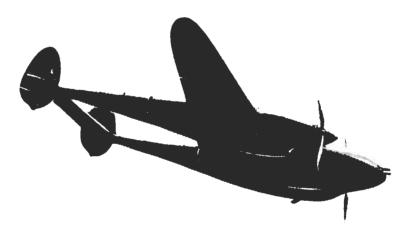
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## PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

ARMY MODELS

## P-38H Series, P-38J Series, P-38L-1 L-5 and F-5B AIRPLANES



This publication contains specific instructions for pilots and should be available for Transition Flying Training as contemplated in AAF Reg. 50-16.

Appendix I of this publication shall not be carried in aircraft on combat missions or when there is a reasonable chance of its falling into the hands of the enemy.

Published under joint authority of the Commanding General, Army Air Forces, the Chief of the Bureau of Aeronautics, and the Air Council of the United Kingdom.

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# Description

#### 1. AIRPLANE.

#### a. GENERAL.

(1) The P-38H, P-38J, P-38L, and F-5B airplanes are twin boomed, single place monoplanes manufactured by the Lockheed Aircraft Corporation. P-38H, P-38J, and P-38L are fighter airplanes. The F-5B is a photographic airplane. Hydraulically operated landing gear, flaps, brakes, and coolant shutters are provided. (Late airplanes are equipped with hydraulically boosted aileron control.) The approximate overall dimensions are as follows:

(2) The armament is mounted in the nose of the fuselage, and armor protection is provided as shown in figure 2. Photographic airplanes are protected by armor the same as the fighters, but all armament is replaced by cameras.

#### b. FLIGHT CONTROLS.

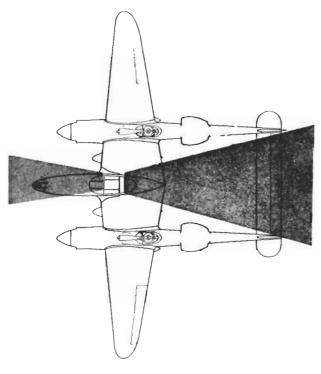
- (1) TRIM TABS.—Trim tabs are mounted on all the movable surfaces and are controllable from the cockpit during flight. Airplanes equipped with aileron control booster do not have aileron trim tabs.
- (2) FLAPS.—The flaps are a Lockheed modified Fowler type.

(a) CONTROLS.—Flap action is controlled by the lever (figure 7-2) on the right-hand side of the cockpit. When the lever is placed to UP, DOWN, or MANEUVER, the flaps will automatically stop at the desired position. The lever should be returned to CLOSED as soon as the end position is reached. The control will not go to the DOWN position until the trigger on the lever is lifted through the notch just forward of the CLOSED position.

#### Note

When using maneuvering flaps, the flap lever must be left in the MANEUVER position. If it is moved even slightly forward and then returned to MANEUVER, the flaps will extend completely. (This condition is corrected on late airplanes.)

- (b) POSITION INDICATOR. On the early airplanes, flap position is indicated by the flap and landing gear position indicator on the instrument panel. On late airplanes the flap position is indicated by a small pop-up lever (figure 3) on the trailing edge of the left center section just inside the boom. This indicator projects above the wing whenever the flaps are not full up.
- (3) SURFACE CONTROL LOCK. The surface control lock (figure 7-10) is stowed on the right-hand window sill and extends across the center of the cockpit when in use. On the late airplanes this lock does not lock the rudders.



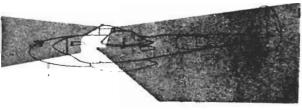


Figure 2 — Armor Protection

- (4) AUTOMATIC PILOT.—A type A-4 automatic pilot is installed in the F-5B airplane. The automatic pilot control unit is on the instrument panel; the shut-off valve (figure 24-10) is below the instrument panel; and the automatic pilot oil pressure gage (figure 33-10) is on the center control stand.
- (5) DIVE RECOVERY FLAP. P-38L and late P-38J airplanes are equipped with electrically operated dive recovery flaps which are controlled by a switch (figure 9-2) on the pilot's control wheel. The dive recovery flaps will extend or retract within two seconds.
- (6) AILERON CONTROL HYDRAULIC BOOSTER. P-38L and late P-38J airplanes are equipped with hydraulically boosted aileron control. On

these airplanes most of the aileron control force is provided by hydraulic boost; the remainder is applied by the pilot. Figure 15 illustrates the control linkage. Control cables which control the boost mechanism are mechanically connected to the control surfaces, allowing manual flight control in an emergency. The aileron boost shut-off valve (figure 9-5), is located on the right side of the cockpit near the pilot's control column. In addition to this valve an automatic by-pass valve is incorporated in the mechanism to allow free movement of the ailerons in case the hydraulic pressure should fail.

#### **IMPORTANT**

The ailerons ride approximately one inch higher with boost OFF. This change in trim is normal.

#### c. LANDING GEAR. (See figure 16.)

(1) The landing gear lever (figures 4-32) controls the extension and retraction of all three wheels. A lock on the lever prevents the lever from being moved out of the DOWN position when the airplane is on the ground (when the left main shock strut is compressed). If this lock fails, or if it is necessary to retract the landing gear on the ground because of engine failure at take-off, the lock may be released by rotating the landing gear control release-knob (figure 4-33) in a counterclockwise direction.

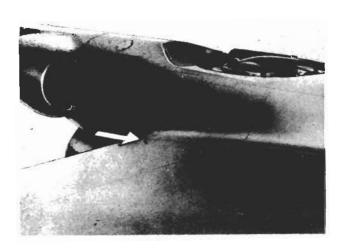
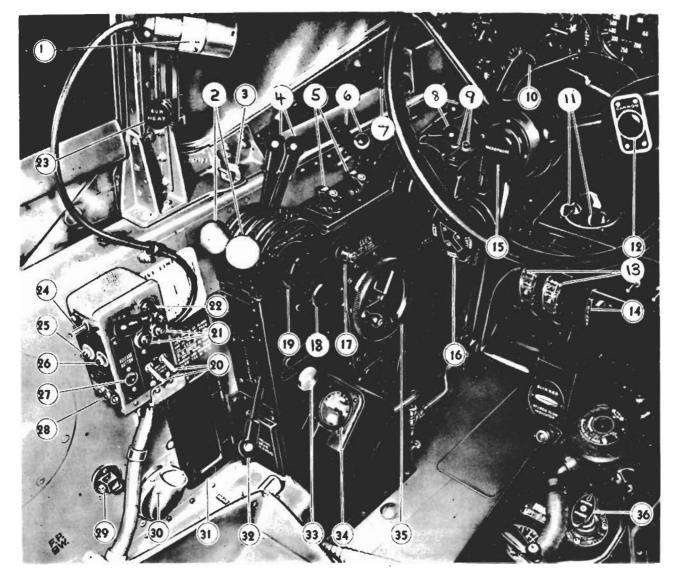


Figure 3 — Flap Pop-up Indicator



- Spotlight (normal position).
- Throttles.
- Surface controls lock clip.
- Propeller controls.
- Propeller selector switches.
- 6. Mixture controls.
- Propeller warning lights (P-38H only).
- Carburetor air filter control. (Late airplanes.) (Control not used on early airplanes.)
- 9. Propeller circuit breaker buttons.
- 10. Gun charger handle (on early airplanes only).
- 11. Ignition switches.
- 12. Cannon trigger button. (Machine gun button on forward side of wheel.) (Switch arrangements vary with different airplane models.)
- Propeller feathering switches.
- 14. Parking brake handle.
- 15. Microphone button. (Location varies with airplane model.)
- 16. Gun charging selector knob (P-38H only).17. Landing gear warning light. (Early airplanes only.)

- Propeller lever vernier knob.
  - Friction control.
- Bomb or tank release selector switches.
- 21. Bomb or tank release indicator lights.
- 22. Cockpit light.
- 23. Gun (or camera) compartment heat control. (Cockpit heat on later airplanes.)
- Arm-safe switch. (Bombs.)
- 25. Arming indicator light.
- 26.
- Safe indicator light.
  Bomb or droppable tank release button. 27.
- Spare indicator lights.
- 29. Spotlight alternate position socket.
- Cockpit ventilator control.
- 31. Gun sight dark glass stowage. (Early airplanes only.)
- 32. Landing gear control handle.
- 33. Landing gear control release.
- Oxygen pressure gage. Elevator tab control. 34. 35.
- 36. Engine primer.

Figure 4 — Cockpit — Left-hand Side

#### (2) POSITION INDICATOR.

On P-38H, early P-38J and F-5B airplanes, the landing gear position is indicated on the instrument panel by the flap and landing gear position indicator. A light on the control stand, and a warninghorn operate when either throttle is closed if the landing gear is not locked down. On later P-38J and F-5B, and all P-38L airplanes, the position indicator and warning light on the engine control stand have been replaced by a warning light (figure 8-24) on the instrument panel. The warning light glows whenever the landing gear is in transit - not locked up or down. With either throttle closed the warning light glows unless the landing gear is down and locked.

(3) BRAKES.—The brake system is not connected to the main hydraulic system. No emergency braking system is provided. See figure 18 for brake system diagram.

#### d. HYDRAULIC SYSTEM. (See figures 14 and 16.)

- (1) Normal system pressure (figure 8-22) is between 1100 to 1400 psi, surge to 1600 psi permissible. See Section IV for emergency operating instructions.
- (2) There are three separate systems of operation for the hydraulic equipment in this airplane.
- (a) The normal system operates all the hydraulic equipment (except brakes) using hydraulic pressure from the engine driven hydraulic pumps and hydraulic fluid from the top half of the main hydraulic fluid reservoir.
- (b) The auxiliary system operates the same equipment and uses the same lines as the normal system except that the hand hydraulic pump furnishes the hydraulic pressure and the fluid comes from the bottom of the main hydraulic fluid reservoir. When the auxiliary system is in use the hand pump source selector valve (figure 17-4) is UP and the bypass valve (figure 17-3) is OPEN.

#### Note

It will be impossible to build up pressure with the hand pump unless the aileron boost valve is OFF and the coolant override switches are OFF. The coolant override valves have a fixed bleed in the system when the switches are in the override position.

(c) The emergency system is used to extend the landing gear in case of complete failure of the normal and auxiliary systems. The emergency system is equipped

with a separate reservoir and separate lines. Pressure is supplied by the hand pump. When the emergency system is in use the hand pump source selector valve is DOWN and the bypass valve is CLOSED. (Late airplanes have the bypass valve incorporated in the source selector valve.)

#### e. ELECTRICAL SYSTEM.

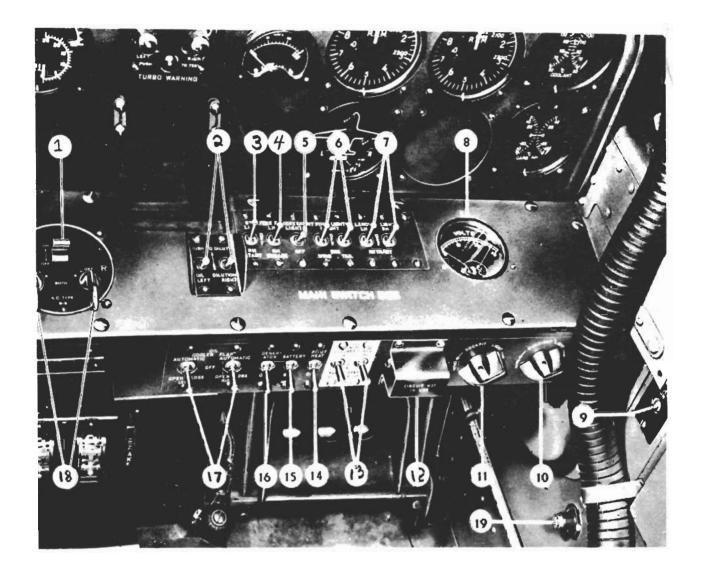
- (1) GENERAL.—On P-38H and early P-38J airplanes, the 24 volt electrical system is powered by a generator on the left engine and by a battery. F-5B, P-38L, and late P-38J airplanes have a generator on each engine and a battery. On fighter airplanes the battery is in the left boom, and on photographic airplanes the battery is in the nose compartment. The battery switch (figure 5-15) cuts out the battery, leaving the rest of the system operating on the generator(s). The generator switch (figure 5-16) (two switches on late airplanes, figure 8-11) turns off the power from the generator, allowing the system to draw power from the battery only. The ignition master switch (figure 5-1) is not connected to the airplane's electrical system, and turns off the ignition only to both engines.
- (2) CIRCUIT BREAKERS AND FUSES.—On late airplanes, circuit breakers are used to replace the fuses previously located in the nose gear wheel well. These circuit breakers are mounted along the right forward side of the cockpit (figure 6) and act as fuses to automatically break the circuit whenever an overload occurs. They may be reset by allowing a short interval for cooling and then pushing the button.

#### Note

It is not possible to tell by visual inspection whether or not a circuit breaker is open.

#### (3) LIGHTS.

(a) LANDING LIGHTS.—The landing light is located under the left wing and controlled by a switch (figure 5-7) on the main switch box. P-38H airplanes have a landing light under each wing, with individual switches. With the switch ON the light turns on and extends. On P-38H airplanes, when the switches are turned OFF the lights turn off, but remain extended. On F-5B and early P-38J airplanes when the switch is turned OFF the lights remain ON and extended. Later P-38J and P-38L airplanes have the landing light recessed in the left wing leading edge. The landing lights should not be used unnecessarily, as the life of the lamps is approximately 25 hours.



- 1. Ignition master switch.
- Oil dilution switches
- Starter switch.
- 4. Engage switch.
- 5. Flourescent light switch.
  6. Position light switches.
- Landing light switches (left-hand only on P-38J, P-38L, and F-5B).
- 8. Voltmeter.
- 9. Inverter switch (P-38H).
- 10. Gun sight light rheostat (on control column on later airplanes).
- 11. Cockpit light rheostat.
- 12. Intercooler flap switches. (P-38J, P-38L, and F-5B. Circuit not in use on P-38H.)
- 13. Coolant flap override switches.
- 14. Pitot heat switch.
- 15. Battery switch.
- 16. Generator switch.
- 17. Oil cooler flap switches.
- 18. Ignition switches.
- 19. Inverter warning light (P-38H).

Figure 5 — Main Switch Box



- 1. Fluorescent light rheostat (late airplanes).
- Landing light. Starter and booster.
- Starter and booster.
   Cross suction and oil dilution.
   R.H. fuel pump.
   L.H. fuel pump.
   Cockpit lights.
   Position lights.

- Recognition lights.
   Bomb and droppable tank release.
   Camera and armament firing and solenoids and relays.
   Camera and armament firing and solenoids and relays.
- 13. Contactor heater switch.

- 14. SCR-695 radio.
- 15.
- Range receiver. SCR-274N and SCR-522A Receivers.
- Radio dynamotor. Fuel gages. 17.
- 18.
- Temperature instruments.
  Oxygen and landing gear warning.
  Coolant override. 20.
- 21.
- 22. Right intercooler flap motor.
  23. Left intercooler flap motor.
  24. Right oil cooler flap motor.
  25. Left oil cooler flap motor.

(b) RECOGNITION LIGHTS.—These airplanes have three downward lights, red, green, and amber. White lights are on some airplanes.

#### CAUTION

It is possible to burn the plastic lenses of the downward recognition lights by operating them for more than thirty seconds while on the ground.

- (c) POSITION LIGHTS.—The position lights are controlled by switches (figure 5-6) on the main switch box.
- (d) COCKPIT LIGHTS. (Figures 7-12 and 4-22).

  —These lights are controlled by a rheostat (figure 5-11) on the main switch box and by a switch on the lights themselves.
- (e) FLUORESCENT INSTRUMENT LIGHTS.

  —The fluorescent lights are mounted on the forward side of the pilot's control column and are turned ON by a switch (figure 5-5) on the main switch box. Light intensity is regulated by twisting the ends of the lighting unit.
- (f) SPOTLIGHT. (Figure 4-1).—The spotlight is normally on the left windshield support. An alternate position (figure 4-29) is provided over the fuel tank selector valves. The spotlight switch is located on the light. The beam may be focused by sliding the screw head forward and aft in its slot.
- (4) INVERTER.—On P-38H airplanes the inverter is turned on by the switch (figure 5-9) under the flap control lever. It supplies alternating current to operate the fluorescent lights and the remote indicating compass. A warning ligh: (figure 5-19) glows when the inverter is not operating, indicating failure of the inverter and consequent failure of the compass and fluorescent lights.
- (a) On P-38J, P-38L, and F-5B airplanes the inverter operates only the compass and is turned on by a switch (labeled COMPASS) on the main switch box. No warning light is installed.

#### f. PILOT COMFORT.

- (1) The rudder pedals are adjusted by pushing or pulling the small lever (figure 7-18) on the outboard corner of each pedal and moving the pedals to suit. Care must be taken to insure that both pedals are adjusted equally.
- (2) The seat is adjusted by lifting the small lever (figure 17-1) on the right side of the seat and raising or lowering the seat as required. After the lever is released, check to make sure the seat is firmly locked in the new position.

- (3) Shoulder harness should be worn at all times. It will be impossible to lean forward unless the harness lever (figure 13-7) on the left side of the pilot's seat is raised. The harness lock will re-engage as soon as an upright position is resumed.
  - (4) PILOT'S RELIEF TUBE. (Figure 7-16.)

#### 2. POWER PLANT.

- a. ENGINES.—P-38H, P-38J, and F-5B airplanes are powered by one V-1710-89 right-hand rotating engine and one V-1710-91 left-hand rotating engine. P-38L airplanes are powered by one V-1710-111 right-hand rotating engine and one V-1710-113 left-hand rotating engine. These are 12-cylinder V-type liquid-cooled Allison engines. The engines drive three-bladed, constant-speed, full-feathering Curtiss electric propellers.
  - b. FUEL, OIL, AND COOLANT SPECIFICATIONS.

Fuel.....Specification AN-7-28, Grade 100/150 or Specification AN-7-26, Grade 91.

Oil.....Specification AN-VV-O-446, Grade 1120 (for cold weather operation, Grade 1100A).

Coolant. Specification AN-E-2 (Ethylene Glycol—Inhibited with NaMBT).

c. FUEL SYSTEM. (See figures 10, 10A, and 11.)

A separate fuel system is provided for each engine. Fuel may also be cross-fed to the opposite engine during single engine operation or when operating on the droppable tanks.

The booster pump switches and the tank selector valves are on the left beside the pilot's seat. On airplanes equipped with outer wing tanks, the outer wing tank low level warning lights are in the forward left-hand corner of the cockpit. On unmodified airplanes the engine priming pump is on the floor in front of the seat. On modified airplanes the priming-oil dilution switch is on the main switch box.

#### Note

All P-38L-5 airplanes and some P-38L-1 and P-38J airplanes are equipped with a modified fuel system. The new system may be readily identified by the two booster pump master switches (figure 13A-4) and the two speed control switches (figure 13A-3). All airplanes equipped with the old system will be referred to as unmodified airplanes and airplanes equipped with the new system will be referred to as modified airplanes.

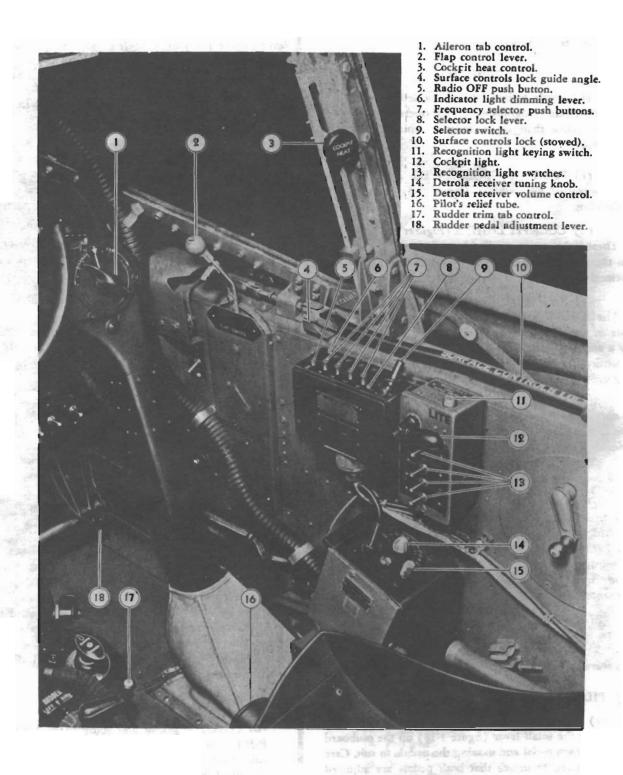
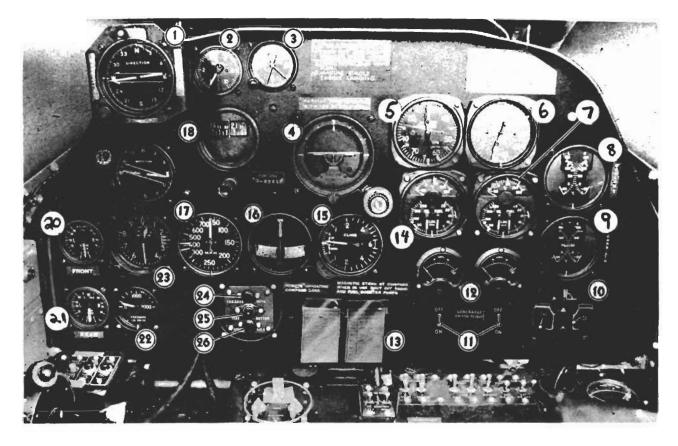


Figure 7 — Cockpit — Right-hand Side

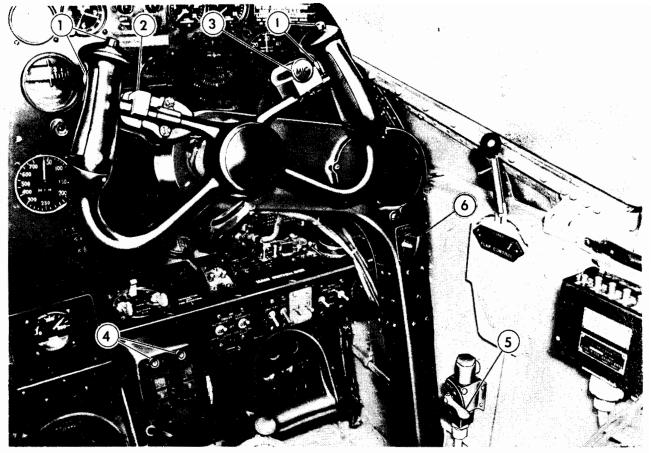
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- 1. Standby magnetic compass.
- 2. Suction gage.
- 3. Clock.
- 4. Gyro Horizon.
- 5. Manifold pressure gages (left and right).
- 6. Tachometers (left and right).
- Engine gage right engine (oil temperature and pressure and fuel pressure).
- 8. Coolant temperature gage.
- 9. Carburetor air temperature gage.
- 10. BC-608 contactor.
- 11. Generator switches.
- 12. Ammeters.
- 13. Compass correction cards.
- 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.

Figure 8 — Typical Instrument Panel (P-38J-25 Panel Shown)



- Control wheel switches (cannon and machine gun trigger, bomb release, etc.).
- 2 Dive recovery flap control switch.
- Microphone switch.

- 4. Propeller feathering switch warning lights.
- 5. Aileron boost shut-off valve (late airplanes).
- 6. Gun sight light rheostat (late airplanes).

Figure 9 — Control Wheel

#### d. OIL SYSTEM. (See figure 19.)

- (1) OIL DILUTION.—The oil dilution system is controlled by two switches on the main switch box (figure 5-2).
- (2) TEMPERATURE CONTROL.—Oil temperature control is automatic when the switches (figure 5-17) are set to automatic. In case of failure of the automatic system, manual control over the oil cooler flaps may be obtained by means of the same switches.
- e. THROTTLE CONTROL.—The throttle is mechanically connected to the supercharger regulator so that control of the supercharger as a separate operation has been eliminated. Early airplanes are equipped with turbosupercharger overspeed warning lights which flicker when rated turbo speed is reached and glow steadily when war emergency speed is reached. Late airplanes are equipped with turbo-supercharger regulators incorporating two overspeed controls. The normal overspeed

control regulates to 24,000 turbo rpm. The War Emergency overspeed control regulates to 26,400 turbo rpm and comes into operation whenever the throttles are advanced past the take-off stops. The overspeed warning lights are deleted from these airplanes. These late airplanes are also equipped with manifold pressure regulators. With these two regulators, each manifold pressure has a corresponding cockpit throttle position which is fixed for all altitudes up to the critical altitude. (Critical altitude is the altitude where the overspeed governor takes control). Above critical altitude, the turbo rpm is held constant at either 24,000 or 26,400, depending on the throttle position, and the manifold pressure will automatically drop approximately 1½" Hg. for every 1000 feet above critical altitude.

Thus above critical altitude, if it is desired to reduce the manifold pressure, no reduction will be obtained until the throttle is pulled back to the position which would normally give the manifold pressure then being allowed by the overspeed control. At manifold pressures below that being allowed, the power plant is operating below its critical altitude and throttle operation is normal. If it is desired to increase the manifold pressure, no change will occur until the throttle is past the take-off stop. At this point the War Emergency overspeed control comes into operation and the supercharger speed increases to 26,400 rpm with a corresponding rapid increase in manifold pressure. This increase is approximately 5" Hg. and no intermediate settings can be made.

f. MIXTURE CONTROLS.—The mixture controls (figure 4-6) have four positions, FULL RICH, (Wired off in some planes) RICH, AUTO LEAN, and CUT-OFF.

#### g. PROPELLER CONTROLS.

- (1) PROPELLER CONTROL LEVERS.—
  These levers (figure 4-4) select the desired engine rpm for automatic constant speed propeller operation.
- (2) PROPELLER SELECTOR SWITCHES (figure 4-5). These switches have four positions:
- (a) AUTO CONSTANT SPEED. The propeller governors are in opera, in and engine speed will be maintained as set on the propeller levers.
- (b) FIXED PITCH. Propeller pitch is fixed, engine speed depends upon power and airplane speed.
- (c) INC RPM.—Engine speed increases with lower pitch,
- (d) DEC RPM.—Engine speed decreases with higher pitch.
- (3) PROPELLER CIRCUIT BREAKERS.—These circuit breakers open, and the propeller pitch changing mechanism becomes inoperative, when the current required to operate the propellers becomes too high. When the circuit breakers open, the buttons (figure 4-9) popup, disclosing a red and white band on the buttons. The circuit breakers may be reset by pushing the buttons after allowing approximately 15 seconds for the switches to cool. Only the black portion of the buttons is visible when the circuit breakers are properly set.
- (4) FEATHERING SWITCHES. (Figure 4-13.)— These switches turn the propellers to their minimum drag position. Late airplanes are equipped with indicator lights which glow over the proper feathering switch when either a hard left or hard right rudder

control is applied to overcome the yaw caused by failure of one engine at low air speed.

- (5) WARNING LIGHTS. (Figure 4-7.) Propeller warning lights are installed on P-38H airplanes only. They indicate when the propeller circuits are not properly set for take-off and landing, that is, when the circuit breakers are open, or the selector switches are not set to AUTO CONSTANT SPEED. These lights, however, do not warn of an improperly set propeller control lever
- (6) VERNIER KNOB. (Figure 4-18.)—The vernier knob provides for fine adjustment of the right-hand propeller pitch control when synchronizing the engines.
- (7) FRICTION CONTROL. (Figure 4-19.)—The friction control may be adjusted to prevent the throttles and propeller controls from creeping out of their set position.

#### b. CARBURETOR AIR TEMPERATURE CONTROLS.

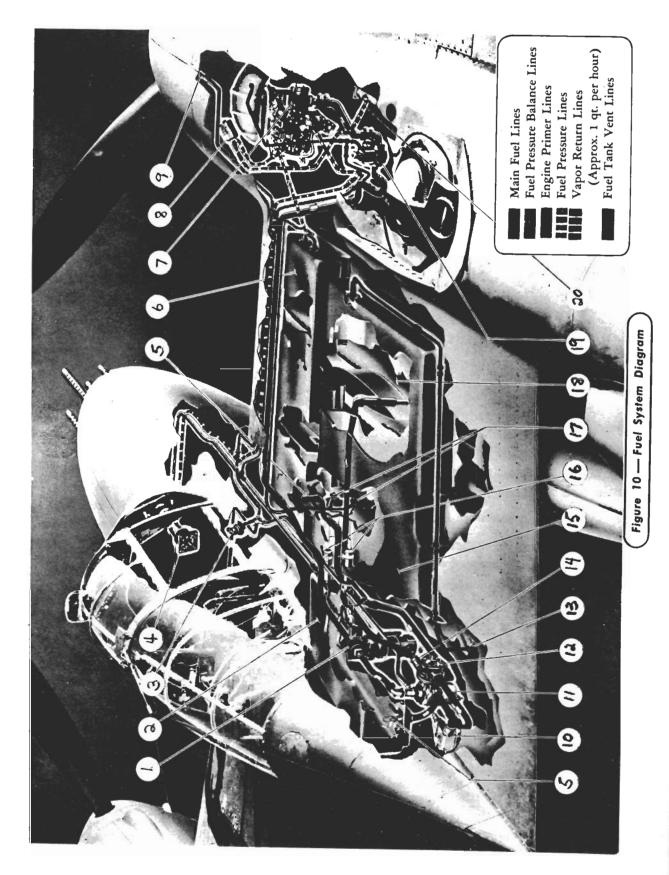
(1) P-38H airplanes are not provided with a control for the carburetor air temperature, as the intercoolers are located in the wings and there are no intercooler flaps. On P-38J, P-38L, and F-5B airplanes a core type intercooler is located under each engine, and the intercooler flap, controlling carburetor air temperature, is operated by the switches (figure 5-12) on the face of the main switch box.

#### i. CARBURETOR AIR FILTER CONTROL.

(1) This control is located behind the pilor's seat' on early airplanes. On late airplanes, this control is located on the engine control stand (figure 4-8).

#### j. COOLANT TEMPERATURE CONTROLS.

- (1) Coolant temperature is automatically regulated between 101°C (214°F) (flaps closed) and 121°C (250°F) (flaps open) with the coolant flap override switches set to OFF.
- (2) The override switches (figure 5-13) may be operated to fully OPEN or fully CLOSE the flaps in the event that the regulators fail to maintain the above temperatures. It is not possible to set the coolant flaps to any position except full OPEN or full CLOSE when using the override switches. If hydraulic pressure fails completely, the flaps will assume a faired (mid) position.



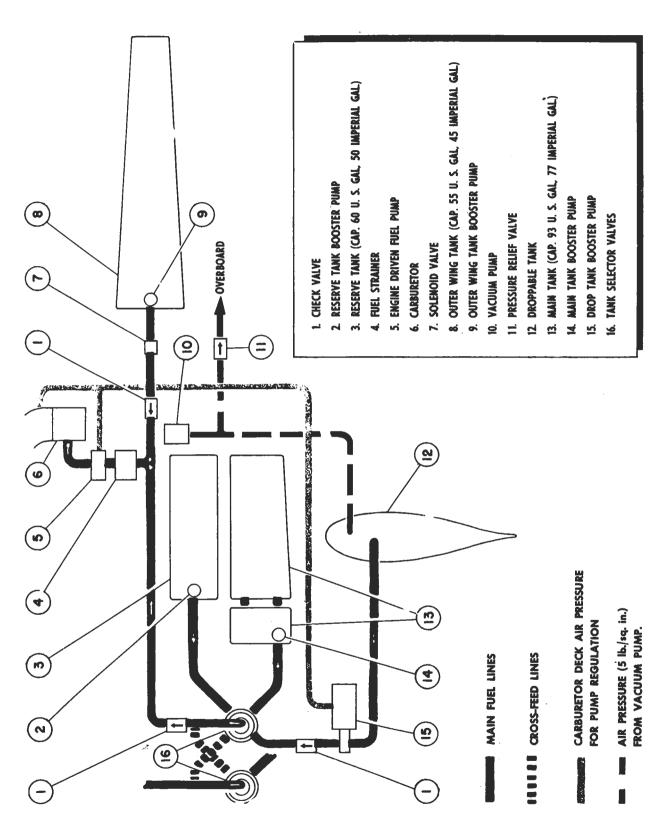
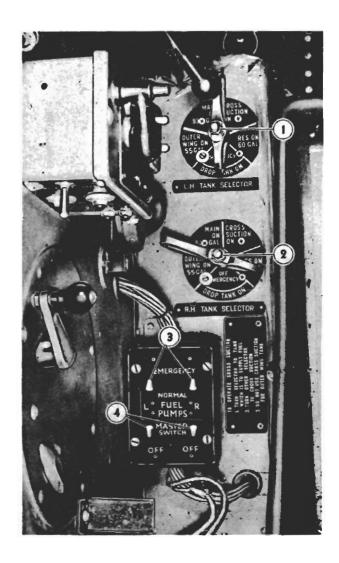


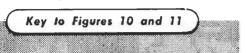
Figure 10A -- Simplified Fuel System Diagram (Modified Airplanes)

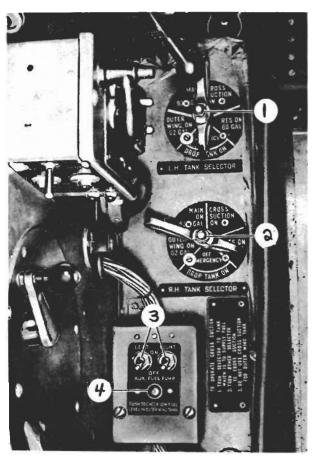


- 1. Left-hand tank selector valve.
- 2. Right-hand tank selector valve.
- 3. Booster pump speed control switches.
- 4. Booster pump master switches.

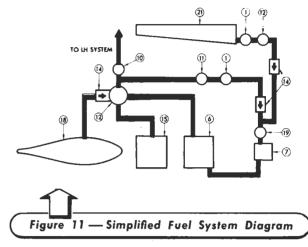
Figure 13A — Fuel System Controls (Modified Airplanes)

- Electric fuel pump. Surge tank (considered part of main tank). 2.
- Engine priming pump.
- Fuel pressure gage.
- Outlet from tank.
- Reserve tank (capacity 60 U.S. gal., 50 Imperial gal.).
- Carburetor.
- Oil dilution valve.
- Line to engine primer distributor.
- 10. Crossfeed valve.
- 11. Fuel filter.
- 12. Tank selector valve.
- 13. Main tank vent.
- Check valve. 14.
- Main tank (capacity 93 U.S. gal., 77 Imperial gal.).
- 16. Passages between main tank and surge tank.
- Reserve tank vent. 17.
- Droppable tank (capacity 165 U.S. gal., 137 Imperial gal.). 18. Or (300 U.S. gal., 250 Imperial gal).
- Engine driven fuel pump.
- 20. Oil dilution line (injects fuel into oil system).
- 21. Outer wing tank (capacity 55 U.S. gal., 45 Imperial gal.). (Not shown in figure 10.)





- 1. Left-hand tank selector valve.
- 2. Right-hand tank selector valve.
- 3. Auxiliary fuel pump switches.
- 4. Outer wing tank low level check button.

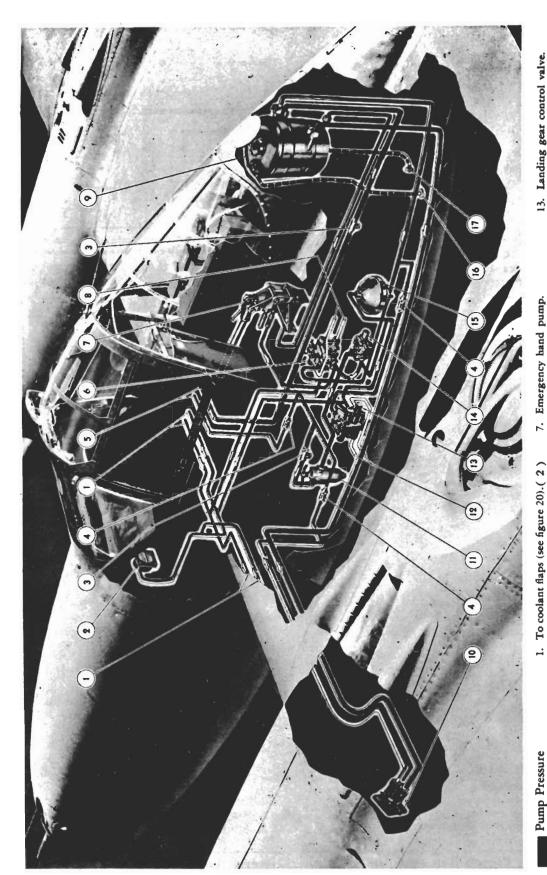


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- 1. Spotlight (in alternate position).
- 2. Left window crank.
- 3. Window crank ratchet handle.
- 4. Electric fuel pump switches.
- 5. Outer wing tank switches.
- 6. Crossfeed switch.
- 7. Shoulder harness release.
- 8. Right-hand tank selector valve.
- 9. Left-hand tank selector valve.

Figure 12 — Fuel System Controls (Late Airplanes)

Figure 13 — Fuel System Controls (Early Airplanes)



13. Landing gear control valve.

To flap system (see figure 16). 9. Main hydraulic reservoir.

Engine driven pump. 11. Hydraulic fluid filter.

10.

Ground test connections. (2)

2. Hydraulic pressure gage.

Return to Reservoir

To right-hand engine pump.

Check valves. (3)

Flap control valve.

IIII Tank Drain or Vent

System Pressure

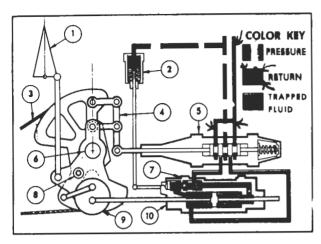
Pump Suction

17. Main reservoir drain.

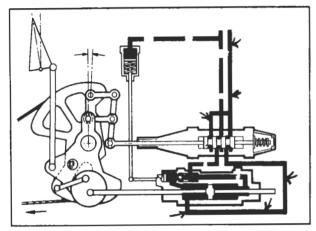
To landing gear (see figure 16).

<sup>14.</sup> System pressure regulator.

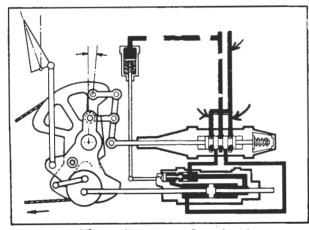
<sup>15.</sup> Hydraulic pressure accumulator. 16. Vent to atmosphere.



Aileron Neutral



Aileron Moving



Aileron Movement Completed

- 1 Aileron.
- 2. Low pressure by-pass actuator.
- Control cable.
- 4. Parallelogram linkage.
- 5. Control valve.
- 6. Center pivot point.
- By-pass valve.
   Pin in over-size hole.
- 9. "Feel" lever.
- 10. Aileron boost cylinder.

Description of Aileron Boost Unit Operation:

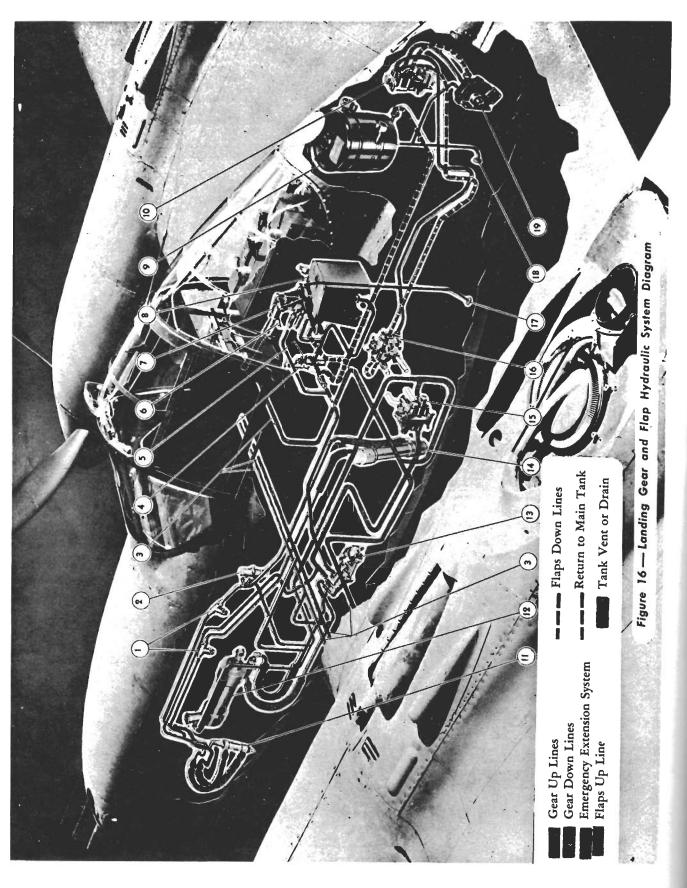
In the neutral position, no force is applied to the control cables (figure 15-3) the pin is centered in the oversized hole (figure 15-8) and the control valve (figure 15-5) is closed.

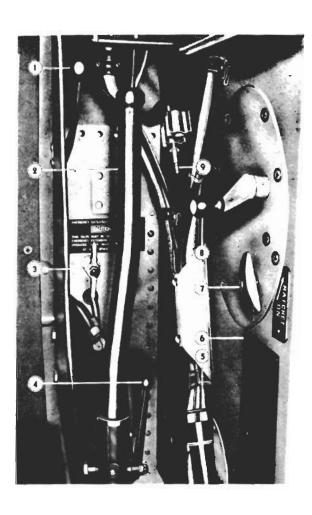
As a force is applied to the control cable, the large control wheel is rotated slightly, the pin is displaced from the center of the oversize hole, and the resultant distortion of the parallelogram linkage (figure 15-4) moves the control valve to one side. This displacement of the control valve allows hydraulic fluid to flow to the boost cylinder (figure 15-10) and assist the original force in moving the aileron.

As the motion of the control wheel is stopped, hydraulic fluid continues to flow to the boost cylinder until the pin is again centered in the hole and the control valve is returned to the OFF position. In this position, the application of force by the pilot continues to act through the feel lever (figure 15-9) and prevents the air loads on the aileron from displacing the pin from the center of the hole.

In the event of failure of the hydraulic pressure, or shutting off the aileron boost shut-off valve (foure 9-5) in the cockpit, the low pressure by-pass actuator cylinder (figure 15-2) moves under spring tension and opens the by-pass valve (figure 15-7). The opening of the by-pass valve allows free flow of fluid from one side of the boost cylinder to the other and prevents the occurrence of a hydraulic lock condition.

With pressure in the boost system thus reduced to zero, full manual operation of the ailerons is obtained when the pin hits the side of the oversize hole (figure 15-8).







one direction, high pressure flow in the other direction.)

2. Sequence valve (open only when wheel is UP).

4. Energency extension by pass valve.

5. Pressure relief valve.

6. Source selector valve (DOWN position).

8. Energency hand pump.

9. Main hydraulic reservoir.

9. Main hydraulic reservoir.

10. Landing gear door locking cylinder.

11. Landing gear door locking cylinder.

12. Landing gear door cylinder.

13. Landing gear door cylinder.

14. Landing gear door cylinder.

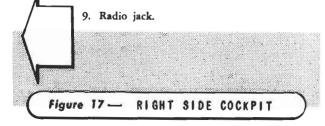
15. Landing gear door cylinder.

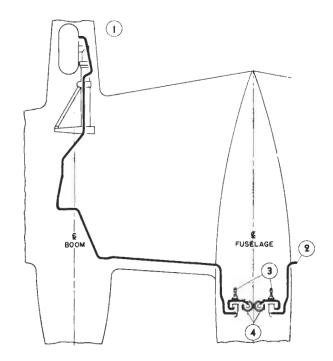
16. Landing gear door cylinder.

17. Landing gear door cylinder.

18. Landing gear door cylinder.

- 1. Seat adjustment release handle.
- 2. Hand pump handle.
- 3. Emergency extension by-pass valve. (Early airplanes only.)
- 4. Source selector valve handle.
- 5. Radio jack (stowed position).
- 6. Emergency extension procedure placard.
- 7. Window ratchet.
- 8. Right-hand window crank.





- 1. Main landing gear wheel and brake.
- 2. To left-hand gear.
- 3. Brake cylinders.
- 4. Hydraulic fluid reservoirs.

Figure 18 — Brake System Diagram

- 1. Automatic oil temperature regulator.
- 2. Line to oil pressure gage.
- 3. Oil tank (capacity 13 U.S. gal., 11 Imperial gal.).
- 4. Supercharger regulator. (BARLY AIRPLANES ONLY)
- 5. Vents to atmosphere.
- 6. Oil from engine.
- 7. Oil cooling radiators.
- 8. Oil to engine.

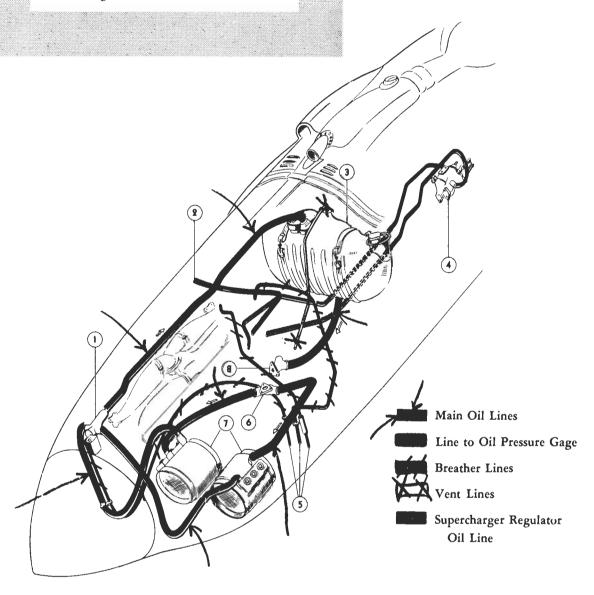


Figure 19 — Oil System Diagram

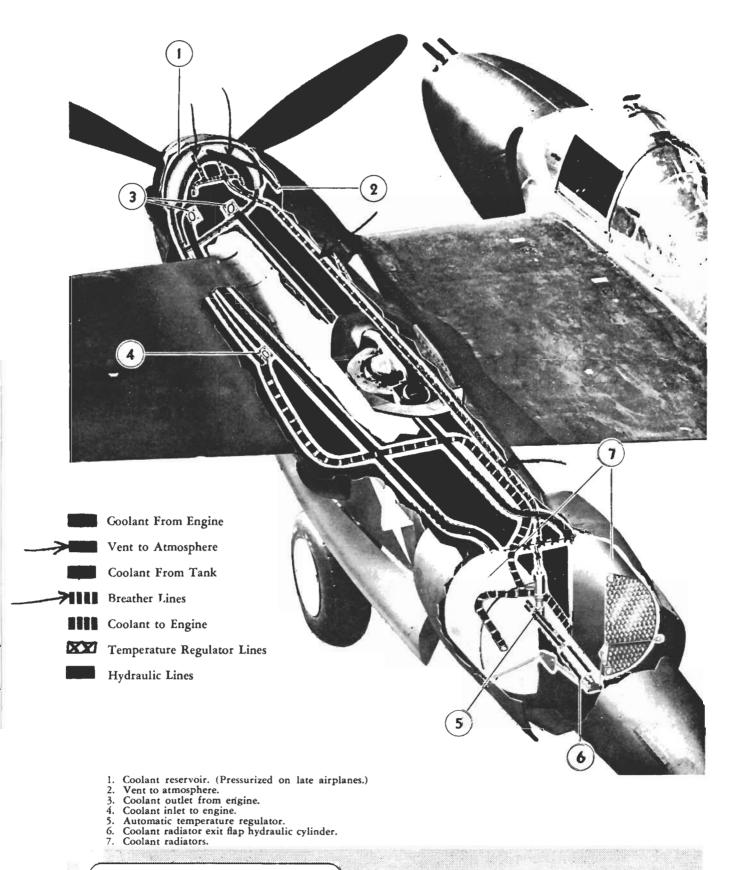
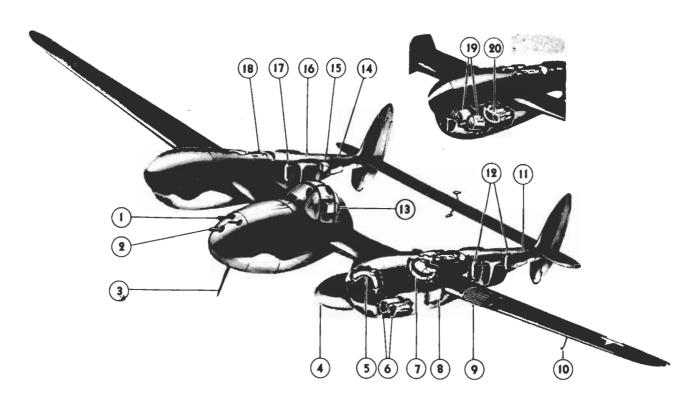


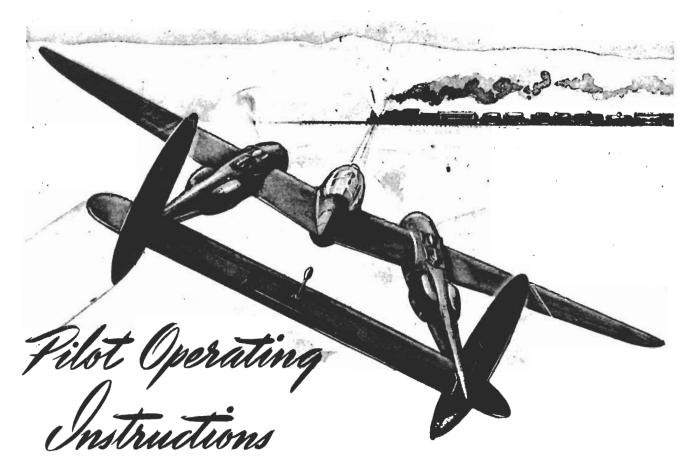
Figure 20 — Coolant System Diagram



- 1. .50 caliber machine guns.
- 2. 20 mm cannon.
- 3. Antenna mast.
- 4. Droppable fuel tank.
- 5. Coolant tank.
- 6. Oil cooler radiators (P-38H).
- 7. Oil tank.
- 8. Carburetor air filter.
- 9. Carburetor air intercooler (P-38H).
- 10. Airspeed pitot.

- 11. Battery compartment door.
- 12. Oxygen bottles.
- 13. Radio equipment.
- 14. Baggage compartment door.
- 15. Recognition radio.
- 16. Coolant radiators.
- 17. Oxygen bottle.
- 18. Turbo supercharger.
- 19. Oil cooler radiators (P-38J and F-5B).
- 20. Carburetor air intercooler (P-38J and F-5B).

Figure 21 — Airplane Contents Diagram



#### 1. FLIGHT RESTRICTIONS.

- a. MANEUVERS PROHIBITED.
  - '(1) Snap rolls and intentional spins.
  - (2) Continuous inverted flight.
- (3) Airspeed or accelerations in excess of those given on the DIVE LIMITS placard (figure 25) which is posted in the cockpit of each airplane. Do not exceed 3.5 G's negative acceleration.

#### **CAUTION**

Extreme care must be taken during acrobatic maneuvers which require a downward recovery. Acrobatics should not be attempted at altitudes below 10,000 feet.

#### b. AIRSPEED LIMITATIONS.

	Maximum Allowable
Condition	Airspeed (Indicated)
Diving	See Placard (figure 25)
	Section II paragraph 18
Landing gear extended.	
Flaps 100% extended	
Flaps 50% extended	
Landing light extended.	140 mph.
300 Gal. droppable tanks	installed 250 mph.

#### 2. BEFORE ENTERING PILOT'S COMPARTMENT.

a. Check the loading of the airplane. Determine the approximate take-off weight and the center of gravity position.

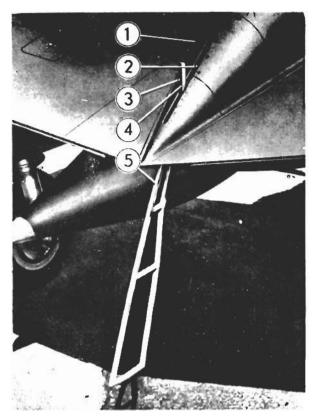
#### WARNING

Dangerous instability exists when the center of gravity is aft of 32% mac. (32% gear up corresponds to 28.5% gear down.) Under these tail heavy conditions, full down elevator will be required to prevent stalling the airplane if the airspecd is allowed to drop below 90 mph indicated with flaps down, power on, and landing gear up.

#### Note

Tail heavy conditions may be relieved by lowering the landing gear.

- b. Check that the cannon and machine guns have been charged and that the radio transmitters have been tuned to the proper frequencies.
- c. Access to the airplane is by means of the retractable ladder on the rear of the fuselage (figure 22-5). Push the up-lock release (figure 22-2) and raise the handle (figure 22-4) to a vertical position. Force the handle down until the ladder locks in the position shown. To



- 1. Flush type handhold.
- 2. Uplock release.
- 3. Downlock release.
- 4. Ladder lever.
- 5. Ladder.

Figure 22 - Access Ladder

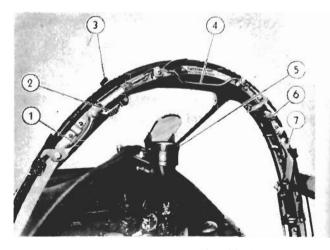
retract the ladder, push the downlock release (figure 22-3) and pull the handle straight up until the ladder stows in place, then swing the handle forward until flush with the fuselage contour, and press firmly into place. A flush, hinged handhold (figure 22-1) is built into the left side of the fuselage.

(1) To open the top hatch, turn the two releases (figure 23-3) on the top of the windshield and rotate the hatch backward.

#### 3. ON ENTERING PILOT'S COMPARTMENT.

- a. CHECK FOR ALL FLIGHTS.
- (1) Battery switch (figure 5-15) OFF if battery cart is used. ON if cart is not used.
- (2) Cross-feed switch (figure 13-6) OFF. (Cross-feed switch is replaced by a cross-feed position of the tank selector valves on later airplanes.)
- (3) Turn the tank selector valves to OUTER WING ON (or outer wing tank switches ON).

- (a) Check operation of outer wing tank booster pumps by checking the fuel pressure.
- (b) Check the condition of the low level warning light bulbs by pushing the test button on the side of the warning light box, or (on modified airplanes) press the bulbs into their sockets.
- (4) Oxygen pressure (figure 4-34) 400 to 450 lb/sq in.
- (5) Bomb selector switches (figure 4-20) ON and arming switch (figure 4-24) SAFE. (These positions insure that tanks or bombs may be dropped quickly in the event of engine failure at take-off.
  - (6) Throttles (figure 4-2) 1/10 OPEN. (3/4 inch.)
- (7) Propeller control (figure 4-4) INC RPM. (Full forward.)
- (8) Propeller selector switches (figure 4-5) AUTO CONSTANT SPEED.
  - (9) Propeller circuit breakers (figure 4-9) ON.
- (10) Propeller feathering switches (figure 4-13) NORMAL.
  - (11) Mixture (figure 4-6) IDLE CUTOFF.
- (12) Oil cooler flap switches (figure 5-17) AUTO-MATIC.
  - (13) Generator switch (figure 5-16 or 8-11) ON.



- 1. Hatch locking arm (locked position).
- 2. Hatch release button.
- 3. External hatch release levers
- 4. Hatch release handle.
- 5. Gunsight (late airplanes).
- 6. Hatch release button.
- 7. Hatch locking arm (released position).

Figure 23 — Hatch Controls

- (14) Coolant flap override switches (figure 5-13) OFF.
- (15) Intercooler flaps (figure 5-12) OPEN . (If installed.)
- (16) Gun-sight light (figure 5-10) operating and seat adjusted so that the sight reflection is easily visible.
- (17) Inverter switch (figure 5-9) (or compass switch on main switch box) ON.
- (18) Contactor heater ON if contactor is to be used during the flight.
  - (19) Armament switch (on control column) OFF.
- (20) Fuel quantity (figure 8-20 and 21) adequate. Check the fuel level in outer wing tanks by pressing the low level test button (figure 12-4), or, (on modified airplanes) by operating the low level test switch on the side of the warning light box.
- (21) Turbo-supercharger warning lights functioning (if installed).
- (22) Carburetor air filters (figure 4-8) AS RE-OUIRED.

#### Note

The use of carburetor air filters reduces the critical altitude and range of the airplane and should be avoided in clear air.

- (23) Clock and altimeter set.
- b. SPECIAL CHECK FOR NIGHT FLYING.—Test by operating.
- (1) Landing lights (figure 5-7). (Not more than 5 seconds for test.)
- (2) Recognition lights (figure 7-13). (Not more than 10 seconds for test.)
  - (3) Cockpit lights (figure 5-11).
  - (4) Fluorescent lights (figure 5-5).
  - (5) Position lights (figure 5-6).
  - (6) Spot light (figure 4-1).

#### 4. FUEL SYSTEM MANAGEMENT.

a. GENERAL.—On unmodified airplanes fuel is supplied to each engine by an engine driven fuel pump and one master booster pump which draws fuel from either the main, reserve, or droppable tank depending on the setting of the selector valve. (An additional booster pump for the outer wing tank is installed on airplanes equipped with these tanks.)

On modified airplanes fuel is supplied to each engine by an engine driven fuel pump and an individual

booster pump for each tank. The droppable tanks on modified airplanes are also pressurized to 5 lb/sq in.

On all airplanes equipped with outer wing tanks, two low level warning lights are installed on the forward left-hand side of the cockpit. These lights automatically come on when fuel for approximately 5 or 6 minutes of engine operation remains in the tank.

#### b. NORMAL USE.

(1) Warm up, take off and fly for the first 15 minutes on RESERVE tanks. This is to provide space in the reserve tanks for the vapor return from the carburetors. Switch both engines to the *left* droppable tank until almost dry, then shift to *right* droppable tank until almost dry. Determine hourly fuel consumption from the charts in Appendix II. Fuel gages are not installed in the droppable tanks. Do not drop external tanks unless necessary for increased range or for combat. Use up the fuel in the outer wing tanks (if installed); then use main tanks, and switch back to RESERVE for the remainder of the flight.

#### WARNING

Always check the fuel level in the tank before trying to operate the engine from that tank. To check the fuel level in the outer wing tanks, press the low level test button (figure 12-4), or, (on modified airplanes), operate the low level test switch on the side of the warning light box. It is not possible to check the fuel level in the droppable tanks.



(2) On unmodified airplanes the booster pumps (figures 12-3, or 13-4) should be operated during takeoff and landing to prevent engine failure which may result from engine-driven fuel pump failure. The booster pumps should also be operated during flight whenever necessary to maintain the required 16 to 18 lb/sq in. fuel pressure.

On modified airplanes the booster pump master switches (figure 13A-4) should be on at all times. The speed control switch should be in the EMERGENCY position during take-off and landing to prevent engine failure which may result from engine-driven fuel pump failure. The booster pumps should also be operated on EMERGENCY whenever necessary during flight to maintain the desired fuel pressure of 16 to 18 lb/sq in. The speed control switches have no effect on the droppable tank booster pumps. On modified airplanes the booster pump switches merely supply power to the booster pumps. The proper pump is turned on by contacts on the tank selector valve.

#### Note

Never exceed 250 mph indicated with 300 gallon droppable tanks installed.

- (3) To release droppable fuel tanks:
  - (a) Raise flaps and landing gear.
- (b) Turn tank selector valves (figures 13-8 and 13-9) to MAIN, RESERVE, or OUTER WING.
- (c) Move arming switch (figure 4-24) to ARM or SAFE.
- (d) Turn selector switches (figure 4-20) ON for tank(s) to be dropped.
- (e) Press the release button (figure 4-27) when flying at an angle not greater than 30° from the horizontal.

#### Note

An emergency droppable tank or bomb release control is installed in late airplanes. It is located either behind and to the left of the seat or directly in front of the pilot's seat.

(f) Full fuel tanks may be dropped without danger at airspeeds up to 400 mph. Empty 150 gallon tanks should be dropped only while flying at an airspeed of 160 mph or less. On late airplanes, droppable tanks are equipped with displacement struts which increase the safe dropping speed to 350 mph.

#### WARNING

EMPTY 300 GALLON TANKS ARE TO BE DROPPED ONLY IN AN EMERGENCY as the tanks may hit the airplane when released. To drop the tanks, it is necessary to slow the airplane down to 120 mph with landing gear and flaps up to avoid serious damage.

#### b. LONG RANGE FERRY FLIGHT.

(1) Whenever flying with droppable tanks, it is advisable to operate both engines from the LEFT droppable tank until empty and then operate both engines from the RIGHT droppable tank. This procedure empties the left tank in the minimum time and, if necessary, it can be released sooner than by operating each engine from its own individual tank.

#### c. CROSS FEED OPERATION.

- (1) On early airplanes the left and right fuel systems are connected by an electrically operated "crossfeed" valve which makes it possible to operate either engine from any tank, except the outer wing tank. Late airplanes have a crossfeed position on the tank selector valves. When prolonged single engine flight makes it necessary to use fuel from the dead engine side, or when operating both engines from one droppable tank, operate the fuel system as follows:
- (a) Airplanes with four-way fuel tank selector valves.
- 1. Turn tank selector valve to the tank to supply fuel.
- 2. Turn crossfeed switch (figure 13-6) to CROSSFEED.
  - 3. Turn other tank selector valve OFF.
- (b) Airplanes with five-way fuel tank selector valves.
- 1. Turn tank selector valve to the tank to supply fuel.
- Turn other tank selector valve to CROSS-SUCTION.

#### Note

It is not possible to cross-feed fuel from the outer wing tanks.

#### CAUTION

Do not attempt to use the booster pumps on modified airplanes during cross-feed operation if there is a leak in the fuel lines to the dead engine. The booster pumps will pressurize the fuel lines, forcing fuel out through the leak.

#### 5. STARTING ENGINES.

#### Note

Engine fire extinguishers are NOT installed in this airplane. Strict adherence to the following instructions as to mixture control positions will reduce the possibility of fire. If fire does occur, shut off mixture control, tank selector valve, electric fuel pump, and ignition to the affected engine. a. With ignition OFF and mixture controls at IDLE CUT OFF, turn the engines over by hand two or three revolutions if they have been idle for more than three

hours.

- b. On unmodified airplanes check the operation of the fuel booster pumps (figure 12-3 or 13-4). The fuel pressure with the engines not operating should be 15 to 16 lb/sq in. On modified airplanes check the operation of the fuel booster pumps (figure 14A-3 and 4) on each tank. The fuel pressures with the engines not operating should be as follows:
- (1) With the speed control switches on NORMAL —8 to 10 lb/sq in. on any tank except the droppable tanks.
- (2) With the speed control switches on EMERG-ENCY—16 to 18 lb/sq in. on any tank except the droppable tanks.
- (3) Droppable tank fuel pressure 15 to 16 lb/sq in.
- c. Turn the booster pumps on unmodified airplanes OFF after above test. On modified airplanes, leave booster pumps ON and return the speed control switches to NORMAL.
- d. Return the tank selector valves to RES. ON and prime the left engine. On unmodified airplanes, push the primer handle down, turn 90° to unlock, and prime two to four strokes. On modified airplanes, hold the primingoil dilution switch (figure 5-2) in the aft position two to four seconds.

#### Note

Priming time will be shortened if the booster pumps are on EMERGENCY.

- e. Turn ignition master switch (figure 5-1) ON.
- f. Turn left ignition switch (figure 5-18) to BOTH.
- g. Hold the starter switch (figure 5-3) to LH (lefthand) until the inertia starter has reached maximum rpm.
- b. Push the engage switch (figure 5-4) to LH, still holding starter switch to LH, and prime as required.
- i. As soon as the engine definitely fires, place the mixture control (figure 4-6) to AUTO RICH.

#### Note

It may be necessary to operate the electric fuel pumps for a short while if the engine driven pumps do not build up pressure immediately.

#### CAUTION

Due to the fire hazard, electric fuel pumps must not be operated unless the mixture control is in the CUTOFF position or unless the engine is running.

- j. Return the mixture control to IDLE CUTOFF if the engine does not continue to run.
- k. Stop the engine if oil pressure does not register within 30 seconds.
- 1. Start the right-hand engine by repeating the preceding paragraphs 5f through j.
  - m. Lock the primer pump DOWN.
- n. Turn battery switch (figure 5-15) ON before disconnecting the battery cart.

#### Note

If battery power is not sufficient for starting, use the inertia starter handcrank or an external energizer. The handcrank is stowed in left main landing gear wheel-well.

## 6. ENGINE WARM-UP AND ACCESSORY CHECK.

- a. Keep the RPM under 1400 until the oil temperature reaches 40°C (105°F) or shows a definite increase of 10°C (18°F) and the oil pressure is steady below 75 lb/sq in.
- b. While the engines are warming up, test the communication equipment with the control tower, or with another airplane.

#### 7. EMERGENCY TAKE-OFF.

- a. When necessary, take-off may be made without the normal engine and accessories ground tests provided that the oil pressure is steady below 85 lb/sq in. and that the oil temperature has shown a definite increase of at least 10°C (18°F) since starting. If necessary, use the oil dilution system to reduce the oil pressure.
- b. Over-dilution is likely to result from diluting the oil in a cold engine. If dilution is necessary during warm-up, oil pressure should be carefully watched during the remainder of warm-up and during take-off to insure that over-dilution has not occurred.

## 8. ENGINE AND ACCESSORIES OPERATION GROUND TEST.

a. Extend and retract the flaps (figure 7-2) to check

the operation of the hydraulic system. When both engines are operating at 1400 RPM, fifteen to twenty seconds is the normal extension time; twenty-five seconds is the normal extension time if only one engine is operating at 1400 RPM.

- b. Check for normal fuel pressure (figures 8-7 and 8-14) 16 to 18 lb/sq in. with electric fuel pumps OFF.
  Check for idling pressure of 9 lb/sq in.
  - c. Increase RPM to 2300.
  - (1) Check propeller control levers (figure 4-4) DEC RPM then INC RPM (full forward).
  - (2) Check propeller selector switches (figure 4-5) DEC RPM then INC RPM, then return to AUTO CONSTANT SPEED. Be sure that propeller warning lights (on P-38H only) glow when selector switches are out of AUTO CONSTANT SPEED.
  - (3) Check magnetos. Maximum normal drop, 100 RPM after shifting from both to either left or right magneto. Engine must run smoothly on either magneto.
  - (4) With the generator switch (two on later airplanes) ON, check the voltmeter (figure 5-8) for approximately 28 volts and the ammeter (two on later airplanes) (figure 8-12) for charge.
  - (5) Move intercooler flap controls to OPEN (if installed) and check operation of turbo-superchargers by opening throttles individually to take-off power (see specific engine Flight Chart in Section III).

#### CAUTION

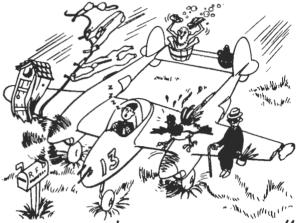
Do not operate engines at take-off power for more than two or three seconds while on the ground.

- d. Type A-4 Automatic Pilot (F-5B only).
  - (1) Check vacuum (figure 8-2) 4" to 5" Hg.
- (2) Check automatic-pilot oil pressure (figure 33-10) 125 lb/sq in.
- (3) Check the artificial horizon unit uncaged (figure 24-5).
- (4) Match the directional gyro cards on the directional gyro (figure 24-6).
- (5) Turn the automatic-pilot control valve (figure 24-10) ON.
- (6) Turn the course setting knob (figure 24-4), the elevator trim knob (figure 24-9), and the aileron trim knob (figure 24-7) to check operation of the units.

(7) TURN AUTOMATIC PILOT CONTROL VALVE OFF BEFORE TAKE-OFF.

#### 9. TAXIING INSTRUCTIONS.

The airplane taxis easily and forward visibility is good. Use differential throttle control for turning to save the brakes. There is no danger of nose over or ground loop should it become necessary to turn sharply or to apply full brakes.



WATCH WHERE YOU'RE GOING WHEN TAXIING !!

10. TAKE-OFF.

- a. Check the following:
- (1) Top hatch—LOCKED IN PLACE. Side windows—cranked (figure 13-2) CLOSED. Side window ratchets (figure 13-3)—ON.

#### Note

Open side windows will cause buffeting of the tail section.

- (2) Propeller levers (figure 4-4) INC RPM (full forward).
- (3) Propeller selector switches (figure 4-5) AUTO CONSTANT SPEED.
  - (4) Mixture (figure 4-6)—AUTO RICH.
- (5) Tank selector valves (figures 13-8 and 13-9) RESERVE ON.
- (6) Dive flaps (figure 9-2)—UP. (P-38L and late P-38J airplanes.)
- (7) Wing flaps UP. Wing flap lever (figure 7-2) CLOSED. Up to 1/2 flaps may be used for short take-off run.)
  - (8) Flight controls free and proper movement.

#### Note

Look at surfaces for this check-to see that they move in the right direction.

(9) Aileron boost shut-off valve (figure 9-5) ON. Aileron boost should be on at all times. Turn off only in case of emergency.

#### WARNING

Never turn the aileron boost shut-off valve from OFF to ON during flight.

#### Note

A slight "nibbling" at the control wheel may be noticed on take-off. This is because retraction of the landing gear may reduce the hydraulic system pressure below 200 lb/sq in. If the system pressure falls below this value, the aileron boost will become inoperative. As the pump increases the pressure, the "nibbling" may be noticed when the boost again becomes effective.

- (10) Generator switch(es) (figure 5-16 or 8-11) ON.
- (11) Intercooler flaps (figure 5-12) OPEN if installed).
- (12) Droppable tanks or bombs prepared for immediate dropping by turning bomb selector switches (figure 4-20) ON and arming switch (figure 4-24) to SAFE.
- (13) Fuel booster pumps (figures 12-3, 13-4, or 13A-3) ON. Booster pump speed control switches (figure 13A-4) EMERGENCY. (Speed control switches are on modified airplanes only.)
- (14) Rudder, elevator tab 3° back and aileron tabs ZERO.
- (15) Taxi a few feet straight down the runway so that the nose wheel will be in line when take-off power is applied. Maximum performance take-offs require holding the airplane with brakes at the end of the runway until engine power reaches the desired setting. Because of the tricycle landing gear, there is no tendency for the airplane to take-off by itself, and no feeling of lightness as take-off speed is reached. Start to ease the control column back at about 70 mph, then at 90 or 100 lift the airplane into the air.
- (16) Hold brakes, open throttles to 46" Hg. 3000 RPM.
- (17) Release brakes and keep manifold pressure below 54" Hg.

#### CAUTION

Be prepared to reduce power immediately to prevent uncontrollable yaw and roll in case of failure of one engine during take-off.

(18) Retract landing gear as soon as practical after leaving the ground.

#### Note

Retract the landing gear immediately after the airplane is off the ground so that the flight may be safely continued in the event of one-engine failure after take-off.

(19) Reduce manifold pressure to 43" Hg. at 2600 rpm after clearing all obstacles.

#### 11. ENGINE FAILURE DURING TAKE-OFF.

- a. If one engine fails before the airplane leaves the ground, close both throttles immediately and apply full brakes. If it is going to be impossible to stop on the runway, retract the landing gear by turning the landing gear control release knob and raising the landing gear lever.
- b. If one engine fails after the airplane leaves the ground, but before the safe single-engine airspeed (120 mph) has been reached, close both throttles and LAND STRAIGHT AHEAD. Retract the landing gear if it is not possible to land on the runway.
- c. If one engine fails after reaching the safe airspeed of 120 mph and after the landing gear has started up:
- (1) Reduce power enough to regain control, then apply power gradually. Hold enough rudder to prevent the airplane from skidding and hold the wings level.
- (2) Release droppable tanks or bombs over an unpopulated area.
  - (3) Trim rudder tabs.
- (4) Set the mixture on the dead engine to IDLE CUT-OFF.

#### Note

Do not apply so much power that the airplane cannot be held straight with the rudder. A manifold pressure of 45" Hg. at 3000 RPM should be enough to accelerate the airplane to a good single engine climbing airspeed of 165 mph.

(5) Feather the dead engine's propeller.

- (6) Turn OFF electric fuel pump of dead engine.
- (7) Circle the field and land, do not make turns into the dead engine unless trim and speed have been establish.

#### 12. CLIMB.

- a. Mixture (figure 4-6) AUTO RICH.
- b. Intercooler flaps (figure 5-12) OPEN (if installed).
- c. Refer to the Take-off, Climb and Landing Chart in Appendix II for the best climbing speeds at different weights, powers and altitudes. The average best-climbing-speed at sea level is 160 mph.
- d. On P-38H airplanes, carburetor air temperature is critical in a high power climb between 15,000 and 25,000 feet. Above 25,000 feet turbo-supercharger overspeed is critical. Excessive temperatures will cause detonation and very rough engine operation resulting in loss of power and probable engine damage.
- (1) On P-38J, P-38L, and F-5B airplanes with intercooler flaps OPEN, the manifold pressure is limited by the rating of the engine up to 25,000 feet. Above 25,000 feet, turbo-supercharger overspeed is again critical.
- e. The following maximum manifold pressures are to be used for "War Emergency" only. Never exceed 60 inches Hg. In a climb above 25,000 feet these limits indicate the approximate values at which the turbo-supercharger warning lights should glow. In level flight it should be possible to obtain the manifold pressure shown below at slightly higher altitudes.

Altitude Feet		Р-38Н		P-38J, P-38L and F-5B B-33 turbo
		B-13 turbo B-33 turbo		
up to	7,000	60	60	60
	20,000	55	55	60
	25,000	45	52	60
	30,000	35	49	53
	35,000	30	44	45
	40,000	20	36	37

Early P-38H airplanes are equipped with type B-13 turbo-superchargers. Later P-38H airplanes and P-38J, P-38L, and F-5B airplanes are equipped with type B-33 turbo-superchargers.

f. Refer to the Specific Engine Flight Chart in Section III for power time limitations.

g. Refer to the Take-off, Climb and Landing Chart in Appendix II for rate of climb. Note correction to be made during hot weather.

#### 13. GENERAL FLYING CHARACTERISTICS.

a. Due to the counter-rotating propollers, there is no noticeable torque effect in any two engine flying with this airplane. Rudder and aileron trim tab settings do not require adjustment as a result of changes in airspeed and power.

#### b. TO INCREASE POWER IN FLIGHT.

- (1) Move mixture controls (figure 4-6) to AUTO RICH if maximum cruising power is to be exceeded (see Specific Engine Flight Chart in Section III).
- (2) Move propeller controls (figure 4-4) to the new RPM.
- (3) Move throttles (figure 4-2) to the new manifold pressure.

#### c. TO DECREASE POWER IN FLIGHT.

- (1) Move throttles (figure 4-2) to the new manifold pressure.
- (2) Move propeller controls (figure 4-4) to the new RPM.
  - (3) Re-adjust the throttles.
- (4) Move mixture controls (figure 4-6) to AUTO LEAN if permissible.
- d. The turbo-superchargers are controlled by the same levers which operate the throttles. On P-38H, F-5B, and early P-38J airplanes supercharger overspeed is indicated by warning lights. Rated turbo-supercharger speed is 24,000 RPM and overspeed is 26,400 RPM allowable for 5 minutes. The warning lights start to flicker at 25,600 turbo-supercharger RPM and burn continuously at 26,400 RPM. Operation within the flickering range is permissible only during "War Emergencies" and the throttles must be retarded when the flicker changes to continuous burning. P-38L and late P-38J airplanes are equipped with supercharger regulators incorporating an overspeed control and on these airplanes overspeed warning lights are not installed.
- e. On P-38J, P-38L, and F-5B airplanes the intercooler flaps should be open for take-off and climbs and nearly closed at all other times. Carburetor air temperature should not be allowed to exceed 45°C (113°F). P-38H airplanes are not equipped with intercooler flaps.

- f. Flight operations should be planned from the Flight Operations Instructions Charts in Appendix II. When using these charts, make sure that the chart being used is applicable to the airplane. Charts are clearly marked to indicate the airplane model, the weight, and the external load items carried. If the weight or external load is to be changed during the flight, be sure to use the proper charts.
- g. The airplane is stable at all normal speeds. The airplane becomes slightly nose-heavy when the flaps and landing gear are extended. Release of droppable fuel tanks causes no noticeable change. Two-engine cruising below 170 mph indicated airspeed is not recommended because the airplane requires more attention and range is not increased.

## 14. AUTOMATIC PILOT OPERATING INSTRUCTIONS. (F-5B Only)

- a. Trim the airplane for "hands off" flight.
- b. Set the directional gyro (lower) card to agree with the compass and rotate the course setting knob until the upper and lower cards coincide.
  - c. Check the directional gyro. (Uncaged)
- d. Turn the automatic pilot elevator and aileron trim knobs to zero.
  - e. Turn the automatic pilot control valve ON.
- f. Adjust the course setting knob and the trim knobs to hold the airplane in straight and level flight.
- g. Adjust the speed valves (figure 24-2) to obtain the proper rate of control.
- b. Disengage automatic pilot every 15 minutes in flight to reset the directional gyro with the compass and retrim the airplane for "hands off" flight.
- i. Make small directional changes (flat turns) by turning the course setting knobs slowly to the new heading.
- j. Make faster turns by setting the airplane in a bank with aileron trim knob, caging the directional gyro, and rotating the course setting knob until the ball bank indicator is centered.

#### **CAUTION**

The operating limits are 55° in a climb or dive and 90° in a bank. Both gyros should be caged during any maneuvers which might exceed these limits.

#### 15. STALLS.

a. With power OFF, the airplane stalls at the following indicated airspeeds at the gross weight noted:

15,000 lb. 17,000 lb. 19,000 lb.

Flaps and landing gear UP 94 mph 100 mph 105 mph

Flaps and landing gear DOWN 69 mph 74 mph 78 mph

- b. As stalling speed is approached, the center section stalls first with noticeable shaking of the airplane, however, the ailerons remain effective.
- c. In either "power-on" or "power-off" stalls with flaps and landing gear up, the airplane "mushes" straight forward in a well-controlled stall. With flaps and landing gear down, there appears to be a slight tendency for one wing to drop. There is, however, no tendency to spin. Under these conditions, the nose drops slightly and, as the speed increases, the wing will come up.

#### 16. SPINS.

a. Deliberate spinning is prohibited because the spin tends to flatten out after two or three turns. When this occurs, the control column is forced back and engine power must be used to help get the control column forward. Before flattening out, normal recovery may be made without power. Recovery is made by applying full opposite rudder and easing the control column forward.

#### 17. ACROBATICS.

#### CAUTION

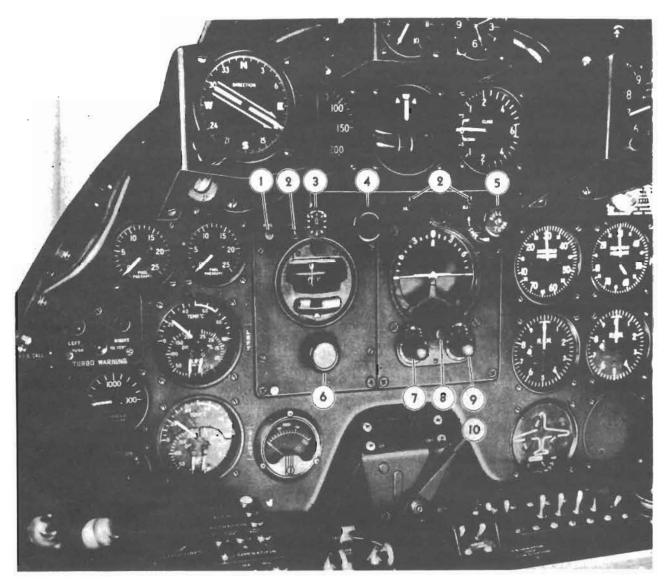
Cage all gyro instruments before engaging in acrobatics.

a. Although such maneuvers as loops, Immelmanns, and rolls are permitted with this airplane, the pilot is cautioned to exercise extreme care in acrobatic maneuvers which require a downward recovery as the loss of altitude in downward recovery is very rapid. In general, acrobatics should not be attempted at altitudes below 10,000 feet until the pilot becomes familiar with the speed at which the airplane can gain and lose altitude.

#### 18. DIVING.

#### CAUTION

Manifold pressure must be kept at or above 20 inches Hg. during extended shallow dives in order to prevent possible malfunctioning or misfiring of engines when throttles are opened after the pullout from the dive. In steep dives with dive recovery flaps extended the throttles may be closed completely without danger.



- 1. Rate control (ground adjustment only).
- 2. Speed valves--(3).
- 3. Course setting knob indicator.
- 4. Course setting knob.
- 5. Artificial horizon caging knob.

- 6. Directional gyro caging knob.
- 7. Ailecon trim knob.
- 8. Miniature airplane control.
- 9. Elevator trim knob.
- 10. Automatic pilot control valve.

Figure 24 - Automatic Pilot Controls

a. The diving speed is restricted as indicated on the placard (figure 25)—a copy of which is posted in the cockpit of each airplane. As the airplane approaches the critical speed, it becomes rapidly nose heavy and starts to buffet as if it were about to stall. If this condition is allowed to develop, the nose heavy condition will become more pronounced, and it will be very difficult to pull out.

b. The speed at which the above condition occurs depends upon the altitude and the acceleration (or G's)

which is being applied in a pullout. Figure 25 shows the placard consisting of three curves of indicated airspeed plotted against acceleration and indicates the safe range at the altitudes shown on each curve.

c. For example: If a straight dive is made in excess of 360 mph (indicated) at 20,000 feet, the airplane will become nose heavy and start to buffet. Or if a pullout of over 4.5 G's is made at 300 mph at 20,000 feet, the same condition will be evident.

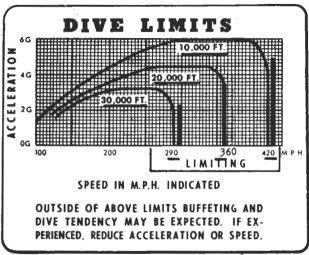
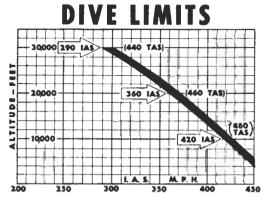


Figure 25 — Dive Placard

- d. When the above conditions are noticed, the following action should be taken immediately.
- (1) In accelerated maneuvers (dive pullouts or steep turns) buffeting may be stopped by reducing the acceleration.
- (2) In steady dives at high speed, buffeting may be stopped by reducing the airplane speed and pulling out using minimum acceleration. Use the elevator tab (figure 4-35) if necessary to assist recovery.

#### WARNING

Elevator tab must be used with care in order to prevent an extreme tail heavy condition after buffeting stops.



BUFFETING AND DIVE TENDENCY EXPERIENCED WHEN EXCEEDING ABOVE LIMITS MAY BE REDUCED BY EXTENDING DIVE RECOVERY FLAPS. DO NOT EXCEED PLACARD LIMITS MORE THAN 20 M. P. H. WITH DIVE RECOVERY FLAPS EXTENDED.

Figure 25A — Dive Placard

- e. A new placard (figure 25A) will be installed in late airplanes and may be made retroactive to airplanes already in service. This new placard indicates the safe speed range at any altitude for one G flight. As the airplane approaches this critical one G condition, its ability to pull out is gradually reduced and at the critical speed, buffeting and nose heaviness will occur.
- f. DIVE RECOVERY FLAPS.—P-38L and Later P38I airplanes are provided with dive recovery flaps to improve the dive recovery characteristics of the airplane. As described above, the airplane without these flaps becomes very nose heavy and starts to buffet above placard dive speeds. This condition is caused by a high speed stall and a consequent decrease in lift in the wing producing the nose heavy condition. The dive recovery flaps which are installed under the wings between the booms and the ailerons, restore the lift to this portion of the wing and thus cause the uncontrollable nose heaviness to occur at a higher speed. The flaps also add some drag to the airplane, which in conjunction with the higher allowable dive speed, permits safe dives at a much steeper diving angle. The dive recovery flaps should be extended before starting the dive or immediately after the dive has started before a buffeting speed has been reached. If the airplane is buffeting before the dive recovery flaps are extended, the buffeting will momentarily increase and then diminish. With these flaps extended, the nose heaviness is definitely reduced but the diving speed should never be allowed to exceed the placard by more than 15 or 20 mph. With the dive recovery flaps extended before entering the dive, angles of dive up to 45° may be safely accomplished. Without dive recovery flaps extended, the maximum angle for extended dives is 15°. Diving characteristics are better with power off than with power on.

#### WARNING

Although the dive recovery flaps greatly improve the diving characteristics of the airplane, dangerous buffeting and nose heaviness will still be encountered at diving angles above 45° if the diving speed is allowed to exceed the placard limits by more than 15 to 20 mph.

#### NIGHT FLYING.

a. Very little light need be used for normal cruising flight as all instrument dials are coated with phosphorescent paint. Fluorescent lights (figure 5-5) should be dimmed down until the instruments are barely visible. This will enable the eyes to become accustomed to the

darkness. The instrument glare shield should be installed for all night flying.

- b. When more light is needed, cockpit lights (figure 5-11) may be turned on, or the spotlight (figure 4-1) may be focused on any point where local light is desired and adjusted to the required brilliancy.
- c. Position lights are turned on by a switch (figure 5-6) on the main switch box.
- d. Landing lights (figure 5-7) may be used for take-off and landing. They should not, however, be extended at any time when the airspeed is greater than 140 mph.
  - e. Recognition lights may be used as required.

#### 20. APPROACH AND LANDING.

a. GENERAL.—The landing technique is similar to that of airplanes with conventional tricycle landing gear and the landing attitude is about the same; i.e., main wheels first, tail slightly down.

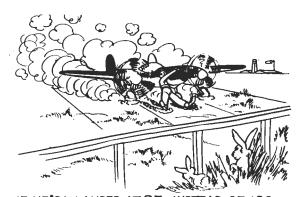
#### Note

Extreme tail-low landings, possible only with flaps UP, may cause the fins to strike the runway.

- (1) With the landing gear DOWN and flaps at MANEUVER, start the approach at 120 mph indicated air speed. When the approach is assured, put the flaps all the way down, come over the fence at 110 mph, flare off to about 80 mph and wait for contact.
- (2) If, for some reason, the flaps cannot be lowered, land a little faster and allow for more flare-off and a flatter gliding angle.

#### b. NORMAL LANDING.

(1) Tank selector valves (figures 13-8 and 13-9) to MAIN or RESERVE, whichever contains the most fuel.



IF HE'DA LANDED AT 85, INSTEAD OF 120 ...

- (2) Mixture controls (figure 4-6) AUTO RICH.
- (3) Propeller levers (figure 4-4) to about 2600 rpm position.
  - (4) Electric fuel pumps (figure 13-4) ON.
- (5) Landing gear (figure 4-32) DOWN (not over 175 mph).
- (6) Pump the brake pedals a few times to insure that brakes are working.
- (7) Wing flaps (figure 7-2) DOWN (not over 150 mph).

#### Note

Lift the flap lever trigger through the quadrant notch to place lever to DOWN.

- (8) Intercooler flaps (figure 5-12) OPEN unless operating in extreme low temperatures. (If installed.)
  - (9) Flaps UP before taxiing.

#### c. CROSS WIND LANDING.

(1) Same as the normal landing. The tricycle landing gear reduces danger of groundlooping from landing in a reasonably strong cross wind. If the drift seems excessive, the up-wind wing may be lowered until just before contact.

### d. SINGLE ENGINE APPROACH AND LANDING.

#### CAUTION

Concentrate sharply on your approach—because once you have fully extended the flaps, and the landing gear or descended below five hundred feet, you cannot again circle the field and you must make a landing. If, however, the flaps are not fully extended and your elevation is still five hundred feet or more, and you want to go around again, proceed as follows before beginning to circle:

Apply as much power as can be held, at the same time retracting the landing gear, Accelerate to at least 160 mph, and Raise the flaps (unless they are already fully raised).

Do not make turns into the dead engine unless trim and speed have been establish. It is recommended that the inexperienced pilot practice single engine landing by completely closing one throttle and setting the corresponding propeller lever to the "DE-CREASE RPM" (full rear) position. With this procedure the throttle engine will present nearly the same drag as a feathered propeller and if necessary both throttles may be opened to go around. Don't forget to push the propeller levers forward if it is necessary to go around.

- (1) Secure radio clearance for emergency landing.
- (2) Turn aileron control booster OFF to conserve hydraulic power for landing gear and flap operation.
- (3) Start approach allowing 1000 feet above field for each two miles away.
  - (4) Extend landing gear at 160 mph.

#### Note

Allow more time for landing gear and flap extension when only one engine is operating.

- (5) Extend flaps to MANEUVER position at 140 mph.
  - (6) Reduce power carefully as needed.
  - (7) Neutralize rudder tab.
  - (8) Continue approach at not less than 120 mph.
- (9) Do not extend full flaps until certain the airplane will make the field.
  - 10) FURTHER INFORMATION.
- (a) At rated power, 44" Hg, 2600 rpm, the airplane will barely hold altitude with landing gear extended and flaps UP.
- (b) With landing gear extended the airplane will not hold altitude at any flap extension.
  - (c) Things to avoid:
- 1. Extension of landing gear or flaps except when necessary for landing.
- 2. Accelerating throttle rapidly from reduced power to full power.
- 3. Low flat approaches with landing gear and flaps fully extended attempting to drag the airplane into the field with power. The technique should be developed to be always reducing power on the approach and avoid being forced to apply excessive power at low airspeeds.

#### e. TAKE-OFF IF LANDING IS NOT COMPLETED.

- (1) Open throttles to take-off stop and after propeller rpm has stabilized, push propeller control forward to take-off position.
  - (2) Retract landing gear.

#### CAUTION

Pull the airplane up in a climb sufficient to stay below 150 mph indicated airspeed until the flaps are retracted.

(3) Retract flaps and proceed in normal take-off technique.

#### 21. STOPPING ENGINES.

a. If a cold weather start is anticipated, the oil system should be diluted before stopping the engines. Idle the engines until oil temperature is below 70°C (158°F),

adjust the throttles to approximately 1000 rpm, hold the oil dilution switches (figure 5-2) ON for the required time as shown in chart below, pull the mixture controls (figure 4-6) to IDLE CUT-OFF, and release the oil dilution switches after the engines stop turning.

#### Oil Dilution Time in Minutes

Outside Air Temperatures	Dilution Minutes
4° to -12°C (40° to 10°F)	3
-12° to -29°C ( 10° to -20°F)	5
-29° to -46°C (-20° to -50°F)	8

- b. If the oil temperature is above 40°C (104°F) upon completion of the diluting process, the engine should be shut down and allowed to cool until the oil temperature is below 40°C. The engine should then be restarted and the same diluting process repeated. This will avoid the possibility of evaporation of the fuel due to the high temperature nullifying the effect of the first dilution.
- c. If oil dilution is not necessary, set the mixture controls to IDLE CUTOFF at 1200 rpm, and slowly move the throttles fully open.
- d. After the engines stop turning, turn the ignition switches (figure 4-11) OFF and leave the mixture in CUTOFF.

#### 22. BEFORE LEAVING PILOT'S COMPARTMENT.

- a. Turn all switches and valves OFF.
- b. Lock the controls.
- (1) To set surface controls lock (figure 7-10), put rudders in neutral, push the right end of the locking tube forward of the guide angle (figure 7-4) and place the left end of the locking tube in the clip provided (figure 4-3). Strap control wheel to center of surface control lock, (Later airplanes are not equipped with rudder locks.)
  - c. Set the parking brake:
- (1) Apply the toe brakes, pull the parking brake handle (figure 4-14) out and release the toe brakes.

#### CAUTION

Do not set the parking brake while the brake discs are hot.

#### 23. TIEING DOWN.

- a. This airplane is tied down by means of ropes which are passed through tie down lugs on each landing gear shock strut, or around the strut if lugs are not provided, and tied to stakes firmly anchored to the ground. Stakes and ropes are provided in the mooring kit which is stowed in the baggage compartment.
- b. If extremely high wind conditions are encountered, additional ropes may be tied around the tril end of each boom and secured to some solid anchor point.



#### AIRSPEED AND ALTIMETER CORRECTION TABLE.

Calibrated*	Airplane I.A.S. Gear and	Airplane I.A.S. Gear and Flaps			INSTALLAT	TION ERRORS	
I.A.S.	Flaps UP	DOWN	Sea Level	10000	20000	30000	40000
)0	83	89	+110	+130	+200	+270	+430
120	106	116	+100	+125	+195	+265	+420
140	130	140	+ 90	+115 *	+175	+250	+380
160	153		+ 70	+100	+140	+190	+300
180	176	• •	+ 50	+ 60	- <del> </del> - 90	+130	+190
200	200		0	0	0	0	0
220	226		— 80	110	160	-230	
240	248		—130	170	250	330	
260 .	269		—160	—230	370	-430	
280	291		210	290	-400	<b>—550</b>	
300	312		260	—360	—500		
320	334		—325	-450	620		
340	356		400	540	<del></del> 750		•••
360	377		500	650			

<sup>\*</sup>Includes "Installation Errors" only. Does not include "Instrument Errors" as obtained by the Field Test Set.

<sup>+</sup>Add to altimeter reading

<sup>-</sup>Subtract from altimeter reading

CONSTINE   CONSTINE	¥213℃		AIRPLAN	AIRPLANE MODELS	10			SPECI	FIC	SPECIFIC ENGINE	M		Ĕ	ENGINE MODELS	ODEL	**
19-18   19-1	DEA MAOF		•: ;	-38H		: :		FLIG	Ħ	CHART			> >	1710-	89.(RI	
19-19-   19-10-   1	Š	ADITION	FUEL	OIL	o Ā	F.	COOL	ANT.			MAX. PERM		DIVING R	:		1 . 1
16-18    60-70   75-95   161-170   131-171   131-120     357			(LB/SQ. IN.)	(LB/SQ. IN.)	ပ္		٥				CONDITIC	N	AL.	TOWABLE	OIL CONSI	JMPTION
18	2	SIRED	16-18	60-70	75–95	209		14-250			NORMAL R	ATED .	13	и.ѕ.от/н	:	IMP.PT/HR
12   55   40   104   85   185   99   99   99   99   99   99   99	₹	KIMUM	18	85	95	203	125	257			MAX. CR		6.	U.S.QT/H	R	IMP.PT/HR
FR   Type   Fig.   Fi	Z	IMUM	12	55	40	104	85	185			MIN. SPEC			U.S.QT/H	<b></b>	IMP.PT/HR
Fig.	₫	FING	6	15							OIL GRADE:		:	8	n	1120 08 1100
No.   No.	3	ERCHARGE		XHAUST DRIVEN	TURBINE						FUEL G	•	l	SPEC. AN-	-F-28	
1000   10,	ð	PATING			HORSE.	5	TICAL A	LTITUDE	A.E.K	USE LOW	MIXTURE	FUEL	FLOW FNG	MAXIA	MUM	MAXIMUM
3000   54   1425   22,000**   AITO-RICH   167   189   AITO-RICH   189   AITO-RICH	8	DITION			POWER	¥	RAM	NO RAM	AOIG	BLOWER BELOW:	POSITION	U.S.	IMP.	ာ့ C	ı.	(MINUTES)
3000   54   1425   24,900   22,000**   AITO-RICH   167   180   NO	TA	(E-OFF	3000	54	1425			22,000**			AUTO-RICH	167				15
3000   54   1425   24,900   31,500**   AUTO-RICH   167   NO     2500   44   1100   34,000   36,700**   AUTO-LEAN   63   NO     2500   35   795   38,000   36,700**   AUTO-LEAN   63   NO     2000   32   545   30,000   S6,700**   AUTO-LEAN   S1   NO     1500   30   485   15,000   S6,000   AUTO-LEAN   34   AUTO-LEAN   34   AUTO-LEAN   34   AUTO-LEAN   34   AUTO-LEAN   34   AUTO-LEAN   AUTO	V EMER	WAR	3000	90	1600	10.0	000	7,000*			AUTO-RICH	180				ιΩ
2500   444   1100   34,000   35,700**   AUTO-LEAN   63   NO     2300   32   645   30,000   36,700**   AUTO-LEAN   63   NO     1700   30   495   15,000   30,000   495   15,000   30,000   31,000   32   AUTO-LEAN   37   AUTO-LEAN   40   AUTO-LEA	W	UTARY	3000	54	1425	24,5	300	22,000**			AUTO-RICH	167				15
2300   35   795   38,000   36,700**   AUTO-LEAN   63   NO   NO   1700   30   315   20,000   15,000	NON AND AND	MAL RATED IX. CONT.)	2600	ħħ	1100	34,(	<b>30</b> 0	31,500**			AUTO-RICH	113				NO LIMIT
1700   30   515   20,000   15,000   15,000   16,000   28   495   15,000   5,000   5,000   16,000   27   400   28   425   10,000   27   400   27   400   28   425	¥ 5	XIMUM	2300	35	795	38.	000	36,700**	ļ ,		AUTO-LEAN	63				NO LIMIT
NEVER EXCEED THE FOLLOWING ALTITUDE 7,000 18,000 25,000 30,000 35,000 40  MANIFOLD PRESSURE AT THE ALTITUDE SHOWN REGARDLESS "WAR EMPRENCY POWER 60 50 50 54 49 51 44 46 36 60 60 60 60 60 60 60 60 60 60 60 60 60	SPI	ECIFIC UMPTION	2000' 1700 1600 1500	32 30 30 28 27	64.5 51.5 4.85 42.5 400	30,6 20,1 15,6 10,6	300 000				AUTO-LEAN	51 37 34 31				NO LIMIT
*WAR EMERGENCY POWER 60 60 52 54 49 51 44 46 36	REMA		ER EXCEED TH	HE FOLLOWING				ALTITU		Ь Г	25,0		, ⊸ ⊢	35,	OOO LEVEL	40,000
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Na ie	AIRPLA	AIRPLANE MODELS	S			SPEC	IFIC	SPECIFIC ENGINE	ш		Ë	ENGINE MODELS	ODELS	
FORM ASC	<u>a</u> u	P-38J F-5B	7	; ;		FLK	H C	FLIGHT CHART			\  -\	V-1710-89 (RH). V-1710-91 (LH).	9 (RH)	)
-	FUEL	-	ត	= 5	COOLANT	Į,			MAX. PERMISSIBLE		DIVING RPM:	PM:		
CONDITION	PRESSURE (IR/SO IN)	E PRESSURE	°C .		°C .				CONDITION	z	AL	ALLOWABLE OIL CONSUMPTION	II CONSU	MPTION
DESIRED	16-18	-	7.6	167-203	21	214-250			NORMAL RATED (MAX. CONT.)		13	U.S.QT/HR		IMP.PT/HR
MAXIMUM	18	85	95	203	125	257			MAX. CRUISE	UISE .	6	U.S.QT/HR	:	IMP.PT/HR
MINIMUM	12	55	017	104	85	185			MIN. SPECIFIC	CIFIC .	7	J.S.QT/HI		7U.S.QT/HRIMP.PT/HR
IDLING	6	15							OIL GRADE: (S)1120(W)1120.0R.1100	(S)	1120	₹	112	0 OR 1100
SUPERCHARGER TYPE:	GER TYPE:	EXHAUST DRIVEN TURBINE	EN TURBIN	ш					FUEL GRADE:	i	100/130;	SPEC. AN-F-28	F-28	
OPERATING		MANIFOLD	HORSE-	8	TICAL A	CRITICAL ALTITUDE	NEE	USE LOW	MIXTURE	FUEL PLOW	FUEL FLOW (GAL/HR/ENG.)	MAXIMUM CYL. TEMP.	MP.	MAXIMUM
CONDITION	KPA W	(BOOST)	POWER	WITH	WITH RAM	NO RAM	1018	BELOW:	POSITION	U.S.	IMP.	۰٫	٠.	(MINUTES)
TAKE-OFF	3000	54	1425			26,600**			AUTO-RICH	167				15-
WAR	3000	09	1600	28,700	700	25,800*			AUTO-RICH	180				22
MILITARY	3000	54	1425	29,	29,000	26,600**			AUTO-RICH	167				15
NORMAL RATED (MAX. CONT.)	D 2600	ħħ	1100	33,	33,800	31,200**			AUTO-RICH	113				NO LIMIT
MAXIMUM	2300	35	795	37,	37,800	36,500**			AUTO-LEAN	63				NO LIMIT
MINIMUM SPECIFIC CONSUMPTION	2000 1700 1600 1600 1600	30 31 31 29	620 545 525 455 425	30, 15, 10,	30,000 20,000 15,000 10,000 5,000				AUTO-LEAN	48 42 40 35				NO LIMIT
1								ALTITUDE	UP TO 26,0001	Н	30,000 FT	35,000	FT	40.000 FT
REMARKS:	NEVER EXCEED MANIFOLD PRES ALTITUDE SHOW	NEVER EXCEED THE FOLLOWING MANIFOLD PRESSURES AT THE ALTITUDE SHOWN REGARDLESS							유	리	7	m l	<b>→ </b> ‡	CLIMB LEVEL
J	OF ENGINE R.P.M.	M. C				*	WAR EME	WAR EMERGENCY POWER	000	200	à	2	2	

	V219:	AIRPLAN	AIRPLANE MODELS				SPEC	IFIC	SPECIFIC ENGINE	w		Ä	SINE	ENGINE MODELS	40	
	DSA MAIOT	P-38L	: :		: :		1	H C	FLIGHT CHART			<b>&gt;</b> >	710	V-1710-111(RH). V-1710-113 (LH)	t)	: :
	CONDITION	FUEL	OIL	OIL TEMP.	يو يو	COOLANT TEMP.	5.			MAX. PERMISSIBLE DIVING RPM:.	ISSIBLE C	DIVING F			•	:
		(LB/SQ. IN.)	(LB/SQ. IN.)	၁့	40	၁	<b>4</b> °			CONDITION	_		TOWABLE	8	CAPTION	
•	DESIRED	16-18	60-70	75-95	107-791	101-121 2	214-250			NORMAL RATED (MAX. CONT.)		13	U.S.QT/HR		IMP.PT/HR	¥
	MAXIMUM	18	85	92	203	125	257			MAX. CRUISE	UISE .	œ.	U.S.QT/HR		IMP.PT/HR	#
	MINIMUM	12	55	64	104	85	185			MIN. SPECIFIC		7	.U.S.QT/HR.	:	IMP.PT/HR	¥
	DUING	o	15							OIL GRADE: (S)		0211.		M	(W)1120.0R.1100	$\exists$
	SUPERCHARGER	TYPE	EXHAUST DRIVEN TURBINE	TURBINE						FUEL G	FUEL GRADE:	100/130;		SPEC. AN-F-28		
т.	OPERATING	$\vdash$	MANIFOLD	HOPKE.	8	TICAL A	CRITICAL ALTITUDE	AEK	NOE TOW	MIXTURE	FUEL	FUEL ROW	WAXI	MAXIMUM CYL. TEMP.	MAXIMUM	<b>3</b>
	CONDITION	W.		POWER	WITH RAM	KAM	NO RAM	BFOA	BELOWER BELOW:	POSITION	U.S.	IMP.	ပ	ů.	(MINUTES)	, a
ICTED	TAKE-OFF	3000	54	1425			26,600**			AUTO-RICH	167				15	
	WAR	3000	60	1600	28,700	8	25,800*			AUTO-RICH	180				ιc	
	MILITARY	3000	54	1425	29,000	8	26,600**			AUTO-RICH	167				15	
	NORMAL RATED (MAX CONT.)	2600	ħ†r	1100	33,800	8	31,200**			AUTO-RICH	113				NO LIMIT	<u>-</u>
	MAXIMUM CRUISE	2300	35	795	37,800	8	36,500**			AUTO-LEAN	63				NO LIMIT	Ŀ
	MINIMUM SPECIFIC CONSUMPTION	2000 1700 1600 1600	28 33 33 33 33 33 33 33 33 33 33 33 33 33	620 545 525 455	30,000 20,000 15,000 10,000 5,000	88888				AUTO-LEAN	442 440 33			<u></u>	NO LIMIT	<u> </u>
	REMARKS: NE	NEVER EXCEED THE FOLLOWING	HE FOLLOWING						ALTITUDE		1 1	30,000 FT.	35,000	FT.	오는	FT.
		MANIFOLD PRESSURES AT THE ALTITUDE SHOWN REGARDLESS	JRES AT THE REGARDLESS				•	WAD CLED	dance voler	흥 기교	HT CLIMB	CLIMB LEYEL	CL IMB	FLIGHT #8	CLIMB FL	FLIGHT
ىـــ 3	<b>9</b>	OF ENGINE R.P.M.	+				**	ITARY PO	**MILITARY POWER OR LESS	54 . 54	007	52	412	25	H	37.5

	OPERA NOTE-US CORDIN	ATING LI	MITS USI	OPERATING LIMITS USING GRADE 91 FUEL NOTE-USE GRADE 91 FUEL ONLY IF MODIFICATIONS ACCORDING TO TO-02-5A-66 HAVE BEEN COMPLIED WITH.	91 FUEL ATIONS AC- LIED WITH:	
	AIRPLANE MO	MODELS:			ENGINE MODELS:	
P-38H	P-3%	P-38L	F-5B	V-1710-89 V-1710-91		V-1710-1111 V-1710-113
FUEL: GRADE 91/96	91/96 SPEC.	. AN-F-26				
OPERATING	MANIFOLD PRESSURE (Max. In. Hg)	R. P. M. (Max.)	HORSE	MIXTURE CONTROL POSITION	BLOWER	MAXIMUM DURATION (Min.)
TAKE-DEE	47	3000	1325	AUTO RICH	SEA LEVEL	'n
	40	3000	1098	AUTO RICH	25,000 FT. ALTITUDE	s
NORMAL	38	2600	1000	AUTO RICH		NO LIMIT
KAIED						
MAXIMUM	32	2300	755	AUTO RICH		NO LIMIT
CRUISING						
DESIRED	28	2200	909	AUTO LEAN		NO LIMIT
CKUISING						
REMARKS: 1. Redu 2. Redu	ice above manifolice above manifol	ld pressures 2" Id pressures 2"	Hg for each 5° Hg for each 1,0	C (9°F) above 43°C 000 ft. above 27,000	1. Reduce above manifold pressures 2" Hg for each 5°C (9°F) above 43°C (110°F) carburetor air temperature. 2. Reduce above manifold pressures 2" Hg for each 1,000 ft. above 27,000 ft. until 20" Hg is reached.	mperature. ed.

# Emergency Operating Instructions

#### 1. ENGINE FAILURE DURING FLIGHT.

- a. FAILURE OF ONE ENGINE.
- (1) PERFORMANCE.—The airplane flies well on one engine. Using normal rated power, it will climb to about 26,500 feet, and can be flown at more than 255 mph (true speed) in level flight at 20,000 feet.

#### (2) FEATHERING EMERGENCY.

- (a) Reduce the power from the live engine if necessary to maintain directional control. This should not be necessary if the indicated airspeed is 125 mph or more.
- (b) Apply all the power to the good engine that can be held, preventing yaw at all times.
- (c) Hold 125 mph or more (at least 160 mph preferred).
- (d) Release droppable fuel tanks, bombs, or chemical tanks, immediately.
- (e) Trim rudder tab slowly to take pressure off rudder pedal.
- (f) Carefully move mixture control of bad engine to IDLE CUT-OFF.
- (g) Carefully select propeller feathering switch (figure 4-13) of bad engine and feather propeller.

#### WARNING

If the propeller does not feather, then attempt to feather it by holding the selector switch (figure 4-5) in the DEC RPM position. If the propeller still will not feather then it is desirable to fly at a low airspeed (130 to 140 mph) to keep the propeller windmilling at the lowest possible rpm.

- (h) Turn off electric fuel pump switch and fuel tank selector valve control of failed engine.
- (i) Close coolant and oil cooler scoops of failed engine.
- (j) If the left engine has failed, and consequently the generator has stopped, take action indicated under ELECTRICAL FAILURE, Section IV, paragraph 10. (This is not applicable to F-5B, P-38L, and late P-38J airplanes which have a generator on each engine.)
- (k) Climb to safe altitude and reduce power to maintain 160 mph indicated airspeed.

- (1) Return to field and fly around until familia with airplane's behavior on single engine.
  - (3) SINGLE ENGINE APPROACH AND LANDING.

#### CAUTION

Concentrate sharply on your approach—because once you have fully extended the flaps, and the landing gear or descended below 500 feet, you cannot again circle the field and you must make a landing. If, however, the flaps are not fully extended and your elevation is still 500 feet or more, and you want to go around again, proceed as follows before beginning to circle:

- (1) Apply as much power as can be held, at the same time retracting the landing gear,
- (2) Accelerate to at least 160 MPH, and
- (3) Raise the flaps.

It is recommended that the inexperienced pilot practice single engine landing by completely closing one throttle and setting the corresponding propeller lever to the "DECREASE RPM" (full rear) position. With this procedure the throttled engine will present nearly the same drag as a feathered propeller and if necessary both throttles may be opened to go around. Don't forget to push the propeller levers forward if it is necessary to go around.

#### Note

TURNS CAN BE MADE SAFELY IN EITHER DIRECTION AS LONG AS AIRSPEED IS HELD CONSTANT ABOVE CRITICAL SINGLE ENGINE SPEED, AND AIRPLANE IS PROPERLY TRIMMED.

- (a) Secure radio clearance for emergency landing.
- (b) Turn aileron control booster OFF to conserve hydraulic power for landing gear and flap operation.
- (c) Start approach allowing 1000 feet above field for each two miles away.
  - (d) Extend landing gear at 160 mph.

#### Note

Allow more time for landing gear and flap extension when only one engine is operating.

- (e) Extend flaps to MANEUVER position at 140 mph.
  - (f) Reduce power carefully as needed.
  - (g) Neutralize rudder tab.
  - (b) Continue approach at not less than 120 mph.
- (i) Do not extend full flaps until certain the airplane will make the field.

#### (4) FURTHER INFORMATION.

- (a) At rated power, 44" Hg. 2600 rpm, the airplane will barely hold altitude with landing gear extended and flaps up.
- (b) With landing gear extended the airplane will not hold altitude at any flap extension.
  - (c) Things to avoid:
- 1. Extension of landing gear or flaps except when necessary for landing.
- 2. Accelerating throttle rapidly from reduced power to full power.
- 3. Low flat approaches with landing gear and flaps fully extended attempting to drag the airplane into the field with power. The technique should be developed to be always reducing power on the approach and avoid being forced to apply excessive power at low airspeeds.

#### (5) FEATHERING—PRACTICE.

- (a) Close throttle.
- (b) Mixture—IDLE CUT-OFF.
- (c) Move propeller feathering switch to feathering position.

#### CAUTION

On all airplanes, except F-5B, P-38L and late P-38J airplanes which have a generator on each engine, shut down the right-hand engine so that the generator which is on the left engine will remain in operation.

#### (6) UNFEATHERING IN FLIGHT.

- (a) Propeller control (figure 4-4) DEC RPM (full rearward).
  - (b) Throttle 1/10 to 1/4 open.
- (c) Return propeller feathering switch to NOR-MAL position.
- (d) Lift the guard on the propeller selector switch of the feathered propeller.

#### Note

It is recommended that the above operations be performed immediately after feathering is completed so that the engine may be started quickly in case the live engine should fail during practice.

- (e) Hold the propeller selector switch (figure 4-5) in INC RPM until the engine is turning 600 to 800 rpm then place it in AUTO CONSTANT SPEED. Place mixture control in AUTO RICH. The engine should start.
- (f) Warm up the engine before operating at full power.

#### b. FAILURE OF BOTH ENGINES.

- (1) Drop external tanks or bombs.
- (2) Turn fuel selector valves OFF.
- (3) Set mixture controls to IDLE CUTOFF.
- (4) Turn ignition OFF.
- (5) Turn battery switch OFF.
- (6) Release the cockpit canopy and roll down both side windows.
- (7) Extend flaps by use of hand pump if there is sufficient time.
  - (8) Leave the landing gear up.
- (9) Make a normal approach at 8 or 10 mph over the stalling speed and set the airplane on the ground slightly before the stall is reached.

#### 2. FIRE.

a. There are no fire extinguishers installed in this airplane. If an engine fire occurs, shut off tank selector valve to that engine, turn boost pump OFF, and move mixture control to IDLE CUTOFF.

#### 3. EMERGENCY EXIT.

- a. RECOMMENDED METHOD. Slow down as much as possible, (below 200 mph) and trim the airplane in an approximately level attitude. If time permits head airplane towards an unpopulated area. Pull the emergency hatch release control (figure 23-4) to release the top hatch, crank or push either side window down, crawl out and slide off the wing head first.
- b. ALTERNATE METHOD. If it is still possible to control the airplane, turn the airplane upside down, unhook the safety belt, and fall out.

#### DROPPABLE FUEL TANK OR BOMB EMERGENCY RELEASE.

a. A droppable tank or bomb emergency release is installed in later airplanes. It is located either behind and to the left of the pilot's seat or directly in front of the pilot's seat.



BE CAREFUL WHERE YOU DROP YOUR TANKS !!

#### 5. EMERGENCY WING FLAP OPERATION.

- a. If the pressure from the engine driven hydraulic pump fails to extend the flaps, they may be extended as follows:
- (1) Turn coolant override switches (figure .5-13) OFF.
- (2) Turn the aileron boost shutoff valve (figure 9-5) OFF.
- (3) Move flap control (figure 7-2) to MANEUVER or DOWN.
- (4) Turn source selector valve handle (figure 17-4) to UP. (This is the normal position.)
- (5) Operate the hand pump (figure 17-2) until the desired flap extension is obtained.
- b. If the above system fails to extend the flaps, leave the control at DOWN while extending the landing gear. Oil from the return side of the landing gear cylinders may fill the system enough to cause the flaps to operate.

#### Note

The auxiliary system should be used for flap extension because in some cases there may not be sufficient fluid to extend both landing gear and flaps, and the landing gear may be extended with the emergency system fluid.

#### CAUTION

If one engine has failed in addition to the hydraulic system failure, remember that the airplane cannot maintain level flight on one engine with landing gear and flaps extended. Under these conditions it may be desirable to land with flaps UP.

#### 6. EMERGENCY LANDING GEAR OPERATION.

a. Check to see that the coolant override switches and the aileron booster shut-off valve are in the OFF position. Place all controls in the normal position for landing gear extension and operate the hand pump (figure 17-2).

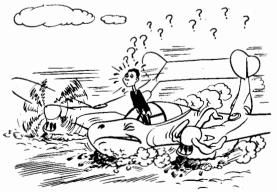
#### Note

Nose gear door must open and nose gear must unlock before any pressure will flow to the main gear door cylinders.

- b. If, after considerable pumping, no reading is given on the position indicator operate the emergency system as follows:
- (1) Source-selector valve handle; (figure 17-4) break safety wire and push DOWN.
- (2) Bypass valve (figure 17-3); break safety wire and CLOSE tightly. (On later airplanes, the bypass valve is controlled by the source selector valve control. If bypass valve is not provided, disregard operation (2).)
- (3) Check landing gear control DOWN and operate the hand pump while yawing the airplane from side to side.

#### Note

This system opens the landing gear doors by forcing them with the wheels.



YOU HAVE AN EMERGENCY EXTENSION SYSTEM...
WHY NOT LEARN TO USE IT?

### 7. EMERGENCY LANDING WITH WHEELS RETRACTED.

a. When a belly landing is necessary, it should be made without external tanks. Use 1/2 to full flaps.

#### Note

When imminent belly landing is due to apparent hydraulic failure, unless forced down by lack of fuel or approaching darkness, don't give up until all methods of landing gear extension have been tried thoroughly and exhaustively.

b. Make a normal approach at 8 or 10 mph over the stalling speed and set the airplane on the ground slightly before the stall is reached. Set the mixture control to CUTOFF and turn the battery switch OFF before contact.

### 8. EMERGENCY LANDING IN WATER (DITCHING).

- a. Unless the water is very smooth, it will probably be more desirable to bail out of the airplane than to try to land it on the water.
- b. If a water landing is necessary, preparations for abandoning the airplane should be made while still in the air. Release bombs or droppable tanks and the top hatch, and push down both side windows. Leave the shoulder harness on to prevent the shock of landing from throwing the head forward into the bullet-proof glass and the gunsight.
- (1) Since a much flatter approach can be made with power on, the landing should be made before the fuel has been completely used up.
- (2) Wind and surface conditions should be noted so that the approach may be made along the swell and as near into the wind as possible.
- c. Make contact with landing gear and flaps UP, (water landings with gear down are invariably fatal) and at an airspeed slightly above the stalling point.
- d. After landing, release the safety belt and swim clear of the airplane before it sinks. The airplane can not be expected to stay afloat once it comes to rest. The seat back cushion provided with the airplane is also a life preserver.

#### 9. ICING CONDITIONS.

- a. Pitot heat (figure 5-14) ON.
- b. The formation of carburetor ice is unlikely due to

the injection type carburetors and the heating effect of the turbo-superchargers. It is possible, however, that ice could form while flying at low powers in a humid atmosphere.

- c. If icing conditions are present during a landing approach, move the throttles occasionally to prevent ice from freezing them in a closed position. Extend landing gear, lower flaps to maneuvering position, and make the approach under partial power.
- d. If carburetor ice forms in cruising flight, it may be removed by increasing the power boldly and putting the airplane into a steep climb. Intercooler shutters (on P-38J, P-38L and F-5B airplanes only) should be closed as far as possible without exceeding the maximum 45°C (113°F) carburetor air temperature.
- e. Ice formation on the windshield may be removed by turning the cockpit heat ON and directing the flexible heater tube to the desired point on the glass.

#### 10. ELECTRICAL FAILURE.

- a. Electrical failure may be indicated by a zero reading on the voltmeter (figure 5-8) and the ammeter (figure 8-12) and by rapidly diminishing battery power (the first indication of a low battery will be given by failure of the propeller governors to hold the proper rpm). When the above conditions are noticed:
- (1) Set the propeller selector switches to FIXED PITCH.
  - (2) Set the oil cooler flap switches to OFF.
  - (3) Restrict the use of all lights and radio.
- (4) If practicable, turn the battery switch OFF until electrical power is needed.
- (5) If it is necessary to land with the propeller selector switches on MANUAL, the following setting should be made to insure that sufficient power will be available and that the engines will not overspeed in the event of mislanding. Make this adjustment, if possible, while there is still sufficient battery power to operate the propellers.
- (a) Altitude—Not over 5,000 feet above the airport.
- (b) Adjust the throttles and propeller selector switches to obtain 2600 rpm and 25" Hg. manifold pressure at an approximate airspeed of 180 mph in level flight.



#### 1. HEATING AND VENTILATING.

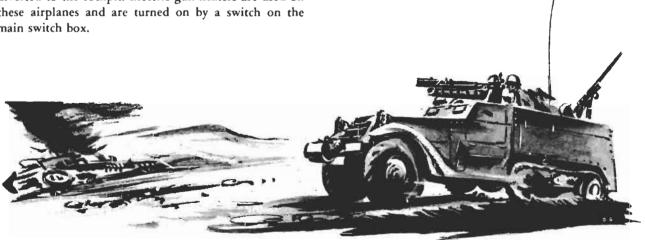
- a. COCKPIT HEAT.—Cockpit heat is supplied by an intensifier tube in the right engine exhaust (both engines on late airplanes) and controlled by a knob (figure 7-3) on the windshield support. Heat outlets are arranged to supply warm air to the windshield and removable hatch. The foot heat outlet may be closed off by operating the heat control (figure 26-5) on the floor under the right foot. On later airplanes, a heated flying suit plug and rheostat are located on the left side of the cockpit.
- b. VENTILATING AIR.—Ventilating air enters from the left wing fuselage fillet. The rate of flow may be varied by rotating the ventilator (figure 4-30) as desired.
- c. ARMAMENT OR CAMERA COMPARTMENT HEAT.—Armament or camera compartment heat is supplied by an intensifier tube in the left engine exhaust on early airplanes. The heat control (figure 4-23) on the left windshield support is used to turn the heat ON and OFF. On late airplanes the left engine heat has been diverted to the cockpit. Electric gun heaters are used on these airplanes and are turned on by a switch on the main switch box.

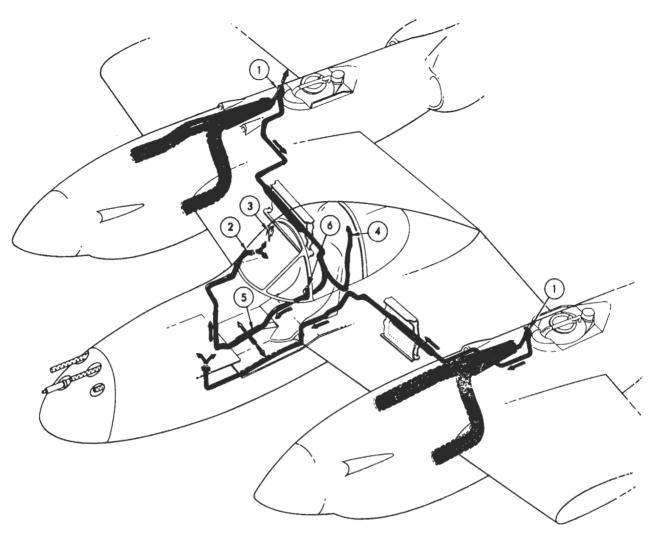
#### 2. OXYGEN SYSTEM.

a. Full pressure in the three oxygen bottles is 400 to 450 lb/sq in.

Altitude		Hours of	Supply
1,000 Feet	Auto N	lix—ON	Auto Mix-OFF
0	8.8		1.6
5	8.3	****	1.9
10	11.0	14.1	2.2
15	11.0	8.1	2.9
20	11.2	7.0	3.7
25	6.3	6.1	4.6
30	6.4	6.4	6.1
35	8.4	8.4	8.4
40	12.0	12.0	12.0

- \* Pioneer regulator
- \*\* Air Reduction Sales Regulator





- Exhaust Manifold
- Cockpit Heat Lines
- Armament Heat Lines
  (Diverted to cockpit on late airplanes)

- 1. Heat by-pass (shut-off) valves. (2)
- 2. Windshield defroster tube.
- 3. Cockpit heat control.
- 4. Flexible hatch defroster tube.
- 5. Foot heat shut-off valve.
- 6. Gun (or camera) heat control. (Cockpit heat control on late airplanes.)

Figure 26 — Heating System Diagram

b. Fit the demand-type mask snugly to the face and test the fit by pinching the tube and sucking lightly. The mask should collapse. Clip the mask tube to the clothing allowing for all necessary head movement without pulling the mask away from the face.

#### WARNING

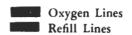
It must be remembered that the suction of breathing is used to open the oxygen valve, and that any leakage in the mask will cause this valve to become inoperative and will stop the flow of oxygen.

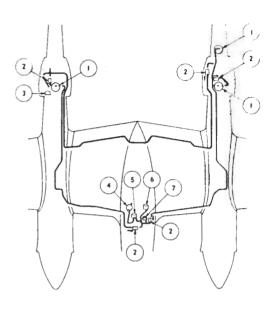
- (c) Make certain the knurled collar at the outlet end of the regulator is tight. Examine top diaphragm to see that it is not ruptured or distorted.
- (d) Turn emergency knob (Figure 27-4) "ON" to check the flow. Check the pressure gage to see that there is no perceptible pressure drop. Turn emergency knob "OFF" and ascertain that it does not leak. Leave it in this position.
- (e) Turn the auto-mix (Figure 27-3) to "OFF". Note on flow indicator (Figure 27-1) that on inhalation the top diaphragm goes down and that nearly 100 percent oxygen is received. Turn the auto-mix to "ON" and note that there is little or no indication of oxygen flow on the indicator. Leave in this position.
- (f) Check pressure of the system. It must not be less than 365 lbs./sq.in. Before take-off, make certain that the pressure gage (Figure 4-34) shows sufficient owygen



- 1. Oxygen flow indicator
- Oxygen pressure warning light.
- 3. Auto-mix lever.
- 4. Emergency knob.

Figure 27 — Oxygen Controls





- 1. Oxygen bottles.
- 2. Check valves.
- 3. Refill connection.
- 4. Demand type oxygen regulator.
- 5. Oxygen flowmeter.
- 6. Oxygen pressure gage.
- 7. Pressure warning light.

Figure 28 — Oxygen System Diagram

supply for the mission. The oxygen pressure warning unit (Figure 27-2) indicates when the pressure drops below approximately 100 lbs./sq.in.

(g) With the auto-mix and the emergency controls both turned OFF, pure oxygen will be supplied as required by normal breathing This setting, however, is wasteful of oxygen and should be used only in an emergency, when denitrogenizing for high altitude flight has been accomplished, or during night flights for improved vision.

#### 3. COMMUNICATIONS EQUIPMENT.

a. These airplanes may be equipped with an SCR-522 command set as shown in figure 7 or an SCR-274N command set illustrated in figure 29. An SCR-695-A radio and a Detrola model 438 beacon receiver have been provided. Provisions are made for the installation of a BC-608 contactor.

#### b. OPERATION OF THE SCR-522 RADIO.

- (1) Plug the headphones and microphones into the jack (figure 17-5).
- (2) Check the generator switch (figure 5-16 or 8-11) and the battery switch (figure 5-15) ON.
- (3) Set the selector switch (figure 7-9) to REM. The T and R positions of this switch are not to be used.
- (4) Push the A, B, C, or D button (figure 7-7), depending on which pre-tuned frequency is to be used, and wait about one minute for warm-up. Lights beside each button indicate which button has been pushed. The lever (figure 7-6) beside the OFF button may be used to dim the indicator lights.
- (5) Press the microphone button and speak slowly and clearly.
  - (6) Release the microphone button to receive.

#### Note

The T and R positions are provided for use on installations employing a separate radio operator. Transmission is impossible with the switch in the R position; reception is impossible with the switch in the T position. The lock lever (figure 7-8) spring loads the selector switch to the R position and prevents operation in the REM position.

(7) To turn off the equipment, push the OFF button (figure 7-5).

#### Note

This radio is not equipped with a volume control. Most installations have a remote volume control installed on the junction box on the right hand side of the cockpit over the hydraulic hand pump.

c. OPERATION OF THE SCR-274N RADIO.— There are three separate receivers, and any two of four available transmitters may be installed.

Receiver Frequencies 190 to 550 kilocycles 3 to 6 megacycles

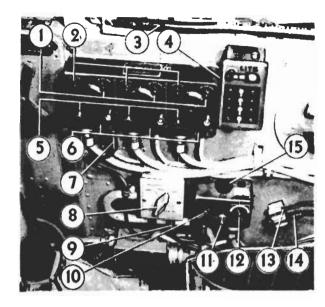
6 to 9.1 megacycles

Transmitter Frequencies
3 to 4 megacycles
4.0 to 5.3 megacycles
5.3 to 7.0 megacycles
7.0 to 9.1 megacycles

The receivers may be tuned in flight; the transmitters are pre-tuned to the proper frequency on the ground.

#### (1) RECEIVING.

(a) Plug the headphones into the jack JK-26 (figure 29-14) which is, in turn, plugged into the bottom of the filter box (figure 29-9).



- 1. Main power switch (receivers).
- 2. Headset selector switches.
- 3. Surface controls lock.
- 4. Recognition light switch box.
- 5. Volume controls.
- 6. Tuning cranks.
- 7. Tel. plug (in B jack).
- 8. Radio range filter switch.
- 9. Headset jack.
- 10. Emission selector switch.
- 11. Main power switch (transmitter).
- 12. Transmitter selector switch.
- 13. Microphone jack (stowed).
- 14. Headset extension cord jack (stowed).
- 15. Transmitter key.

#### Figure 29 --- SCR 274N Radio Controls

- (b) Determine the frequency to be used and turn the main power switch (figure 29-1) for that receiver to MCW or to CW, depending on the type of reception desired.
- (c) For normal reception, set the range selector switch (figure 29-8) to BOTH. To receive radio range without voice interference, set the selector switch to RANGE. To eliminate radio range interference from a station broadcasting range and voice signals on the same frequency, set the selector switch to VOICE.
- (d) Note which jack (A or B) the TEL plug (figure 29-7) is in and turn the headset selector switch (figure 29-2) of the receiver being used to corresponding position (A or B).
- (e) Adjust the volume (figure 29-5) to obtain a light frying noise and tune in the desired station using the crank (figure 29-6).

#### Note

Two or three receivers may be turned on simultaneously by following the instructions contained in paragraphs (d) and (e) above for each receiver.

#### (2) TRANSMITTING.

- (a) Select the desired frequency with the transmitter selector switch (figure 29-12).
- (b) Plug the microphone into the jack JK-48 (figure 29-13) which is plugged into the bottom of the transmitter control box.
- (c) Turn the main power switch (figure 29-11) ON and allow 15 seconds for the transmitter to warm up.
- (d) Turn the emission selector (figure 29-10) to CW, MCW, or TONE as desired.
- (e) If MCW was selected, press the microphone button and talk slowly and clearly.
- (f) If CW or TONE is selected, operate the key (figure 29-15).
- d. DETROLA MODEL 438 BEACON RECEIVER.— This receiver is in addition to the SCR-522 or the SCR-274N radio when the airplane leaves the factory. If it is still installed:
- (1) Plug headphones into the jack (figure 17-5) which is plugged into the face of the radio panel.
- (2) Turn the volume control (figure 7-15) up until the background noise is heard.
- (3) Tune to the desired frequency with the tuning knob (figure 7-14).
  - (4) Frequencies covered are 200 to 400 kilocycles.

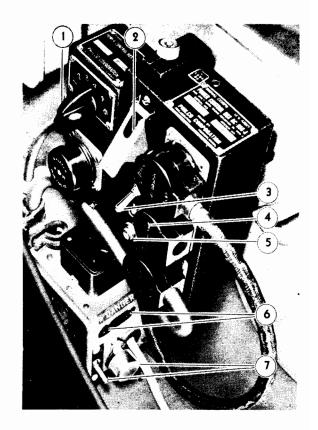
#### e. SCR-695-A RADIO.

(1) Before take-off insert the destructor plug in the radio located just forward of, and accessible through the baggage compartment door on the right boom. The destructor plug socket is on the right side, set apart from the group of three sockets on the left side of the radio.

#### **DANGER**

Do not insert the destructor plug if the red warning lights, located over the radio set in the boom, are lighted. Make sure that the warning light system has been checked and is in proper working order.

(2) After take-off set the "ON-OFF" switch (figure 30-3) to "ON".



- 1. Six-position switch.
- 2. Emergency switch.
- 3. ON-OFF switch.
- 4. Protection plug (to prevent short circuit with safety belt).
- 5. Headset jack.
- 6. Destructor buttons.
- 7. "G" band switches.

#### Figure 30 - SCR 695-A Radio Controls

- (3) Set the six-position switch (figure 30-1) to the position specified by the Communications Officer-in-Charge. (In the absence of specific information, set to "1".)
- (4) Set the "G" band switches (figure 30-7) as directed by the Communications Officer.
- (5) Details concerning the use of the EMER-GENCY switch (figure 30-2) and destructor buttons (figure 30-6) should be obtained from the Communications Officer.
  - (6) To stop the equipment, turn all switches OFF.
- (7) Disconnect the destructor plug as soon as the airplane lands in friendly territory.

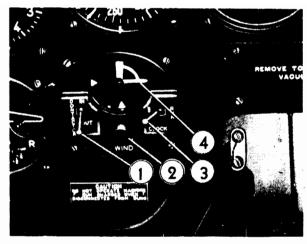
- f. BC-608 CONTACTOR. Provisions have been made for the installation of this unit when in British squadrons or when operating in conjunction with British airplanes.
- (1) Before take-off, turn the contactor heater switch ON, wind the clock and synchronize it with the control clock by setting the clock switch (figure 31-3) to RUN at the given signal.
  - (2) Turn the command transmitter ON.
  - (3) Turn the contactor switch (figure 31-1) to IN.
- (a) Automatic transmission takes place during the 15 seconds the clock hand is between the 12:00 and the 3:00 o'clock position. Normal transmission and reception is not possible during this time.
- g. MN-26Y RADIO COMPASS.—This radio compass may be installed in some airplanes. The compass is intended for use during the ferry flights, and may be removed in combat zones.

#### (1) GENERAL.

- (a) The master control switch marked OFF, COMP., REC. ANT., and REC: LOOP controls all radio compass equipment functions other than tuning and adjustment of signal level.
- (b) The COMP setting is used for obtaining communications reception, visual on-course indication of homing and bearings.
- (c) The REC. ANT setting is used for communication and aural radio range reception.
- (d) The REC. LOOP setting is used for obtaining communications reception during conditions of severe rain and snow static, aural radio range reception, aural null homing from communication stations.
- (e) The OFF setting opens all current consuming circuits thus rendering the equipment inoperative.
- (f) The left-right indicator indicates whether the station is to the right or left of the centerline of the airplane.

### (2) OPERATION OF THE MN-26Y RADIO COMPASS.

- (a) Turn the main switch ON and set the band selector switch to the frequency range desired.
- (b) Tune to the desired station and adjust the volume (audio) control. Set the CW switch to ON for code reception, OFF for voice reception.
- (c) Set the master switch according to the operation to be conducted.



- 1. Contactor in-out switch.
- 2. Clock winding knob.
- 3. Clock stop-run switch.
- 4. Clock indicator.

Figure 31 - BC 608 Contactor Controls

#### 4. ARMAMENT.

- a. The P-38H, P-38J and P-38L airplanes are equipped with four, .50 caliber machine guns and one 20 mm cannon and a small motion picture camera. Space is provided for carrying 500 rounds of ammunition for each .50 caliber gun and 150 rounds for the 20 mm cannon. The motion picture camera operates with the guns to record results.
- (1) Before take-off check that machine guns and cannon have been charged. (P-38H airplanes only are equipped with a machine gun charger which may be operated in flight as follows:)
- (a) Pull the charging selector (figure 4-16) out and turn it to the gun to be charged.
- (b) Pull the charging handle (figure 4-10) all the way back and then push it forward.
- (c) Strike the charging selector with the heel of the hand.

#### Note

Never attempt to move the charging selector unless the charging handle is in the full forward position.

- (d) Charge the other three machine guns in the same manner.
- (2) Turn the armament switch (on control column) to COMBAT.

- (3) Push the machine gun button or the cannon button (on control wheel) to fire the guns.
- (a) If it is desired to use the camera without the guns, set the armament switch to CAMERA and operate either the gun or cannon button.

#### Note

Turn gun heat (figure 4-23, or switch on main switch box) ON whenever the outside air temperature is below freezing.

- (4) The optical gun sight is turned ON by the rheostat (figure 5-10) which adjusts the intensity of the reflection on the glass behind the windshield. Adjust the seat vertically until the sight reflection is easily visible.
- (5) When flying in bright sunlight, place the dark glass (figure 4-31) in position over the gunsight (figure 32-2). Later airplanes are not equipped with gunsight dark glass.
- (6) To drop bombs, set the arming switch (figure 4-24) to ARM (or safe), set the bomb selector switch (figure 4-20) to ON for the bomb to be dropped and, while flying at less than 400 mph I AS and not more than 30° from the horizontal, with flaps UP, press the release button (figure 4-27).



- 1. Emergency hatch release.
- 2. Gunsight dark glass.
- 3. Bullet proof glass.
- Reflecting glass.
- 5. Glare shield.

#### Figure 32 — Gun Sight (Early Airplanes)

#### 5. PHOTOGRAPHIC EQUIPMENT.

a. On F-5B airplanes all the cameras are installed in the fuselage nose which is divided into three camera compartments. The forward compartment accommodates one 6-inch K-17 chart camera. The center compartment will accommodate two 6-inch K-17 chart cameras or one 12-inch or 24-inch K-17 reconnaissance camera. The aft compartment accommodates two 24-inch K-17, or one 24-inch K-18, reconnaissance cameras.

#### b. CAMERA OPERATION.

(1) Before take-off the pilot should determine which cameras are installed and that the airplane is properly balanced. THIS IS IMPORTANT (see Section II, paragraph 2, a.

#### (2) TO OPERATE CAMERAS:

- (a) Set camera diaphragm control (figure 33-4) as required. (Bright, medium, or cloudy.)
- (b) Turn camera switches (figures 33-6, 7 or 8) ON for each group of cameras to be used.

#### Note

Camera heat (figure 4-23) should be adjusted to maintain approximately 5°C (40°F) on the camera compartment temperature indicator (figure 33-1). Some airplanes may be equipped with ethylene glycol electric fan heaters which will be operated through a switch and rheostat in the cockpit.

#### (c) FOR INTERVALOMETER OPERATION:

- 1. Determine time interval from the INTER-VALOMETER SETTING table (figure 34).
- 2. Set the intervalometer hand to the selected time interval. Push and turn knob (figure 33-11) to set hand.
- 3. Set the camera control switch (figure 33-9) to INTERVALOMETER.
- 4. Turn camera master switch (figure 33-5) ON. An exposure will be made immediately.
- 5. Amber lights flash when exposure is made. Green lights indicate when film is winding. The white light gives a three-second warning before exposure.
- 6. To take an extra picture at any instant, set the control switch to RUNAWAY and immediately return it to INTERVALOMETER.

#### (d) FOR MANUAL CONTROL:



Figure 33 — A-1 Camera Controls

(F-5B ONLY)

- 1. Set camera control switch to MANUAL.
- 2. Turn camera master switch ON.
- 3. Pull the camera control trigger, (on the control wheel) to make an exposure.
  - (e) FOR RUNAWAY OPERATION:
    - 1. Set camera control switch to RUNAWAY.
    - 2. Turn camera master switch ON.

#### Note

Because the time to wind varies slightly for each camera, exposures will not be made simultaneously during runaway operation. Pictures will, therefore, not be suitable for stereoscopic viewing.

3. Runaway operation may also be obtained by setting the controls for manual operation and holding the trigger down.

	-	AIRP	LAN	E'S	AIR	SPEE	D II	NDI	CAT	OR I	REA	DIN	G—	MPH	I				ı	NT	ER\	/AL	ON	AET	ER	SE	TTI	NG		SEC			
		Airpl	ane's	Altim	eter R	eadin	g (1,0	000 Ft	.)	Altim	eter S	et at :	29.92	γ Hg.							Al	titud	e Al	0016	Gro	und .	_ 1	.000	Ft.				_
6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
		195		180		145 165 185							140	135	125		2"	3"	4†	4†	51	6t	6t	6†	9	9	9	9	12	12	12	15 12 12	12
260 285 310	275	270	260	250	245	235	230	220	210	200	190	180	175	170	160	140 155 170	2"	2"	3"	3"	4†	4†	5†	5†	6†	6t	6†	6†	9	9	9	9	9
330 355 380	320 345 370	335	325	315	310	300	290	280	270	260	250	240	230	225	215	190 205 220	1"	2"	2"	3"	3"	3"	4†	4†	5† 5† 4†	5† 5† 5†	6† 5† 5†	6† 6† 5†	6† 6† 6†	6† 6† 6†	9 6† 6†	9 9 6†	9 9

To determine intervalometer setting: (1) Find airplane's altimeter reading in left hand side of table; (2) Follow down to first indicated airspeed higher than airplane's airspeed; (3) Follow across horizontal to intervalometer setting below distance above the ground.

Time intervals marked (") are too short for runaway operation with K-17 camera.

Time intervals marked (†) are too short for runaway operation with K-18 camera.

Figure 34 — Intervalometer Setting (60% Overlap)



#### APPENDIX I

### GLOSSARY OF NOMENCLATURE (U. S. A.-BRITISH)

AMERICAN	BRITISH	AMERICAN	BRITISH
Accumulator (hydraulic)	Pressure reservoir	Lean mixture	Weak mixture
Air filter	Air cleaner	Left	Port
Airfoil	Aerofoil	Level off	Flatten out
Antenna	Aerial	Life raft	Dinghy
Battery (electrical)	Electrical accumulator	Manifold pressure	Boost pressure
Ceiling	Cloud height	Mooring line	Mooring guy
Check valve	Non-return valve	Mooring rings	Picketing rings
Command set (radio)	Pilot controller set	Oil pan	Crankcase sump
Course (direction with	Track angle	Panel (center wing)	Centre section plane
respect to true north)		Panel (outboard)	Outer plane
Critical speed	Stalling speed	Radio mast	Rod aerial
Cylinder (hydraulic)	Jack (hydraulic)	Radio range beacon	Radio track beacon
Drift	Drift-angle	Right	Starboard
Empennage	Tail unit	Screen (oil)	Filter
Flare (signal)	Signal star, signal	Stabilizer (horizontal)	Tail plane
	projectile	Stabilizer (vertical)	Fin
Gage (fuel)	Fuel-contents gauge	Tachometer	Engine speed indicator,
Gasoline (gas, fuel)	Petrol or fuel		revolution counter
Generator	Dynamo	Take-off distance	Take-off run
Ground (electrical)	Earth	Tube (radio)	Valve
Gyro horizon	Artificial horizon	Valve (fuel or oil)	Cock
Heading	Course	Weight (empty)	Tare
Indicated air speed (ias)	Air-speed-indicator	Weight (gross)	All-up weight
	reading	Windshield	Windscreen
Landing gear	Alighting gear, under- carriage	Wing	Main plane

#### APPENDIX II

## Flight Operating Charts, Tables, Curves, and Diagrams

#### 1. FLIGHT PLANNING.

The following outline may be used as a guide to assist personnel in the use of the FLIGHT OPERATION IN-STRUCTION CHART for flight planning purposes.

- a. If the flight plan calls for a continuous flight where the desired cruising power and air speed are reasonably constant after take-off and climb to 5,000 feet, the fuel required and flight time may be computed as a "single-section flight."
- (1) Within the limits of the airplane, the fuel required and flying time for a given mission depend largely upon the speed desired. With all other factors remaining equal in an airplane, speed is obtained at a sacrifice of range, and range is obtained at a sacrifice of speed. The speed is usually determined after considering the urgency of the flight plotted against the range required. The time of take-off is adjusted so as to have the flight arrive at its destination at the predetermined time.

Fuel should be used in the following sequence:

- 1. Reserve tanks for first 15 minutes.
- 2. External tanks.
- 3. Outer wing tanks (if installed).
- 4. Main tanks.
- 5. Reserve tanks.
- (2) Select the FLIGHT OPERATION INSTRUCTION CHART corresponding to the weight and external load items of the airplane. Locate the largest figure entered under gph (gallons per hour) in column 1 on the lower half of the chart. Multiply this figure by the number and/or fraction of hours desired for reserve fuel. Add the resulting figure to the number of gallons set forth in footnote No. 2, and subtract the total from the amount of fuel in the airplane prior to starting the engines. The figure obtained as a result of this computation will represent the amount of gasoline available

and applicable for flight planning purposes on the "Range in Air Miles" section of the FLIGHT OPERA-TION INSTRUCTION CHART.

- (3) Select a figure in the fuel column equal to, or the next entry less than, the available amount of fuel in the airplane as determined in paragraph 2, a, (2) above. Move horizontally to the right or left and select a figure equal to, or the next entry greater than the air miles (with no wind) to be flown. Operating values contained in the column number in which this figure appears, represent the highest cruising speed possible at the range desired; however, the airplane may be operated in accordance with values contained under OPERATING DATA in any column of a higher number with the flight plan being completed at a sacrifice of speed but at an increase in fuel economy.
- (4) Using the same column number selected by application of instructions contained in the preceding paragraph, read the gallons per hour given at the altitude to be flown and divide this figure into the number of gallons available for cruising, as determined in paragraph (2) above. This will give the calculated flight duration in hours, which can then be converted into hours and minutes and deducted from the desired arrival time at destination in order to obtain the take-off time (without consideration for wind). To allow for wind, determine the calculated ground speed by dividing the flight duration in hours into the range selected in paragraph (3) and calculate a new corrected ground speed with the aid of a navigator's triangle of velocities.
- (5) The airplane and engine operating values listed below "Operating Data" in any column except I are calculated to give constant miles per gallon at any altitude listed. Therefore, the airplane may be operated at any altitude and at the corresponding set of values given so long as they are in the same column listing the range desired.

#### CAUTION

Ranges listed in column I under "Max. Cont. Power" are correct only at sea level and 12,000 feet.

- (6) The flight plan may be readily changed at any time enroute, and the chart will show the balance of range at various cruising powers by following the "Instructions for Using Chart" printed on each page.
- (7) In using the FLIGHT OPERATION IN-STRUCTION CHARTS set the propeller control

to give the desired rpm and open the throttle to give the desired indicated air speed. Use the manifold pressure only as an approximate value for reference.

b. If the original flight plan calls for a mission requiring changes in power, speed, or gross load, in accordance with "GR. WT," increments shown in the series of "FLIGHT OPERATION INSTRUCTION CHARTS" provided, the total flight should be broken down into a series of individual short flights, each computed as outlined in paragraph a, in its entirety, and then added together to make up the total flight and its requirements.



CAMPAT   C	CLIMB OFF D	* LANDING	NG CHART	E		(HQ/60 0121 V	10700	:	
HARD WIND	KE-OFF D					1711	0230		
HEAD WIND   AT SEA LEYEL   AT 3.000 FT.   AT 6.000     1	-	ISTATE	E (N MIT)			V-1710-	-91 (LH	47	
Name   Second   Name	_	SOD-TURE	RUNWAY			SOFT SURFACE		RUNWAY	
Name	AT SEA	LEVEL AT 3,000 FT.	14	6,000 FT.	AT SEA LE	LEVEL AT 3	3,000 FT.	7	4,000 FT.
0   0   0   0   0   0   0   0   0   0	TO CLEAR OROUND SO' ORL: RINK	TO CLEAR GROUND 30" OBJ. RUN	TO CLEAE SPOUND 50" OBJ. BÜN	TO CLEAR Se' OLU.	Н	TO CLEAR GROUND Se" ORL: BUN	TO CLEAR SO' OBJ.	BROUND	10 CLEAR 30' OBJ.
1	1770 880	<u> </u>	尸	1870	<b>!</b>	1540 1210	1790	1420	2120
1	1350 630	1040 720	1190 850	1410	11 057	180	1350	1010	1590
1	9/0	490 280		670			610	380	750
17   15   15   130   1380   960   1620   1110   1	2511 1180		2180 1620	2630	1450 21	2140 1720	2550	2010	3070
1	1960 860	1410 1010	1680 1190	2040			_	1470	1720
NOTE ASSET OF STATE   1370   1370   1360	1010 350	_		1050		810 510	950	8	1170
NCREASE DISTANCE   3	3340 1470	2330 1710	2800 2000	3510	1840 2750	2750 2150	3280	2560	4130
MISSIGNS USE   3000   EPA   54"   M. HG   M.	2020 760			2130				1320	2430
TYPE	EACH 20'F			IGINE LIMITS	┦₩	18	EPM &	34	Z SE
TYPE									
COMMAN   TATE	CLIM	B DATA		FERR	FERRY MISSIONS USE	2300		<b>26 3 36</b>	3
CLIMB	15,000	FT. ALT.	25,000	00	PT. ALT.	35,000	8	FT. ALT.	
COMBAN   178   155   3500   2   175   152   3400   3   61   53	DEST I.A.S.	TIME FUEL PEO	HEST I.A.S.	TIME FT/MIN PEOM	HOM S.L.	.¥.	TIME	¥ -	BLOWING
COMBAN   178   155   3500   2   175   152   3400   3   61   63	. MPH KNOTS	\$.L U.S.	MPH KNOTS	5. t.	in in	KNOTS	1,5	-	
COMMAN   178   155   2800   2   175   152   2700   4   65   56		9 68 59	162 141 25 151 131 12	2500 B	87 75 I 87 75 I	151 131 1200 151 131 500	28	112 97 116 100	
151   131   1200   4   151   130   150   8   65   56     COMMAT   178   155   2500   2   175   152   2300   4   68   59     HRRY   151   131   1000   5   151   131   1000   10   70   61     NCREASED ELAPSED CLIMBING TIME   5 % FOR EACH   10°C ABOVE O'C A	172 149	92	141	10	98 98	151 131 60	600 18	136 118	
175   152   2300   4   F8   59   151   131   1000   10   70   61   5   4   5   5   5   5   5   5   5   5	151 131		131	콨	35		-+	+	_
LAND DRY SURFACE  AT 3,000 FT.  AT 0.0144. ROULD 10.0144. ROUGH		7 80 69 15 84 73	162 141 16 151 131 E	1600 12 500 30	107 83 1 122 106	151   131   40	400	155   134	
APPROACH AT SEA LEVEL AT 3,000 FT. AT 6,000 FT.  APPROACH AT SEA LEVEL AT 3,000 FT. AT 6,000 FT.  APPROACH SO OSL. BOUL 30 OSL. ROUL 30 OSL.	O'C FREE AIR TEMPERATURE	5	% FOR EACH 20°F ABOVE 32°F	VE 32'F!	FUEL INCLU	FUEL INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE	AND TAKE	-OFF ALLC	WANCE
APPROACH   AT SEA LEVEL   AT 3,000 FT.   AT 6,000 FT.	SIQ DNIQNY	STANCE	(IN FEET)						
APROACH AT SEA LEVEL AT 3,000 FT. AT 6,000 FT.  TO CILAR GROUND TO CIEAR GROUND TO CIEAR GROUND TO SO OBJ. SO		FIRM DRY SOD	1 \$00	-		WETOR	OR SLIPPER	¥ #	
MPH KNOTS 50'OBJ. ROLL 50'OBJ. ROLL 50'OBJ. ROLL	O FT. AT SEA LEVEL	L AT 3,000 FT.	FT. AT 6,000 FT.	FI 80	AT SEA LEVEL		AT 3,000 FT.	AT 6,000 FT.	F
	GEOUND TO CLEAR DROUND ROLL ROLL	10 CLEAR 50' OBJ.	ROU SO' OBJ.	GNOON	TO CLEAR GROUND 30' OBJ. BOLL	40 TO CLEAR	TION	TO CLEAR SO' OBJ.	BOUL
1760 1170 1920 1300 2100 1460	1920	2100	1480 2310	╄		⊢	3880	2000	4350
1480 2350 1660	2140	2350	1700 2590	1900	4590 3970	2080	4430	5650	0967
NOTE: FOR GROUND TEMPERATURES ABOVE 35°C (95°F) INCREASE APPROACH (A.S. 10%)		W 20% INCREASE IN	IN GROUND ROLL	KL.					
REMARKS " FOR COMBAT CLIMB USE 3000 R.P.M.			ALTITUDE	JDE		LAS. Indica	F.A.S.: Indicated Air Speed M.P.M.: Miles Per Hoer	_	
AND 54 IN. HG. TO 20,000 FEET.RE— DUCE MAN. PRESS. AS FOLLOWS ABOVE	PARGIT 61-8 JAYT	25,000	30,000	35,000	000 00 00 00 00 00 00 00 00 00 00 00 00	U.S. U. S.	S.L.: Sea Level U.S.: U. S. Galfons		
	SOSENI CT-G 3 III		3	2	^	, mar.	riel Genome		

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TAKE LUNWAY    SOD-TULE FUNWAY    SOD-TULE FUNWA    SOD-TULE FUNWA  SOD-TULE FUNWA    SOD-TULE FUNWA  SOD-TULE FUNWA    SOD-TULE FUNWA  SOD-TULE FUNWA  SOD-	10,1			4	381			ļ					•	) E S			-	ļ		V-17	8-012	39 (R)			
1900 FF   1910 FF RUN WAY	740			4	50					<	E-0	ı.	I S T	Z	_	FEET )				V-Lī	-012	HT)16			
1050   17   18   19   19   19   19   19   19   19		۱,	7	2		HAR	ما	FACE	N WA	_	-		Š	0 - T UR	ı	WAY		_		0 5.1	SURFA		N WAY		
1950   1960   1970	WEIG				AT SEA		۲.	7,000 FT	_	000'9 L		ž	LEVEL			¥	6,000 FT	<u> </u>	Z.	FVEL		. T.		900 FT	
1845   1360   2310   1360	2 2	 G		-	<b>-</b> -	TO CLEAR 30' OBJ.	-	<u> </u>	_	$\vdash$			TO CLEAR 30' OEJ.	RUM	TO CLEAN SO' OB.		$\vdash$	<del> </del> -	<b>├</b>	<u> </u>	GROUND	TO CLBAR SO' OBJ.	GHOUND	$\vdash$	
1800   1810   3280   1450   2300   1580   2750   1910   2730   1910   2730   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750   1910   2750	17,40	8	0 2 3 5		1030 750 500 300	1620 1230 890 610	1170 860 580 340	<b>.</b>	<u>-</u>			060 770 520 310	1650 1260 910 620	1240 900 620 370	1940 1490 1090 730	1450 1060 710	<b></b>		l	<del></del>	1530 1110 740 430	2250 1710 1230 810	1780 1300 870 520	<del> </del>	
1510   2320   1960   1960   2180   2180   2180   2520   2920   1930   2920	19,40	8	0 2 3 2		1350 1000 690 440	2190 1720 1290 920	1560 1160 920 520				<del> </del> -	·	2300 1800 1350 950	1580 1250 880 540	2750 2160 1630 1140	1970 1470 1030 660	<del> </del>		<del> </del>	<del> </del>	2120 1570 1090 680	3230 2520 1870 1310	2510 1870 1310 820	2390 1696	
C	21,40	90	0 7 4 2		1740 1300 930 610	2910 2400 1740 1250	2000 1520 1090 730						3040 2500 1810 1310	2180 1650 1190 790	3760 2990 2290 1660	2560 1930 1390					2920 2200 1560 1030	4570 3590 2700 1930	3500 2640 1900 1250	38±(626)	
C	NOTE:	NCREAS	SE DISTA	1	*	R EACH	10°C ABC	OVE O'C	្ព	FOR EAC	H 20°F A	BOVE 32	£			=	GINE LIA	AITS FOR	TAKE-0	ı	8	M W	54	Ž	
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100	GROSS	Ь	H		-	1		900.	E	III.		15,00		FT. ALT.		25,0	8	M. A	5		35,000		Ι.	L	1
3100 4 59 49 175 152 2900 5 69 57 170 149 2400 9 89 74 16  1400 7 57 48 160 139 1400 11 66 55 160 139 1100 19 85 71 16  2400 4 63 53 175 152 2300 7 75 62 170 148 1800 11 103 86 16  1100 10 62 52 160 139 1000 15 72 60 160 139 700 27 101 84 —  2000 6 37 56 180 156 1900 8 81 67 175 152 1400 14 116 97 17  2000 7 37 56 180 156 1900 8 81 67 175 162 1400 14 116 97 17  2000 8 37 17 59 165 190 8 81 67 175 152 1400 14 116 97 17  2000 8 37 17 1	WEIGHT IN LBS.			I.A.S. KNOTS	T/MIN PEC		I.A.S.			ROM S.L.	_ <del>-</del>	2	TIME FOR	UEL FROM S	1	I.A.S.	$\vdash$		1	I. H	-	T T T	US FROM S	,	~ =
2400 4 63 53 175 152 2300 7 75 62 170 148 1800 11 103 86 16 11.00 10 62 52 150 139 1000 15 72 60 160 139 700 27 101 84 2000 6 37 56 180 156 1900 8 81 67 175 152 1400 14 116 97 17 700 13 71 59 165 143 700 20 87 72 165 143 300 40 135 112  EACH 10°C ABOVE 0°C FREE AIR TEMPERATURE   5 × FOR EACH 20°F ABOVE 32°F) FUEL INCLUD  SURFACE  FT. AT.6.000 FT. AT SEA LEVEL AT 3,000 FT. AT 6,000 FT. GOUND 1000 2430 1570 2210 1440 2000 1600 2670 1790 4750 3750 11400 2430 1570 2210 1440 20420 1600 2670 1790 4750 3750 11400 2430 1570 2210 1440 20420 1600 2670 1790 4750 3750 11400 2430 1570 2210 1440 20420 1600 2670 1790 4750 3750 11400 2430 1570 2210 1440 20420 1600 2670 1790 4750 3750 11400 2430 1570 2420 1600 2670 1790 4750 3750 11400 2430 1570 2420 1600 1600 1790 4750 3750 11400 2430 1570 2420 1600 1600 1790 4750 3750 11400 2430 1570 2420 1600 1600 1790 4750 3750 11400 2430 1570 2420 1600 1600 1790 4750 3750 11400 2430 1570 2420 1600 1600 1790 4750 3750 11400 2430 1570 1790 1790 1790 4750 3750 11400 2430 1570 1790 1790 1790 4750 3750 11400 2430 1570 1790 1790 1790 4750 3750 11400 2430 1570 1790 1790 1790 4750 3750 11400 2430 1570 1790 1790 1790 4750 3750 11400 2430 1570 1790 1790 1790 1790 1790 1790 1790 17	17,400			156 139	i		154			$\vdash$				<b> </b>		<del>-</del>		<del> </del>		+ -		15 33	<del> </del>		1
2000 E 37 56 180 156 1900 8 81 67 175 152 1400 14 116 97 17  700 13 71 59 145 143 700 20 87 72 165 143 300 40 135 112 —  EACH 10°C ABOVE 0°C FREE AIR TEMPERATURE ( 5 % FOR EACH 20°F ABOVE 32°F) FUEL INCLUD  SURFACE  FT. AT 6.000 FT. AT 5EA LEVEL AT 3,000 FT. AT 6,000 FT. AT 5EA LEVEL  GOUND 10°C CLAR 98040 10°C CLAR 98°C SL. 1800 10°C CLAR 180°C SL. 1800 10°C SLAR 1800 10°C SLAR 180°C SL. 1800 10°C SLAR 180°C SL. 1800 10°C SLAR 180°C S	19,400			156			154															₽ I		to 1	
EACH 10°C ABOVE 0°C FREE AIR TEMPERATURE 1 5 % FOR EACH 20°F ABOVE 32°F) FUEL INCLUDE  S.U.R.F.A.C. A.C. GOOD FT.  FIRM DRY S.O.D  FT. A.C. 6.000 FT.  AT 3,000 FT.  AT 5,000 FT.	21,400								-		·					<u>-</u>		<del>-</del>	<del></del>	<del>                                     </del>		12		<u></u>	
LANDING DISTANCE (INFET)  SURFACE  FIRM DRY SOD  FT. AT.6,000 FT. AT SEA LEVEL  GOUND  10 CLEAR GROUND  10 C	NOTE: IN	CREASE	ED ELAP	SED CLIM	BING TI			EACH 10		히		EMPERAT	-	*	EA CH	20'F ABC	VE 32'F		II INCEO		MM-UP A	ND TAKE	OFF ALL	OWANC	
FIRM DRY SOD  FT. AT.6.000 FT. AT SEA LEVEL AT 3,000 FT. AT 6,000 FT. AT SEA LEVEL  GROUND  TO CLEAR GROUND									_	Z V	Z	_	STA	Z		(E									
FT.   AT. 6,000 FT.   AT SEA LEVEL   AT 3,000 FT.   AT 6,000 FT.   AT 5.500 FT.	GROSS		. A. S.			¥ ¥		SURFA	J				1	W D							0	SLIPPE	<b>&gt;</b>		
1220 2160 1370 1970 1250 2160 1400 2370 1560 4190 3270 1400 2370 1400 3270 3270 3270 3270 3270 3270 3270 32	WEIGHT IN LBS.		ROACH	12.		2.	8 ⊢	PT.	AT. 6,C	OR FT.	12.	<b>-</b> ⊢	٠,٠	ጅ ⊦—		AT 6,01	GROUND	¥.	<	9	8	O FT.	AT 6,0	GEOUN	
14400 2430 1570 2210 1440 20.20 1600 2670 1790 4750 3750 INCREASE APPROACH 1.A.S. 10% AND ALLOW 20% INCREASE IN GROUND ROLL.  AND 54 IN. HG. TO 26,600 FEET THEM GRADUALLY REDUCE  AT 30,000 FEET AND TO 41.0 IN. HS. AT 35,000 FT.	14,000	+	104	+	+	+	╄	1220	2160	1370	+	-	+	<b>↓</b> —	十一	2370	1560	—	—−	┿	-+	3650	5150	1080 1080 1080 1080	
AND 54 (W. HG. TO 25,600 FEET THEM SRADUALLY REDUCE , AT 30,000 FEET AND TO 41.0 (W. HG. AT 35,000 FT.	16,000 NOTE: FC	125	CND TE	2010 MPERATI	JRES ABC	O 2,	002	1400		1570	222	7 9		120	8 2	2670	1790	4750	$\dashv$	$\dashv$	260	4180	5850	7694	,
	REMARK	*	FOR CON	MSAT CL .0 PRES	SURE TO	3000	R. P. M.	AND		. TO 25	,600 FE	ET THEM	N GRADU	ALLY REI	DUCE T.						L. Miles P. S. Miles P. Miles P. S. Miles P. S. Miles P. Miles P. S. Miles P. Miles P. Miles P. Miles	d Air Speed allons Gallons mees are Ave			

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161			P-38	381				TAKE	TAKE-OFF,	CLIMB			LANDING	S CHART	KT	,		V~1710	- 1	III (R'H	<b>+</b>	
LOBN V Dec 18							1 1	-	AKE.	. 0 F F	DIST	Z 4	CE	( IN FEET )		,		. i - i .	-012	V-1710-113(LH	7	
	-		-		HARD	SURFA	CERU	RUNWAY			"	UT-008	-TURF RUNWAY	N WAY		-		SOFT	SURFACE		RUNWAY	
WEIGHT		HEAD WIND	1	AT SEA L	LEVEL	AT 3,0	80 FF	AT 6	AT 6,000 FT.	AT S	SEA LEVEL	7	3,000 FT.		AT 6,000 FT.	-	AT SEA	LEVEL	AT 3,0	AT 3,000 FT.	AT 6,	AT 6,000 FT.
(IN 185.)	L	MPH KW	2 STOWN	BUN SC	TO CLEAR 30' OBJ.	OROUND	TO CLEAR SO' OBJ.	OROUND	TO CUEAR 50' 08.	GROUPED RUN	50' 08J.	A BUN	~~		<del></del>	-	_	TO CLEAR SO' OBJ.	GROUND	SO' OBJ.	GROUND RUN	TO CLEAR SO' OBJ.
		-	┼-	1030	+	1170	1850	~	2210	1060	1650	-	⊢	1450	<del>  -</del>	↓_	-	1900	1530	2250	1780	2680
17 400	_		_	_	1230	98	1440	066	1720	25			1490			1780	020	1460	0111	0171	1300	2 2
1	_	7 5	š \$	000	610	340	2007	2 6 6	1260	310	620	370				068		3 8	430	910	2,0	8 8
	+	-	+-	100	2190	1560	2620	1810	3280	1450	+	+-	+	+	-	+-	╀	2710	2120	3230	2510	011011
19.400					02/1	1160	2060	1350	2600	1070	1800	1250	2160	00,1470		2730	1340	2090	1570	2520	1870	3160
		_			920	250	1120	610	1450	470						1510		501	88	1310	820	1690
		0 !	-	1740 2	2910	2000	3560	2320	0967	1860	3040	2180	3760	2560	_	5220	2490	3730	2920	3590	3500	6260 1990
21,400			- - R :		1740	1090	2180	1260	3140	990								2190	1560	2700	1900	3850
	-		╛	610	1250		- 1	_ 1	2330	990	1310	$\dashv$	$\dashv$	3	7,	2	200		200	acet .	200	
NOTE	NCREASE	NOTE: INCREASE DISTANCE	5 5	% FOR	% FOR EACH 10°C ABO		VE 0.C (	10 % FOR	R EACH 2	EACH 20'F ABOVE 32"FI	/E 32*F)			-	NGINE	MITS F	ENGINE LIMITS FOR TAKE-OFF	- 1	3000	EPM &	7.	Z.
COMBAT MISSIONS USE	MISSION	4S USE	3000			7	2			7	CL **	DATA				FERRY	FERRY MISSIONS USE	USE	2300		35	3
2000	1 Agy	3.4.7	1. L TO 5000	FL ALT	-	١Ē	$\frac{1}{2}$	T ALT	-	15,000	1	FT. ALT	-	000 36	+	1	F. ALT.		35,000		F. AU	
WEIGHT	2	Ι.	1	TIME		3	1	-	+		Г	-	4		Г	-			3	-		_
7 TBS	CLIMB	Ц.,	NOTS	FT/MIN PROM	MPH KNOTS	È	MIN FROM	2 2	+	KNOTS	FT/MIN FROM	U. S.	ֈ՟	KNOTS	FT/Min F	FROM DEL	U.S. IMP.	MPH KNOTS	FT/MIN	TO .	U.S. IMP.	CHANG
	COMBAT	⊢		3200	178		3100 4	⊢	49 175	152	2900 5	69	57 170	348	2400	6	74	165 143	-	15	<b>├</b>	
17,400	FREETY	160	139	1400 4	160	139 16	1400 7	22	48 I60	139	1400 11	99 1	55 160	139	1100	19 85	11	160 139		33	117 97	
٥	COMBAT	8		2600 2	178			63		152	2300 7		62 170	148	1800	_		165 143	300	ଛ	139 116	
	À L		-		_		1100	62		139		72	$\dashv$	139		<del>- i</del>	$\rightarrow$	$\rightarrow$	-		-	_
21,400	COMBAT	185	161	2200	183	159 20	2000 5	67	56 180	156	1900	81	67 175	152	300	14 116	5 97	170	148 200	27	168 140	_
NOTE: IN	CREASEL	ELAPSEC	D CLIMI	NOTE: INCREASED ELAPSED CLIMBING TIME	2	ا تيا	CH 10.C	ABOVE		AIR TEMP	1 =	ر ا		_  Ҳ	37	-	UEL INCL	UDES W	ARM-UP	FUEL INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE	OFF ALL	WANCE
									QNV	5 N G	TSIG	Z	) E	(IN FEET)								
	BEST I A S	× ×			HARD	HARD DRY SURFA	URFACE			1		FIRM DRY SOD	R Y SO	,		L		¥	ET OR	OR SLIPPERY	<b>≻</b>	
WEIGHT	APPROACH	DACH	AT S	AT SEA LEVEL	14	AT 3,000 F	t.	AT 6,000 FT	E	AT SEA LEVEL	LEVEL	AT 3,000 FT.	8 F	AT 6,	AT 6,000 FT.	7	AT SEA LEVEL	Æ	AT 3,000 FT.	0 FT.	AT 6,000 FT.	F.
IN LBS.	I	KNOTS	TO CLEAR 50' OBJ.	CROUND ROLL	50' 08J.		GROUND TO	10 CLEAR 30' OBJ.	GEOUND	TO CLEAR \$0' OBJ	GROUND	TO CLEAR SO' OBJ.	GROUND	TO CLEAR SO' OBJ	GIOUND	-	TO CLEAR GRO	TOUND	TO CLEAR SO' OBJ	GROUND	TO CLEAR SO' OBJ.	GROUND
14,000	120	104	1800	1090	1960	╁	1220	2160 1	1370	1970	1250	2160	1400	2370	1560	4190	⊢	3270	4630	3650	5150	4080
16,000	125	109	2010	1260	2200	$\dashv$	1400	2430 1	1570	2210	1440	2420	1600	2670	1790		4750 3	3750	5260	4180	5850	0691
NOTE: FC	S GROL	IND TEM	PERATU	NOTE: FOR GROUND TEMPERATURES ABOVE 35°C (95°F) INCREASE	VE 35°C	NI (4.56)	CREASE A	APPROAC	APPROACH LA.S. 10% AND	ON YO	ALLOW 20	20% INCREASE IN		GROUND ROLL	OII.							
REMARKS	• ′	FOR COM.	IBAT CI D PRES	FOR COMBAT CLIMB USE 3000 R.P.M. MANIFOLD PRESSURE TO 48.5 IN. HG.	3000 8		AND 54 AT 30.	IN. HG. 000 FEET	TO 26.6	300 FEET	THEN GE	54 IN. HG. TO 26,600 FEET THEN GRADUALLY REDUCE 30,000 FEET AND TO 41.0 IN. HG. AT 35,000 FEET.	REDUCE O FEET.					l	A.S.s Indicated P.N.s Miles For S.L.s See Level U.S.s U. S. Gol IMPs: Imperial	1.8.5. Indicated Air Speed M.P.M. Milas Per Hour S.L. See Level U.S.: U. S. Gallore IMP.: Imperial Gallore		
																		2 2	FIGURES H	TAVE NOT E	EN FLIGHT	CHECKE

			MODEL(S)					1	GHT	9	ERAI	NO.	NI	TRI	FLIGHT OPERATION INSTRUCTION CHART	NO NO	CHA	E			EXT	EXTERNAL LOAD ITEMS	LOAD	ITEMS		
		_	P-38H	T																TANK		SUPPORTS	OR		ONLY	
ENGI	KE(S):	V-17	ENGINE(S): V-1710-89		8 V-1710-91	0-9	_	CHA	ET WE	IGHT I	CHART WEIGHT LIMITS: 16,100	16,1	00		TO 13,500 POUNDS	500	POUN	82								
LIMIT	R.P. K.	CIN. H	M.P. BLOWER (IN. HG.) POSITION	ER MIXTURE ON POSITION	RE TIME		TOTAL G. P. H.	ENS colu	mn equ	TIONS al to or	INSTRUCTIONS FOR USING CHART: column equal to or less than amount of fue	N & TOOU	HART of fu	Sele	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising.	in FU	EL ng.	NOTES: Columns I	S: Co ns II, II	lumn I I, IV an	is for e	NOTES: Column I is for emergency high speed cruising only. Columns II, IV and V give progressive increase in range at a	y high ssive ir	speed or	ruising in rang	ronly. renata
WAL	3000			AR	2		360	Mor	ve horiz reater	contally than th	to left o	r right ! e or nau	and sele tical ai	ect RAI r miles	Move horizontally to left or right and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Ver-	ue equa	ا ت وتا	sacrific (G. P.	e in sp H.)and	eed. M dtruesa	irapeed	sacrifice in speed. Manifold pressure (M. P.), galions per hour (G. P. H.) and true airspeed (T. A. S.) are approximate values	e (M.) S.) are	e.), gal	ons pe	r hour values
MILITARY	3000	武		AR.	15		334	tica	lly bek	bus we	opposite	desire	d cruis	ing alti	tically below and opposite desired cruising altitude (ALT.) read	LT.)	per	for ref	erence	For	ffici	for reference. For efficiency maintain indicated airspeed	maintai	n indic	ated ai	rspeed
NORMAL	2600	44		AR.	NONE	<u>_</u>	226	opt	mum!	F. F.	L. A. S.	m pus	XI.O.K	E setti	optimum R. F. M., I. A. S. and MIXTOKE setting required.	red.		ceedin	mani	fold pre	BBure n	(i. A. S.) nourly. Adjust Mr. a sugary is acceding manifold pressure more than 3 in. Hg.	n 3 in. ]	Hg.	3	200
																						_		ļ		
		_		FUEL	3r		_	=					Ħ					2			FUEL			>		
!	RANGE IN AIR MILES	N AIR M	ILES	U.S.	υń	≨	RANGE IN	IN AIR MILES	(ILES			RANGE IN AIR MILES	IN AIR	MILES			RANGE	IN AIR	RANGE IN AIR MILES		u.s.		KANG	RANGE IN AIR MILES	R MILE	8
8TA:	STATUTE	<b>X</b>	NAUTICAL	GAL.		STATUTE	2	z 	NAUTICAL	7	STA	STATUTE		NAUTICAL	CAL	BT	BTATUTE	-	NAUTICAL	CAL	GAL.		STATUTE	_	NAC	NAUTICAL
AT 3.L	AT 12,000	-	AT 9.L. AT 12.000	300	0	O	20	GAL.	i .	LOW	ALLOWANCE NOT	NOT		AILA	AVAILABLE	z z	FLIGHT	T T	0		38		8		830	0
780	320	240	0 270	70 250	•	430	0		380		•	019		530	0		780		989	S.	250		920	_	830	2
260	290				•	9	0		350			260	_	7190	0		720		620	8	230		870		2	290
230	260	200	_	230 210	6	360	0		32			510	-	450	,		929		5	570	210	_	800	-	9	069
210	240			_		330	6		290		_	470		400	0		280		5	510	190		720		9	630
190	210					290	6		260		_	420		360	0		230		77	460	2		650		26	260
170	8	-	$\perp$	+-		260	0		230			370	-	320	0		470	-	41	410	150		570	-	3	28
2	160					220	0		8			320		280	0		400		ě	350	130		06h		¥	130
120	2					1 90	•		170			270		230	0		340		Ж	300	=		420		ř	360
001	9	+	00	9	9	160	0		140			220	-	190	0		280		12	240	ន		340		Ř	300
2	6		_		3 8	120			110			170		150	0		220		15	190	2		270		×	230
3 9	3 8				2 05	்	96		8			120		110	0		160		ĩ	140	8		1 30		H	170
	MAXIMIM CONTINUOUS	CONTIN	-	4	+	°	OPERATI	ATING DATA	TA	T		OPER.	OPERATING DATA	DATA		$\downarrow$	OPE	OPERATING DATA	DATA				MA	MAXIMUM RANGE	MANGE	
R. P. M.	LAB	A AND T	H. P. G.	ALT.	et R. P. M.		I. A. 8.	A STATE	H. P. O. H. P. A. H.	+ 4 4	R. P. M.	I. A. B.	MIX.	H F F	9 E X	R. P. M.	I. A. S. M.P.H.	<u> </u>	# c #	્ય ક	ALT. Feet	R. P. K.	I. I. A. S. M. P.H.	A MIX.	H In P	0 v H F 4 H
2600	238	A.R.	44 245 396	396 30000	2450		245 A	A.R.	39 18	197 378	2300	228	A.L.	35	130 355	2000	199	A.t.	8	93 321	3000	-	_			
2600	272		44 245 384	384 25000	2450	_	258 A	A .R .	38 194	367	2250	241	A.L.		126 343	1900	213	¥ : -		90 310			_			_
2600	285		44 245 370		20000 2400		267 A	A.R.	38 -	182 349	2150	250	A.L.	<u>-</u> ਲ	120 326	1750	222	A.L.	31	85 293	3000 3000	1600	ᇗ	۱.۲.	56	$\overline{}$
2600	293	+-			15000 2400	1	273 A	A.R.	├	172 330	2050	253	A.L.	34	113 307			<b>A</b> :L		79 274			_			55 234
2600	299	A. R.	44 245 343		12000 2350		275 A	A . R .	36 -	164 316	2000	253	A.L.	33	1 08 Z 92	1600	223	A.L.	ළ ල	19267	-	0 1600	_	_	_	
2600	303		44 245 332		9000 2350		276 A	A.R.	36 15	158 304	1900	253	A.L.	33	103 280	1600	222	A.L.	59	72 248	8 <b>3000</b>	0 1600	176	A.L.	23	50 208
2600	307		44 245 322	+	6000 2350	+	276 A	A. A.	35	152 291	1850	254	¥.	33	99 270	1600	221	A.L.	28	68 236	9003	0 1600	175	. A.L.		
2600	=									147 282	1800	255	A.L.	33	94 257	_	219	A.L.	27	65 224	3000	0 1600	173	3 A.L.		
2600	3 5									142 273			A.L.		91 2 47	_		A.L.		62 213	3 S.L.	1600	173	A.L.	21	42 177
		35 4011	NOTES ALLOW 50 CAL. FOR WARM-UP, TAKE-OFF & INITIAL CLIMB	NOTES WARM-UP.	S TAKE-OF	TINI #	IAL CLIM		-			EXAMPLE AT 15,800 LB.CROSS WT. WITH	LB. CRO.	EX AMPLE	1 250 1 1 1 2 50	, st.	CAL. OF FUEL			1. A. S.:	INDICATI	ED AIRAPE	LEGEND		1. 701. 1. 701.	THROT
	-	אדוא נווי	WANCK FOR	WIND. RE	CSERVE & (	COMBAT	<b>73 RE</b> Q.	á			TO FLY	T 780	TING TO	TAL ALL	(AFTER DEDUCTING TOTAL ALLOWANCES OF 50 TO FLY 780 STAT. AIRMILES AT 12,000 P	200 500 500	FT. ALT.			G. P. H.:	U. S. CAL TRUE AL	G. P. H.: U. S. CAL. PER HOUR T. A. S.: TRUE AIRSPEED	<u> </u>	440	A. R.: AUTO-RICH A. L.: AUTO-LEAN C. L.: CRUISING LEAN	LEAN
											WALIW	MAINTAIN 1600 RPM AND WITH MIXTURE SET A 1	X Tag	QNY .	223 MP1	MPH IND. AIRSPEED	RSPEED			i	RED PI	RED PICURES ARE PRELIMINARY.	RE PR	LIMINA	RY,	į

		*	MODEL(S)					FLIGHT	1 OP	ERAJ	NO.	INS	TRU	OPERATION INSTRUCTION CHART	Z	HAR	<b>—</b>			EXTE	EXTERNAL LOAD ITEMS	OAD F	TEMS			1
		۵	P-38H															-	TW0	165	GAL	GALLON		TANKS		
ENG	ENGINE(S): V		-1710-89	Ø	V-1710-	-91	СНА	RT W	CHART WEIGHT LIMITS: 18,100	LIMITS	18	00		TO 13,500 POUNDS	009	OUN	8	- 1								
LIMITS	B. P. M.		M. P. BLOWER (IN, HG.) POSITION	MIXTURE POSITION	TIME	TOTAL G. P. H.		STRU-	INSTRUCTIONS FOR USING CHART: column equal to or less than amount of fue	FOR US	SING C	HART nt of fu	: Selective to be	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising.	in FUE cruis <b>in</b>		NOTES: Columns	Colu II, III,	mn I is IV s.nd	tor en	NOTES: Column I is for emergency high speed cruising only. Columns II, III, IV and V give progressive increase in range at a	highs sive inco	peed cr rease in	uising range	only.	
WAR	3000	9 0		AR	5	360		ove hor	izontally	to left o	rright	and sele	ect RAN	Move horizontally to left or right and select RANGE value equal to	e equal 1		acrifice	in spec	od. Ma	unifold 1	sacrifice in speed. Manifold pressure (M. P.), gallons per hour	(M. P.	), gallo	ns per	hour	
MILITARY	3000	24		AR	15	33#		ally be	low and	opposite	desire	d cruis	ing sitit	tically below and opposite desired cruising altitude (ALT.)	T.) read		or refer	rence.	For e	fficie	for reference. For efficiency maintain indicated airspeed	sintain	indicat	ed sin	speed	
NORMAL	, 2600	) dtd		₩.	NONE	228		timum 	К. Р. М.	, I. A. S.	M pus	XTOR	E settin	optimum R. F. M., I. A. S. and MIXTURE setting required.	<sub>g</sub>	~ ŭ	I. A. S. eeding	) hour manifo	y. Ad	just RP sure m	(I. A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.	ly if nex 3 in. Hg	cessary 5.	to avo	ex-	
																	`									
		1		FUEL			=					Ш					IV			FUEL			Λ			
	RANGE IN AIR MILES	N AIR MI	LES	C.S.		RANGE	E IN AIR MILES	MILES			RANGE IN AIR MILES	IN AIR	MILES		æ	RANGE IN AIR MILES	N AIR B	(ILES		Ç.S.	-	RANGE IN AIR MILES	IN AIR	MILES		
BTA	BTATUTE	×	NAUTICAL	GAL.	8TA	STATUTE		NAUTICAL	CAL	BTA	STATUTE		NAUTICAL	JY.	8TA1	STATUTE	_	NAUTICAL	V.	GAL.	8TA	STATUTE		NAUTICAL	CAL	
AT 9.L.	AT 3.L. AT 12,000	0 AT S.L.	. 47 12,000	630		09	GAL		ALLOW	ANCE	NOT		AVAILABLE	- 1	IN F	FLIGHT	    ⊶-	0		630	_	1640		1420		
280	999	200	570	570	_	850		740	0	-	011		960		==	1370		1190		570	Ĭ	1630		1420	_	
530	009	0917	520	520		077		670	٥	_	0101		880		2	1250		1090		520	=	0611		1290	_	
08↑	540	727	0 470	£70		200		610	0		910		790	Ĺ	<u> </u>	1130		086		470		340		1170		
#30	480	370		#20		630		240	0	.=	810		710		~	0 101		880		470	=	1200		1050	_	
380	430	330		370		220		480	Q		720		630		~	890		770		370	<u> </u>	0901		8	_	
330	370	280	320	320		081		410	0		620	-	55	_		0/2		670		320		920		98		
280		240	0 270	270	_	400		350	Q	-	520		7460		~	650		560		270	-	077		670	_	
220	250	190	220	220		330		280	Q.		430		370			530		7460		220	_	630		550	_	
170	200	150	071 6	170		250		220	Ģ		330		290	_		6 H		360	<u> </u>	170		06 #	<u> </u>	450		
120	2	110	120	120		180		150	0		230		200		. •	290		250		120		340		300	_	
2	80	9	07 0	02		8		6	06		<b>9</b> ±		120		_	170		150		0,		200		170	_	
*	MAXIMUM CONTINUOUS	CONTIN	nous	L		OPERA	OPERATING DATA	ATA			OPER.	OPERATING DATA	DATA			OPERA	OPERATING DATA	V.T.A				HAXID	MAXIMUM BANGE	NGE		
R. P. M.	I. A. S. M.P.H.	MIX. In. TURE In. Hr.	0 a xi	ALT. Feet	R. P. M.	I. A. S. M.P.H.	MIX- TURE	In. P.	9 5 H	R. P. M.	1. A. S. M.P.E.	MIX. TURE	M. P. G. Лв. г. Ид. В.	H of as	R. P. M.	I. A. S. M.P.H.	MIX.	H. H.	He	ALT. Feet	В. Р. М.	LAB. K.P.E.	MIX.	4	Q V, PI	
2600		A . R . 44			2500	222	A .R.	40 2	211 347	2300	200	A.R.	35	149 322	2150	187	A.L.	33 11	114 306	3000						
2600	248	A . R . 44			2500	238	A.R.	2 2	205,339	2300	812	A.R.	35 14	146 315	2050	202	A.L.	33 11	111 298	25000	1850	178	A.L.	8	85 269	
2600	259	A.R. 44	_	20000	2450	245	¥. ₩.	39	195 322	2300	822	¥.L.	35 13	130 300	1950	211	A.L.	33 10	105 282	20000	1700	182	A.L.	-	79 252	
2600								38	185 305	2300	237	A.L.	35 13	130 288	1850	217	A.L.	33 10	100 267	15000	1600	185	A.L.	8	74 236	
2600						253		37	178 292		240	A.L.	35 13		1800	217	A.L.	8	95 255	12000	1600	184	A.L.	58	70 224	
2600	+	A.R. ##	T		2400	255	A.R.	37 1	171 282	2200	242	4.L.	34 12	125 268	1750	218	A.L.	33 9	91 24 th	9000	1600	183	A.L.	28 (	67 212	
2600		A.R. ##				257	A.R.	36	1 63 271	2150	243	<b>≯</b> :	34 12	120 257	1650	218	A.L.	33 8	87 233	9	1600	180	4.L.	27 (	63 200	
2600									158 262	_	-			247	1600				83 223	300	1600		A.L.		_	
2000	288	A.R. 44	1 245 278	3 3.1.	2350	261	A .R.	35	154 253	2000	244	A.L.	34 110	22	1600	217	A.L.	32 8	80 213	S.L.	1600	175	۸:۱.	25	56 179	
	O 45	LOW 60 US ALLOW	O ALLOW 60 GAL, FOR WARM-UP, TAKE-OFF & INTIAL, CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQUE	NOTES ARM-UP, TAI IND, RESER	KE-OFF & I VE & COMB	NITIAL CL IAT AS RE	O'D			AT 17 (AFTER TO FLY MAINTA	7,740 1 DEDUCT 1370 UN 1800	E. CROSK ING TOTA STAT. A	EXAMPLE AT 12,740 LB.GROSS WT. WITH (APTER DEDUCTING TOTAL ALLOWA TO PLY 1370 STAT. AIRMLES AT MAINTAIN 1830 RPM AND 217		= : #	CAL) C.ALT.		ائن ⊏	A 25. 17. P. P. 18. P. P. 19. P. P. 18. P. P. 18.	DICATED ANTFOLD S. CAL. PI UE AIRSE A LEVEL	LEGE LA 3.: INDICATED AIREFEED M.P.: MANIFOLD PRESSUR G. P. H. U. 3. CAL PER HOUN T. A. S. TRUE AIREFEED 8. L.: SEA LEVEL	LEGEND FED UNE	55440 55411	FULL RI AUTO-RI AUTO-LI CRUISOR	F. T.: FULL THROTTLE F. R.: FULL RICH A.E.: AUTO-LEAN C. L.: CRUISING LEAN	
										HELM	WITH MIXTURE SET	- 1	A-L .													

		MODEL(S)				ï	FLIGHT		PERA	TION	Z	STR	UCT	OPERATION INSTRUCTION CHART	CHAI	R			EXT	EXTERNAL LOAD ITEMS	LOAD	ITEMS			
		P-38H																0 <b>X</b> ⊢		300 6	GALLON		TANKS	S	
ENGINE	- \ :(s):	ENGINE(S): V-1710-89	8 V	8 V-1710-91	16	CHA	RT W	EIGHT	LIMIT	CHART WEIGHT LIMITS: 19,500	500		TO 13	TO 13,700 POUNDS	POUN	NDS					l				
LIMITS	R.P. M.	IN. HG.) POSITION POSITION	MIXTURE POSITION	TIME	TOTAL G. P. H.	ļ.—	STRU umn ec	CTION:	S FOR 1	USING (	CHAR unt of f	: Se	lect figu	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising.	JEL ing.	NOTE	S: Co	lumn I	is for end V give	NOTES: Column I is for emergency high speed cruising only. Columns II, III, IV and V give progressive increase in range at a	y high	speed	cruisin in ran	g onl	<u>.</u> خدا
WAR	3000	60	AR	5	360		ove hor	izontall	y to left	or right	and se	lect RA	ANGE V	Move horizontally to left or right and select RANGE value equal to	al to	sacrific	e in sp	eed. M	political	sacrifice in speed. Manifold pressure (M. P.), gallons per hour	e (M. P	P.), gal	lons pe	er hou	in S
POWER	3000	54	AR	15	334		ally be	low and	d opposi	te desire	ed crui	sing al	titude (	tically below and opposite desired chuising altitude (ALT.) read	read	for ref	erence.	For e	ffici	for reference. For efficiency maintain indicated airspeed	naintain	n indic	ated a	irspe	e G
NORMAL RATED	2600	ממ	AR	NOME	226	<u>-</u>	timum	R. P. N	f., I. A.	optimum R. P. M., I. A. S. and MIXTURE setting required.	IIXII	RE set	ting req	uired.		(I. A. ceeding	(I. A. S.) hourly. ceeding manifold	ırly. At fold pre	djust Rl ssure m	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.</li> </ol>	ıtly if n. 13 in. H	lecessar Ig.	y to as	roid e	-x
	-		FUEL			II				!	Ħ					ΙΛ	İ		FUEL			>			
RA	RANGE IN AIR MILES	R MILES	U.S.		RANGE	RANGE IN AIR MILES	MILES			RANGE	RANGE IN AIR MILES	MILE	ςς.		RANGE	RANGE IN AIR MILES	MILES		U.S.		RANGE	RANGE IN AIR MILES	R MILE	Si	
BTATUTE	E	NAUTICAL	GAL.		STATUTE		NAUTICAL	CAL	ST	STATUTE		NAU	NAUTICAL	:	STATUTE		NAUTICAL	CAL	GAL.		STATUTE	_	NAU	NAUTICAL	l,
			906		0	60 GAI	¥	LLOW	ANC	GAL. ALLOWANCE NOT	•	AIL	AVAILABLE	Z.	FLIGHT	HT	0		906	2,2	2210	-	19	1920	
			8#0	_	1180		1030	_		1510		1310	0.1	_	1840		1600	0	840	2.	2200		15	1910	
			810	_	1130		066	_	_	09h		1260	00	_	1780		1550	0	810	2	2110		35	1840	
			730	<del>-</del>	1020	· -	88		<u>-</u>	310		1140	G	_	1610		1390	0	730	=	0161		16	1660	
			650		016		790	_	_	170		1010	0	_	1430		1240	0	650	<u>-</u>	1700		14	1480	
-	, , , , , , , , , , , , , , , , , , , ,	,	570		800		002	_		030	_	8	890	_	1250		1090	0	570	<u>-</u>	06		12	1290	
•	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	7 =	06+		069		88		<del>i</del>	880	ļ	7.5	750	· -	1080		040	2	<b>6</b>	= 2	1280	_	1	1110	
			01+		570		200	_		240		9	640		900		780	0	410	<u> </u>	1070		O)	930	
			330		091		8	_		980		51	510		730		630	0	330		860		^	750	
			250		350		310	     _	-	450		36	390		550		480	0	250		650		, L	570	
			170		240		210	_		310		27	270		370		320	2	170		0 11		(*)	390	
			96		130		110	_		091	-	14	140		200	_	170	0	8	.,	230		CV.	200	
MAX	MAXIMUM CONTINUOUS	TINUOUS			OPER	OPERATING DATA	ATA			OPEH	OPERATING DATA	DATA			OPER	OPERATING DATA	DATA				MAXI	MAXIMUM RANGE	ANGE		
R. P. M.	L. A. S. MIX- M.P.H. TUNE	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	ALT. Feet	R. P. M.	I. A. S. M.P.H.	MIX. TURE	2 S K	Q 0, 1€ E ≪ €	R. P. M.	I. A. S.	MIX.	* = %	0 5 X	R. P. M.	I. A. S. X.P.H.	MIX.	д н ж ж. н ж	e	ALT. Feet	R. P. M.	I. A. S.	MIX.	X F F F	9 4 4	<b>⊬ ∢ œ</b>
			30000	2550	216	A.R.	41 2	219 340	2350	195	A . R	36	157 316	6 2200	185	A.L.	34	123303	30000						
_	Use Column	2 0	25000	2500	233	A.R.	40	213 332	2350	211	A .R	35	153 307	2200	200	A.L.	34	121 296							
			20000	2500	241	A .R.	39 2	203 316	2300	223	A.R.	35	147 295	5 2100	509	A.L.	34	115281	20000	1750	182	A . l.	31	87	252
			15000	2450	242	×	38	192 300	2300	230	A.R.	₹	141 281	2000	216	A.L.	33	109266	15000	1600	188	A.L.	. 32		238
Max. 1	Max. Permissible IAS	ble IAS with	12000	2#00.	249	A.R.	38	184 288	2300	234	A.L.	35	130 272	1950	217	A.L.	33	104254	12000	1600	186	A.1.	31	78	226
300 8	allon can	100 gallon tanks-250 MPH.	8	2400	250	A.R.	37   17	178 277	2300	239	A.L.	35	130 265	9001	218	A.L.	33	100 246	9006	1600	184	A .L .	3	73	214
			9	<b></b> -	Use	Calumn 3	ი		2250	12	A.1.	æ.	127, 255	1800	219	A.1.	33	96234	9009	1600	182	A.L	A.L. 29	69	202
	Use Column	umu 3	8 - 2		Permis gallon	Max. Permissible 1AS with 300 gallon tanks-250 MPH.	1AS 1	with MPH.	2200	242	A.L.	<b>#</b> #	122 245	1750	220	¥:-	8 8	92 224	<u>8</u> -	1600	180	A 4	28	66	191
			1						3 7	243	¥:	5	110 23		-1	١,٠	25	017100	_	3	4			1	
_	O ALLOW	NOTES  ALLOW 60 GAL. FOR WARM-UP, TAKE-OFF & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQ'D.	NOTES ARM-UP, TAI	KE-OFF & 1	NITIAL CI BAT AS RI	LIMB EQ'D.			[ TA  FFA)	EXAMPLE  PO 00  (AFTER DEDUCTING TOTAL ALLOWANCES OF  (AFTER DEDUCTING TOTAL ALLOWANCES OF  TO ELY 1800 STAT. ANAMILES AT 19 000	LB. CRO	EXAMPLE 385 WT. WITH 17AL ALLOW AIRMILES	VIE 900 LOWANCES O		CAL. OF FUEL 7 60 CAL.) (2) FT. ALT.			LA. S. I. N. S. I. N. P. I. M. P. I. M. P. I. M. T. A. S. I. T. S. I. T. A. S. I. T. A. S. I. T. S. I. T. A. S. I. T.	INDICATEL MANIFOLD J. S. GAL. I RUE AIRS	LEGI INDICATED AIRSPEED MANIFOLD PRESSURE U. S. GAL. PER HOUR	LEGEND EED URE	7.7.4 1.8.4.4	F.T.: FULL THROTTLE F.R.: FULL RICH A.R.: AUTO-RICH A.L.: AUTO-LEAN	THROTTLE RICH -RICH	TTLE
									MAIN	MAINTAIN 1950 RPM AND 217 WITH MIXTURE SET & 1	50 RPA	M AND	712	MPH IND. AIRSPEED	RSPEED			\$. L.:	SEA LEVE	d		73	CRUI	SING LE	EY.

Fig. 16   Fig.			$\overline{}$					,	1 . 1			<u> </u>		ŀ	_							_	<del></del>				Т			- 1		_	_ [	b) 1
NG  E   NG  NG   NG   NG   NG   NG   N	_	6		nly.	non	ge eg	ķ				ij													Fi 4 €			1	,			_		_	- N
NG  E   NG  NG   NG   NG   NG   NG   N	0		5	nge s	per h e val	airsp	void			EB	UTIC		50	99	06	30	070	110	20	190	120	9	64				1			$\rightarrow$	-		1	THE PERICH SING
NG  E   NG  NG   NG   NG   NG   NG   N	A T I	ΞŞ	2	ruisi in ra	ons r	ted	\$			WIL.	NAI		•	S.	J	J	e	(F)	ev .	-	-		ANGE	H 7. P.			$\downarrow$			;	<b>T</b>	<del>2</del> 2	2	A VICE
NG  E   NG  NG   NG   NG   NG   NG   N	ER /	EAT	5	sase i	gall	ndica	36881		Λ	N AIR					_							_	UM R	MIX-						-	. ب	<u>.</u>	ا بِ	<b>8. 8. 4. 4. 9</b> 中國國際計畫
NOTICE   N	100	<u> </u>	扎	incre	P.),	i uia.	Hg.			GE I	M												XIM			-	+		_	+				
NOTICE   N	roy	ER	S	y nig ssive	S.)	naint	tly if			RAN	ATUT		710	3	570	200	430	360	280	210	9	2	Ž				1			-	_		_	SGEN E
NOTICE   N	NAL	1 3	ž	genc	BBUF	c y ı	sligh thar				ST		•				_							P. M.						1	100	030	020	LI ESSUR HOUR D
NOTICE   N	TER.	<u>Б</u> 1	4	emer ve pr	d pre	ien	more m		٦			_		-	_		_		_		_	_	┞	`	<u> </u>	-	•		-	-+		_	ᅱ	ED AII
NOTICE   N		8	٦	V sri	nifok	fic	just j		FUE	U.S	GAI	8	52	225	ž	17	20	125	≗	75	20	52		ALT Feet	900	220	8	8	8 8	3	ş	8 ;	S.	DICAT
NOTICE   N	] E	٠,	Z.	er Tu	Ma ue ai	or e	Adpres											_			_		T	F < €			_			3	500	195	6	2.5.7.3.7. 5.3.7.8.8
NOTICE   N	ž	EAL	_ _ _ _	olum III, I	peed,	نوا	urly.			D.	LICAL		30	2	2	20	ଷ	9	10	09	10	20		5 A H			$\neg$	79	77	٥	74	72	ᆌ	- 3 F
NOTICE   N	S	<u> </u>	Ľ	B.II.	eins H.)a	renc	man man			MILE	NAU	0	ດິ	₹	3	æ	e	~	2	-	1		ATA	K. P. In. Hr.				36	35	8	35	34	34	
NOTICE   N	١.			lum	erific P	Je .	A. S		۸	AIR		_								_			ING	CIX.				æ	<u>.</u>	ا بد	~	~	æ	
NGLE   F. NG INE   Solid State   P. NG INE   P. NG ING ING ING ING ING ING ING ING ING	¥			<b>ဒ</b> ိပိ	58(	2 5	E 5		-	EIN		H											BRAT				+	_						
NGLE   F. NG INE   Solid State   P. NG INE   P. NG ING ING ING ING ING ING ING ING ING	🕺	Š	질.		유	pg .				RANG	TUT	LIG	9	25	8	30	99	00	9	8	20	9	OPI	I. A.				163	168	128	98	185	188	TUEL GAL.) ALT.
NGLE   ENGINE   Page    z	9	2	r iei	equal	 	_:				ST.	l	v	-	•	-		.,		-				P. X.				350	350	38	900	300	300	50 50 FT	
NGLE   ENGINE   Page    ₽	ú	č.	for co	alue e flown	(ALT	uired				 	· -								_			╀	1	_					-				0 0 000,000 dni h	
NGLE   ENGINE   Page    <u>5</u>		<u>-</u>	ngu need	$GE_{v}$	nde	g req				14	BLE															$\neg$		_	<u>-</u>		- 1	_ [	1 Z.	
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	⊋	ì	۲ [	select to pe	RAN ilea	altit	ettin			CES	UTIC	LA	470	8	380	330	280	240	190	1.60	<u>6</u>	5	<				- 1				88	85	8	WPLE I. WITI VILOW II.ES
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	ST	,	I,	fuel	elect.	ieing	RES			R MI	ž	VAI											DAT				39	<u>8</u>	8 8		. 37	. 37	8	EXA DIAL OTAL O
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	Z	Š		nt of	and so	d cru	XTO		E	IN A	_	1		-			-					_	NIL	XX			¥. K	A.R	¥ .	¥	A.R	A.R	A.R	INC TO STAT
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	3	4	0	amou Benou	ight	esire	M Pu			NGE	1	LON						_	_		_	_	PER	A. 9.			_	2	<u>د</u> و	2	8	86	6	00 1 EBUCT 600 235
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	E	1	<u>.</u>	USI han	torr	ite d	S.			2	FAT	1	550	8	£	380	330	270	220	9	=	5	ľ		-		- 1			-4				15,7 TER DI 1LY NTAIN H MIX
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	2		I W	less t	to lef	oddo	I. A.				52	NC												ā.			245	<b>5</b> #2	2#2	240	240	240	235	14 0 1 1 1 W
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	9		HTI	toor	tally an th	and	'. M.,				<u>'                                     </u>			$\vdash$									T	i	927	17.	797	8	9 3	- 3	124	913	607	
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	=		/EIG	og ug	rigon er th	elow	1 R. I			m	ICAL	LL	0		0	0	0	0	0	0	0	0		0 4 pt				92	12		9		98	
NGLE   ENGINE OPERATION   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-38H   NGLE   P-37H   NGLE   NGLE	3		KT	I I I	ve ho	lly b	imun			MILES	TUV		CH CH	, œ	8	23	25	21	17	13	80	J	¥	4 5 E			_	-	_	+			- 68	
N G L E	<u> </u>		CHA	i los	M c	tice	opt			AIR 1	2	AL		İ									(C D)			~	=				=	~		
N G L E			ŀ	4 4					=	EIN				1									ZATI)		<u> </u>	٠	٠	₹	₹ .	₹	<u> </u>	- <b>₹</b>	_	44
N G L E		z		C. P.	38(	33	226			ANG	<b>E</b>	0	9	ı R	2	2	8	9	8	2	2	8	OPEF	I. A. S.	991	179	6	197	502	8	207	209	212	ERVE
N G L E IN E (S) 300 (S) 1		2	9	빌브						-	STAT		¥	¥	ကိ	8	55	7	=	=	Ξ	_			2	0	٥	_	_	0			0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
N G L E IN E (S) 300 (S) 1		Z Z	2		2	15	Š													L				, a.	260	260	260	255	255				245	WIND.
N G L E IN E (S) 300 (S) 1		E	-	TURE	~	œ	<u>α</u>		UEL	s.	AL.	8	20	125	8	75	요	125	8	22	20	25		LT.	8	8	8	8	8	8	8	8	Ϊ.	                         
N G L E IN E (S) 300 C C C C C C C C C C C C C C C C C C		0	ร	POSI	4		<u> </u>		표	<u> </u>	1	<del>                                     </del>		~			_						+							_			-	NON
N G L E IN E (S) 300 C C C C C C C C C C C C C C C C C C	E(S)		- 1	OWER							1	8,	000	32	310	270	2 E	200	160	120	8	읈			3 27	3 27	3 26	3 25	3 24	3 5€	3 23	3 22	3 22	N TWO
N G L E IN E (S) 300 C C C C C C C C C C C C C C C C C C	ODE	Z 0	٦	12 2			 			EB	UTIC	1		-						Ļ.			Sno		12	-2	$\neg$	2	-2	-2	_		17	M. F.
N G L E IN E (S) 300 C C C C C C C C C C C C C C C C C C	ے ج	Z		H. HG	90	54	77			R MII	ž	3. L.	250	32	280	250	210	188	140	110	70	₽	TINU		₹	#		≢.	<b>≢</b>	<b>3</b>	<u></u>	_≢	3	40 07 11 CLT
N G L E IN E (S) 300 C C C C C C C C C C C C C C C C C C		ш.	-						г	NAT	<u> </u> _			<u> </u>						-			CON	MIX.	A.R.	A.R.	A.R.	A.R	A.R	A.R	A.R.	A.R	¥.	ALLOW INITIA
SING ENGINE LIMITA WILUTER WINDTER MATED  120 870 120 120 120 120 120 120 120 120 120 12		L E	<u>@</u>	R. P.	3000	3000	2600			GE L	M	2,0	20	0	360	320	270	230	8	9	06	20	MUM	1	-	_	=			m	6	≢.		
S   ENC     LINKIT		9 Z	Z				1			Z.	15	ار ۲		i-						$\vdash$			MAXI		-	_	-		7				_	
1   2   2   2   2   2   2   2   2   2		S	Ĕ	LIKIT	WAR	POWE	RATE				BT,	AT S.	9	370	330	290	240	200	160	120	80	Ç	1	P. M.	89	909	009	009	909	009	909	009	909	
	<u> </u>	-				-			<u> </u>	l							1		_				L	K	7	7	7	7	7	~	7	7	7	

			MODEL(S)	(S)			_	<u> </u>	FILGHT		PEDA	OPERATION INCIDING TO THE	2	L			2	ADT			ä	EXTERNAL LOAD ITEMS	VI 10	VD ITE	2		
	α.	-38J	and		F-5B			-									5		_								
ENG	INE(S)	ENGINE(S): V - 1710	0-89	Φ	V-1710	16-01	_	CH/	ART W	EIGHT	CHART WEIGHT LIMITS:	S: 17,	400		2	TO 13,500 POUNDS	2	UNDS		Ţ	TANK	SUPPORTS	ORT		ONLY		
LIMITE	B R.P.M.	H. E.P.	P. BILO (G.) POSI	BLOWER MIXTURE POSITION POSITION		TIME	TOTAL G. P. H.		STRU Jumn e	CTION TUB to	S FOR	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising.	CHAR	T: Se	lect fig.	Select figure in FUEL to be used for cruising.	FUEL	NO	NOTES: (	Column	I is for	NOTES: Column I is for emergency high speed cruising only.	ency hi	gh spee	d cruis	ing or	1. v.
WAR	3000	00   60			AR	5	360	×	ove hor	rizontal	ly to left	Move horizontally to left or right and select RANGE value equal to	t and Be	elect R.	ANGE	value eq	ual to	S.B.C.	ifice in	apeed.	Manifo	sacrifice in speed. Manifold pressure (M. P.), gallons per hour	ure (M	(. P.),	allons	Der h	our.
MILITARY POWER	3000	20 54			ω W W	15	33#	<u> </u>	greate	sr unam slow an	tne stat d opposi	or greater than the statute of nautical air miles to be hown. Yer- tically below and opposite desired cruising altitude (ALT.) read	ed crui	earmii isingal	es to be ltitude	MOWII.	ver- read		r. н.) referen	and tru ce. Fo	e airape r e f f i	(G. P. H.) and true airspeed (T. A. S.) are approximate values for reference. For efficiency maintain indicated airspeed	V. S.)	are app tain ind	roxima licated	te val airso	eed pee
NOBIKAL	M 2600	00 04			AR	NONE	226	g.	timum	R. P. I	И., I. А.	optimum R. P. M., I. A. S. and MIXTURE setting required.	LXL	RE set	ting re	quired.		(I. )	A. S.)	nourly.	Adjust ressure	(I. A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.	ightly i han 8 ir	f necess	ary to	avoid	ex-
																											1
		I		-	FUEL			=					Ħ					IV			FUEL	II.					
	RANGE	RANGE IN AIR MILES	ILES		U.S.		RANCE	IN AIR	IN AIR MILES			RANGI	E IN AI	RANGE IN AIR MILES	Si,		RAN	RANGE IN AIR MILES	IR MIL	ES	C. S.	mi	ž	RANGE IN AIR MILES	AIR MI	LES	
8TA	STATUTE	z —	NAUTICAL		GAL.	STAT	STATUTE	_	NAUTICAL	CAL	ST	STATUTE		NAU.	NAUTICAL		STATUTE	<u>بر</u>	NAT	NAUTICAL	GAL.		STATUTE	2	ž	NAUTICAL	بد
AT 8.L.	AT 12,000		AT S.L. AT 12.000		0 #		° 20		. A	GAL. ALLOW		ANCE NOT		VAIL	AVAILABLE	EI EI		FLIGHT	0		2	٥	1220			1060	
0 <b>±</b>	450	35	_	390	360	3	909		520			810		700	0		80		40	870	360	_	1210		•	1050	
380	430	330	_	370	340	2	570	_	490			760		999	Q		950	•••	œ	920	3#0	•	0+1			066	
350	390	300		340	310	25	520		450			969		900	9		870			750	310	6	95			910	
310	350	270		310	280	÷	470		410			620		540	0		780		9	089	280	•	940			620	
280	310	240		270	250	¥	420		360			260		067	Q		700		•	610	250		840			730	
250	280	210	_	240	220	'n	370		320			06 h		430	0		9		<u>س</u>	530	220	0	740	İ		640	
210	240	180		210	067	č	320		280			420	_	370	0		530		J	460	8	_	9			550	
180	200	160		170	091	2.	270		230			360		310	0		450		(*)	390	9	•	940			470	
150	160	130		140	130	77	220		190			290		250	0		360		   	310	30	6	0##			380	ĺ
<u> </u>	130	100		110	8 8		0 !		150			2 20		190	Q		280	-	ev	240	8 8		340			290	
2	MAXIMUN	MAXIMUM CONTINUOUS	- 1	80	?		OPERA'	TING DATA	100 VI			160 OPER	OPERATING DATA	140		+		OPPRATING DATA	CDAT	170	+	_	240	MAXIMIN BANCE	DANG		1
R. P. M.	I. A. B. K.P.H.	MIX.	H. P. G. Hr. H.	F < 0	ALT. Feet	R. P. M.			i	- A - E	R. P. M.		MIX	M. P. In. Hg.	O C H	R. P. M.		B. MIX.	7. E. P. RE. P. HE.	9 A H	ALT. Feet	F. 75	<u> </u>	B. MIX.	الان الان الان	0 a =	
2600	252		44 245	388		2450	240	A.R.	39 20	200 371	2300	22	A.L.	35	131 346	2050	0 201	1 A.L.	32	104	323 30000	006t 00	271 0	2 A.L.	. 27	77	282
2600	264		44 245	374		2450	248	A.R.	38	189 352	2300	232	A.L.	35	131 331	1900	0 208	9 4.∟.	32	98 30	304 <b>25000</b>	1750	0   175	5 A.L.	. 27	71	267
2600	277	A.R.	44 245	36	20000	24 00	256	A.R.	38 17	179 335	2250	239	A.L.	3#	127 314	1750	212	2 A.L.	. 32	91 28	283 20000	1650	0 178	8 A.L.	. 27	99	248
2600			44 245	348		24 00	797	A.R.	37 17	172 323		246	A. L.	34	120 298	1650	0 219	9 A.L.	33	87 26	15000	1600	0 178	B <b>A.L</b>	. 26	61	229
2600			44 245	340		2350	267	A.R.	36 16	166 308	2100	249	¥. Ł.	34	116 288	38 1600	0 217	7 A.L.	33	82 25	255 12000	1600	0   173	3 A.L	. 25	22	212
2600	302	A.R.	44 245	331	900	2350	271	A.R.	36 16	160 298	2050	250	A.L.	33	111 276	1600	0 217	7 A.L	. 31	78 243	<b>3000</b>	1600	0 169	9 A.L.	. 24	53	199
2600			44 245	321		2350	273	A.R.	35 15	154 287	2000	251	<b>A</b> .L.	33	107 265	1600	0 216	6 A.L.	30	75 231	87	1600	0 165	5 A.L.	. 23	20	187
2600			44 245	=	$\overline{}$	2300	275	A.R.		149 277	8	251	A. L.	33	102 254	1600	0 215		. 29	17		_				47	173
2600	3 1	A.R. 44	4 245	302	S.L.	2300	279	A.R.	ᇎ	144 269	1820	252	<u>.</u> .⊢	33	99 245	1600	0 214	4 A.L.	. 28	99	210 S.L	1600	0 161	1 \A.L.	- 53	917	168
	0	NOTES ALLOW 50 CAL FOR WARM-UP TAKE-OPT & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, PESSENCE & COMBAT AS REQUI	GAL. FO	NOTES DR WARM-UP, OR WIND, RES	TES -UP, TAKE RESERVE	-OFF & IN	TIAL CLII TAS REG	<b>B</b> d			AT (AFT) TO FI	AT 17,400 LB GROSS WT. WITH 410 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.) TO FIX 1000 STATAIRMILES AT 12,000 FT. ALT. MARIYANI 1600 RPM AND 217 MPH 190. ABREYERD	LB.GRO	EXAMPLE 388 WT. WITH TAL ALLOW AIRMILES A	PLE WITH 4: LOWANCE LES AT 1:	410 GAL OF FUEL ICES OF 50 GAL.) 12,000 FT. ALT. MPH IND. AIRSPÉEED	OF FUEL C CAL.) FT. ALT.	1		4 A B B B B B B B B B B B B B B B B B B	1.A.S.: INDICATED / M.P.: MANIFOLD P G.P.H.: U. S. GAL, PE T.A.B.: TRUE AIRSPI S.L.: SEA LEVEL	LEGI INDICATED ARRENED MANIFOLD PRESSURE TAUE ARRAPEED SEA LEVEL	LEGEND EED IURE UR		F.T.: FULL THROTTLE F.R.: FULL RICH A.R.: AUTO-LEAN C.L.: CRUISING LEAN	FULL THROTTLE FULL RICH AUTO-RICH AUTO-LEAN CRUISING LEAN	£ 3
											HTT.M	WITH MIXTURE SET A.L.	E SET	A.L.													

MS	KS		d cruising only. se in range at a rallons per hour	dicated airspeed	ary to avoid ex-		AIR MILES	NAUTICAL	1560	1550	1430	1290	1160~	1020	068	750	610	1690	340	200	1 RANGE	X. M. P. G. T. RE In. P. A. H. B.	L. 30 95 276	31 88	33	L. 31 <b>79</b> 229	3	- 29	L. 28 66 192	27	26 58	E T.: FULL THROTTLE F.R.: FULL RICH A.L.: AUTO.RICH C.L.: CRUSING LEAN
EXTERNAL LOAD ITEMS	GAL. TANK		NOTES: Column I is not emergency high speed cruising only. Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Manifold pressure (M. P.), gallons per hour of D. V. and the column of M. P., gallons per hour of D. V. and the column of M. A. A. C. C. C. C. C. C. C. C. C. C. C. C. C.	for reference. For efficiency maintain indicated airspeed	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.</li> </ol>	Λ	RANGE IN AIR MILES	STATUTE	1780	1770	0491	06+1	1330	1170	1020	860	780	920	380	230	MAXIMUM RANGE	R. P. M. I. A. S. MIX. M.P.R. TURE	2000 165 A.L	170	1700 175 A.L.	1600 178 A.L	1600   176   A.L.		1600   171   A.L.	1600 169 A.L.	163	END
EXTE	. 65	,	V give	fficie	just RP gure mo	FUEL	U.S.	GAL.	740	680	630	570	5 10	¥50	390	330	270	2 10	33	90		ALT. Feet	30000	25000	20000	15000	12000	900	0009	300	S. L.	DICATED ANIFOLD S. CAL. P UE ARSI
	OMI		NOTES: Column I is Columns II, III, IV and sacrifice in speed. Ma	eference. For el	. S.) hourly. Adj ng manifold pres		R MILES	NAUTICAL	0	1300	1200	1090	910	860	011/	630	520	001	280	170	DATA	M. P. G. T. H. R. R. 88.	. 34 126 309	34 119 291	34 113 275	. 33 107 260	33	33 97	. 33 94 229	33	32 86	LEG I. A. 9. INDICATED AIRSPEED M. P. MANDICOLD PRESSURE C. P. H.: U. S. CAL. PER HOUR T. A. S.: TRUE AIRSPEED S. L.: SEA LEVEL
IART		SUNDS	NOT Colur sacrif	for	(I. A	IV	RANGE IN AIR MILES	тЕ	FLIGHT	_		_						_		_	OPERATING DATA	I. A. S. MIX- M.P.B. TURE	190 A.L.	196 A.L.	204 A.L.	210 A.L.	212 A.L.	212 A.L.	13 A.L.	213 A.L.	_	# 7 F 9
S C		500 POUNDS	in FUEL cruising. equal to	T.) read	d.		RA)	STATUTE	N FL	1500	1390	1250	1 120	066	960	730	280	1460	330	200	0	R. P. M. I. /	2250 19	2150 19	2050 20	2000 21	1900 21	1850 21	1800 213	1700 2	1650   21	GAL, OF FUEL F 60 GAL.) O FT. ALT. ND. AIRSPEED
NSTRUCTIC		TO 14,	S 3 2 2	tically below and opposite desired cuising altitude (ALT) read	optimum R. P. M., I. A. S. and MIXTURE setting required.		AIR MILES	NAUTICAL	AVAILABLE	1060	086	830	008	700	610	510	450	330	230	140	AG DATA	M. P. G. T. In. Hg. Hg. H. S.	A.R. 36 161 322	35 151 304	A.R. 34 144 287	A.L. 35 131 276	A.L. 35 191 268	A.L. 35 131 261	A.L. 34 125 251	A.L. 34 120 241	A.L. 34 115 232	PLE 740 LOWANCES OF 12,00 212 MPH 1
ERATION I		JMITS: 19,40	INSTRUCTIONS FOR USING CHART: column equal to or less than amount of fuel Move horizontally to left or right and select contract than the stering or monthly as elect	opposite desired cr	I. A. S. and MIXT	111	RANGE IN AIR MILES	STATUTE	ALLOWANCE NOT	1220	1130	1000	920	810	700	280	061	380	270	160	OPERATING DATA	R. P. M. L. A. S. MIX-	2350 200 A.	2350 208 A.	2300 216 A.	23 00 226 A.	2300 231 A.	2300 235 A.	2250 237 A.	2150 238 A.	2100 239 A.	AT 19,400 LB.CROSS WT.WITH (AFTER DEDUCTING TOTAL ALLOWA) TO FLY 1500 STAT. AIRMILES AT MAINTAIN 1900 RPM AND 212 WITH MIXTURE SET A.L.
FLIGHT OPERATION INSTRUCTION CHART		CHART WEIGHT LIMITS: 19,400	INSTRUCTIONS column equal to or Move horizontally	tically below and	optimum R. P. M.,	_	SE IN AIR MILES	NAUTICAL	GAL. ALLOW	830	07.7	700	620	550	084	400	330	260	180	110	AG DATA	MIX- M.P. G. T. TURE II. P. H. S.	A.R. 41 223 347 3	A.R. 40 210 327 2	A.R. 39 198 308 2	A.R. 38 189 294 2	38 183 285	A.R. 37 175 274 2	A.R. 36 169 264 2	A.R. 36 164 256 2	A.R. 36 158 247 2	
		V-1710-91	11ME TOTAL LIMIT G.P. H. 5 360	15 334	NONE 226	11	RANGE IN	STATUTE	09 0	950	880	900	210	630	550	091	380	290	210	130	OPERATING DATA	R. P. M. L. A. S. MI	2550 221 A.	2500 229 A.	2450 234 A	2450 242 A.	24 00 246 A.	2400 249 A	2400 251 A.	253	2350 255 A.	NOTES ALLOW 5C CAL, FOR WARM-UP, TAKE-OFF & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQ'D.
	– 5B	8 V-	NATURE	AR.	AR	FUEL	U.S.	GAL.	240	089	630	570	910	450	390	330	270	210	1 50	8		ALT. Feet	30000	25000	20000	15000	12000	006	9000		S. L.	NOTES RM-UP, TAKE IND, RESERVE
MODEL(S)	ond F-	-89	POSITION POSITION	-					AT 12,000	99	620	260	200	01170	380	320	260	210	150	06	w	F . S.	245 354	245 330 3	245 326 7	245 314	245 307	245 298	245 290	2 45 2 82	245 275	NO FOR WARM E FOR WIND
МОБ	-38J a	-1710	(IN. HG.)	54	44		RANGE IN AIR MILES	NAUTICAL	AT S.L. A	590	550	200	450	390	3.0	290	240	160	130	88	CONTINUOUS	M. P. Jn. Hg.	A.R. 44 2	A.R. 44 2	A.R. 44 2	A.R. 44 2	<b>‡</b>	A.R. 44 2	A.R. 44 2	A.R. 44 2	A.R. 44 2	W 60 GAL
	P	E(S): V	я. Р. М.	3000	2600	I	NGE IN	TE	1 12,000	770	710	0 119	280	510	0++	370	310	240	2	8	MAXIMUM CO	I. A. S. MIX. M.P.II. TURE	227 A.	238 A.	248 A.	260 A.	266 A.	27! A.	276 A.	280 A.	285 A.	O ALLO
		ENGINE(S):	LIMITS	MILITARY	NORMAL RATED		Z.	STATUTE	AT S.L. AT 12,000	9	049	280	270	#20	390	330	270	210	150	8	MAX	R. P. M. I.	2600 2	2600 2	2600 2	2600 2	2600 2	2600 2	2600 2	2600 ′ 2	2600 2	

		MOI	MODEL(S)					GH	0	ERA	NOL	N	TR	UCT	Z	FLIGHT OPERATION INSTRUCTION CHART	<del> </del>			EXT	ERNAL	EXTERNAL LOAD ITEMS	TEMS		
	<u>Р</u>	P-38J	pup	F-5B					5										) H	6		6	}	2	
ENGINE	. V : (S)	ENGINE(S): V-1710-89		8 V-1710-91	10-01		CHA	RT W.	HCHT	CHART WEIGHT LIMITS: 21400	712	000		5	500	TO 14500 POUNDS	80		8	9		GALLON JANKS	<u> </u>	2	
LIMITS	R.P.K.	(IN MG.)	1 2 2	MIXTURE	TIME	TOTAL G P H	Z 3	STRUC	TIONS	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column count to or less than amount of find to be used for critishing	BING	HART	Sele	e naed f	Select figure in FUEL to be used for cruising	EL	NOTES:	S:	lumn I	is for e	mergenc	NOTES: Column I is for emergency high speed cruising only.	peed cr	uising o	only.
WAR	3000	09		AR	2	360	×	ve hori	zontall	Move horizontally to left or right and select RANGE value equal to	or right	and sel	xt RA	NGE va	lue equa	t t	Eacriff	in ag	eed.	anifold	pressur	sacrifice in speed. Manifold pressure (M. P.), gallons per hour	), grailo	ns per	hour
MILITARY	3000	54		AR	13	33#	 P ½	greater ally bel	ow and	or greater than the beautie of natition air mighs to be nown. Yestitically below and opposite desired cruising altitude (ALT.) read	e desire	d cruis	ing alt	itude (.	ALT.) r	pea.	for res	erence.	For e	ffici	ency	(c. f. f.) and the ampped (1. A. S.) are approximate values for reference. For efficiency maintain indicated airspeed	indicat	ted airs	beed
NORMAL	2600	3		¥	NONE	226	<u>6</u>	timum	R. P. M	optimum R. P. M., I. A. S. and MIXTURE setting required.	S. and M	IXTUR	E setti	ing requ	ired.		(I. A. ceedin	S.) hot	rly. A fold pre	djust R.	PM sligh	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid ex- ceeding manifold pressure more than 3 in. Hg.</li> </ol>	cessary E.	to avoic	ė k
									ſ																
	-			FUEL			=					<b>E</b>					2			FUEL			>		
Z	NGE IN	RANGE IN AIR MILES	82	U.S.		RANGE IN AIR MILES	IN AIR	MILES			RANGE	RANGE IN AIR MILES	MILES			RANGE	RANGE IN AIR MILES	MILES		U.S.		RANGE	RANGE IN AIR MILES	MILES	
STATUTE	33	NAUTICAL	TCAL	GAL.	BTAT	STATUTE	_	NAUTICAL	JVT.	8TA	BTATUTE		NAUTICAL	ICAL	8.	STATUTE	_	NAUTICAL	ICAL	GAL.		STATUTE	_	NAUTICAL	CAL
				010		् 60	GAL.		LOW	ALLOWANCE	NOT		AIL	AVAILABLE	Z.	FLIGHT	H T	0		1010		2210		1930	0
				000	12	1240		1080		<u>-</u>	1560		1350	<b>2</b> 2		1870		1630	20	950		2200		1920	Q
				920	12	1210		1050		_	1510		13	1310		1810		1570	Ó	920		2130		1860	0
				830	=	0601	_	950		-	360		11	1180		0 1 9 1		1420	0	830		1930	_	1680	0
				740	55	970		840		_	1210		10	1050		1460		1270	0	2		1720		1490	0
				650	80	850		740		-	1070		6	920		1280		1110	0	650		1510		1310	0
	use Corumn 2	Z LWD		260		730		640			920		00	800		8		096	00	260		300		1130	0
				470	•	620		540			270		9	670		930		8	800	#10 #10		0601		950	0
				380	u)	200		430			620		ιĊ	240		750		650	0	380		880		770	0
				290		380		330			480		7	410		570		500	9	290		670		590	Q
				200	.4	260		230			330		8	280		390		Æ	340	8		091		001	0
				9		140	-	130			<u>8</u>	-		160		220	-	1,5	190	<u> </u>		260	-	220	
MAX	зили сс	MAXIMUM CONTINUOUS	US.			OPERA	ATING DATA	ATA			OPER	OPERATING DATA	DATA			OPER	OPERATING DATA	DATA				MAXI	MAXIMUM RANGE	NGE	
R. P. M. I. A. S. M.P.H.	A. 8. MIX-	7 H	0 c k	ALT. Feet	R. P. M.	I. A. S. M.P.H.	MIX.	H. P. G. H. F. G. H.	# <b>#</b>	R. P. M.	I. A. S. K.P.H.	MIX	K. P. In.	0 만 보 는 숙 #	R. P. M.	I. A. S. K.P.H.	HIX.	X = X	0 m mi € 4 mi	ALT. Feet	R. P. M.	I. A. S.	KIX. TURK	M. P. G	Q ₹ ¥
•				30000	2550	214	. R	42 232	338	2400	<b>36</b>	A.R.	37	172 314	2300	181	A.t.	35	131 298	3000	2050	158	A.L.	32 10	104 267
	Use Column	lumn 2		25000	2550	221		_	6 86	2350	201	A.R.	36	162 296	2300	192	A.L.	35	131 287	25000	1900	167	¥.ŀ.	32 6	98 254
				2000	2500	230	A .R .	40 207	7 302	2350	210	A.R.	35	154 282	2200	200	A.L.	34	124 272	20000	1750	174	A.L.	33	94 243
				15000	2450	237	A.R.	39 197	7 288	2300	219	¥.8.	35	148 269	2150	201	<b>A</b> .L.	34	117257	15000	1700	178	A.L.	33	88 229
				12000	2450	239	A .R.	38 19	190 278	2300	222	A.R.	=	143 259	2050	508	4.L.	34	113 247	12000	1600	178	¥.L.	33	85 218
Max.	Permiss	Max. Permissible 1AS with	S with	806	2450	242	A .R.	38 184	14 269	2300	226	A.L.	35	131 251	800	211	A.L.	33	108 238	<b>8</b>	1600	178	A.L.	32 8	80 208
300 0	allon t	300 gallon tanks- 250 MPH.	O MPH.	9009	2400	245	A .R .	37 17	178 260	2300	231	A.L.	35	131 245	1950	212	<b>A</b> .L.	33	104 228	8		175	۸.۱.		76 196
				3000	2400	247	A.R.	37 17	171 250	23 00	236	A.L.	35	131 239	1850	213	<b>A</b> .t.	8	99 218		1600	172	4.L.	8	71 185
				S. L.	2350	250	A.R.	36 16	166 242	2250	238	₩.t.	34	127 231	1800	214	¥.	33	96 211	S.L.	1600	162	A.L.	28	65 168
	OALLO	w 60 cA	L. FOR WAS	NOTES	E-OFF A IN	ITIAL CL!	5			AT 2	EXAMPLE AT 21,400 LB.GROSS WT. WITH 1010 GAL OF PUEL	E CROS	EXAMPLE	를 된 101	O GAL.	IF PUEL			f. A. 5.:	INDICATE	L D AIRSPE	LEGEND	7	E.T. FULL THROTTLE	4ROTTL
	PLUS	NAMOLIA	CE FOR WY	PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQ'D.	E & COMB.	AT AS RE	ď.			TO FL	(AFTER DEDUCTING TOTAL ALLOWANCES OF 60 GAL.) TO FLY 1860 STAT AIRMILES AT 12,000 FT. ALT.	TING TOT	AL ALL	S AT 12	000.	GAL.)			C. P. P.	MANIFOL U. S. GAL. TRUE AIR	M. P.: MANIFOLD PRESSURE G. P. H.: U. S. GAL. PER HOUR T. A. S.: TRUE AIRSPEED	M K &	. 4 4 c	A. R.: FULL RICH A. R.: AUTO-RICH A. L.: AUTO-LEAN	Z Z Z
										WITH	MAINTAIN 2050 RPM AND 209 WITH MIXTURE SET A 1	50 RPM	AND 2	60	MPH IND. AIRSPEED	RSPEED				SEA LEVI	1.	I tada ac	MANIN		
																		:	SUBJE	T TO R	EVISION	SUBJECT TO REVISION AFTER FLIGHT CHECK	FLIGHT	CHECK	

		¥ 	١.					GE	r OPE	FLIGHT OPERATION INSTRUCTION CHART	Z	STE	20℃	150 T	S	ART		4		EXTERNAL LOAD ITEMS	LOADI	AD ITEMS	C	2	
	۵.	P.380 and		T (															ָ . מ	PROPELLER	L	FEATHERED	- I	ت لا 10 ج	_
SIS	SINGLE	SINGLE ENGINE		7 7 7 7 7 7	0 PERA 1 10 N	z	CHAE	T W	HORT LE	CHART WEIGHT LIMITS: 17.000	000	_	2	ις.	ro 13.500 pounds	SUNDS	عا	EXTERNAL TANK SUPPORTS	7   A	ANK A	7 L L L	. C	ה		· ·
	V (C)	×	J # 7	MIXTURE	NHI.	TOTAL	S	TRUC	TIONS F	INSTRUCTIONS FOR USING CHART:	CHAR		lect fi	gure ir	Select figure in FUEL	ON	NOTES:	NOTES: Column I is for emergency high speed cruising only.	is for e	mergenc	y high s	speed c	ruising	only	٦.
EV.	+	90	FORTION	AR	•	360	Wo.	mn eq re hori:	contally to	column equal to or less than amount of fuel to be used for cruising.  Move horizontally to left or right and select RANGE value equal to	ht and s	elect R.	ANGE	value	equal to	180 180 190 190 190 190 190 190 190 190 190 19	ifice in	recrifice in speed. Manifold pressure (M. P.), gallons per hour	Manifold	pressure	M. P.	.), gralle	ons per	r hour	
MILITARY	3000	54		æ	15	334	or g	reater Ily bel	than the ow and or	or greater than the statute or nautical air miles to be nown. Yertically below and opposite desired cruising altitude (ALT.) read	nauticai ired cru	aırmı. İsing a	les to r	(AL)	.) ver-	įį	r. н.) referer	(G.F.n.) and true atropeed (1. A. S.) are approximate values for reference. For efficiency maintain indicated airspeed	airspeed effici	ency n	o., are naintain	approx.	imate tedai	values	. –
NONMAL RATED	2600	1111		AR.	NONE	226	opt	mum	R. P. M., I	optimum R. P. M., I. A. S. and MIXTURE setting required	MIXT	JRE se	tting r	equire	_i	(I.	A. S.) ing m	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.</li> </ol>	djust R.	PM sligh	tly if ne	S.	to av	oid ex-	. 1
																									Ī
		<b>.</b>		FUEL			=		_ i		≣		,	<u> </u>  -		≥	i 		FUEL			>			
	RANGE D	RANGE IN AIR MILES	SE.	U.S.		RANGE IN AIR MILES	A AIR	ILES		RAN	RANGE IN AIR MILES	IR MIL	ES	-	RAI	RANGE IN AIR MILES	AIR MII	ES	Ü.S.		RANGE	RANGE IN AIR MILES	MILE	80	$\Box$
STA	STATUTE	YN	NAUTICAL	GAL.	STA	STATUTE	z	NAUTICAL	'AL	STATUTE		NAU	NAUTICAL		STATUTE	3	Y	NAUTICAL	GAL.		STATUTE		NAUTICAL	ICAL	
AT 3.L.	3.L. AT 12,000	7	3.L. AT 12,000	9		50	GAL.	l .	ALLOWANCE	NCE NOT		AVAILABLE	ABI		N FLI	FLIGHT	0		2						
580	630	200	550	360		680		290		750		မ	920		840			730	360		930		810	c	i
530	280	460	88	330		620		35		069		မ	909		770			670	330		850		740	0	
480	230	23	9	300	2,	570		490		630		r.	940		700			610	300		770		670	0	
÷ 30	68 <del>+</del>	380	410	270		510		OH H		260		IJ	490		630			550	270		069		600	0	
380	42 O	330	370	240		450	<u> </u>	390	:	200	<u> </u>	ਾ <b>ਹੀ</b> '	430		260			68 <sub>7</sub>	240		929		240	0	
340	370	290	320	210	_	00+		340	-	0 t t		eo.	380		06 1			420	210		240		470	0	
290	320	250	280	180		340		38		380		6)	330		420			360	98		094		0077	0	
240	260	210	230	150	~	280		250		310		2	270		350			300	120		390		340	ь	
8	210	170	180	120	.,	230		200		250		8	230		280			240	120		310	-	270	0	
3	160	130	140	90	_	170		150		081	_	-	160		210			180	96		230		200	0	
*	TAXIMUM	MAXIMUM CONTINUOUS	sno			OPERAT	ATING DATA	TA		OPI	OPERATING DATA	G DATA			0	OPERATING DATA	4G DAT	\ \			MAXI	MAXIMUM RANGE	ANGE		
R. P. M.	I. A. 8. K.P.K.	MIX- K. P. TURR In.	0 4 H	ALT. Feet	R. P. M. I. A. S. K.P.H.		XIM YUT M	H. P. O.	F < 10	R. P. M. I. A. S. M.P.H.	. 7. XIM. T. YUM.	# H	0 a k	ed ⊢≺ ed	R. P. M. L. A	I. A. S. MIX. M.P.H. TURE	* * * *	F <b>₹</b> 6	ALT. Feet	R. P. M.	I. A. S.	KIX.	7 - F	Q = = =	F < 6
2600	151	A.R. tt	123 257	30000			_												30000	_				-	_
2600	167	A.R. 44	123 256	25000	2600	178	œ; œ	43 12 43 12	12   254   18 947   21	2450 152	4	38	93	217					25000						
9 9	2	<del>- }-</del>	+	-	+	+		$\rightarrow$	220	+-	<u> </u>	-	3	616		-	-	1	2				!	:	ļ
2600	2 02								230						2300 149	€ A.R	3E	72 188							
2600	208									2400 180			90	210 2	2300 160			74 191		2300	156	<b>A</b> .t.	35	65 16	187
2600	214	A.R. tt	123 230	9009	2500	200 A	A.R.	9	104 218 2	2400 186	. R	37	89 2	205 2	2300 167	7 A.R.	₩ 	73 188	809	2250	161	A.L.	30	64 16	183
2600	-							=	211					200 2	2300 173		34	17		_		A.L.			180
2600	223	A.R. 44	123 218	S. L.	2450	207 A	A.R.	38	97   205   2	2400 195	A.R.	36	₹	195 2	2300   179	9 A.R.	-1	170 183	S.L.	2200	173	¥. L.	34	62 17	178
	0	LLOW RO GAL	NOTES ALLOW NO GAL. FOR TWO STORM WARK-UP, TAKE-OFF A	NOTES	tK-UP. TAE	A 770-A				EXAMPLE AT 17,000 LB. GROSS WT. WITH	LB. GR	EXAMPLE 088 WT. WITH		360 6	360 GAL OF FUEL	4		4 3 4 3	INDICATE	D AIRSPEE	LEGEND	F 6	FULL	THROTT:	<u> </u>
	ū	OWERT AS R	· a . o							TO FLY 800 STAT. AIRMILES AT 12,000 F		OTAL AL	LOWAN	12,00 12,00	STAT. AIRMILES AT 12,000 FT. ALT.	ጉዞ		7.7. 1.4.4.	U. S. GAL. TRUE AIR: SEA LEVE	G. P. H.: U. S. GAL, PER HOUR T. A. S.: TRUE AIRSPEED S. L.: SEA LEVEL	ı	4 4 0	A. L.: AUTO-RICH A. L.: AUTO-LEAN C. L.: CRUISING LEAN	EAN VG LEA	z
										WITH MIXTURE SET	RE SET	A.L.				<b>a</b>		SUBJE	RED FIG	RED FIGURES ARE PRELIMINARY, SUBJECT TO REVISION AFTER FLIGHT CHECK	E PRELI	PLIGHT	Y.	×	

Part   Part				MODEL(S)	(S)			<u>.</u>	911	TH O	PERA	TION	N	TRI	CTI	NO	HAR	Ļ			EXTE	EXTERNAL LOAD ITEMS	LOAD II	TEMS		
The Fig.   10   10   10   10   10   10   10   1			ı	-38	_			•												TAN		UPPC	RTS		۲	
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	ENGI	NE(S):V	1-171	0-11	92 .>	-1710-	13		HART	WEIGHT	LIMITS	17	,400		0 13,	500	POUN	DS								
1900  66   48   5   30   30   4   4   5   30   4   4   5   30   4   4   5   30   4   4   5   30   4   4   5   30   4   4   5   4   5   5   4   5   5   5	LIMITS	ı		G.) POSIT	VER MIX	i .		T.A.1.	INSTR column	UCTION equal to	S FOR to	ISING ( an amou	THART	S S	t figure used for	in FUI r cruísir		NOTES Column	5: Colu 9 II, III,	inn I je IV and	for em	progress	high s	peed cr rease in	uising (	only.
1, 10, 10, 10, 10, 10, 10, 10, 10, 10,	WAR	- !	<b>w</b>		₹		 İ	00 :	Move h or grea	orizontal ter than	ly to left the statu	or right te or na	and selo utical as	ect RAN ir miles	GE valt to be flo	ne equal ⊪wn. Ve		eacrifice (G. P. I	e in sper H.) and	ed. Ma true an	nifold p	T. A. S	(M. P.) are a	), gallo approxit	ns per mate va	hour ducs
This   First   First   This   First   This   First   This   This   First   This   First   This   First   This   First   This	MILITAR FOWER NORMAL RATED	. —		_				 ₹: 8	tically optimu	below an m R. P. A	d opposit	te desira 3. and M	ed cruis IXTUR	ing alti Esettin	tude (A ig requit	J.T.) re red.		for refe (I. A. S seeding	erence. 3.) hour manifo	For e. ly. Ad.	fficie just RPI sure mo	n cy m M slight	naintain ily if nec 3 in. Hg	indical cessary 7.	led airs to avoic	beed l ex-
The color of the					-	-																				
NATIONAL   NATIONAL	i		<b>-</b> :		FL	JEL		=					=	•	Ī	:	,	<u> </u>	,		FUEL			>		!
17.17   17.1		RANGE IN	AIR M	ILES			RAN	3	IR MILI			RANGE	IN AIR	MILES			RANGE	IN AIR	MILES	:	U.S.		RANGE	IN AIR	MILES	i
190   190	BTA	rute	z	AUTICAL		_	STATUTE			TICAL		ATUTE	- 1	NAUTIC	AL	STA	TUTE		NAUTIC	AL.	GAL.	STA	TUTE		NAUTIC	'AL
190   190	AT 5. L.	AT 12,000	$\rightarrow$	L. AT 12		0				ALLOW		0 N S		A I ĭ. A	BLE		LIGH	T	ា		011					:
130   230   330   340   350   440   450	9	450	350			091	8		. '	520		810		700		_	000		870		360		210		105	
310   240   210   220   220   240   250   260	380	n 30	33(		-	O to	929		7	<u>6</u>		780	:	099	-		920		820		340	<u>-</u>	9		6	0
150   210	350	390	300			91	520		3	99		069		900			870		Z.		310	2	040		91(	0
110   240   220	310	350	27(			980	470		3	10		620		350			780		9		280	J,	0116		85(	6
180   180   180   240   240   250	280	310	24(		-	20	420		)	09		999		06n			007		610	_	250		940		73(	0
150   150	250	280	21(			20	370		(1)	120		06h		430	-		019		530		220		240	-	97	0
150   150	210	240	18(			06	320		61	980		420		370			530		094	_	061	_	240		55(	0
150   130   140   130   120	98	200	16(			09	270		CM	30		360		310	_		#20		390		160		240		17(	0
130   130   130   130   130   130   150   150   150   150   150   160   140   150	150	091	13		_	30	220		-	96		290	! 	250		:	360		310	İ	30		0 1 1	-	380	
10   10   10   10   10   10   10   10	9	130				90	170		-	28		220		190			280		240		001	,	340		36	0
ANNION CONTINUOUS   A Continuous	98	90	7			02	120	_	٦	00		091		140			200		170		02	.,	240		20	0
14.5. MIN. W. P. G. T. ALT. 14.8. MIN. W. P. G. T. R. P. M. LA.S. M. P. G. T. R. P. M. LA.S. M. R. P. G. T. R. P. M. LA.S. M. P. G. T. R. P. M. LA.S. M. P. G. T. R. P. M. LA.S. M. P. G. T. R. P. M. LA.S. M. P. G. T. R. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. P. M. P. M. P. G. T. R. P. M. P. M. P. G. T. P. M. P. M. P. G. T. P. M. P. M. P. G. T. P. M. P. M. P. G. T. P. M. P. M. P. G. T. P. M. P. M. P. G. T. P. M. P. M. P. W. P. M. P. W. P. M. P. W. P. W. P. M. P. W. P. W. P. W. P. M. P. W. P. W. P. W. P. W. P. W. P. W. P. W. P. W. P. W. P. W. P	Ж	AXIMUM (	CONTIN	saoa			OFF	FRATING	DATA			OPER	ATING 1	DATA			OPER	VIING E	ATA				MAXIN	HUM KA	NGE	
252 A.R. 44 245 388 30000 2450 240 A.R. 39 200 371 2300 221 Å.L. 35 131 346 2050 201 A.L. 32 104 323 30000 1900 172 Å.L. 27 77 77 254 A.R. 38 189 352 2300 222 Å.L. 35 131 346 2050 201 A.L. 32 104 325000 1500 1500 172 Å.L. 27 77 172 225 230 232 A.L. 35 131 331 1900 208 A.L. 32 91 282 2000 1500 1500 172 Å.L. 27 77 172 257 4 245 348 15000 2450 2450 256 A.R. 38 174 335 2250 239 A.L. 34 120 288 1500 208 A.L. 32 91 282 2000 1500 1500 172 Å.L. 27 77 173 174 245 349 15000 2350 2350 2350 240 A.R. 36 166 308 2100 249 A.L. 34 116 288 1500 217 Å.L. 39 87 259 1500 1500 1500 1500 1500 172 Å.L. 25 57 37 37 112 24 120 120 120 A.R. 36 166 308 2050 250 A.R. 38 111 276 1500 215 Å.L. 39 172 230 1500 1500 1500 1500 1500 1500 1500 15	R. P. M.						M., I. A.	. —			7. P.	1. A. S.	MIX.	_	H.	<u>.</u>	I. A. S.	. XIW			ALT.	2	I A.S.			
252 A.R. 44 245 388 30000 2450 2450 2450 2450 2450 2450 2450	:				-		W.J.	- 4	. 4			F. 1	TURE	- +	<b>(</b> ::i		M I.H.	TURE			133		H.	TURE		- •
294 A.R. 444 245 374 25000 2450 245 A.R. 38 189 352 2350 239 A.L. 39 131 331 1900 208 A.L. 32 94 304 25000 1750 175 A.L. 27 75 65 27 A.R. 4.R. 44 245 349 15000 2450 256 A.R. 36 166 308 2100 249 A.L. 34 120 298 1650 219 A.L. 32 91 282 20000 1650 178 A.L. 27 65 27 A.R. 44 245 349 15000 2400 257 A.R. 36 166 308 2100 249 A.L. 33 112 276 1600 217 A.L. 31 78 243 9000 1600 173 A.L. 25 57 30 307 A.R. 44 245 321 6000 2350 273 A.R. 35 164 287 2000 251 A.L. 33 102 254 1600 217 A.L. 31 78 243 9000 1600 160 179 A.L. 29 71 221 3000 1600 179 A.L. 27 45 31 A.R. 44 245 31 3000 2350 273 A.R. 35 164 287 2000 251 A.L. 33 102 254 1600 215 A.L. 31 78 243 9000 1600 160 170 A.L. 27 45 31 A.R. 44 245 302 5.L. 2300 275 A.R. 34 144 269 1850 252 A.L. 33 102 254 1600 214 A.L. 28 68 210 S.L. 28 0 160 165 A.L. 29 71 221 3000 1600 1600 1600 1600 1600 1600 160	2600	252		245	388								*.L.			2050	201	A.L.		323	30000	1900	172	A.L.		
277 A.R. 44 245 36 2000 2450 256 A.R. 38 179 335 2250 239 A.L. 34 127 314 1750 212 A.L. 32 91 283 20000 1550 178 A.L. 27 155 290 A.R. 36 156 308 2100 249 A.L. 34 120 298 1550 212 A.L. 32 87 256 15000 1500 173 A.L. 25 57 302 A.R. 36 156 308 2100 249 A.L. 34 116 288 1500 217 A.L. 32 82 256 12000 1500 173 A.L. 25 57 302 A.R. 36 156 308 2100 249 A.L. 33 111 276 1500 217 A.L. 31 78 243 9000 1500 1500 173 A.L. 23 50 302 A.R. 36 156 290 A.L. 33 107 255 1500 215 A.L. 31 78 243 9000 1500 1500 150 A.L. 23 50 311 A.R. 44 245 311 3000 2350 273 A.R. 35 154 287 2000 251 A.L. 33 107 255 1500 215 A.L. 29 71 221 3000 1500 150 A.L. 22 45 311 A.R. 44 245 311 3000 2350 275 A.R. 35 154 287 2000 251 A.L. 33 107 255 1500 214 A.L. 29 71 221 3000 150 A.L. 20 45 311 A.R. 44 245 311 3000 2350 275 A.R. 35 154 287 2000 251 A.L. 33 102 254 1500 214 A.L. 29 71 221 3000 150 155 A.L. 22 45 150 A.L. 20 45 150 A.R. 30 150 A.L. 31 100 A.R. 30 150 A.L. 31 100 A.L. 31 100 A.L. 32 45 150 A.L. 31 100 A.L. 32 45 150 A.L. 31 100 A.L. 32 45 150 A.L. 31 100 A.L. 31 100 A.L. 31 100 A.L. 32 45 150 A.L. 31 100 A.L. 31 100 A.L. 31 100 A.L. 31 100 A.L. 31 100 A.L. 31 100 A.L. 31 A.L. 31 100 A.L. 31 A.L.	2600	797		245	374 25								¥.∟			1900	208	¥.t		ਲ੍ਹ	25000	1750	175	۲۰۲		
290 A.R. 444 245 348 15000 2490 267 A.R. 37 172 323 2150 246 A.L. 34 120 298 1650 219 A.L. 32 87 265 15000 1600 178 A.L. 26 61 299 A.R. 444 245 349 12000 2350 271 A.R. 36 166 308 2100 249 A.L. 33 111 276 1600 217 A.L. 31 78 243 9000 1600 173 A.L. 25 57 302 A.R. 44 245 331 9000 2350 271 A.R. 36 166 298 2050 250 A.L. 33 111 276 1600 217 A.L. 31 78 243 9000 1600 173 A.L. 25 57 300 2350 273 A.R. 35 154 287 2000 251 A.L. 33 107 255 1600 215 A.L. 29 71 221 3000 1600 160 160 A.L. 22 45 31 A.R. 36 144 245 31 3000 2350 275 A.R. 35 154 287 2000 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 1600 165 A.L. 22 45 31 A.R. 35 144 245 31 3000 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 1600 165 A.L. 22 45 31 A.R. 36 144 245 31 A.R. 35 144 245 300 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 1600 165 A.L. 22 45 A.L. 20 A.R. 31 14 A.R. 44 245 31 A.R. 36 144 269 1850 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 1600 165 A.L. 22 45 A.L. 20 A.L. 31 A.R. 44 245 300 1600 1600 1600 1600 1600 1600 170 A.L. 41 A.R. 41	2 <del>9</del> 80			245	36   20								*: -:				212	۳.		283	20000	1650	178	۲٠۲		
297 A.R. 44 245 340 12000 2350 267 A.R. 36 166 308 2100 249 A.L. 34 116 288 1600 217 A.L. 31 78 243 9000 1600 173 A.L. 25 57 302 A.R. 36 160 298 2050 250 A.L. 33 111 276 1600 217 A.L. 31 78 243 9000 1600 160 160 160 160 160 160 160 160	2600			245	348								¥.L.	₹			219	A.L.		269	15000	1600	178	A.L.		
307 A.R. WW 245 331 9000 2350 273 A.R. 36 160 298 2050 251 A.L. 33 107 255 1600 217 A.L. 30 75 231 6000 1600 160 160 4.L. 22 30 75 231 6000 230 235 A.R. 35 149 277 1900 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 160 165 A.L. 22 47 31 21 3000 230 275 A.R. 34 144 269 1850 252 A.L. 33 99 245 1600 214 A.L. 28 68 210 S.L. 1600 161 A.L. 22 46 A.L. 20 17 21 3000 161 A.L. 22 46 A.L. 20 17 21 3000 161 A.L. 20 17 21 31 31 31 31 31 31 31 31 31 31 31 31 31	2600			245	340					166 308				# S			217	A.L.		255	2000	1600	173	¥.L.		
307 A.R. 44 245 321 6000 235 A.R. 34 144 269 1850 255 A.L. 33 107 265 1600 215 A.L. 29 71 221 3000 165 A.L. 23 50 311 A.R. 44 245 311 3000 235 A.R. 34 144 269 1850 255 A.L. 33 99 245 1600 214 A.L. 28 68 210 S.L. 1600 151 A.L. 22 45 311 3000 279 A.R. 34 144 269 1850 252 A.L. 33 99 245 1600 214 A.L. 28 68 210 S.L. 1600 161 A.L. 22 45 311 A.R. 5100 161 A.L. 28 68 210 S.L. 1600 161 A.L. 22 45 311 A.R. 5100 161 A.L. 52 45 A.L. 52	2600	<del>-</del> +	_:					+		160 298			•	25	0/7	1600	217	۸٠۲		78 243	8	1600	169	۲.۲		
311 A.R. 44 245 311 3000 235 A.R. 35 149 277 1900 251 A.L. 33 102 254 1600 215 A.L. 29 71 221 3000 1600 159 A.L. 22 147 314 A.R. 441 245 302 S.L. 2300 279 A.R. 34 144 269 1850 252 A.L. 33 99 245 1600 214 A.L. 28 68 210 S.L. 1600 161 A.L. 22 147 314 A.R. 441 245 302 S.L. 200 279 A.R. 31 144 269 1850 252 A.L. 33 99 245 1600 214 A.L. 28 68 210 S.L. 1600 161 A.L. 22 147 314 314 314 314 A.R. 441 245 302 S.L. 1600 161 A.L. 28 1600 161 A.L. 28 1600 161 A.L. 20 14 A.L. 28 168 210 S.L. 1600 161 A.L. 20 14 A.L. 28 168 210 S.L. 1600 161 A.L. 20 14 A.L. 28 1600 161 A.L. 20 14 A	2600			44 24S						154 287			A.L.	33			216	A.L.			0009	1600	165	A, L.		
ALLOWER FOR WARM-UP, TAKE-OFF AINTIAL CLIMA  O ALLOW SO GAL FOR WARM-UP, TAKE-OFF AINTIAL CLIMA  TUS ALLOWANCE FOR WIND, RESERVE A COMBAT AS REQD  TO FLY, 1000 STAT AIMMILES AT 12,000 FT.AIT.  S LESS ALEVEL  WITH MIXTURE SET A.L.  S LESS ALEVEL  TO SEVERIOR STATEMENT AND 217 MPH IND AIRSPEED  S LESS ALEVEL  TO SEVERIOR ATTERMEDIATE  TO SEVERIOR ATTERMEDI	2600			245	3			_					A.L.	33			215	A.L.			3000	1600	159	A.L.		7 173
ALLOW SO GAL FOR WARM-UP, TAKE-OF & INITIAL CLIMB AT 17,400 LB.CROSAN, WITH 410 GAL, OF FUEL APPLOSAL FOR WARM-UP, TAKE-OF & INITIAL CLIMB PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS REQD.  (AFTER DEDUCTING TOTAL ALLOWANCES OF SO GAL) TO FIRST AND SO FINAL TO SO FINAL	2600	- 1		44 245	302 5.	L.   23	00 27	<b>-</b> ≪	, I		_	.	A.L.	33			214	A.L.	- 1		S.L.	1600	101	۲.	- 1	101
1. 12,000 FT. ALT. T. A.S.: TRUE AIRSPEED  S.L.: SEA LEVEL  S.L.: SEA LEVE			ow 50	GAL. FOR	WARM-UF	59 P. TAKE-OFF ESERVE A CO	& INITIAL	CLIMB REQ'D.			AT ].	7,400 R DEDUCT	ELB. GROSS	S WT. WIT	Ϋ́		FUEL GAL.)			A N N N N N N N N N N N N N N N N N N N	DICATED ANIFOLD D	AIRSPEED PRESSURE	CEND	F E E	FULL TH FULL RIC	ROTTI.E H
											TO FL	y: 1000 'AIN 160	STAT. A	AND 21		.000 FT IND. AIRS	ALT.		-	A. S. TR	TUE AIRSP	EED		 	AUTO-LE CRUISING	Z Z Z
											¥	MIXTURE	SET A.	۲.					0	R	ED FIGU	RES ARI	E PRELL	MINAR	, and	

		MOE	MODEL (S)			1	FLIGHT (	PER	OPERATION INSTRUCTION CHART	INST	RUCTI	NO	HAR			EXJ	EXTERNAL LOAD ITEMS	OAD IT	EMS	
		ď	P-38L												TWO	70 165		GALLON	TANKS	S)
ENGIN	ENGINE(S): V-1710-111 & V-1710-113	-1710-	- B	V-17I	0-113	CHA	RT WEIGE	T LIMI	CHART WEIGHT LIMITS: 19,400		TO   4	TO  4,500 POUNDS	POUND	s						
LIMITS	R. P. M.	R. P. M. 11N. 34G.1	BLOWER MIXTURE	l—-	TIME TOTA	NT IN	STRUCTIO	NS FOR	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to he used for cruising.		Select figure in FUEL to he used for cruising.	e in FUE or cruisin		NOTES: Columns 1	Column I	Is for e	NOTES: Column I is for emergency high speed cruising only. Columns II, III, IV and V give progressive increase in range at a	high sp sive incre	eed crui	sing only.
WAR MAX.	3000	09	'	<b>A</b> R	5 360		ove horizont	ally to lef	Move horizontally to left or right and select RANGE value equal to or greater than the statute or nearliest air miles to be flown. Ver-	nd select R.	ANGE va.	lue equal to		aerifice i	n speed. 1	Manifold	sacrifice in speed. Manifold pressure (M. P.), gallons per hour	(M. P.),	gallons	per hour
NULTARY	3000	3.0		AR	15 334	_	ally below a	and oppos	tically below and opposite desired cruising altitude (ALT.) read	cruising a	ultitude (2	ALT.) rea		Jr refere	nce. For	e ffic	for reference. For efficiency maintain indicated airspeed	aintain	indicated	airspeed
NORMAL	2600	₹		AR	NONE   226		timum R. P.	M., I. A	optimum R. P. M., I. A. S. and MIXTURE setting required.	TURE se	tting requ	iired.	) ()	I, A. S.) eding n	hourly. A	Adjust R essure r	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid exceeding manifold pressure more than 3 in. Hg.</li> </ol>	ly if nece 3 in. Hg.	essary to	avoid ex-
	<b>T</b>			FUEL		=		_		111				ΛI		FUEL	١.		Λ	
DE	RANGE IN AIR MILES	AIR MILES		U.S.	RANG	RANGE IN AIR MILES	MILES		RANGE IN	RANGE IN AIR MILES	ES	-	RANGE IN AIR MILES	N AIR MI	LES	U. S.		RANGE IN AIR MILES	N AIR MI	LES
STATUTE	UTE	NAUTICAL	ICAL	GAL.	STATUTE	_	NAUTICAL	ğ	STATUTE	NAU	NAUTICAL	STA	STATUTE	ž	NAUTICAL	GAL.		STATUTE	ż	NAUTICAL
AT S.L.	AT S.L. AT 12,000	AT S.L. AT 12.000	47 12.000	240	9	60 GAL.	. ALLOW	WANC	ANCE NOT	AVAII	AVAILABLE	z. _	FLIGHT		0	240				
069	770	966	099	089	950		830		1220		1060	**	1500	-/	1300	089		1770		1550
049	210	550	620	630	880		077		1130		086		1390		1200	630	91	0 1 9 1		1430
280	049	200	260	570	800		700		1030		068	2	1250		1090	570	=	06 tr	!	1290
920	280	450	200	210	710		620		920		800	=	1120		970	510	- 3	1330		1160
#20	210	390	0111	05h	630		550		810		700	57	066		960	450	=	1170		1020
390	0 11	340	380	390	550	<u> </u>	480		200	·	610	30	860		740	390	0-	1020	ļ	890
330	370	290	320	330	09 h		007		290		510	`	730		630	330	œ	860		750
270	310	240	260	270	380		330		061		420	<u></u>	290		520	270	7	200		610
210	240	180	210	210	290	-	260	_	380		330	3	09 h		0017	210	2	550	:	
150	170	130	150	150	210		180		270		230	(+)	330		590	150	· m	390		340
06	001	8	06	90	130	<b></b>	110		160		140	.,	200		170	90	2	230		200
W	MAXIMUM CONTINUOUS	NTINCOL	82		OPER	RATING DATA	ATA		OPERAT	OPERATING DATA			OPERAT	OPERATING DATA	ΓA			MAXIM	MAXIMUM RANGE	3:
R. P. M. L.	L. A. S. MIX. M.P.H. TURE	M. F. P.	5. 4. 2. - 4. 8.	ALT. Feet	R. P. M. I. A. S. M. P. H.	MIX	# E E E E E E E E E E E E E E E E E E E	R. P. M.	I. A. S.	MIX. In. TURE In.	H <b>₹</b> 60	R. P. M.	L.A.S.	MIX. K.	H. P. G. T. Hr. B. A. B. B.	ALT. Feet	R. P. M.	K. P. H.	MIX. In TURE In	1 H 4 8
2600		#	354			A .R.	41 223 3	347 2350	200	A.R. 36	161 322	2250	190	A.L. 3	34 126 309	30000	2000	165	A.L. 30	95 276
2600		<b>#</b>	330			A .R .	210		208	A.R. 35	151 304	2150	196 ≀	A.L. 3	34 119 291	1 25000	1850	170	A.L. 31	89 260
		<b>.</b>		20000		A.R.	39 198 3	308 2300	216	A.R. 34	144 287	2050	204 :	A.L. 3	34 113 275	5 20000	1700	175	A.L. 31	84 244
		<b>‡</b>	314			A.R.	189		226	A.L. 35	131 276	2000	210	A.L. 3	33 107 260	00051	1600	178	A.L. 31	79 229
2600	266 A.	<b>#</b>	245 307	_		A.R.	80		231		131 268				_	_	0 1600		A.L. 30	7.4
2007	-	;		- 6	1	X .	2 2	_	235	—i	1 31 261	_	-	A.L. 3	33 97 239		0 1600	_	A.L., 29	70 204
2600			245 290	000	2400 251	× .	69		237											99
2600		3	245 275		2350 255	* *	36 158 2	247 2100	238	A.L. 34	115 241	1700	213   A	A.L. 3	33   90 219 32   86 210	9 300 0 S.L.	1600	169 A 163 A	A.L. 27 A.L. 26	62 181 58 169
	C	9	ž	NOTES						EXAMPLE							LEC	GND		
	FLUS PLUS	ALLOWANG	E FOR WAR!	M-DP, TAKI D, RESERVI	ALLOW OU GALL FOR WARM-UP, TAKE-OFF & INITIAL C PLUS ALLOWANCE FOR WIND, RESERVE & COMBAT AS R	CLIMB REQ'D.		AF 101	AF 19,400 LB. GROSS WT. WITH 740 C (AFTER DEDUCTION TOTAL ALLOWANCES OF TOTAL 1500 STAT, AIRMLES AT 12,000 MAINTAIN 1600 BERLAND 313, MENTAL	18. GROSS WT. WITH 740 GAL, OF FUEL TING TOTAL ALLOWANCES OF 50 GAL.) STAT, AIRMILES AT 12,000 FT. ALT. 70 BEMANN 310 MINI MALGERER ALT.	WITH 74( LOWANCES) LES AT 12,	740 CALLOFFUEL (CES OF 50 CAL.) 12,000 FT. ALT.	FUEL SAL.) ALT.		C.P. H.	INDICATED MANIFOLD U. S. GAL. P TRUE AIRSI SEA LEVEL	INDICATED AIRSPEED MANIFOLD PRESSURE U. S. GAL. PER HOUR TRUE AIRSPEED		F. T.: FU A. R.: AU A. L.: AU C. L.: CR	E. T.: FULL THROTTLE F. R.: FULL RICH A. R.: AUTO-RICH A. L.: AUTO-LEAN C. L.: CRUISING LEAN
								T:W	WITH MIXTURE SET	ET A.L.					alano	RED FIG	RED FIGURES ARE PRELIMINARY,	PRELIM	INARY,	į.
																	NOTES AND A	I I I I I	TO THE CO	DCA

		MOI	MODEL(S)				긒	FLIGHT		OPERATION INSTRUCTION CHART	= <u>×</u>	VSTE	UCT	NOI	CHAR	_		EX	TERNA	L LOAD	EXTERNAL LOAD ITEMS		
		P-38	38 L														F	TWO 3	3006	GALLON		TANKS	S
ENGINE	ENGINE(S): V-1710-111	-1710-	æ =-		V-1710-113	ro	CHA	CHART WEIGHT LIMITS:	SHTL	MITS:	21,400		5	TO 14,500 POUNDS	POUNI	s							
LIMITS	B. P. K.	M.P.	M. P. BLOWER MIXTURE (IN. HG.) POSITION POSITION	MIXTURE	TIME	TOTAL G.P. H.		STRUCT	IONS F	INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for emissing	G.CHA mount o	RT: Se	lect figur	Select figure in FUEL to be used for cruising		NOTES:		Column I is for emergency high speed cruising only.	emer ger	cy high	speed c	ruising n	only.
WAR MAX.	3000	09		AR	S	360	Wo.	ve horizo	ntally to	Move horizontally to left or right and select RANGE value equal to	ght and	select R.	ANGE va	lue equa		acrifice	factifice in speed. Manifold pressure (M. P.), gallons per hour	Manifo	Manifold pressure (M. P.), gallons per hour	re (M.	P.), gall	ons per	hour
MILITARY	3000	ま		AR	15	334	tica	greater t	nan me vandog	or greater man the statute or nautical air miles to be nown. Vertically below and opposite desired cruising altitude (ALT.) read	sired cr	uisinga uisinga	es to be I Ititude (	ALT.) re		or refe	(c. r. n.) and true arspect (1. A. S.) are approximate values for reference. For efficiency maintain indicated airspeed	e airspei r effic	iency	mainta	s approx in indice	imate vi ted airs	speed
NORM AL RATED	2600	77.7		A.R.	NONE	226	opt	imum R.	P. M., I	optimum R. P. M., I. A. S. and MIXTURE setting required	H MIXT	URE set	ting requ	iired.	- 0	(I. A. S. ceeding	<ol> <li>A. S.) hourly. Adjust RPM slightly if necessary to avoid-ex- ceeding manifold pressure more than 3 in. Hg.</li> </ol>	Adjust pressure	RPM slig more thi	thtly if r an 3 in.	necessary Hg.	to avoi	id-ex-
	_			FUEL			=		_		Е			_		2		FUEL			>		
RA	RANGE IN AIR MILES	IR MILE.	sa	u.s.		RANGE IN AIR MILES	IN AIR R	HILES		RAN	NGE IN	RANGE IN AIR MILES	80		RANGE IN AIR MILES	N AIR	411.ES	U.S.		RANG	RANGE IN AIR MILES	MILES	
STATUTE	E	NAU	NAUTICAL	GAL.	STA	STATUTE		NAUTICAL	       _	STATUTE	Ħ	NAU	NAUTICAL	ST,	STATUTE		NAUTICAL	GAL.		STATUTE		NAUTICAL	CAL
				0101		09	GAL.	ALLOW		ANCE NOT		VAIL	AVAILABLE	z -	FLIGHT	-يا	0	1010				 	
				950	12	1240		1080		1560	-	1350	50		1870		1630	950	9	22 00		1920	0
				920	12	1210		1050		1510		1310	0	<u>-</u>	0181		1570	320		2130		1860	0
				830	2	0601		950	_	1360	_	1180	08	=	0491		1420	830		1930		1680	0
				740	6	970		940		1210		1050	8	_	09†1		1270	740	0	1720		% ₹	Ó
	100	,		650	80	850		240		1070		6	920		1280		1110	650	0	1510		1310	0
	nae con cui	7		260	7	730		049	_	920		æ	800	-	1100		096	260	0	1300		1130	0
				470	9	620		240		770		9	670		930		900	470		0601		950	0
				380	r.	200		064		620		ù	240		750		650	380	_	880		770	0
				290	E	380		330		480	!	7	410		570		200	290	0	670		290	0
				200	2	260		230		330		5	280		390		340	200	-	091		0017	0
				110	_	140		130		180		ī	160		220		190	=	•	260	_	220	0
MAX	MAXIMUM CONTINUOUS	NTINUO	ns.			OPERA	TING DATA	(TA		10	ERATIN	OPERATING DATA		_	OPERA	OPERATING DATA	ATA			MAX	MAXIMUM RANGE	ANGE	
R. P. M. I. J.	I. A. S. MIX- M.P.H. TURE	ж Б. р.	0 2 K	ALT. Feet	R. P. M.	L. A. S. M. P. H.	MIX.	In. P. Hr. Hr.	F 국 z	R. P. M. I. A	I. A. S. MIX- M.P.H. TURE	K K F F F F F F F F F F F F F F F F F F	9 1 H	R. P. M.	I. A. S. H.T.H.	MIX-	M. P. G. In. P. Hg. H.	T. ALT.	R. P. M.	M. I. A. S.	, MIX.	H. P.	ος π. Η <b>∢ π</b> .
				30000	2550	214	A.R.	42 232	338 2	24 00 1 94	. A. R.	8. 37	172 314	2300	181	A.L.	35 131 2	298 30000	2050	0 158	A.L.	32 104	267
	Use Co	Use Column 2		25000	2550	221	A.R.	41 219	319	2350 201		A.R. 36	162 296	2300	192	A.L.	35 131 2	287 25000	1900	2 167	A.L.	32 9	98 254
				20000	2500	230	A.R. 4	40 207	302 2	2350 210	0 A.R.	8. 35	154 282	2200	200	اب	34 124 272	272 2000	1750	174	A.L.	33 9	94 543
				15000	2450	2.37	A.R. 3	39 197	288 2	2300 219	9 A.R.	8.35	148 269	2150	207	A.L.	34 117 257	57 15000	1700	0 178	A .L.	33	88 229
;				12000	2450	239	A.R. 3	38 190	278 2	2300 222	2 A.R.	R. 34	143 259	2050	209	A.L.	34 1132	247 12000	1600	0 178	A.L.	33 8	85 218
Max. P	Max. Permissible IAS with 300 gallon tanks-250 MPH.	nke-250	MPH.	9000	2450	242	A.R. 3	38 184	269 2	2300 226	6 A.L.	L. 35	131 251	2000	211	A.L.	33 108 238	38 9000	1600	0 178	`A.L.	32 8	80 208
•				0009	2400	245	A.R.	37 178	260 2	2300 231	. A.L.	L. 35	131 245	1950	212	A.L.	33 104 2	228 6000	1600	0 175	A.L.	30 7	76 196
				3000	2400										23.3	. T. A	66			0 172	A.L.	29 7	71 185
				S. L.	2350			166				贲				A.L.	96		$\Box$		A.L.	—I	65 168
	O ALLO	W 60 CA	NOTES ALLOW 60 CAL. FOR WARM-UP, TAKE-OFF & INITIAL CL. PLUS ALLGWANCE FOR WIND, RESERVE & COMBAT AS RE	NOTES ARM-UP, TAK IND, RESERV	E-OFF & IN	AT AS REQ	in B			TXAMPLE AT 21,400 LB, GROSS WT, WITH 1010 GAL, OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 60 GAL.)	O LB.G	EXAMI ROSS WT.	VLE WITH 103	EXAMPLE  LB. GROSS WT. WITH 1040 CAL. OF FUEL  THIC TOTAL ALLOWANCES OF 60 CAL.)	FUEL CAL.)		<b>₹ 2</b> 0	LEGE LA.S. INDICATED AIRSPEED M.P.: MANIFOLD PRESSURE C.P.H.: U.S.GAL. PER HOUR	EO AIRSPILD PRESSE	LEGEND PRE URE		F. T.: FULL THROTTLE F.R.: FULL RICH A. R.: AUTO-RICH	HAOTTCH CH
										TO FLY 1860 STAT. AIRMII MAI^TAIN 2050 RPM AND	50 ST	T. AIRMIL PM AND	STAT. AIRMILES AT 1.2, OUC. RPM AND 209 MPH IND.	_	FT. ALT.			SEA LE	respectory.			CRUISING	C LEAN
										WITH MIXTURE SET A.L.	URE SET	A.L.					SITE	RED FIGURES ARE PRELIMINARY, SUBJECT TO REVISION AFTER FLIGHT CHECK	GURES A	RE PREI V AFTER	FLIGHT	CHECK	