PILOT TRAINING MANUAL FOR THE LIGHTNING

P-38

This revised edition supersedes the original (brown cover) Pilot Training Manual for the Lightning. All copies of the latter are rescinded.

Headquarters Army Air Forces
Washington 25, D. C., 1 Aug 1945

The use and authentication of this manual are governed by the provisions of AAF Regulation 50-17.

BY COMMAND OF GENERAL ARNOLD:

HEADQUARTERS ARMY AIR FORCES ☆ OFFICIAL ☆ WASHINGTON, D.C.

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SECTION 1 *Meet the Lightning*

HISTORY

In the spring of 1937 the United States Army Air Corps submitted to various manufacturers specifications for a high altitude fighter airplane.

To fill these requirements of performance, armament, and adaptability, the Lockheed Aircraft Corporation embarked on the construction of a radically different model, later designated the XP-38.

This highly experimental model was completed and ready for test in December of 1938. Lt. Ben Kelsey, pilot and engineer, was given the dubious honor of testing the new airplane. One night late in December, the XP-38 was dismantled and transported by trucks to March Field. By the middle of January, 1939, Kelsey began the conventional ground tests.

Even then numerous rumors had started concerning the future of the XP-38. Its twin booms and tricycle landing gear certainly deviated from the conventional. These, coupled with two engines and dual engine controls, appeared to be too much for one man to handle, according to the hangar talk. The brakes failed during a fast taxi run, and heads nodded an "I told you so." Undaunted, Kelsey carried on and a few days later was ready for the first takeoff.

Again the hangar boys wagged their heads when the XP started a violent shaking as it became airborne on its first takeoff. Thanks to Kelsey's skill the XP continued to fly—a whole half hour. The ailment was corrected and subsequent test flights were made.

Early in February, the XP left on a cross country flight to Wright Field where a brief check would decide its acceptability. It made the hop from March Field to Wright Field in 5 hours and 33 minutes flying time. Kelsey had a brief conference with General Arnold, and then took off for Mitchel Field, N. Y. Forty-two minutes later the XP made the headlines by cracking up in a creek 200 yards from Mitchel Field.

Discouraged, but not quitting, the manufacturers started the YP-38, the first of 13 for the U.S. Army Air Corps.

The YP, like its predecessor the XP, made the headlines—and in a detrimental fashion. Eventually it became common knowledge, as any Southern California citizen could testify, that the "Yippy" was a jinx airplane.

The pilot was a doomed man if anything went wrong. He could not bail out, the tail had a nasty habit of shaking off, and the plane could not be pulled out of a dive.

The British and French, hard pressed for airplanes, contracted to purchase more than 600 P-38's. They specified certain modifications. They insisted that there be no turbo-superchargers or counter-rotation propellers. As expected, the airplane gave a very poor performance. Again the insults grew. It seemed as if the P-38 was doomed to die a dishonorable death.

A small nucleus of factory and Army men, including Kelsey, never lost faith. The manufacturer continued production with original designs.

Training new pilots for the airplane was slow. It was a lot of airplane to step into and take up alone. All was not lost, however. The manufacturer came to the rescue, and, with the sanction of General Giles, Jimmie Mattern introduced the "Piggyback" as a training aid. The Piggyback, probably one of the greatest single training aids, tremendously increased the efficiency of the training program. It did much to dispel numerous baseless rumors about the P-38.

The tempo of training and producing fighter pilots for the airplane kept increasing. Yet the crucial test of meeting and bettering the enemy had yet to come.

First contact with the enemy was made in the Aleutians, August 4, 1942. Two P-38's met and shot down three type 97 Japanese flying boats. Ten days later, over Iceland, a P-38 shot down a Focke-Wolf Kurier. The christening had occurred. The skeptics claimed this proved nothing. Several weeks later over France, the Lightnings were unable to make contact with the enemy, and again the skeptics had a chance to gloat.

Fate finally relented, and in November 1942 the P-38 received its real test in the North African invasion. Taking the Luftwaffe on under all conditions, the black sheep became a white hope—the queen of the African skies. The same excellent reports poured in from the Aleutians, and the Southwest Pacific. It was in the Southwest Pacific that 12 P-38's without loss to themselves disposed of 15 Zeros. Said one bewildered Jap pilot: "Two airplanes—one pilot!"

The P-38 had won its spurs. It became the darling of the bomber boys for bringing them home. New fields were tried—all with the same success. Dive-bombing, skip-bombing, and strafing became part of the day's work for "The Forked Devil," as the men of the Luftwaffe called the Lightning.

The P-38 not only dishes it out; it can take it:

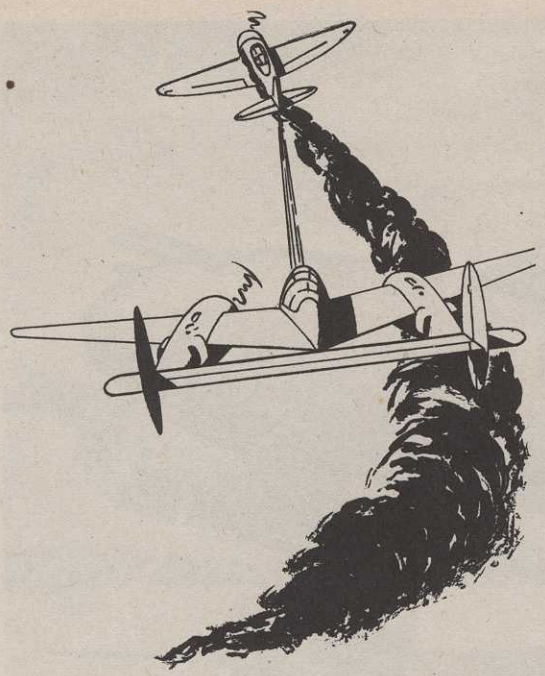
A few recorded cases: Captain Hoelle clipped a telephone pole while strafing. His ship was horribly battered, but he came back.

One lad lost an engine 5 times over Kiska but made it home each time.

A P-38 pilot left 3 feet of wing on a Jap destroyer and brought his plane back.

Jack Illfrey flew home on one engine with 2 holes in the good propeller and 168 holes in his airplane.

Here's how Lt. Ben Kelsey describes the P-38: "This comfortable old cluck will fly like hell, fight like a wasp upstairs, and land like a butterfly." He adds: "As a fighting ship it's just like a big girl and you have to take her up on your lap and manhandle her. It's an extremely honest airplane; it doesn't bite and doesn't do unexpected things."



COMBAT EXPERIENCE

The reputation of a fighter airplane depends on the destruction it deals out to the enemy, the protection it gives the pilot, and the way the men who fly it feel about it. They must be convinced that their plane is the best in the world.

The P-38 is a leading fighter of World War II. It has a very long range, enabling it to give bomber support deep into enemy territory. It fights equally well at high or low altitudes. The P-38 is also a fighter bomber, capable of carrying 2 tons of bombs.

Its four .50-cal. machine guns and one 20-mm. cannon, all mounted in the nose, produce a concentration of fire power ideal for strafing. The safety factor of 2 engines has endeared it to fighter pilots who call the second engine their "round trip ticket." With one engine knocked out, P-38 pilots in combat have finished the fight and made it home.

The P-38 has demonstrated a remarkable adaptability. It has met the enemy on all fronts, coping equally well with the changing needs of different situations.

High altitude fighter

Two turbo-superchargers give the Allison engines sea level horsepower at extremely high altitudes. The success of the P-38 as a high altitude escort over Europe and as a high altitude intercepter in the Southwest Pacific area has established an enviable combat record.

Low altitude fighter and fighter-bomber

Sweeping in at mast height, P-38's have sunk many German, Italian, and Japanese ships. The presence of all the guns in the nose, rather than the wings, eliminates criss-crossing cones of fire. It has an effective straight-ahead range of more than 600 yards, making it excellent for strafing.

A flight of P-38's can go into action with all guns blazing while at the same time carrying a bomb load capable of sinking the largest vessels. The P-38 has won fame as a dive bomber and skip bomber in every theatre of war in addition to its other successes.

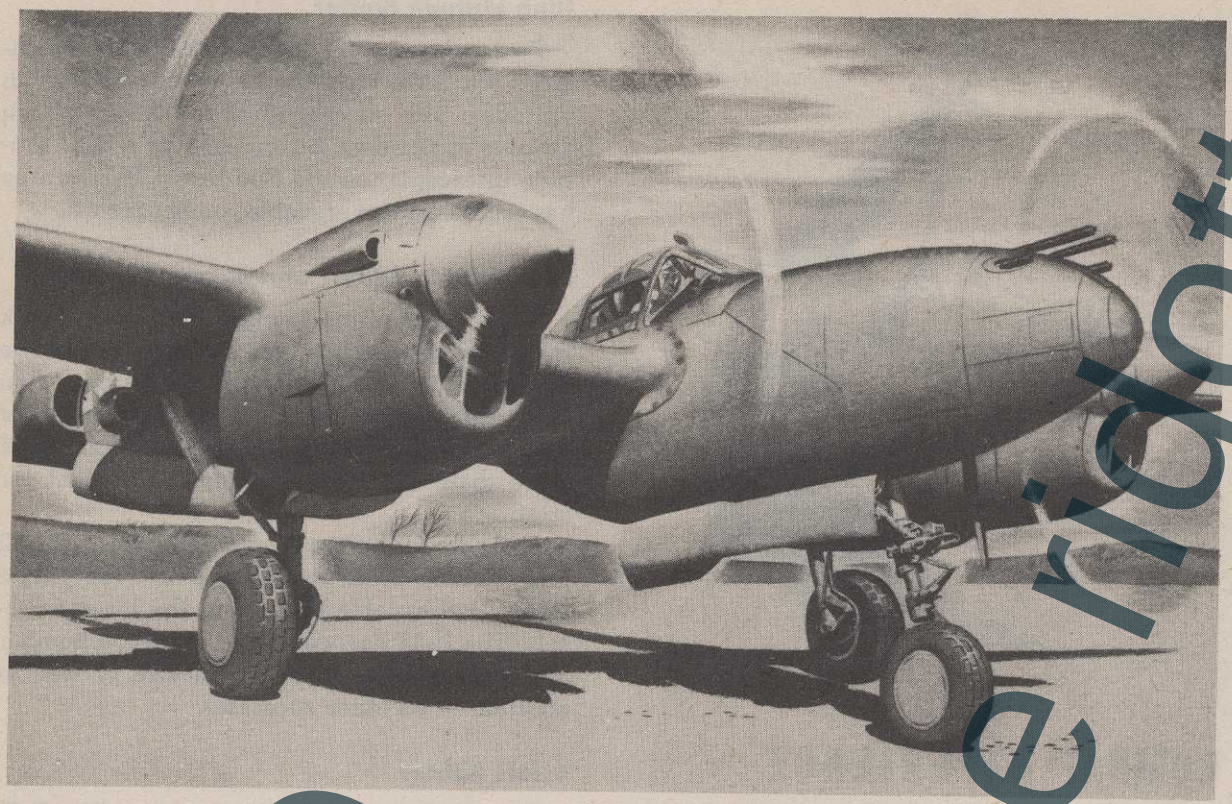
Escort fighter

Carrying droppable fuel tanks, the P-38 has a range of more than 1000 miles. It was the first fighter to fly the Atlantic and can be ferried to any fighting front. It was also the first fighter to go all the way with bombers on long range missions.

Photo-reconnaissance

The photo-reconnaissance version of the Lightning is known as the F-5. Instead of the usual 4 machine guns and 1 cannon, the F-5 has three types of cameras used in six different arrangements. Its pilot can take pictures straight down and obliquely.

Pilots who fly F-5's come in sometimes at tree-top height, take their pictures, and are gone before enemy anti-aircraft guns can be trained on them. Or again, they come over at 30,000 feet and take pictures so clear that you can pick out automobile tire tracks in the enlarged prints. Unarmed, and generally alone, these F-5's, because of their great range and tremendous speed, are among the finest photo-reconnaissance ships in the world.



GENERAL DESCRIPTION

"Boy, that's a lot of airplane!"

The P-38 is a big fighter plane. It stands almost 10 feet high, spreads out 52 feet, and is over 37½ feet long.

When the impression of size ceases to be a novelty, you notice some rather peculiar looking features. The long slender booms tapering into twin rudders are unique in aircraft design.

A closer inspection from the front quarter shows that the P-38 is a midwing airplane, with 2 liquid-cooled engines and 2 three-bladed propellers. It has a streamlined center section, called a gondola, and stands solidly on a tricycle landing gear. There are four .50-cal. machine guns and one 20-mm. cannon in the nose.

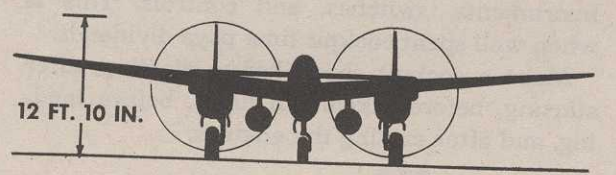
Right under the wing between the engines and the gondola, you can see two odd projections. They are shackles for external tanks or bombs. The plane can carry quite a payload on these shackles.

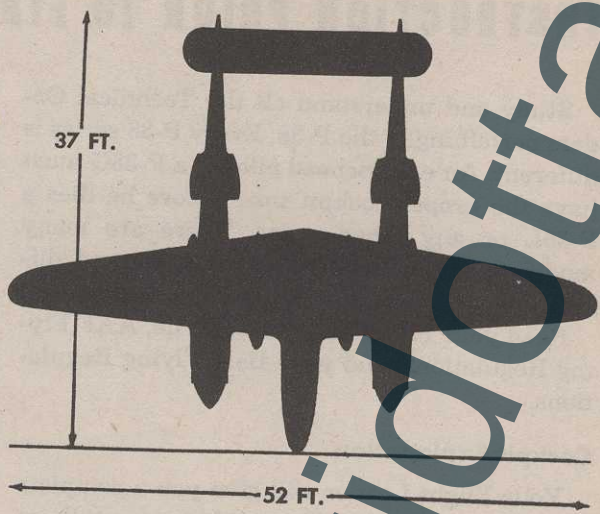
As you turn around to the right of the airplane, the slender profile comes into view. The clean lines of the boom are broken in 3 places. On the forward portion of the boom, right under the wing, is a large tear-shaped ram air intake. Just behind the wing and on top of the boom is the turbo-supercharger. In the center of the boom is the prominent coolant radiator and shutter.

Continuing around to the rear, you see the horizontal stabilizer and the elevator with its counterweights for dynamic stability. Looking over the tail section, you have a good rear view of the plexiglas enclosure of the cockpit.

The P-38 is a most impressive looking airplane. You wonder if you can handle it, but you needn't worry. With a little time and application on your part, and whether you fire guns or cameras, the P-38 will become a formidable weapon in your hands.

DIMENSIONS AND DATA





Wing area	327.5 sq. ft.
Wing loading	49 lb. sq. ft.
Gross weight (combat)	16,000 lbs.
Center of gravity limits	forward—20.00% M.A.C.
	aft —32.00% M.A.C.
Aspect ratio	8.26:1
Maximum speed	over 420 mph
Operational ceiling	30,000 feet
Armament	Four .50 cal. machine guns.
	One 20 mm. cannon.
	Installations to carry 10 rockets.
	Installations to carry 2 bombs up to 2000 lbs each.

P-38 AND F-5 SERIES COMPARISON

XP-38		P-38G-10	F-5A-1
YP-38			F-5A-3
P-38			F-5A-10
P-38D		P-38G-15	P-322
P-38E	F-4	P-38H-1	
	F-5-1	P-38H-5	
P-38F		P-38J-1	
P-38F-1	F-4A	P-38J-5	
P-38F-5		P-38J-10	F-5B-1
P-38F-13	P-322	P-38J-15	F-5C-2
P-38F-15	P-322	P-38J-20	F-5E-4
P-38G-1		P-38J-25	F-5E-4
P-38G-3		P-38L-1	F-5E-4
P-38G-5		P-38L-5	F-5G-6

INSTRUCTION PRIOR TO FIRST FLIGHT

Study and understand all the Technical Orders pertaining to the P-38. Every P-38 series is different. An experienced pilot of a P-38G must have the proper cockpit time before he flies a P-38L or any other series. There are many modifications, relocations of controls, and differences in operation that he must know.

Read your Pilots' Information File, AAF Flying Regulations, and your Base Flying Regulations.

Cockpit Explanation

Your Flight Leader will give you a complete cockpit explanation. The explanation will include the location and operation of all instruments, switches, and controls.

Cockpit Time

Cockpit time is your introduction to the P-38. Take advantage of it. Rehearse procedures. Read and re-read the checklists.

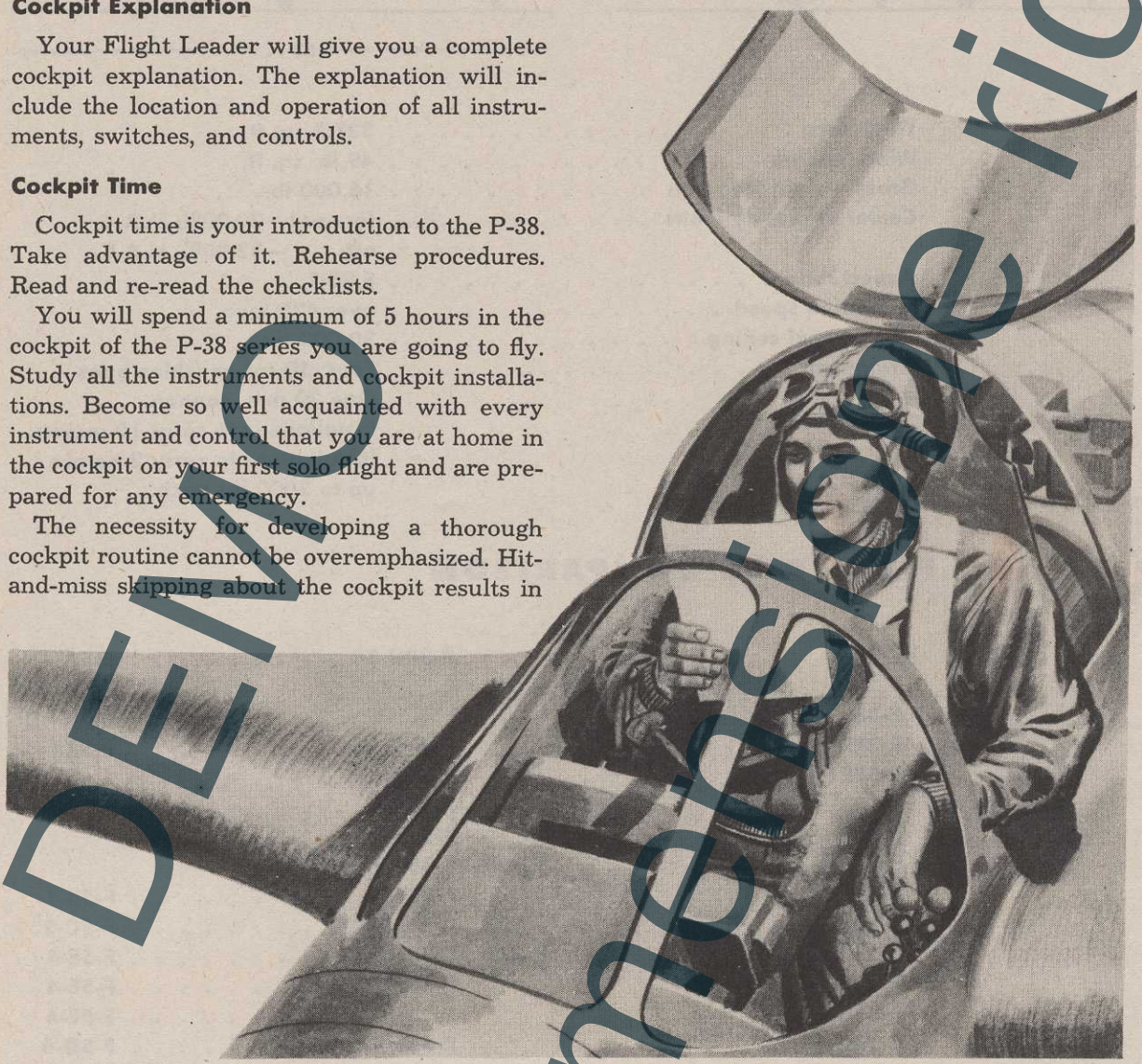
You will spend a minimum of 5 hours in the cockpit of the P-38 series you are going to fly. Study all the instruments and cockpit installations. Become so well acquainted with every instrument and control that you are at home in the cockpit on your first solo flight and are prepared for any emergency.

The necessity for developing a thorough cockpit routine cannot be overemphasized. Hit-and-miss skipping about the cockpit results in forgetting some essential check. **Always check the cockpit from left to right.** Use the checklist.

Blindfold Test

You are required to pass a blindfold test. Blindfolded, you have to locate and operate all instruments, switches, and controls. This is when well spent cockpit time pays dividends.

Make a cockpit check before starting, after starting, before takeoff, in flight, before landing, and after cutting the engines.



PIGGYBACK DEMONSTRATION

After five hours' cockpit time, you receive a demonstration flight in a piggyback P-38. Make every minute of this ride count. Know what the instructor is doing from the time you both enter the cockpit until the flight is over and the engines are cut off.

Piggyback Bailout Procedure

The first thing you do after you and the pilot are in the piggyback is rehearse the recommended piggyback bailout procedure. You'll know then, before takeoff, how to leave the airplane in case it's necessary to bail out.

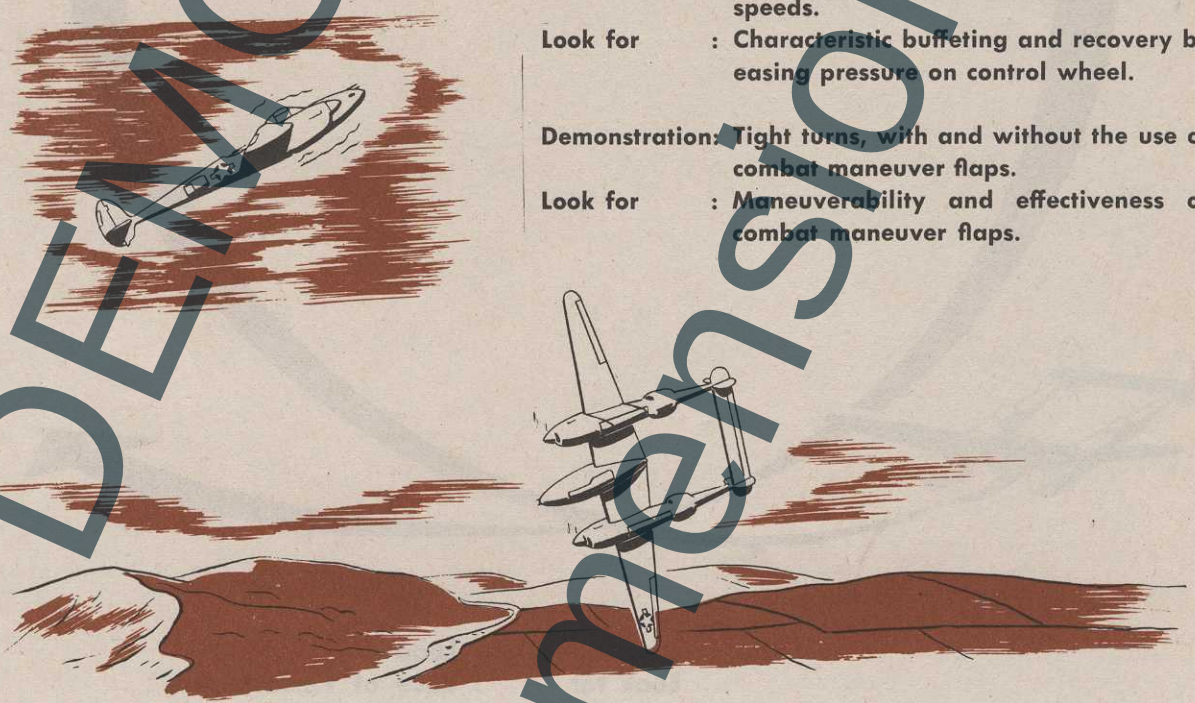
As a passenger you wear a B-8 or B-10 back-type parachute. In an emergency, you leave first and the pilot follows. If you are too large to leave while the pilot is in the cockpit, you hold the control wheel as the pilot leaves and then go out after him.

The Demonstration and What to Look For

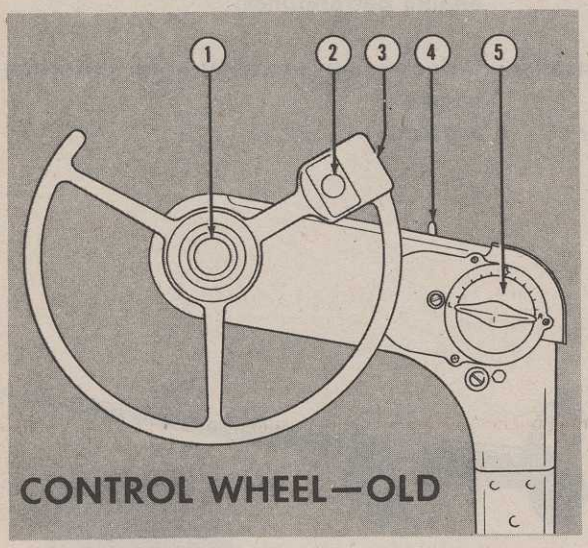
Demonstration: Power-off and power-on stalls, gear and flaps up and down.
Look for : Indications on hydraulic pressure gage during gear operation and attitude of airplane and indicated airspeeds during stalls.

Demonstration: Accelerated stalls at high and low airspeeds.
Look for : Characteristic buffeting and recovery by easing pressure on control wheel.

Demonstration: Tight turns, with and without the use of combat maneuver flaps.
Look for : Maneuverability and effectiveness of combat maneuver flaps.

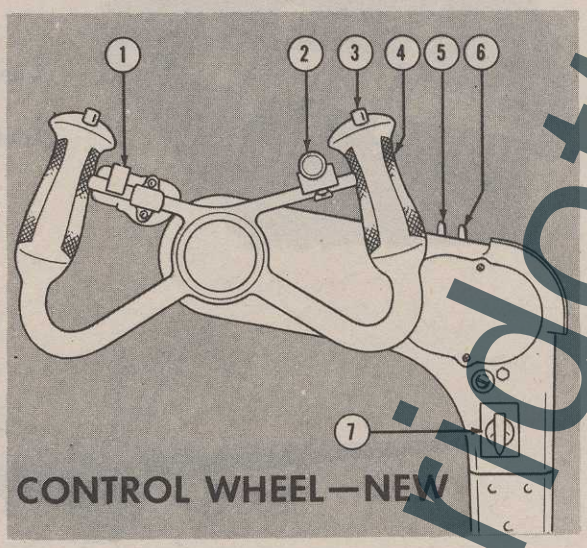


SECTION 2 Equipment



CONTROL WHEEL—OLD

1. Radio transmitter button.
2. Cannon trigger button.
3. Machine gun trigger button (back of wheel).
4. Gun-camera selector switch.
5. Aileron trim tab control. P-38's with aileron boost do not have an aileron trim tab control.



CONTROL WHEEL—NEW

1. Dive flap control.
2. Radio transmitter button.
3. Bomb-rocket release button.
4. Machine gun-cannon trigger button (back of wheel).
5. Bomb-rocket selector switch.
6. Gun-camera selector switch.
7. Gunsight light rheostat.

SURFACE CONTROLS LOCK

Lock the flight controls by the tube assembly on the right-hand window sill.

To set the lock:

1. Put rudders in neutral.
2. Push the right end of the locking tube forward of the guiding angle.
3. Place the left end of the tube in the clip on the left window sill.
4. Strap the tube to the center of the control wheel.

On the P-38L and later P-38J's the surface controls lock does not lock the rudders.

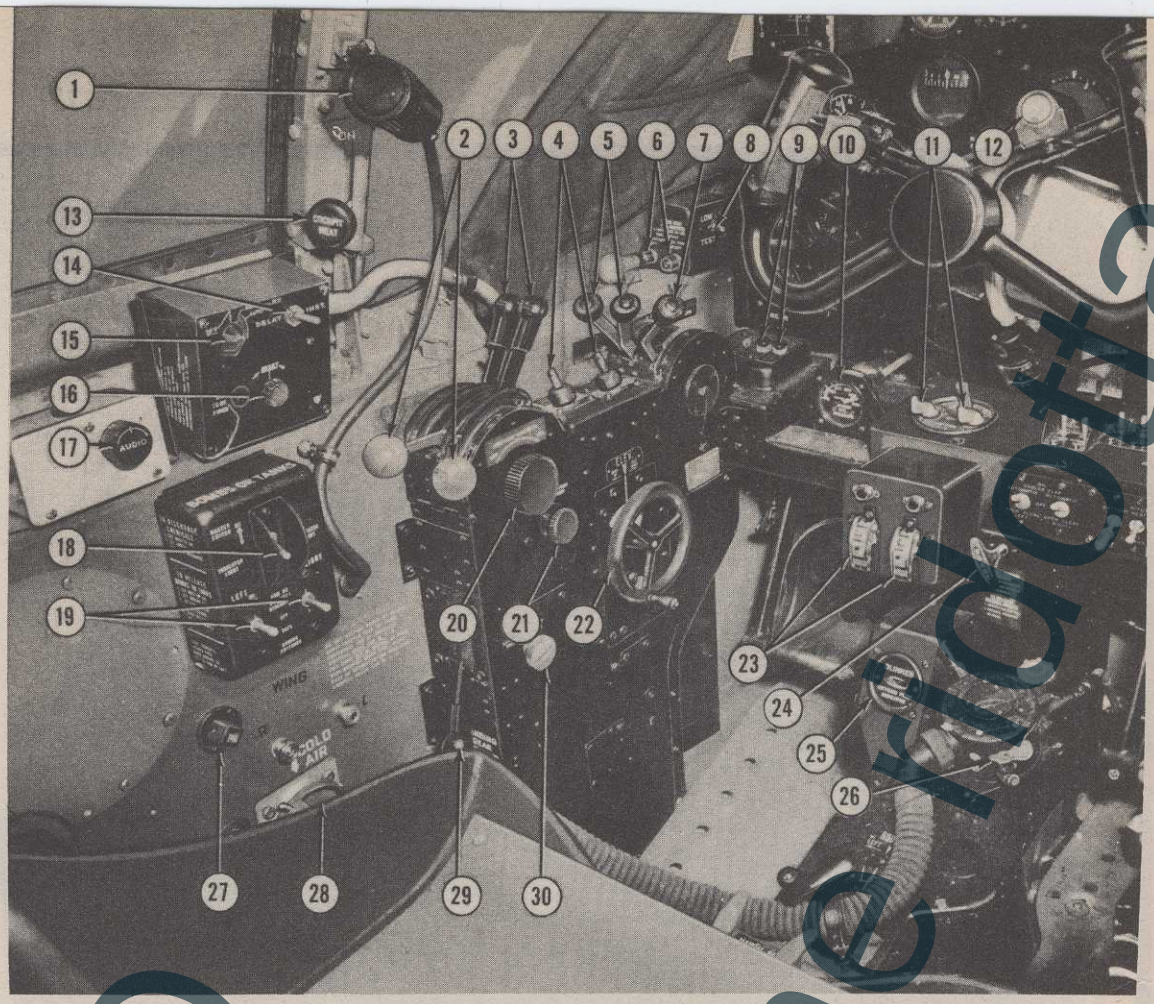
COCKPIT HEAT

Cockpit heat and warm air to defrost the windshield are supplied by an intensifier tube connected to the right engine exhaust. The cockpit heat control is on the right windshield support.

There is a heat outlet for your feet. Open and close it by the control on the floor under your right foot.

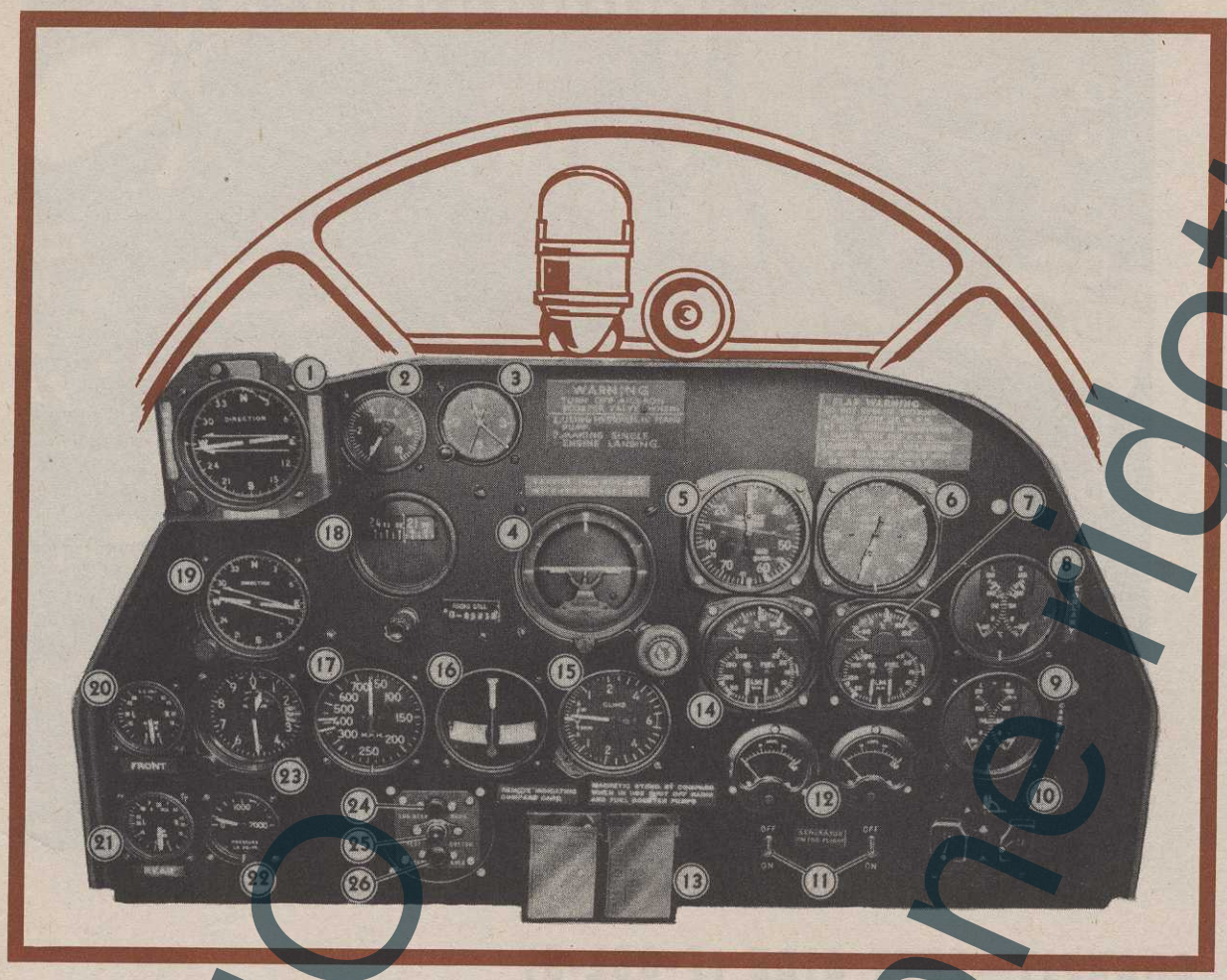
Later P-38 series have cockpit heat controls on both windshield supports and a heated flying suit plug and rheostat on the left side of the cockpit.

BEFORE TAKEOFF, CHECK THE CONTROLS FOR FREEDOM OF MOVEMENT AND BE SURE THE CONTROLS LOCK IS STOWED IN PLACE



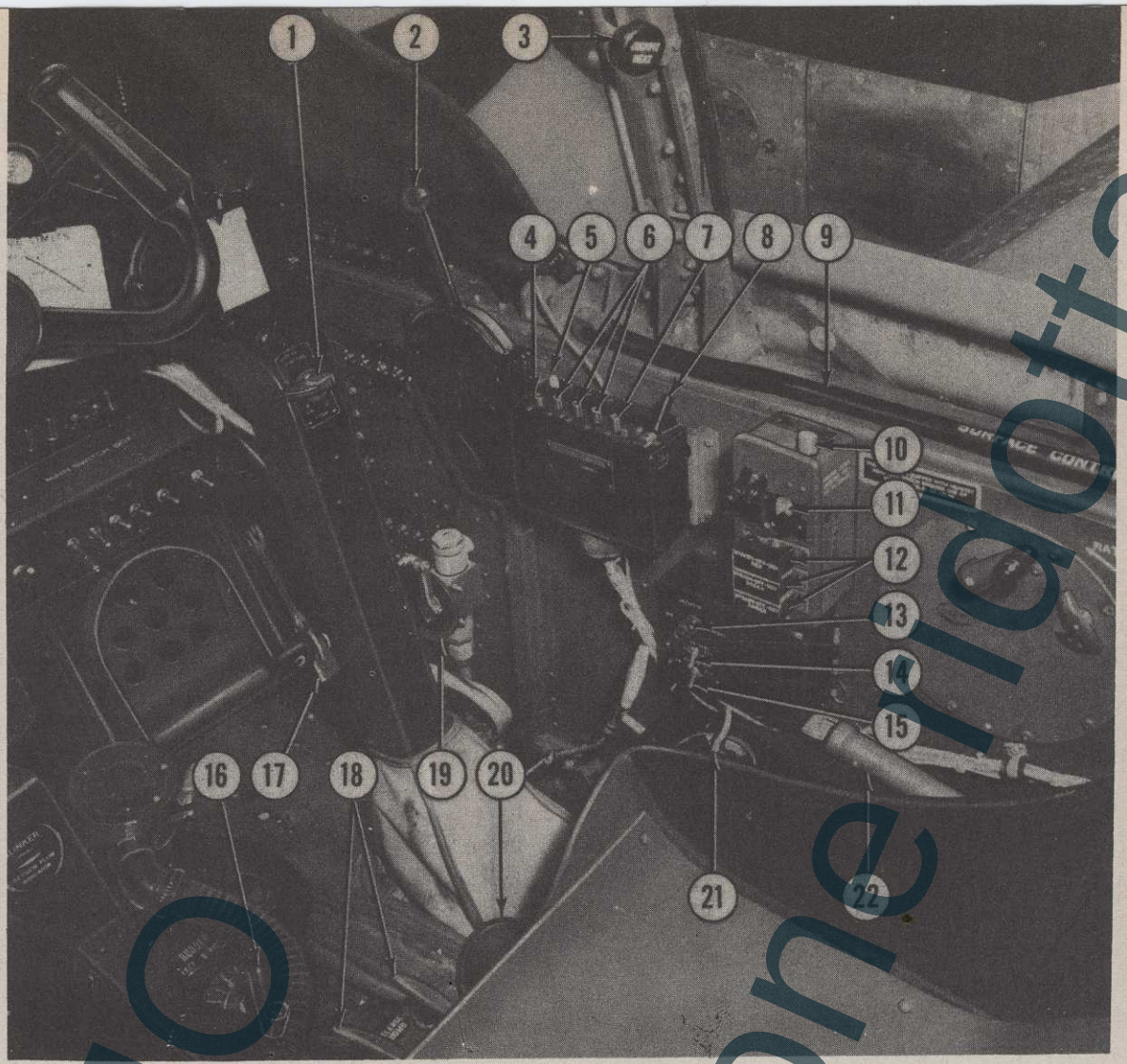
COCKPIT—LEFT SIDE (P-38L-5)

1. Spotlight (normal position).
2. Throttles.
3. Propeller governor controls.
4. Propeller selector switches.
5. Mixture controls.
6. Outer wing low level fuel warning lights.
7. Air filter control.
8. Outer wing low level fuel test switch.
9. Propeller circuit breaker buttons.
10. Oxygen pressure gage.
11. Ignition switches.
12. Radio transmitter button.
13. Cockpit heat control.
14. Rocket arming switch.
15. Rocket selector switch.
16. Rocket reset knob.
17. Radio volume control.
18. Bomb-drop tank master switch.
19. Bomb-drop tank selector and arming switches.
20. Friction control.
21. Propeller lever vernier knob.
22. Elevator trim tab control.
23. Propeller feathering switches.
24. Parking brake handle.
25. Oxygen flow indicator.
26. Oxygen auto-mix lever.
27. Spotlight alternate position socket.
28. Cockpit ventilator control.
29. Landing gear control handle.
30. Landing gear control release knob.



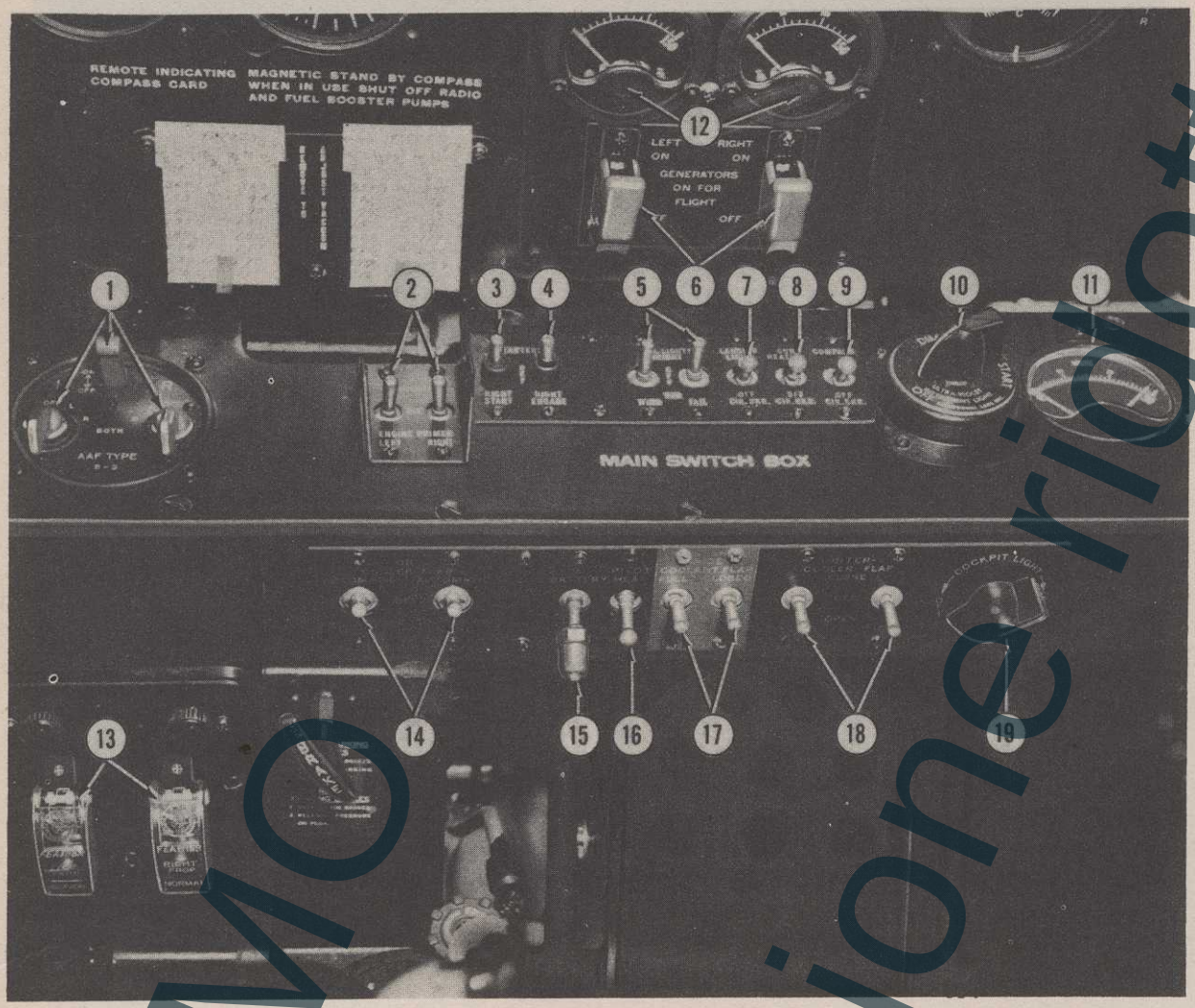
INSTRUMENT PANEL (P-38J-25)

1. Standby magnetic compass.
2. Suction gage.
3. Clock.
4. Gyro horizon.
5. Manifold pressure gages (left and right).
6. Tachometers (left and right).
7. Engine gage right engine (oil temperature and pressure and fuel pressure).
8. Coolant temperature gage.
9. Carburetor air temperature gage.
10. BC-608 contractor (eliminated).
11. Generator switches.
12. Ammeters.
13. Compass correction cards.
14. Engine gage left engine (oil temperature and pressure and fuel pressure).
15. Rate of climb indicator.
16. Bank and turn indicator.
17. Airspeed indicator.
18. Directional gyro.
19. Remote indicating compass.
20. Front (reserve) fuel tanks quantity gage.
21. Rear (main) fuel tanks quantity gage.
22. Hydraulic pressure gage.
23. Altimeter.
24. Landing gear warning light.
25. Landing gear warning light test button.
26. Spare bulb.



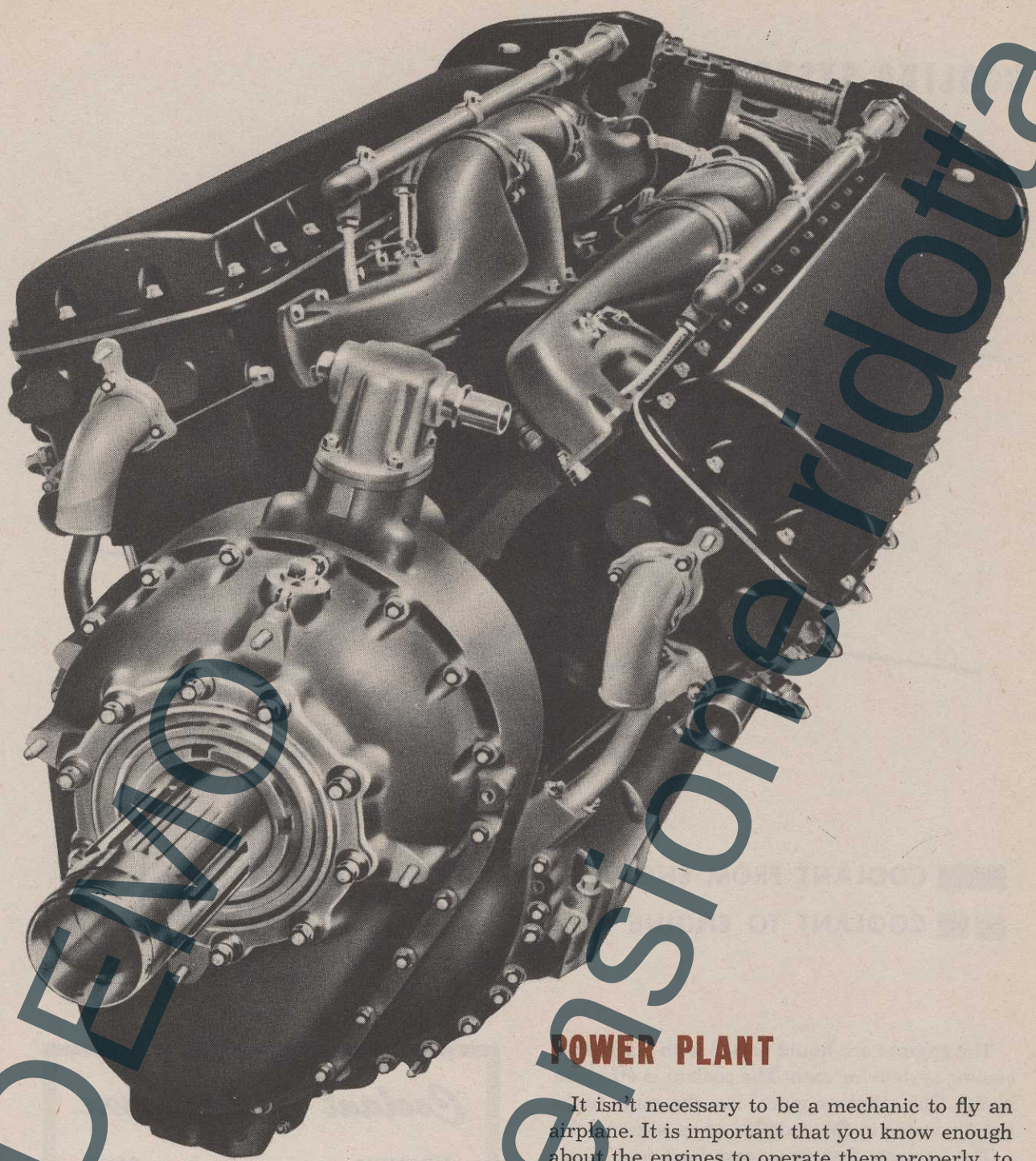
COCKPIT—RIGHT SIDE (P-38L-5)

1. Gunsight light rheostat.
2. Flap control lever.
3. Cockpit heat control.
4. VHF radio OFF push button.
5. Wing and tail position light switches.
6. Frequency selector push buttons.
7. Selector lock lever.
8. VHF radio control lever.
9. Surface controls lock (stowed).
10. Recognition light keying button.
11. Cockpit light.
12. Recognition light switches.
13. AN/APS-13 warning light rheostat.
14. AN/APS-13 test switch.
15. AN/APS-13 ON-OFF switch.
16. Rudder trim tab control.
17. Rudder pedal adjustment lever.
18. Manual bomb-drop tank release.
19. Aileron boost control lever.
20. Relief tube.
21. Low frequency range receiver.
22. Hydraulic hand pump.



MAIN SWITCH BOX (P-38L-5)

1. Ignition switches.
2. Oil dilution and engine primer switches.
3. Starter switch.
4. Engage switch.
5. Wing and tail position light switches.
6. Generator switches.
7. Landing light switch.
8. Gun heater switch.
9. Compass light switch.
10. Fluorescent light rheostat.
11. Voltmeter.
12. Ammeter.
13. Propeller feathering switches.
14. Oil cooler flap switches.
15. Battery switch.
16. Pitot heat switch.
17. Coolant flap override switches.
18. Intercooler flap switches.
19. Cockpit light rheostat.



POWER PLANT

It isn't necessary to be a mechanic to fly an airplane. It is important that you know enough about the engines to operate them properly, to know their limitations, and to recognize trouble.

The P-38 has two 12-cylinder V-1710 liquid-cooled Allison engines. Know them, understand them, and treat them with respect. These engines are your life insurance.

FEATHERING

Feathering a propeller permits you to stop a disabled and vibrating engine. It decreases the drag of the propeller and increases the single engine performance of the airplane.

The feathering control switches have two positions: NORMAL and FEATHER. To feather a propeller, **all you have to do** is place the feathering control switch at FEATHER. The feathering switch by-passes the AUTOMATIC and manual FIXED PITCH switches. Regardless of the position of the selector switches, the propeller blades turn to the feather angle and stop.

If you can't feather a propeller with the feathering switch, you can feather by holding the propeller selector switch in the manual DECREASE position.

Featheritis

If you develop engine trouble in flight, don't jump for the feathering switch.

1. Don't get in a hurry to land.
2. You have a good single engine airplane under you.
3. Go over your checklist. Feathering may not be necessary.
4. Definitely determine which engine is bad. Wrong engines have been feathered.
5. Check the airplane thoroughly. Try to determine the cause.

Note: You may be out of gas. Switch to fullest tank. Remember, don't be in a hurry, don't get excited. You're not going to fall out of the sky.

Feathering Indicator Lights

On later P-38's, feathering indicator lights located above the feathering switches help you feather the propeller of a bad engine. If your right engine fails, you push hard left rudder to correct yaw. The right feathering light then glows, indicating that the right propeller is the one to be feathered. The reverse is true if the left engine fails.

Unfeathering

1. Return feather switch to NORMAL.
2. Hold propeller selector switch to INCREASE RPM until tachometer reading is approximately 1000 rpm.
3. Move propeller selector switch to AUTOMATIC. This brings the rpm up to the setting of the propeller governor lever.

Overspeeding Propeller

An overspeeding propeller is one which allows the engine to overspeed. If you have an overspeeding prop, immediately retard the throttle to 3000 rpm. Then do the following:

1. Check to be sure propeller selector switches are in AUTOMATIC.
2. Make certain circuit breakers are in.
3. Try to reduce rpm by propeller governor.
4. Hold selector switch in DECREASE RPM position.

If this fails to reduce the rpm, place feather switch to FEATHER and return it to NORMAL when desired rpm is reached. Be careful not to reduce the rpm too much when using this method.

Warning Lights

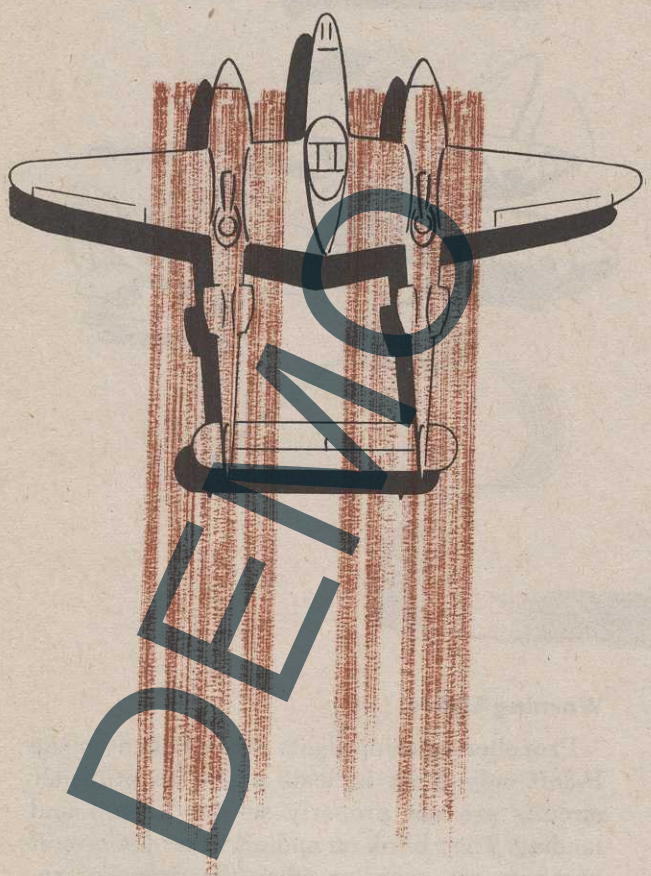
Propeller warning lights are installed on the P-38H only. They indicate when the propeller circuits are not properly set for takeoff and landing. They blink on and off when the circuit breakers are open, or when the propeller selector switches are not set in AUTOMATIC. However, these lights do not warn of an improperly set propeller pitch control.

PROPELLER PREFLIGHT CHECK

Check to see that propeller circuit breaker buttons are in.

Automatic Operation Check

1. Propeller selector switches in AUTOMATIC.
2. Propeller governors in the full forward takeoff position.
3. Open throttles to obtain 2300 rpm.
4. Pull the propeller governors back until you get a reduction of 200 rpm.
5. Return the propeller governors to the full forward takeoff position, noting that they return to 2300 rpm. If they do, the propellers are operating normally and are ready for flight.



Remember!

Increase rpm first, then manifold pressure.
Decrease manifold pressure then rpm.

PROPELLER CHECKLIST

Generator Switch

Be sure it is ON and working properly. The Curtiss electric propeller needs electricity to operate.

Circuit Breakers

Buttons in at all times.

Feather Switch

In NORMAL position.

Takeoff

Propeller selector switches in AUTOMATIC. Propeller control governors full forward in takeoff position.

Cruising

Selector switches in AUTOMATIC. Obtain desired rpm with propeller governors.

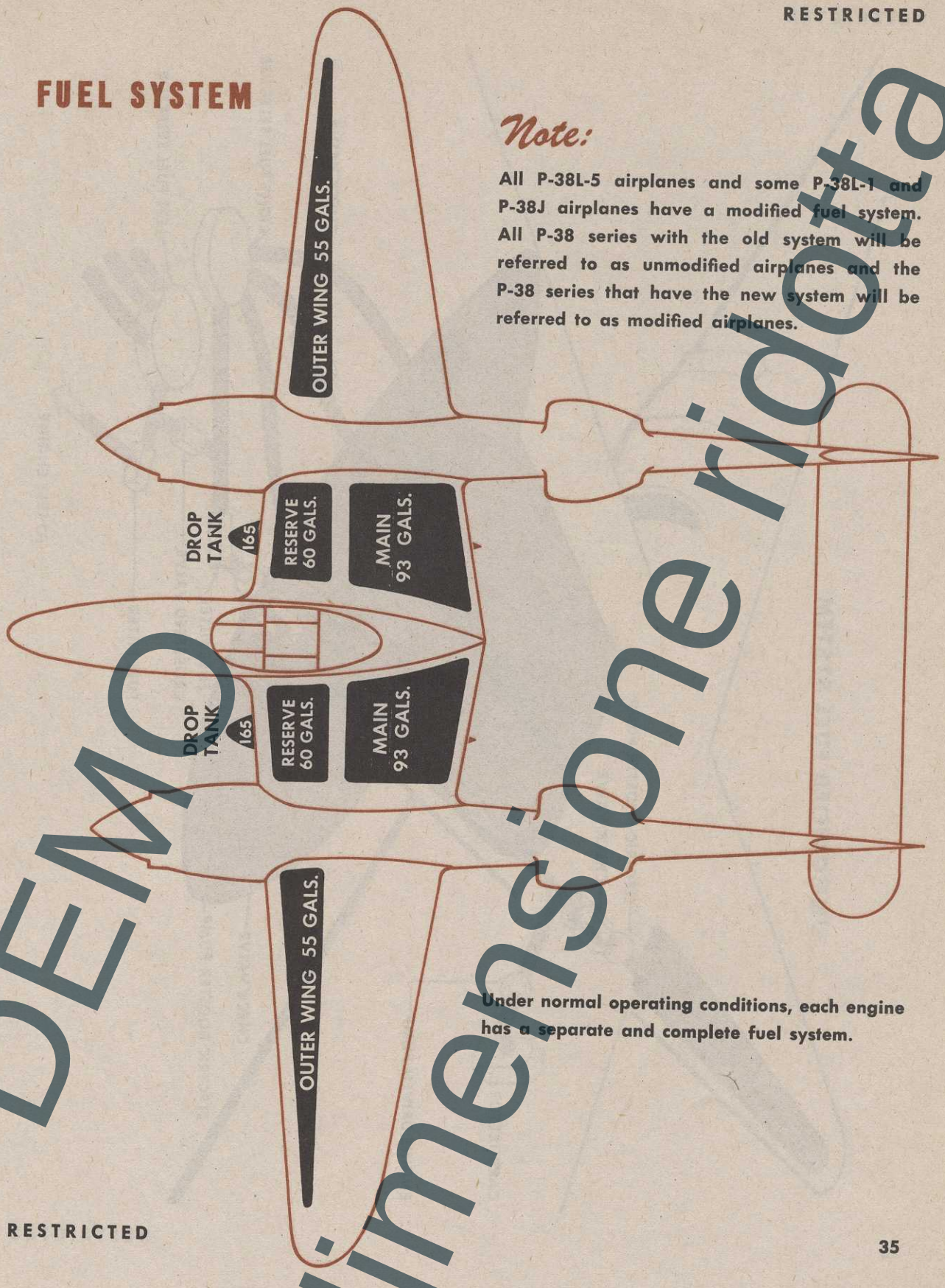
Landing

Selector switches in AUTOMATIC. Set to 2600 rpm with governors.

After Landing

Before stopping the engines, move the governors full forward to takeoff position.

FUEL SYSTEM

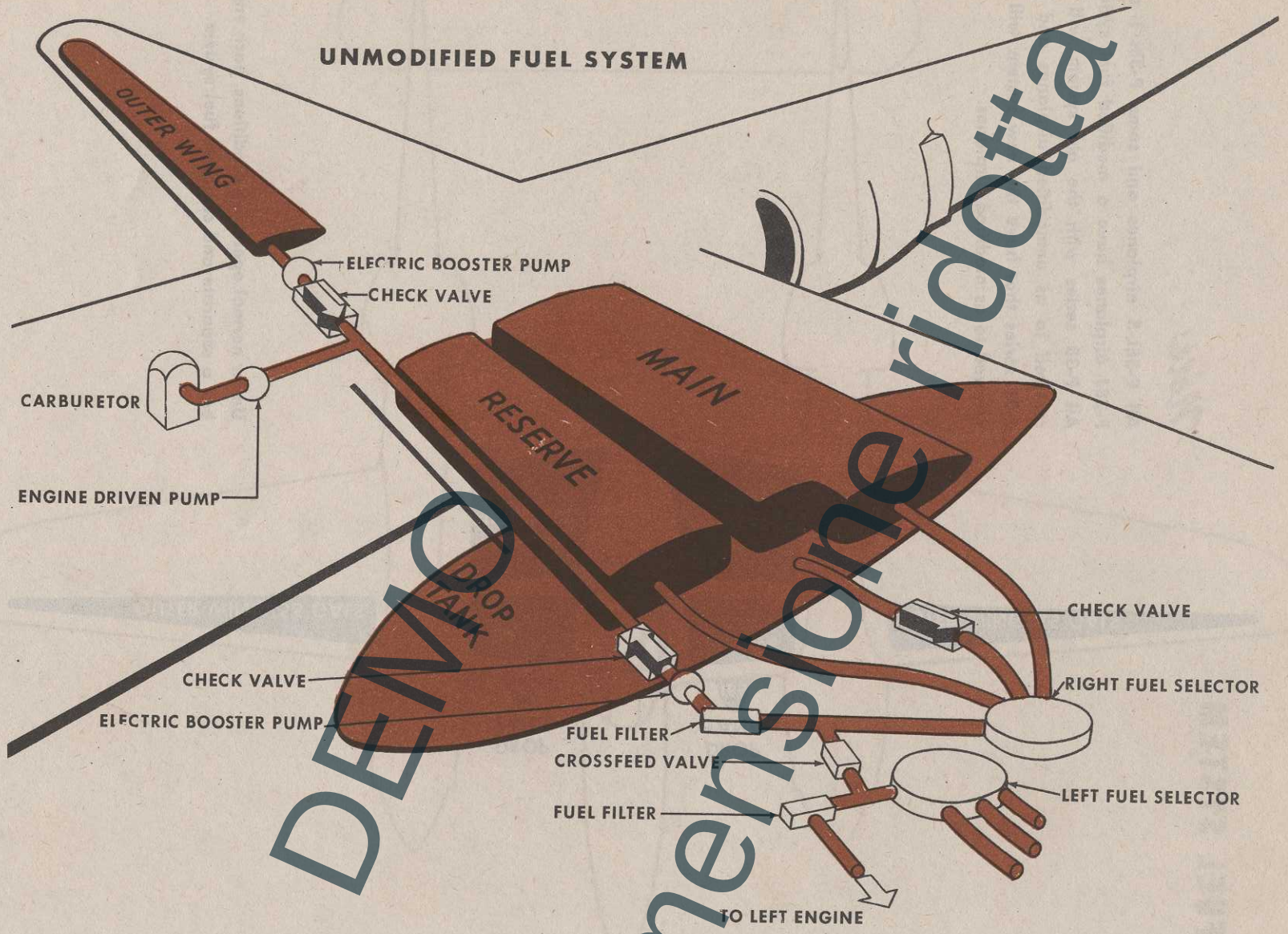


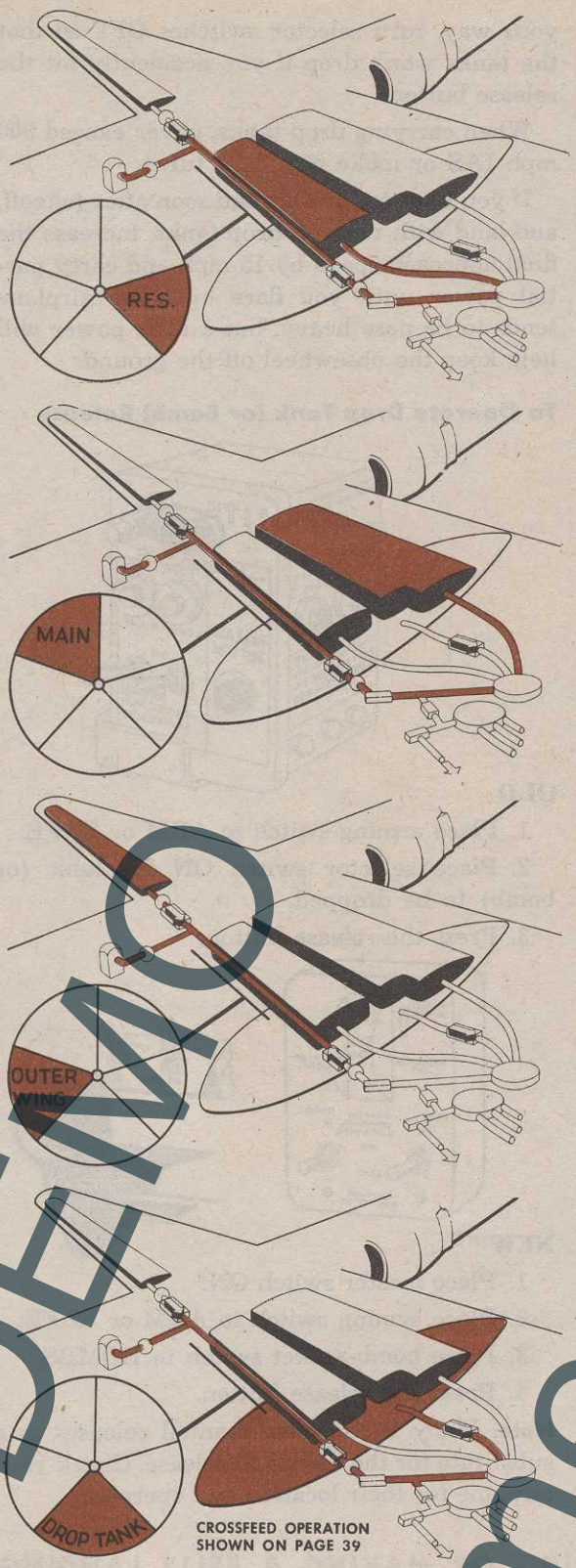
Note:

All P-38L-5 airplanes and some P-38L-1 and P-38J airplanes have a modified fuel system. All P-38 series with the old system will be referred to as unmodified airplanes and the P-38 series that have the new system will be referred to as modified airplanes.

Under normal operating conditions, each engine has a separate and complete fuel system.

UNMODIFIED FUEL SYSTEM





CROSSFEED OPERATION SHOWN ON PAGE 39

Fuel Pressure

Fuel is supplied to each engine by one engine-driven pump and one electric booster pump. The engine pumps maintain a normal fuel pressure of 16-18 psi up to 12,000 feet. Above 12,000 feet, normal fuel pressure is maintained by the booster pumps.

Electric Fuel Booster Pump

The electric booster pumps serve for starting the engines, takeoff and landing, flying above 12,000 feet, or in case the engine-driven pumps fail.

The electric booster pumps are controlled by two switches on the left side of the cockpit floor.

Fuel Tanks

P-38 Series Through P-38J-10

There are two reserve and two main self-sealing wing fuel tanks. This normal capacity is more than doubled by the addition of two 165-gallon drop tanks.

P-38J-15 Through P-38L-5

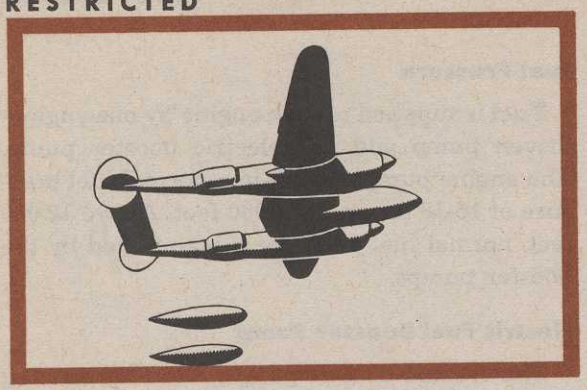
In addition to the four standard wing tanks and two drop tanks, these P-38 series have two outer wing tanks with a capacity of 55 gallons each.

The outer wing tanks have their own fuel booster pumps. When you are using fuel from the outer wing tanks, in the unmodified fuel system, turn the regular fuel booster pumps OFF.

Fuel Quantity Gages

Two fuel quantity gages on the instrument panel indicate only for the reserve and main tanks. The fuel quantity in the drop tanks and outer wing tanks must be estimated by hourly fuel consumption.

Fuel test lights for the outer wing tanks are located forward of the engine control stand. If you are using the outer wing tanks, the warning lights glow when there are approximately 10 to 15 gallons left. Later airplanes have a low level test button so that you can check fuel level in the outer wing tanks before you turn the tanks on.



Drop Tanks

Beneath each wing is a shackle for carrying an external drop tank (or bomb). Sway braces are added for carrying 330-gallon drop tanks.

You may have to drop the external tanks to lighten your load if an engine fails, or to give you greater maneuverability in combat. Before you drop them, turn the fuel selector valves to the wing tanks.

If you release empty drop tanks at high speeds, they will damage the flaps. Some P-38's have a special brace to prevent this and you can drop the tanks, empty or full, at any speed.

You can drop the tank (or bombs) individually or both at the same time. The release box is on the left side of the cockpit just below the window.

Look around to be sure no one is behind or under you when you release the tanks.

You can release full 165-gallon drop tanks at any speed without damage to the flaps. With the tanks empty, or less than half full, slow down to 150 mph IAS and, at the instant of pressing the release button, pull up. This makes the tanks break clean away from the underside of the wing.

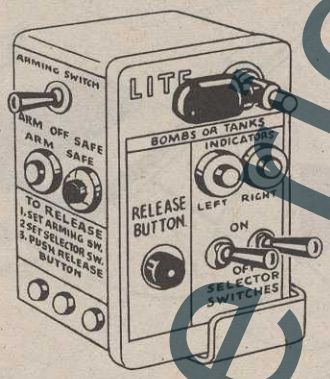
With two full 165-gallon drop tanks, you are carrying an added weight of better than 2000 pounds. The flight characteristics of the airplane remain unchanged, but because of the extra weight, use maneuver flaps for takeoff. Have the drop tank selector switches ON and the arming switch SAFE so you can immediately release the tanks if an engine fails on takeoff.

When you have finished climbing and are on your way, turn selector switches OFF so that the tanks won't drop if you accidently hit the release button.

When carrying drop tanks, never exceed 300 mph IAS or make any tight turns.

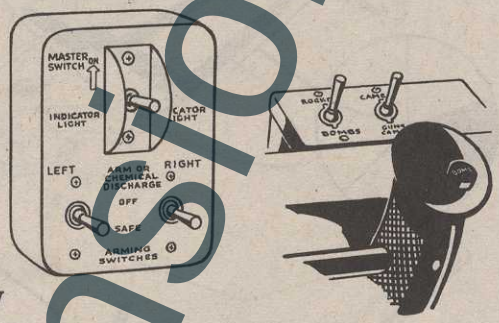
If you have to turn around soon after takeoff, and land with two full drop tanks, increase the final approach speed by 15 mph and carry partial power until you flare out. The airplane tends to be nose heavy, but a little power will help keep the nosewheel off the ground.

To Operate Drop Tank (or Bomb) Release



OLD

1. Place arming switch to ARM or SAFE.
2. Place selector switch ON for tank (or bomb) to be dropped.
3. Press the release button.



NEW

1. Place master switch ON.
2. Place arming switch to ARM or SAFE.
3. Place bomb-rocket switch to BOMBS.
4. Press the release button.

Note: Many P-38's have manual releases as a substitute for the electrical release. Check your airplane for their location and operation.

RELEASE DROP TANKS BEFORE DITCHING OR MAKING A BELLY LANDING

BEFORE TAKEOFF

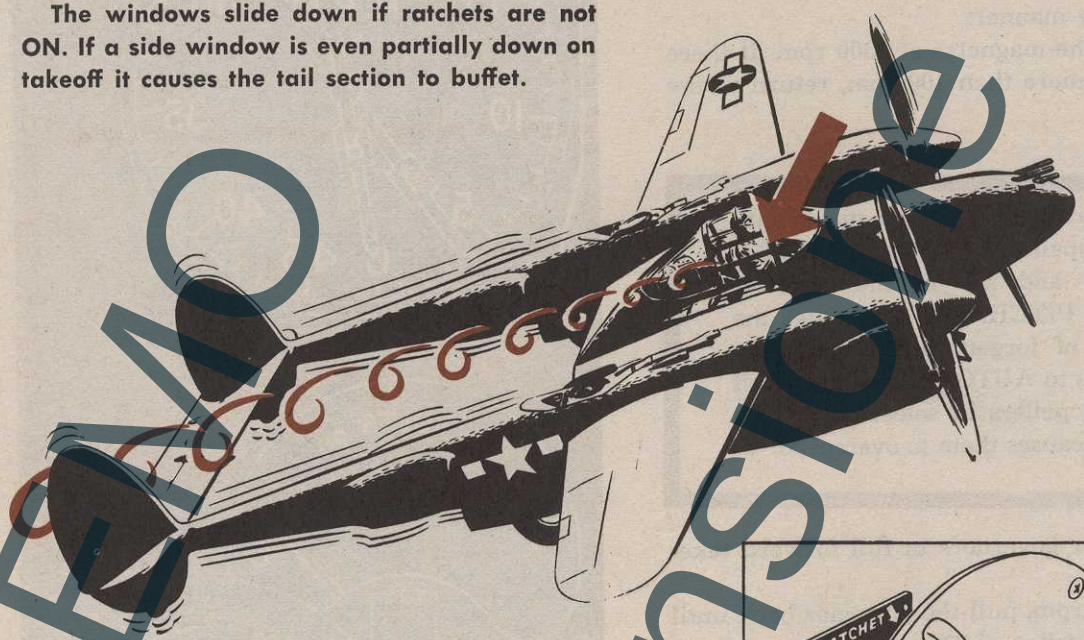
This is the time when you can find out what you want to know about your airplane. Don't be in a hurry to take off. A little extra time before takeoff can save you a lot of trouble after you are in the air.

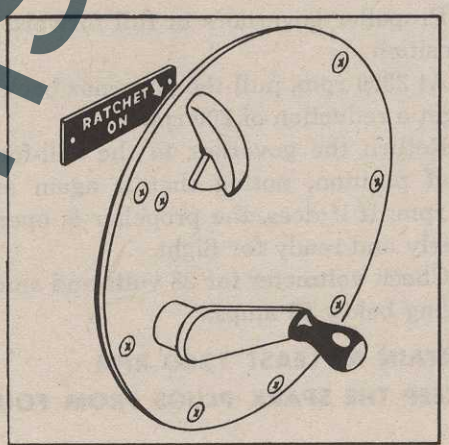
Here is the check you make before takeoff. Follow it closely!

1. Safety belt locked. Shoulder harness on and unlocked.
2. Canopy locked and side windows closed with ratchets ON.
3. Rudder and aileron tabs at 0.
4. Elevator trim tab 0° to 3° back (this relieves pressure on control column).
5. Fuel selectors on RESERVE.
6. Electric fuel booster pumps ON.
7. Drop tank selector switches ON and arming switch SAFE.
8. Propeller governor controls full forward.
9. Propeller selector switches AUTOMATIC.
10. Tighten friction control.
11. Mixture control AUTO RICH.
12. Set gyro flight instruments. Check gage for approximately 4″ of vacuum.
13. Generator switch(es) ON.
14. Oil and coolant shutters AUTOMATIC.
15. Intercooler flaps OPEN. (If installed.)
16. Dive flaps UP.
17. Wing flaps up and control handle in CLOSED.
18. Aileron boost ON. Turn control wheel to full travel in both directions. Do this a couple of times to be sure the aileron boost control is working properly.

Tip

The windows slide down if ratchets are not ON. If a side window is even partially down on takeoff it causes the tail section to buffet.



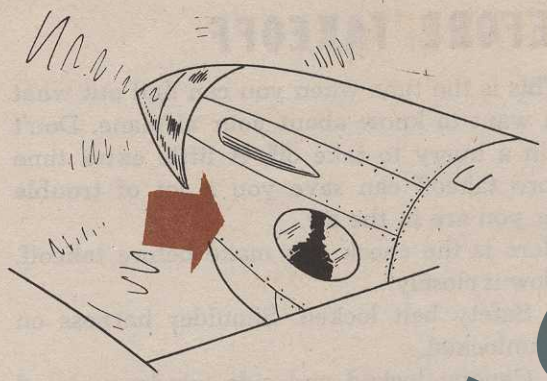


Now you are ready to check your engines:

It is far better to know what condition the engines are in before takeoff than to wait until you are off the ground. Remember, you're the fellow who is going to fly this airplane. Be confident that it is operating properly.

Check the direction of the nosewheel by looking at the polished area on the inside of the engine nacelles. See that it is straight before you run up the engines.

When you are ready for the run-up check, apply the power smoothly.



CHECK DIRECTION OF NOSEWHEEL IN POLISHED AREA ON NACELLES

RUN-UP CHECK

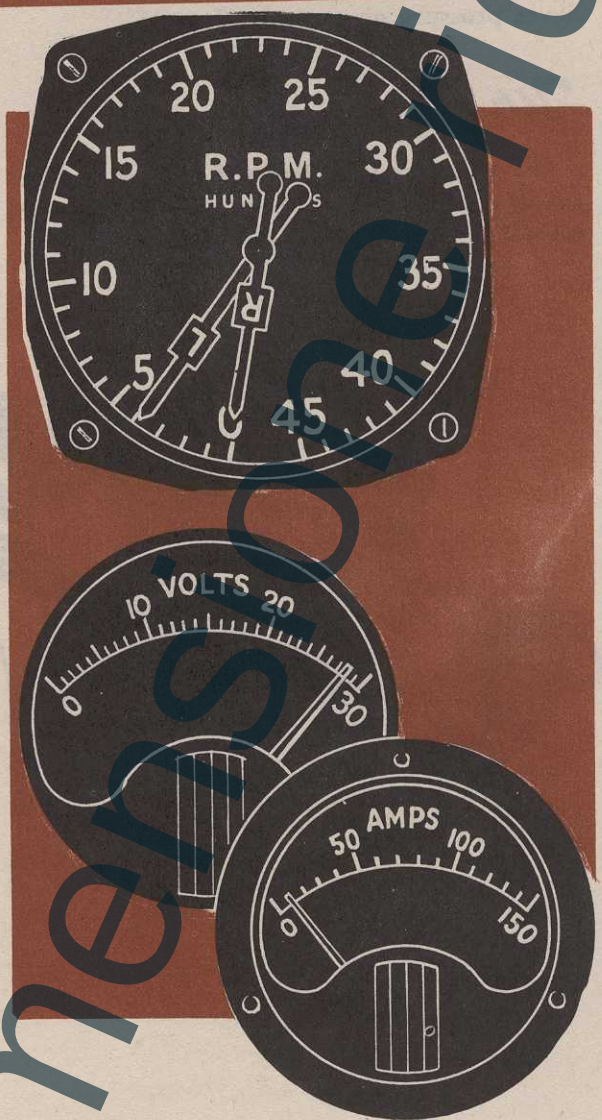
Pump the brakes so you can hold the airplane and then check both engines, one at a time, in the following manner:

1. Check the magnetos at 2300 rpm. If there is a drop of more than 100 rpm, return to the line.

> Caution: Check the magnetos with the propeller switches in AUTOMATIC and not in the selective FIXED PITCH. This eliminates the danger of forgetting to return the switches to AUTOMATIC. A takeoff with propellers in selective FIXED PITCH causes them to overspeed.

2. Propeller governors in full forward takeoff position.
3. At 2300 rpm, pull the governor back until you get a reduction of 200 rpm.
4. Return the governor to the full-forward takeoff position, noting that it again attains 2300 rpm. If it does, the propeller is operating properly and ready for flight.
5. Check voltmeter for 28 volts and ammeter charging below 50 amps.

MAINTAIN AT LEAST 1200 RPM TO KEEP THE SPARK PLUGS FROM FOULING



TAKEOFF

Roll the airplane a few feet down the runway so that the nosewheel will be in line when you apply power. Check its direction by means of the polished area on the inside of the engine nacelles.

No-flap takeoffs are preferred because you reach minimum single engine performance airspeed more rapidly this way than when you use flaps.

For maximum performance takeoffs, hold the airplane with brakes at the end of the runway until allowable takeoff manifold pressure and rpm have been reached. Then release the brakes. This way, the superchargers are in operation before you start your roll. Also, you have ample time to stop within the limits of the field in case of an emergency.

The tricycle landing gear gives the airplane a level flight attitude on the ground. During your roll down the runway, the wings offer a negative angle of attack and there is no tendency for the airplane to take off by itself. You will notice that there is no feeling of lightness as you reach takeoff speed. The airplane literally has to be lifted off the ground. At 80 mph ease the wheel back steadily and firmly. At 100 mph the airplane becomes airborne.

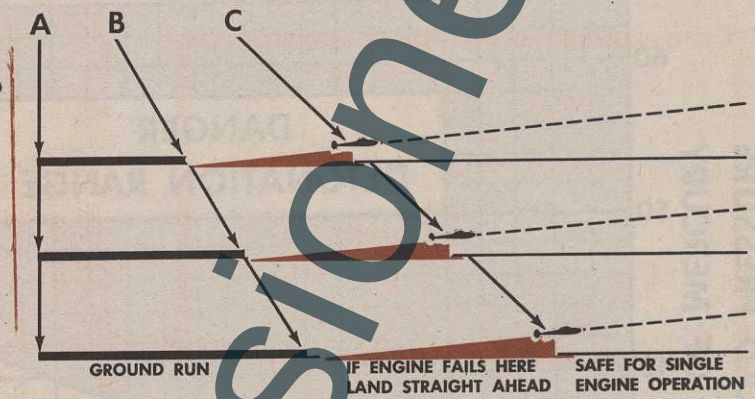
When you are certain you are airborne, retract the landing gear. The landing gear offers considerable drag when it is down. With the gear up, you quickly reach the minimum single engine airspeed of 130 mph.

Keep your hand on the throttles so that you can meet any emergency instantly.

P-38 TAKEOFFS

THE FOLLOWING FIGURES ARE APPROXIMATE AND VARY WITH WEIGHT AND WIND CONDITIONS. BUT IN ALL INSTANCES, TAKEOFFS WITH RECOMMENDED MANIFOLD PRESSURE AND RPM (1 BELOW) REDUCES THE GROUND RUN AND THE CRITICAL TIME IMMEDIATELY AFTER BECOMING AIRBORNE UNTIL YOU REACH SAFE SINGLE ENGINE AIRSPEED.

	A POWER HELD WITH BRAKES	B AIRPLANE LEAVES GROUND	C REACH 130 MPH SAFE SINGLE ENGINE AIRSPEED
1	54" Hg. 3000 RPM	10 SECONDS 1378 FEET	15 SECONDS 1555 FEET
2	45" Hg. 3000 RPM	14 SECONDS 1833 FEET	20 SECONDS 2055 FEET
3	35" Hg. 3000 RPM	18 SECONDS 2287 FEET	25 SECONDS 2553 FEET



USE UP TO ½ FLAPS FOR SHORT FIELD TAKE OFFS, CLEARING OBSTACLES, AND WHEN CARRYING DROP TANKS

TAKEOFF PROCEDURE

1. Pump brakes and hold.
2. Open the throttles to prescribed takeoff manifold pressure and rpm.
3. Release brakes.
4. When you are certain you are airborne retract the landing gear.

Tip: After takeoff from a muddy field, brake the wheels before retracting the landing gear. This prevents mud from being thrown into the wheelwells.

5. Reduce the power to prescribed climbing manifold pressure and rpm after you've reached sufficient airspeed and have cleared all obstacles.

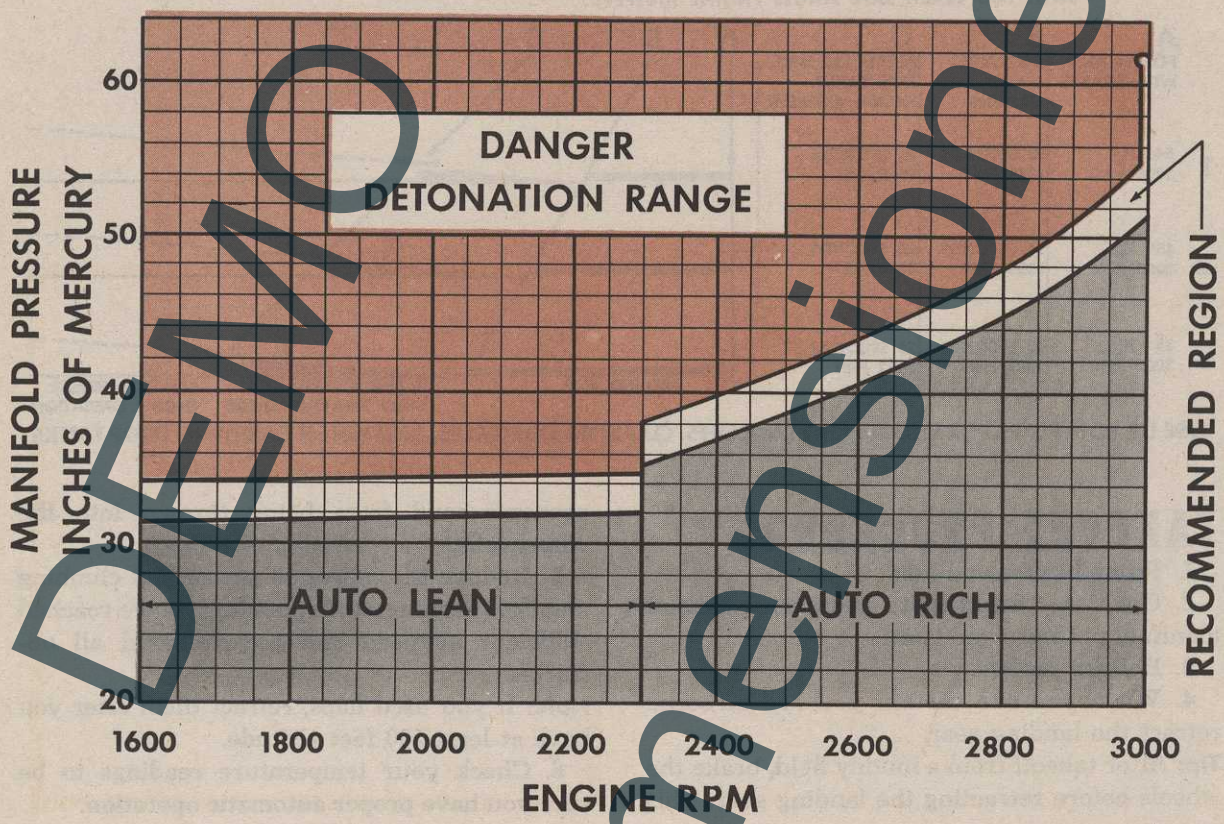
Note: If you used flaps, retract them after you have at least 500 feet altitude.

6. Check your temperature readings to be sure you have proper automatic operation.

OPERATING DATA

GRADE 100 FUEL P-38H, P-38J and P-38L V-1710-89 and V-1710-91 engines. V-1710-111 and V-1710-113 engines.	MANIFOLD PRESSURE	RPM
Military Takeoff Power	54"	3000
Normal Rated Maximum recommended for operation with AUTO RICH mixture in level flight and climb.	44"	2600
Maximum Cruise Maximum recommended for operation with AUTO LEAN mixture.	30"	2300

P38 J & L POWER SETTING CHART
USE WITH ANF 28 FUEL MAX C.A.T. 60°C



CLIMB

After takeoff, establish desired climbing manifold and rpm settings.

Make frequent checks on the temperatures and pressures to be sure you have proper automatic operation.

Your most efficient climbing speed is between 155 mph and 175 mph. Try to keep the airspeed at 165 mph IAS.

You need little or no trim for rudder and aileron, but save your strength and relieve that nose heaviness with the elevator trim tab.

After you have established a normal climb, turn the electric fuel booster pumps OFF.

Important: If you are going to altitude, you must turn the electric booster pumps on again at approximately 12,000 feet.

CRUISE

Watch your gasoline supply carefully. Fly for the first 15 minutes on RES (reserve). Time each tank. Don't depend entirely upon the fuel quantity gages.

You will find the airplane trims easily and flies hands off.

Make it a habit frequently to check all the engine instruments for proper reading. After a while, you will be able to read all the instruments at a brief glance.

Learn to keep your head out of the cockpit

STALLS

In either power-on or power-off stalls with flaps and landing gear up, the airplane mushes straight ahead in a well controlled stall. With flaps and gear down, there is a slight tendency for one wing to drop. Under these conditions, the nose drops slightly and, as the airspeed increases, the wing comes up. There is little tendency to spin or whip off on one wing.

There is a noticeable vibration as you approach the stalling speed. The center section stalls first while the ailerons remain unstalled and effective. With power on there is excellent rudder control.

Practice stalls so that you know the feel of the controls near the stall and the indicated stalling speed of your airplane.

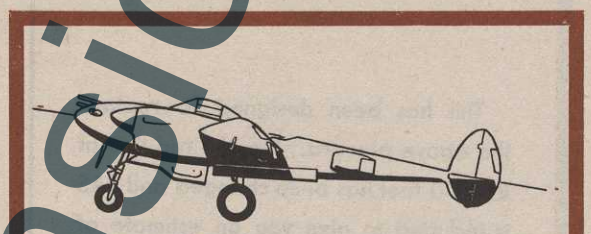
With power off, the P-38 stalls at approximately the following indicated airspeeds at the gross weights noted:

Flaps and gear up

15,000 lbs.	17,000 lbs.	19,000 lbs.
94 mph	100 mph	105 mph

Flaps and gear down

15,000 lbs.	17,000 lbs.	19,000 lbs.
69 mph	74 mph	78 mph

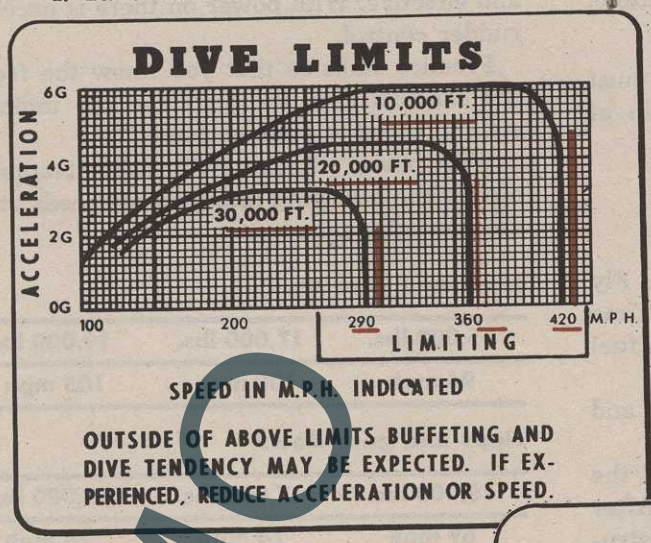


FLAPS AND GEAR DOWN—POWER OFF

FLAPS AND GEAR DOWN—POWER ON

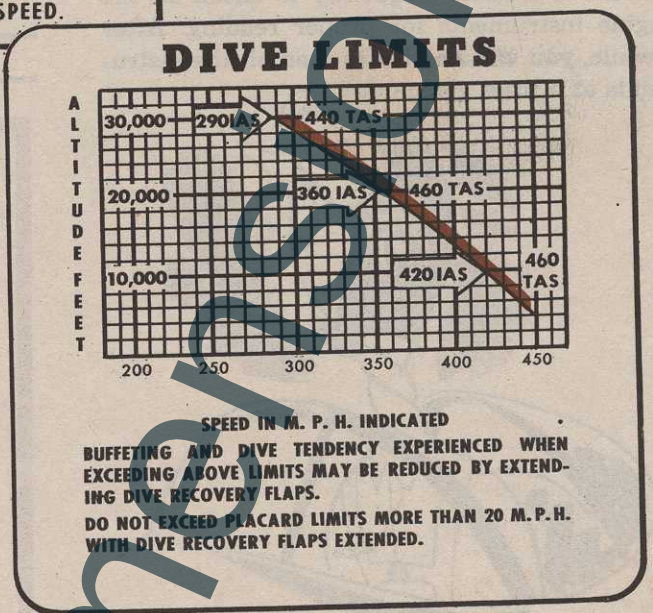
Flight Restrictions

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

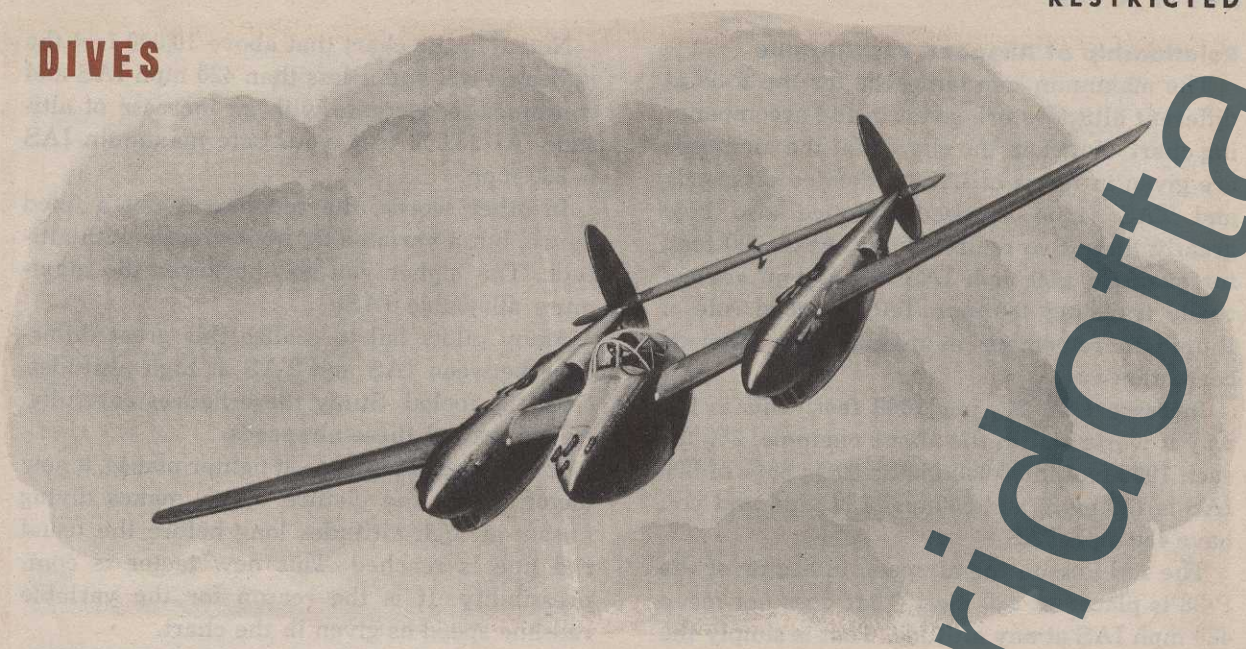


In early P-38 series, this placard is on the left side of the cockpit between the electric drop tank release box and the engine control stand. In later airplanes it is on the horizontal arm of the control column. It is there for your reference.

This has been designed to replace the above placard. The IAS red line at 20,000 feet has been changed and TAS is included to give you an estimate of your actual ground speed. The reason for these changes are shown in the chart on page 76.



DIVES



In all high speed aircraft, particularly the P-38, you encounter a serious acceleration problem.

Previously you have flown airplanes that had a comparatively low terminal velocity and did not accelerate above a certain speed.

This is our problem: In high speed dives, the lack of resistance, due to the clean lines of the airplane, causes a tremendous acceleration if gravity is allowed to exert its full influence. As you approach the critical airspeed, the airplane becomes noseheavy and starts to buffet as if you were about to stall. Therefore, it is very foolhardy to point the P-38 straight down for any length of time. Adding to this problem of acceleration is the problem of time required and space necessary to pull out of the dive and regain straight and level flight.

In your flying experience you have become aware of the futility of trying to recover from a stall by holding the stick back. The same situation exists here. In a high speed dive, only a few G's cause the airplane to buffet.

When it is necessary to point down, reduce power and enter the dive at a low airspeed.

CAUTION

Manifold pressure must be kept at or above 20" Hg during extended shallow dives in order to prevent the engines from misfiring when you advance the throttles after the pullout from the dive.

Normal Dive Recovery

If you have allowed yourself to build up excessive airspeed in a dive, follow this recommended procedure for recovery:

1. Pull back the throttles (if you haven't already done so).
2. Apply sufficient back pressure until you feel a slight nibble in the wheel. Any further pressure causes the airplane to buffet and defeats your purpose of trying to pull out.
3. Use only a few degrees of elevator trim tab to help you.

Caution: **USE THE ELEVATOR TAB WITH EXTREME CARE.**

TOO MUCH TRIM CAUSES A TAIL-HEAVY CONDITION.

Relationship of Airspeed and Altitude

The maximum safe airspeeds for the P-38 at different altitudes are given in the accompanying chart. Notice in the chart that the airspeeds are given in terms of IAS (indicated airspeed) and TAS (true airspeed). Notice also how greatly these two figures differ. At 30,000 feet, for example, 300 mph IAS means you are actually traveling 480 mph TAS. A good rule of thumb to remember in making this airspeed correction is:

Increase IAS 2% per 1000 feet. This is the way it works out in the above example: 2% for each 1000 feet in 30,000 feet is 60%; 60% of 300 IAS is 180 mph; add 300 and 180 mph and you have 480 mph TAS.

The red line on the airspeed indicator of the P-38 is placed at 420 mph. That does not mean 420 mph IAS at any altitude. That is simply the speed at which the load on the wings and other structural parts reaches the maximum they are designed to carry.

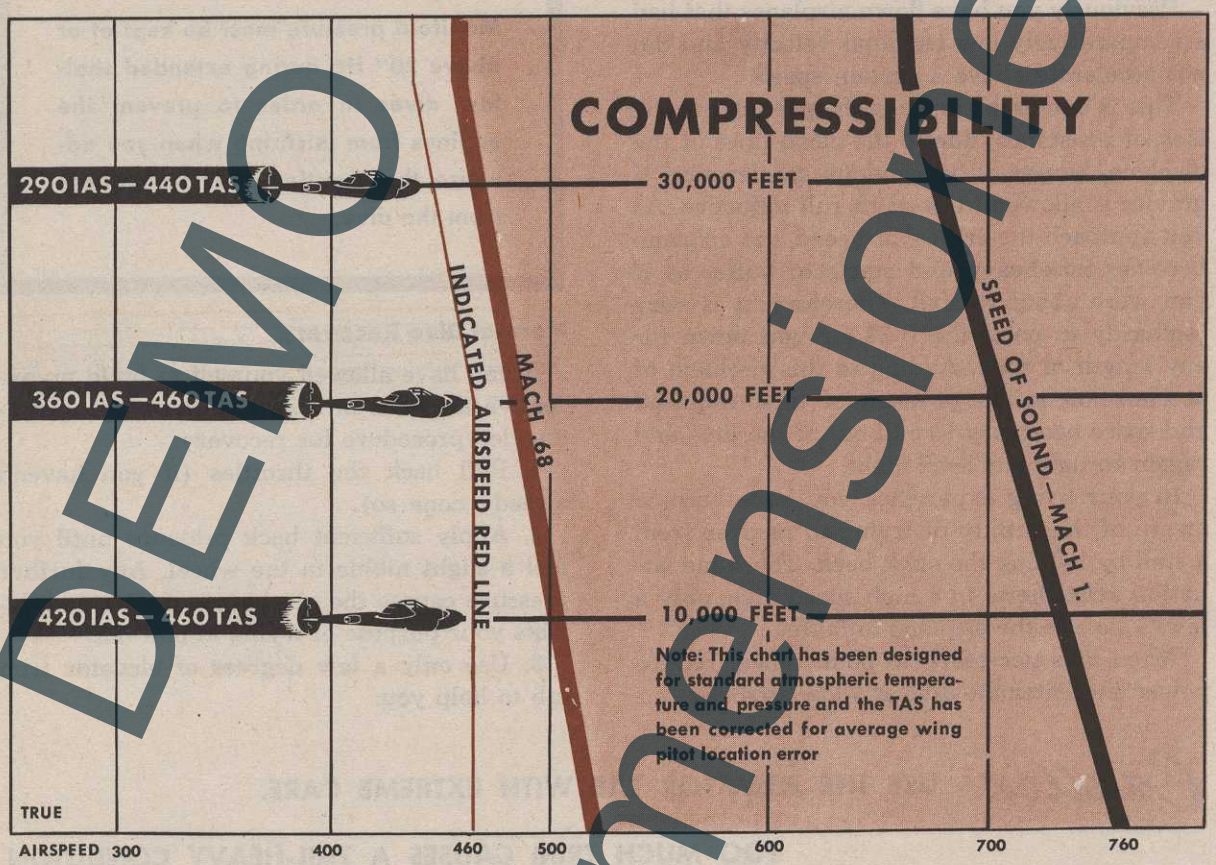
Notice in the chart that above 10,000 feet the indicated red line is less than 420 mph IAS and continues to decrease with an increase of altitude. At 30,000 feet, your safe maximum IAS is 290 mph.

In other words, the red line is not a fixed figure, but a **variable** figure—variable with altitude. The higher you go, the lower the maximum allowable IAS.

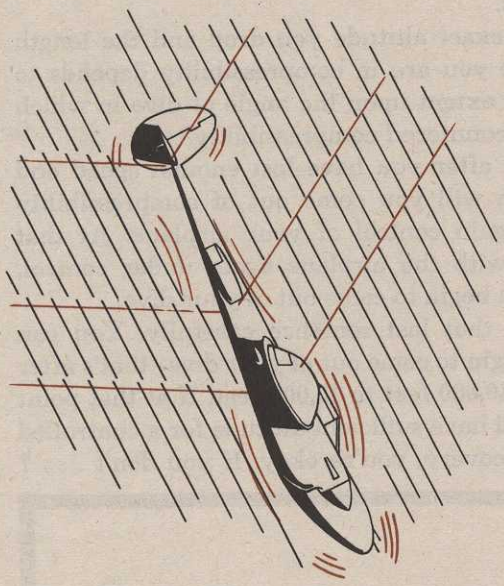
Many pilots fail to realize this great difference between IAS and TAS at high altitudes. Don't be fooled. Study these figures carefully. **Never exceed these airspeeds.**

In the case of high speed fighter planes, a new factor enters the picture which makes diving unsafe at high altitudes long before the usual red line is reached. This new factor is compressibility. It is the reason for the variable red-line speed as given in the chart.

Another rule of thumb in correcting IAS to TAS is: Add 5 mph per 1000 feet to IAS to get TAS.



COMPRESSIBILITY



Since extremely high airplane speeds have been developed only in recent years, the phenomenon of compressibility is still pretty much of a mystery. Scientists and engineers know comparatively little about it and dive tests are still being run to prove or disprove the many theories about it. Here we attempt to give you a pilot's explanation about compressibility in a P-38; one that will help you understand this phenomenon and impress upon you the importance of avoiding it.

About all that is known for certain is this. When an airplane approaches the speed of sound, it loses its efficiency. Compression waves or shock waves develop on the wings and other surfaces of the airplane.

Although there is a great deal of disagreement as to **what** happens when compressibility is reached, and **why**, there is no question as to the **result**, so far as the pilot is concerned.

The lift characteristics of the airplane are greatly reduced and the stability, control, and trim are affected.

Each type high speed fighter plane has its own individual compressibility characteristics. In your P-38, the first effect as you approach compressibility is that the airplane becomes noseheavy. The control wheel moves forward and becomes increasingly difficult to pull back. At this stage, an uncontrollable buffeting and vibrating develops. If the speed of the airplane isn't checked and control regained, it is possible that the terrific vibrations of the shock waves may cause structural failure, or the airplane may crash while still in the compressibility dive.

Relationship of Compressibility to the Speed of Sound

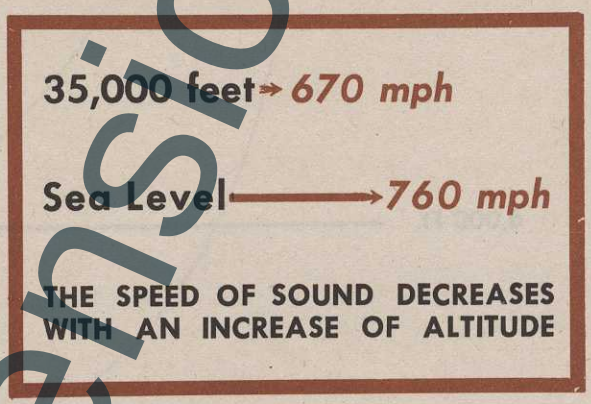
Under standard temperature and atmospheric conditions, the speed of sound at sea level is 760 mph. An airplane goes into compressibility before actually reaching the speed of sound. This speed varies in different airplanes depending upon the individual design of the airplane.

The speed at which an airplane enters compressibility, in ratio to the speed of sound, is technically known as its **Mach number** (pronounced Mock and named after the man who did considerable research in this field).

One of the most important things to remember about compressibility is that the speed of sound varies with altitude. Note these approximate figures:

At sea level, sound travels 760 mph.

At 35,000 feet, sound travels 670 mph.



Therefore, the higher you go, the sooner you reach the speed of sound, and the lower your safe IAS will be.

In a high speed dive from altitude, you get into compressibility before you reach the 420 mph IAS red line on the airspeed indicator.

RESTRICTED

COMPRESSIBILITY DIVE

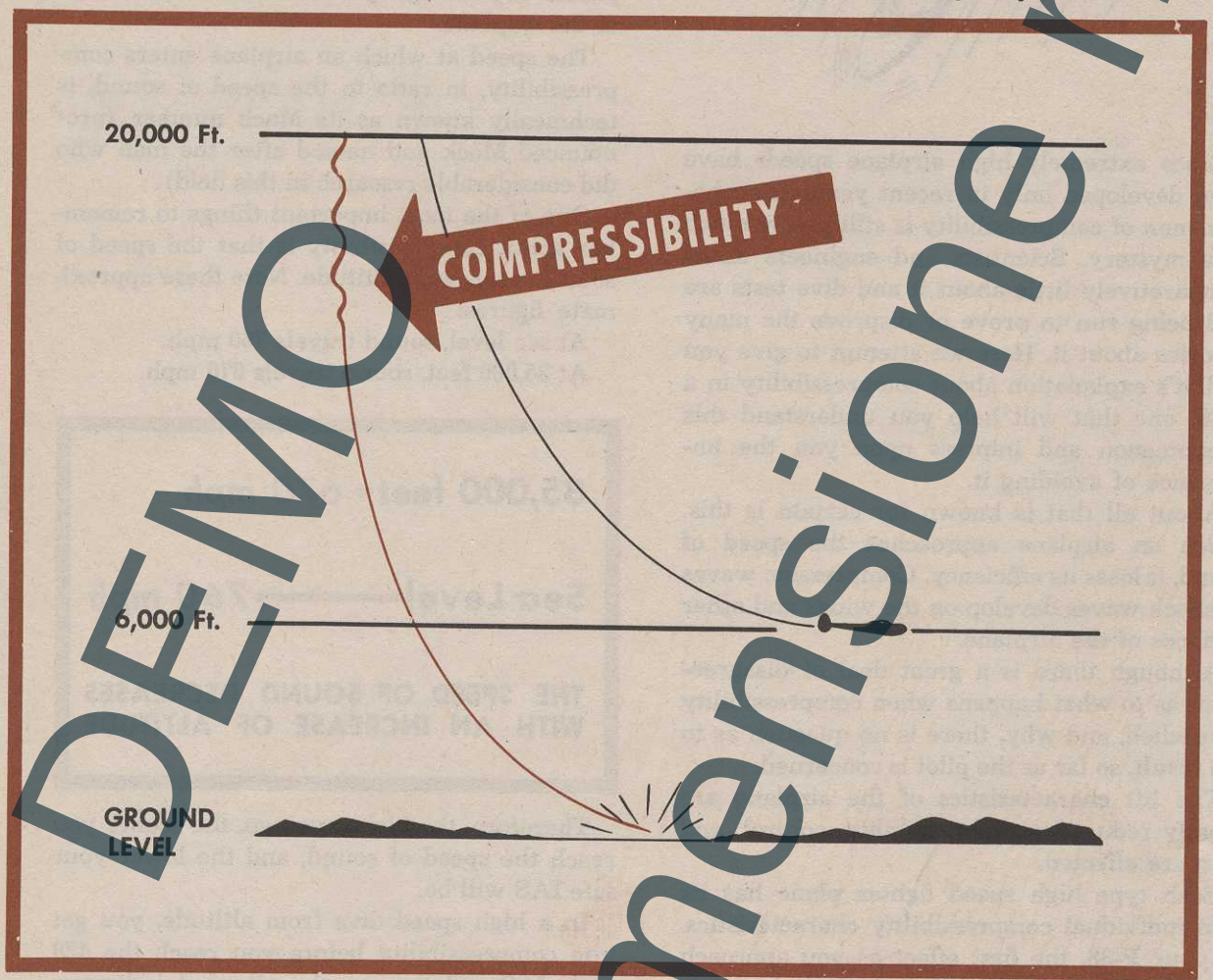
It is possible to come out of compressibility if you don't go too far. This all depends on the circumstances of the dive; the angle, starting altitude, airspeed, and the point at which compressibility was reached.

Then there is this to consider; while in compressibility you have no control over the airplane. Also it is possible to aggravate your situation and make it a lot worse. All that you can do is pull back the throttles (if they aren't already back), hold the stick as steady as possible with some back pressure, and then ride it through until you decelerate enough, at a lower altitude, to reduce your speed below the red line speed given in the chart. This usually means an uncontrolled dive of between 10,000 feet and 15,000 feet, depending upon circumstances.

The exact altitude you drop and the length of time you are in compressibility depends to a great extent upon the angle of dive in which you encountered compressibility.

Only after you have lost enough speed and altitude will you come out of compressibility and regain control of your airplane. At that point, with the airplane again under control, you can **begin** to come out of your dive.

Note that last sentence carefully. You can then **begin** to come out of your dive—that's after losing 10,000 feet to 15,000 feet. If at that point you still have sufficient altitude for a controlled dive recovery, you're okay. If you don't . . . ?



RESTRICTED

Landing Procedure

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

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

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

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

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

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

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

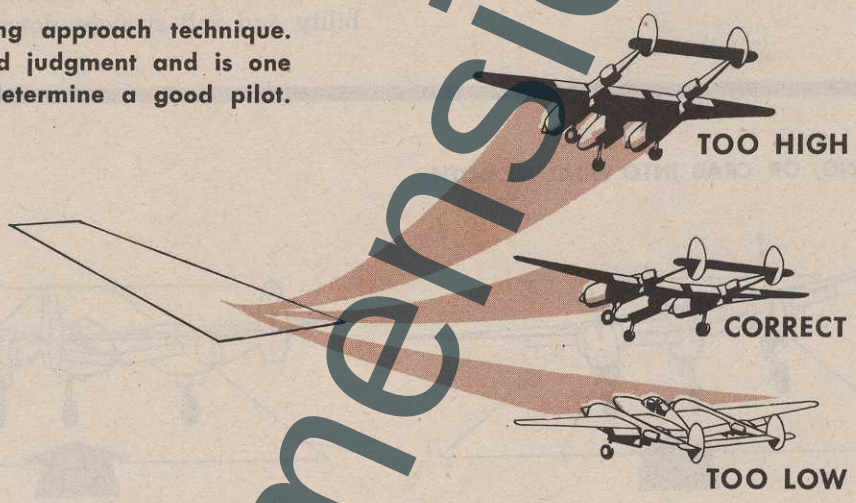
13. Contact is made between 90 mph and 100 mph. Land with your heels on the floor. Keep your feet off the brakes.

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

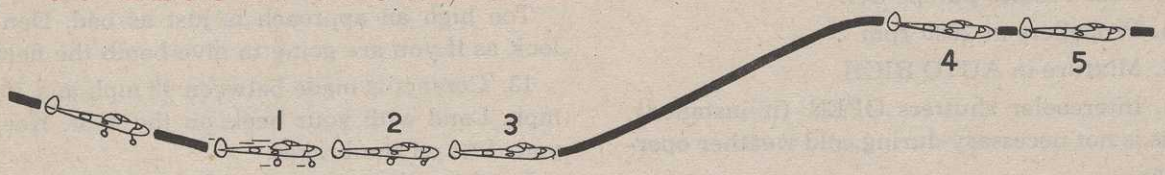
14. After contacting the runway, keep the airplane straight. Steer with the rudders as long as they are effective. Do not use brakes unless necessary. Then apply them on and off.

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

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



GO-AROUND PROCEDURE



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

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

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

In going around, use the following procedure:

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

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

CROSSWIND LANDINGS

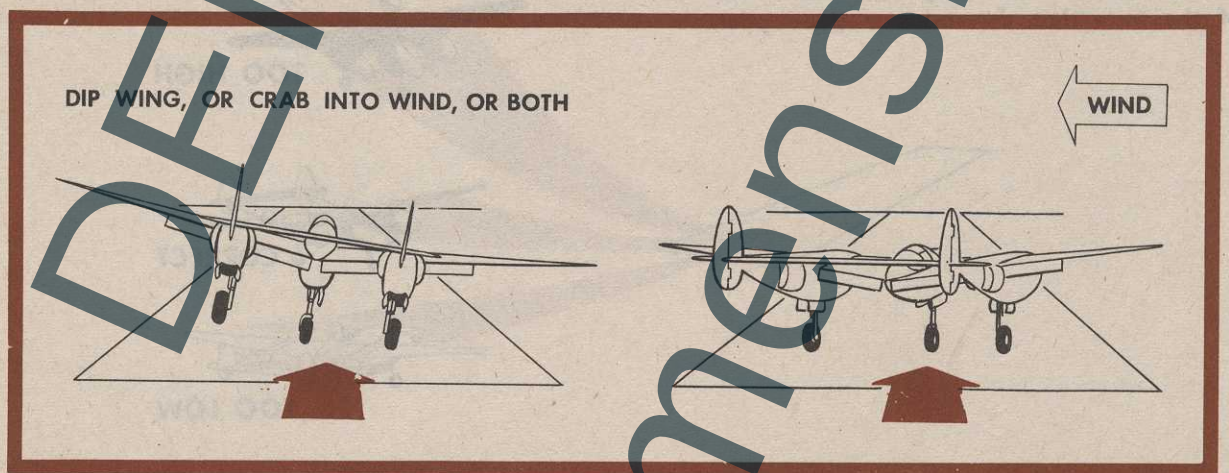
A crosswind landing in a P-38 presents no problem because of the tricycle landing gear.

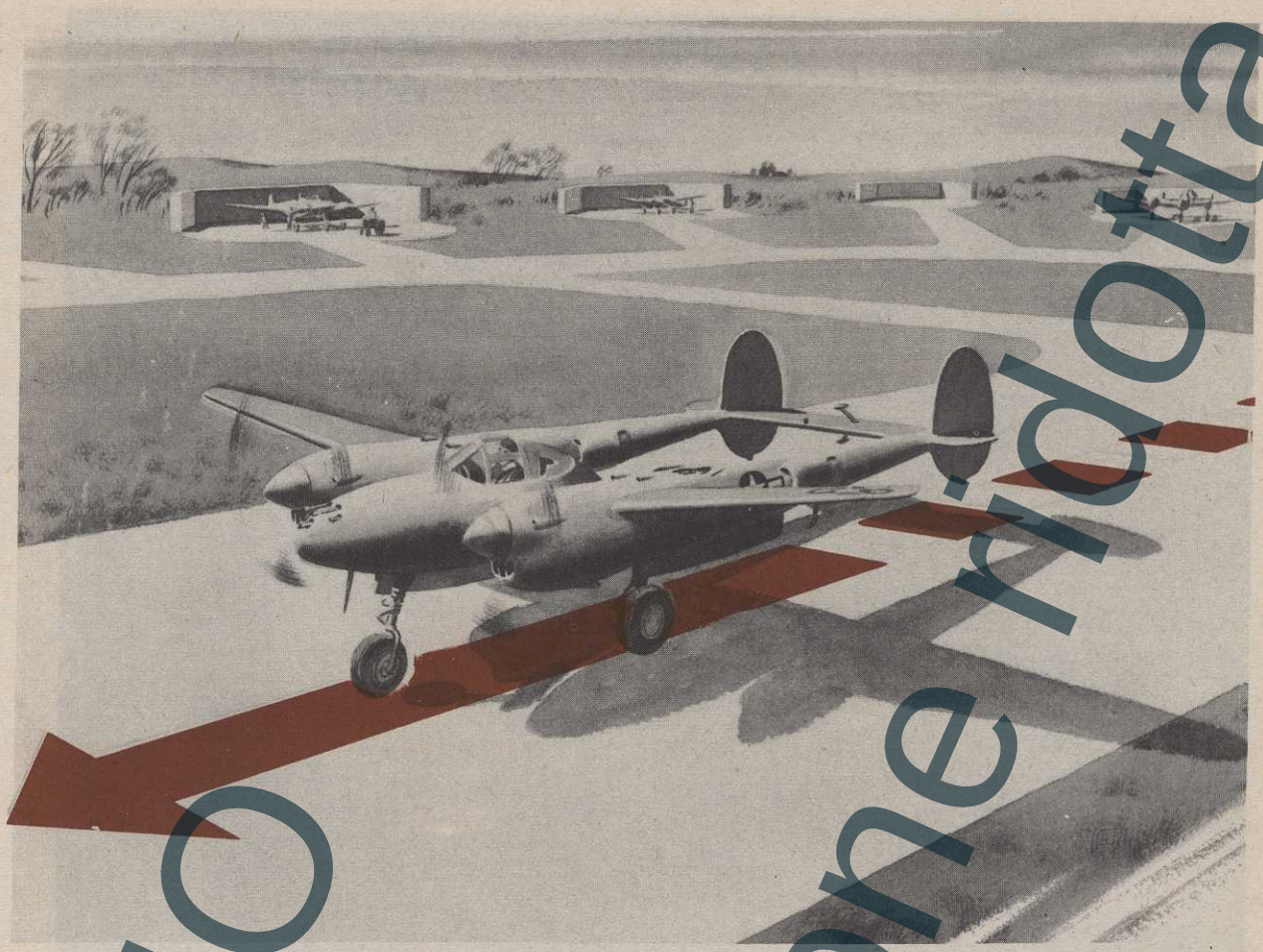
With the tricycle landing gear the center of gravity is **forward** of the main wheels. Once the wheels have touched the ground, the P-38 rolls straight down the runway. It will not groundloop.

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

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

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





AFTER LANDING

Keep the airplane straight with rudder. Avoid unnecessary use of the brakes.

Don't raise the flaps until you have reached the end of the runway. This helps you slow the airplane.

After you have slowed down, pull your flaps up, turn the booster pumps OFF; push the propeller governors full forward, and set the trim tabs to 0. Then place the oil and coolant shutters in FULL OPEN. This helps keep the temperatures down while you taxi.

Don't set the parking brakes after you have returned to the line. The brake discs get hot while taxiing and will freeze if you set them. After you have turned the engines off, hold the brakes until chocks have been placed.

To Stop the Engines

1. Open throttles to 1600 rpm.

Note: Hold this for a few seconds to burn out any impurities that may have collected on the spark plugs while taxiing.

2. Return throttles to 1200 rpm.
3. Move mixture controls to IDLE CUT-OFF.
4. When engines stop firing, open throttles.
5. When the propellers stop rotating, turn all switches OFF.
6. Turn fuel selectors OFF.

NIGHT TRANSITION

You will do almost all your flying during daylight hours. But there will be times when you take off in the wee hours of the morning and sometimes in the late afternoon, coming home after dark.

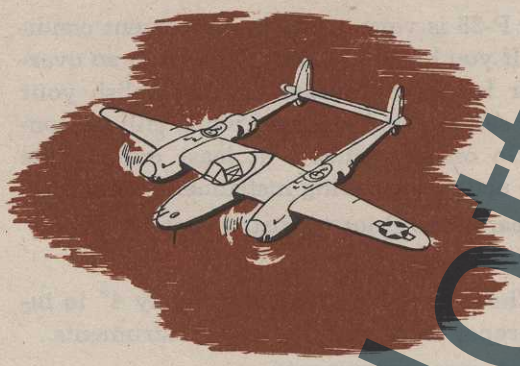
Night flying in a P-38 presents no problem. But there are several precautions you must remember. Here are a few tips to help you:

Before Takeoff

Equip yourself with a flashlight.
Make the **Additional Check for Night Flying.**
Check gage for approximately 4″ of vacuum and uncage gyro flight instruments.
Check to see that aileron boost is ON.
Set altimeter.
Use of oxygen from the ground up improves your night vision.
Establish radio contact.
Taxi slowly, intermittently using landing light if necessary.
Turn the landing light off when a plane is landing.
Get radio permission to take off.
Pick a point at the end of the runway to keep you straight on your takeoff run.

During flight

Proceed to your assigned zone and altitude.
Remain in your zone until called by the tower.
Keep your head on a swivel.
Frequently check your instruments and fuel supply.
A turn can change contact flying to instrument flying. If you lose the horizon, immediately go on instruments until you definitely establish your attitude. Don't fly by the seat of your pants.
Always keep the field in sight.
Don't make steep turns at any time.
Important: If radio contact fails, turn on your landing light and point your plane at the tower. When they give you a green light, go in and land.



If an emergency occurs, immediately start your letdown for landing and turn on your landing lights. This is your emergency clearance.
Don't be alarmed by the glow of the turbo-superchargers.

Landing

When you retard the throttles, sparks and perhaps flames will appear. Don't be alarmed. It's there in the daytime, too, but you can't see it.
Maintain a minimum of 1000 feet in the pattern until you turn into the final approach.
Use of landing lights and floodlights is optional. If there is haze or dust over the field, a blackout landing is recommended.
Go-around procedure is the same.
A safety officer will be in the tower or in a radio truck. Help yourself by observing his instructions.

INSTRUMENT FLYING

Under the present system, you receive instrument training under a hood while flying formation with your instructor. The instructor has contact with you by radio and can tell you to come out from under the hood if there are any airplanes in the vicinity. As a precaution in case of radio failure, come out from under the hood every 3 minutes and look around.

Instrument Letdown Procedures

The P-38 is very stable in instrument conditions. If you have to climb up through an overcast or let down through one, establish your power settings and airspeed while still on contact. Go on instruments at least one minute before actually entering instrument conditions.

Preparations Prior to Instrument Letdown

1. Pitot heat on.
2. Check vacuum at approximately 4″ to insure proper rotor speed of gyro instruments.
3. Set gyro instruments.
4. Lower landing gear. This creates greater stability and helps keep the airspeed down.
5. Lower maneuver flaps. This reduces the wing loading giving you added control.

Power Settings to Descend at 180 mph IAS

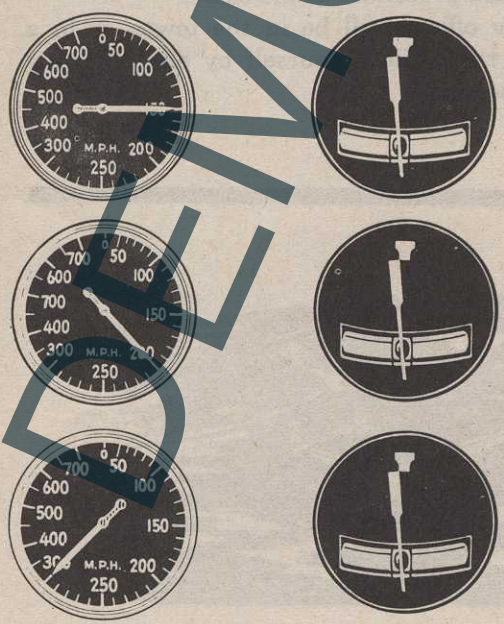
P-38L

Rate of Descent	Manifold Pressure	RPM
500 ft/min	28″	2600
1000 ft/min	25″	2600

P-38J

500 ft/min	24″	2600
1000 ft/min	20″	2600

Note: The above power settings vary with loading and differences in gross weight.



Never attempt an instrument let down unless you have radio contact, your position has been established, and you have received authorization and instructions from a radio clearing authority such as a driection-finding fixer station.

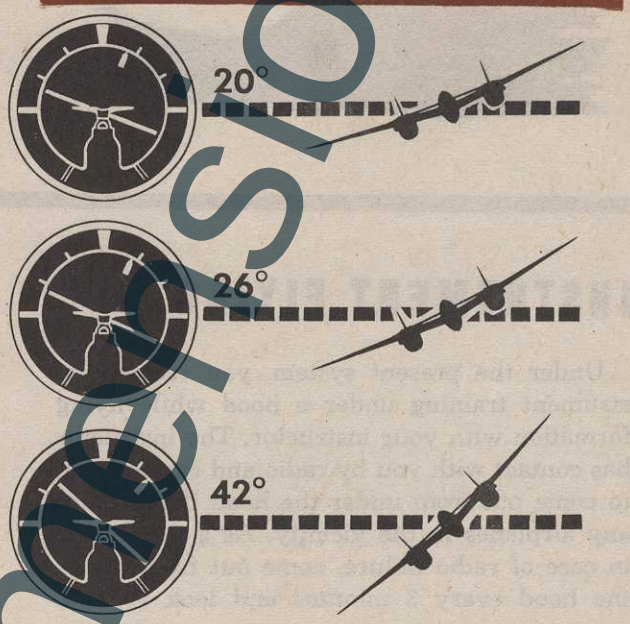
Never make a spiral let down or exceed a one needle width turn.

Be particularly cautious not to exceed 200 mph IAS. Your airspeed can build up very rapidly. Never make an instrument let down at high speeds. Gyro instruments at high speeds aren't dependable.

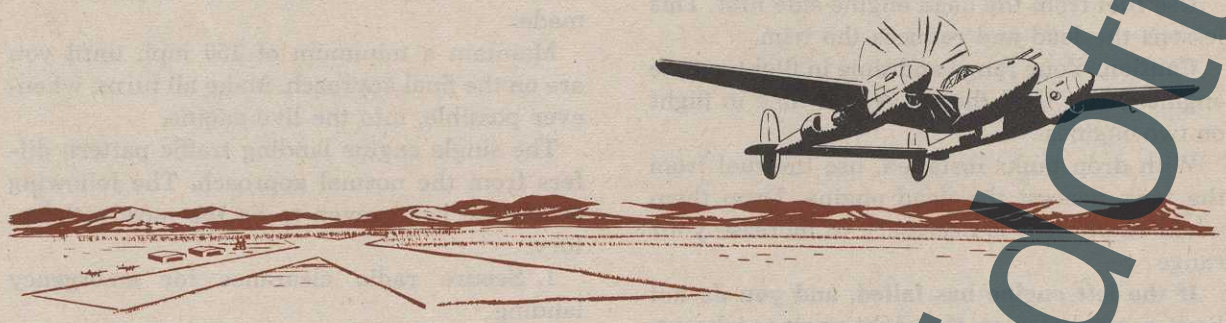
When flying formation during instrument conditions, the sole duty of each wingman is to concentrate on flying heads-up formation. Only the flight leader will be on instruments. The formation letdown procedure is the same as for single aircraft.

AN LE OF BANK IN RELATION TO AIRSP ED FOR STANDARD RATE TURN

Indicated Air speed	Angle of Bank
150	20°
180	23°
200	26°
225	30°
275	38°
300	42°



SECTION 4 *Emergencies*



ENGINE FAILURE

When an engine conks out on a single engine fighter, the first thing the pilot does is look around for a place to make a forced landing. If he happens to be above an overcast, rough terrain, or a heavy sea, his best bet is to hit the silk. If his engine fails on takeoff he has no other choice but to glide straight ahead. You, as a P-38 pilot, are not faced with this problem. If an engine fails after takeoff or during flight, you still have a good single engine airplane under you. Follow the same procedure as outlined in **Single Engine Practice** on page 83.

The minimum airspeed at which you can fly the P-38 on one engine is 130 mph **with landing gear up.** It can happen that one engine quits on takeoff when you don't have 130 mph with the gear up.

With Less Than 130 MPH

If an engine fails, or there is any irregularity, between the start of the takeoff run and 130 mph IAS, **cut both throttles and stop.**

If you cannot stop on the runway, retract the gear and slide in. Use the landing gear emergency release knob to lift the control handle.

With 130 MPH or More

If an engine fails after you have left the ground and the landing gear is up, or starting up, and you have a minimum of 130 mph IAS, do the following:

1. Reduce power to gain directional control. Correct yaw with rudder, applying as much power as you can hold.

2. While correcting yaw, release drop tanks (if installed).

3. Move mixture control of bad engine to IDLE CUT-OFF. Be certain you pull the mixture control of bad engine.

4. Feather propeller of bad engine.

5. Trim to take pressure off rudder pedal.

The most important thing to remember is the first step. Come back on the power, gain directional control with rudder, and then apply as much power as you can hold. Use rudder and not aileron to correct the initial yaw. Use of aileron increases the drag on the dead engine side. Don't apply so much power on the live engine that you can't hold the airplane.

The landing gear, when down, offers 60% of the total drag. Be sure the landing gear has been retracted, or is on its way up. An IAS greater than 130 mph is what you are striving for. Put the nose down to gain extra speed.

Sacrifice Altitude for Airspeed

Try to maintain a level climb away from the field. **Don't get excited** and try to turn back and land. Get plenty of altitude and fly around until the ship feels comfortable. You may be able to find out the trouble and restart the engine. If not, with the assistance of an experienced pilot in the tower you can take your time and make a well-planned single engine landing.

Single Engine Range

For maximum single engine range, use the lowest power which maintains an IAS of approximately 160 mph.

Use fuel from the dead engine side first. This lessens the load and reduces the trim.

Caution: Your range and time in flight on one engine is less than the range and time in flight on two engines.

With drop tanks installed, use the fuel from the tank nearest the dead engine. Drop them when empty if it is necessary to increase your range.

If the left engine has failed, and you do not have a generator on the right engine, take action as indicated under Electrical Failure.

Note: Keep aileron boost ON until coming in for a landing. There are no aileron trim tabs and aileron boost relieves aileron pressure on long trips.

Single Engine Landing Traffic Pattern

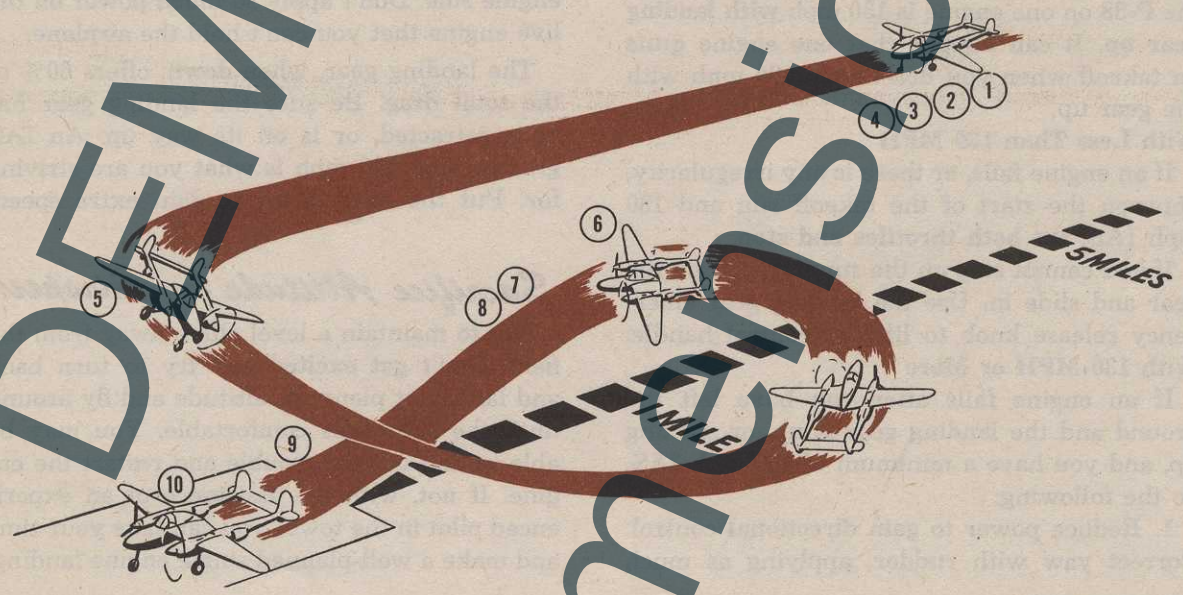
If you have to make a single engine landing and are carrying drop tanks, release them over an unpopulated area. If your airplane has aileron boost control, make sure it has been turned OFF so that you have all available hydraulic pressure to lower landing gear and flaps.

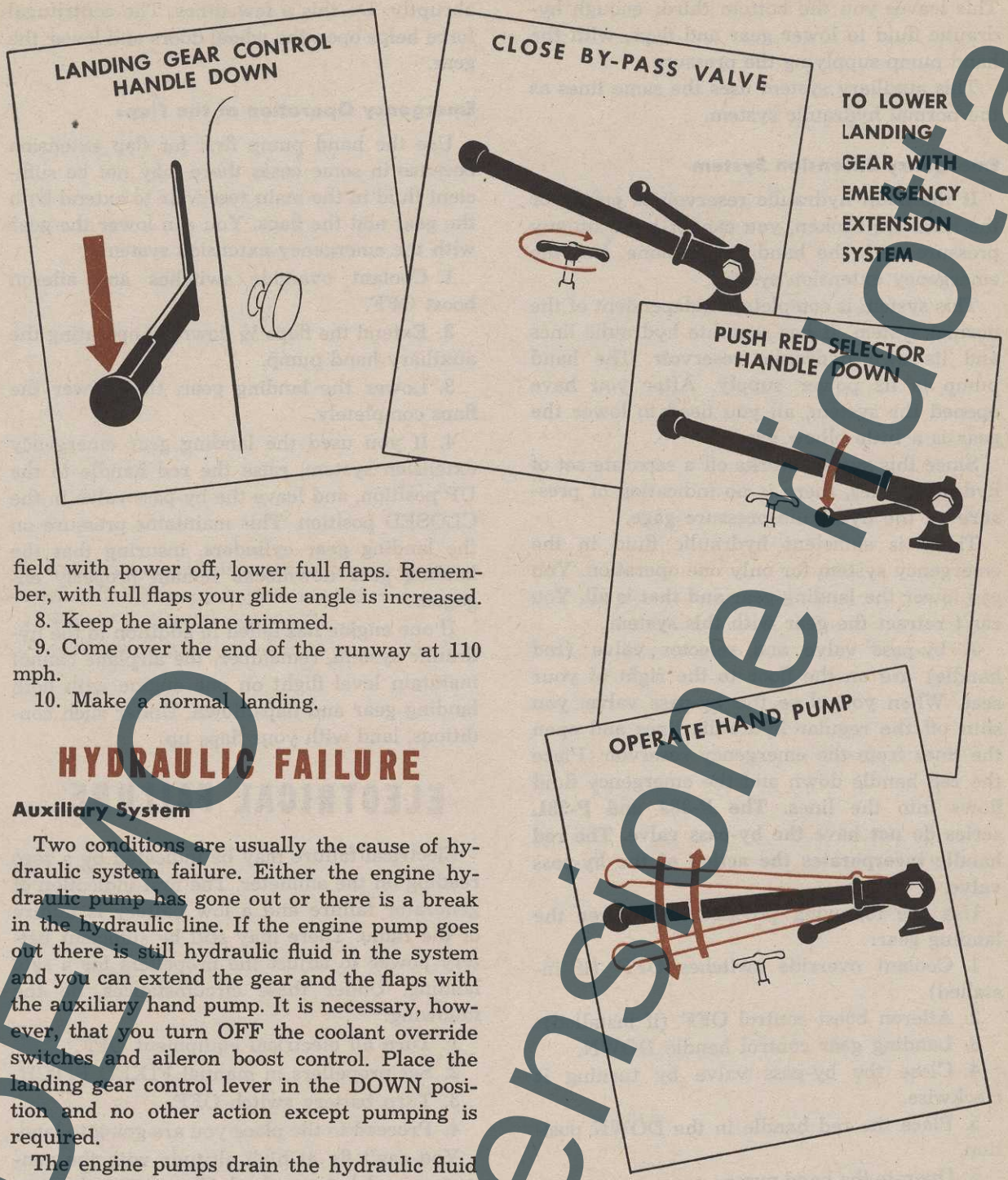
You can maintain altitude on single engine with landing gear down. However, you cannot maintain altitude on one engine with full flaps and gear down. If on the final approach you have landing gear and flaps down, you have committed yourself and a landing must be made.

Maintain a minimum of 150 mph until you are on the final approach. Make all turns, whenever possible, into the live engine.

The single engine landing traffic pattern differs from the normal approach. The following procedure has proven to be the most satisfactory.

1. Secure radio clearance for emergency landing.
2. Turn aileron boost control OFF so that you will have all available hydraulic power to lower landing gear and flaps.
3. At 160 mph, 4000 feet above the terrain, about 5 miles from the end of the runway, lower the landing gear. The extension time will be doubled (or approximately 30 seconds) because only one hydraulic pump is working.
4. Lift trigger on flap control handle through notch.
5. Come over end of runway at 3500 feet above terrain at 150 mph and start turn into live engine, descending until—
6. At completion of 360° turn you are 1 mile from end of runway at 1000 feet above terrain.
7. When you are certain you can make the





field with power off, lower full flaps. Remember, with full flaps your glide angle is increased.

8. Keep the airplane trimmed.

9. Come over the end of the runway at 110 mph.

10. Make a normal landing.

HYDRAULIC FAILURE

Auxiliary System

Two conditions are usually the cause of hydraulic system failure. Either the engine hydraulic pump has gone out or there is a break in the hydraulic line. If the engine pump goes out there is still hydraulic fluid in the system and you can extend the gear and the flaps with the auxiliary hand pump. It is necessary, however, that you turn OFF the coolant override switches and aileron boost control. Place the landing gear control lever in the DOWN position and no other action except pumping is required.

The engine pumps drain the hydraulic fluid from the top two-thirds of the hydraulic reservoir while the hand pump drains from the bottom third. So, if there is a leak in the hydraulic system, only the top two-thirds can drain out.

NOTE: Coolant overide switches and aileron boost valve must be off to operate auxiliary hand pump.

DITCHING

Never attempt to ditch the P-38 except as a last resort. Although it is possible to ditch the P-38 successfully, it is a hazardous business.

If trouble arises when you're on an overwater flight and you're sure that you can't reach land, don't hesitate to bail out. You won't be able to save the airplane anyway in landing on water, so you might as well abandon it in the air.

If it isn't possible to get up high enough to make a successful parachute drop, remember that the P-38 can be ditched successfully.

Your best chance for rescue lies in correct and speedy radio procedure before ditching. See **Emergency Radio Procedures.**

Approach and Touchdown

Determine the direction of your approach well in advance. Touchdown parallel to lines of crests and troughs in winds up to 35 mph. Ditch into wind only if wind is over 35 mph or if there are no swells. Use only half flaps. The retraction mechanism is such that when full flaps are down, surface pressure can't force them up, tending to force the nose under before complete loss of speed. In every case try to ditch while power is still available. Touchdown in a normal landing attitude.

The recommended ditching procedure is as follows:

1. Jettison tanks or bombs if you're carrying any.
2. Unfasten the parachute harness.
3. Make sure that your shoulder harness and safety belt are locked and tight.
4. Jettison the canopy and open both side windows.

Once the airplane stops you won't have more than a few seconds, so fix in your mind the following procedure:

1. Release the safety belt.
2. Jump out and pull the one-man life raft loose from the parachute.
3. Inflate your Mae West. If possible, salvage the parachute. It will come in handy.
4. Inflate the life raft and wiggle into it.

Even in shallow water don't get out of your Mae West until you are safely on shore.

See PIF for further information on Ditching.

WIND VELOCITIES

Few white caps	10 to 20 mph
Many white caps	20 to 30 mph
Streaks of foam	30 to 40 mph
Spray from crests	40 to 50 mph

BAILOUT

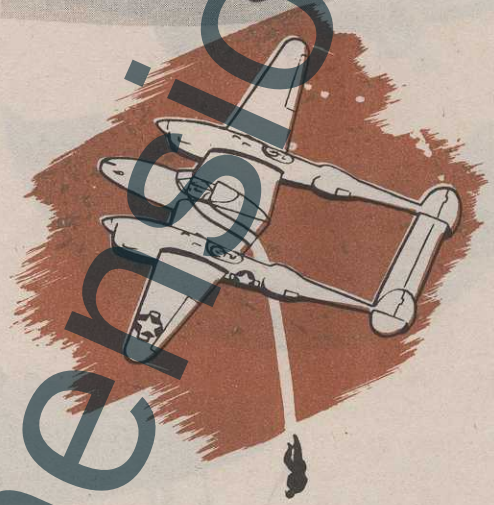
Many stories have been circulated that you can't successfully bail out of the P-38. Rumor had it that you wouldn't have a chance of missing the horizontal stabilizer, and twin booms and rudders. Actual experience has disproven these stories. In spite of the hangar talk that crops up from time to time, **it is no more difficult to bail out of a P-38 than any present-day fighter.**

Before you bail out, if you have the time, make the necessary radio calls as outlined in Emergency Radio Procedures. If you bail out over water or unpopulated territory, your best chance for rescue lies in correct and speedy radio procedure before you abandon your airplane.

The method of leaving the plane is largely dependent on your altitude, attitude, and airspeed. The final decision on how to get out rests with you. Here are three recommended and accepted procedures for bailing out.

Over the trailing edge of the wing

1. Head towards an unpopulated area and disconnect oxygen tube and radio equipment.
2. Slow the plane down as much as possible.
3. Roll down the left window and release the canopy.



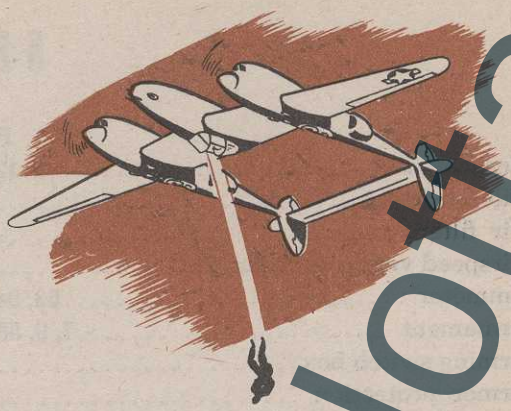
4. Release your safety belt and **slide** out **head first** off the trailing edge of the wing. **Never stand up or jump!**

YOU WILL CLEAR THE HORIZONTAL STABILIZER

Roll the plane over and drop out

1. Disconnect oxygen tube and radio equipment.
2. Roll elevator trim tab forward while holding plane level. (This will keep the nose of the plane up while you are on your back.)
3. Release the canopy and roll the plane over on its back.
4. Unhook your safety belt and drop out.

Unless you are very low to the ground, keep your hand off the ripcord when leaving the plane. If you hold the ripcord handle as you bail out, the slipstream jerks your arm and the chute opens before you are clear of the plane.



Sucked out at high speed

If your P-38 is out of control and traveling at a high airspeed, disconnect the oxygen tube and radio equipment, unhook your safety belt, and then release the canopy.

When the canopy is released, the vacuum created in the cockpit sucks you out of the seat and carries you clear of the plane.

If you feel conditions warrant leaving your plane and you have made up your mind to jump, decide which is the best way to get out, and then go.

ICING

If you anticipate icing conditions, or are in heavy rain, turn the pitot heat ON. Water or ice blocking the opening of the pitot tube can give you a false airspeed reading.

The formation of carburetor ice is unlikely in the P-38 because of the injection type carburetors and the heating effect of the turbosuperchargers. It is possible, however, for carburetor ice to form while you are flying at low power in icing conditions.

Remove carburetor ice by increasing power to supercharger range. Close the intercooler shutters (if installed) as far as possible without exceeding the maximum 45°C carburetor temperature.

If you want to add power and not increase your airspeed when flying in limited visibility or turbulence, lower partial flaps or the landing gear or both, as needed.

If icing conditions are present during a landing approach, move the throttles occasionally to prevent ice from freezing them in a closed position. With gear and flaps down, make approach under partial power.

You can remove ice from the windshield by turning the cockpit heat ON and directing the flexible heater tube to the desired point.

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