUM CRUISE	2300	30"	AUTO LEAN	60 GALS.

When starting the engines, taxiing and taking-off the **Reserve (Aux) Fuel Tank** should be used. This is to provide space in the reserve tanks for the vapor to return from the carburettors.

After takeoff and climb above 1000 ft, the pilot should switch to the Wing Tanks (or External Tanks if equipped). Note that the external fuel tanks do not have a gauge attached, therefore pilots must estimate fuel usage via the consumption tables above. External Tanks are not intended to be jettisoned, unless in combat or emergency situations.

Once the low-level Wing Fuel lamps illuminate (left side of the cockpit), the pilot should then act and switch over to the Main Fuel Tanks for the duration of flight. Finally, if the main tanks run dry, pilots should switch over to the reserve tanks for the remainder of the flight.

The Fuel Booster Pumps should be ON at all stages of flight and on the ground. During takeoff, landing & flight above 10,000 ft the fuel booster pumps should be set to

EMERGENCY mode. If the electrical system fails, or the booster pumps are not in emergency mode, the aircraft can only be flown below 10,000 ft otherwise there will be insufficient fuel pressure to drive the engine.

In Summary:

Fuel Tanks should be used in the order of:

Reserve (Ground, takeoff) → External → Wing → Main → Reserve

Booster Pumps should be ON at all times. EMERGENCY mode for takeoff, landing & flying above 10,000 ft.

JETTISON OF EXTERNAL TANKS

To jettison the external tanks when in-flight:

1. Set the individual left/right arming switches as required.
   Arm = Dropped
   Safe = Not Dropped
2. Set the Master Arm to ARMED
3. Press the FUEL DUMP keybind (Default is **LCtrl+LShift+D**)

Note that for safety reasons, pilots should only drop tanks when flying above 1000' AGL.

Taxi

Ensure the parking brake is disengaged before taxiing off and that ATC communication is setup as required. The aircraft taxis quite easily, thanks to the nosewheel configuration and the excellent visibility from the cockpit.

The 'S' taxi technique necessary in other, taildragger Warbirds of the time is not needed in the P-38. Taxi slowly and steadily, using the rudder and differential breaks to steer the aircraft.

Individual use of the left & right engines can be employed to spin the aircraft in a tight turning circle.

Take-off & Climb

Before takeoff, set flaps as needed. Most often flaps are not required for modern runways; however some shorter runways may require 1 stage of flaps, especially when carrying a full fuel load.

The aircraft has little tendency to veer left or right due to the counter-rotating propellers; use gentle rudder inputs to correct any deviations from the centreline.

TAKEOFF POWER – 54" Manifold Pressure – 3000 RPM

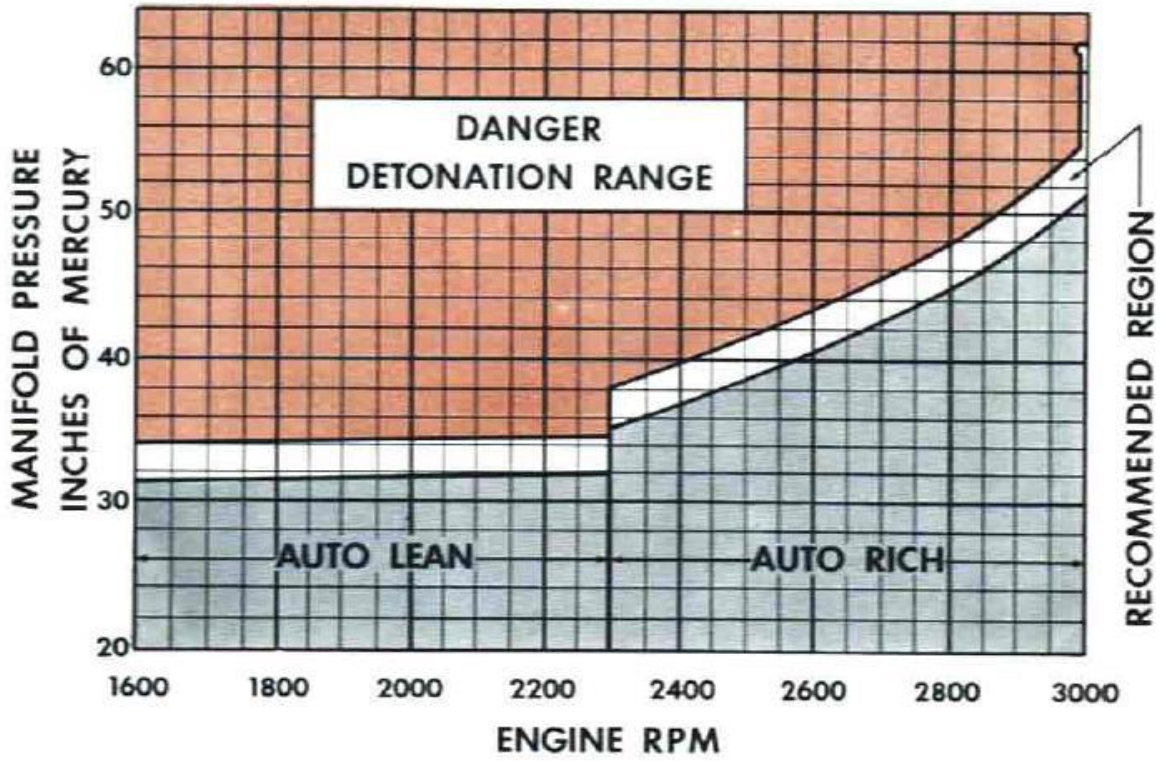
Ensure that coolant settings are set to either AUTO or OPEN before takeoff to prevent overheating the engines.

Raise the gear once clear of the runway and switch to EXTERNAL or WING tanks once clear of 1000'. Establish climb power settings and maintain a best climb speed of 155-175mph IAS.

MAX CONTINUOUS POWER – 44" Manifold Pressure – 2600 RPM

Cruise

During cruise, pilots should respect the following chart with regards to operation of the mixture lever to prevent engine detonation and maintain optimal performance.



Note that for cruise operation, the engine has 2 different normal rated power settings that can be used indefinitely:

AUTO RICH – 44" Manifold Pressure – 2600 RPM

AUTO LEAN – 30" Manifold Pressure – 2300 RPM

Keep an eye on fuel levels during cruise and monitor your gauges to ensure all systems remain functional and within limits. Take the time to trim the aircraft correctly; the aircraft has trim systems that can capably and confidently maintain hands-free flying during cruise conditions.

Landing Procedure

RESTRICTED

Landing Procedure

1. Fuel selectors to fullest tanks.
2. Fuel booster pumps ON.
3. Propellers at 2600 rpm.
4. Mixture in AUTO RICH.
5. Intercooler shutters OPEN (if installed). This is not necessary during cold weather operation.
6. Lift flap trigger through quadrant notch leaving flap control handle in CLOSED position.
7. Slow up on downwind leg to 175 mph and lower landing gear. Don't cut the throttles to slow down. Reduce them gradually and maintain at least 15" manifold pressure. If you cut the throttles, the engine will backfire and possibly load up.

Make the following thorough check to be certain gear is down and locked:

Hydraulic pressure .....returned to normal.
Hand pump .....resists operation.
Warning light .....out.
Polished area.....nosewheel down.

8. Turn on base leg at 150 mph.
9. Make final turn into field at 150 mph.
10. Drop full flaps and trim elevator.
11. Start glide at 130 mph, carrying at least 15" manifold pressure. Gradually reduce this power and airspeed and,
12. Come over the fence at 110 mph.

Perfect your landing approach technique. It requires skill and judgment and is one of the tests that determine a good pilot.

Don't drag your approach in from miles back. On long, low approaches, an engine failure leaves you in an embarrassing situation.

Too high an approach is just as bad. Don't look as if you are going to dive bomb the field.

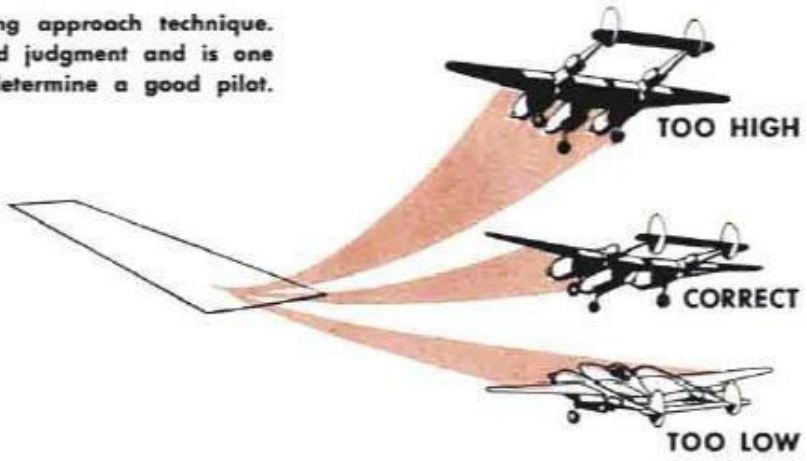
13. Contact is made between 90 mph and 100 mph. Land with your heels on the floor. Keep your feet off the brakes.

Land on the two main wheels, holding the nosewheel off the ground. With full flaps down you can't drag the rudder fins on the runway. With ½ flaps or less you can.

14. After contacting the runway, keep the airplane straight. Steer with the rudders as long as they are effective. Do not use brakes unless necessary. Then apply them on and off.

Tip: Be prepared to encounter prop wash when landing behind another airplane. If you hit prop wash, correct immediately! Don't sit there fat, dumb, and happy while the airplane does a snap roll.

Make every approach and landing with the same care and concern as you did on your first solo.



Go-Around Procedure

GO-AROUND PROCEDURE

If you overshoot and cannot land in the first third of the field, go around.

If for any reason you do not feel that everything is just right, go around.

You will not be criticized. It will be considered good judgment. But try to make up your mind early. Don't wait until you are half-way down the runway.

In going around, use the following procedure:

1. Steadily advance throttles to takeoff manifold pressure.
2. Retract the landing gear.
3. Climb straight ahead and gain at least 500 feet altitude.
4. Lower nose slightly and build up airspeed.
5. Milk up the flaps.

Don't try to fly around the field with gear and flaps down; don't turn until flaps are up.

Crosswind Landings

CROSSWIND LANDINGS

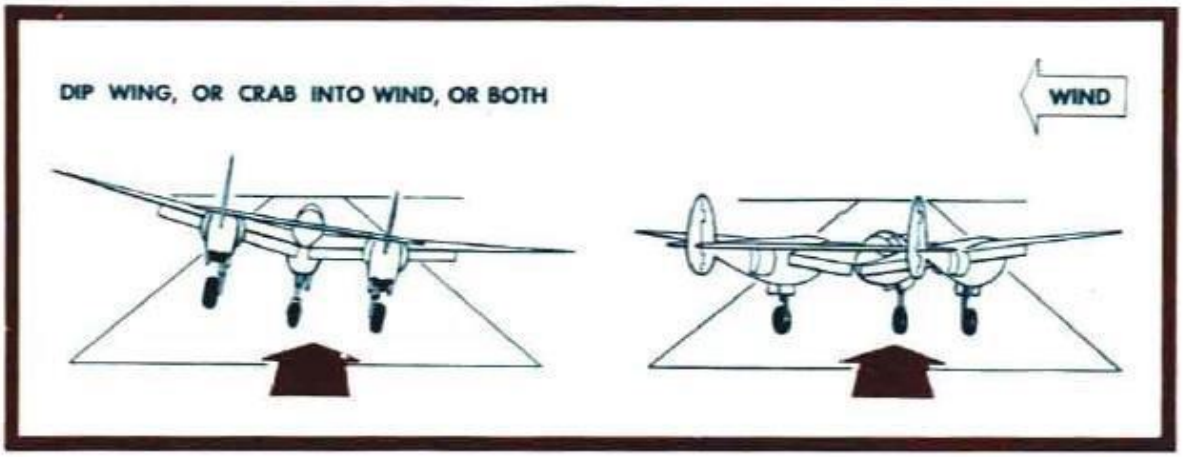
A crosswind landing in a P-38 presents no problem because of the tricycle landing gear.

With the tricycle landing gear the center of gravity is **forward** of the main wheels. Once the wheels have touched the ground, the P-38 rol straight down the runway. It will not groundloop.

On the final approach, crab or lower a wing into the wind, or use a combination of both.

Be sure you straighten out before making contact. Do not land in a crabbed or one-wing-low attitude. The gear was not built to take excessive side stress.

Immediately upon landing, put the nose-wheel on the runway to obtain directional stability and roll straight down the runway.

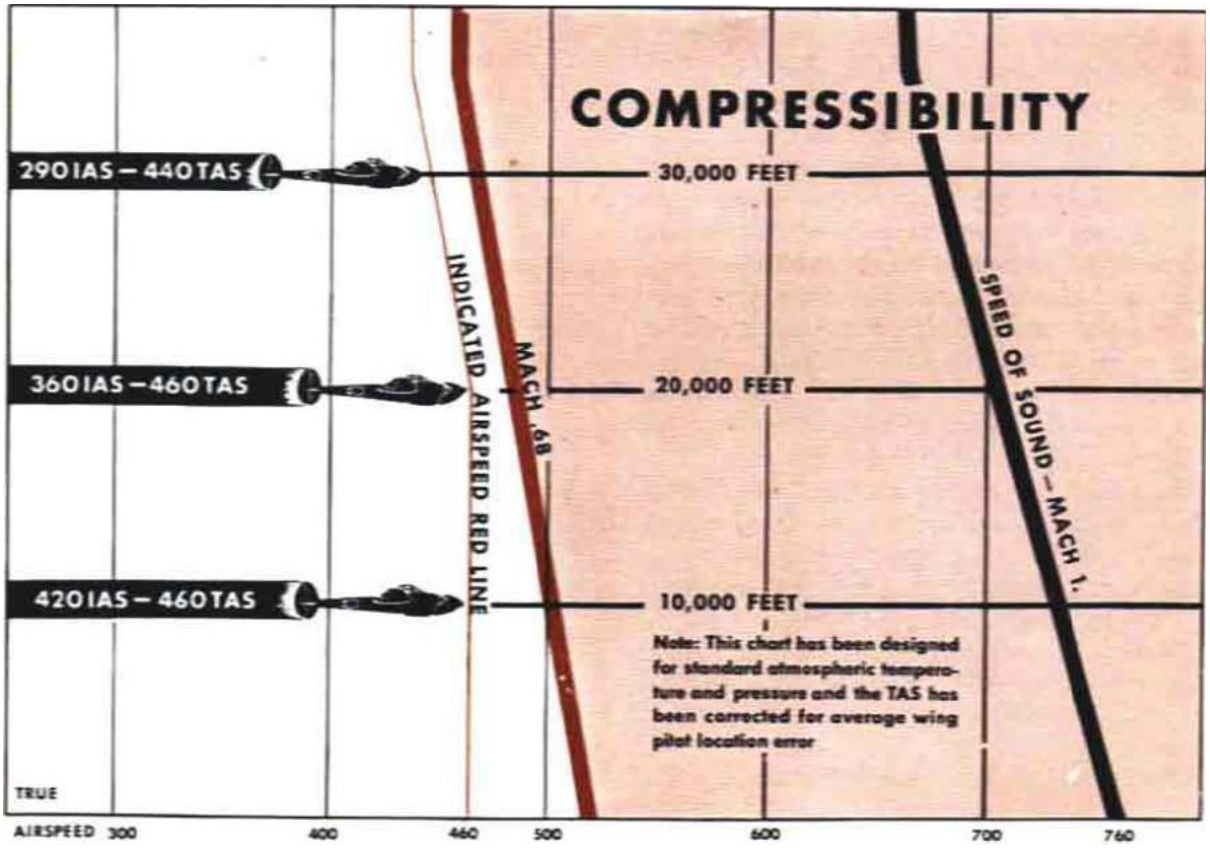


Dives & Compressibility

The P-38 has a unique and dangerous tendency to nose-down in a dive as the aircraft approaches Mach 1 and the effects of airflow compressibility begin to alter the flight dynamics of the aircraft.

Pilots must be extremely wary of this tendency and be ready to counter with dive flaps and elevator trim. Remember, prevention is the best cure! Use your dive flaps and manage your dive speed to avoid a deadly compressibility dive.

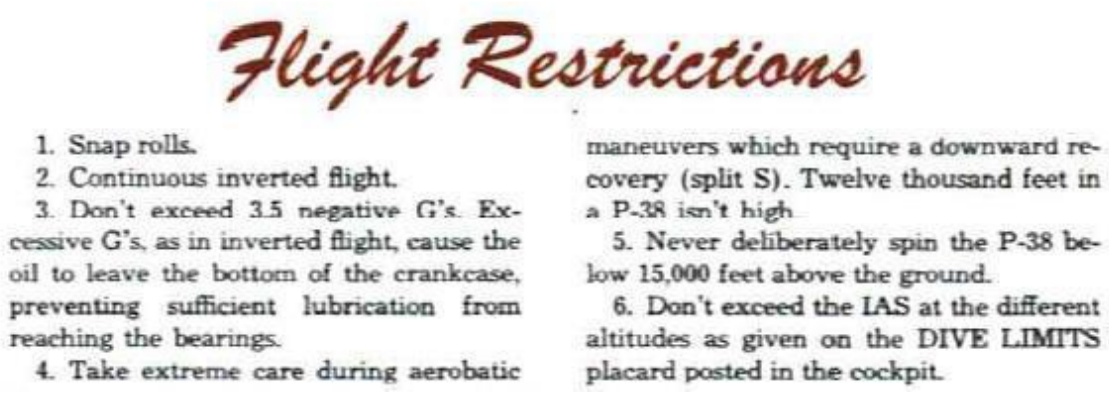
Pilots should observe the following chart, observing the maximum dive speeds indicated at each altitude. Flying beyond Mach 0.68 is considered dangerous and will likely lead to the above-mentioned dives.



To recover from a dive:

1. Pull back the throttle & deploy dive flaps if not already deployed
2. Pull the stick aft to see if elevator authority is sufficient to correct attitude
3. If not, use elevator trim to force the aircraft out of the dive
4. Once out of the dive, restore trim and then restore power

Flight Restrictions



Flight Restrictions

1. Snap rolls.
2. Continuous inverted flight.
3. Don't exceed 3.5 negative G's. Excessive G's, as in inverted flight, cause the oil to leave the bottom of the crankcase, preventing sufficient lubrication from reaching the bearings.
4. Take extreme care during aerobatic maneuvers which require a downward recovery (split S). Twelve thousand feet in a P-38 isn't high.
5. Never deliberately spin the P-38 below 15,000 feet above the ground.
6. Don't exceed the IAS at the different altitudes as given on the DIVE LIMITS placard posted in the cockpit.

After Landing

- Keep the aircraft straight via the rudder
- Avoid unnecessary use of the brakes
- Don't raise flaps until you've reached the end of the runway as they help to slow the plane down
- Once clear of the runway:
  - Pull flaps up
  - Booster Pumps OFF
  - Prop levers full forward
  - Coolant switches all to OPEN

Engine Shutdown Procedure

To stop the engines:

1. Open throttle to 1600rpm
   Hold this for a few moments to burn out any impurities that may have collected on the spark plugs while taxiing.
2. Return throttles to 1200rpm
3. Move mixture controls to IDLE CUT OFF
4. When the engines stop firing, open the throttles
5. When the propellers stop rotating, turn all switches OFF
6. Turn the fuel selectors OFF

Engine Management

Supercharger

The P-38 is equipped with 2 exhaust driven turbo-superchargers. They are on the top surfaces of the tail booms, aft of the engine nacelles. A supercharger is like an oxygen mask to an engine at high altitudes; drastically improving performance. Superchargers increase the density of the air passing into the engine, providing enhanced performance by ensuring adequate air intake & thus an efficient fuel-air mixture for combustion.

There are no additional controls to operate the superchargers in the P-38; they are mechanically connected to the throttle and operate automatically with throttle response.

The superchargers are engaged in the final 1/3 of the throttle range (approximately 40" Manifold Pressure and above), therefore engine response is somewhat sluggish in the higher settings due to the lag of the supercharger spinning up to speed.

The P-38L is also equipped with a Turbo Supercharger regulator, which incorporates an automatic overspeed governor to prevent the turbo wheel from exceeding limits. Its operation is automatic and the pilot has no control over this.

You can hear the Superchargers in action if you listen closely!

Manifold Pressure

The P-38L is equipped with a manifold pressure regulator, which automatically controls the carburettor butterfly valve. This provides a constant manifold pressure for a given throttle setting during climb, descent and manoeuvring. Furthermore, the regulator prevents the manifold pressure from exceeding allowable limits during a dive.

Pilots do not need to compensate for altitude to maintain a consistent manifold pressure. The design of the throttle automatically maintains a consistent manifold pressure at all altitudes below the critical altitude.

Intercoolers

Due to the effects of air compression, air passing through the turbo-supercharger is heated significantly; the intercoolers cool the air before allowing it to pass through to the carburettor. The intercoolers are located on the bottom of the engine nacelles.

They intercoolers are operated manually by the pilot, with a 3-way momentary switch for each engine allowing the pilot to manually set the position of the intercoolers by holding the switch in the OPEN or CLOSE position.

The intercoolers should be used by the pilot to maintain Carb Heat within acceptable limits during high altitude flight. It has a similar functionality to the 'Carb Heat' switch seen in modern aircraft.

For more information on the engine cooling systems, please see Aircraft Cooling Systems.

Carburettor Air Filter

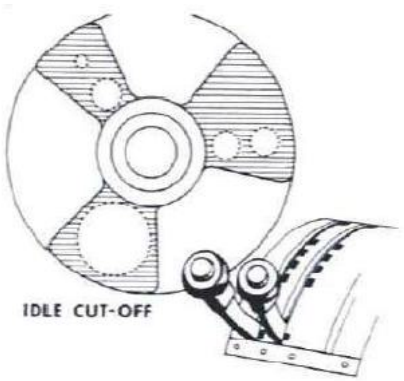
Use the carburettor air filter during dusty ground operations to prevent the engines from intaking dust or debris. The control is located next to the mixture control levers (forward to engage the filter).

Note that the air filter reduces engine performance and should therefore NOT be used in flight, once clear of the ground.

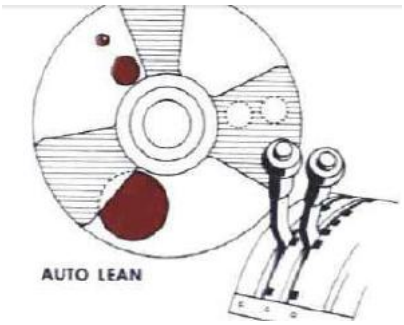
Mixture Controls

The P-38L is equipped with pressure type carburettors that maintain an automatic mixture setting at any altitude or setting. There are 4 main settings:

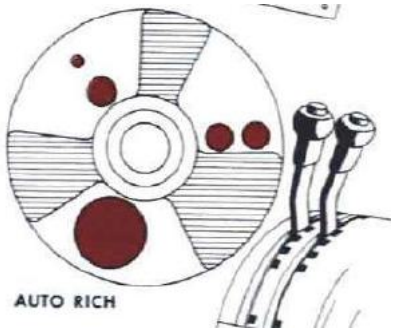
Idle Cut-off: Used for starting & stopping the engines (shuts off fuel flow)



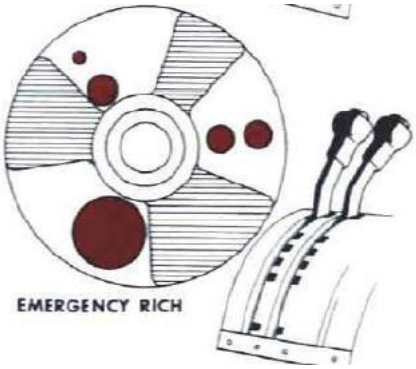
Auto Lean: For economical cruising



Auto Rich: For take-off, climb, cruising & landing.



Emergency Rich: For use when the automatic mixture feature fails



Checklists

Note: all checklists below are identical to the ones also available as handy interactive checklists found in the MSFS Toolbar.

Before Engine Start

- Parking Brake: Set
- Canopy: Closed and Locked (buffeting!)
- Fuel Selectors: Reserve
- Fuel Pumps: Off
- Throttles: Cracked
- Propellers: Full Forward
- Mixtures: Idle Cut-Off
- Carburettor Air Filter: As Required
- Prop Feathering Switches: Normal
- Altimeter: Set
- Flaps: Up
- Dive Recovery Flaps: Up
- Aileron Booster: On

Engine Start

- Battery: On
- Magnetos: Both
- Master Magneto: On
- Generators: On
- Mixtures: Full Forward
- Fuel Pumps: On
- Left Engine Primer: Hold 2 to 4 Seconds
- Right Engine Primer: Hold 2 to 4 Seconds
- Left Engine Energizer: Hold UP 5 Seconds
- Left Engine Starter: Hold UP to Start
- Right Engine Energizer: Hold DOWN 5 Seconds
- Right Engine Starter: Hold DOWN to Start

After Engine Start

- Pitot Heat: On
- Wing Lights: Bright

- Tail Lights: Bright
- Landing Light: On
- Compass Switch: On
- Coolant Shutters: Auto/Off
- Oil Shutters: Auto
- Intercooler Shutters: Open
- Parking Brake: Release

Run-up Check

- Rudder trim: 0 Degrees
- Elevator trim: 3 Degrees Pitch UP
- Fuel Pump Speed: Emergency
- Propellers: Full Forward
- Throttles: 2300 RPM
- Check both magnetos by cycling them to OFF and back to BOTH (one at a time). You should note a small drop in rpm when switching one of the mags off.
- Check Prop control by pulling back Prop Lever until a 200rpm reduction is achieved
- Restore Prop Lever to Full FWD
- Check Volt Meter: 28 Volts
- Check Ammeters: 2 x 25 Amperes
- Windows and Canopy: Shut and Locked (buffeting!)

Take Off

- Throttles: 54 MP
- Rotate: 80 MPH
- Lift-off: 100 MPH
- Landing Gear: Raise
- Throttles: 45 MP after 14 seconds
- Throttles: 35 MP after 18 seconds
- Climb Speed: 155 to 175 MPH
- Intercooler Shutters: Auto/Off
- Fuel Pump Speed: Normal
- Fuel Selectors: Drop or Wing after 15 minutes
- Fuel Pump Speed: Emergency above 10,000’

Approach

- Propellers: 2600 RPM

- Reduce Speed: 160 MPH
- Fuel Pump Speed: Emergency
- Fuel Tanks: On
- Flaps: Down

Failures & Emergency Procedures

Emergency Take Off

If the situation demands you may dispense with the usual **engine and accessories operation ground test** provided:

- The oil pressure is steady below 85 lbs sq/in.
- An increase of 10°C in oil temperature is observed since engine start.

If needed, you may use the oil dilution system to reduce oil pressure. Be sure to monitor the oil pressure while doing so, especially during your take off run and initial climb out.

Engine Failure During Take Off

A) If an engine fails during your take off roll and before you leave the ground, immediately pull both throttles to zero and apply full brakes.

B) If an engine fails after take-off but before safe single-engine speed has been reached (120 mph), attempt to land straight ahead. If it's not possible to land on a runway, retract the landing gear and prepare for a belly landing.

C) If an engine fails after take-off and the safe single-engine speed has been reached (120 mph):

1. Reduce power on the working engine just enough to obtain control. Full rudder should be able to counter the single engine induced yaw.
2. Release any external tanks.
3. Trim rudder.
4. Set the dead engine's mixture to IDLE CUT-OFF.
5. Feather the propeller of the dead engine.
6. Turn off the fuel pump of the dead engine.
7. Circle to a field to land, in the direction of the **operating engine only.**

Engine Failure – Prop Feathering

During flight, should one or both engines fail, it is sometimes necessary to feather the propeller to reduce drag and achieve optimal glide performance.

Feathering the engine is actually very easy, with only 1 step:

1. Lift the switch-guard and set the Feather Switch to ON

Th unfeather the engine:

1. Set Feather Switch to OFF, lower switch-guard
2. Increase Prop RPM lever forward to required position.

What is more difficult is determining when the prop should be feathered. Generally, the prop should only be feathered if:

1. The affected engine has failed
2. Airspeed and/or altitude is low, with little or no chance to restart the engine

The red lamps above the feather switch will illuminate if their respective prop should be feathered. If you see this lamp illuminate, get ready to feather that engine!

In many cases, it may be possible to restart the engine in-flight. See the following section for details on how you can do that.

Restarting an Engine in-flight

To restart an engine in-flight, pilots have the option to use both a windmilling start as well as a powered start-up (as performed on the ground). Since the powered engine start is the same as the ground procedure, it will not be discussed here.

A Windmilling engine start is best for an in-flight engine restart, as it reliably makes use of the aircrafts speed to turn and crank the engines. It should be performed as follows:

1. Fuel Booster Pump ON, mode set to EMERGENCY
2. Prop rpm set FULL FORWARD
3. Mixture to AUTO-RICH
4. Magnetos – BOTH , Master Magneto – ON

The engine will then fire once the airflow spins the propeller up to a sufficient RPM. Engine combustion state can be confirmed by advancing the throttle and monitoring the response in manifold pressure.

If there is no response in manifold pressure, even in level flight, or the engines failed to start, pilots should attempt another windmill start by increasing airspeed if sufficient altitude is available. Otherwise, Pilots can attempt to use a powered engine-start via the energizers and

starter. Alternatively, if the engine cannot be started, the pilot should feather the affected engine and glide to the nearest emergency landing zone.

Single Engine Flight

When flying with only a single engine in an emergency, pilots should make a decision to either feather the prop or attempt to restart the engine. Once the decision has been made, pilots should follow the respective procedures outlined above.

If the engine cannot be started & has been successfully feathered, pilots should continue to fly the aircraft with only one engine, observing the following:

- Use as little power as is necessary to maintain desired speed/altitude. Do not use more power than you can compensate for with the rudder
- Set rudder trim to relieve rudder pressure
- Set Generator OFF on the dead engine and check generator readings. The aircraft can maintain sufficient electrical power with a single generator.
- Monitor fuel levels

P-38 pilots usually began training single engine flight after only 10 hours in the airframe!

When practicing single engine flight, pilots should simply pull the throttle completely rearward on one engine to simulate a 'dead' engine. This allows pilots a quick escape in case of an emergency.

Specifications

General Data

Max Gross Weight	21,600 lbs / 9,798 kg
Empty Weight	12,800 lbs / 5,806 kg
CG Limits	20% - 32% of MAC
Pax	1 pilot
Total Fuel Capacity	746 US gal / 2823 litre
Wing Main Tanks (2x)	186 US gal / 704 litre
Wing Tip Tanks (2x)	110 US gal / 416 litre
Wing Auxiliary Tanks (2x)	120 US gal / 454 litre
External Drop Tanks (2x)	330 US gal / 1249 litre
Wingspan	52 feet / 15.85 metre
Wing area	328.5 sqf / 30.5 sqm
Length	37.8 feet / 11.5 metre
Trim availability	Pitch and Rudder
Ailerons	Hydraulically boosted
Flaps	8° (manoeuvre) 20° (approach) 40° (landing)
Dive Recovery Flaps	35°
G Limits	+6.0 / -3.5
Critical Altitude	25,800 feet
Service Ceiling	40,000 feet

Propulsion

Powerplant

Brand	Allison
Models	V-1710-111 (right hand rotation) V-1710-113 (left hand rotation)
Horsepower	1530 x 2 (3060 total)
Displacement	1710 In2 / 28 litre
Cylinders	12
Turbo	Installed
Supercharger	Installed
Cooling	Liquid
Fuel System	Stromberg Injection Carburettor
Negative G	Capable

Airscrew

Brand	Curtiss Electric
Model	88996-18
Blades	3
Diameter	11.5 feet / 3.5 metre
Type	Constant speed
Max RPM	3,000
Feathering	Available
Beta min	10.0°
Beta cruise	35.0°
Beta max	57.7°
Beta feather	87.5°

Performance

V Speeds

Code	Description	Speed (IAS)	
		mph	knots
VBG	Best power-off glide speed		
VC	Design cruise speed	275	239
VD	Design diving speed	445	385
VNE	Never exceed speed	420	365
VFE	Max flaps extended	150 (40°) 250 (20°) 250 (8°)	130 (40°) 217 (20°) 217 (8°)
VLO	Max gear extended	175	152
VNO	Max speed normal operations	290	252
VR	Rotation speed	80	70
VREF	Threshold cross speed	110	96
VS	Stall speed flaps up	94	82
VS0	Stall speed full flaps	69	60
VTO	Take off speed	94	82
VX	Best angle of climb speed	160	139
VY	Best rate of climb speed	160	139

Reference Power Settings

Setting	MP	RPM
War Emergency Power	60	3,000
Military Power / Take off	54	3,000
Max Continuous Cruise / Normal Rated Power	44	2,600
Normal Cruise	30	2,300
Economy Cruise	30	1,500

Max Speeds

Setting	Altitude (feet)	HP	Speed (TAS)	
			mph	knots
War Emergency Power	Sea level	1,530	342	297
War Emergency Power	26,000	1,495	416	361
Military Power	Sea level	1,395	331	288
Military Power	26,200	1,385	408	355
Normal Rated Power	Sea level	1,110	302	262
Normal Rated Power	32,200	1,138	400	348

Fuel Burn

MP	RPM	HP	Consumption per hour per engine	
			US Gal	Litre
60	3,000	1,600	180	681
54	3,000	1,425	167	632
44	2,600	1,100	113	428
30	2,000	620	48	182
28	1,600	425	33	125

Roll Rates

Altitude (feet)	Speed in knots (IAS)	Degrees per second	
		Ailerons only	With rudder added
10,000	174	68°	104°
10,000	261	90°	130°
10,000	348	97°	139°

Unit Conversion Tables

Note: for readability, some number series are rounded.

Distance

Nautical Miles (nm)	Miles (m)	Kilometres (km)
50	58	93
100	115	185
200	230	370
300	345	556
400	460	741
500	575	926
750	863	1389
1,000	1151	1852

Speed

Knots (kts)	Miles per hour (mph)	Kilometres per hours (kph)
50	58	93
100	115	185
150	173	278
200	230	370
250	288	463
300	345	556
350	403	648
400	460	741

Intake Pressure

Manifold Pressure (MP, inHg)	Boost	Atmospheric Pressure (ATA)
United States	*England*	*Germany (MP / 28.958)*
10	-9.8	0.35
20	-4.9	0.69
(29.92) 30	+0.0	1.04
40	+4.9	1.38
45	+7.4	1.55
50	+9.8	1.66
55	+12.3	1.73
60	+14.7	2.07

Instrument Camera Views

To aid in cockpit instrument accessibility, 9 instrument camera views have been setup. These are accessible through various keybinds (“Toggle Instrument View 1-9").

Changelogs

Current version: v1.1.0

1.1.0

We are proud to introduce Update 1.1.0 which is a major update that includes a complete rewrite of code to ensure Xbox compatibility, improved FPS and superior systems simulation, as well as the inclusion of the much-anticipated new propeller physics simulation. It also includes various sound, art and tablet improvements and fixes.

Art

- New propeller discs and start-up animation
- Oxygen gauge reflection fixed
- Icing added to exterior model
- Intercooler flaps added (bottom shutter under each engine)
- Fixed several multiplayer artifacts (gear animations, canopy open/close animations)
- New canopy rip-off animation sequence with a rattling canopy to warn you it's not locked
- A marker line has been added at the elevator trim centre
- Elevator trim disc improved
- Nearly all gauge faces have been redesigned to be a very close match with the original gauges (also easier to read now)
- Yoke now always shows in external view

Cockpit

- Both the MSFS Toolbar menu checklists and the tablet checklists have been overhauled and are more comprehensive
- Checklist added for the Runup phase
- All 3 compasses work now exactly as they do in reality. An overview:
    - Directional Gyro (most right) depends on a running engine for vacuum (always worked)
    - Standby Magnetic Compass (left top) (always worked)
    - Remote Indicating Compass (left bottom) now depends on electricity (use compass switch)
    - Compass adjustments knobs now all turn their respective compass 2x faster
- Aileron booster (bottom right, below the flap handle) now can be operated (saves hydraulics during 1 engine operations), this will result in slower roll rates at higher speeds
- Hydraulic gauge responds to aileron input (with aileron booster on), flaps and gear
- Cross Suction scenarios now working as expected:
    - Simultaneous left and right Cross Suction cuts fuel to both engines
    - Cross Suction from a wingtip will cut fuel to the cross feeding side
- Fuel pump on without engines running now shows pressure (but the mixture lever needs to be forward)
- Electrical systems have been overhauled with authentic battery and generator power levels
- All electrical systems have corrected wattage and amp defined, from heavy starter systems to simple light bulbs
- Oxygen system redesigned
- Flap feather lights now work as per the original aircraft: e.g. if a prop is feathered, and you apply full rudder to compensate for yaw, the feathered light will turn on
- Transponder Code defaults to 1200
- Wing Tip low fuel lights now turn on when there is 10 Gal left (used to be 5 Gal), which corresponds to about 5 min of fuel

- Panel and Glareshield lights rebalanced, glareshield also affects the GNS430 buttons (but not the screen, this seems unsupported in MSFS at the moment)
- Closing a prop feather guard will now unfeather the prop
- Fixed wing and taillights, selection of bright or dim modes now works
- Fuel gauges require volts
- Ammeters only work when the respective engine is running, and the generator is switched on

Engines

- Retuned take-off, climb and cruise performance
- Start-up process is now authentic, meaning you have to hold the START switch first and listen for the flywheel to spool up (about 5 seconds), after which you may hold the ENGAGE switch to couple the propeller.
- A 2 to 4 second prime pre-start-up is now required. When over primed, you need to open the throttle to let fumes escape and wait a few minutes.
- Advanced thermodynamics with custom modelling of oil, coolant, and intercooler systems
- All cooling systems have working automatic shutters, or can be controlled manually as per the original aircraft
- Engine stresses, which build up over time when pushed too much
- Carburettor icing can occur when you fly through a cloud and low MP and are within a 4C (+/- 7C) temperature range
- Priming now requires at least 4Psi of fuel pressure (check gauges)
- The turbo's steel structure will start glowing when hot (visible in low light conditions)

Sounds

- Rebalanced a few sounds, engine volume etc
- Canopy sounds restored
- Gear movement sounds tweaked, gear bay close sound added
- Switch sound volume upped
- Ground roll build-up improved
- Right engine stutter/delay fixed

Flight Model

- Modern propeller physics
- Open window buffeting (only fly with windows closed)
- Overall improvements in various areas, including overall flight behaviour, landing and better ground handling
- Drag added for all external components that are under your control (all cooling shutters, canopy top and windows)
- Compressibility stalls now coded for a better approximation of the effect
- Dive flaps lift and drag both increased: more lift so you can dive out within 10,000ft, more drag so you keep a good speed when going down at 45deg with minimal thrust.

Tablet

- Live Data page now reflects correct temperatures
- Live Data page now displays drag for individual components (Oil Cooler, Radiator, Intercooler, Drop tanks and Canopy)
- Live Data page displays engine priming status (Under primed, Primed, Over primed)
- Newly designed Auto Pilot, now working well under all scenarios
- Select the Default MSFS pilot if you like instead of the WWII themed pilot
- Dynamic Engine Stresses (previously Engine Damage)
- Dynamic Engine Stresses console, showing where and how much the stresses are

Miscellaneous

- Heavy code rewriting and optimization of almost the entire aircraft, giving you a deeper simulation while enjoying more FPS
- All flight start scenarios have been correctly pre-configured (start on Apron, Runway, Cruise, etc)
- All flights start with full tanks but without drop tanks mounted by default

1.0.3

This update mainly addresses the left engine issue, but also has a few other fixes and improvements.

- Fixed CAT issue causing issues with the left engine.
- Improved VR camera setup
- Fixed spoilers not deploying in the air
- Added Open Canopy simvar to support hardware users

1.0.2

Update 1.0.2 focuses on fixing small bugs, improving sound, thermodynamics & the FlyingIron Tablet.

Art:

- Removed SU7 compass "sticker"
- Fixed pedal animation
- VR Yoke support
- External tank rotation fixed
- Fixed attitude indicator plane height
- Animated bomb release buttons (for external tank jettison)

Sound:

- Overhauled AI & multiplayer sound

Systems:

- Custom CAT modelling (Carb Air Temp)
- Working Yoke drop tank release buttons
- AP keybinds and hardware support
- Stats page added to the tablet
- Added custom spotlight for cabin (less bright and Tungsten temperature)
- Added windshield deice capabilities to the Cabin Heat levers
- Fixed various SU7 bugs
- Improved checklists
- VR Camera fix

Flight Model:

- Refinements based on P38 pilot feedback to engine RPM/MP
- Various improvements on propeller physics
- Take-off roll a bit longer now, again matching real take-off timings perfectly.
- Various improvements on elevator incidence and lift
- Decreased wheel brake power after propeller rebalancing for more realism
- Updated FM to take advantage of SU6
- Various improvements in stability, tuning and overall feel

1.0.1

Update 1.0.1 includes various fixes and improvements in systems, flight model, art and the tablet.

Systems:

- Tablet and Radio renamed to prevent conflicts with other mods
- Thermodynamics model improved
- Oxygen Gauge + Logic Fixed
- Oil Cooler 'Auto' Mode fixed

FM:

- Improved ground handling, most notably nosewheel steering
- Improved control in runway crosswind conditions (weathervaning effect)
- Improved landing characteristics
- Added Canopy drag
- Small tweaks to lift

Art:

- Added Fuel Selector Decals
- Added Aircraft Placard
- Added more polygons to dash for better curvature
- Fixed reversed decals
- Fixed Elevator animation
- Added landing light 3d model
- Added stow & wing fuel level test tooltips
- Added Cockpit light bulb
- Fixed Right Wing Light colour

Tablet:

- Added loadout manager
- Added pushback service
- Fixed Autopilot
- Added new Tablet click spot*
- Remembers open page when stowed, will activate again upon unstowing.
- A lot more data on the Live Data page as well as more Units of Measurement
- Settings page now has brightness control
- Performance optimizations
- Checklist page: improved Engine Startup
- V-Speed page: added max speed with drop tanks
- Adjusted fuel consumption and range data

* The additional click spot can be accessed on the port side, just aft of the Outer Wing Fuel Warning panel.

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https://discord.gg/ex3tKj

Thank you for your purchase & supporting FlyingIron Simulations; we hope you thoroughly enjoy flying this module, as much as we enjoyed making it.

Warmest Regards,
Dan, Alex & Raimond (GotGravel)
FlyingIron Simulations