A detailed illustration of a P-51H Mustang fighter plane in flight, viewed from a low angle looking up. The plane is silver with a black nose and canopy. It features a large 'F' on the wing and a blue star insignia on the fuselage. The background is a clear blue sky.

P-51H

'HIGH PERFORMANCE' MUSTANG

A sepia-toned photograph of an aircraft factory interior. The image shows a large hangar with a high ceiling and many windows. Several aircraft are visible, including a large bomber in the foreground and smaller planes in the background. Workers are seen around the aircraft, and the overall scene depicts a busy manufacturing environment.

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AIRCRAFT FACTORY P-51H "HIGH PERFORMANCE" MUSTANG
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THANK YOU FOR BUYING THE
AIRCRAFT FACTORY P-51H "HIGH PERFORMANCE" MUSTANG.
- THE AIRCRAFT FACTORY TEAM

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ERGONOMIC ADVICE

- 1) Always maintain a distance of at least 45 cm to the screen to avoid straining your eyes.
- 2) Sit upright and adjust the height of your chair so that your legs are at a right angle. The angle between your upper and forearm should be larger than 90 degrees.
- 3) The top edge of your screen should be at eye level or below, and the monitor should be tilted slightly backwards, to prevent strains to your cervical spine.
- 4) Reduce your screen’s brightness to lower the contrast and use a flicker-free, low-radiation monitor.
- 5) Make sure the room you play in is well lit.
- 6) Avoid playing when tired or worn out and take a break (every hour), even if it’s hard ...



CONTENTS

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Some people experience epileptic seizures when viewing flashing lights or patterns in our daily environment. Consult your doctor before playing computer games if you, or someone of your family, have an epileptic condition.
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In order to play Aircraft Factory you must have an Intel PC compatible computer, which meets the following requirements:

MS Flight Simulator X.
Windows XP - 7 - 8 Pentium IV or faster
Hard drive space: at least 300 MB, CD ROM drive, 3D Graphics Card, Direct X 9c or higher

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SETUP

DESIGNERS NOTES

OVERVIEW

VISUAL EFFECTS AND SOUND

AIRCRAFT FACTORY P51H MUSTANG

REFERENCES

CREDITS

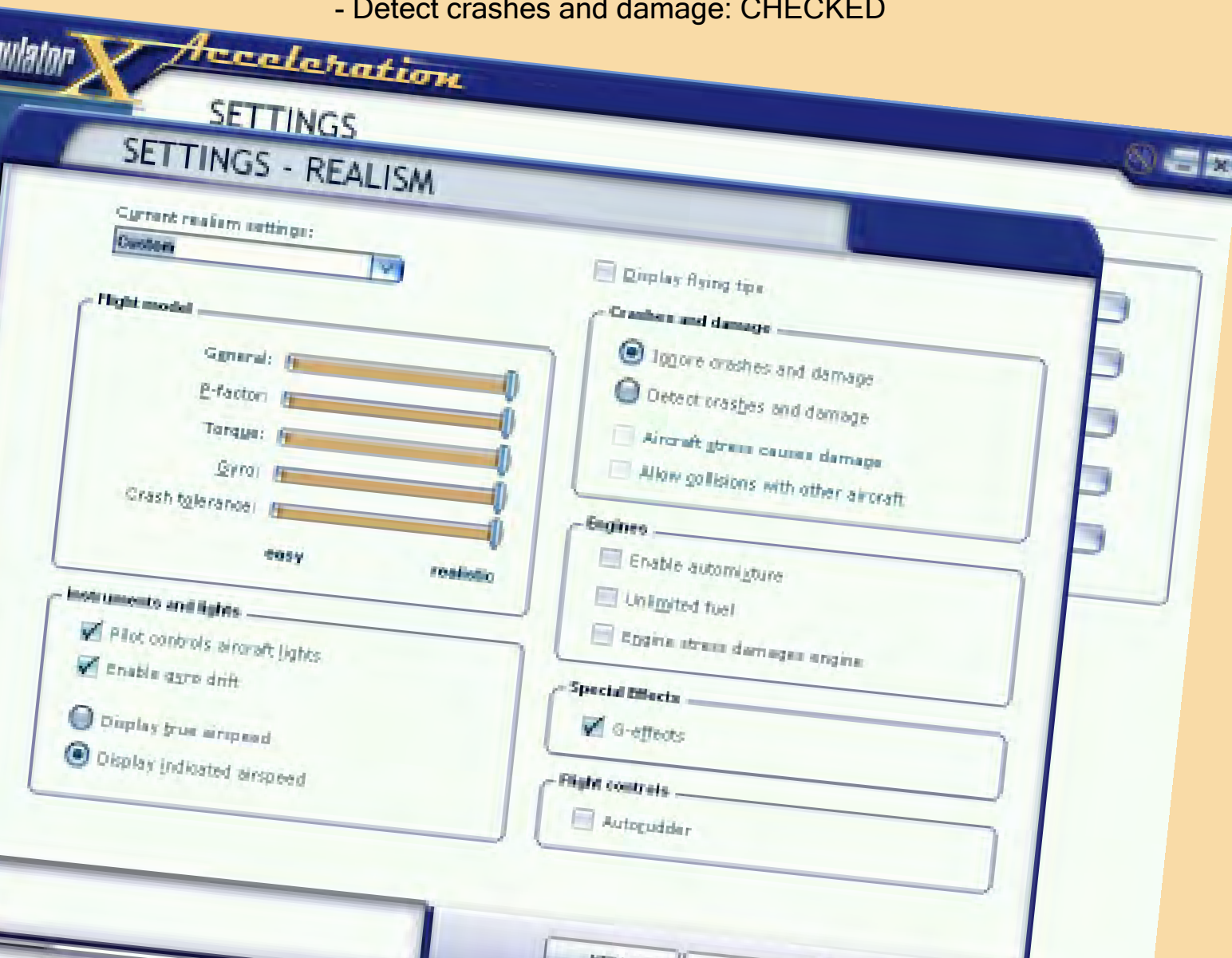
SEE THE REAL THING

SETUP

SYSTEM CONFIGURATION

To make sure you are getting the most out of your Aircraft Factory P-51H, please verify that your FSX realism settings are set to the following;

- Current realism settings: HARD
- Detect crashes and damage: CHECKED



FEATURES

- **EXPERIENCE THE HIGHEST PERFORMANCE P-51 MUSTANG EVER PRODUCED**
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P-51H MUSTANG

HIGH PERFORMANCE HISTORY

Aircraft Factory is our budget line of products. So far only for FSX we created this line with one simple idea. Great simulated aircraft at a great low price. With realistic modelling they are aimed at the get up and go flyer whilst keeping the basic checklists and systems in place to keep all flyer's happy. Ideal for your first payware for the Microsoft flight simulator series, and a great jump of point to the more systems intensive aircraft from the Wings of Silver, Wings of Power and ultimately Accu-sim aircraft.

The flight model was very carefully researched and we used the actual P-51H pilot's training manual and technical orders to ensure our procedures and performance matched the real thing as closely as possible.

The P-51H differs from the P-51D primarily in performance. The procedures are identical in many cases to the P-51D, and aircraft handling is very similar, with the "H" model having greater agility and a higher roll rate due to its substantially lighter weight and larger ailerons. The fuel capacity is lower on the "H" model because the fuselage tank was made smaller to reduce the negative impact on weight and balance from the excess weight being so far aft from the centre of gravity. However, the "H" model has a range similar to the "D" model because its airframe has slightly less drag, and the aircraft weighs considerably less than the "D" model. The P-51H was conceived and manufactured during WWII and would have seen combat had the war not ended in September, 1945. It was developed on a time line that was roughly concurrent with that of the Focke-Wulf Ta 152, and its performance was similar to the German aircraft. However, the P-51H, with its top speed of 487 mph at 25,000 feet, was substantially faster than either the Ta 152C or H models, by at least 15 mph. In addition, the P-51H incorporated many of the automatic features common to late-war German aircraft. It used a Simmonds control unit to maintain a constant manifold pressure relative to throttle position, eliminating the need for the pilot to "chase" the throttle lever to maintain manifold pressure as the aircraft gained altitude. The supercharger switch from low to high speed was fully automatic, as were many of the controls related to the water injection and war emergency power.

Perhaps the greatest advantage the P-51H would have had over the Ta 152 is the fact that the Mustang remained a superlative dog-fighter despite achieving parity of power and speed with the Ta 152. If anything, the P-51H was a nimbler, better-handling aircraft than the P-51D, and its lighter weight would have allowed a tighter turning radius at high altitude than the German plane. In a dive or level flight, the P-51H was as fast or faster than any single-engine, propeller-driven Axis fighter ever built. The P-51H, although not well-known, was probably the finest piston-engined fighter to emerge from WWII in every respect and was likely the fastest propeller-driven aircraft in the world at the close of WWII.



COCKPIT - HIGH



COCKPIT - LOW



NAVIGATION

PANELS

The Aircraft Factory North American P-51H Mustang is equipped with several panels which can be very helpful during the flight. Those are:

1) Radio Panel (accessible by pressing “shift + 2” keys)

The Radio Panel installed in the P-51H is a default FS radio stack which consists of (from the top): radio which allows you to change and swap COMM and NAV frequencies; Distance Measuring Equipment (DME); autopilot and transponder. The panel has also NAV/GPS switch which allows the plane to follow the GPS data.

Note: to achieve a desirable heading when you are in HDG autopilot mode, you have to operate the Heading Hold Selector on your Compass (below the Airspeed gauge).

2) Default FS GPS (accessible by pressing “shift + 3 keys)

3) Trim Panel (accessible by pressing “shift + 4” keys)

The Trim Panel allows you to set a desired trim for the ailerons, rudder and elevator. Their settings can be changed by pressing left mouse button or by mouse wheel when hovering a cursor over a selected trim.

The Trim Panel has also a flap lever at the bottom which allows you lower or raise the flaps in your plane.

RADIO PANEL (SHIFT +2)



TRIM PANEL (SHIFT +4)



LIVERIES



LIVERIES





TECHNICAL SPECIFICATIONS

The following abbreviated procedures were condensed from the P-51 Pilot Training Manual. It's worth noting that the P-51D manual begins with a cautionary tale, several pages long, comparing the aircraft to a wild stallion. It was -- and is -- that kind of aeroplane. Throughout the manual, the prospective pilot is warned repeatedly about the high-performance nature of the Mustang, and its propensity to turn on the unwary. It also, however, strongly emphasizes the fact that the P-51 is a superb aircraft in the right hands, asserting that it was the finest aircraft of its kind anywhere in the world. That argument continues to this day, but there is little doubt that, among the piston powered aircraft of the 20th century, the North American P-51 Mustang has emerged as an icon, and is by far the most widely recognized piston fighter ever produced.

GENERAL INFORMATION

Empty Weight: 6,585 lbs (P-51D 7,266 lbs)
Wingspan: 37.00 feet
Wing Area: 235.00 square feet
Normal Takeoff Weight: 9,374 lbs.
Maximum Takeoff Weight: 11,500 lbs.
Top Speed, altitude: 487 mph TAS @ 25,000 feet MSL (P-51D 437 mph)
Top Speed, Sea Level: 401 mph TAS (P-51D 367 mph)
Initial climb: 4,000 fpm with WEP
Stalling Speed, clean (9,000 lbs.): 114 mph IAS
Stalling Speed, landing (9,000): 100 mph IAS
Power plant: Packard Merlin V-1650-9, 1380 HP for takeoff, 2,218 HP War Emergency
Armament: Six .50 calibre machine guns; two bombs up to 1000 lbs each; ten rockets

WEIGHTS AND LOADING

The Aircraft Factory P-51H flight model is set up with a high level of realism, which extends to aircraft loading and fuel supply. In the Fuel and Payloads menu, you will see three fuel tanks and six station loads. The first two station loads are the pilot and weight of the engine oil, which is stored in a tank mounted on the aircraft firewall. When full, this tank weighed 94 pounds, which is reflected in the default weight of this station load. The normal pilot weight was considered to be 200 pounds for this aircraft, also reflected in the station loading. The remaining four station loads reflect the guns and ammunition, handled separately for each wing. Thus, the plane can be set up for flight with the normal gun and ammo weight present in the wings, without ammo but just with the gun weight, or without guns and ammo for acrobatic trim. The manual states that the presence of the gun and ammunition weight has a negligible effect on aircraft handling, but this weight will affect the rate of climb and fuel consumption as well as takeoff distance, albeit marginally. Set up your Aircraft Factory Mustang to suit your mission and proceed to the Cockpit Check. The default loadings for weight are normal for this aircraft, so no action needs to be taken here unless you plan a special mission.

COCKPIT CHECK - FUEL SUPPLY

The first thing you will want to consider is whether or not to fly with the aft fuselage tank filled. When full, this tank had an adverse affect on the aircraft's handling. Only normal, conservative manoeuvres were allowed with this tank full, as it moves the aircraft's centre of gravity well aft. Unless you are planning a long-range ferry mission, it is recommended this tank be set to empty or nearly empty. Note: for "Auto Start", this tank must have enough fuel in it to get the plane started, as the simulator will NOT select either wing tank automatically. To get around this, start with five gallons of fuel in the centre tank if you plan on using the "Auto Start" feature to start your aircraft.



CHECK, CHECK,...

COCKPIT CHECK – CONTROLS

1. Parking Brake - Set
2. Fuel Selector - Set to fuselage tank if fuel is present; use fullest wing tank if fuselage tank is empty.
3. Elevator Trim - 2 degrees nose-heavy
4. Rudder Trim - 7 degrees nose-right
5. Aileron Trim - Neutral
6. Flaps - Up for takeoff
7. Carburetor Air - Normal
8. Propeller Control - FULL FORWARD
9. Tail wheel - 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 LEFT MAIN TANK (or FUSELAGE TANK if so equipped) and turn fuel shut-off valve ON.
5. Put the booster pump on EMERGENCY.
6. Turn the magneto switch on BOTH.
7. Set mixture control to RICH.*
8. Confirm fuel pressure is at least 10 psi.*
9. Use the primer - three to four shots for a cold engine.
10. Engage starter switch until the engine starts.
11. Check engine instruments to confirm oil pressure rises to at least 50 psi within 30 seconds.
12. Idle at 1200-1300 RPM until the oil temperature reaches 40 degrees C.
13. Check the suction gauge to see if it is working.
14. Check all instruments for proper function.
15. After warmup, idle at 1000 RPM or slightly less.

(The following procedure was taken directly from the P-51 manual except for those noted with an asterisk.)

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. Turn the booster pump to emergency
5. Check the coolant/oil shutter position (open for takeoff).

TAKEOFF

This section was taken directly from the manual except for the notations in parentheses. After you have pulled out and lined up on the runway, make sure the steerable tail wheel is locked and the stick well back. Then advance the throttle gradually, and smoothly, up to the desired manifold pressure. Don't hoist the tail up by pushing forward on the stick until you have sufficient airspeed to give you effective rudder control (at least 60 mph IAS). This is important to watch in the takeoff, since the P-51, like all single-engine planes, has a tendency to turn left because of torque. If you horse the tail off the ground too quickly with the elevators, better be ready to use the right rudder promptly. Keep the air plane in a three-point attitude until you have plenty of airspeed. In a normal takeoff, the rudder trim tab is sufficient to make torque almost unnoticeable.

AFTER TAKEOFF

1. Raise the landing gear.
2. Throttle back to normal climbing power.
3. Adjust the prop to climbing RPM.
4. Re-trim the ship as required for climbing.
5. Turn the booster pump to the normal position.
6. Check over all your instruments.



CLIMB CONTROL

A normal, brisk climb is made at 165 mph IAS with a manifold pressure of 46” and the propeller set to 2700 RPM. A climb to 25,000 feet can be accomplished in about 15 minutes and will cover about 49 nautical miles. Allow the climbing speed to fall off gradually above 15,000 feet until you are climbing at 155 mph IAS at 25,000 feet. A climb to 25,000 feet will use about 25 gallons of fuel in this flight model if the mixture is set to automatic. For maximum performance, climb at 61” and 3,000 RPM at 165 mph.

Cruise Control Schedule
(Clean Configuration, No Wing Racks, 9,000 lbs.)

Set your Mustang up for optimum cruising, depending on your mission, using the following table, for aircraft weights of 8,000 to 9,600 lbs. These two settings are just two possible examples taken from the manual. Your Aircraft Factory P-51H matches the fuel economy and range of the real aircraft per the manual, and you can use the manual to set up a variety of cruise settings. Use the “Range” information below, in miles per gallon, to calculate your range based on the amount of fuel you have on board. All figures are for the mixture control set to automatic.

NOTE: These figures are slightly higher than those listed in the P-51H manual. This is because the cleanest configuration specified in the manual is with wing racks installed. On a very clean aerodynamic design such as the P-51H, the wing racks create noticeable drag and thus will reduce the range as compared to a perfectly clean aircraft.

Altitude	Pilot’s IAS	Manifold Pressure	RPM	TAS MPH	GPH	Specific Range
10,000	220	33	1600	253	46	5.5 mpg
20,000	224	33	1950	300	53	5.9 mpg

LANDING

1. Check tanks and select the fullest tank for landing.
2. Put the fuel booster on normal.
3. Check the mixture control and set to RICH.
4. Set the prop to about 2700 RPM.
5. Check the traffic pattern and obtain clearance to land.
6. Slow down to a sensible speed before peeling off.
7. Slow down to 170 mph before lowering your landing gear. When the landing gear comes down, the aeroplane gets quite nose-heavy. However, you can easily adjust the trim tabs to take care of this. Don’t forget that the gear takes 10-15 seconds to go down.
8. The normal speed in the traffic pattern with wheels down is 150 mph IAS.
9. Do not lower full flaps before 165 mph IAS. Remember, it takes about 15 seconds to go from the full up position to the full down position. Allow plenty of time for this operation to make sure your flaps are down when you need them.
10. After your flaps are down and you roll out of the turn onto the landing (approach) leg, your speed should be about 115-120 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 (about 20-25 inches of Hg on final at a descent rate of 500 fpm at 120 mph IAS at 9,000 lbs. aircraft wt.)
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-51 doesn’t mush but stalls rather suddenly when you lose flying speed. So have your plane close to the runway at this point.

ENGINE LIMITATIONS AND CHARACTERISTICS

The Packard Merlin V-1650-9 used in this P-51H was an extremely potent engine and an excellent performer at high altitudes. The two-stage supercharger did a good job of maintaining power up to high altitudes and its operation was normally automatic. The maximum allowable manifold pressure for this aircraft is 80", which is considered "War Emergency Power" or "Combat Power". This setting was to be used for only five minutes at a time. The normal maximum power for takeoff is 61" at 3000 RPM.

WEP

In the real aircraft, there was a gate that stopped throttle travel, limiting power to just 61". To increase power beyond this rating, the pilot simply pushed the throttle lever past the gate to the desired setting. The P-51H had both "dry" and "wet" WEP ratings. The "dry" rating was identical to the P-51D, which is 67". The "wet" rating is a full 80" of manifold pressure, producing over 2,200 HP at altitudes below 10,200 feet. In the real aircraft, a Simmonds control unit limited the maximum manifold pressure to 67" unless the water injection switch was turned on. If the water injection was turned on, a micro switch in the throttle quadrant was enabled and the maximum manifold pressure allowed by the Simmonds control unit was increased to 80". If the water injection switch was turned off, or the water tanks were empty, the maximum manifold pressure allowed by the control unit was 67" regardless of the throttle position. In this flight model, there is no War Emergency Power switch. The maximum "wet" manifold pressure is available by using the throttle control only. Adjust the manifold pressure using the throttle control as indicated by the chart below for various flight conditions.

CRITICAL ALTITUDE

The critical altitude for this engine is 32,000 feet. This is the altitude where the engine can still produce the full 67" of manifold pressure for "dry" combat power at full throttle. Above this altitude, the manifold pressure and engine power will begin to fall off.

The War Emergency Power rating of 80" will begin to fall off above 25,000 feet.

ENGINE CONTROL	TAKEOFF MAXIMUM	TAKEOFF NORMAL	DRY WAR EMERGENCY	WET WAR EMERGENCY
MP	61"	45"	67"	80"
RPM	3000	3000	3000	3000
TIME LIMIT	15 MINUTES	UNLIMITED	5 MINUTES	7 MINTUES
THROTTLE POSITION	FULL	SET BY PILOT	WEP ON SET BY PILOT	FULL WEP ENABLED

ENGINE CONTROL	MAXIMUM CONTINUOUS	MAXIMUM CRUISE	NORMAL CRUISE
MP	46"	36"	30"
RPM	2700	2400	2250
TIME LIMIT	UNLIMITED	UNLIMITED	UNLIMITED
THROTTLE POSITION	SET BY PILOT	SET BY PILOT	SET BY PILOT



FLIGHT CHARACTERISTICS

From the P-51 Manual:
“The P-51 is one of the sweetest-flying fighter planes ever built. It is very light on all controls and stable at all normal loadings. Although light on the controls, it is not so sensitive that you would call it jerky. Light, steady pressures are all you need to execute any routine manoeuvre. At various speeds in level flight or in climbing or diving, the control pressures you have to hold are slight and can be taken care of by slight adjustments on the trim tabs. However, the trim tab controls are sensitive; use them carefully.”

SPINS

The aeroplane does not have any spin tendency at the stall, and it is necessary to force the aeroplane into the spin. In general, spins in this airplane are uncomfortable because of heavy oscillations and rolling. These motions are not regular, but occur erratically during the spin. Normally, the air plane goes over to a slightly inverted position in the first half-turn of the spin. Recovery is made by applying rudder against the spin and returning the stick to neutral.

STALLS AND SPINS

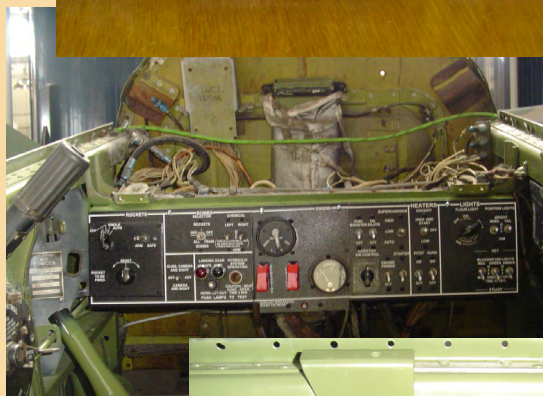
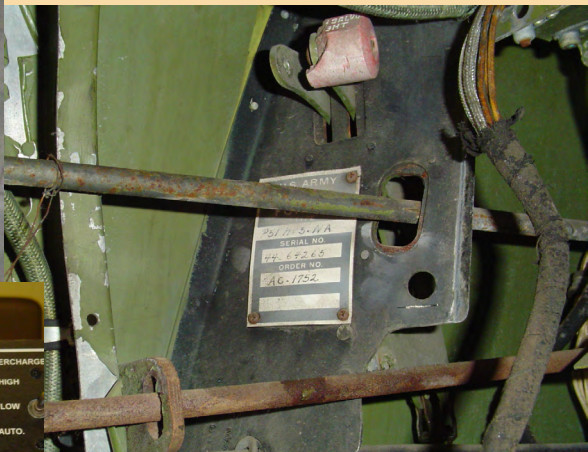
From the P-51H Manual:
The stall in this aeroplane is comparatively gentle. With idling power, stall warning is given by very slight air plane buffeting 2 to 3 mph above stall speed, followed by nose-down pitching at stall. There is mild longitudinal oscillation until the stick pressure is relieved. If further back-pressure is applied, the air plane will roll off on either right or left wing. This rolling condition is more severe with flaps down.

POWER-ON SPINS

Power-on spins are not recommended. If a power-on spin is encountered inadvertently, close throttle completely and apply control for recovery. Large losses in altitude should be anticipated if power-on spins and recoveries are attempted.

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

BIG THANKS TOO,...



Invaluable assistance was provided by the following people:

- Steve McDevitt, Collings Foundation B-17G captain, airshow/warbird/airline pilot
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- Harry Goldman, U.S. Army Air Force B-26 pilot/First Pathfinder Division
- Gene Koscinski, U.S. Army Air Force B-24 Bombardier
- Bud Lindahl, U.S. Army Air Force B-24 Navigator/Bombardier
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- Gordon Rapp Certified instructor / T-6 owner
- Roy Test, U.S. Army Air Force B-17G co-pilot (32 missions)
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- Lt. Clyde B. East, U.S. Army Air Force F-6C/D Mustang pilot/Ace (13 victories)
- Michael Karatsonyi, Luftwaffe Me 109 G pilot
- Mike Dornheim, Aeronautical Engineer and aviation journalist

SPECIAL THANKYOU

A special thankyou to the Chanute Air museum for full access to the restoration of the P-51H Mustang 'HEATWAVE' as well as a very warm welcome from all museum staff and curator Mark Hanson shown below with Capt Jake from A2A Simulations and A2A Comanche being welcomed as we landed at the Museum.

Remember to support your museums and let history be kept alive!

<http://www.aeromuseum.org>



CREDITS

The creators of Microsoft FSX
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