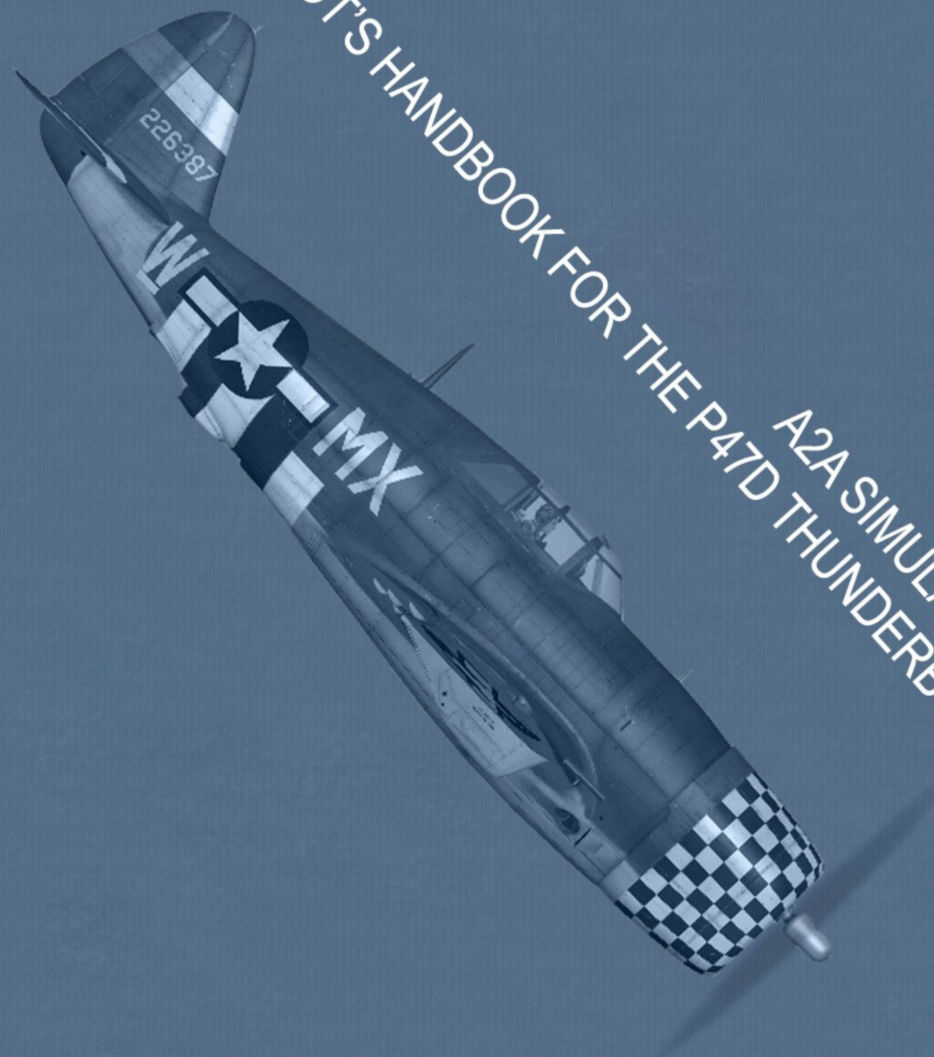
RESTRICTED

PILOT'S HANDBOOK FOR THE P47D THUNDERBOLT

A2A SIMULATIONS



P-47

RESTRICTED

A2A MANUAL No. 44-1

Wings of Power 3: P-47 Razorback
Pilot's Handbook

PILOT'S HANDBOOK
Table of Contents

CHAPTER 1: **Introduction**

Designer's Notes
Wings of Power 3: P-47 Razorback Features
Wings of Power Overview
P-47 History

CHAPTER 2: **Quick Start Guide**

System Requirements
Installation
Realism Settings
Custom Key Mappings
Custom Ways To Control Turbo
Quick Flying Tips

CHAPTER 3: **Razorback Variants**

P-47D-20-RA
- 378th FS, 362nd FG

P-47D-22-RE
- 63rd FS
- Red Tail Tuskegee
- MkI, RAF No 30 Squadron
- "Miss Behave"
- “Black Sheep”

P-47D-23-RA
- "Miss Lorraine"
- 341st FS, 348th FG

CHAPTER 4: **General Description**

Model P-47D23 Specifications
Main External Components

CHAPTER 5: **Cockpit**
- Cockpit Front
- Cockpit Left
- Electrical Panel (Cockpit Left)
- Cockpit Right
- Flight Controls
  - Surface Controls
  - Control Surface Lock
  - Trim Tabs
  - Wing Flap Control
  - Landing Gear Control
  - Parking Brake
  - Tailwheel Lock
- Heating and Ventilation Controls
- Window Defogging
- Throttle Quadrant
  - Throttle
  - Mixture Control
  - Propeller Control
  - Turbo Boost
  - Water Injection (ADI)
- Water Injection System
  - Water Injection System Controls
- Engine Instruments
  - Manifold Pressure
  - Tachometer
  - Cylinder Head Temperature (CHT)
  - Cowl Flaps
  - Fuel Pressure Gauge
  - Fuel Pressure Warning Light
  - Carburetor Temperature (CAT)
  - Oil Pressure
  - Oil Temperature
- The Induction System
  - The Turbo-Supercharger
  - Turbo Warning Light
  - Turbo-Supercharger Over-Boost Limiting System
  - Intercoolers
  - Intercooler Flaps
- Engine Starting Controls
  - Magnetos
  - Primer

Starter
Powerplant
Pilots

CHAPTER 6: **Propellers**
Curtiss Electric C542S
Hamilton Standard Hydromatic
Curtiss Electric C642S-B40 Paddle-type

CHAPTER 7: **Oil System**
Engine Oil System
Overview
Oil Coolers
Oil Tank Pendulum
Oil Dilution Controls

CHAPTER 8: **Fuel System**
Internal Tanks
Drop Tanks
Switching Tanks
Fuel Booster Pump
Fuel Consumption

CHAPTER 9: **Hydraulic System**
General Description
Emergency Hand Pump

CHAPTER 10: **Electrical System**
DC Power System
Battery
Radios
VHF Radio
Detrola
Lighting

CHAPTER 11: **Landing Gear**
Landing Gear Operation
Failure of Engine-Driven Hydraulic Pump

CHAPTER 12**:** **Landing Flaps**
Landing Flaps Operation
Failure of Engine-Driven Pump
Flaps Indicator

CHAPTER 13: **Oxygen**
Operation of Oxygen Equipment
Preflight Check
In Flight
After Flight

CHAPTER 14: **Normal Operations Checklists**
General Information - P-47D-20/22
Weights and Loading
Aircraft Limitations
Engine Management
Cockpit Check - Fuel Supply and Fuel Management
Mixture Control
Cockpit Check - Controls
Engine Starting
Pre-Takeoff Check
Taxi and Takeoff
After Takeoff Check
Climb
Turbo Boost Operation During Climb and Flight
Climb Performance to 25,000 feet (14,500 lbs.)
Cruise Settings
Cruise Control Schedule (14,500 lbs.)
Landing
Engine Limitations and Characteristics
Flight Characteristics
Stalls
Spins
Permissible Acrobatics
Icing
Engine Failure During Takeoff
Engine Failure During Flight

CHAPTER 15: **Stalls**
- What Is A Stall?
- Stalling the Razorback
- Stall Characteristics
- Stall Warning
- In the Stall
- Stall Recovery
- Practice Stalls
- Spins
- Flight Controls

CHAPTER 16: **Level Flight Characteristics**
- General Characteristics
- Slow Flying
- Cruising Flight
- Diving

CHAPTER 17: **2D Panels**
- Pilot's Notes (Shift-2)
- Controls (Shift-3)
- Payload and Fuel Manager (Shift-4)
- Pilot's Map (Shift-5)
- Radios (Shift-6)
- Maintenance Hangar (Shift-7)
- Joystick Mapping Utility (Accessed Outside FSX)

Credits
Thank you, from A2A Simulations

Chapter 1: Introduction

DESIGNER'S NOTES:

Well we finally released our beloved P-47 "Razorback." Our goal was to not only create the most realistic P-47 Razorback, but the most amazing flying experience. This product furthers our commitment to making products that lead to multiple new simulation technologies. Once you fly this aircraft, we think you will agree that it is unlike any aircraft you have flown in Microsoft Flight Simulator.

This P-47 Razorback was carefully researched with as much "hands on" experience as possible, including visiting real P-47's, running it up, recording the actual engine running inside and out, interviewing pilots, studying the flight manuals, and documenting the plane. Even though this is a single-engined plane, it's packed with advanced systems.

We believe this arduous process of creating an A2A Simulations aircraft will be appreciated by both history buffs, pilots, and anyone who simply loves aircraft. Our aircraft are built 'by the book' and performance is certified within Microsoft Flight Simulator X. Ultimately, it has to pass the final test by our own real or former pilots. Hundreds of hours were spent with our group of specialists and technical advisers to ensure the best and most thorough simulation possible was given to you, our customer.

The more you fly this aircraft, the more you discover.

We are passionate about our work and are proud to be the makers of Wings of Power. We think you will have many hours of enjoyment with it. Please take a look at some of the new features listed below and take the time to experience every one of them in the simulator. We feel confident that you, like us, will agree that the A2A Wings of Power Razorback is indeed an amazing aircraft.

A2A simulations

The Air to Air Simulations Team

Wings of Power 3: P-47 Razorback Features

Big, powerful, fast, and amazing high altitude performance.

The famously rugged 2,300 horsepower Pratt & Whitney R-2800.

Fly high and fast above the bad weather and cover the ground at over 400 mph.

As with every A2A aircraft, it is **gorgeously constructed**, inside and out, down to the last rivet.

Designed and built to be flown "**By The Book.**"

Custom Cockpit Systems and Gauges for the ultimate in realism taken far beyond what is available by default.

Visual **Real-Time Load Manager,** with the ability to load external stores, including fuel tanks, bombs, and rockets with authentic drag and weight.

Extensive re-working and streamlining of all coding. We now have a single code base for both SP2 and Acceleration, so **both SP2 and Acceleration will yield 100% full features.**

Naturally animated pilot.

3D Lights 'M' (built directly into the model) with under-wing landing light than can be turned on, deployed, and retracted and fully functional recognition lights.

Pure3D Instrumentation now with **natural physics**.

...Gauges have real physics including startup vibrations and airframe jolts.

...Natural 3D appearance with exceptional performance.

...Smooth movements.

Sound **engineered by A2A sound professionals.**

Oil pressure system models **oil viscosity** (oil thickness).

Authentically modeled **hydraulic system.**

In cockpit **pilot's map** for handy in-flight navigation.

Auto-Mixture that actually performs as intended. Now you can set for “auto-rich” or "auto-lean" and the aircraft fuel-to-air ratio will be automatically determined and set by the carburetor based upon various factors, such as altitude.

Three different models, each with a different propeller. Early D20 variant has the smallest propeller while the D22 and D23 have larger Curtiss or Hamilton Standard types.

Real supercharger and turbocharger modeled with accurate behavior.

Fuel delivery system simulated.

All models include A2A **specialized materials with authentic metal.**

Pilot's Notes pop-up 2D panel keeps important information easily available.

Wings of Power Overview

General Operational Information and Guidelines

The following information is provided to help pilots become familiar with the Wings of Power series of aircraft for Microsoft Flight Simulator X. These aircraft are materially different in terms of the flight modeling than what is commonly available. Be aware that what is generally accepted as standard performance or aircraft behavior, in many cases will not apply to these aircraft.

Why? Because Wings of Power aircraft are flight tested and tuned until they reflect the proper results throughout the entire performance envelope.

Flight simulation that goes beyond maximum performance figures

Many times, an aircraft is considered to fly accurately if it reproduces a handful of specific performance figures (top speed, max climb rate, stall speeds, etc.). These figures really only represent how an aircraft is performing at a single point in time. We push through these numbers and authentically simulate all flight through an almost unlimited amount of conditions.

As the pilot in command, you can take a Wings of Power aircraft to any given altitude, choose your own power setting (adjust the throttle and watch the manifold pressure / boost gauge), adjust your prop speed and witness your aircraft climb and cruise exactly as it did in real life. You will even experience accurate fuel consumption rates, engine temps, and stall characteristics. You can plan realistic and even historic flights based on your aircraft weight, and calculate cruise speeds, distances traveled, and even authentic figures like “distance-to-altitude” shown in the manuals. These figures are not just estimated, they are finely tuned and put through a rigorous and exhaustive testing process by pilots.

Every Wings of Power aircraft is test flown by the book with hand-drawn charts and passes a rigorous testing procedure before it is released to beta testers. Among our testers are **highly experienced real-world pilots** who continue to push the aircraft through its paces. We encourage people to go out and buy the actual pilot training manuals for these aircraft and use them. When it comes to unique stall characteristics and other aspects not documented in the manuals, we refer to actual pilot flight-test reports and our own pilot interviews. The end result is from a hard working team effort. The bottom line is, for the first time ever, you can experience these thoroughbred aircraft today for everything that it truly was and still is.

FULL POWER does not mean FULL THROTTLE

It is common in the flight simulation industry to accept that the maximum throttle setting (100 percent throttle) should reflect the published takeoff power of piston-engined aircraft. For example, the published takeoff power setting for the B-24D Liberator is 49" of manifold pressure and 2700 RPM. A standard FSX model of the B24 would expect the pilot to simply shove the throttles and propeller controls to the stop and head for the wild blue yonder. This is just not the way things are in real life or with Wings of Power.

In reality, a real pilot would never under any circumstances shove the throttle all the way to the stop unless war emergency power was required and even in this case it would almost never mean throwing both boost and throttle to the extreme forward position. On takeoff, a pilot "walks" the throttle carefully but briskly forward until the proper takeoff power setting is reached. This setting is read on the manifold pressure gauges. Use the boost lever with extreme care, especially at low altitudes.

How long does it take to get airborne?

The takeoff distances are tested and compared against the performance tables for that airplane's respective pilot's training manual. However, to achieve these figures, the airplane must be flown exactly according to the procedure in the checklist. Using full throttle, incorrect flap positions, incorrect takeoff weights, erroneous trim settings, or improper liftoff technique will materially affect the takeoff distance.

The distances provided are the distances it takes to clear a 50' obstacle, which is a common pilot training procedure. These can be reduced by about 1/3 by using full war emergency power and up to 1/2 flaps on most airplanes. See the checklist for details.

The climb is a carefully executed process

The rate of climb for piston aircraft is normally greatest at sea level and falls steadily as the aircraft gains altitude. The weight of the aircraft, the power setting, and the climbing speed are absolutely critical in obtaining proper and accurate climb performance and if any of these parameters change, the time and distance to climb will also change. For most aircraft, there are two climb power settings: rated power and desired climbing power. The lower power setting is usually reserved for lower aircraft weights and in some cases is not desirable due to fuel economy or engine cooling reasons. It can easily be seen that a simple figure published in a book cannot begin to accurately indicate an aircraft's actual ability to climb.

An engine can run out of breath

Engines, like people, need air to breath. The higher the altitude, the thinner the air. The solution is supercharging or turbocharging, which is basically a fan in the induction system that forces more air into the engine when needed, so it can get the air it needs to breath. For turbochargers, a turbine wheel (fan) spins, forcing more air into the engine. The thinner the air, the less resistance on the turbine, which means it has to spin faster to maintain the same pressure than at a lower altitude. The critical altitude, for turbocharged aircraft, is the altitude at which maximum power can no longer be maintained because the air is so thin, the turbine can't spin fast enough to maintain the desired pressure. From this "critical altitude," the higher the aircraft climbs, the less power it can produce (in reality and now in these aircraft, above these altitudes the turbine over-speeds if excessive boost is applied). Depending on the type of control system – electronic or oil type – the critical altitude usually falls somewhere between 26,000 and 30,000 feet. For supercharged aircraft, the critical altitude is the altitude beyond which the supercharger can no longer produce the maximum rated manifold pressure.

Flaps improve slow flight characteristics

It is common that simulated aircraft are built with drastically exaggerated flap drag values, including the stock aircraft. Therefore, many virtual pilots habitually fly the landing approach far too high and have a much greater rate of descent than is actually specified for a particular aircraft. These very high flap drag values allow pilots to get away with unrealistically steep, high approaches. This is not the case with Wings of Power aircraft.

This can easily be demonstrated by setting the aircraft up on a simulated final approach at a specified landing weight. Thrust, drag, and weight are in the proper equilibrium as specified. The same is true for all Wings of Power aircraft, which can be tested in the same way. The bottom line is that flaps are not air brakes; these aircraft need to be flown at the proper speeds and power settings or landings are going to be very challenging!

To obtain ultimate realism, fly the Wings of Power aircraft by the numbers using the information given in each aircraft's checklist. Even better, go out and buy a copy of the aircraft's actual flight manual and use that to fly the plane. That's what we did.

P-47 History

Affectionately known as “The Jug,” the P-47 Thunderbolt is as big as the American Spirit and holds a unique honor in the ranks of World War II fighters. Ironically, the original concept was born in Russia and can be seen by its rugged and hearty design. Like a gentle giant, the P-47 handles with grace but packs an enormous punch. This plane was much heavier and bulkier than other fighter planes of its day, outweighing aircraft like the Fw 190 by several thousand pounds.

Equipped with a large, powerful radial engine, it looked as tough as it was. However, when British pilots first saw the P-47, it was often mocked due to its size. The light, maneuverable Spitfire could get on a P-47’s tail with ease in test trials. What they didn’t know at that time was the P-47 was a different type of fighter and the battles were to be fought at higher altitude where the air is thin, using high-energy tactics. Both the British and the Germans soon found out that in the right hands, the P-47 was lethal.

Down low, the P-47 lumbers along, but up high is where it lives and breathes. While it could not turn with Axis fighters, such as the Fw 190 and Me 109, it could outdive both of these and had a zoom-climb capability that was amazing. This zoom-climb was used to good advantage; it was said that if a P-47 pilot met an enemy Focke-Wulf at 25,000 feet and wanted to out-climb him to 30,000 feet, the P-47 could dive to 20,000, zoom to 30,000, and be waiting for the enemy.

A quick burst of the eight Browning .50 caliber machine guns is powerful enough to shred a fighter, which was essential for a properly executed “boom and zoom” attack. Being tasked to protect the B17 and B24 heavy bombers up high and with their ruggedness and power, the P-47 performed its job with great capability.

Built around a massive Pratt & Whitney R-2800 radial engine, the “Jug” was tough, powerful, and fast. The Wings of Power P-47 captures the beauty of the sound, function, and feel of the real P-47 like no other.

Chapter 2: Quick Start Guide

Chances are, if you are reading this manual, you have properly installed the A2A Wings of Power P-47 Razorback. However, in the interest of customer support, here is a brief description of the setup process, system requirements, and a quick start guide to get you up quickly and efficiently in your new aircraft.

System Requirements

The A2A Simulations Wings of Power Razorback requires the following to run:

REQUIRES LICENSED COPY OF MICROSOFT FLIGHT SIMULATOR X

SERVICE PACK 2 (SP2) REQUIRED
(Note, while the A2A Wings of Power Razorback may work with SP1 or earlier, many of the features may not work correctly, if at all. We cannot attest to the accuracy of the flight model or aircraft systems under such conditions, as it was built using the SP2 SDK. **Only Service Pack 2 is required. The Acceleration expansion pack is fully supported but is NOT REQUIRED.**)

OPERATING SYSTEM:
Windows XP SP2
Windows Vista

PROCESSOR:
2.0 GHz single core processor (3.0GHz and/or multiple core processor or better recommended)

HARD DRIVE:
250MB of hard drive space or better

VIDEO CARD:
DirectX 9 compliant video card with at least 128 MB video ram (512 MB or more recommended)

OTHER:
DirectX 9 hardware compatibility and audio card with speakers and/or headphones

Installation

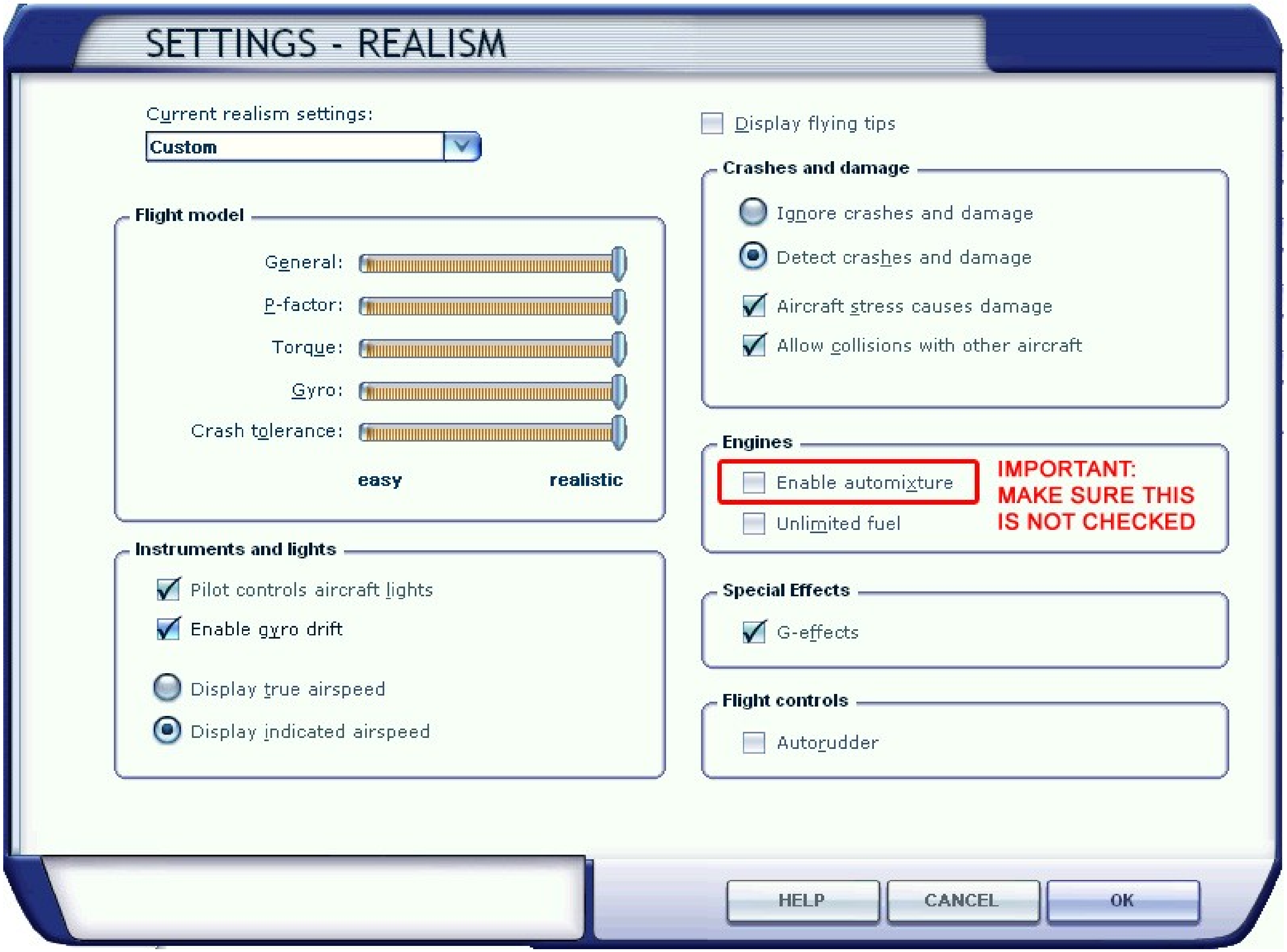
Included in your downloaded zipped (.zip) file, which you should have been given a link to download after purchase, is an executable (.exe) file which, when accessed, contains the automatic installer for the software.

To install, double click on the executable and follow the steps provided in the installer software. Once complete, you will be prompted that installation is finished.

Realism Settings

The A2A Simulations Wings of Power Razorback was built to a very high degree of realism and accuracy. Because of this, it was developed using the highest realism settings available in Microsoft Flight Simulator X.

The following settings are recommended to provide the most accurate depiction of the flight model. Without these settings, certain features may not work correctly and the flight model will not perform accurately. The figure below depicts the recommended realism settings for the A2A Wings of Power P-47 Razorback.


SETTINGS - REALISM
Current realism settings:
Custom
Display flying tips
Flight model
General:
P-factor:
Torque:
Gyro:
Crash tolerance:
easy
realistic
Crashes and damage
Ignore crashes and damage
Detect crashes and damage
Aircraft stress causes damage
Allow collisions with other aircraft
Engines
Enable automixture
Unlimited fuel
IMPORTANT: MAKE SURE THIS IS NOT CHECKED
Instruments and lights
Pilot controls aircraft lights
Enable gyro drift
Display true airspeed
Display indicated airspeed
Special Effects
G-effects
Flight controls
Autorudder
HELP
CANCEL
OK

FLIGHT MODEL. To achieve the highest degree of realism, move all sliders to the right. The model was developed in this manner, thus we cannot attest to the accuracy of the model if these sliders are not set as shown above. The only exception would be "Crash tolerance."

INSTRUMENTS AND LIGHTS. Enable "Pilot controls aircraft lights" as the name implies for proper control of lighting. Check "Enable gyro drift" to provide realistic inaccuracies which occur in gyro compasses over time.

"Display indicated airspeed" should be checked to provide a more realistic simulation of the airspeed instruments.

ENGINES. Ensure "Enable auto mixture" is NOT checked. The Razorback has a fully working automatic mixture control and this will interfere with our extensively documented and modeled mixture system.

FLIGHT CONTROLS. It is recommended you have "Auto-rudder" turned off if you have a means of controlling the rudder input, either via side swivel/twist on your specific joystick or rudder pedals.

ENGINE STRESS DAMAGES ENGINE. (Acceleration Only). It is recommended you have this UNCHECKED.

CUSTOM KEY MAPPINGS

You can add keyboard shortcuts to our custom systems using the following FSX shortcuts:

P-47 Razorback	Use this in SETTINGS / CONTROLS
Turbocharger Lever (increase)	Autobrake (increase)
Turbocharger Lever (decrease)	Autobrake (decrease)
Intercooler Flaps (open)	Floats (extend)
Intercooler Flaps (close)	Floats (retract)
Oil Cooler Flaps (open)	Decision height (increase)
Oil Cooler Flaps (close)	Decision height (decrease)
ADI	Tail hook (up/down) - SP2 / Acceleration

CUSTOM WAYS TO CONTROL THE TURBO

There are 5 different ways to control the turbo. They are:

1. Shortcuts (above).
2. Lever clutch (in game, match your throttle and boost lever, then click on the link at the base of the levers).
3. 2D CONTROLS panel (Shift-3) click on the Thr < Tur to use joystick throttle axis to control turbo lever, and click on it again to use the throttle again.
4. Assign separate axis using the Joystick Mapping Utility.
5. In the cockpit, place your mouse over the control and use the mouse wheel to make tiny adjustments.

Quick Flying Tips

- **Keep your Pilot Notes up** (SHIFT -2). They will provide you with helpful information.
- To **Change Views** Press A or SHIFT + A.
- **Open your cowl flaps when running the engine on the ground** or taxiing to ensure that it does not overheat. This is especially true on very hot days (80-100° F). You can open them with the switches on the quick 2D "Controls" panel using SHIFT-3.
- **Keep the engine at or above 1,000 RPM**. Failure to do so may cause spark plug fouling. If your plugs do foul, try running the engine (you will know by the fluctuating RPM displayed on the gauge) at a higher RPM. You have a good chance of blowing them clear within a few seconds by doing so. If that doesn't work, you will have to wait a little while for them to clear properly.
- **DO NOT apply full power below 7,000 feet.**
- Operate Landing Gear (press G).
- **REDUCE POWER** after takeoff.
- You will need to hold your brakes on to prevent the aircraft from moving at idle due to the torque, but do not apply full power with wheel brakes on or the aircraft may nose over.
- DO NOT lower flaps or landing gear when going over 195mph IAS.
- On landing, raise your flaps once you touch down to settle the aircraft, pull back on the stick for additional elevator braking while you use your wheel brakes.
- Be careful with high-speed dives, as you can lose control of your aircraft if you exceed the maximum allowable speed.
- Use AUTO-RICH for TAKEOFF / CLIMB and AUTO-LEAN for CRUISE. The aircraft features a fully automatic (and realistic) working mixture system. Simply drag the mixture control for each engine near the various mixture settings and it will "snap" into place.
- For landings, take the time to line up and plan your approach. Don't use landing gear or flaps as brakes. Keep your eye on the speed at all times.
- Using a Simulation Rate higher than 4X may cause odd system behavior

Chapter 3: P-47 Razorback Variants

P-47D-20-RA

- ✓ Curtiss C542S 12ft 2in diameter propeller
- ✓ A-17 turbo regulator (allows turbo boost up to 56" manifold pressure)

P-47D-20-RA flown by Lieutenant Joe Hodges of the 378th FS, 362nd FG, Wormingford, England 1943.

P-47D-22-RE

- ✓ Propeller change: Hamilton Standard Hydromatic 24E-50-65 13 ft 1 7/8 in diameter
- ✓ A-23 turbo regulator increases possible MP boost over 56”

P-47D-22 of the 63rd FS, Boxted, England 1944.

P-47D-22, Red Tail Tuskegee Ramitelli, Italy, June 1944. Pilot, serial, and unit unknown.

Thunderbolt MkI, RAF No 30 Squadron, Burma Late 1944.

P-47D-22-RE “Miss Behave,” Flown by Lt. Robert Bosworth of the 82nd FS, 78th FG, Duxford, England November 1944.

P-47D-22-RE "Black Sheep," Flown by Lt. Jerry Wurmser of the 316th FS, 324th FG, Luneville, France March 1945.

P-47D-23-RA

- ✓ Propeller change: Curtiss Electric C642S-B40 13 ft diameter Paddle-type propeller

P-47D-23-RA "Miss Lorraine," of the 342nd FS, 348th FG, Leyte, Philippines Late 1944.

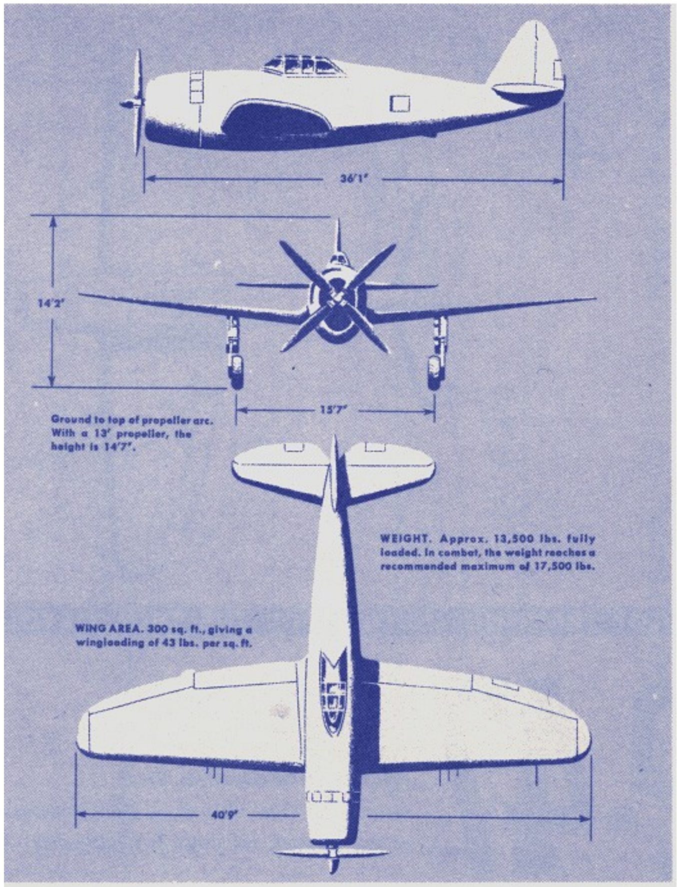
P-47D-23-RA of the 341st FS, 348th FG, Leyte, Philippines Late 1944.

Chapter 4: General Description

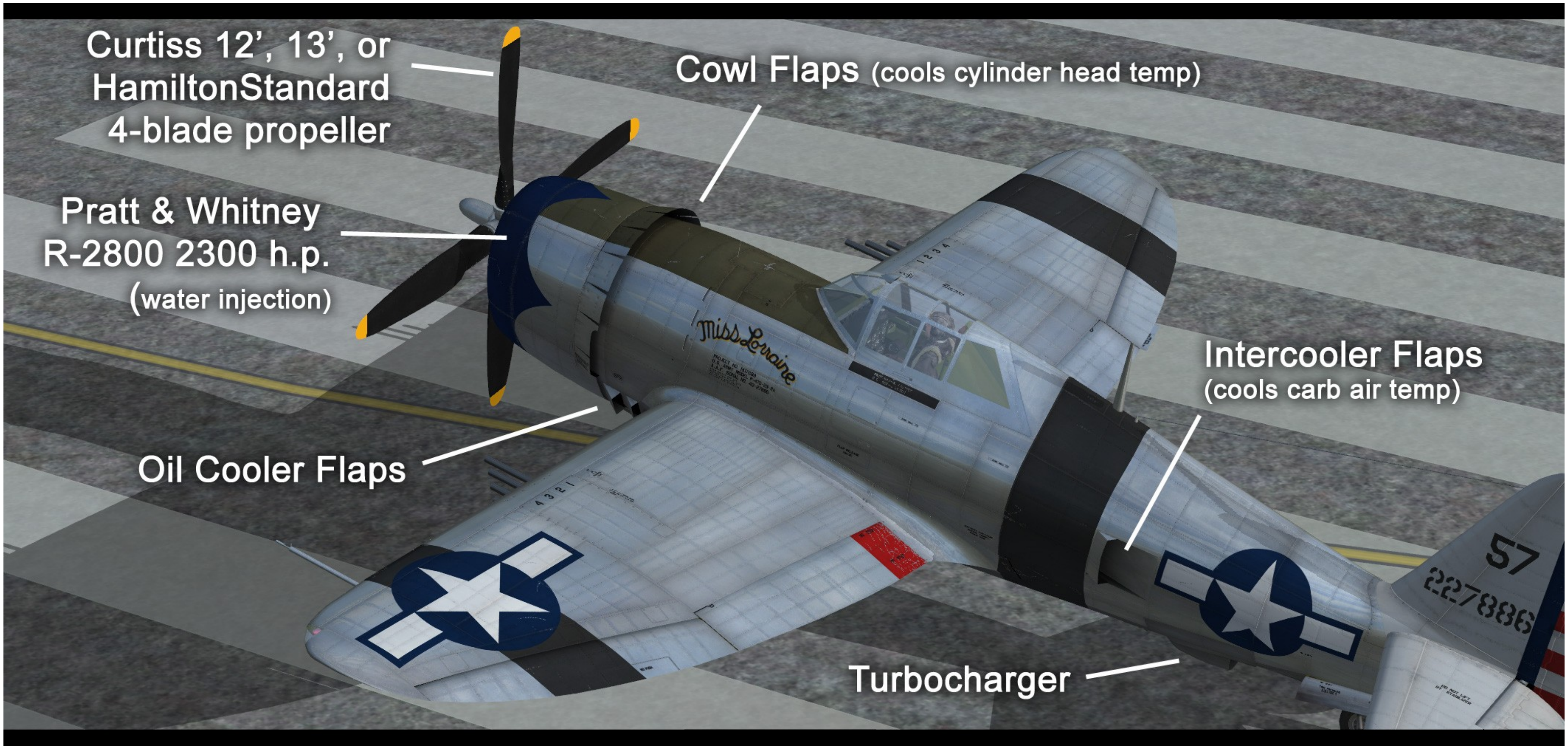
The P-47D Razorback is a low-wing, single-place, all metal mono-plane powered with a 2300-horsepower Pratt & Whitney radial engine. The P-47D was manufactured by the Republic Aviation Corporation. The engine drives a four-bladed propeller. Hydraulically operated landing gear, wing flaps, tailwheel, and brakes are provided.

Model P-47D23 Specifications

Wing Span	40 feet, 9 5/16 inches
Length	36 feet, 1 3/4 inches
Height	14 feet, 8 1/16 inches
Powerplant	2,300 horsepower (combat emergency with water injection) Pratt & Whitney R-2800-59 engine equipped with turbocharger in the tail
Weights	13,500 lbs operating weight 17,000 lbs gross weight
Service Ceiling	38,000 feet
Top Speed	426 mph at 30,000 feet
Climb	6 min to 15,000 feet
Fuel	305 gal (internal), 375 gal (external)
Range	Max 800 miles at 10,000 ft (4.2 hrs) Normal 390 miles at 25,000 ft

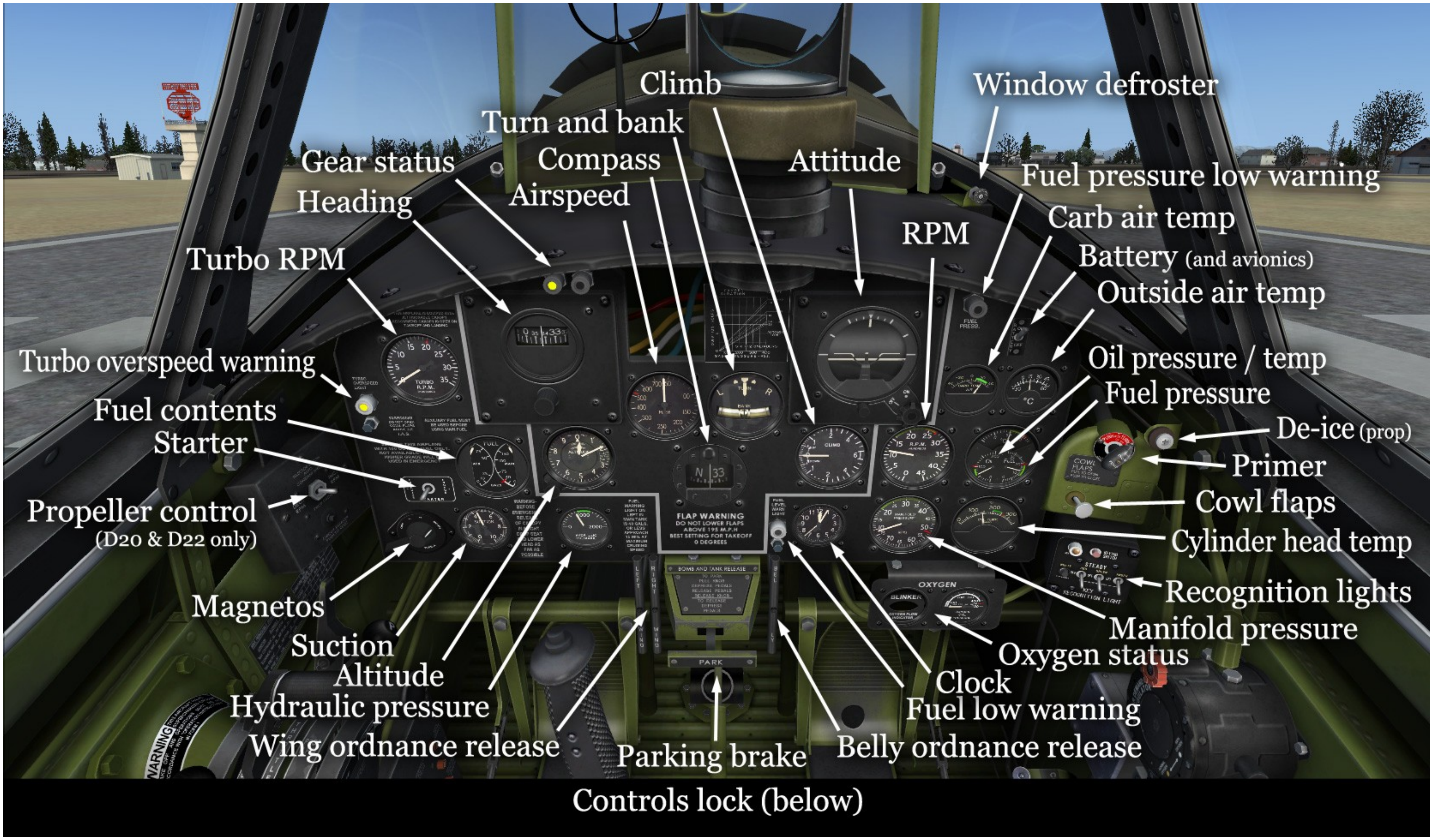


Main External Components

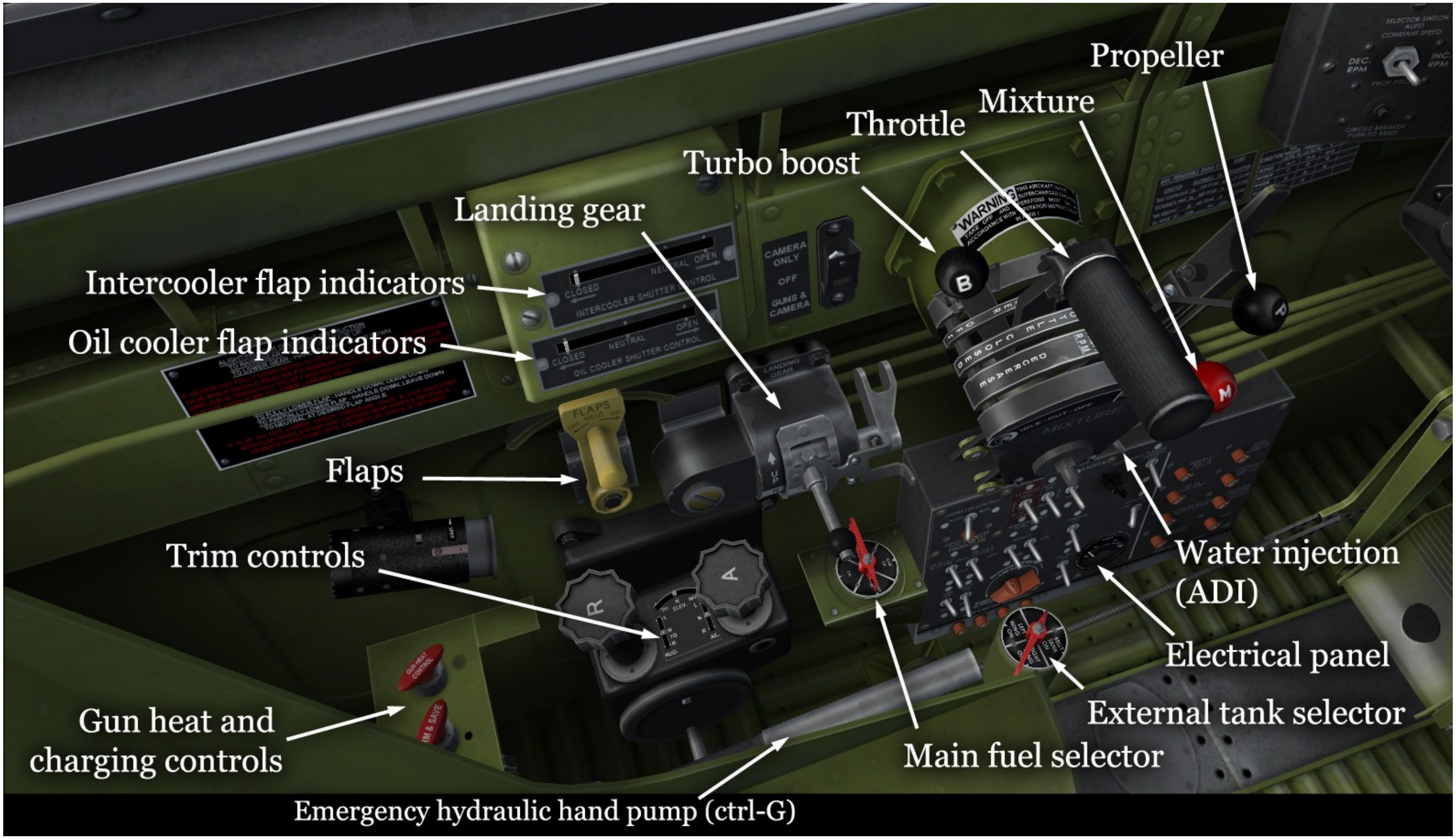


Chapter 5: Cockpit

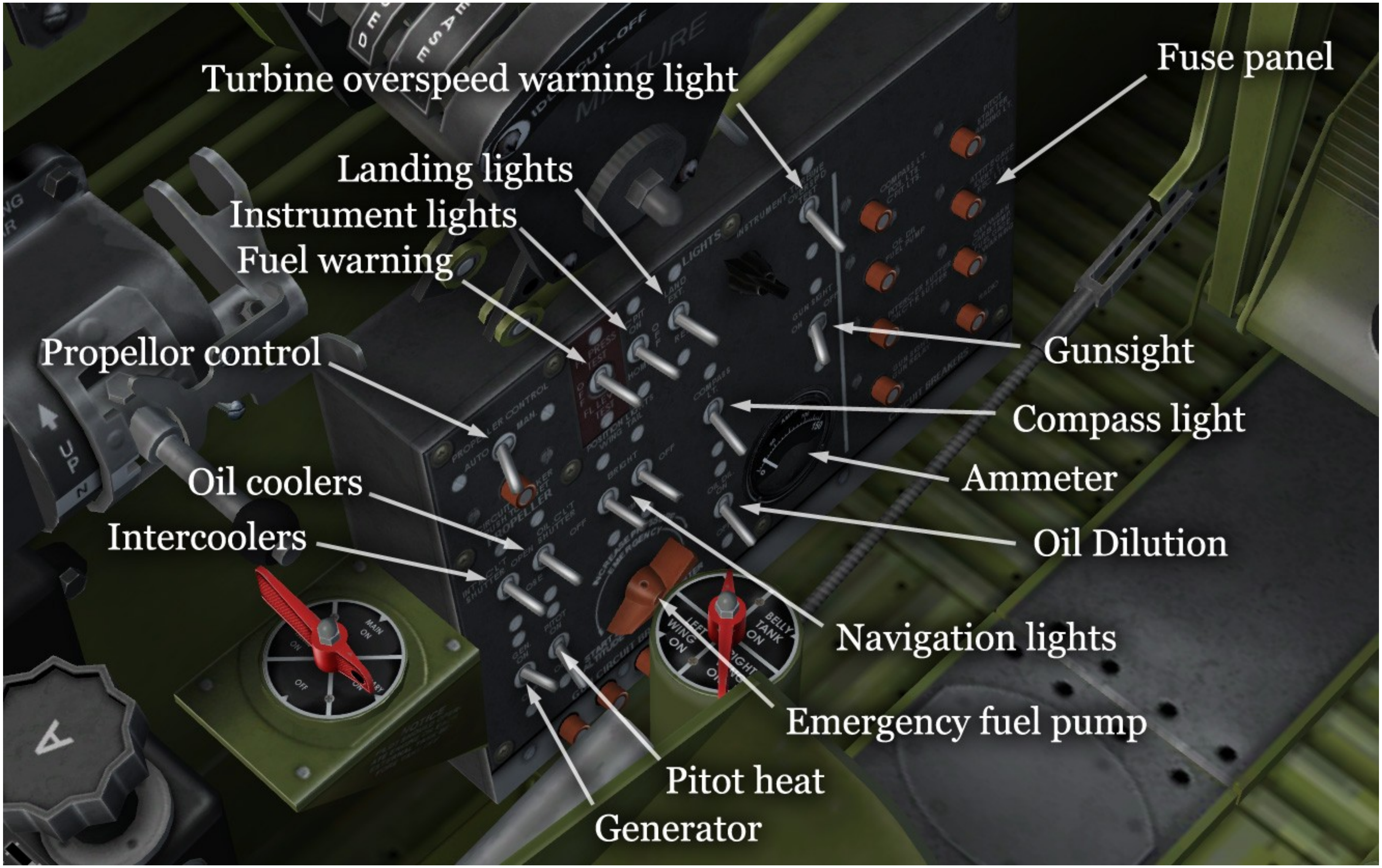
Cockpit Front



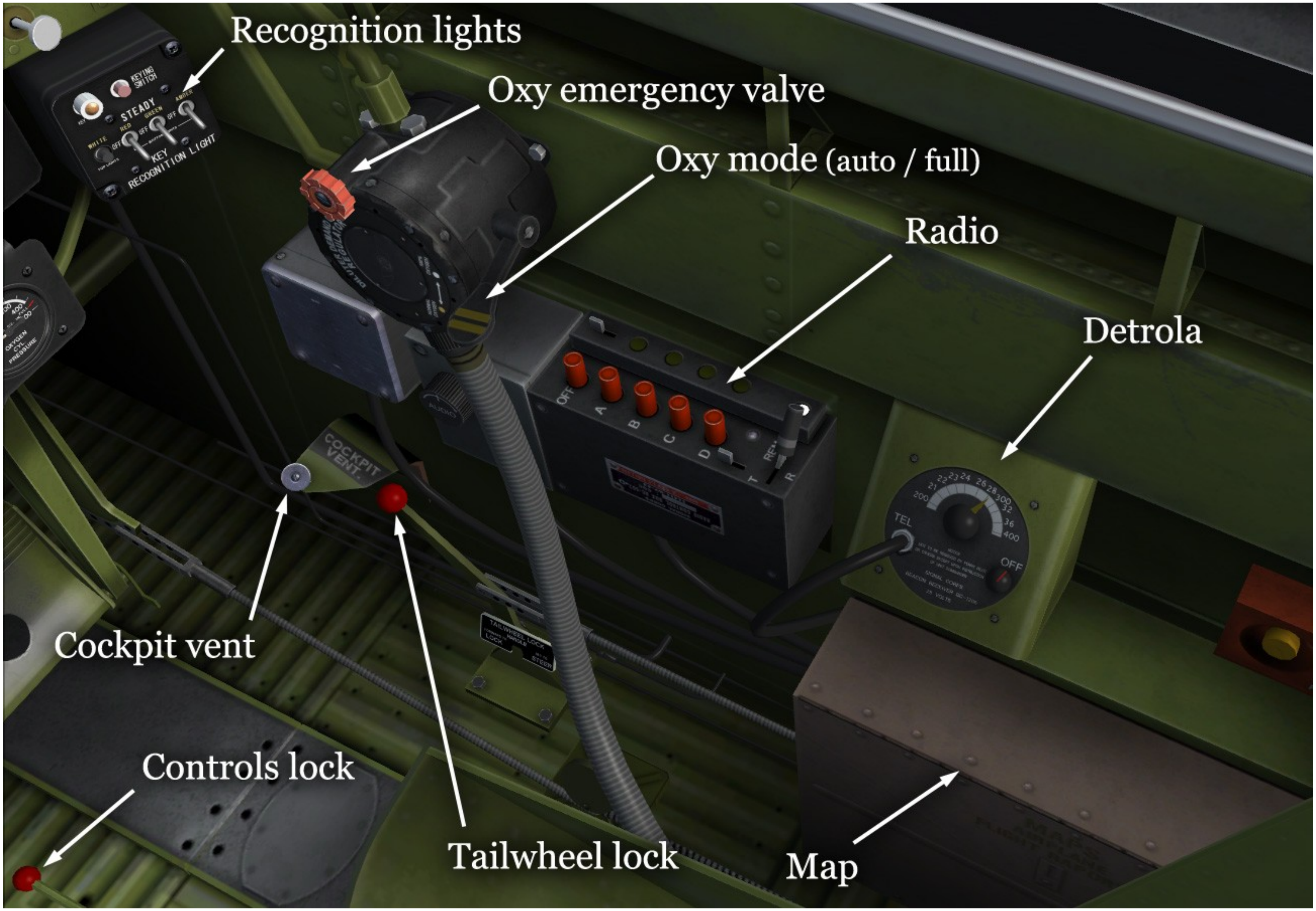
Cockpit Left



Electrical Panel



Cockpit Right



Flight Controls

SURFACE CONTROLS. The surface controls are conventional.

CONTROL SURFACE LOCK. The control stick and rudder pedals may be locked by means of a small red lever located at the base of the control stick. Reach down and pull red knob up and back so that the tongue aft of the red knob swings aft and down over a small hook on the forward side of the control stick. At the same time, the forward part of the knob assembly swings up and forward, pushing a long slender rod forward which clamps the two rudder pedals in position. The control surface locking pins are spring loaded to the unlocked position to prevent accidental locking of the controls.

TRIM TABS. Trim tabs may be adjusted in flight by a crank on the box on the left side of the cockpit. Care must be exercised to see that the trim tab wheel is rotated in the correct direction to produce the desired effect.

WING FLAP CONTROL. The wing flaps are actuated by engine hydraulic pressure with provision for emergency hand pump operation. They are actuated by means of the flap control switch. CAUTION: NEVER LOWER FLAPS ABOVE 195 MPH.

LANDING GEAR CONTROL. Move the control lever to UP to raise and to DOWN to lower landing gear. Hit the “G” key (or whatever button or key you have mapped to operate the landing gear) again to return the lever to neutral once the gear has stopped moving.

CAUTION:
NEVER LOWER LANDING GEAR ABOVE 200 MPH.
NEVER EXCEED 250 MPH WITH LANDING GEAR DOWN.

PARKING BRAKE. To park, pull parking brake handle, depress the pedals, release pedals, then release the handle. To release, depress the pedals. They can also be engaged and released via the CONTROLS panel (SHIFT-3) and the default (CTRL - .) keystroke.

TAILWHEEL LOCK. The retractable tailwheel may be locked via the lever on the floor at the right of the pilot’s seat. When the lever is placed in the rearward position, the tailwheel is free swiveling. When the lever is placed in the forward position, the tailwheel is locked.

HEATING AND VENTILATING CONTROLS. Fresh air is controlled by a push-pull control on the right side of the cockpit. Adequate heat is supplied by the hot air type defroster which has a control mounted on the right side of the cockpit just behind the windshield.

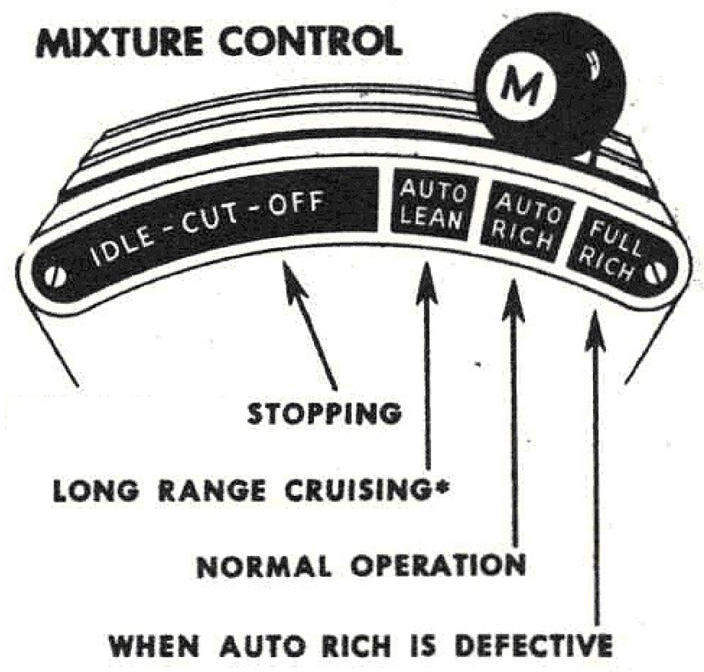
WINDOW DEFOGGING. If conditions are correct, moisture can cause the windows to fog up. Use the defroster control at the base of the windshield or open your canopy.

Throttle Quadrant

THROTTLE. This is the large lever that controls the fuel and air that enters into the engine, much the same as an automobile or tractor.

MIXTURE CONTROL. The mixture lever is the red knob marked "M" with four distinct positions: FUEL CUTOFF, AUTO-LEAN, AUTO-RICH and FULL RICH. Placing the lever in FUEL CUTOFF shuts off fuel flow at the carburetor. The AUTO-LEAN and AUTO-RICH carburetor mixture settings are obtained by placing the mixture levers in the appropriate detent position. FULL RICH should only be used if the AUTO MIXTURE system fails.

In training, AUTO-RICH normally is employed. When AUTO-LEAN is used to conserve fuel, keep a close watch on the cylinder-head temperature. If the engine starts to overheat, shift the control to AUTO-RICH and reduce the throttle setting until the temperature goes down.



The fuel/air ratios set by the mixture control were derived through many hours of careful testing after consulting the actual aircraft engine performance charts. These ranges very carefully duplicate the fuel flows and engine powers of the real aircraft. In all cases and at all power settings as specified in the actual manual, the Wings of Power Razorback will reproduce virtually identical real-world powers and fuel flows using the same mixture, RPM, and torque pressure values specified in the aircraft manual. Thus, as with other Wings of Power and A2A aircraft, the actual aircraft manual can be used for flight planning.

PROPELLER CONTROL. The propeller lever is the blue knob marked "P," with forward movement increasing propeller RPM. See the PROPELLER section below for more detail.

TURBO BOOST. The engine exhaust-driven turbo-supercharger is not used for takeoff and landing and generally not required below 7,000 feet. The turbo controls consist of a turbo boost lever on the throttle quadrant (black knob furthest to the left). This can also be connected / linked to the throttle above 7,000 feet if desired. IMPORTANT: Never let the boost lever be advanced of the throttle or you can damage your turbocharger.

TECH NOTE:

The turbo boost lever on the real P-47 comes on very strong at the very end of the turbo boost lever travel. This is due to the physics of the waste gate that directed exhaust back to power the turbo. During testing of the Wings of Power P-47, we found that even high end computer hardware did not offer the resolution to give ample control of the turbo, so we made the turbo power more responsive across the entire range of the turbo lever (not come on overly strong towards the end).

However, the issue was with the turbo boost / throttle coupler (coupling both throttle and turbo levers together). With our newly scaled turbo lever, coupling the throttle and turbo resulted in over-boost, so if you use this coupler, your P-47 reverts its turbo lever operation back to its original scale (less effect at lower settings, more at higher) so boost levels are authentic.

If you use the turbo coupler, pull the throttle back first prior to removing to avoid over-boost.

Water Injection (ADI)

WATER INJECTION SYSTEM. The water injection system, known as **ADI** (Anti-Detonant Injection), has a single 15-gallon supply tank. The supply has a duration of approximately 10 minutes with the ADI master switch ON.

WATER INJECTION SYSTEM CONTROLS. An ADI PUMP MASTER switch, on the forward left of the throttle quadrant supplies water under pressure to the ADI shutoff valves. When this switch is ON and the throttle is at full forward position, ADI liquid is then injected into the engine. ADI alters the mixture to a power mixture and helps keep the engine cool and thus increases power output by 10-15%. This increased power is felt and not necessarily reflected on the engine manifold pressure gauge.

Engine Instruments

The P-47's giant powerplant has the reputation of being the most dependable in the fighter business. lt’s still an engine, however, and exacts the customary penalty for abuse. You’ll read reports of pilots drawing excessive power for long periods. These reports are true. But that’s in combat, where an engine, like everything else, is expendable. No combat pilot purposely abuses his engine. In fact, he does everything possible to conserve it, so that the extra power is there when needed. To use an engine properly, you must understand what your engine instruments have to tell you. The P-47’s instruments are grouped on the right side of the panel.

Engine instruments provide an X-ray view of your powerplant in operation. Train yourself to use all of them and you’ll receive advanced notice of any impending engine trouble in time to take corrective action.

MANIFOLD PRESSURE
This gauge represents the air pressure being fed to the carburetor and gives indication of the amount of power being produced. The manifold pressure gauge give a direct reading of manifold pressure in inches of mercury (Hg). Military power is redlined at 52” Hg. The normal operating range is from 25” Hg to 52” Hg.

TACHOMETER
The tachometer shows engine revolutions per minute.

It is redlined at 2700 RPM. Normal operating range extends from 1700 to 2550 RPM. On planes with an electric propeller, the RPM is regulated by the propeller control handle on the throttle quadrant when the propeller selector switch is in the normal operating position (AUTOMATIC).

If necessary, RPM may be regulated by placing the selector switch in MANUAL, or fixed pitch, and varying the RPM by moving the toggle to INC. RPM or DEC. RPM.

On planes with a Hydromatic propeller, the RPM is regulated entirely by the control handle on the throttle quadrant.

CYLINDER HEAD TEMPERATURE GAUGE

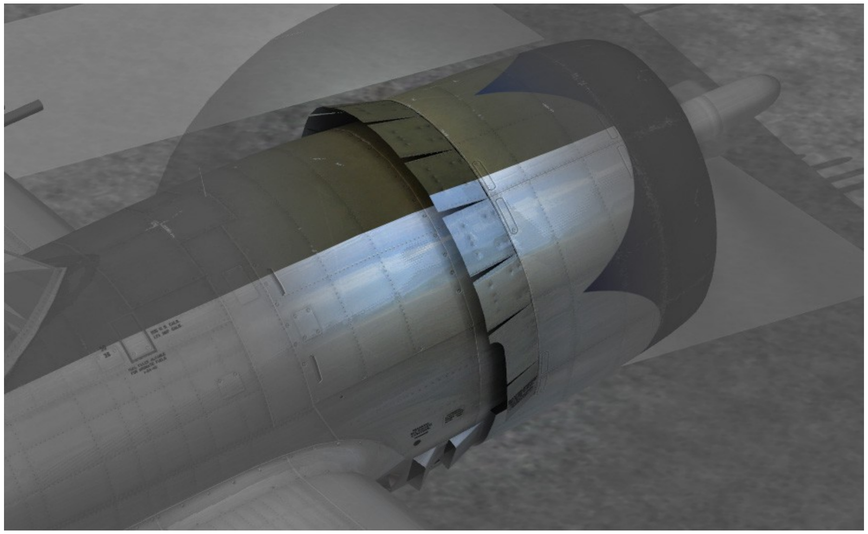
The cylinder head temperature gauge indicates cylinder head temperature in degrees Centigrade. Correct operating temperatures are about 150ºC on the ground, 200°C in the air. Avoid exceeding 232°C continuously. The gauge is red-lined at 260°C. Changes in power and speed can result in rapid changes in cylinder head temperatures, so keep a close eye on this gauge.

Excessive temperature may be caused by climbing at low speeds, especially with cowl flaps closed.

Low temperatures may be caused by dives with cowl flaps open or long power-off glides.

COWL FLAPS

The flow of cooling air for the engine is controlled by hydraulically operated cowl flaps. The cowl flaps are actuated by the push / pull lever in the upper right hand portion of the front cockpit. Take care not to open cowl flaps 100% at speeds above 225mph IAS.



FUEL PRESSURE GAUGE
A fuel pressure gauge on the instrument panel reads 16-17 psi when the engine is running properly. With the engine idling, the gauge should record at least 7 psi. Any other reading is a sign of trouble.

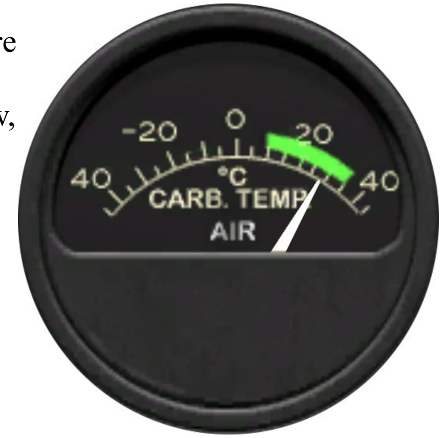
Proper fuel pressure is required for the engine to run properly.

FUEL LOW PRESSURE WARNING LIGHT
A fuel low pressure warning light illuminates when fuel pressure is low.

NOTE:
When using oil dilution or at very low idle, the pressure may get very low. Use the electronic booster pump located on the electrical panel on the lower left to keep fuel pressure within acceptable limits.

CARBURETOR TEMPERATURE

Operating limits are 12° to 35°C. Control the temperature with the intercoolers. High carb temps are most commonly created by heavy use of the turbocharger, usually during high power output at high altitudes (20-30,000 feet). Carb temp can move rapidly from extremely low to high and back to low, so keep an eye on this gauge when making power adjustments.

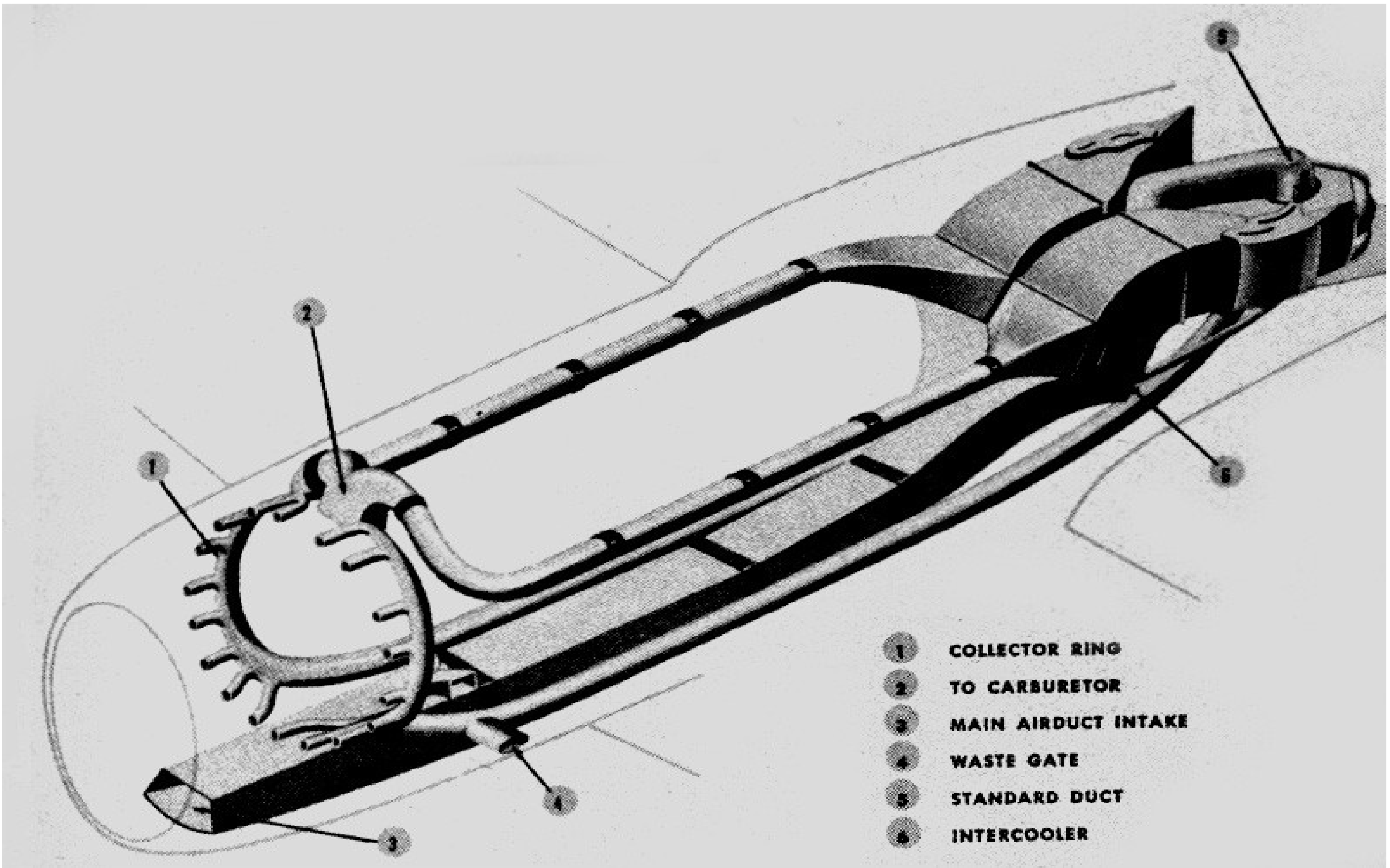


OIL PRESSURE
Operating limits in flight are 60-90 lbs. Best operation is 75-85 lbs. When engine idles, pressure is about 25 lbs.

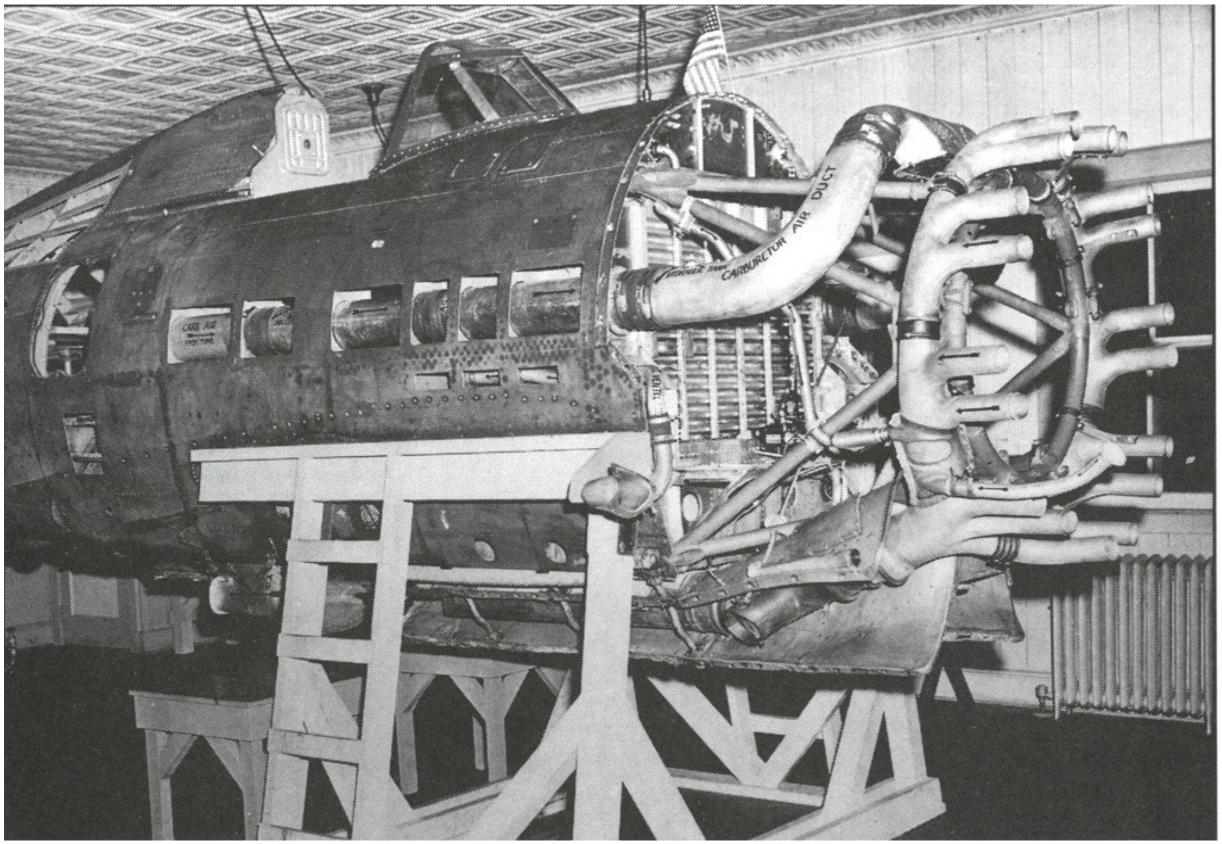
OIL TEMPERATURE
Operating limits are 40° to 95°C. Best operation is 50° to 70°C.
Regulate temperature with a switch on the main switch panel, which adjusts the oil cooler shutters. The indicator, which is on the left side of the cockpit, shows the position of the shutters as CLOSED, NEUTRAL and OPEN. Except in cold weather, the coolers are left **OPEN.**

The Induction System

The induction system consists of an entry air inlet at the bottom of the cowling, below the engine, down to the rear of the fuselage into the turbo-supercharger, intercooler, and connecting ducting. Supercharged carburetor air temperature is controlled by positioning of the intercooler flaps (located on the electrical panel on the lower left). For details on turbo-supercharger and turbo-supercharger controls, see TURBO-SUPERCHARGER sections below.



You can see from the photo below a nice view of all the ducting that is packed inside the P-47 and behind the engine. The air travels all the way to the rear, where the turbocharger increases the pressure and pushes it all the way back up to the front and forces it into the engine. This is what makes the P-47 such a high performing, high altitude fighter.



The Turbo-Supercharger

The P-47 has two superchargers: a geared device which is an integral part of the engine and a turbo-supercharger, installed just forward of the tail section.

The P-47's fame as a high-altitude fighter stems from the turbo. It gives the plane's maximum performance at 27,000 feet. On the latest series, maximum performance is obtained at 30,000 feet.

The supercharger's operation is quite simple. Air is compressed by an impeller which is spun by exhaust gases blowing against a bucket wheel attached to the same shaft. The supercharged air is then forced into the intake via the inter-coolers.

An indicator showing the position of the intercooler shutters (panel doors on each side of the fuselage) is on the upper left of the cockpit. It is marked CLOSED, NEUTRAL and OPEN. The shutters, electrically operated, are controlled by a toggle switch on the main switch panel. Normally, you fly with the intercooler doors OPEN, but in cold weather you may need the door in NEUTRAL or CLOSED to give correct carburetor air temperature. Doors must be in NEUTRAL for any speed above 250 mph.

A lever on the throttle quadrant controls the turbo. The lever regulates waste gates, which either direct exhaust gases against the bucket wheel, or permit the gases to escape out the forward exhaust.

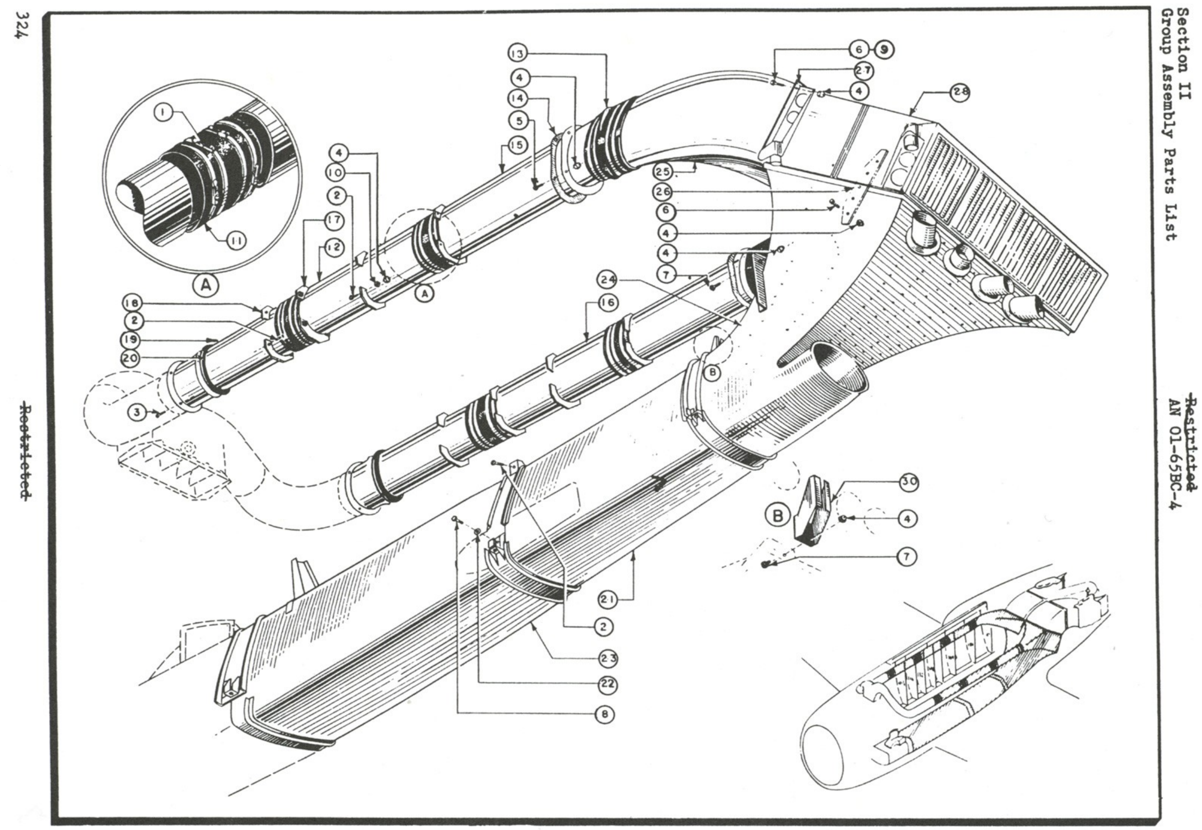
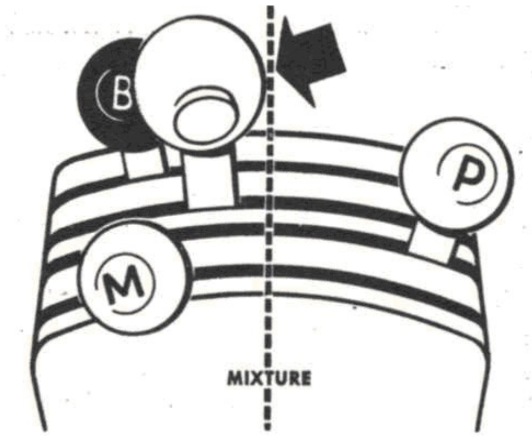


Figure 163 - Supercharger System Installation

The turbo warning light goes on the instant you start the engine. It glows steadily unless you use the turbo, in which case the light starts to flicker and continues to flicker until a speed of 20,000 RPM is reached. Then it glows steadily again. When this happens, reduce the RPM. The turbo is over-speeding. When using the turbo, the rule is keep the light flickering. The engine exhaust-driven turbo-supercharger is not used for takeoff and landing and generally not required below 7,000 feet. The turbo controls consist of a turbo boost lever on the throttle quadrant (black knob furthest to the left). This can also be connected / linked to the throttle above 7,000 feet if desired.

The turbo instruments consist of the manifold pressure gauge and a turbo RPM gauge on the front panel. The yellow light will blink when the turbo is operating. It will become solid if the turbo exceeds its 20,000 RPM limit. The turbo RPM can be pushed to 22,000 RPM for 15 minutes maximum. The idea behind the light is to "keep the light blinking."

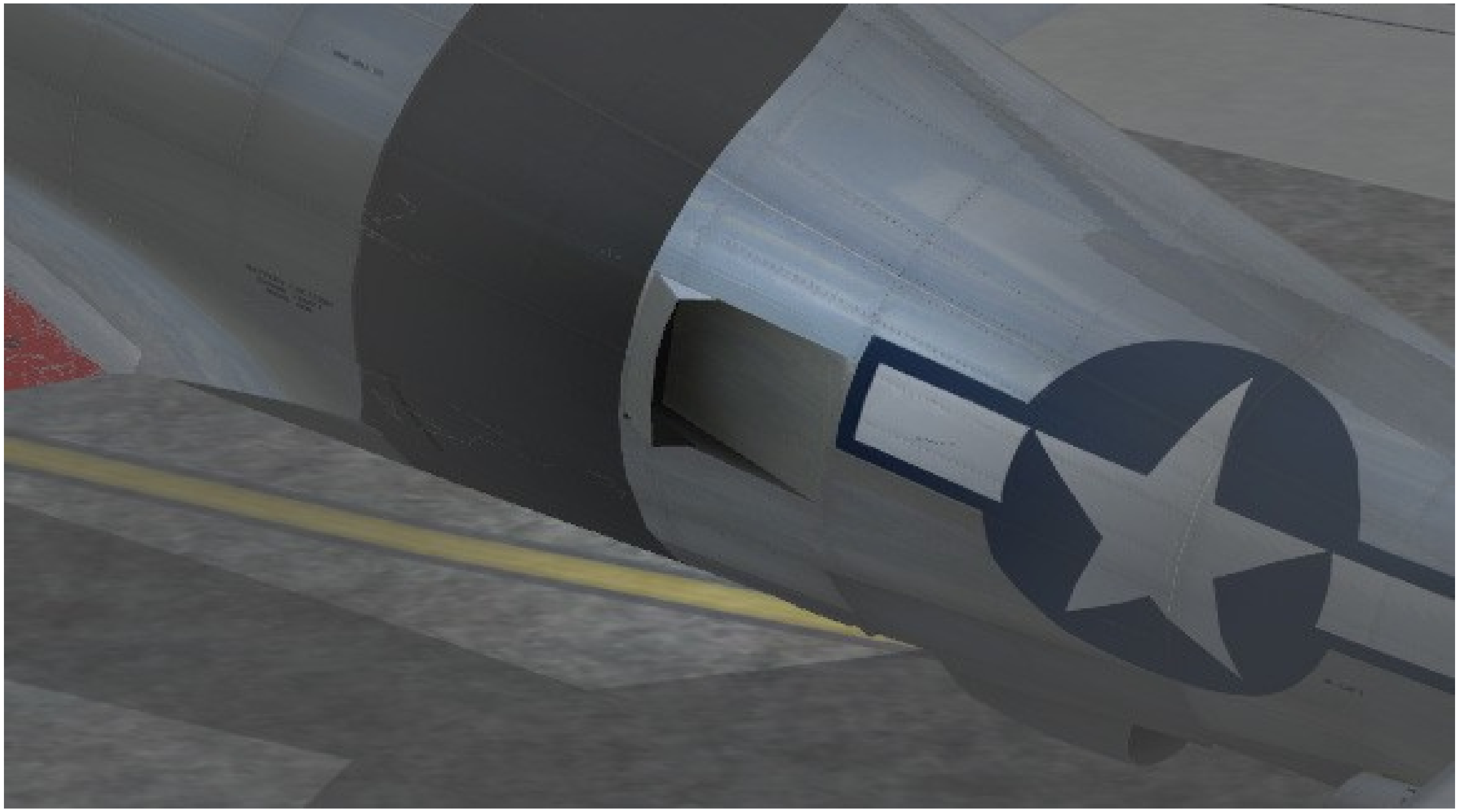
IMPORTANT:
Never let the boost lever be advanced of the throttle or you can damage your turbocharger.



TURBO-SUPERCHARGER OVER-BOOST LIMITING SYSTEM. The system consists of an exhaust back-pressure sensing switch and a relay. The exhaust back-pressure sensing switch, sensing an exhaust back-pressure in excess of the maximum operating pressure will cause the wastegate to be driven open. However, engine damage is still possible by over-working the turbo system. The earlier P-47 D20 variant with the smaller Curtiss propeller comes with an A-17 type turbo regulator that will automatically regulate turbo pressures to keep below 56". Later variants have the A-23 turbo regulator that allows for higher manifold pressures, though exceeding maximum manifold pressure of 52" is not recommended.

INTERCOOLERS. The heat of compression due to the turbo-supercharger is removed from the inlet carburetor air by an intercooler. The intercooler exit is provided with sliding shutters, which are controlled by an electric switch on the main switch panel.

INTERCOOLER FLAPS. The intercooler switch is located on the electrical panel on the lower left and is spring-loaded to the OFF position. The intercooler flaps are positioned for carburetor air cooling by moving the switch in the desired direction. These shutters cool your CARB AIR TEMPERATURE.



Engine Starting Controls

MAGNETOS
The magneto switch is located on the lower left front portion of the cockpit. The lever selects RIGHT, LEFT, BOTH and OFF positions for the magnetos.

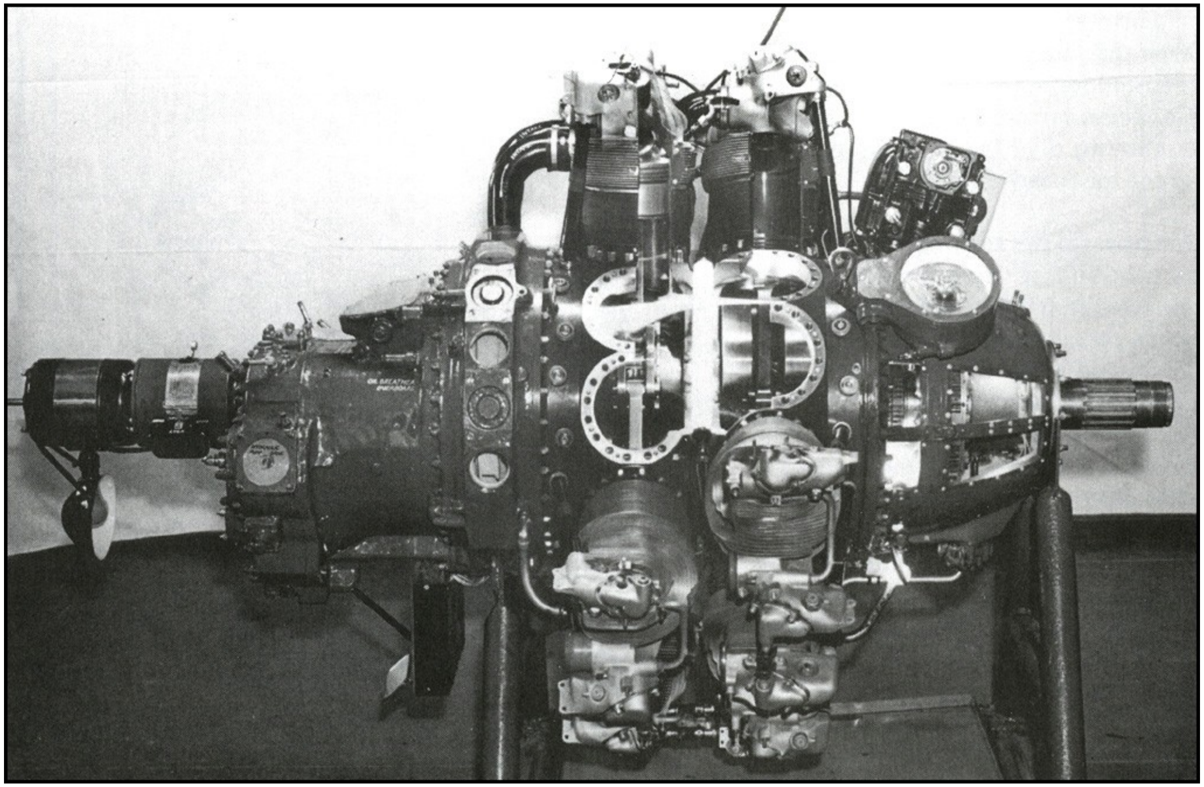
PRIMER
The PRIMER is on the right. Click on it to inject fuel through the carburetor acceleration pump nozzles.   Use 2-3 shots before starting a warm engine and 4-6 shots before starting a cold engine. The PRIMER is not active and does not create any sound unless the P-47 Accu-Sim expansion pack is installed.

STARTER
Move the STARTER switch left to energize the inertia wheel and to the right to engage the inertia wheel to kick start the engine. The inertia starter is not active unless the P-47 Accu-Sim expansion pack is installed. To start without the Accu-Sim expansion pack, simply move the switch to ENGAGE or use the CTRL-E key.

Powerplant

The Pratt & Whitney R-2800 engine is a twin-row, 18-cylinder, supercharged, air-cooled engine. There are both geared and turbine superchargers; the turbine-driven supercharger is a separate and remotely installed unit. A control on the throttle quadrant opens and closes the waste gates, permitting variation in speed of the turbine-driven unit. Water injection is provided for high power settings. This engine is capable of developing a maximum (at sea level) of 2000 BHP dry (without water injection) or 2300 BHP wet (with water injection).

Perhaps the greatest tribute to the R-2800 was made by Dr. Ing. Richard Vogt, who headed the aircraft division of Blohm & Voss. After inspecting and testing a captured R-2800, he was quoted as saying, “How could our leaders have ever dreamed of going to war against a nation which could afford to build such a beautiful engine for a warplane.” The engine surfaces were created to such perfection there was no oil seepage between the power sections, even without internal seals.



Pilots

Aside from being strikingly good looking, both pilots come with natural animations, in authentic US World War II attire. Among other animations, the pilot will naturally look in the direction you are flying, put on his goggles when you start moving and his oxygen mask.

Chapter 6: Propellers

On planes with one of the Curtiss electric propellers, the RPM is regulated by the propeller control handle on the throttle quadrant when the propeller selector switch is in the normal operating position: AUTOMATIC. If necessary, RPM may be regulated by placing the selector switch in MANUAL, or fixed pitch, and varying the RPM by moving the toggle to INC. RPM or DEC. RPM. On planes with a Hydromatic propeller, the RPM is regulated entirely by the control handle on the throttle quadrant.

Curtiss Electric C542S (D-20 variant)

Hamilton Standard Hydromatic (D-22 variant)

Curtiss Electric C642S-B40 Paddle-Type Propeller (D23 variant)

The smaller Curtiss C542S will produce less thrust than the larger Curtiss C642S or Hydromatic. The bigger two propellers will produce stronger climbs and higher service ceilings.

Chapter 7: Oil System

ENGINE OIL SYSTEM. A 28-gallon tank with pendulum installed for inverted flights is in the upper part of the fuselage. The normal oil load is 19 gallons.

OIL COOLERS. The oil coolers, an arrangement of split doors, are in the upper part of the engine compartment.

OIL TANK PENDULUM. The oil tank pendulum allows for about 7 seconds of inverted flight. Flying for longer than this time period will result in a loss of oil pressure.

OIL DILUTION CONTROLS. An oil dilution switch is on the main switch panel. With this switch ON, the oil is thinned by gasoline. Be sure the switch is OFF at all times, except when actually intended to be in use.

Chapter 8: Fuel System

INTERNAL TANKS. There are two self-sealing tanks installed in the fuselage under and forward of the floor of the pilot's compartment. The main tank has a capacity of 205 U. S. gallons (171 Imp. gallons). The auxiliary tank has a capacity of 100 U. S. gallons (83 Imp. gallons), making a total capacity of 305 U. S. gallons (254 Imp. gallons).

There is a fuel level warning lamp for the main tank. It will come on when approximately 40 U. S. gallons (33 Imp. gal.) remain in the tank.

DROP TANKS. To use the drop tanks, place the main selector on EXTERNAL TANKS and the other cock to the tank desired. There are no gauges for the external tanks. Time your consumption and when you figure a tank is about to run dry, watch the fuel pressure gauge. Switch tanks the instant the indicator oscillates. Never take off or land using an external tank. Use these tanks above 3000 feet and drain them first. You jettison the tanks by an upward pull on T-shaped control handles in the lower forward area of the cockpit. Each tank has a separate handle.

Drop all external tanks before making a wheels up landing.

SWITCHING TANKS

Never let a gas tank run completely dry before switching. Anytime the fuel pressure gauge indicates a drop, switch tanks at once. It's best to time your consumption and change tanks before the pressure drops off. Switch while flying level and with the throttle retarded to approximately 20” Hg. Above 15,000 feet, use the fuel pressure rheostat to maintain pressure during the operation. If a tank has run completely dry, in addition to using boosted pressure, it may be necessary to prime until the engine catches on the new tank.

FUEL BOOSTER PUMP

Fuel is drawn from a tank by an electric variable-speed booster pump and forced into the carburetor by an engine-driven pump. The fuel selector neck turns on the proper booster pump automatically. The booster pump has an emergency speed controlled by a rheostat to take care of any falling off of pressure. Normally, the indicator points to START & ALTITUDE. To get emergency boost, turn the rheostat to the right.

FUEL CONSUMPTION

The P-47 burns between 90 and 130 gallons of gas an hour during normal cruising operations, and as low as 60 gallons of gas an hour on the most economical cruise settings. The plane consumes about 25 gallons during warm up and takeoff.

When drawing full military power, the gas consumption reaches 275 gallons an hour. War emergency power, an even greater gas hog, eats up around 315 gallons an hour. Also note that fuel economy may decrease with the age of the engine.

You must learn how to make intelligent use of AUTO-LEAN and reduced RPM settings. Long range cruising for maximum range is not a matter of guesswork. And it’s not a matter of accepting the word of a hangar theorist who has a system that “worked OK for him.” For a given gross weight, external load, and altitude, there is usually one indicated airspeed which delivers the most miles per gallon, with one combination of RPM and manifold pressure achieving that speed most economically. Check your cruise control charts for exact cruise settings.

Chapter 9: Hydraulic System

GENERAL DESCRIPTION. A hydraulic system contains fluid in lines that run throughout the aircraft. This fluid is pumped to very high pressure with an engine driven hydraulic pump. Objects can be moved with valves that divert this high pressure fluid to other areas. The main hydraulic system actuates:

Cowl flaps
Landing gear
Wing flaps

EMERGENCY HAND PUMP. There is a hand pump available if the engine-driven pump fails. If pumping fails to raise the pressure, there's a leak in the system.

A hydraulic pressure gauge, mounted on the instrument panel, indicates the pressure when the engine is running. It also registers increases in pressure created by the hand pump. Proper operation requires a pressure of 1000 psi.

When operating landing gear, flaps, or cowl flaps, significant reductions in hydraulic pressure will occur and pressure should resume to normal once operation has stopped.

The hydraulic brakes have a separate system. The hand pump is not connected with it.

NOTE:
Accu-Sim expansion pack is required for unexpected hydraulic failures.

Chapter 10: Electrical System

The electrical system is built around a generator and a 24-volt battery. Under the circumstances, make every effort to preserve your battery. The generator makes every effort to keep the battery charged.

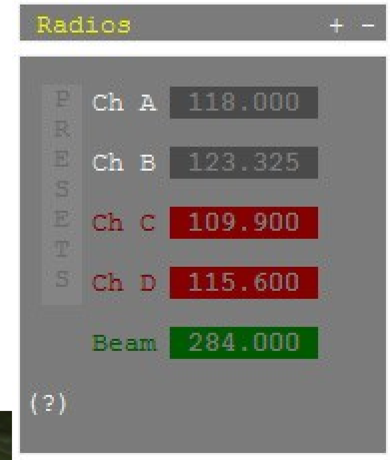
DC POWER SYSTEM. Twenty-eight volt DC power is supplied to the DC distribution system by an engine-driven generator.

BATTERY. The airplane is equipped with a 24-volt battery. The battery is in the lower forward compartment of the airplane. Use of battery current is controlled by a switch on the front panel. Without the Accu-Sim expansion pack, the battery has unlimited life.

You can recharge your battery in the CONTROLS (SHIFT-3) panel.

NOTE:
The Wings of Power P-47 has a custom battery that comes care of Accu-Sim programming. This battery has extended life over the normal battery. If you have Accu-Sim installed, use care in cold weather, especially when using the Accu-Sim inertia starter.

Radios



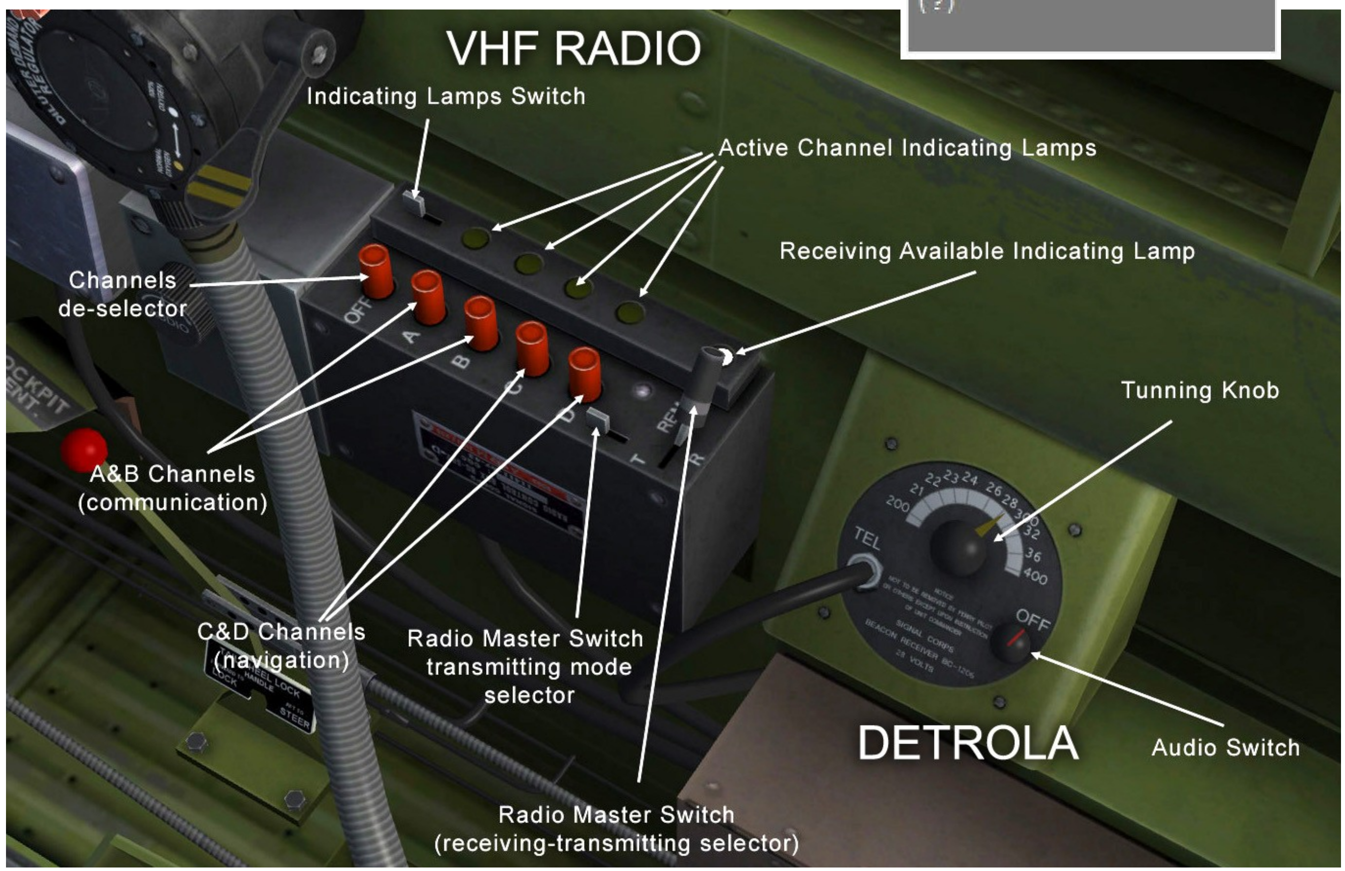
VHF RADIO. The “Radios” 2D Panel shows frequencies tuned in by ground crew before the flight. There are four channels (four frequencies) to choose from: two for communication (channels A and B) and two for navigation (channels C and D). Pilot presses appropriate channel button and that frequency is the active one. If this is the communication channel (A or B), pilot can communicate with other planes, ground towers, air traffic control, or weather stations; if this is one of the navigation channels (C or D), pilot receives information about direction and distance to tuned station.

THE DETROLA. This is a backup system in case of VHF Radio failure or in case the tower has no VHF equipment. This is a receiver only. The navigational data received by the pilot are rendered and pictured on the 2D MAP. Red Arrow shows the direction to station tuned in using VHF Radio, Green Arrow shows the direction to station tuned in via the Detrola.

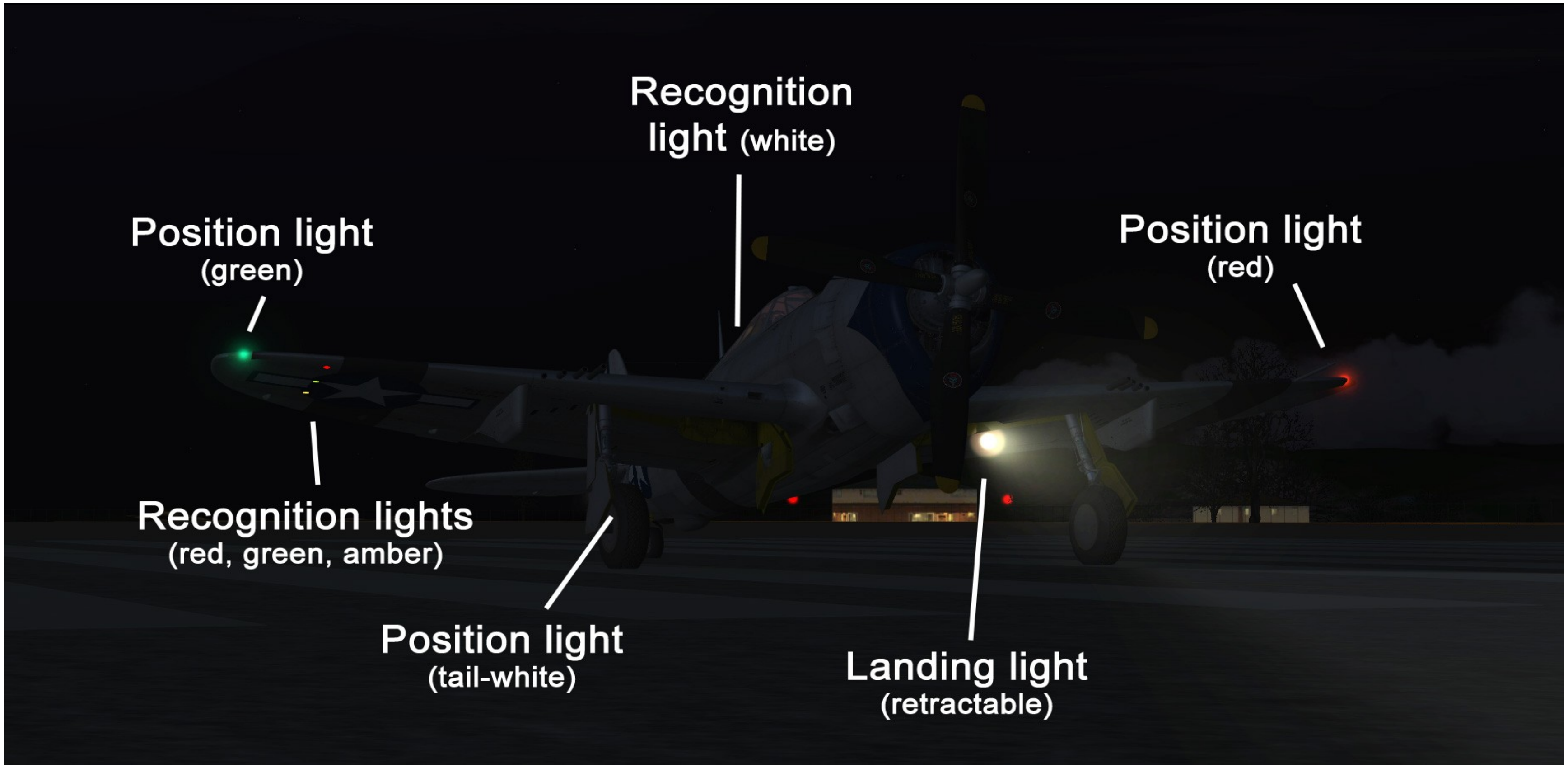
<u>Channels A and B</u>
COM frequencies for VHF Radio.

<u>Channels C and D</u>
NAV (VOR stations) frequencies.

<u>Detrola</u>
ADF (NDB stations) frequencies



Lighting



Your Razorback is equipped with the finest 3D Lights technology, as the lighting effects are built into the model, creating highly realistic visuals. An under-wing landing light can be retracted and extended independently of being turned on or off. The recognition lights can also be operated along with navigation lights.

Chapter 11: Landing Gear

LANDING GEAR OPERATION
Move the control lever to UP to raise and to DOWN to lower landing gear. Hit the "G" key (or whatever button or key you have mapped to operate the landing gear) again to return the lever to neutral once the gear has stopped moving.

FAILURE OF ENGINE-DRIVEN HYDRAULIC PUMP
a. Make sure the flaps lever is in NEUTRAL position.
b. TO RETRACT LANDING GEAR, move control lever to UP position as usual. Operate the hand pump until the position indicator shows that the gear is UP and locked.
c. TO EXTEND LANDING GEAR, move control lever to the DOWN position as usual. This will release the gear, which should drop into position and lock due to its own weight. If it does not fully attain the locked DOWN position, operate the hand pump until the "locked" signal is given.

CAUTION:

NEVER LOWER LANDING GEAR ABOVE 200 mph.
NEVER EXCEED 250 MPH WITH LANDING GEAR DOWN.

NOTE: With Accu-Sim installed, landing gear may jam if deployed at high speed.

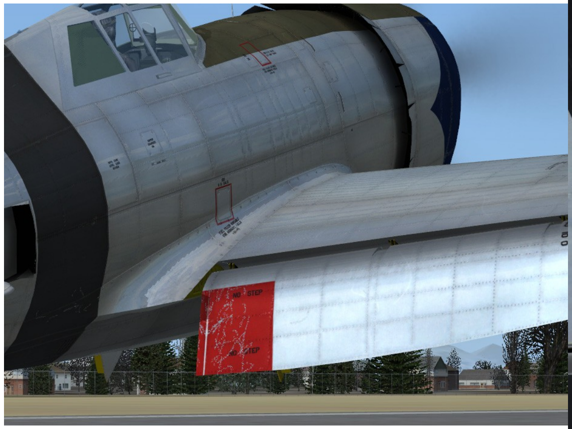
Chapter 12: Landing Flaps

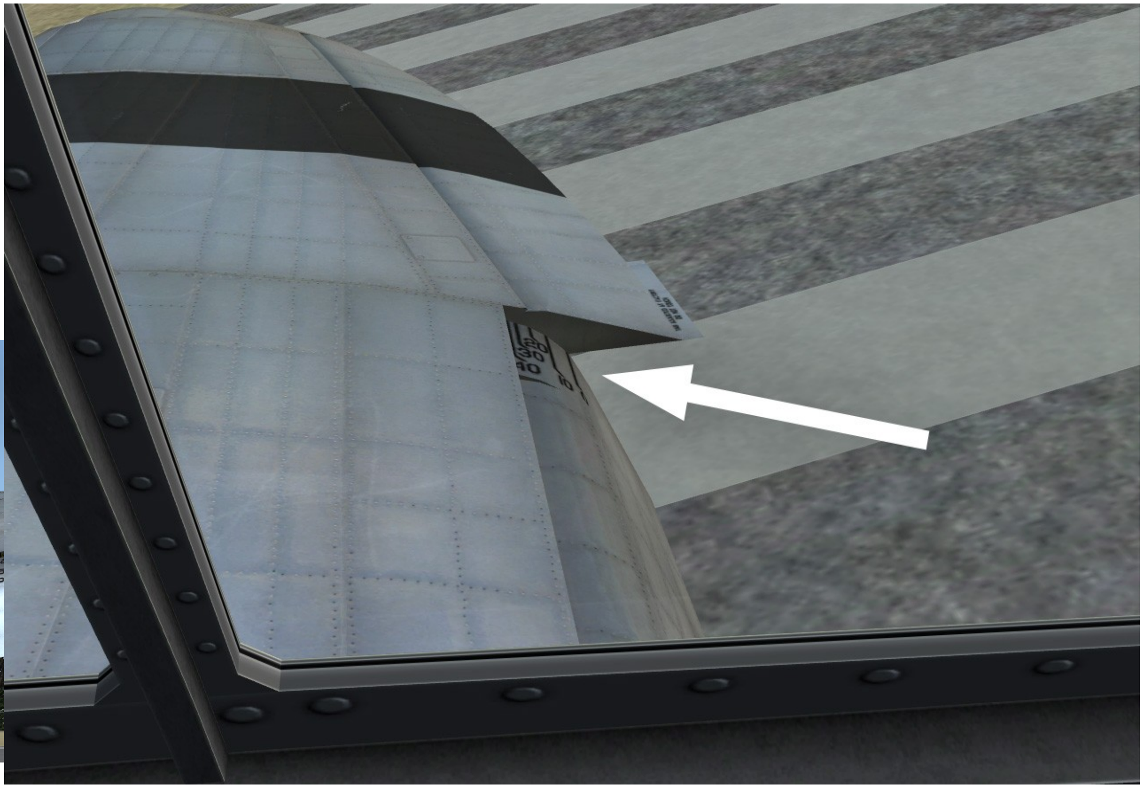
LANDING FLAPS OPERATION
Move the control lever to UP to raise and to DOWN to lower landing flaps. Hit the “F6” key to raise or “F7” key to lower (or whatever button or key you have mapped to operate the flaps). Hit the assigned key or button again to stop the flaps (and return the lever to neutral).

FAILURE OF ENGINE-DRIVEN HYDRAULIC PUMP
a. Make sure the landing gear lever is in NEUTRAL position.
b. TO LOWER FLAPS, move control lever left to the DOWN position, as usual. Operate the hand pump until the flaps are to the desired position, then move the lever to neutral.
c. TO RAISE FLAPS, move control lever right to the UP position. Operate the hand pump until the flaps are to the desired position, then move the lever to neutral.

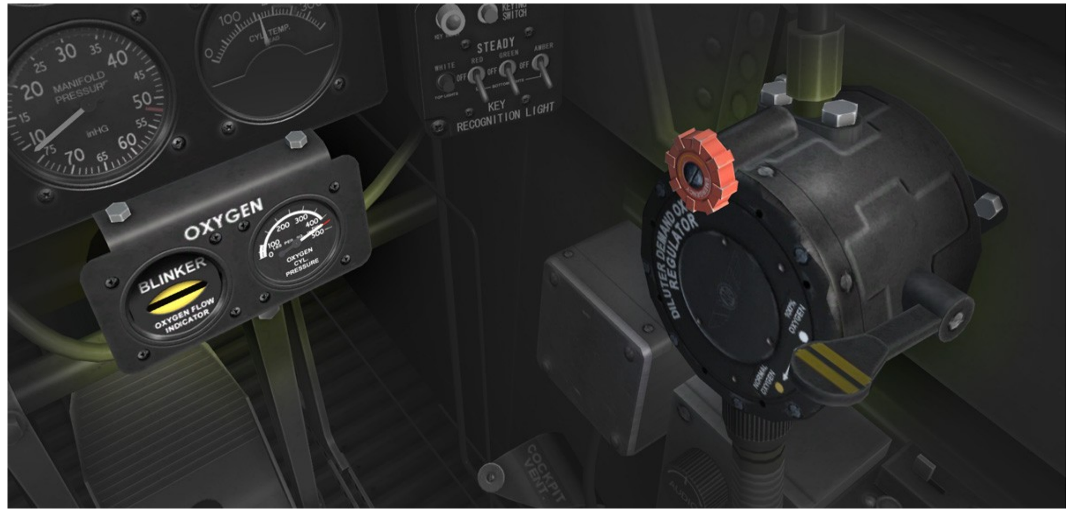
FLAPS INDICATOR
On the far edge of either the left or right flap, lines and numbers indicate how many degrees the flaps are extended.

CAUTION:
NEVER LOWER FLAPS ABOVE 195 MPH.
NOTE: With Accu-Sim installed, flaps may jam or even break if flaps are extended at high speed.





Chapter 13: Oxygen



OPERATION OF OXYGEN EQUIPMENT

PREFLIGHT CHECK

a. Put on oxygen mask.

b. Turn on the EMERGENCY valve and see that you get a large flow. Observe the pressure gauge. There should be no perceptible pressure drop. Turn OFF the EMERGENCY valve.

c. Push the lever up to the ON position. Notice you get nearly 100% oxygen, which will be indicated on the flow indicator. Push the lever down to the AUTO-MIX position. Notice that on inhalation you get almost pure air and that there is little or no indication of oxygen flow on the flow indicator. Leave it in this position.

d. Check the pressure of the system. It must not be less than 400 pounds per square inch.

IN FLIGHT

If for any reason you feel you are suffering from lack of oxygen, if your mask should suddenly leak, if the demand mechanism fails, or if no oxygen flow is indicated by the flow indicator, immediately turn on the EMERGENCY control on the regulator.

a. Check the flow indicator frequently.

b. In any flight over 30,000 feet, pay particular attention to your oxygen equipment. Be sure all items and instruments are functioning perfectly before attempting flight to these extreme altitudes. Any failure of the equipment may be fatal.

AFTER FLIGHT

If your pressure is less than 100 pounds per square inch, observe that the supply warning light is on. Occasionally, at the end of a flight, when the pressure is slightly above 100 pounds per square inch, bleed the oxygen out of the system by opening the EMERGENCY valve on the regulator and see that the supply warning light goes on at about 100 pounds per square inch. Then turn the EMERGENCY off.

Chapter 14: Normal Operations Checklists

General Information - P-47D23

- Empty Weight: 9,956 lbs
- Wingspan: 40.79 feet
- Wing Area: 300 square feet
- Normal Takeoff Weight: 13,411 lbs
- Maximum Takeoff Weight: 17,500 lbs
- Top Speed, altitude: 429 mph TAS @ 30,000 feet MSL
- Top Speed, sea level: 321 mph TAS
- Stalling Speed, clean (12,500 lbs.): 113 mph IAS
- Stalling Speed, landing (12,500 lbs.): 100 mph IAS
- Powerplant: Pratt & Whitney R-2800-59W, 2000 HP for takeoff, 2300 HP combat emergency
- Armament: eight .50 caliber machine guns; bombs; six rockets in tube launchers

Weights and Loading

This aircraft has been set up with a complete array of station loads, including drop tanks, bombs, and rockets. For heavier weights, use 15-20 degrees of flaps for takeoff and allow a longer takeoff run.

Aircraft Limitations

- Maximum airspeed - 500 mph IAS (redline)
- Maximum flap extension - 195 mph IAS
- Maximum gear extension - 195 mph IAS

Engine Management

The engine can "load up" and foul the spark plugs if it is not kept clear. Keep your engine idling at 8-900 RPM while on the ground to make sure the cylinders are clean and to assure enough cooling airflow.

Wings of Power 3: P-47D Thunderbolt Checklist

Cockpit Check - Fuel Supply and Fuel Management

The P-47D has a fuel capacity of 305 gallons total in two fuselage tanks along with drop tanks. Check the fuel selector switch position and the tank contents and make sure the fuel selector is on MAIN for takeoff. Climb on the main tank for ten minutes, then switch to the auxiliary tank and exhaust the contents (except for a reasonable reserve) before switching back to the main tank for the remainder of the mission. If drop tanks are fitted, switch to these after reaching 3,000 feet and exhaust these first, then switch to the auxiliary tank and finally the main tank. The auxiliary position selects the 100-gallon rear fuselage tank and the external tanks position causes fuel to be drawn from the centerline drop tank.

Mixture Control

The real aircraft had an automatic mixture control system which could be placed in either Auto-Rich or Auto-Lean for normal operations. This flight model also uses an authentic automatic mixture control system, just as the real aircraft did.

Cockpit Check - Controls

1. Parking Brake – Set.
2. Fuel Selector - Set to MAIN.
3. Elevator and Aileron Trim – Neutral.
4. Rudder Trim - 5 degrees nose-right.
5. Flaps - Up for takeoff (15-20 degrees down for weights over 15,000 lbs.)
6. Cowl Flaps - OPEN FULL.
7. Intercooler and Oil Cooler Flaps – Neutral.
8. Propeller Control - FULL FORWARD.
9. Tailwheel - Unlocked for taxi.
10. Flight Instruments - Checked and Set.
11. Engine Instruments – Checked.
12. Switches – Checked.

Engine Starting

1. Cockpit Check – COMPLETE.
2. Set or hold your parking brakes.
3. Turn the battery and generator switches to ON.
4. Put fuel selector on MAIN.
5. Check fuel booster pump is set to START & ALTITUDE
6. Turn the magneto switch to BOTH.
7. Set mixture control to RICH.
8. Confirm fuel pressure is at least 10 psi.
9. Use the primer, 2 to 3 shots for a warm engine, 4 to 6 shots for a cold engine.
10. Move starter switch left to ENERGIZE, then move starter switch right to ENGAGE. (NOTE: With Accu-Sim installed, you will need to hold the starter switch on ENERGIZE until you hear the inertia starter wheel reach full speed, then move to right to ENGAGE.)
11. Check engine instruments to confirm oil pressure rises to at least 50 psi within 30 seconds. If the engine is cold, oil pressure may be high. In this case, wait until it lowers to 70 psi before raising RPM over 1200.
12. Idle at 800-1000 RPM until the oil temperature reaches 40° C.
13. Check the suction gauge to see if it is working.
14. Check all instruments for proper function.
15. After warm-up, idle at 1000 RPM or slightly less.
16. If you have Accu-Sim installed, idling too low will cause the engine to load up and it will die. If this happens, wait several minutes to attempt a restart.

Pre-Takeoff Check

1. See that the trim tabs are properly set.
2. Check the mags at 2300 RPM. 100 RPM drop maximum.
3. Check the propeller control.
4. Check ammeter and radios.
5. Check brakes.

Taxi and Takeoff

The P-47 is a "blind" airplane. You must S-turn to see ahead of you. Use the brakes to steer while taxiing, using about 8-900 RPM maximum to taxi at 5-10 mph. Make certain the runway is clear, then line up in the center. Close the canopy, lock the tailwheel and half close the cowl flaps. With the turbo boost pulled all the way back, advance throttle slowly until 52 inches Hg at 2700 RPM is obtained for take-off. The P-47 requires a longer takeoff run than other fighters. You may be tempted to exceed redline in order to build up speed. Don't do it! Your plane gets off the ground OK using prescribed power limits - thousands do every day. Raise the tail about 6" and stay on the ground until reaching about 110 mph. Then fly the plane off the runway. The raised tail and increased speed give you better rudder control in case of trouble.

A2A Simulations Certified Flight Simulator X Test Report

Takeoff

P-47D-23 equipped with Pratt and Whitney R-2800 engine and four-bladed Curtiss Electric C642S-B40 13 ft diameter Paddle-type propeller. All tests with flaps up, mixture "auto-rich", manifold pressure 52", carb air temp 18 degrees, 2,700 RPM.

Brakes held until 40” manifold pressure, then release and advance throttle to 52” MP. Let tail come up and use slight back pressure on the stick.

Test weight: 12,572 pounds
Takeoff run: 1,364 feet, 13.2 seconds
Over 50ft obstacle: 2,125 feet, 16.3 seconds

Test weight: 13,432 pounds
Takeoff run: 2,326 feet, 18.1 seconds
Over 50ft obstacle: 2,944 feet, 20.7 seconds

Test weight: 17,221 pounds
Takeoff run: 6,309 feet, 40.3 seconds
Over 50ft obstacle: 7,566 feet, 46.2 seconds

CAUTION: At gross weight aircraft can be unstable – allow aircraft to fly off the runway with only slight back pressure on stick.

After Takeoff Check

1. Landing gear - UP (set landing gear lever to its neutral position).
2. Flaps - UP (set flaps lever to their neutral position).
3. Throttle back to normal climbing power.
4. Adjust the prop to climbing RPM.
5. Retrim the ship as required for climbing.
6. Check over all your instruments.
7. Put fuel selector on AUX (if fuel is in tank).

Climb

Develop climbing speed before starting to climb. Be easy on the back pressure until you have at least 140 mph, then climb gently. Then reduce your power to climbing power, 42" boost and 2550 RPM. The minimum climbing speed is 155-160 mph IAS, best climbing speed is 165 mph IAS. Adjust cowl flaps as needed to cool the cylinders; about 1/3 open is about right for climbing. Above 3,000 feet, switch to drop tanks if they are available. Otherwise, climb on the main tank for ten minutes and then switch to the auxiliary (reserve) tank.

Check cylinder head temperature frequently. If over 260°C (500°F), increase IAS. Check oil temperature (95°C, 203°F) and carburetor air temperature (35°C, 95°F). It will be necessary in prolonged climbs or in hot weather to climb at higher speeds in order to properly cool the engine. Speed of climb should be increased until allowable cylinder head temperature is obtained.

Turbo Boost Operation During Climb and Flight

When operating at high power above 7000 feet, the throttle should be wide open and should be left there. Adjustments of power should then be made by the turbo boost control. The turbo boost control should always be moved slowly, so that manifold pressure will follow and over-boost will be avoided.

NOTE :

You may interconnect the turbo boost and throttle control when over 10,000 feet.

CAUTION

NEVER shut off throttle completely with the turbo boost on. Power at altitudes above 27,000 feet is limited by the RPM of the turbine only. Over speeding of the turbine must be avoided, except in extreme emergencies.

NEVER exceed the redline at 20,000 RPM on turbo tachometer except in extreme emergency.

A2A Simulations Certified Flight Simulator X Test Report

Standard Climb Performance

P-47D-23 equipped with Pratt and Whitney R-2800 engine and four-bladed Curtiss Electric C642S-B40 13 ft diameter Paddle-type propeller.

Test weight 13,541 pounds
Fuel: 279 gallons
Oil quantity: 19 gallons

Manifold pressure: 42”, 2550 RPM, intercooler and oil cooler flaps neutral, cowl flaps as needed, climb speed 165mph IAS, ADI - off.

ALT (ft)	Time(min)	Climb	Turbo RPM	Carb Air Temp
5,000	2.7	2102	6575	28
10,000	5.2	1938	7934	22
15,000	7.9	1848	9968	18
20,000	10.6	1644	12005	19
25,000	13.7	1310	15436	23
30,000	17.5	1184	18783	31

NOTE: Turbo needed at approximately 12,000 feet to maintain 42” manifold pressure

A2A Simulations Certified Flight Simulator X Test Report

High Power Climb Performance

This flight test was to document extreme high end performance using emergency power and is not to be used for normal climbs as temperatures can easily exceed limits.

P-47D-23 equipped with Pratt and Whitney R-2800 engine and four-bladed Curtiss Electric C642S-B40 13 ft diameter Paddle-type propeller.

Test weight 13,512 pounds
Fuel: 276 gallons
Oil quantity: 19 gallons

Manifold pressure: 56”, 2700 RPM, intercooler, oil cooler and cowl flaps – wide open. Climb speed 170mph IAS, ADI – on

ALT (ft)	Time(min)	Climb	Turbo RPM	Carb Air Temp
5,000	2.2	2602	8841	30
10,000	4.0	2718	10678	25
15,000	5.9	2658	13026	23
20,000	7.8	2387	16480	24
25,000	10.2	1788	20023	29
30,000*	13.9	1311	22041	37

NOTE: Turbo needed at approximately 7,000 feet to maintain 56” manifold pressure.

Critical altitude occurs at 28,000 feet.

Maximum cylinder head temperature recorded was 271 degrees.

ADI ran out at approximately 22,000 feet.

*51.5” was maximum manifold pressure possible due to 22,000 turbo RPM redline.

Cruise Control Schedule

Once the desired height is established, reduce power and set RPM. Then increase power to desired manifold pressure.

You can see by our Microsoft Flight Simulator X A2A flight tests the difference in cruise performance. This can help you best plan your long distance flights.

A2A Simulations Certified Flight Test Report

Cruise Performance

P-47D-23 equipped with Pratt and Whitney R-2800 engine and four-bladed Curtiss Electric C642S-B40 13 ft diameter Paddle-type propeller.

Test weight 13,194 pounds

Mixture: Auto-Lean

Alt	RPM	Manifold Pressure	TAS (mph)	IAS (mph)	GPH	Miles per gallon
6,000	1,700	31	223	206	59	**3.78**
12,000	1,750	32	240	202	65	3.69
12,000	2.050	33	268	226	88	3.05
20,000	2,150	30	275	204	84	3.27
25,000	2,150	32	**306**	291	97	3.15

NOTE: Intercooler flaps used to maintain desired carb air temp between 15-20 degrees

Landing

1. Check tanks and select the fullest interior tank for landing.
2. Reduce airspeed to 150-200 mph.
3. Check the mixture control and set to AUTO-RICH.
4. Set the engine to about 2550 RPM and 30" of boost.
5. Close cowl flaps.
6. Open canopy.
7. Check gear is down and locked.
8. Do not make turns below 150 mph IAS.
9. Begin lowering flaps about halfway around your turn to final approach.
10. After your flaps are down and you roll out of the turn onto the landing (approach) leg, your speed should be about 125-135 mph IAS. Don't keep so much power on that you'll be making a power approach. However, keep enough power on to keep your engine clean.
11. Just before getting to the runway, break your glide, make a smooth round-out and approach the runway in a 3-point attitude.
12. Hold the plane off in the 3-point attitude just barely above the runway until you lose flying speed and the plane sets down. The P-47 has no tendency to drop a wing but settles rather quickly when you lose flying speed. So have your plane close to the runway at this point.

Engine Limitations and Characteristics

The turbo-supercharged Pratt & Whitney R-2800-series engine is a reliable and potent performer. They can take a lot of battle damage and still make it home. The P-47D is fitted with a water-injected R-2800-59W which provides 2,300 HP when the water injection switch is enabled. Emergency power is not required for takeoff. The turbocharged engine produces power to very high altitudes.

To activate emergency boost, turn the switch on the electrical panel to AUTO. The water injection will come on automatically whenever the throttle is advanced beyond 95 percent. Leave the switch off for takeoff and normal flying.

ENGINE	Takeoff	Emergency	Military	Max Continuous	Max Cruise	Normal Cruise	Econ Cruise
MP	52”	56”	52”	42”	36”	32”	30”
RPM	2700	2700	2700	2550	2550	2250	1700

Flight Characteristics

The Thunderbolt is a heavy aircraft and flies like it. This is not an airplane you can toss around. Control responses are good but not lightning-quick, so a little more planning ahead is needed than with a lightweight fighter. This is especially true in slow flight and with takeoffs and landings. However, it is quite stable and predictable.

Stalls

Power-off stalls are fairly mild and there is little tendency to drop a wing unless the stick is horsed backward unnecessarily. With power on, the left wing will tend to drop. In either case, the recovery is straightforward; apply power, push the stick forward, and use the rudders for directional control until flying speed is regained. With accelerated stalls, the procedure is similar unless the stall develops into a spin.

Spins

Never spin the aircraft intentionally even with power off unless you have sufficient altitude to get out of the spin above 10,000 feet. Never spin the airplane intentionally with the power on under any conditions. The P-47 does not tend to spin by itself but needs rudder input from the pilot. However, in a deep accelerated stall, a spin may develop. Recovery is generally very prompt by putting the nose down and applying opposite rudder. If this does not work, apply power until the spin breaks.

Permissible Acrobatics

All acrobatics are permissible, with the exception of snap rolls and power-on spins.

ICING

Under icing conditions, close intercooler shutter and use higher power with as much turbine supercharger as is consistent. This will result in high carburetor air temperatures and should eliminate the ice. Authentic icing effects are simulated if you have the Accu-Sim expansion pack installed.

ENGINE FAILURE DURING TAKE-OFF

a Nose down.

b. Land on field STRAIGHT AHEAD. If too late, retract gear and land OFF field STRAIGHT AHEAD.

CAUTION:DO NOT ATTEMPT TO TURN BACK ONTO THE FIELD.

ENGINE FAILURE DURING FLIGHT

a. Nose down.

b. Ignition switch OFF.

c. If airplane is equipped with a belly tank, pull release lever immediately.

d. Fuel selector valve OFF.

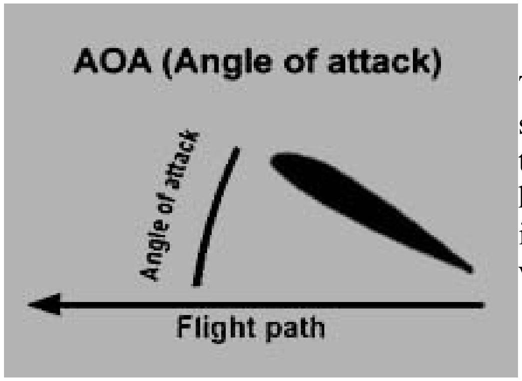
e. Manually lower flaps.

f. Master battery switch OFF.

g. If a suitable emergency airfield is available, the landing gear may be lowered. IF NOT, KEEP LANDING GEAR “UP” AND LAND AIRPLANE ON ITS BELLY.

Chapter 15: Stalls

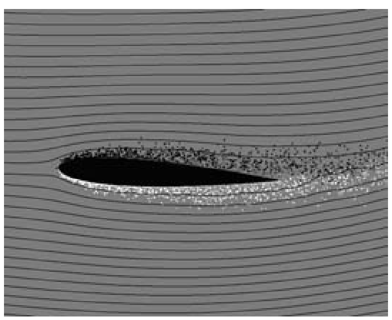
WHAT IS A STALL? In order for a wing to produce efficient lift, the air must flow completely around the leading (front) edge of the wing, following the contours of the wing. At too large an angle of attack, the air cannot contour the wing. When this happens, the wing is in a "stall."



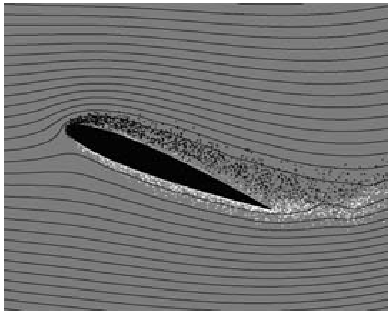
Typically, stalls in civilian aircraft occur when an airplane loses too much airspeed to create a sufficient amount of lift. A typical stall exercise would be to put your aircraft into a climb, cut the throttle, and try and maintain the climb as long as possible. You will have to gradually pull back harder on the stick to maintain your climb pitch and as speed decreases, the angle of attack increases. At some point, the angle of attack will become so great, that the wing will stall (the nose will drop).

Below are some graphical representations of a wing traveling though the air in various conditions:

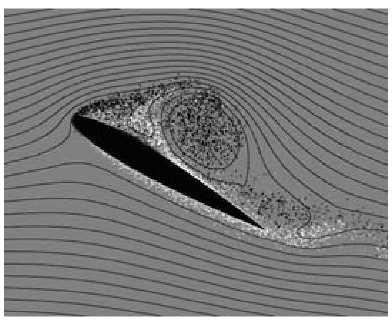
LEVEL FLIGHT
A wing creating moderate lift. Air vortices (lines) stay close to the wing.



CLIMB
Wing creating significant lift force. Air vortices still close to the wing.



STALL
The angle of attack has become too large. The boundary layer vortices have separated from the top surface of the wing and the incoming flow no longer bends completely around the leading edge. The wing is stalled, not only creating little lift, but significant drag.



STALLING THE P-47 RAZORBACK

STALL CHARACTERISTICS. The stall characteristics of the airplane are good. Recovery from stalls should present no problem to the average pilot provided the recommended recovery procedures are followed and the proper cautions are observed. The stalling speed increases with the angle of bank. Therefore, care must be exercised in banking the airplane at low airspeeds or with a nose-high attitude. The extended landing gear has no appreciable effect on the stalling speeds.

NOTE:
During stalls at a medium gross weight, the airplane can be expected to lose altitude before being returned to level flight if the proper recovery procedures are begun immediately after the complete stall has been reached.

STALL WARNING. Warning of the impending power-on or power-off stall comes in the form of a comparatively mild buffeting of the horizontal stabilizer and elevator and occasional light buffeting of the ailerons.

Should stall warning occur during flight, act immediately to avoid completely stalling the airplane. If in level flight, increase the airspeed; in a turn, decrease the angle of bank.

IN THE STALL. At the full and complete stall, if a rapid roll occurs, the control wheel may momentarily move hard over, placing the ailerons in their maximum travel position and remain there until flying speed is regained. A reversal of elevator force may take place during a complete stall, but the force tending to keep the control column back is usually comparatively light and should present no problem to the pilot in pushing the control column forward to recover from the stall. However, with a deliberate attempt by the pilot to obtain a very high angle of attack and under an abnormal combination of conditions, such as a rearward center of gravity, power on the engine and wing flaps up, it might be possible to encounter a somewhat high elevator force reversal, which would require considerable force by the pilot to push the control column forward during stall recovery. A combination of these conditions, which might induce a high elevator force, is considered to be far out of the normal operating range. Normally, no abrupt rolling action either precedes or accompanies a power-off or low power-on stall. However, as in the case of most performance airplanes, high power stalls will result in an abrupt roll either just before or at the stall.

WARNING:
Never use power and a nose-high approach to reduce the landing speed, except when required in emergency procedures. Under these conditions sufficient power should be used to maintain a safe airspeed above the stall warning speed.

The ailerons are effective up to the point of stall. Use of the ailerons in the stall will not aggravate the stall as is experienced in some types of airplanes.

STALL RECOVERY. When the airplane is stalled, recovery should always be made by nosing the airplane down sufficiently to regain flying speed with minimum loss of altitude. Power-off stalls are fairly mild and there is little tendency to drop a wing unless the stick is horsed backward unnecessarily. With power on, the left wing will tend to drop. In either case the recovery is straightforward; apply power, push the stick forward, and use the rudders for directional control until flying speed is regained. With accelerated stalls, the procedure is similar unless the stall develops into a spin.

PRACTICE STALLS. For both power-on and power-off stalls, set propeller at 2100 RPM with landing gear up and 2350 RPM with landing gear down and manifold pressure necessary to produce a stall. **DO NOT** allow stall to progress beyond the buffeting stage. Practice all stalls with and without rudder boost operating and conduct all practice at least 5000 feet above terrain altitude. Monitor CHT closely since low airspeeds and turbulent airflow will hinder proper engine cooling.

WARNING:
Stall characteristics are greatly affected by position and gross weight. **DO NOT** practice stalls with fuel in your auxiliary tank (aft center of gravity) or when at gross weight or when carrying ordnance.

To become completely familiar with the stalling characteristics of the airplane, practice stalls may be made with the wing flaps up, wing flaps full or partially down, landing gear up, landing gear down, power on, power off, or any combination of the above configurations. When making power-on stalls, avoid abrupt pull outs. To minimize rolling tendencies, avoid excessively nose high attitudes during the approach to the stall. Since the rolling tendency is most pronounced in a turn, it is recommended that all stall practice be conducted straight ahead.

SPINS. Spins are a prohibited maneuver and must not be done intentionally. However, if a spin is entered accidentally and the landing gear and wing flaps are down, **DO NOT** attempt to raise them. While rotating, the airspeed indicator may indicate a much higher airspeed than the actual indication should be. A spin might occur if a stall is allowed to progress into heavy buffeting. Lower the nose and level the wings to place the airplane in a streamlined flight attitude (a spin is a stalled condition). Make a normal recovery from the dive. If a fully developed spin occurs, use normal recovery techniques, i.e. reduce all power to idle, apply full opposite rudder followed after a two-second interval by forward stick. Full forward stick may be necessary to streamline the airplane. When rotation stops, center the rudder and pull out of the dive. **DO NOT** make an abrupt pull up as this may over-stress the airplane or produce a secondary stall. Avoid violent control movements at all times.

FLIGHT CONTROLS. The flight controls enable the airplane to be controlled without undue effort by the pilot under any reasonable load, flap, and power combination. No unusual reactions of any controls will be experienced except for possible light elevator reversal during power-on stalls. To properly trim, set up the flight attitude, power, and airspeed desired, relieve all elevator pressure first, then rudder pressure, and finally aileron pressure. Minimize the use of aileron trim; use it only when elevator and rudder trim are not completely effective.

WARNING:
Use of excessive trim during letdowns or approaches is dangerous, since power changes result in high control forces until the airplane is re-trimmed.

Chapter 16: Level Flight Characteristics

GENERAL CHARACTERISTICS. The flight characteristics are excellent for a heavy airplane. Maneuvering and control of the airplane do not require undue force by the pilot. The airplane is very stable and trims out very easily. Only small changes in trim are required for normal operation to maintain the desired airplane attitude. Rudder control is good. Response to power changes is immediate and positive.

SLOW FLYING. No control abnormalities will be discovered during low-speed flight. Maintain a close watch on engine CHT due to poor cooling air flow and be alert for possible engine malfunction, since engine failure during low-speed flight will result in a dangerous condition. Turns at low speeds are critical and controls should be well coordinated at all times.

CRUISING FLIGHT. No control or other flight peculiarities are evident during cruising flight. Avoid abrupt control movements at all times. Lowering the landing gear will increase the airplane drag. Slight nose up trim will also be required. Wing flap position will greatly increase the airplane drag. Oil cooler flap, intercooler flap, and cowl flap position affect airplane performance, resulting in a loss of airspeed when open.

DIVING

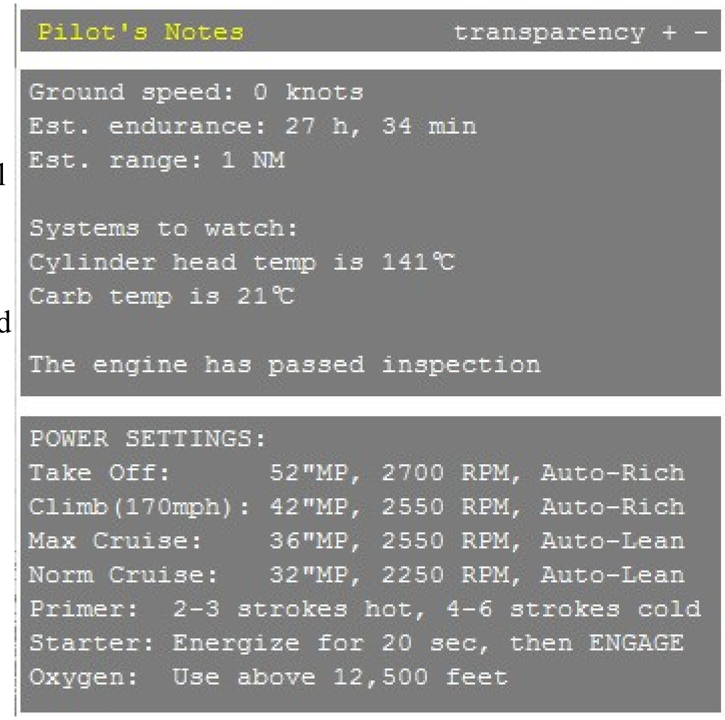
a. Aileron forces become high at speeds above 350 mph IAS. At least 12,000 feet should be allowed for recovery from dives at limiting speed which is 500 mph IAS. NEVER dive with cowl flaps OPEN.

b. Due to the compressibility effect, diving at high altitude will produce a tendency for the airplane to nose down. If extremely high indicated speeds are reached, the elevator tab will have to be used for recovery. Except in extreme emergencies, an indicated air speed of 400 mph should not be exceeded above 25,000 feet.

Chapter 17: 2D Panels
PILOT'S NOTES

PILOT'S NOTES (SHIFT-2). Important information is readily available with the Crew Reports screen.

Ground Speed is the actual speed your aircraft is moving over the ground surface.



Estimated Endurance is the amount of time your aircraft can fly at the current rate of fuel consumption. Take into account, as you are climbing to your cruise altitude, this estimated endurance will be less than once you level off, throttle back, and settle into a cruise.

Estimated Range is the distance your aircraft will fly at the current speed and rate of fuel consumption. Again, take into account this will change based on climb, cruise, and descent operations.

Systems To Watch displays your CHT and CAT temps. This becomes vital information if you install the Accu-Sim P-47 Expansion Pack as high temperatures can damage your engine.

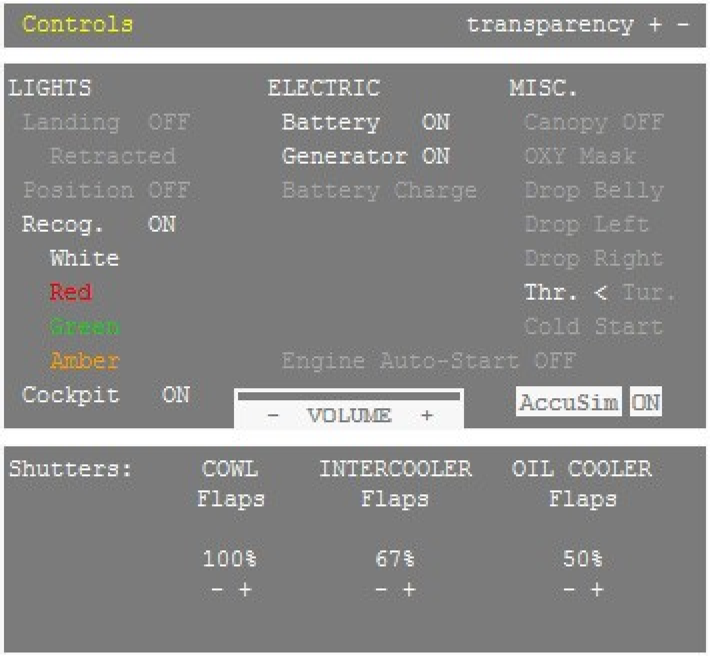
Comments appear below. This is again vital information for Accu-Sim expansion pack users as engine checks, damage, etc., would be shown here.

Power Settings represent your clipboard showing you important info to quickly establish a proper takeoff, climb, and cruise.

CONTROLS

CONTROLS (SHIFT-3). This control panel was initially created to allow you to operate and watch systems like lights and engine flaps while in the external view. It soon became a nice little place where we could put anything we wanted to have quick access to. You can control all of your shutters, lights, put on your oxygen mask, drop ordnance, charge your battery, or even set your aircraft to a complete cold start.

Accu-Sim users can enable or disable the entire expansion pack with a single click and also adjust the volume of the custom sound system.

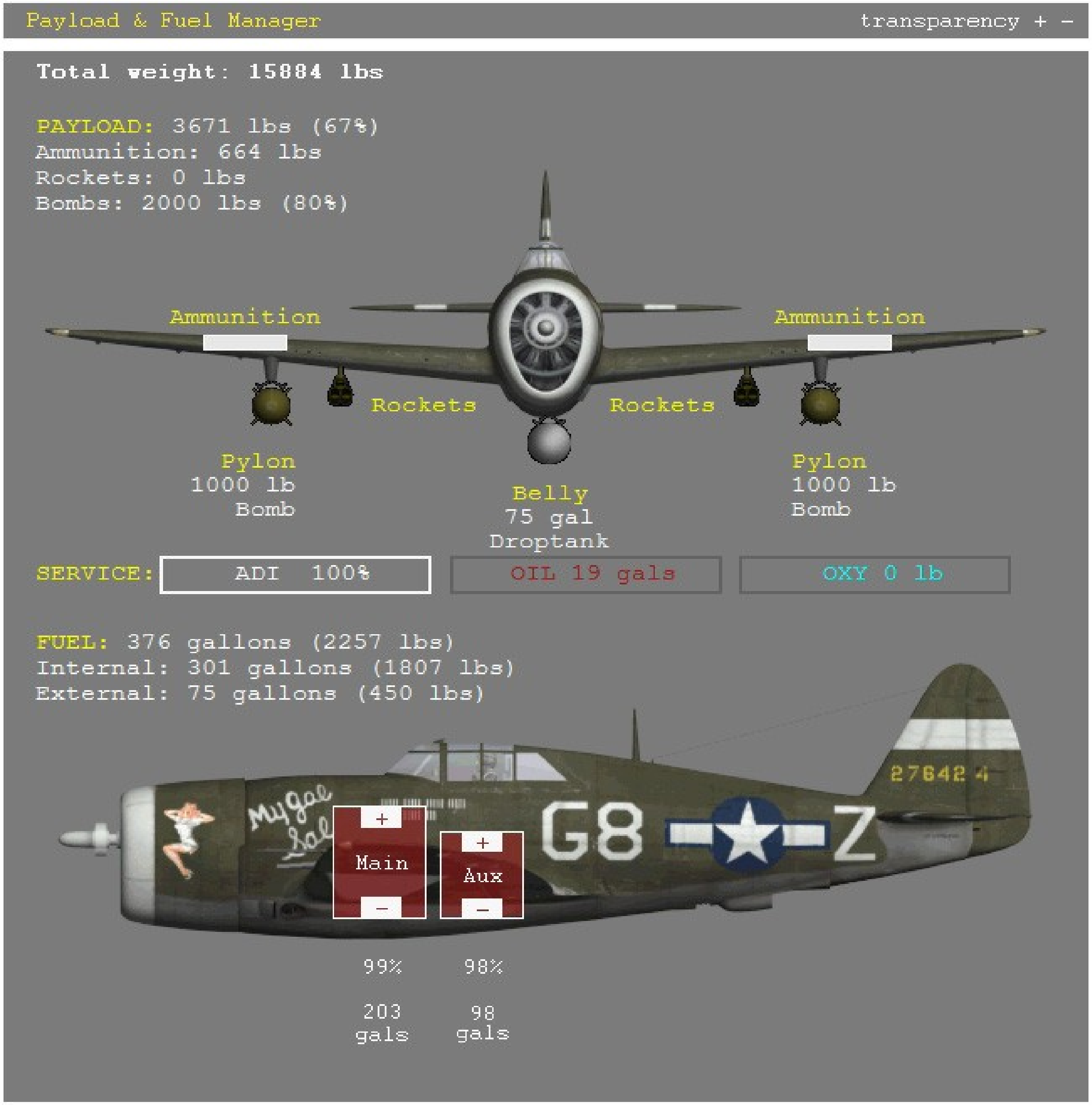


PAYLOAD and FUEL MANAGER (Real-time)

PAYLOAD AND FUEL MANAGER (SHIFT-4)

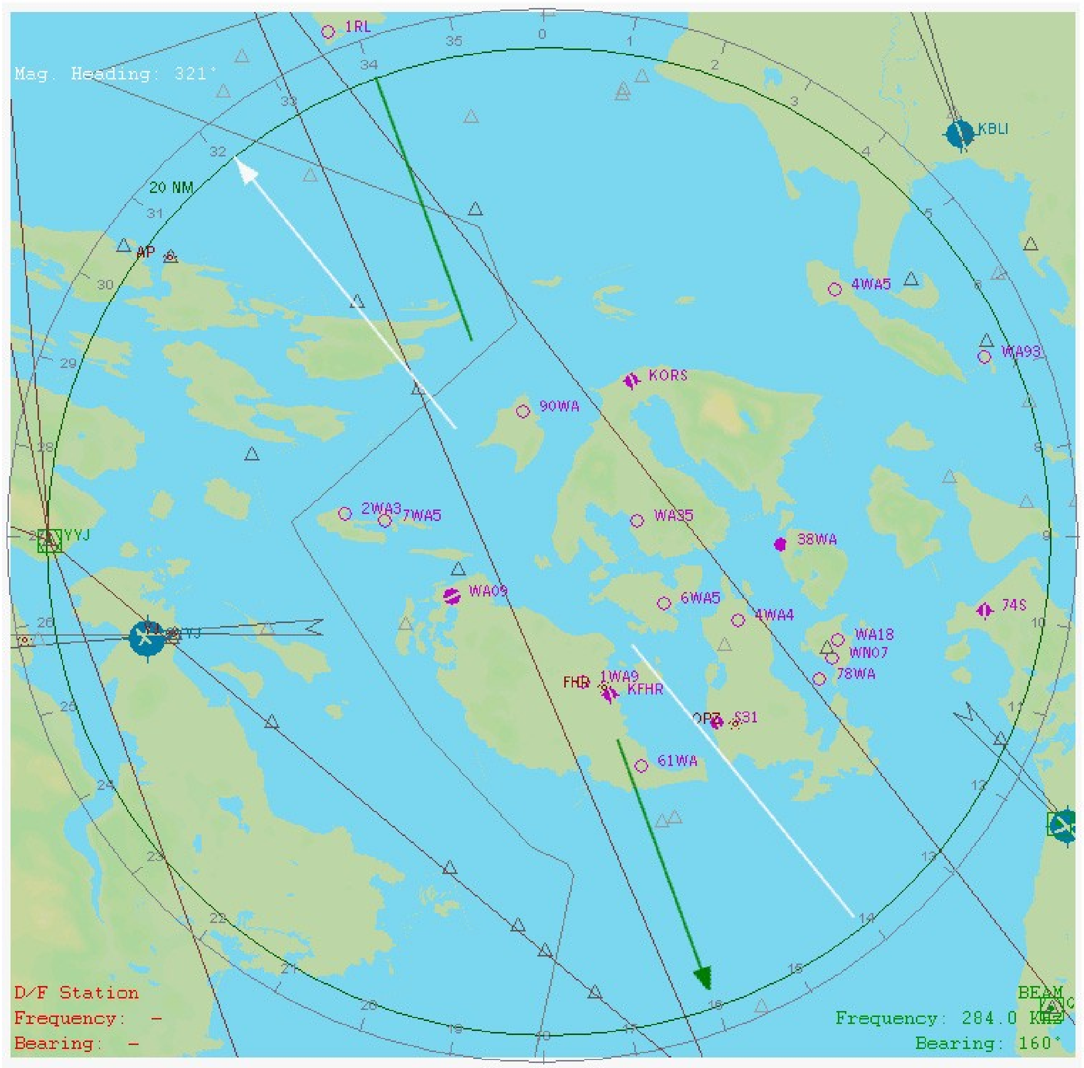
This real-time payload and fuel manager allows you to visually click and load your aircraft. You can also service ADI fluid (water injection), oil (loads warm oil on cold days), and oxygen.

The aircraft initially is prepared for low level training flight w/o ammunition, oxygen, and water. User can setup the plane and save it as the flight.

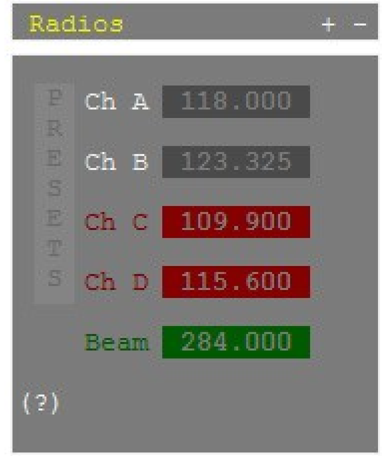


PILOT'S MAP

PILOT'S MAP (SHIFT-5). The pilot's map gives full access to similar information that may be found on real maps and allows this information to be easily accessed rather than have to use the default map from the upper menus. This is a period aircraft, so we tried to create this in the true light of a pilot needing to still use visualization or VOR to know precisely where the aircraft is over the map, hence, we did not include the little aircraft icon in the middle. You can access this map by clicking on the map box in the lower right area of the cockpit.



RADIOS



RADIO SELECTOR (SHIFT-6).

The 2D radio selector panel allows you to set the frequency of the radio. Pushing the corresponding button on the cockpit radio accesses this frequency. See RADIOS for a detailed description.

MAINTENANCE HANGAR

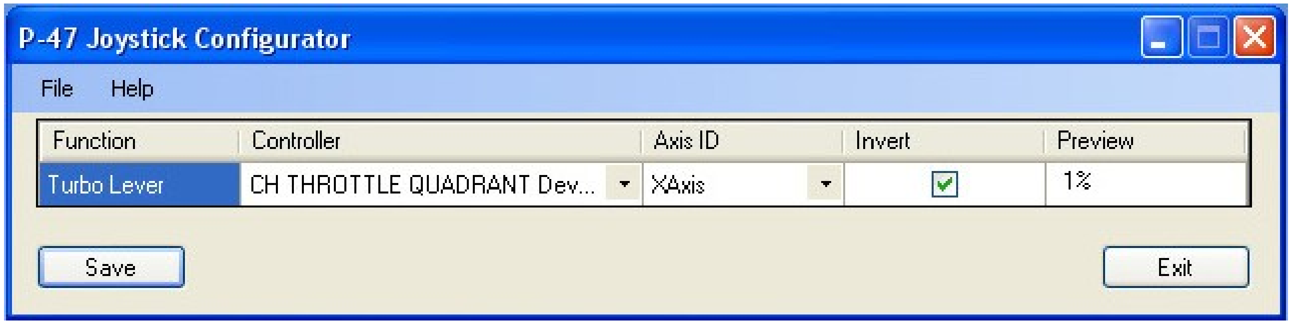
MAINENANCE HANGAR (SHIFT-7)

The Maintenance Hangar is where you can get a review of how your aircraft engine and major systems are functioning. It keeps track of airframe hours, engine hours since last overhaul, and gives the condition of the engine. If there are some specific issues, like overheating damage, your mechanic will write those notes here.   You can also overhaul the engine by clicking on the OVERHAUL button.

Joystick Mapping Utility

This utility is not a 2D Panel, but is located in your FSX /A2A/P47/tools directory. It can also be accessed from your Windows START Menu / All Programs / A2A Simulations / Wings of Power 3 / directory.

This tool allows you to map any axis to your turbo boost handle, for the ultimate in realism.



CREDITS

Microsoft: Creators of Microsoft Flight Simulator X

Project Management: Scott Gentile

Lead Artist (3D modeling, texturing, gauges): Robert Rogalski

Aircraft Painting: Martin Catney

Systems Programming: Robert Rogalski, Scott Gentile

C++ Programming: Michal Krawczyk, Fredrick Vamstad, Robert Rogalski

Flight Dynamics: SD Research and Scott Gentile

Visual Effects and Audio: Scott Gentile

Public Relations, Web Design: Lewis Bloomfield

Manual: Scott Gentile, Robert Rogalski, Larry Green

Manual Proofreading: The beta team

Quality Control: Cody Bergland

Beta Testing: The world's best beta team, including Forest "FAC257" Crooke, Glenn Cummings (GlennC), Ryan "Hog Driver" Gann, Captain Jakey, Erwin Schultze (dutch506), Guenter Steiner, Paul "Gypsy Baron" Strogen, Oskar Wagner.

Special Thanks to: Tim Gallagher, Bill Hopkins, Tim Chop of the Berlin Airlift and the New England Air Museum.

Very Special Thanks to our friends and families who stuck by us and worked hard to support our efforts

What an amazing aircraft this is.

We leave you with a shot of our beloved Thunderbolt flying into a beautiful sky.

From all of us at A2A Simulations, thank you.