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HANDBOOK
FLIGHT OPERATING INSTRUCTIONS

USAF MODELS
P-51D AND P-51K SERIES
AIRCRAFT

REVISION
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USAF

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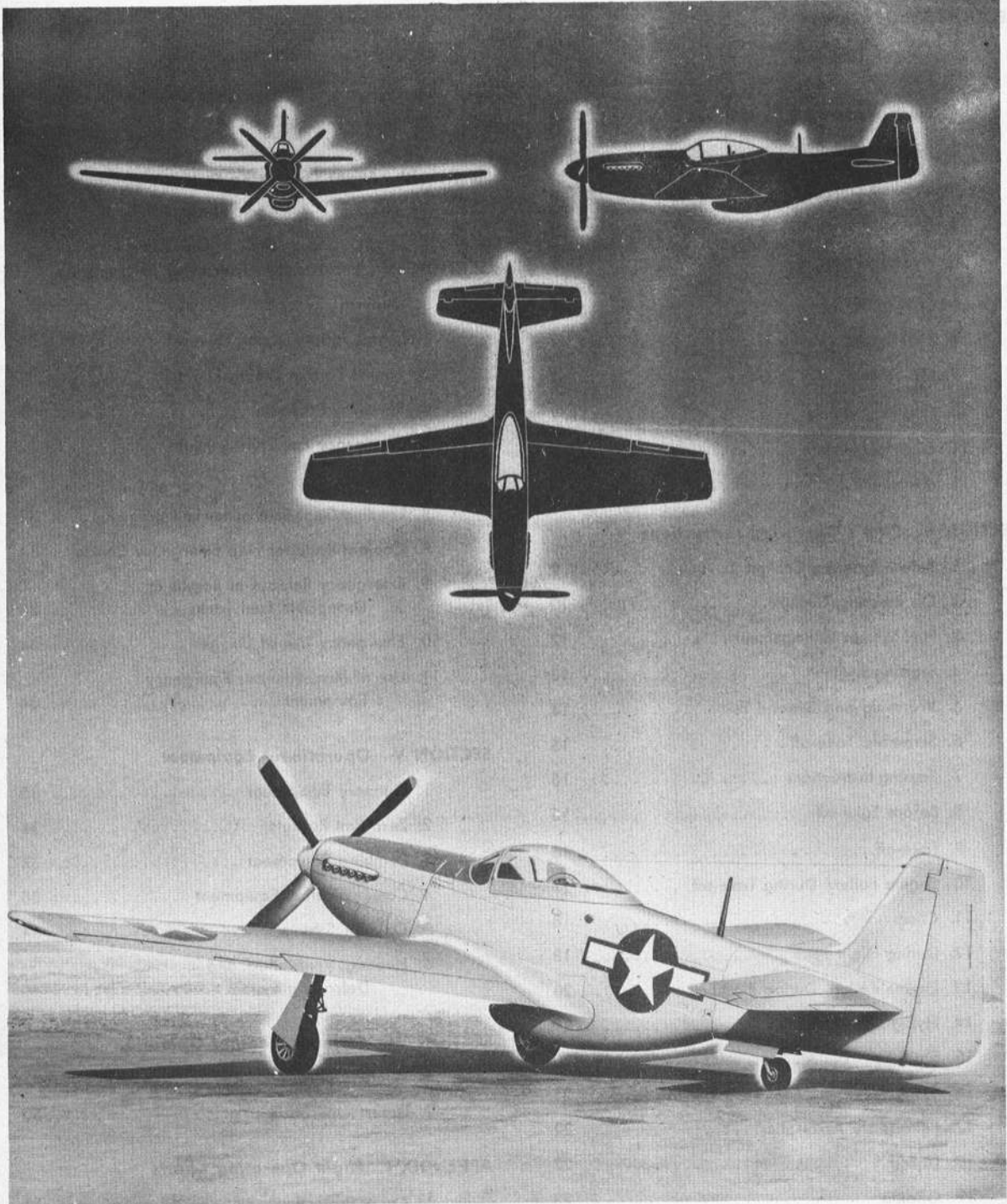
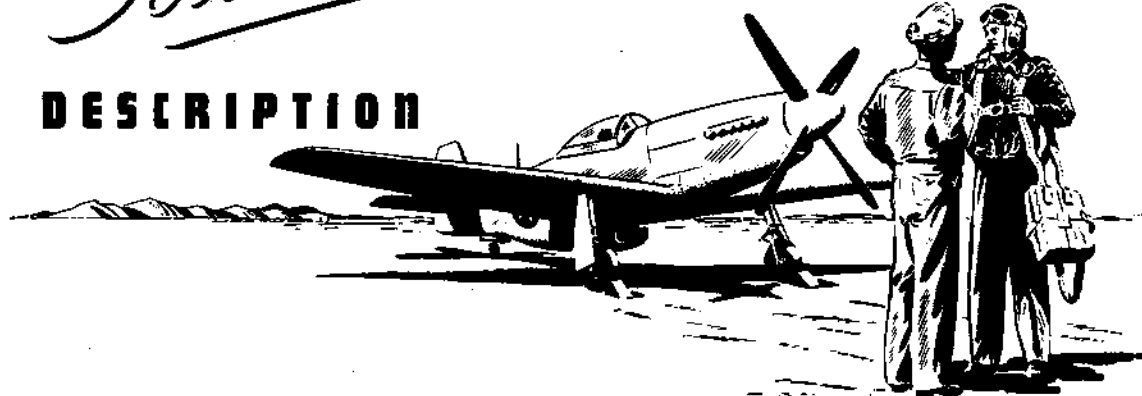


Figure 1—Three-quarter Rear View of Airplane

Section I

DESCRIPTION



1. GENERAL.

The North American P-51D and P-51K Fighter Airplanes are single-place, low-wing monoplanes having a wing span of 37 feet, a length of 32 feet 2 inches, and a height (tail down) of 13 feet 8 inches. The gross weight with no external load, full fuel, and armament is approximately 10,000 pounds. The power plant is either a V-1650-7 or V-1650-3 engine. The airplanes are armed with six .50-caliber machine guns and may be equipped with bomb racks to carry bombs, depth charges, chemical tanks, or fuel tanks. Late airplanes are equipped to carry zero rail rockets. Armor plate protection is shown in figure 50.

The only difference between the airplanes designated as P-51K and those designated as P-51D is that the P-51D Airplanes are equipped with Hamilton Standard four-blade propellers; the P-51K Airplanes are equipped with Aero-products four-blade propellers. There is no difference in the operation of the two airplane models.

2. BLOCK NUMBERING SYSTEM.

To clarify the relationship between the various groups of serial numbers used on these P-51 Airplanes, the following block numbering system has been adopted.

BLOCK NUMBER	SERIAL NUMBER INCLUDED
P-51D-5-NA	AAF44-13253 to 14052
P-51D-10-NA	AAF44-14053 to 14852
P-51D-5-NA	AAF44-14853 to 15752
P-51D-20-NA	AAF44-63160 to 64159
	AAF44-72027 to 72626
P-51D-25-NA	AAF44-72627 to 74226
P-51D-30-NA	AAF44-74227 to 75026
P-51D-5-NT	AAF44-11153 to 11352
P-51K-1-NT	AAF44-11353 to 11552

BLOCK NUMBER

P-51K-5-NT
P-51K-10-NT
P-51K-15-NT
P-51D-20-NT
P-51D-25-NT

P-51D-30-NT

SERIAL NUMBER INCLUDED

AAF44-11553 to 11952
AAF44-11953 to 12552
AAF44-12553 to 12852
AAF44-12853 to 13252
AAF44-84390 to 84989
AAF45-11343 to 11542
AAF45-11543 to 12342

3. FLIGHT CONTROLS.

The ailerons, elevators, and rudder are conventionally operated by a control stick and rudder pedals. Trim tab controls (a wheel for the elevator tabs, and knobs for the rudder and aileron tabs) and the flap control lever are on the control pedestal at the left side of the cockpit. A surface control lock is forward of the base of the control stick. A dorsal fin and reverse boost rudder tab have been installed on most airplanes. On late airplanes and on some airplanes modified in service, a 20-pound bobweight has been added to the elevator control system to improve the flight characteristics. (See section II, paragraph 14. b.)

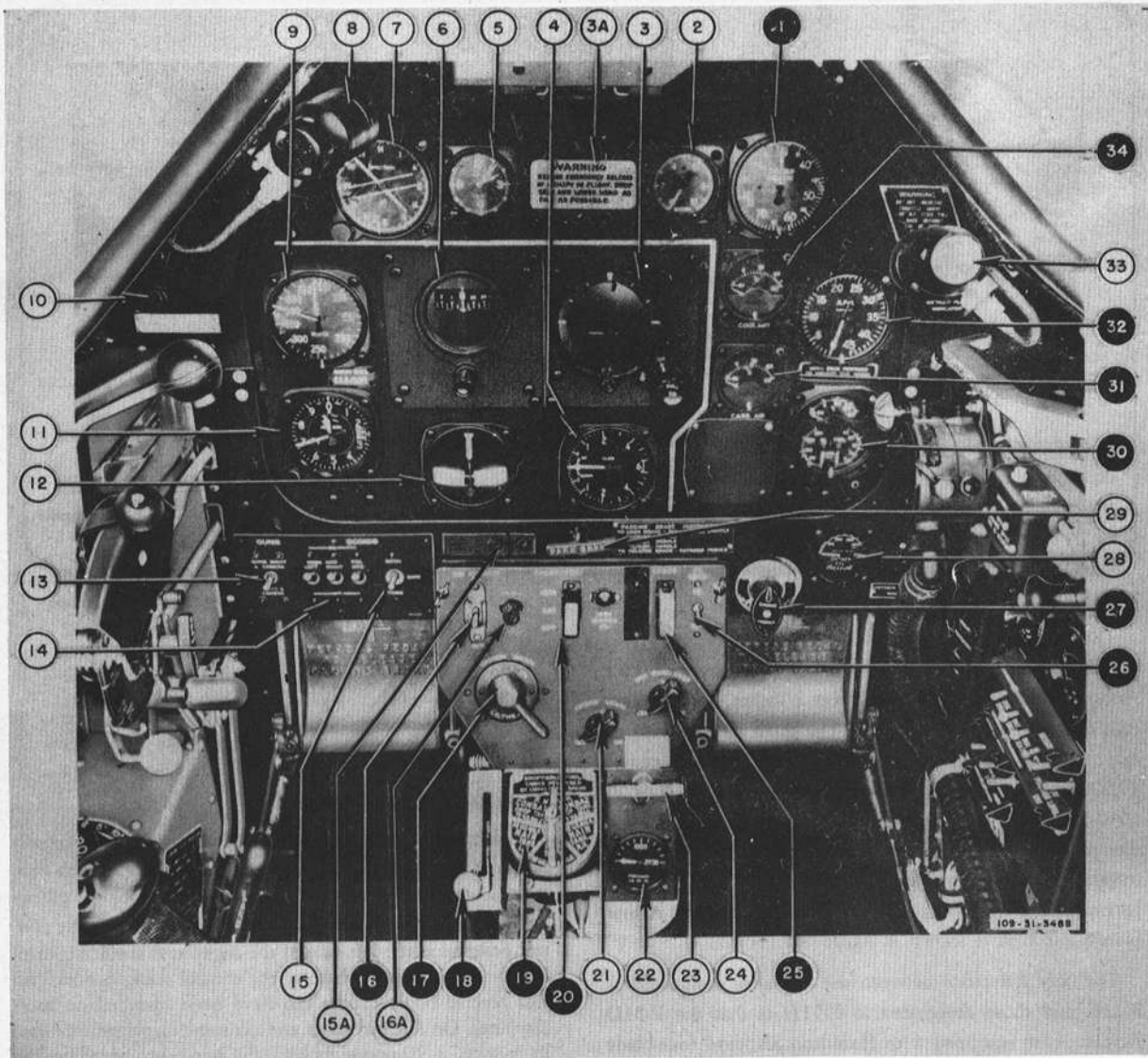
4. LANDING GEAR.

a. GENERAL.—The landing gear is hydraulically operated. When the surface control stick is pulled back, the tail wheel is linked to the rudder pedals and is steerable 6 degrees right or left. With the control stick forward, the tail wheel is unlocked and full-swiveling.

CAUTION

Do not move the landing gear control when airplane is on the ground, as there is no safety mechanism to keep the gear from retracting.

b. LANDING GEAR WARNING SIGNALS (Late Airplanes).—On late airplanes, the landing gear warning signal system consists of a red and a green warning light at the

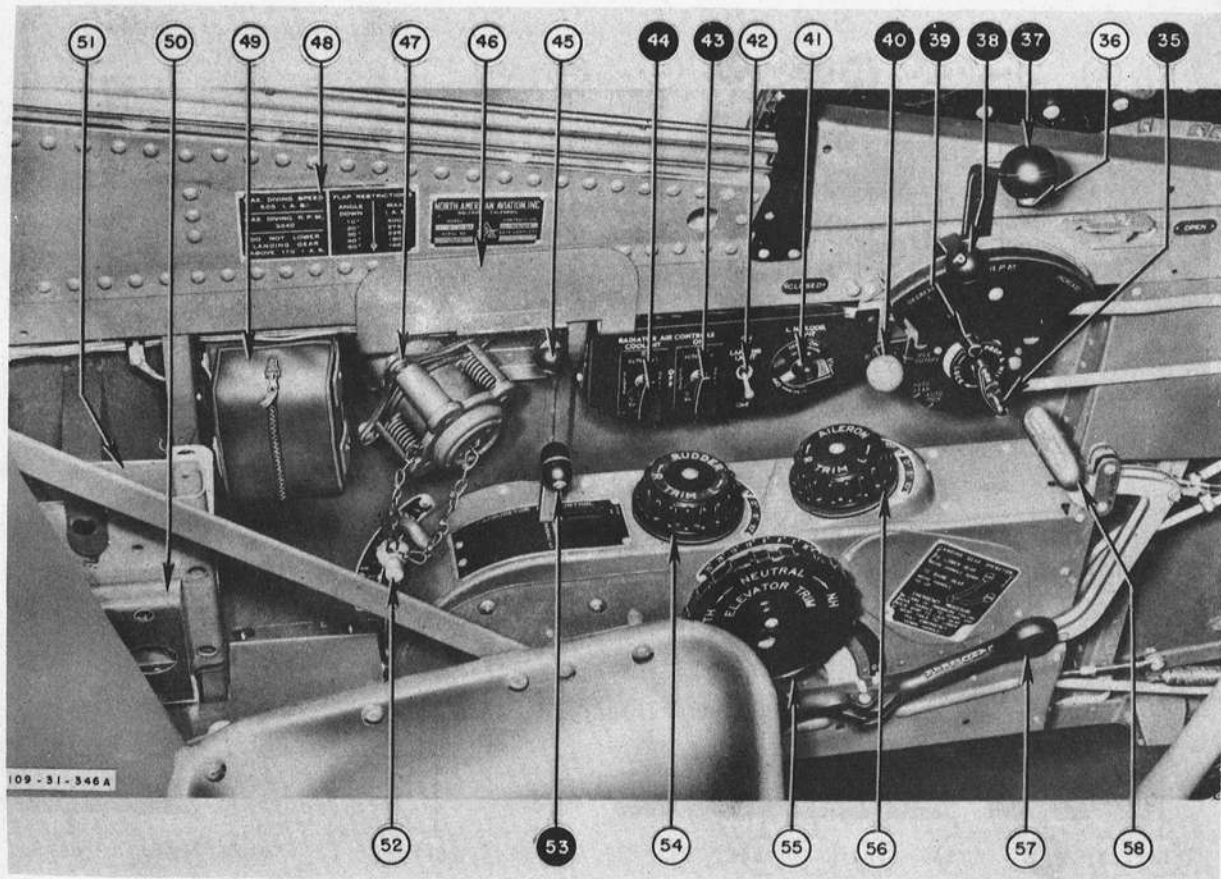


- | | | |
|---|--------------------------------------|--|
| 1. Manifold Pressure Gage | 13. Gun and Camera Safety Switch | 24. Gun Sight Rheostat |
| 2. Suction Gage | 14. Bomb Arming Switches | 25. Starter Switch |
| 3. Flight Indicator | 15. Bomb Release Selector Switch | 26. Oil Dilution Switch |
| 3A. Canopy Emergency Release Placard | 15A. Landing Gear Position Indicator | 27. Engine Primer |
| 4. Rate-of-Climb Indicator | Lights | 28. Oxygen Pressure Gage |
| 5. Clock | 16. Fuel Booster Pump Switch | 29. Parking Brake Handle |
| 6. Directional Gyro | 16A. Warning Horn Silencer Button | 30. Oil Temperature and Fuel and Oil Pressure Gage |
| 7. Remote-reading Compass Indicator | 17. Ignition Switch | 31. Carburetor Air Temperature Indicator |
| 8. Fluorescent Light | 18. Fuel Shut-off Control | 32. Tachometer |
| 9. Airspeed Indicator | 19. Fuel Selector Control | 33. Fluorescent Light |
| 10. Landing Gear Warning Signal Test Switch | 20. Supercharger Control Switch | 34. Coolant Temperature Gage |
| 11. Altimeter | 21. Cockpit Light Switch | |
| 12. Bank-and-Turn Indicator | 22. Hydraulic Pressure Gage | |
| | 23. Fairing Door Emergency Control | |

Indicates power plant and fuel system controls and instruments.

Figure 2—Cockpit—Forward View (Typical of All Models)

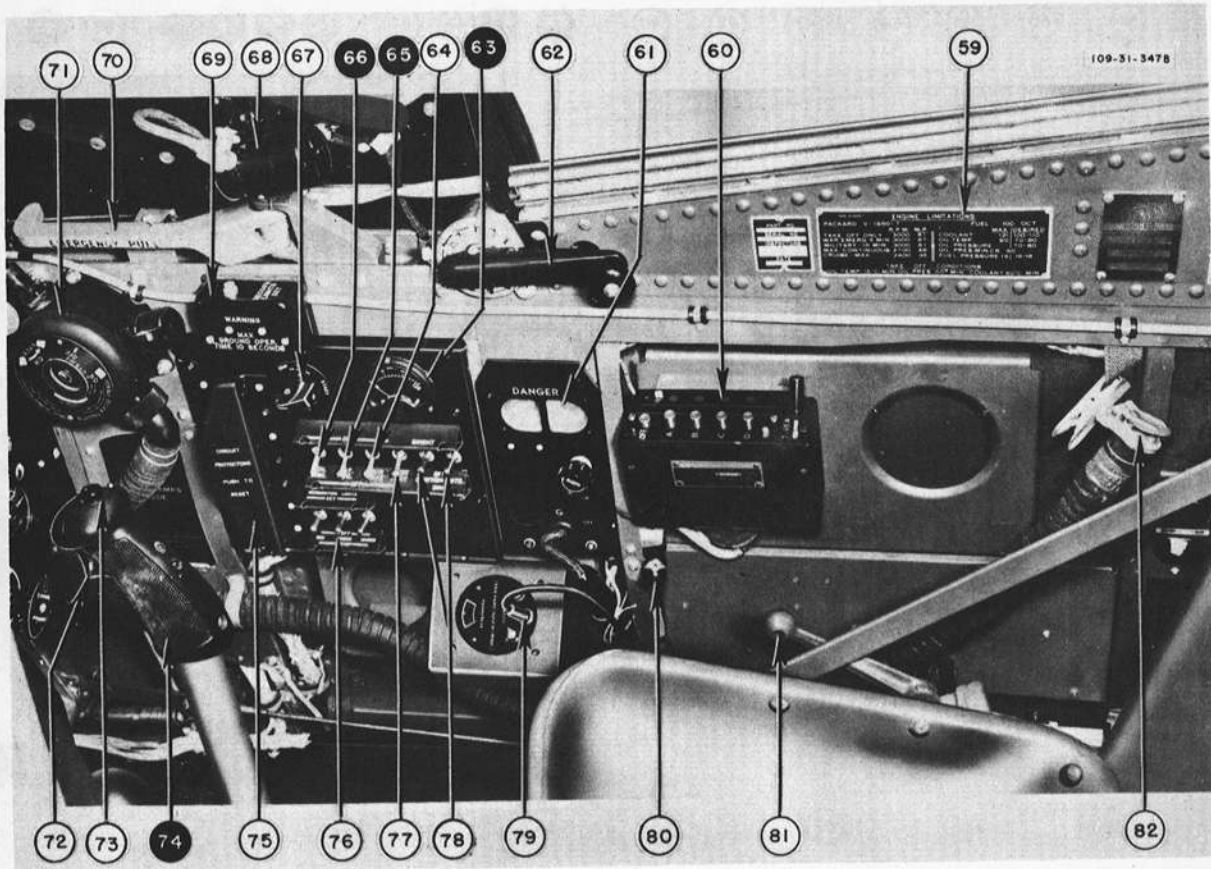
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- | | |
|---|--------------------------------|
| 35. Throttle Friction Lock | 46. Arm Rest |
| 36. Radio Transmit-Receive Switch | 47. Signal Pistol Mount |
| 37. Throttle Control | 48. Airplane Restriction Plate |
| 38. Propeller Control | 49. Signal Pistol Stowage Case |
| 39. Propeller and Mixture Control Friction Lock | 50. Drop Message Bag Holder |
| 40. Mixture Control | 51. Map Case |
| 41. Left-hand Fluorescent Light Switch | 52. Wing Flap Control |
| 42. Landing Light Switch | 53. Carburetor Air Control |
| 43. Oil Radiator Air Control Switch | 54. Rudder Trim Tab Control |
| 44. Coolant Radiator Air Control Switch | 55. Elevator Trim Tab Control |
| 45. Cockpit Light | 56. Aileron Trim Tab Control |
| | 57. Landing Gear Control |
| | 58. Bomb Salvo Control Handles |

⊗ Indicates power plant and fuel system controls and instruments.

Figure 3—Cockpit—Left Side (Typical of All Models)



- | | |
|---|---------------------------------|
| 59. Engine Limitations Plate | 71. Oxygen Regulator |
| 60. SCR-522-A Radio Control Box | 72. Gun Trigger Switch |
| 61. Detonator Switches | 73. Bomb Release Switch |
| 62. Canopy Handcrank | 74. Surface Control Stick |
| 63. Ammeter | 75. Circuit-breaker Reset Guard |
| 64. Gun Heater Switch | 76. Recognition Light Switches |
| 65. Battery-disconnect Switch | 77. Pitot Heater Switch |
| 66. Generator-disconnect Switch | 78. Position Light Switches |
| 67. Right-hand Fluorescent Light Switch | 79. Detrola Receiver |
| 68. Fluorescent Light | 80. Cockpit Light |
| 69. Recognition Light Keying Switch | 81. Seat Adjustment Handle |
| 70. Canopy Emergency Release Handle | 82. Oxygen Mask Connection |

⊗ Indicates power plant and fuel system controls and instruments.

Figure 4—Cockpit—Right Side (Typical of All Models)

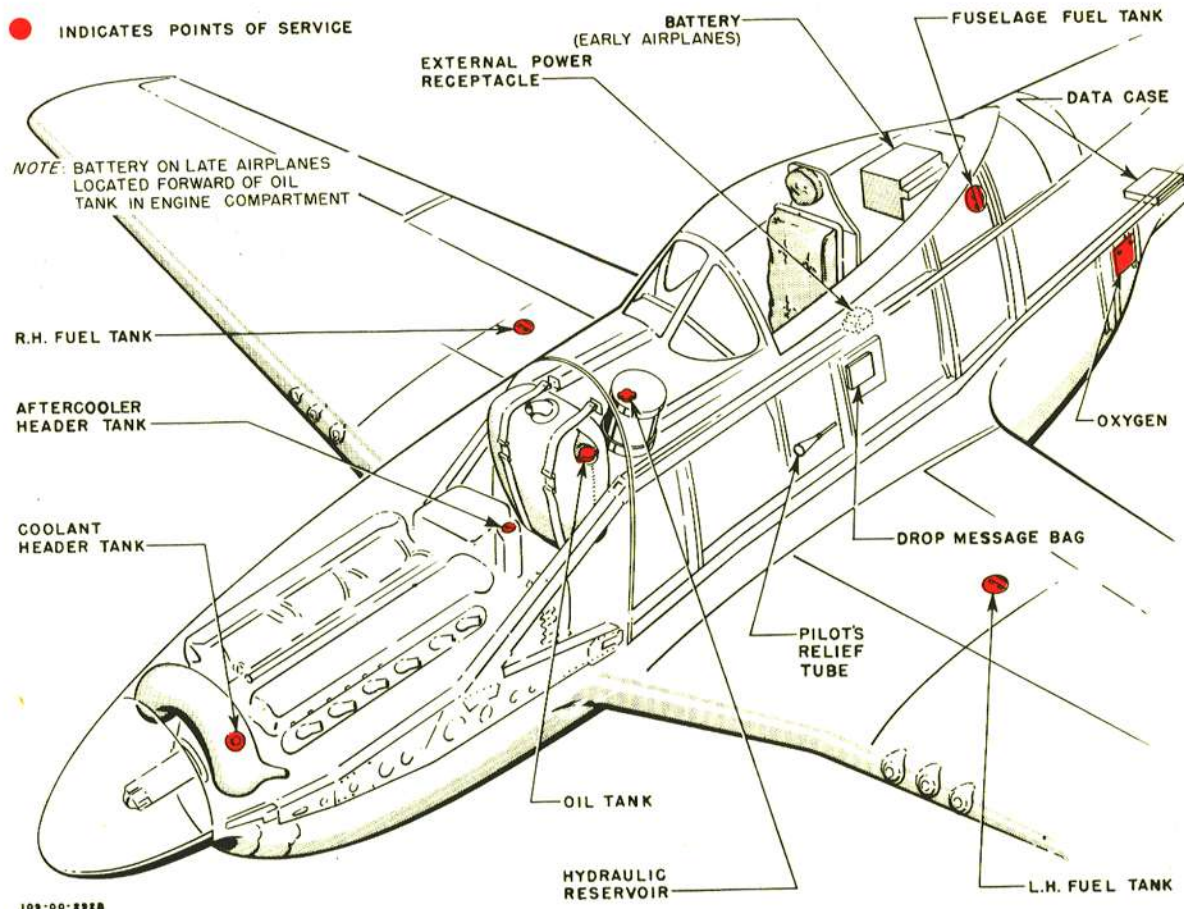


Figure 5—Interior Arrangement

left of the instrument panel, and a warning horn located on the left side of the cockpit, aft of the pilot's seat. (See figure 25.) Both warning lights have dimmer masks and are of the push-to-test type. The signals operate in the following manner:

(3) *Green light off, red light off* when gear is up and down and locked, regardless of throttle or fairing door position.

(2) *Green light off, red light on* when gear is in any unlocked position, regardless of throttle position; or when the gear is up and locked and the fairing doors are not fully closed.

(3) *Green light off, red light off* when gear is up and locked with fairing doors fully closed and throttle forward (beyond minimum cruising power).

(4) On early airplanes, *green light off, red light on, and horn on* when gear is up and locked and throttle is retarded below minimum cruising power.

(5) On late airplanes, *green light off, red light on, and horn on* when gear is in any position other than down

and locked and throttle is retarded below minimum cruising power.

Note

A horn cutout switch is on the front switch panel. When the throttle is advanced after the horn has been cut out, the horn circuit is automatically reset. While the throttle is retarded and the horn is cut out, the red light remains on until the gear reaches the down-and-locked position.

c. **LANDING GEAR WARNING LIGHT** (Early Airplanes).—Some early airplanes do not have the green light or warning horn. The red light operates the same on all airplanes (when main gear is in transit between up-and-locked and down-and-locked positions or when gear is up and throttle is retarded for landing), but it is tested with a switch in early installations.

5. BRAKES.

The brakes are hydraulically operated. Fluid for the brake system is obtained from the hydraulic reservoir. A standpipe in the reservoir reserves a supply of fluid for brake operation in case fluid for the hydraulic system is lost. The parking

brake control is just below the center of the instrument panel.

6. HYDRAULIC SYSTEM.

The landing gear and wing flaps are operated hydraulically. The wing flaps are preselectively set by moving the control to the desired flap setting. The flaps are automatically held in the position chosen until another flap setting is selected.

7. POWER PLANT.

a. ENGINE.—The Packard-built Rolls Royce V-1650-7 and V-1650-3 are 12-cylinder, liquid-cooled, in-line engines. They are equipped with two-stage, two-speed superchargers, injection-type carburetors, and automatic manifold pressure regulators. An aneroid switch automatically controls the supercharger blower shift on both models. The engines turn either a Hamilton Standard or an Aeroproducts propeller.

b. FUEL, OIL, AND COOLANT.

Fuel—Specification No. AN-F-48, Grade 100/130

Oil—Specification AN-O-8, Grade 1120

Coolant—Type D (70 percent water and 30 percent ethylene glycol, Specification No. AN-E-2, inhibited with NaMBT)

Note

For operation in temperatures below -12°C , use Type C coolant (30 percent water and 70 percent ethylene glycol, Specification No. AN-E-2, inhibited with NaMBT).

c. AUTOMATIC MANIFOLD PRESSURE REGULATOR.—On the V-1650-3 or V-1650-7 engine, the regulator is not sensitive to manifold pressure changes throughout the entire range of available supercharger pressures. When operating at powers between 42 and 61 in. Hg manifold pressure, the regulator should afford constant manifold pressure within plus or minus one inch for any flight attitude below the critical altitude for the flight condition in question. However, when operating below approximately 42 in. Hg manifold pressure, the regulator cannot be expected to hold a constant manifold pressure for the various flight conditions.

d. ENGINE CONTROLS.

(1) THROTTLE.—On late airplanes, a gate on the engine control quadrant limits the manifold pressure to 61 in. Hg, with the throttle full forward. Moving the throttle past the gate enables the pilot to obtain a war emergency power of 67 in. Hg. On early airplanes, which have no gate position, war emergency power is obtained by pulling the emergency boost control, at the left of the instrument panel. Instructions on the use of the War Emergency Rating are given in section II, paragraph 12. b.

(2) MIXTURE.—On late P-51D and P-51K Airplanes, the mixture control has the following settings: "IDLE CUT OFF," "RUN," "AUTO RICH" (marked only on some late airplanes), and "EMERGENCY FULL RICH." The carburetor

on these airplanes is fully automatic, and the normal operating position is "RUN."

Note

"RUN" position is recommended for take-off; however, "AUTO RICH," supplied on late airplanes as an alternate position for take-off, may be used. Return the control to "RUN" when a safe altitude is reached.

The "EMERGENCY FULL RICH" position is for use in case the carburetor fails to operate properly in "RUN." To place the control in "EMERGENCY FULL RICH," a spring detent on the lever must be pressed with the thumb and the control moved through the lockwire at the "RUN" position (at "AUTO RICH" on late airplanes). On early P-51D and early P-51K Airplanes, the mixture control positions are "IDLE CUT OFF," "AUTO LEAN," and "AUTO RICH" with no lockwire.

(3) AUTOMATIC SUPERCHARGER CONTROL.

(a) The supercharger control switch has three positions: "LOW," "AUTOMATIC," and "HIGH." (See figures 13 and 14.) The switch should be in "AUTOMATIC" for all normal operations. When it is in this position, supercharger speed change is controlled by an aneroid-type pressure switch, vented to carburetor intake pressure. The aneroid switch will change the blower speed from low to high at the altitude for best performance at military power. It is calibrated to shift the supercharger to high blower at a carburetor entrance pressure equivalent to approximately 19,600 feet altitude on the V-1650-3 engine (between 20,800 and 24,800 feet airplane altitude) and to approximately 14,500 feet altitude on the V-1650-7 engine (between 15,700 and 19,700 feet airplane altitude). To prevent excessively frequent blower speed changes, resulting from small speed or altitude changes near shift altitude, the aneroid switch is constructed so that the shift downward from high to low speed occurs approximately 1500 feet below the upward shift point during a normal descent. However, during a dive or rapid descent, the shift downward may occur at, or above, the upward shift point because of the increase of ram air pressure in the carburetor air intake caused by the higher airspeed.

Note

It will be noted in flight that the blower shift altitude specified in the preceding paragraph (a) for the particular engine does not correspond to the figure read by the pilot on the altimeter. This condition is normal, since the blower shift aneroid is referenced to carburetor entrance air pressure which increases with increase in indicated airspeed. Differences in airplane altitude at the time of blower shift are due to the ram variations in climb, level flight, and descent.

(b) For maximum fuel mileage on long-range cruising operations, it is advantageous to remain in low blower speed above the altitude of shift. The ranges shown on the charts in appendix I are possible only when using proper supercharger speed, exactly as noted.

(c) In case of blower shift aneroid failure, the supercharger will automatically return to low speed and the amber light beside the manual blower switch will go out. This light is on only when the supercharger is in "HIGH." On late airplanes the light is of the push-to-test type.

(4) ENGINE PRIMER.—Early airplanes have a hand-priming system. On late airplanes, the priming system is controlled by an electric switch. (See figures 13 and 14.)

e. CARBURETOR AIR.—Ram air, unrammed filtered air, or (on late airplanes) unrammed hot air may be supplied to the carburetor. Early airplanes have only a cold air control; late airplanes have both a cold and hot air control. Figure 49 shows the principle of operation. In order to obtain hot air, the hot air control must be in "HOT" and the cold air control must be in "UNRAMMED FILTERED AIR." If the cold air control is in "RAM AIR," operation of the hot air control will be ineffective. On all airplanes, hot air will automatically be admitted to the carburetor whenever the air duct becomes obstructed by ice. For further information on the carburetor heat system, see section VI, paragraph 1. a. (4).

B. FUEL SYSTEM.

Two self-sealing tanks are carried in the wing, and an auxiliary 85-gallon, self-sealing tank is installed in the fuselage, aft of the cockpit. Two 75-gallon, pressurized drop tanks may be installed on the wing racks. Fuel flows as follows: from either of the wing tanks or the fuselage tank through a booster pump to the fuel selector valve; through the selector valve, shut-off valve, and fuel strainer to the engine-driven fuel pump; then to the carburetor. Fuel from the combat tank flows through the selector valve into the main fuel line. All main fuel lines are self-sealing. Late airplanes have the carburetor vapor return line routed to the fuselage tank. On other airplanes the vapor return line is connected to the left wing tank. It is important that you know to which tank the vapor return line is connected. (See section II, paragraph 3.) The booster pump switch on early airplanes has three positions: "NORMAL," "EMERGENCY," and "OFF." On late airplanes, the switch has two positions: "ON" and "OFF." (See figures 13 and 14.)

CAUTION

As neither the wing nor the bomb racks were designed for the 110-gallon combat tanks, it is not recommended that these tanks be used. If this installation is necessary to accomplish particular missions, the airplane should be held to straight and level flight until the tanks are released.

9. OIL SYSTEM.

The oil system has a capacity of 21 US (17.5 Imperial) gallons. Scavenged oil flows through an oil radiator in the air scoop assembly. A thermostatically controlled outlet flap regulates the flow of air through the radiator. An oil dilution system is provided. (See figures 13 and 14 for location of control.)

10. COOLING SYSTEMS.

The engine incorporates two separate cooling systems: one to cool the engine, and the other to cool the supercharger fuel-air mixture. Each system has a separate pump, expansion tank, and radiator. The engine cooling system radiator and aftercooling system radiator are constructed as a unit which is located in the air scoop assembly above and aft of the oil radiator. A thermostatically controlled outlet flap regulates the flow of air through the radiators. The controlling switch for the flap actuator, located on the front switch panel, has four positions: "AUTOMATIC" for normal operation; two emergency manual positions, "OPEN" and "CLOSE," and an "OFF" position. A spring-loaded guard holds the switch in "AUTOMATIC," the position used for all operation except for control failure and during ground check. A manual emergency release, on the right side of the cockpit floor, is provided on late airplanes to open the flap in case of actuator failure.

11. ELECTRICAL SYSTEM.

The 24-volt, direct-current electrical system receives power from an engine-driven generator. A 34-ampere hour battery serves as a stand-by. An external power socket is on the right side of the fuselage just behind the cockpit. External power should be used instead of the airplane battery to start the engine and operate the electrical system while the airplane is on the ground. An adapter for connecting the British type of external power supply is stowed adjacent to the external power socket. All of the electrical circuits are protected by either circuit breakers or circuit-breaker switches located on the right switch panel. On airplanes which have the zero rail rocker installation, the armament control switches are on the front switch panel and most of the engine control switches are on a separate panel at the left. (See figures 14 and 37.) Location of main electrical switches is shown in figures 2 and 4. On late airplanes the upper recognition light has been deleted.

12. MISCELLANEOUS EQUIPMENT.

a. PILOT'S RELIEF TUBE.—The relief tube horn is stowed on a bracket on the floor of the cockpit at the left of the pilot's seat.

b. ENGINE CRANK.—Early airplanes have an engine crank and extension tube stowed in brackets at the back of the right main landing gear well. On late airplanes, these parts have been deleted.

c. DROP MESSAGE BAG.—A drop message bag is contained in a holder on the map case cover.

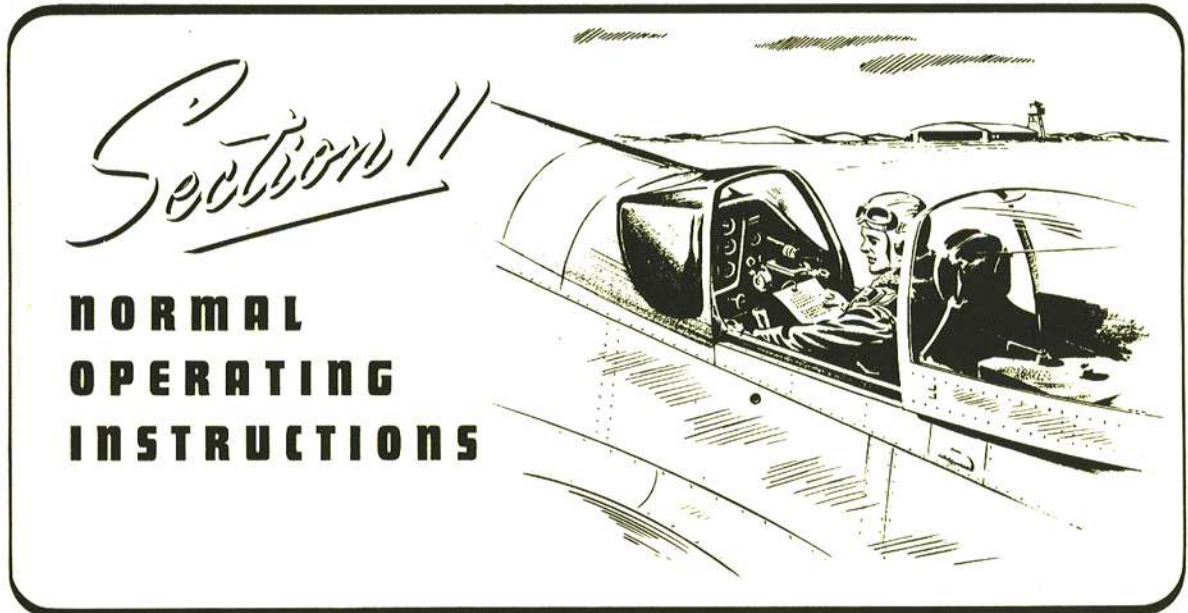
d. DATA CASE AND TAIL POSITION LIGHT LENSES.—A data case is fastened to the access door on the underside of the fuselage, just forward of the tail wheel. On late airplanes, a case containing three tail position light lenses (red, green, and clear) is accessible through this door.

e. ARM REST.—A folding arm rest is on the left longeron, aft of the engine control quadrant.

Section I
Paragraph 12

f. ANTI-G SUIT PROVISIONS.—An air pressure outlet connection on the left side of the pilot's seat provides for attachment of the air pressure intake tube of the anti-G suit. Air pressure for the inflation of the anti-G suit bladders is supplied from the exhaust side of the engine-driven vacuum pump, and is regulated by a type M-2 valve which is a junction point for pressures exerted in both the droppable combat fuel tanks and the anti-G suit. If combat tanks are installed on the airplane, the acceleration force (G load) required to

actuate the M-2 valve should be approximately 3 to 3½ G's because of the approximate 5-pound-per-square-inch pressure exerted in the tanks. Without the combat tanks installed, the valve should open at 2 G's. After the valve opens, pressure is passed through a regulator valve into the suit in proportion to the G force imposed. For every 1 G acceleration force, a corresponding one-pound-per-square-inch air pressure is exerted in the anti-G suit.



Section II

NORMAL OPERATING INSTRUCTIONS

1. BEFORE ENTERING COCKPIT.

a. Note carefully the following:

FLIGHT RESTRICTIONS

1. When external fuel tanks are installed, only normal flying attitudes are permitted.
2. Inverted flying must be limited to 10 seconds because of loss of oil pressure and failure of the scavenge pumps to operate in an inverted position.
3. No acrobatics are permitted with more than 40 gallons of fuel in the fuselage tank.
4. Intentional "power-off" spins are permitted, provided such spins are started above 12,000 feet. Intentional "power-on" spins and snap rolls are prohibited. It is impossible to do a good snap roll with the airplane, and most attempts usually end up in a power spin.
5. Slow rolls are prohibited if the airplane is not equipped with a dorsal fin and reverse boost rudder tab.
6. If 110-gallon combat tanks or 1000-pound bombs are installed, airplane is restricted to level flight until tanks or bombs are released.

AIRSPPEED LIMITATIONS

1. The maximum permissible speed is 505 IAS or .75 Mach, whichever is less. See figures 26 or 27 for diving speed limits at altitude.
2. Observe the following wing flap setting airspeed restrictions:
 - With wing flap setting at 10 degrees, do not exceed 400 IAS.
 - With wing flap setting at 20 degrees, do not exceed 275 IAS.
 - With wing flap setting at 30 degrees, do not exceed 225 IAS.
 - With wing flap setting at 40 degrees, do not exceed 180 IAS.
 - With wing flap setting at 50 degrees, do not exceed 165 IAS.
3. In a sideslip, stay above 110 IAS.
4. Do not extend landing gear above 170 IAS.
5. With droppable 75-gallon combat fuel tanks installed, speed is limited to about 400 IAS due to incipient buffeting.

THESE LIMITATIONS MAY BE SUPPLEMENTED OR SUPERSEDED
BY INSTRUCTIONS INCLUDED IN SERVICE PUBLICATIONS.

b. Make sure the airplane has been serviced and is ready for flight, particularly in regard to proper quantities of fuel, oil, coolant, hydraulic fluid, and oxygen.

c. Ascertain that the total weight of fuel, oil, ammunition, and special equipment carried is suited to the mission to be performed. This is most important on combat missions, as the rate of climb of the airplane may vary as much as 500 feet per minute, depending on the load carried.

d. See that external power supply (if available) is connected.

e. Prior to any ground run-up exceeding 40 in. Hg manifold pressure, see that the tail of the airplane is anchored securely to a fixed object. If wheel chocks are available, use them also.

f. To gain access to cockpit, push in on spring-loaded door on left forward side of sliding canopy, and slide canopy aft.

CAUTION

In order to avoid cracking the windshield panels, do not grasp the windshield frame when entering or leaving the airplane.

2. ON ENTERING COCKPIT.

Note

A pilot's check list and an engine limitations plate are provided in the cockpit for a quick check of airplane operations.

a. Perform the following operations prior to all flights:

(1) Adjust rudder pedals for proper leg length to obtain full brake control while taxiing. Press foot against the lever on the inner side of each rudder pedal. (See figure 6.)

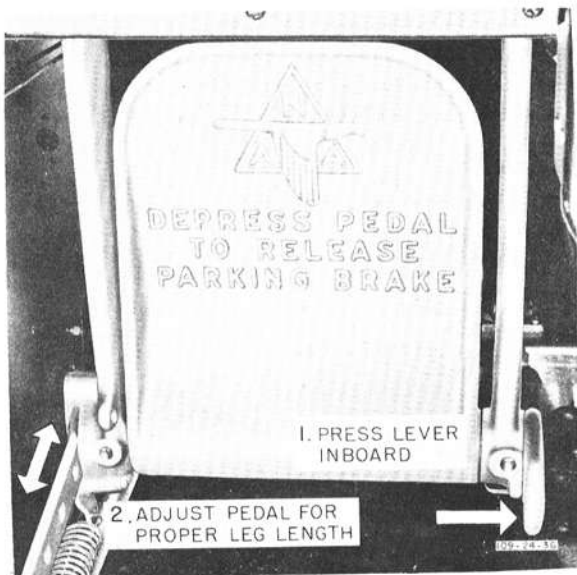


Figure 6—Rudder Pedal Adjustment

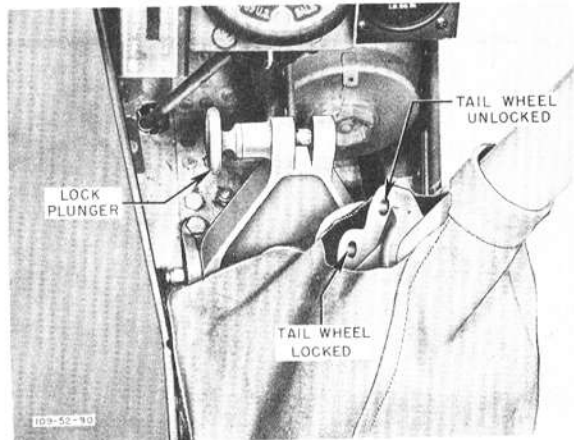


Figure 7—Surface Control Lock

(2) Adjust the seat level to obtain full travel of the rudder pedals in the extreme positions. The adjustment lever is on the right side of the seat.

(3) See that ignition switch is "OFF."

(4) Set parking brakes.

(5) See that the bomb and gun safety switches are "OFF."

(6) See that landing gear control handle (figure 3—item 57) is in the "DOWN" position.

(7) Unlock surface control lock at the base and just forward of the control stick by pulling the plunger on left side of the lock. (See figure 7.) Check the controls for free and proper movement, watching control surfaces for correct response.

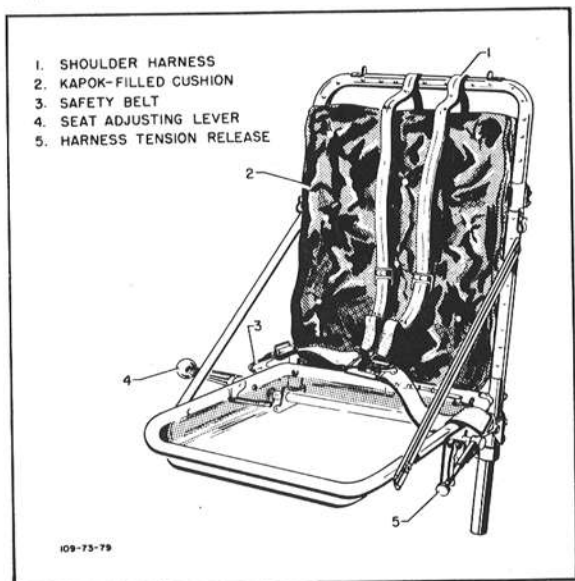


Figure 8—Pilot's Seat

- (8) Set altimeter to correct barometric pressure.
- (9) Check remote-reading compass for correct reading.
- (10) Turn "ON" generator-disconnect switch. (See figure 4—item 66.) If external power is not used, turn "ON" battery-disconnect switch. (See figure 4—item 65.)
- (11) Check landing gear warning lights by pushing lamp housing or push-to-test switch.
- (12) Test gun sight illumination by operating rheostat control. (Gun safety switch must be on "SIGHT AND CAMERA" or "GUNS, SIGHT, AND CAMERA.")
- (13) Turn "OFF" generator-disconnect switch. (If battery-disconnect switch is "ON," turn it "OFF.")
- (14) Close sliding canopy. (See figures 9 and 10.)

b. When night flying is anticipated, make the following additional checks with the generator-disconnect switch "ON." (If no external power, battery-disconnect switch "ON.")

- (1) Test fluorescent instrument lights by operating rheostat controls. The control for the left light is on the radiator air control panel; the control for the right light is on the right-hand switch panel.
- (2) Test position lights by moving switch on right-hand switch panel to "BRIGHT" and "DIM."
- (3) Test landing light by operating switch on radiator air control panel.
- (4) Test cockpit swivel lights by turning on switch located on lamp housing. The cockpit light master switch on the front switch panel must be "ON" before turning on the lights.
- (5) Test operation of recognition lights; the switches are on the right-hand switch panel. The keying switch is on the right longeron.

Note

Do not operate recognition lights longer than 10 seconds on the ground.

- (6) Turn "OFF" generator-disconnect switch. (If battery-disconnect switch is "ON," turn it "OFF.")

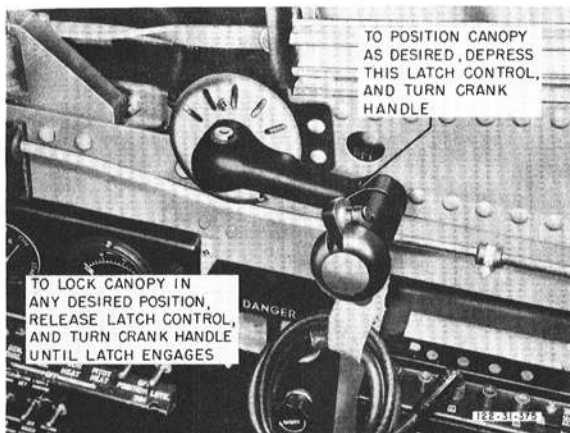
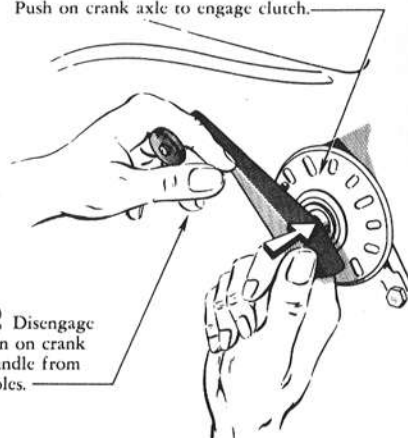


Figure 9—Sliding Canopy Operation—Late Airplanes

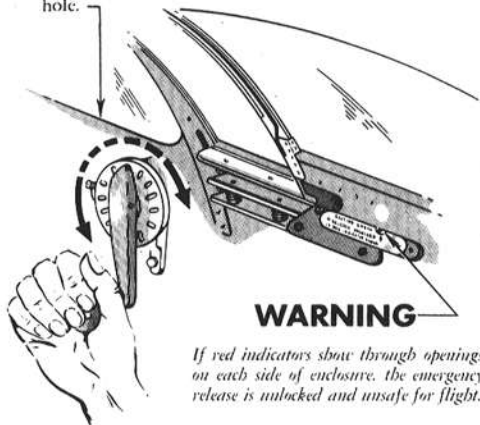
TO OPERATE CANOPY WITH HANDCRANK

- 1 Push on crank axle to engage clutch.



- 2 Disengage pin on crank handle from holes.

- 3 Turn crank in desired direction, holding knob inboard. Lock canopy by engaging pin in nearest hole.



WARNING

If red indicators show through openings on each side of enclosure, the emergency release is unlocked and unsafe for flight.

TO OPERATE CANOPY MANUALLY

Pull out on crank handle to disengage clutch. Canopy will then be free-sliding.

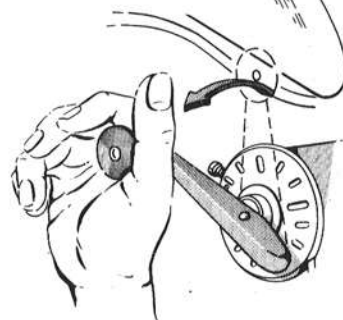


Figure 10—Sliding Canopy Operation—Early Airplanes

3. FUEL SYSTEM MANAGEMENT.

CAUTION

Keep fuel booster pump operating at all times during flight to ensure adequate fuel pressure. The electrical circuit is connected through a switch to the fuel selector valve; therefore, turning the valve from one position to another automatically shuts off the booster pump in the tank formerly used and starts the pump in the tank selected, provided that the booster pump switch is "ON" ("NORMAL" or "EMERGENCY" in early airplanes).

a. Take off and climb with the fuel selector on "MAIN TANK L.H.," and the booster pump switch in "EMERGENCY" (early airplanes) or "ON" (late airplanes).

b. When a safe altitude has been reached, move the booster pump switch to "NORMAL" (early airplanes) or leave at "ON" (later airplanes), move fuel selector to "FUS. TANK," and cruise on the fuselage tank fuel until only 25 gallons remain.



Figure 11—Fuel Selector Control

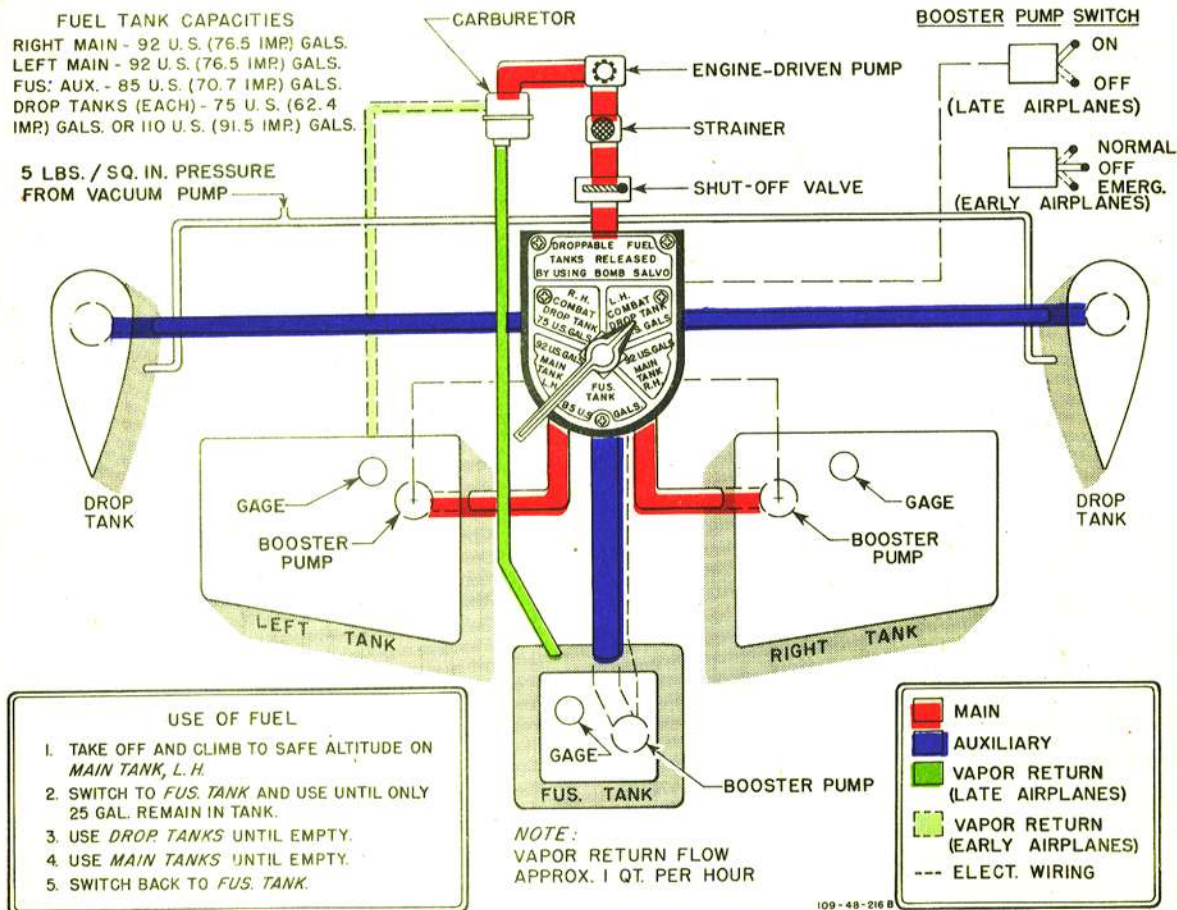


Figure 12—Fuel System Line Diagram

WARNING

The carburetor vapor return line feeds to the fuselage tank on later airplanes (to the left-hand main tank on early airplanes); therefore, it is necessary to use fuel from the fuselage tank first.

CAUTION

Retain approximately 25 gallons in the fuselage tank to keep the CG of the airplane in the optimum position for landing.

c. After draining the fuselage tank to 25 gallons, move the fuel selector to either of the droppable tank positions and use fuel from them alternately until they are empty.

Note

The combat tanks have no booster pump; a controlled pressure of 5 pounds per square inch is maintained within them by the exhaust side of the vacuum pump.

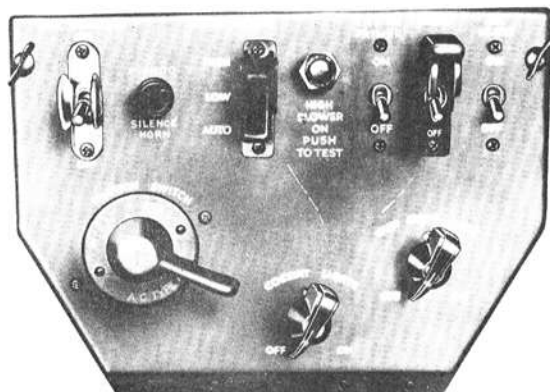
d. Switch fuel selector to "MAIN TANK L.H." or "MAIN TANK R.H."; then alternately use fuel from the left and right main tanks until the wing tanks are empty, to avoid wing heaviness.

e. When wing tanks are empty, switch fuel selector back to "FUS. TANK."

4. STARTING ENGINE.

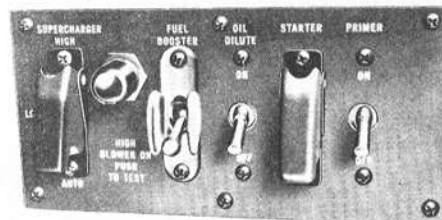
a. Follow this procedure when starting the engine.

- (1) See that ignition switch is "OFF."
- (2) See that mixture control is in "IDLE CUT OFF."
- (3) Have ground personnel pull the propeller through 8 blades.



109-54-296B

Figure 13—Front Switch Panel—Early Airplanes



122-43-73

Figure 14—Engine Control Panel—Airplanes With Zero Rail Rocket Installation

(4) Turn "ON" generator-disconnect switch. (See figure 4-item 66.) If external power supply is not used, turn "ON" battery-disconnect switch. (See figure 4-item 65.)

(5) Open throttle one inch (early airplanes) or to "START" position (late airplanes). (See figure 19.)

(6) Move propeller control to full "INCREASE RPM."

(7) On early airplanes, make certain boost control, at lower left side of instrument panel, is in "AUTOMATIC." On late airplanes, see that throttle gate is safety wired.

(8) See that supercharger blower switch is in "AUTO."

(9) Turn oil and coolant radiator air control switches at left side of cockpit to "AUTOMATIC."

(10) Move carburetor air control, at aft end of control pedestal, to "RAM AIR." ("UNRAMMED FILTERED AIR," or "UNRAMMED HOT AIR," if required.)

(11) Turn "ON" fuel shut-off control, adjacent to the fuel selector (figure 11), and turn fuel selector to "MAIN TANK L.H."

(12) Switch booster pump to "ON" (late airplanes) or "NORMAL" (early airplanes). Check booster output on fuel pressure gage: 10-14 pounds per square inch, "ON"; 8-12 pounds per square inch, "NORMAL."

(13) *Electric prime:* three to four seconds when cold, one when hot (late airplanes). *Hand prime:* three to four strokes when cold, one when hot (early airplanes).

(14) Make sure propeller is clear.

(15) Turn ignition switch to "BOTH."

(16) Lift guard on starter switch, and press switch to "START."

Note

Whenever possible, use an external power supply to start the engine. Use airplane's battery in an emergency only.

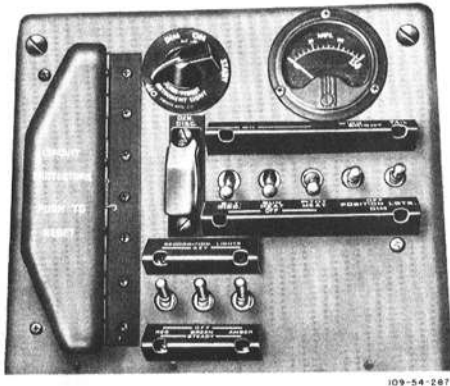


Figure 15—Right Switch Panel

(17) As engine starts, move mixture control to "AUTO RICH" or "RUN." If engine does not start after several turns, continue priming.

CAUTION

Leave mixture control in "IDLE CUT OFF" until engine fires. After firing, if engine does not start, move mixture control back to "IDLE CUT OFF" position.

(18) Check oil pressure. If pressure is not up to 50 pounds within 30 seconds, stop engine and investigate.

5. WARM-UP AND GROUND TEST.

CAUTION

During ground check, do not run up engine with surface controls in a locked position.

a. Warm up the engine at 1300 rpm until the oil temperature shows a definite increase and the oil pressure remains steady when the throttle is opened. The desired oil and coolant temperatures will be maintained by having the radiator air controls in "AUTOMATIC."

If coolant and oil temperatures exceed limits with controls in "AUTOMATIC," shut engine off and investigate.

b. Keep the flight indicator uncaged at all times except during maneuvers which exceed operating limits.

Note

If horizon bar on flight indicator is not level after engine is started, cage gyro momentarily.

c. After the engine has been warmed up sufficiently, proceed with these tests:

(1) Check both left and right main, and fuselage fuel systems by rotating fuel selector with booster pump switch in "ON" or "EMERGENCY." Check fuel pressure within limits. If combat tanks are installed, momentarily switch to each combat tank position several times to permit air trapped in the combat tank lines to bleed into the main system. Then check each position for smooth operation of the engine.

(2) Check operation of wing flaps.

(3) Check operation of radiator air outlet flaps (with assistance of outside observer) using override positions of radiator air control switches. Return switches to "AUTOMATIC."

(4) Check communication equipment for proper operation.

(5) At 2300 rpm, check the following:

Suction	3.75-4.25 in. Hg
Hydraulic pressure	800-1100 lbs./sq. in.
Ammeter	100 amperes maximum

(6) Check the instruments for desired ranges.



Figure 16—Radiator Air Control Panel

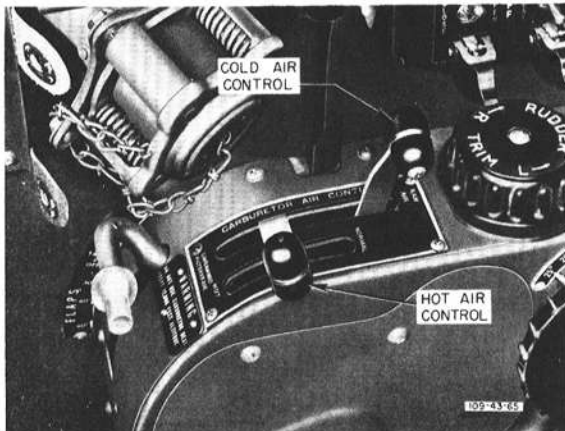


Figure 17—Carburetor Air Controls—Late Airplanes

(7) With propeller control in full "INCREASE RPM," set throttle control to obtain 2300 rpm. Move propeller control back to note maximum drop of 300 rpm. Then move forward to full "INCREASE RPM."

(8) Check supercharger operation: With propeller control at full "INCREASE RPM," engine speed 2300 rpm, hold supercharger switch in "HIGH." Note rpm drop (at least 50 rpm).

(9) With propeller control in full "INCREASE RPM" and engine speed 2300 rpm, check each magneto. Maximum allowable drop in rpm is 100 on right magneto and 130 on left magneto.

(10) Pull throttle control back to idle engine.

(11) Have ground personnel release tail, remove wheel chocks, and disconnect external power supply.

(12) If battery-disconnect switch was "OFF" (while using external power supply), turn it "ON" now.

6. SCRAMBLE TAKE-OFF.

Use oil dilution (3 minutes maximum) to obtain proper oil pressure at moderate power, and as soon as the engine will take the throttle, taxi out, and take off.

Note

Overdilution is likely to result under these conditions because of low oil flow and a cold engine, which holds back evaporation. If dilution is used, observe the oil pressure closely during the time of dilution and take-off to determine whether or not the oil has been overdiluted. Overdilution will cause low oil pressure, and loss of oil through the engine breathers.

7. TAXIING INSTRUCTIONS.

a. Raise the wing flaps, to prevent damage to them.

CAUTION

Taxi cautiously, to avoid damage from objects which the tires might pick up and throw against the radiator air outlet flaps.



b. Steer a zigzag course to obtain an unobstructed view.

c. Taxi with the stick slightly aft of neutral to lock the tail wheel. In the locked position, the tail wheel may be turned 6 degrees to the right or left with the rudder pedals. For sharp turns, push the stick forward of the neutral position to allow the tail wheel full-swiveling action.

d. Use the brakes as little as possible.

e. Upon reaching the take-off position, stop the airplane at right angles to the runway so that approaching airplanes may be plainly seen.

8. BEFORE TAKE-OFF.

a. Trim airplane as follows: Rudder trim, 5 degrees right; aileron trim, 0 degrees; metal elevator trim, 26 percent aft CG -2 degrees "NH," 31 percent aft CG -4 degrees "NH"; fabric elevator trim, 26 percent aft CG -2 degrees "TH," 31 percent aft CG -0 degrees.

b. Check flying controls for free movement (look at control surfaces).

c. Check fuel levels.

d. See that fuel selector is set on "MAIN TANK L.H.," and that booster pump switch is in "ON" or "EMERGENCY".

e. Generator-disconnect switch "ON."

f. Mixture control "AUTO RICH" or "RUN."

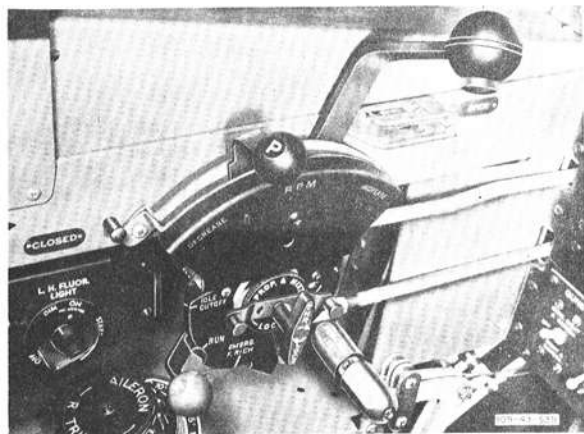


Figure 18—Engine and Propeller Controls—
Early Airplanes

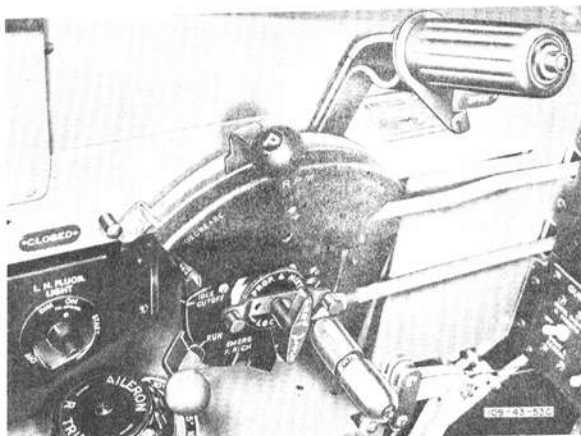


Figure 19—Engine and Propeller Controls—
Late Airplanes

- g. Propeller control at full "INCREASE RPM."
- b. supercharger blower switch "AUTO."
- i. Oil and coolant radiator air controls "AUTOMATIC."
- j. Boost control "AUTOMATIC" (early airplanes only).
- k. Carburetor air control "RAM AIR." ("UNRAMMED FILTERED AIR" or "UNRAMMED HOT AIR," if required.)
- l. See that cockpit enclosure is locked and that emergency release handle is safetied.
- m. If it is necessary to wait at the take-off position for a long period, recheck the magnetos at 2500 rpm with the

propeller control at full "INCREASE RPM."

9. TAKE-OFF.

- a. Make sure take-off area is clear.
- b. Wing flaps 15 to 20 degrees down for best obstacle clearance.
- c. Oil pressure within limits.
- d. Oil temperature within limits.
- e. Coolant temperature within limits.

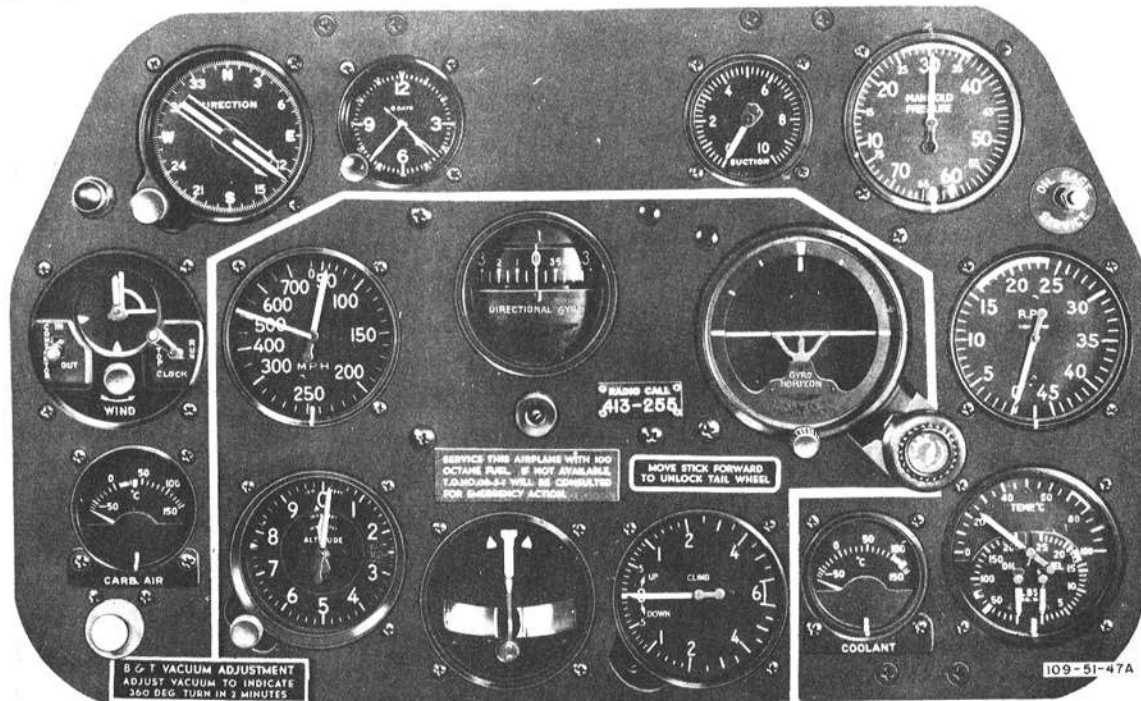


Figure 20—Instrument Panel—Early Airplanes

f. Open throttle to gate—61 in. Hg at 3000 rpm (5 minutes maximum), and take off.

Note

It is recommended that 61 in. Hg and 3000 rpm be used for all take-offs and that this power setting be reached as quickly as possible after starting the take-off run.

g. Do not attempt to lift the tail too soon, as this increases the torque action. Pushing the stick forward unlocks the tail wheel, thereby making steering difficult. The best take-off procedure is to hold the tail down until sufficient speed is attained, and then raise the tail slowly.

TAKE-OFF SPEEDS

9,000 lbs. (no external load)	95 IAS
10,000 lbs. (external load)	103 IAS
11,000 lbs. (external load)	110 IAS

See Take-off, Climb, and Landing Charts for further information.

10. ENGINE FAILURE DURING TAKE-OFF.

a. The chances of engine failure during take-off can be greatly reduced if the engine is run up carefully and checked thoroughly beforehand.

b. The hazards due to engine failure during take-off can be minimized by observing the following practices:

(1) Retract the landing gear as soon as the airplane is definitely airborne.

(2) Raise the flaps as soon as the airplane reaches a safe altitude.

c. If the engine fails immediately after take-off, act quickly as follows:

(1) Depress the nose at once so that the airspeed does not drop below stalling speed.

(2) If external fuel tanks or bombs are installed, release them immediately.

(3) Release the sliding canopy by pulling the emergency release handle on top of the longeron, at the right of the instrument panel.



WARNING

Before emergency release of canopy in flight, drop seat and lower head as far as possible. If excessive force was used in securing the canopy prior to take-off, it may be necessary to crank the canopy back enough to relieve the pressure against the windshield before the emergency release will be effective.

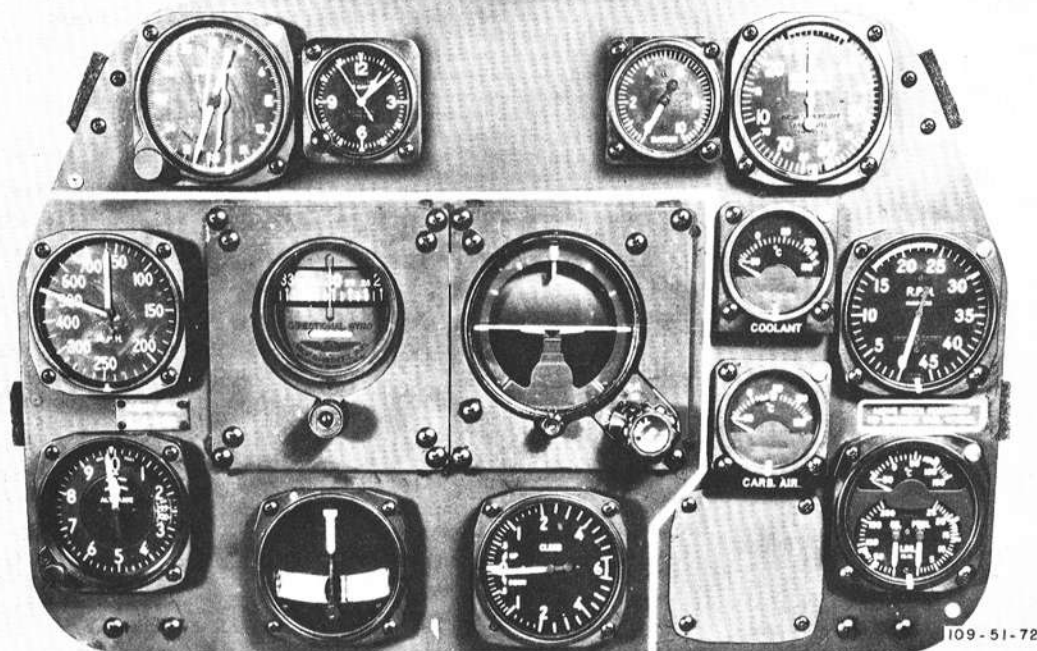


Figure 21—Instrument Panel—Late Airplanes

(4) When a reasonable doubt exists as to the condition of the terrain on which you are being forced to land, or if there is a probability of the airplane nosing over or over-running the available landing area, retract the landing gear.

- (5) Lower the flaps fully, if possible.
- (6) Move mixture control to "IDLE CUT OFF" and turn ignition switch "OFF."
- (7) Turn fuel shut-off control "OFF."
- (8) Turn battery-disconnect switch "OFF."
- (9) Land straight ahead, only changing directions sufficiently to miss obstructions.
- (10) After landing, get out of the airplane as quickly as possible and remain outside.

11. CLIMB.

a. As soon as the airplane is sufficiently clear of the ground, proceed as follows:

- (1) Pull the landing gear control handle inboard and up to retract the gear. Check position of gear by warning lights at left of instrument panel.

WARNING

Do not apply brakes after take-off to stop rotation of wheels, as brake discs may seize.

(2) Raise the flaps by pulling flap control to the full up position when sufficient airspeed is attained and all obstacles are cleared. No sink is noticeable when the flaps are raised.

(3) Check the coolant and oil temperatures, and the oil pressure.

Note

As the rate of climb can vary widely, depending on weight carried, external loading, and altitude, refer to Take-off, Climb, and Landing Charts for the rate of climb applicable to the particular mission to be conducted.

12. DURING FLIGHT.

a. GENERAL.

- (1) As soon as desired altitude is attained, turn booster pump switch to "NORMAL" (early airplanes only).

CAUTION

Keep booster pump "ON" (late airplanes) or "NORMAL" (early airplanes) at all times during flight.

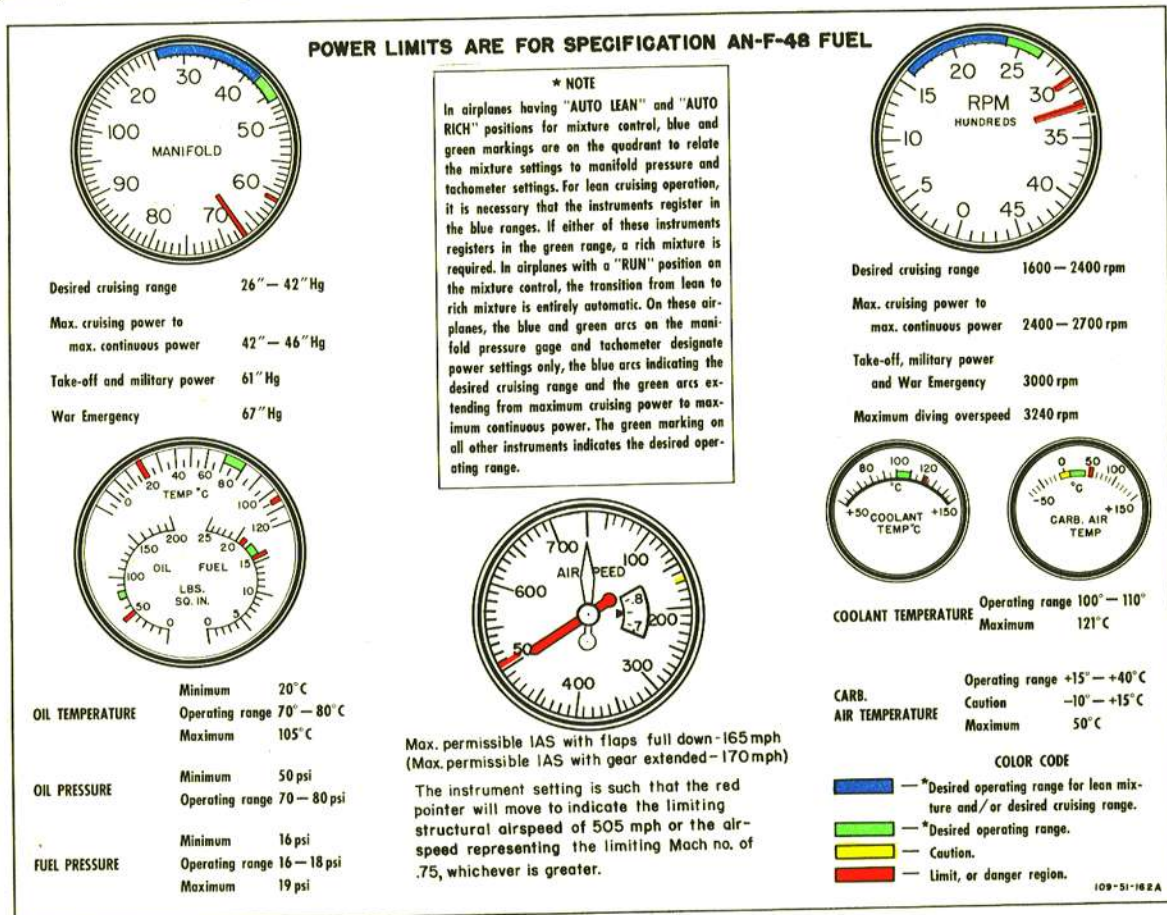


Figure 22—Instrument Limitations

(2) Set throttle and propeller controls to desired manifold pressure and rpm.

(3) Periodically check for the desired instrument readings.

Note

With the radiator air controls set in the "AUTOMATIC" position, the coolant temperature will be approximately 100°-110°C and the oil temperature will be approximately 70°-80°C. It should be noted that with very high powers on hot days, even though the radiator air controls are in the "AUTOMATIC" position, these temperature limits may be exceeded because the outlet flaps are in the full open position, making it impossible for the automatic control to maintain the desired temperature limits.

(4) For engine operation, see Power Plant Chart, section III, and Flight Operation Instruction Charts, appendix I.

Note

To ensure the lowest fuel consumption on a long-range mission, it is recommended that the highest manifold pressure consistent with Flight Operation Instruction Charts be used with any given rpm setting. However, to minimize lead fouling of spark plugs consequent to prolonged cruising at low power (especially in the range from 1600 to 1900 rpm), it is also recommended that a high power (3000 rpm and 61 in. Hg) be used for one minute every 30 minutes when the fuel supply is adequate.

WARNING

Do not use carburetor heat on V-1650-3 and V-1650-7 engines at altitudes above 12,000 feet. This precaution is necessary because heat has an adverse (leaning) effect on the carburetor altitude compensator mechanism above this altitude.

b. WAR EMERGENCY RATING.

(1) GENERAL.

(a) The War Emergency Rating given on the Power Plant Charts has been established to make available in combat the absolute maximum manifold pressure at which

Figure 23 deleted in revision dated 17 December 1947.

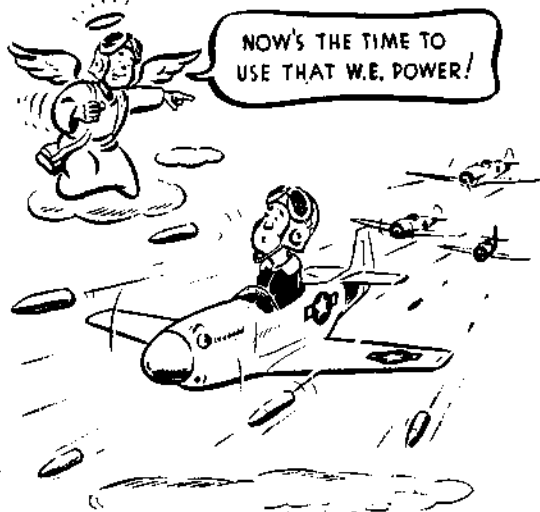
Figure 23—Engine and Airplane Limitations

the engine may be operated, within reasonable safety limits, for a 5-minute period under emergency conditions.

(b) This rating is considerably higher than the ratings given in the engine specification under which the engine was delivered. Since its use will decrease the engine's normal service life and time between overhauls, the War Emergency Rating should be held for use *only when emergency conditions exist*. The War Emergency Rating is not a guaranteed power rating; it is a maximum manifold pressure rating as established by the correct setting of the automatic manifold pressure regulator and the correct setting of the propeller governor to allow the propeller to turn at 3000 rpm.

(c) Use of the War Emergency Rating is permissible only when the following requirements are fulfilled:

1. The airplane must be in combat or precombat areas, as designated by the AAF



2. Specification No. AN-F-48, Grade 100/130 fuel must be used.

3. KLG RC5/3, Lodge RS5/5, or AC LE-44 spark plugs must be installed.

4. A break-through seal must be installed on the emergency boost control (early airplanes) or at the gate (late airplanes) to inform the crew chief that the engine has been operated at War Emergency Rating.

Note

Entry shall be made on Form 1A of time of war emergency power operation for close coordination with ground engineering officer.

5. The airplane must be placarded with a decal stating that use of the War Emergency Rating is permitted.

(2) OPERATION.—If it is necessary to use the War Emergency Rating, proceed as follows:

(a) Check mixture control. On late airplanes, the mixture control will be in "RUN"; on early airplanes, the mixture control will be in "AUTO RICH."

(b) Move propeller control to full "INCREASE RPM."

(c) Advance throttle to full open position (beyond gate on late airplanes).

(d) Pull out on boost control lever (early airplanes).

(e) Use war emergency power for 5 minutes maximum. Do not permit coolant outlet temperature to exceed 121°C. Oil inlet temperature must not exceed 105°C.

CAUTION

If the oil has been diluted, it is desirable to operate the engine 10 to 15 minutes at from 80 percent normal to military power before using the War Emergency Rating.

(f) To return to normal power operations:

1. Push boost control lever in (early airplanes).

2. Set throttle and propeller controls to give desired manifold pressure and rpm.

13. ENGINE FAILURE DURING FLIGHT.

Follow instructions in section IV, paragraph 3.

14. FLYING CHARACTERISTICS.

a. GENERAL.—The airplane is stable at all normal loadings, but the directional trim changes at low speeds as speed and horsepower output are varied. The trim tab controls are sensitive and must be used carefully. The effect of flap and landing gear operation on the trim of the airplane in flight is as follows:

Landing gear extended—airplane becomes nose heavy.
Flaps lowered—airplane becomes nose heavy.

b. CHARACTERISTICS OF ELEVATOR BOBWEIGHT.—With the fuselage tank filled, the center of gravity of the airplane is moved so far aft that flying characteristics become unsatisfactory. Stick forces tend to reverse when the airplane enters a tight turn or pull-out, making it necessary for the pilot to exert considerable forward pressure on the stick to prevent further tightening of the turn or pull-out. In order to reduce this tendency, a bobweight has been added to the elevator system to increase the normal stick forces under accelerated flight conditions. When not more than 25 gallons remain in the fuselage fuel tank, combat maneuvers may be made without as great a danger of overaccelerating the airplane due to low stick forces. However, with the fuselage tank full, it is still necessary to exercise extreme care in flying and to avoid accelerated flight. Keep in mind that the restrictions given in paragraph 1. a. still apply.

15. STALLS.

The stall in this airplane is comparatively mild. The airplane does not whip at the stall but rolls rather slowly, and has very little tendency to drop into a spin. When the stick and rudder are released, the nose drops sharply, and the airplane recovers from the stall almost instantly. When a complete stall is reached, a wing will drop. If you keep pulling back on the stick when the wing drops, the airplane will fall into a steep spiral. In a straight power-off stall, some warning

is given about 3 to 4 mph above the stall by slightly elevator buffet. A high-speed stall is preceded by sharp buffeting at the elevators and wing root, but recovery is almost immediate when pressure on the stick is released. Recovery from any stall is entirely normal: Release the back pressure on the stick and apply opposite rudder to pick up the dropping wing. The speed at which a stall occurs can vary widely, depending on the gross weight and external load of the airplane.

STALLING SPEEDS

With or Without Wing Racks (No External Load)

GEAR AND FLAPS UP

Gross Weight	9500	8500	7500
IAS (mph)	103	97	91

GEAR AND FLAPS DOWN

Gross Weight	9500	8500	7500
IAS (mph)	96	90.5	85

With Wing Bombs or Combat Tanks

GEAR AND FLAPS UP

Gross Weight	11,000	10,000	9000
IAS (mph)	113	107.5	102

GEAR AND FLAPS DOWN

Gross Weight	11,000	10,000	9000
IAS (mph)	103	98	93

16. SPINS.

a. POWER-OFF SPINS. (See figure 24.)

(1) DESCRIPTION.

(a) In general, spins in this airplane are uncomfortable due to heavy oscillations. Occasionally the left spin will dampen out after approximately three turns, but the right spin continues with an oscillatory action.

(b) Upon applying controls to start a spin, the airplane snaps $\frac{1}{2}$ turn in the direction of spin with the nose dropping to near vertical. At the end of one turn, the nose rises to or above the horizon and the spin slows down, occasionally coming almost to a complete stop. The airplane then snaps $\frac{1}{2}$ turn with the nose dropping to 50-60 degrees below the horizon and continues as during the first turn.

(c) The force required to hold the controls in the spinning position is quite heavy and some rudder buffet will be noticed.

(d) Upon applying controls for recovery, the nose drops to near the vertical position, the spin speeds up, then stops in 1 to $1\frac{1}{4}$ turns after recovery controls have been applied.

(2) RECOVERY.—Recovery procedure is the same in both a left and right spin. As soon as you apply opposite rudder, the nose will drop slightly. The spin will speed up rapidly for about $1\frac{1}{4}$ turns and then stop. The rudder force will be light at first, become very heavy for about one second in the first half turn, and then drop to zero as the spin stops. Recovery is effected in the normal manner, that is, by applying full opposite rudder followed by movement of the stick to neutral.



Figure 24—Spin Characteristics

109-00-287A

Note

During the spin, a slight rudder buffeting will be noticeable. If you attempt to recover from the dive too soon after the spin has stopped, you will also feel a rather heavy buffeting in both the elevator and rudder. The remedy for this condition is to release some of the pressure you have applied on the stick.

b. POWER-ON SPINS.

(1) **DESCRIPTION.**—Power-on spins are extremely dangerous in this airplane and should never be intentionally performed. In a power-on spin, the nose of the airplane remains 10-20 degrees above the horizon and recovery control has no effect upon the airplane until the throttle has been completely retarded.

(2) **RECOVERY.**—Close throttle completely and apply controls for recovery. Hold full opposite rudder with stick in neutral until recovery is effected. As many as 5 or 6 turns of spin will be made after applying controls for recovery and 9000-10,000 feet of altitude will be lost.

17. PERMISSIBLE ACROBATICS.

All acrobatics are permitted, with the exception of snap rolls and power-on spins. Slow rolls are permitted only if the airplane is equipped with a dorsal fin and reverse boost rudder tab. Inverted flying must be limited to 10 seconds because of loss of oil pressure and failure of the scavenge pumps to operate in an inverted position.

18. DIVING.

a. MAXIMUM DIVING SPEEDS.

(1) **GENERAL.**—At high diving speeds there is danger of the airplane being affected by compressibility—a phenomenon likely to be encountered when the true speed approaches the speed of sound. Compressibility may be indicated by instability of the airplane, uncontrollable rolling or pitching, stiffness of controls, or combinations of these effects. The high-speed dive characteristics of the airplane depend to some extent on the elevator installation. Late airplanes are equipped with metal-covered elevators and a vertical stabilizer with an angle of incidence of $\frac{1}{2}$ degree; all other airplanes have fabric-covered elevators and a vertical stabilizer with an angle of incidence of 2 degrees.

(2) **FABRIC-COVERED ELEVATORS.**—At a true speed of approximately 75 percent of the speed of sound, airplanes with fabric-covered elevators tend to porpoise. This porpoising starts at approximately the speeds shown in red on figures 26 and 27 and increases in intensity as the airspeed is further increased. Although the airplane does not exhibit any unusual characteristics other than porpoising at the indicated speeds, these limits should not normally be exceeded, since compressibility effects may be evidenced in a more violent manner if allowed to progress. Figures 26 and 27 show the pilot's indicated airspeed corresponding to a true speed of 75 percent of the speed of sound at various altitudes. Note, however, that at the lower altitudes, the speed of sound does

not govern, and the limiting speed becomes a structural consideration only.

(3) **METAL-COVERED ELEVATORS.**—With the metal-covered elevators installed, the longitudinal characteristics remain normal until the true speed of the airplane reaches approximately 76 to 78 percent of the speed of sound. At this speed, the airplane may become slightly nose-heavy because of the effects of compressibility. Inasmuch as further increases in true speed may result in more severe nose-heaviness, diving speed should be limited at this point and recovery started immediately after the change in trim is evident.

b. ALTITUDE REQUIRED FOR PULL-OUT.—Figure 26 shows the minimum safe altitude required for a pull-out from dives, with a constant 4G acceleration. Figure 27 shows the minimum safe altitude required for a pull-out from dives with a constant 6G acceleration (when using anti-G suit).

c. RECOVERY.—If, through necessity or inadvertence, you exceed the diving speed limits shown on figure 26 and pronounced compressibility effects are experienced, ease off on your power and pull up gradually.



WARNING

Be very careful in pull-outs, since the stick forces are relatively light, and an abrupt pull-out may cause structural failure.

The elevator trim tab will normally not be required to aid recovery. However, if found necessary, it should be used with care and in small increments.

19. GLIDING.

Gliding may be carried out at any safe speed down to the recommended margin of about 25 percent above stalling speed. With the landing gear and flaps up, the glide is fairly flat with the nose very high. Forward visibility in this condition is poor. Lowering either the flaps or landing gear, or both, greatly steepens the gliding angle, and the rate of descent is considerably increased.

20. NIGHT FLYING.**Note**

On early airplanes, spare bulbs are contained in the small compartment on the right forward side of the cockpit. Disconnect oxygen hose before opening compartment door. On late airplanes, spare bulbs are in clips on the left underside of the instrument shroud.

a. In flying at night, the sequence outlined for daylight operation should be even more strictly observed. In addition, familiarize yourself with the location of the different lights and their control switches, especially the landing light switch.

(1) INSTRUMENT LIGHTING.—Turn on the fluorescent lamps by turning the rheostat knobs (on radiator air control panel and right-hand switch panel) to "START" until the lights come on; then switch to either "ON" or "DIM" position. Rotating the lens housing selects the visible or invisible illumination.

(2) POSITION LIGHTS.—The position light switches are on the right-hand switch panel. Two intensities of light are available: "BRIGHT" and "DIM."

(3) LANDING LIGHT.—The switch for the landing light is located on the radiator air control panel.

(4) COCKPIT LIGHTS.—A cockpit swivel light is on each side of the cockpit. Turn on light by turning switch on lamp housing. The cockpit light switch on the front switch panel must be "ON" before operating the lights.

(5) RECOGNITION LIGHTS.—Set the switches, located on the right switch panel, for the light or combination of lights desired. Place the switches in "STEADY" position for continuous operation and in "KEY" position for intermittent operation, using the keying switch.

21. APPROACH AND LANDING.

(Recommended landing speeds are shown in figure 28.)

a. APPROACH.—When approaching the field, follow this sequence:

Note

It is recommended that military power be used for a short period just prior to landing.

- (1) Mixture control "AUTO RICH" or "RUN."
- (2) Oil and coolant radiator air controls "AUTOMATIC."
- (3) Fuel selector to internal tank with most fuel. Booster pump switch "ON" or "NORMAL."
- (4) Propeller control set for 2700 rpm.

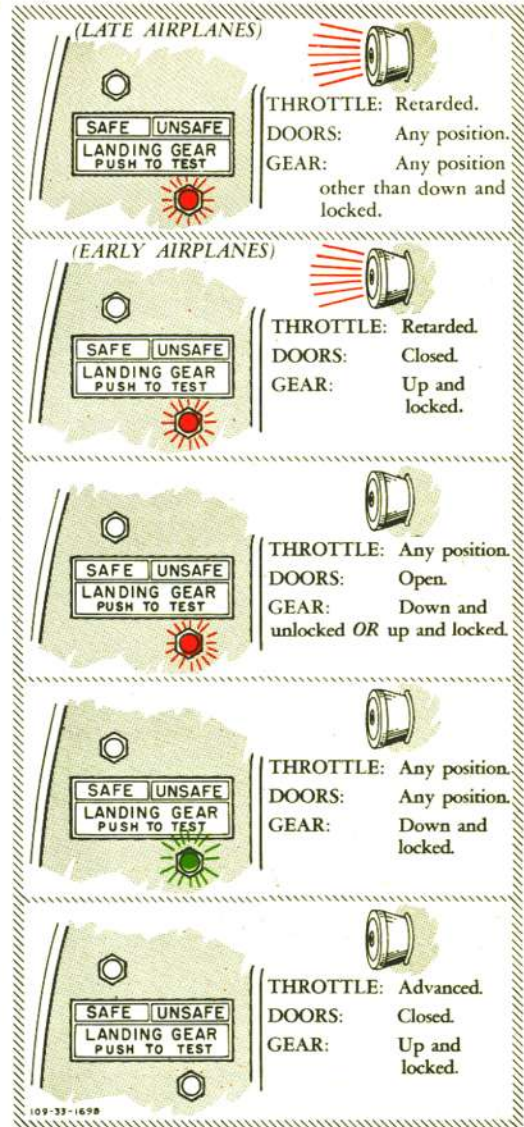


Figure 25—Landing Gear Warning Signals

(5) Lower the landing gear below 170 IAS. Check position of gear by the warning lights at left of instrument panel. On late airplanes, a horn will sound when throttle is retarded with gear up. (See figure 25.)

WARNING

After lowering landing gear, do not attempt to raise gear by moving landing gear control to "UP" until the "DOWN" cycle is completed.

(6) If desired, lower the flaps 15 degrees to give a steeper approach angle. When the airplane has been brought into the wind for landing, lower the flaps fully at an altitude of at least 400 feet, provided the indicated airspeed is below 165 IAS and above 100 IAS.



LIMITING IAS
 260
 285
 310
 340
 370
 400
 430
 465
 495
 505
 505

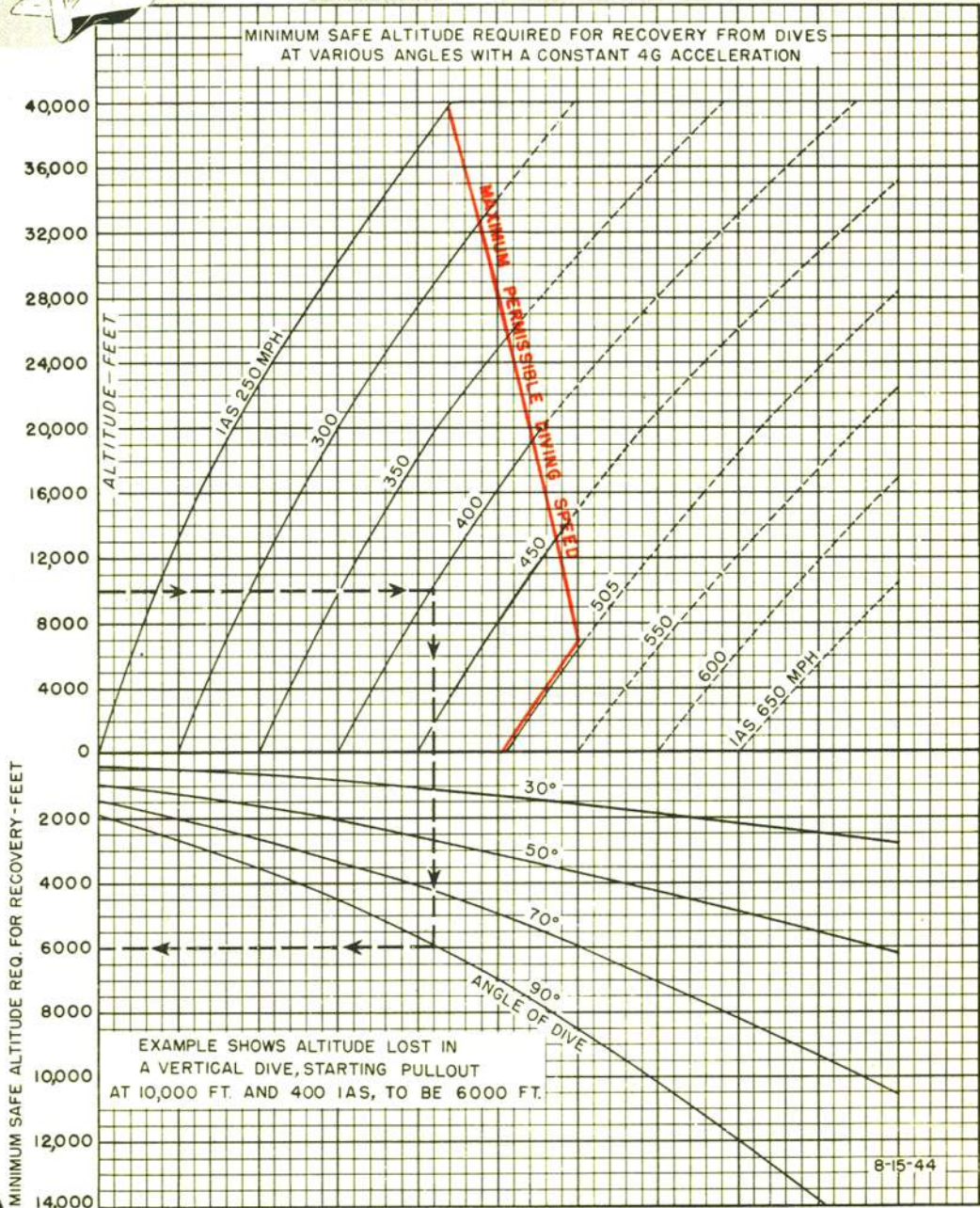


Figure 26—Diving Limitations—4G Pullout

AN 01-60JE-1

122-93-1918

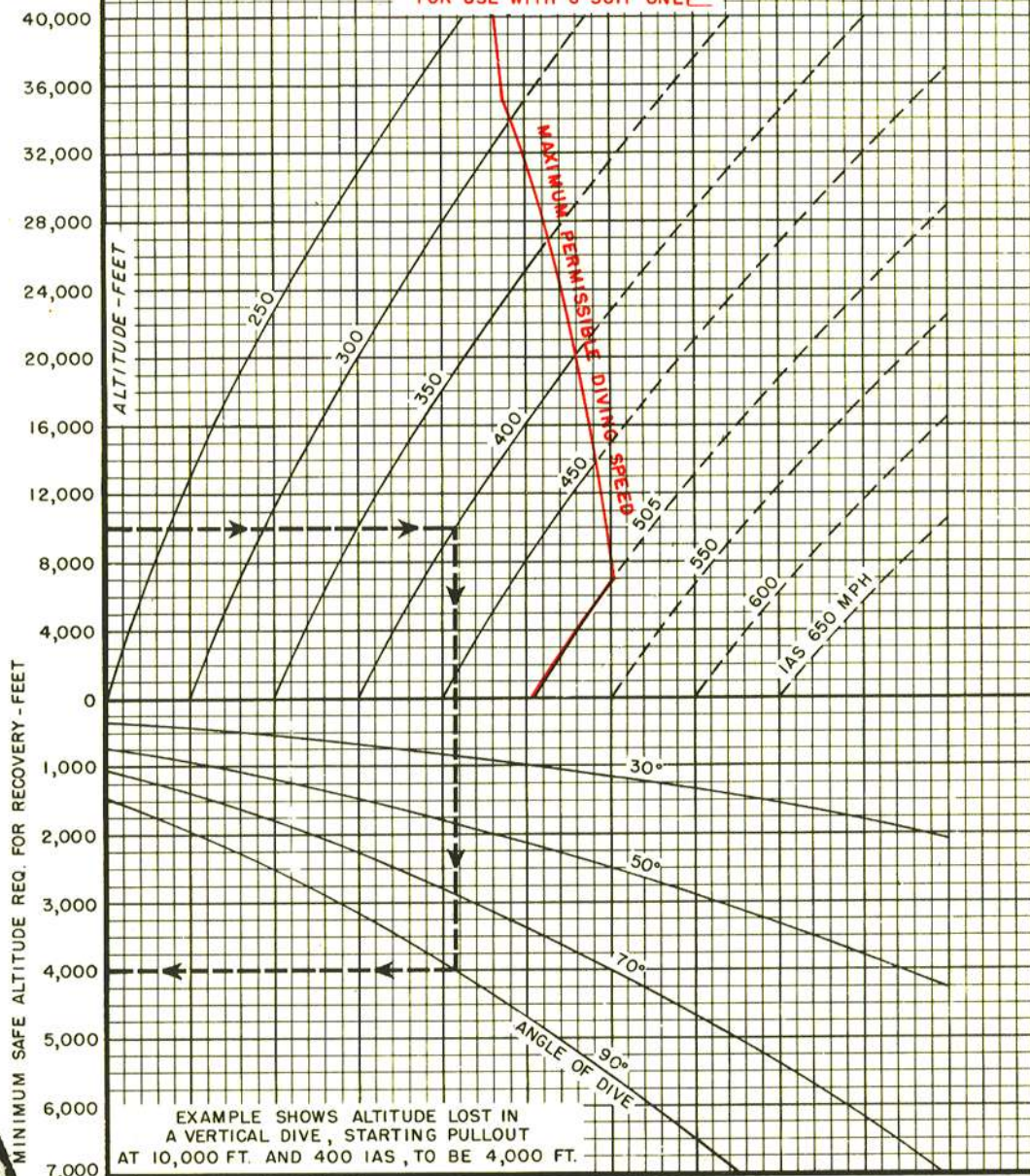


LIMITING IAS

- 260
- 285
- 310
- 340
- 370
- 400
- 430
- 465
- 495
- 505
- 505

MINIMUM SAFE ALTITUDE REQUIRED FOR RECOVERY FROM DIVES AT VARIOUS ANGLES WITH A CONSTANT 6G ACCELERATION

FOR USE WITH "G" SUIT ONLY



EXAMPLE SHOWS ALTITUDE LOST IN A VERTICAL DIVE, STARTING PULLOUT AT 10,000 FT. AND 400 IAS, TO BE 4,000 FT.

Figure 27—Diving Limitations—6G Pullout

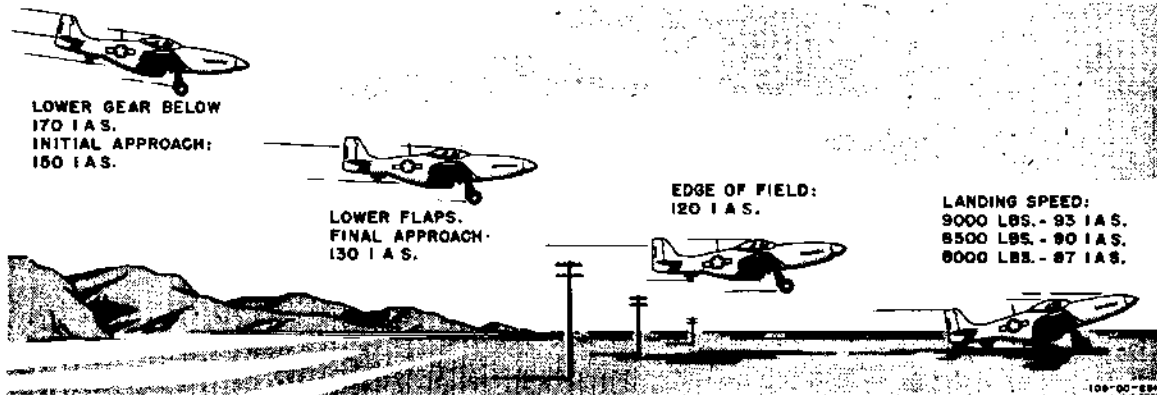


Figure 28—Approach and Landing Speeds

b. LANDING.

(1) GENERAL.—After you have turned into the field and lowered the flaps, maintain a correct gliding speed. Adjust the elevator trim tab to assist in landing. Having stopped after landing, raise the flaps before taxiing.

(2) CROSS-WIND LANDING.—As the airplane has a landing gear of wide tread and a steerable tail wheel, cross-wind landings may be negotiated safely. Keep one wing down, into the wind, to counteract drift.

(3) MINIMUM RUN LANDING.

(a) For a minimum run landing over an obstacle, lower the flaps fully and reduce power to obtain the lowest IAS consistent with safety.

(b) For a minimum run landing with no obstacle, use full flaps and make a flat, power-on approach.

(4) GO-AROUND PROCEDURE.—If an attempt to land is unsuccessful:

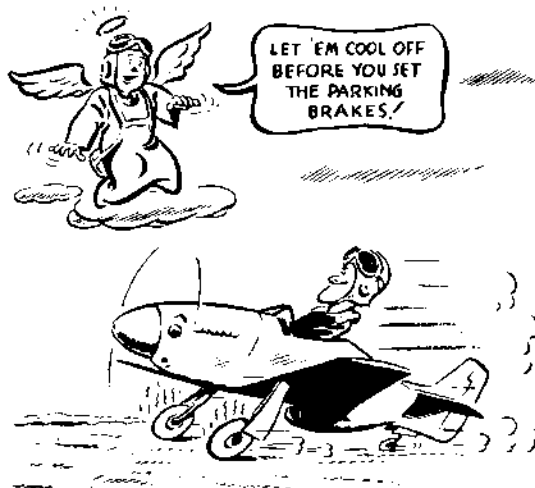
- (a) Open throttle.
- (b) Push propeller control to full "INCREASE RPM."
- (c) Raise landing gear.
- (d) When airspeed reaches 100 IAS, raise flaps.

22. STOPPING ENGINE.

- a. Turn booster pump switch "OFF."
- b. If a cold weather start is anticipated, hold oil dilution switch "ON" (3 minutes maximum).
- c. Run engine to 1500 rpm, set mixture control in "IDLE CUT OFF," and move throttle fully open. Leave mixture control in "IDLE CUT OFF" as a precaution against accidental starting.
- d. Turn ignition switch "OFF" after the engine ceases firing.
- e. Turn fuel shut-off control "OFF."

23. BEFORE LEAVING COCKPIT.

- a. Turn "OFF" all switches.
- b. Release parking brakes after wheels are chocked. ■
- c. Lock the control surfaces. (Use upper locking notch on control stick when airplane is to be towed.) (See figure 7.)
- d. Place carburetor air control in "UNRAMMED FILTERED AIR" position.



- e. Open canopy, and pull crank handle inboard to disengage clutch, so that canopy can be moved manually. (See figure 10.)
- f. Close canopy after leaving cockpit.



1. AIRSPEED CORRECTION TABLES.

a. Two corrections must be made on the IAS in order to obtain the true indicated airspeed. The first correction is for the pitot installation; the second is for compressibility effects. Use the Airspeed Installation Correction Table to find the corrected indicated airspeed; then use the Com-

pressibility Correction Table to obtain the true indicated airspeed.

b. EXAMPLE.

(1) PROBLEM.—Find true indicated airspeed from an IAS of 400 at 25,000 feet.

(2) ANSWER.—Corrected IAS = $400 + 4$ (position error) or 404. True indicated airspeed = 404 less 19 or 385.

AIRSPEED INSTALLATION CORRECTION TABLE
(With or Without External Load)

FLAPS UP		FLAPS FULL DOWN	
IAS (mph)	CORRECTION	IAS (mph)	CORRECTION
100	Add 5 mph	90	Add 3 mph
150	Add 4 mph	100	Add 1 mph
200	Add 3 mph	110	Subtract 1 mph
250	Add 2 mph	120	Subtract 2 mph
300	Add 2 mph	130	Subtract 3 mph
350	Add 3 mph		
400	Add 4 mph		

COMPRESSIBILITY CORRECTION TABLE

Pressure Altitude	Subtract From Corrected Indicated Airspeed						
	IAS (mph)						
	150	200	250	300	350	400	500
10,000	0	1	2	3	4	6	10
15,000	0	1	3	4	7	10	17
20,000	1	2	4	6	10	14	25
25,000	1	3	5	9	13	19	33
30,000	2	4	7	12	19	25	42
35,000	2	5	10	16	25	33	53

POWER PLANT CHART

AIRCRAFT MODEL(S)

PROPELLER(S)

ENGINE MODEL(S)

P-51D AND P-51K

HAMILTON STANDARD

V-1650-7

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.	COOLANT TEMP.	CARB. AIR TEMP.
DESIRED	16-18	70-80	70-80	100-110	15-40
MAXIMUM	19	80	105	121	50
MINIMUM	16	50			
IDLING	9	15			

MAXIMUM PERMISSIBLE DIVING RPM: 3240
MINIMUM RECOMMENDED CRUISE RPM: 1600

OIL GRADE: 1120, SPEC. NO. AN-O-8

FUEL GRADE: 100/130 SPEC. NO. AN-F-48

COOLANT: SPEC. NO. AN-E-2 WITH W&MT

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
5 MINUTES			15 MINUTES			TIME LIMIT			UNLIMITED			UNLIMITED		
RUN 3000			RUN 3000			MIXTURE R. P. M.			RUN 2700			RUN 2400		
MANIF. PRESS.	SUPER- CHARGER	FUEL (2) Gal/Mtn	MANIF. PRESS.	SUPER- CHARGER	FUEL (2) Gal/Mtn	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER- CHARGER	FUEL (3) GPH (3)	MANIF. PRESS.	SUPER- CHARGER	FUEL (3) GPH (3)
F.T.	HIGH	1.0	F.T.	HIGH	1.0	-55.0	40,000 FT.	-57.0	F.T.	HIGH	63	F.T.	HIGH	49
F.T.	HIGH	1.5	F.T.	HIGH	1.5	-55.0	38,000 FT.	-67.0	F.T.	HIGH	70	F.T.	HIGH	54
F.T.	HIGH	1.5	F.T.	HIGH	1.5	-55.0	36,000 FT.	-67.0	F.T.	HIGH	77	F.T.	HIGH	59
F.T.	HIGH	2.0	F.T.	HIGH	2.0	-52.4	34,000 FT.	-62.3	F.T.	HIGH	84	F.T.	HIGH	63
F.T.	HIGH	2.0	F.T.	HIGH	2.0	-48.4	32,000 FT.	-55.1	F.T.	HIGH	90	F.T.	HIGH	68
F.T.	HIGH	2.5	F.T.	HIGH	2.5	-44.4	30,000 FT.	-48.0	F.T.	HIGH	97	F.T.	HIGH	72
F.T.	HIGH	3.0	F.T.	HIGH	3.0	-40.5	28,000 FT.	-40.9	46	HIGH	101	F.T.	HIGH	77
F.T.	HIGH	3.5	61	HIGH	3.0	-36.5	26,000 FT.	-33.7	46	HIGH	99	F.T.	HIGH	82
67	HIGH	3.5	61	HIGH	3.0	-32.5	24,000 FT.	-26.5	46	HIGH	97	42	HIGH	84
67	HIGH	3.5	61	HIGH	3.0	-28.6	22,000 FT.	-19.4	46	HIGH	95	42	HIGH	83
67	HIGH	3.5	61	HIGH	3.0	-24.6	20,000 FT.	-12.3	F.T.	LOW	94	42	HIGH	82
67	HIGH	3.5	F.T.	LOW	2.5	-20.7	18,000 FT.	-5.2	F.T.	LOW	100	42	HIGH	81
F.T.	LOW	3.5	F.T.	LOW	2.5	-16.7	16,000 FT.	2.0	46	LOW	105	F.T.	LOW	79
F.T.	LOW	3.5	F.T.	LOW	3.0	-12.7	14,000 FT.	9.1	46	LOW	102	42	LOW	84
F.T.	LOW	3.5	61	LOW	3.0	-8.8	12,000 FT.	16.2	46	LOW	99	42	LOW	82
67	LOW	2.5	61	LOW	3.0	-4.8	10,000 FT.	23.4	46	LOW	97	42	LOW	80
67	LOW	3.0	61	LOW	3.0	-0.8	8,000 FT.	30.5	46	LOW	94	42	LOW	78
67	LOW	3.5	61	LOW	3.0	3.1	6,000 FT.	37.6	46	LOW	92	42	LOW	76
67	LOW	3.5	61	LOW	3.0	7.1	4,000 FT.	44.7	46	LOW	90	42	LOW	74
67	LOW	3.5	61	LOW	2.5	11.0	2,000 FT.	51.8	46	LOW	88	42	LOW	72
67	LOW	3.0	61	LOW	2.5	15.0	SEA LEVEL	59.0	46	LOW	86	42	LOW	70

GENERAL NOTES

(1) Gal/Mtn: APPROXIMATE U.S. GALLON PER MINUTE PER ENGINE

(2) GPH: APPROXIMATE U.S. GALLON PER HOUR PER ENGINE.

F.T.: MEANS FULL THROTTLE OPERATION.

VALUES ARE FOR LEVEL FLIGHT WITH W&MT.

FOR COMPLETE CRUISING DATA SEE APPENDIX I
NOTE: TO DETERMINE CONSUMPTION IN BRITISH
IMPERIAL UNITS, MULTIPLY BY 10 THEN DIVIDE
BY 12.

TAKE-OFF CONDITIONS:

3000 RPM 61" HG

CONDITIONS TO AVOID:

OPERATION BELOW 1600 RPM LOW BLOWER
OPERATION BELOW 2000 RPM HIGH BLOWER

SPECIAL NOTES

*AVOID OPERATION BELOW 1600 RPM IN LOW BLOWER
AS GENERATOR WILL NOT DELIVER SUFFICIENT AMPERAGE.

*AVOID OPERATION BELOW 2000 RPM IN HIGH BLOWER
BECAUSE OF ENGINE ROUGHNESS.

DATA AS OF 8/20/44 BASED ON FLIGHT TESTS

ANPC-511
E-1-6-E

Figure 29—Power Plant Chart—V-1650-7 Engine

AN 01-60JE-1

POWER PLANT CHART

 AIRCRAFT MODEL(S)
 P-51D AND K

 PROPELLER(S)
 AEROPRODUCTS CONSTANT-SPEED
 OR HAMILTON STANDARD

 ENGINE MODEL(S)
 V-1650-3

GAUGE READING	FUEL PRESS.	OIL PRESS.	OIL TEMP.	COOLANT TEMP.	CARB. AIR TEMP.	MAXIMUM PERMISSIBLE DIVING RPM: 3200 MINIMUM RECOMMENDED CRUISE RPM: 1600								
DESIRED	16-18	70-80	70-80	100-130	15-90	OIL GRADE: 1120, SPEC. NO. AN-O-8								
MAXIMUM	20	85	105	121	50	FUEL GRADE: 100/130 SPEC. NO. AN-F-48								
MINIMUM	15	50				COOLANT: SPEC. NO. AN-E-2 WITH N8MDT								
IDLING	9	15												
WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
5 MINUTES			15 MINUTES			TIME LIMIT			UNLIMITED			UNLIMITED		
RUN 3000			RUN 3000			MIXTURE R. P. M.			RUN 2700			RUN 2400		
MANIF. PRESS.	SUPER-CHARGER	FUEL ⁽²⁾ Gal./Min	MANIF. PRESS.	SUPER-CHARGER	FUEL ⁽²⁾ Gal./Min	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER-CHARGER	FUEL ⁽³⁾ GPH	MANIF. PRESS.	SUPER-CHARGER	FUEL ⁽³⁾ GPH
F.T.	HIGH	2.0	F.T.	HIGH	2.0	-55.0	40,000 FT.	-67.0	F.T.	HIGH	63	F.T.	HIGH	48
F.T.	HIGH	2.0	F.T.	HIGH	2.0	-55.0	38,000 FT.	-67.0	F.T.	HIGH	74	F.T.	HIGH	56
F.T.	HIGH	2.0	F.T.	HIGH	2.0	-55.0	36,000 FT.	-67.0	F.T.	HIGH	85	F.T.	HIGH	64
F.T.	HIGH	2.5	F.T.	HIGH	2.5	-52.4	34,000 FT.	-62.3	F.T.	HIGH	96	F.T.	HIGH	70
F.T.	HIGH	2.5	F.T.	HIGH	2.5	-48.4	32,000 FT.	-55.1	F.T.	HIGH	102	F.T.	HIGH	77
F.T.	HIGH	2.5	F.T.	HIGH	2.5	-44.4	30,000 FT.	-48.0	F.T.	HIGH	100	F.T.	HIGH	84
67	HIGH	3.0	61	HIGH	2.5	-40.5	28,000 FT.	-40.9	66	HIGH	98	42	HIGH	86
67	HIGH	3.0	61	HIGH	2.5	-36.5	26,000 FT.	-33.7	66	HIGH	97	42	HIGH	84
67	HIGH	3.0	F.T.	LOW	2.5	-32.5	24,000 FT.	-26.5	F.T.	LOW	99	F.T.	LOW	71
F.T.	LOW	2.5	F.T.	LOW	2.5	-28.6	22,000 FT.	-19.4	F.T.	LOW	111	F.T.	LOW	78
F.T.	LOW	2.5	F.T.	LOW	2.5	-24.6	20,000 FT.	-12.3	46	LOW	119	F.T.	LOW	83
F.T.	LOW	3.0	61	LOW	3.0	-20.7	18,000 FT.	-5.2	46	LOW	117	F.T.	LOW	91
67	LOW	3.0	61	LOW	3.0	-16.7	16,000 FT.	2.0	46	LOW	116	42	LOW	94
67	LOW	3.0	61	LOW	3.0	-12.7	14,000 FT.	9.1	46	LOW	114	42	LOW	93
67	LOW	3.0	61	LOW	3.0	-8.8	12,000 FT.	16.2	46	LOW	112	42	LOW	92
67	LOW	3.0	61	LOW	3.0	-4.8	10,000 FT.	23.4	46	LOW	110	42	LOW	90
67	LOW	3.0	61	LOW	2.5	-0.8	8,000 FT.	30.5	46	LOW	109	42	LOW	88
67	LOW	3.0	61	LOW	2.5	3.1	6,000 FT.	37.6	46	LOW	107	42	LOW	86
67	LOW	3.0	61	LOW	2.5	7.1	4,000 FT.	44.7	46	LOW	105	42	LOW	85
67	LOW	3.0	61	LOW	2.5	11.0	2,000 FT.	51.8	46	LOW	103	42	LOW	83
67	LOW	3.0	61	LOW	2.5	15.0	SEA LEVEL	59.0	46	LOW	101	42	LOW	81
GENERAL NOTES														
⁽¹⁾ Gal./Min: APPROXIMATE U.S. GALLON PER MINUTE PER ENGINE ⁽²⁾ GPH: APPROXIMATE U.S. GALLON PER HOUR PER ENGINE. F.T.: MEANS FULL THROTTLE OPERATION. VALUES ARE FOR LEVEL FLIGHT WITH RAM.							FOR COMPLETE CRUISING DATA SEE APPENDIX I NOTE: TO DETERMINE CONSUMPTION IN BRITISH IMPERIAL UNITS, MULTIPLY BY 10 THEN DIVIDE BY 12. REC FIGURES ARE PRELIMINARY SUBJECT TO REVISION AFTER FLIGHT CHECK.							
TAKE-OFF CONDITIONS:							*CONDITIONS TO AVOID:							
3000 RPM 61 IN. HG							OPERATIONS BELOW 1600 RPM LOW BLOWER OPERATIONS BELOW 2000 RPM HIGH BLOWER							
SPECIAL NOTES														
*AVOID OPERATION BELOW 1600 RPM IN LOW BLOWER AS GENERATOR WILL NOT DELIVER SUFFICIENT AMPERAGE. *AVOID OPERATION BELOW 2000 RPM IN HIGH BLOWER BECAUSE OF ENGINE ROUGHNESS.														
DATA AS OF 5-8-45 BASED ON FLIGHT TESTS														

 AIR MC-572
 8-1-46

Figure 30—Power Plant Chart—V-1650-3 Engine

Section IV

EMERGENCY OPERATING INSTRUCTIONS



1. GENERAL.

All emergency instructions, except those contained in section II, have been assembled in this section to facilitate quick reference. Thoroughly acquaint yourself with these instructions before flying this airplane.

2. ENGINE FAILURE DURING TAKE-OFF.

Follow instructions in section II, paragraph 10.

3. ENGINE FAILURE DURING FLIGHT.

a. If the engine fails during flight, the airplane may be abandoned, ditched (*paragraph 6*), or brought in for a dead-stick landing. For a landing with the engine dead, follow these instructions:

- (1) Depress the nose at once so that the airspeed does not drop below stalling speed. Keep IAS well above stalling speed.
- (2) If external tanks or bombs are installed, release them immediately. (*See paragraph 9.*)
- (3) Turn "OFF" fuel shut-off control and battery-disconnect switch.
- (4) Choose an area for landing. If near a landing field, notify tower. Judge your turns carefully and plan to land into the wind.
- (5) Release sliding canopy by pulling emergency release handle on right longeron.

WARNING

Before emergency release of canopy in flight, drop seat and lower head as far as possible. If excessive force was used in securing canopy prior to take-off, it may be necessary to crank the canopy back

enough to relieve the pressure against the windshield before the emergency release will be effective.

(6) If a long runway is available and if there is sufficient time and altitude to properly plan an approach, lower the landing gear. *If landing under any other condition, keep the gear up; you will stand less chance of injury by making a belly landing.*

(7) Lower the flaps approximately 30 degrees, saving the last 20 degrees of flap to overcome possible mistakes in judgment. Lower flaps fully when proper landing is assured.

(8) Land into the wind, changing direction only as necessary to miss obstructions.

(9) After landing, get out of the airplane as quickly as possible and remain outside.

4. RUNAWAY PROPELLER.

a. Failure of the governor to operate properly may result in a runaway propeller. A runaway propeller goes to full low pitch and may result in an engine rpm as high as 3600 or more. When such a failure occurs, the only method of reducing the rpm is to pull the throttle back and decrease airspeed. In doing this, it is highly important to make use of the allowable maximum overspeed (diving) rpm of 3240, given on the Power Plant Charts, and to reduce the IAS to approximately 140 mph in order to obtain the maximum horsepower available. The following procedure is recommended:

- (1) Pull throttle back to obtain 3240 rpm.
- (2) Raise nose of airplane to lose speed, and then return to sea level altitude. Keep IAS at approximately 140 mph.

(3) When over landing field, lower gear and come in at normal landing speed indicated in figure 28.

5. EMERGENCY EXIT DURING FLIGHT.

a. If an emergency exit must be made during flight, the following procedures are recommended:

(1) Unfasten safety belt and shoulder harness, and disconnect headphones and oxygen tube. Release sliding canopy by pulling emergency release handle on right longeron; then roll airplane over on its back and drop out.

WARNING

Before emergency release of canopy in flight, drop seat and lower head as far as possible. If excessive force was used in securing canopy prior to take-off, it may be necessary to crank the canopy back enough to relieve the pressure against the windshield before the emergency release will be effective.

(2) If possible, reduce speed and trim airplane to fly "hands off." (Trim to descend at 500 feet per minute.) Then proceed as follows:

(a) Unfasten safety belt and shoulder harness, and disconnect headphones and oxygen tube.

CAUTION

If jump is made at high altitude, remain connected to the regular airplane oxygen supply while all other preparations for leaving the airplane are made. Just before leaving the airplane, disconnect the oxygen mask from the mask-to-regulator tubing and place the type H-2 emergency bail-out oxygen cylinder in operation by pulling the rip-cord cable of the oxygen cylinder (the caution tag and pin assembly having been removed prior to take-off).

(b) Release sliding canopy.

(c) Raise seat to topmost position.

(d) Rise to a crouched position in seat, placing left foot on seat and right foot on right longeron adjacent to armor plate. Grasp armor plate with right hand and right longeron with left hand. (See figure 31.)

(e) Kick with legs and push with hands at instant of leaving cockpit, and dive for the right wing tip.

Note

The right side is recommended because the slipstream will help you clear the airplane. If this method is used, the wing will either pass your body before contact, or it will be possible to slide off the wing, and you will not strike the empennage.

6. DITCHING.

a. The airplane should be ditched *only as a last resort*. If, on an overwater flight, trouble arises and you are quite certain that you will not be able to reach land, leave the airplane while in flight. However, if it is not possible to maintain sufficient altitude for a successful parachute drop, ditching is the only remaining procedure. The instructions for ditching are as follows (figure 32.):

(1) If bombs or droppable tanks are installed, release them immediately.

(2) Release sliding canopy. (See "WARNING" note in paragraph 5. a. (1).)

(3) Be sure your shoulder harness and safety belt are fastened securely as there is a violent deceleration of the airplane upon final impact.

(4) Land into the wind with flaps half down and landing gear up. Approach with one wing low (about 20 degrees) and speed just enough above stalling to maintain lateral control. Kick hard inside rudder just as the low wing tip hits the water, so as to spin the airplane around on the surface. This is known as "landing with a swerve" and although it is a difficult maneuver, it prevents the severe diving and extremely high deceleration that always result when a straight landing is made. As soon as the airplane comes to rest, get out *immediately*.

WARNING

Get out quickly upon landing. After the final impact, the airplane will sink very rapidly, *only remaining above the surface of the water for a period of 1½ to 2 seconds.*

7. LANDING GEAR EMERGENCY LOWERING.

In the event of hydraulic system failure, the landing gear may be lowered by placing the landing gear control handle in the "DOWN" position and yawing sideways. However, if the red landing gear warning light illuminates or horn sounds when the throttle is retarded (indicating an unsafe condition), pull the fairing door emergency knob, located just forward of the control stick, and then yaw the airplane sideways to force the gear into the locked position. If the tail wheel does not lock, increase the airplane's speed to increase the air load on the partially extended wheel, or dive the airplane a short distance and pull out with enough acceleration to down the tail wheel.

8. COOLANT RADIATOR FLAP EMERGENCY CONTROL.

If, under any condition of flight, an excessive coolant temperature persists, first try the manual "OPEN" position of the

electrical control switch. If, after approximately 20 to 30 seconds, the temperature remains high and failure of the coolant flap actuator is indicated, pull the emergency release lever at the right side of the seat. One quick pull up will open the flap to a minimum of 7 inches.

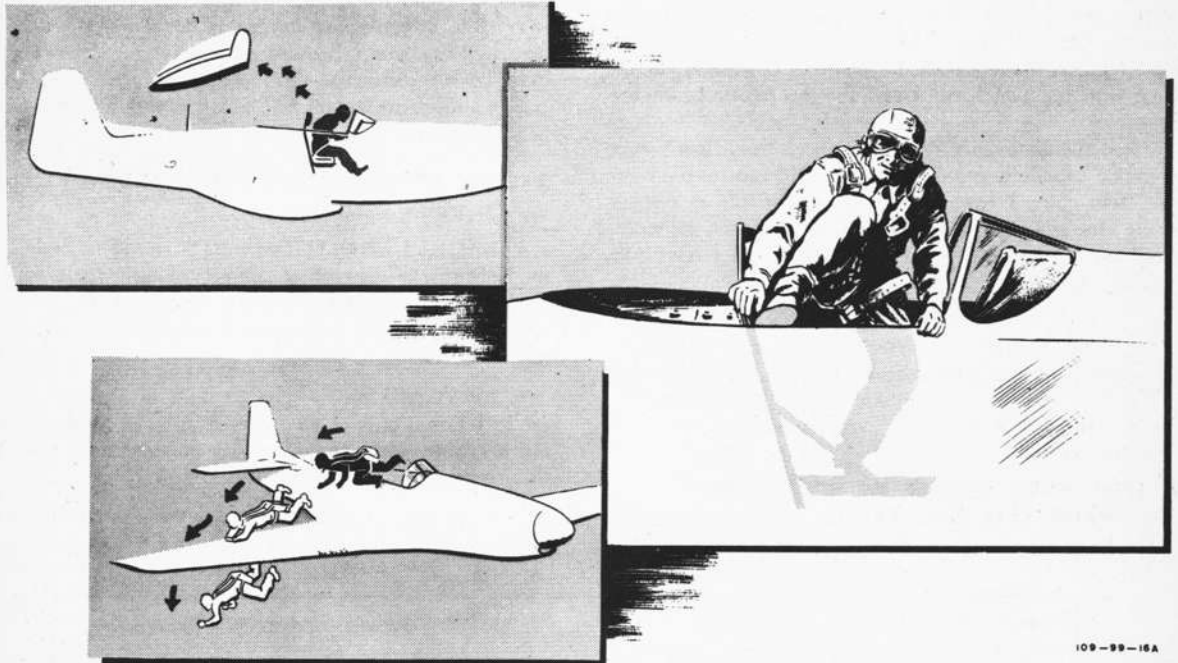


Figure 31—Emergency Exit During Flight

109-99-16A

109-00-276A

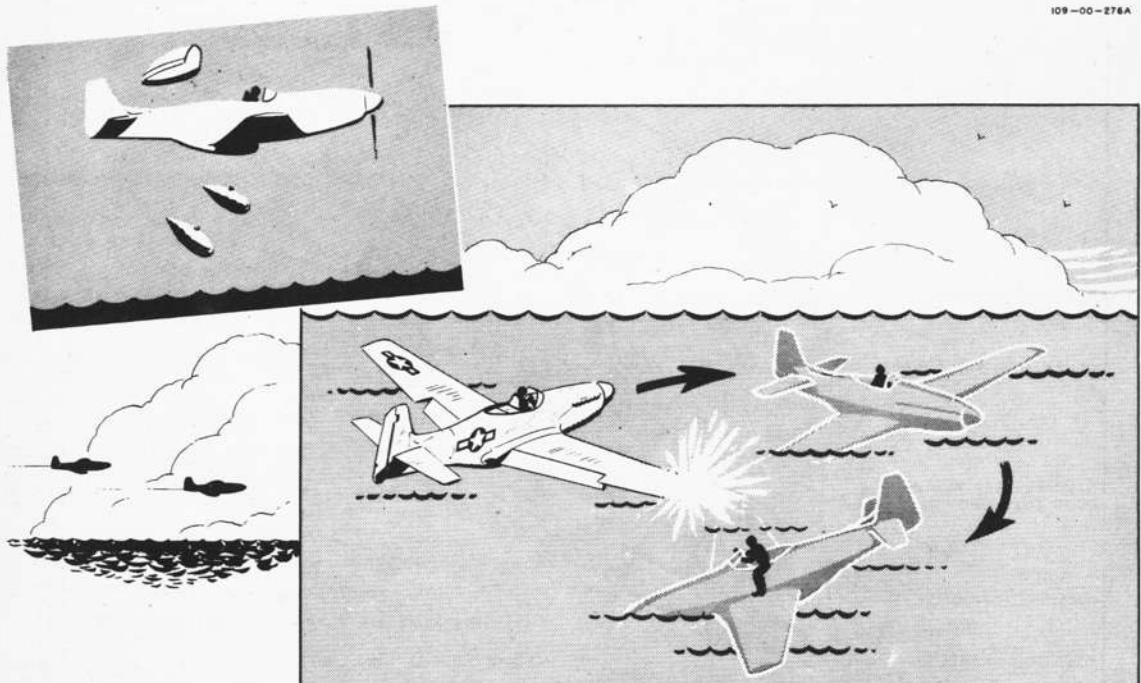


Figure 32—Ditching Airplane

The emergency control will extend the flap approximately $5\frac{1}{2}$ inches beyond the flap setting at the time of release; therefore, if the high coolant temperature was not caused by actuator failure, an undesirable cooling condition may result from use of the emergency control. To check this possibility, after using the emergency release, hold the electrical control switch in the closed position for approximately 20 seconds. This will ensure that the flap is not extended beyond 7 inches if the electrical actuator is functioning at all. Then turn the switch to "OFF" for the remainder of the flight.

When the emergency release has been used, low power operation should be avoided to prevent the coolant temperature from going below the minimum allowable as a result of the greater flap opening. There is no provision for emergency closing of the flap, nor can the emergency release be reset in flight.

CAUTION

Use the emergency release with discretion. High coolant temperatures may be the result of high power settings, low altitude flight, engine malfunction, or a broken indicator rather than actuator failure.

9. EMERGENCY RELEASE OF BOMBS OR DROPPABLE FUEL TANKS.

The bombs or droppable fuel tanks are released by pull-

ing out on both emergency bomb release handles at left side of instrument panel.

10. EMERGENCY USE OF OXYGEN.

If for any reason there is a lack of oxygen, immediately turn "ON" the red emergency knob on the oxygen regulator. If a flow of pure oxygen is not received, place the type H-2 emergency bail-out oxygen cylinder in operation by pulling the rip-cord cable on the oxygen cylinder and reduce altitude to 20,000 feet or less within a time interval of 10 minutes or less.

11. USE OF MISCELLANEOUS EMERGENCY EQUIPMENT.

a. RADIO DEMOLITION SWITCH.—This switch, on the right side of the cockpit, controls a charge for demolishing the identification radio in an emergency. If identification set is installed, press both buttons simultaneously to set off the charge.

b. FIRST-AID KIT.—The contents of the first-aid kit are to be used only in an emergency, when medical aid is not available. Use contents of kit in accordance with the directions contained therein.

c. LIFE PRESERVER.—The back cushion on the seat is filled with kapok and may be used as a life preserver.

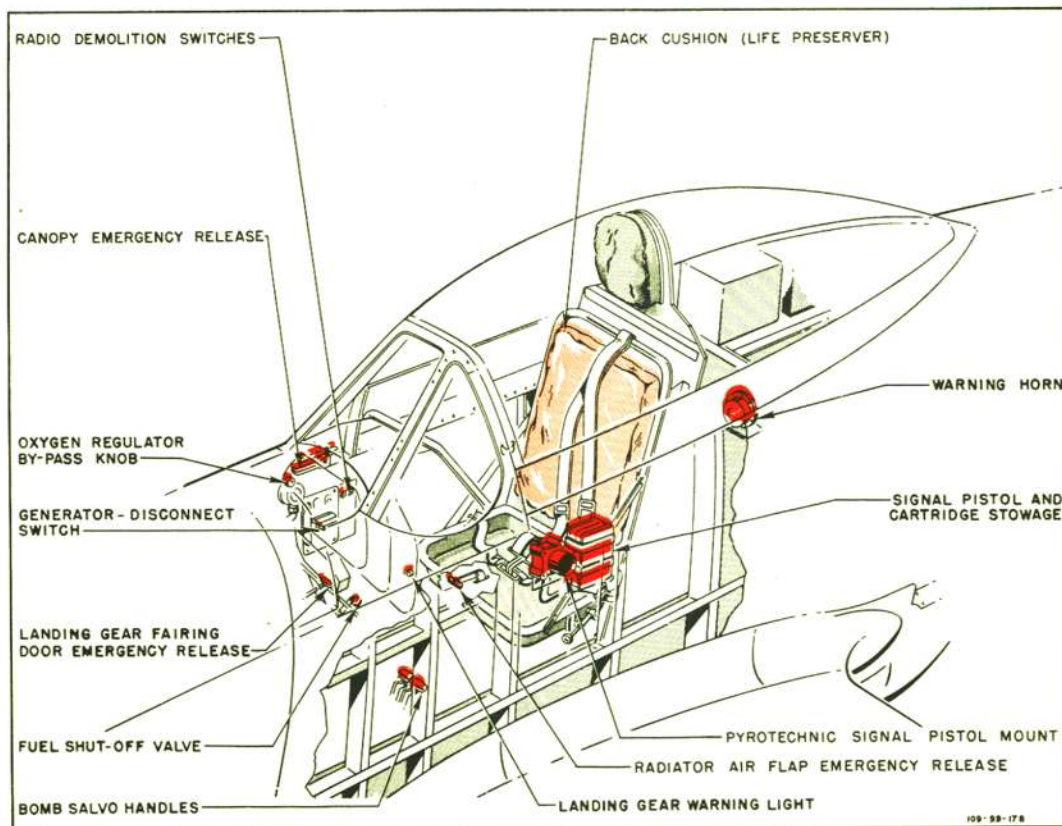


Figure 33—Emergency Equipment



1. GUNNERY EQUIPMENT.

a. GENERAL.

(1) DESCRIPTION.—Either of two gun installations may be used: a maximum of three fixed .50-caliber guns in each wing, or an alternate load of two guns in each wing. The maximum load includes 400 rounds of ammunition for each inboard gun and 270 rounds for each center and outboard gun. When the alternate installation is used, the center guns are removed, and 500 rounds of ammunition are provided for each outboard gun. Airplanes with the zero rail rocket installation have a K-14A or K-14B compensating gun sight. Other airplanes have a Type N-9 gun sight, the rheostat for which is on the front switch panel. Spare gun sight lamps are in clips on the underside of the instrument shroud. A gun sight aiming point camera with an overrun control is in the leading edge of the left wing. Late airplanes have a Type B-6 gun and bomb control switch assembly.

CAUTION

Keep gun sight in operation at all times when engine is running to prevent damage to gyro.

(2) OPERATION.

(a) On missions requiring gun heat, turn "ON" gun heater switch immediately after starting engine.

(b) Turn gun and camera safety switch to "CAMERA AND SIGHT." On K-14A gun sight, turn gyro motor "ON-OFF" switch on selector dimmer control to "ON." On the K-14B gun sight, the "ON-OFF" switch has been eliminated, and the gyro motor is turned on when the battery-disconnect switch is moved to "ON."

(c) Move selector switch on selector-dimmer control to "GYRO" or "FIXED AND GYRO."

(d) On combat missions, turn gun and camera safety

switch to "GUNS, SIGHT, AND CAMERA" as soon as the airplane is safely off the ground.

(e) To operate gun sight, turn on rheostat located on selector-dimmer control. (The gun sight will not operate until the gun and camera switch has been turned on.)

(f) Fire guns by squeezing trigger on control stick grip. When camera only is required, turn gun safety switch to "SIGHT AND CAMERA" and squeeze trigger.

Note

When the gun and camera safety switch is on, the heaters in the camera will function automatically at low temperature.

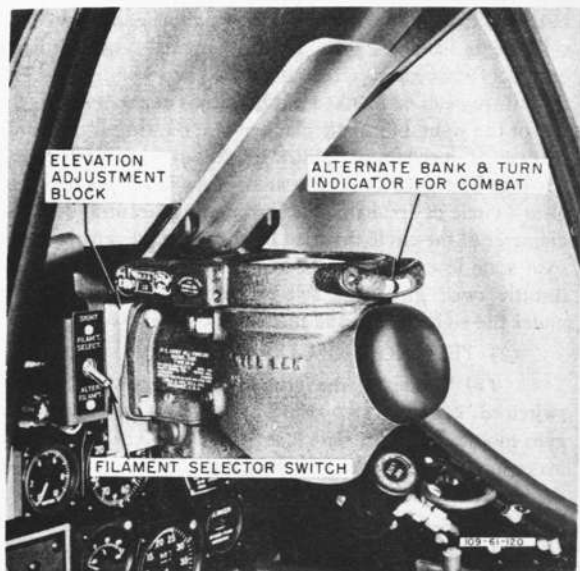


Figure 34—Type N-9 Gun Sight

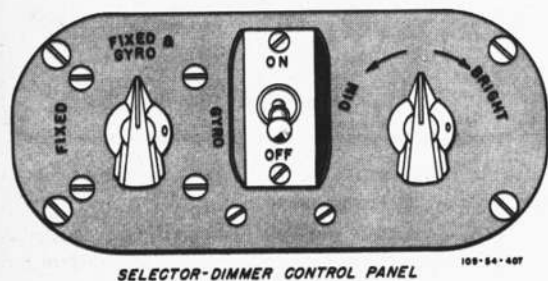
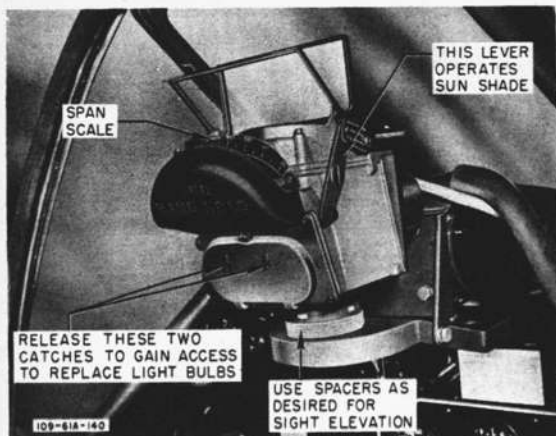


Figure 35—K-14A Gun Sight Installation

(e) Before landing, make sure that the gun and camera safety switch is at "CAMERA AND SIGHT" and gun heater switch is "OFF."

b. K-14A OR K-14B COMPENSATING GUN SIGHT.

(1) DESCRIPTION.—The K-14A or K-14B sight compensates the correct lead angle for target crossing speed at ranges of from 200 to 800 yards. The sight contains two optical systems, fixed and gyro. The fixed optical system projects on the reflector glass a cross surrounded by a 70-mil ring. The 70-mil ring can be blanked out by means of the lever on the left of the sight. Normally blanked out, the ring is used only in case of mechanical failure of the gyro or for ground strafing. The gyro optical system projects on the reflector glass a circle of six diamonds surrounding a central dot. The diameter of the circle is varied by changing the setting of the span scale lever on the face of the sight or by rotating the throttle twist grip. The selector-dimmer control panel is under the right side of the instrument shroud.

(2) TESTING THE GUN SIGHT.

(a) While on the ground, turn gun-camera safety switch to "CAMERA AND SIGHT." On K-14A gun sight, turn gyro motor "ON-OFF" switch to "ON"; on K-14B gun sight, make sure battery-disconnect switch is "ON." Rotate dimmer rheostat until correct reticle brilliance is obtained.

(b) Set selector to "FIXED AND GYRO." Both the fixed and gyro reticles will appear on the reflector. If the 70-mil ring appears, blank it out with lever at left of sight.

(c) Make sure dot of the gyro is superimposed on

the fixed cross. This is done by switching selector switch back and forth from "FIXED AND GYRO" to "GYRO."

(d) Take off and fly in a circle at a constant rate of turn. Rotate the twist grip on the throttle slowly and note that, with the sight set for long range (small diameter gyro reticle), the gyro reticle lags farther behind the fixed cross than when the sight is set for short range (large diameter reticle).

(3) COMBAT OPERATION OF GUN SIGHT.

(a) Identify your opponent; then set the span scale to correspond with the enemy type.

(b) Fly your airplane so that the enemy appears within the gyro reticle, and rotate the throttle twist grip until the diameter of the gyro reticle corresponds to the size of the enemy.

(c) Continue to rotate throttle twist grip, keeping the enemy within the gyro reticle—then fire!

(4) OPERATIONAL NOTES.

(a) Turn sight on before take-off, and leave on until landing, whenever the presence of the enemy is possible.

(b) When not using the sight and when maneuvering into position for attack, keep the sight set at shortest range (large diameter gyro reticle) and decrease the diameter to correspond to the enemy's size.

(c) Track the target before firing. Continually frame the target, by operating the twist grip, while tracking for a minimum period of one second; then fire. The gyro sight compensates correctly only after the target has been correctly framed and tracked for a minimum period of one second.

(d) Learn to use the sight in place of your flight instruments. Note that, with the selector set for normal operation (fixed and gyro), the relative positions of the fixed and gyro reticles indicate what your airplane is doing. If the cross and dot are superimposed, you are flying in a straight line.

(e) For firing at a stationary ground target, use the fixed part of the sight.

2. ZERO RAIL ROCKETS.

a. DESCRIPTION.—Late airplanes are equipped to carry 10 zero rail rockets, each of which is attached to two pods on the underside of the wings. If bombs or droppable fuel tanks are installed, only six rockets may be carried. The armament switches are located on the front switch panel (figure 37), and the gun sight rheostat is on a bracket, just to the right of the gun sight.

b. OPERATION.

(1) Turn "ROCKET TO BE FIRED" dial to "1". (See figure 37.)

(2) Place bomb-rocket selector switch in "ROCKETS" position.

Note

When this switch is in "ROCKETS," the bomb release circuits are inoperative.

(3) To nose arm rockets for an instant delay upon impact, turn arming switch to "DELAY."

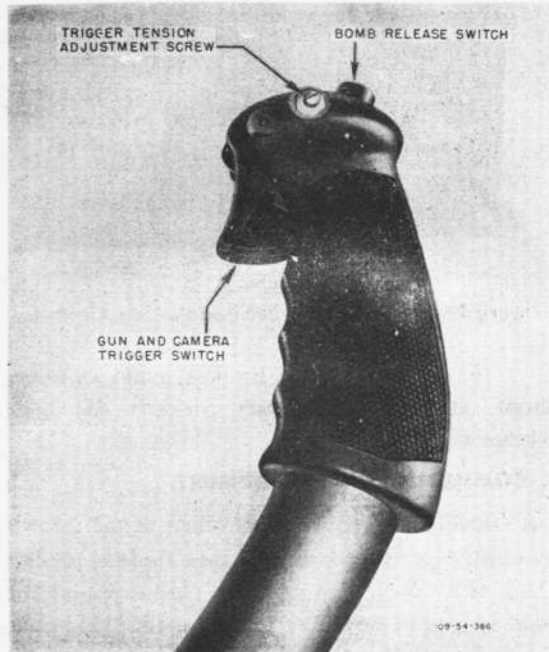


Figure 36—Gun and Bomb Control Switches—Type B-6

(4) To fire rockets one at a time, turn rocket release control switch to "SINGLE" and press bomb release button on control stick, once for each rocket.

Note

Rockets on airplanes with the MX-241-4 rocket tube modification cannot be fired simultaneously with the machine guns. An electrical interrupter has been placed in the gun firing circuit which will cut out the machine guns if the gun trigger and the rocket firing button are operated simultaneously. However, if the rocket switch on the intervalometer is "OFF," the firing circuit interrupter will not function.

(5) To fire all rockets in train, turn control switch to "AUTO" and press bomb release button for approximately one second.

Note

The firing order of the rockets singly or in train is as follows:

LEFT WING		RIGHT WING
1 3 5 7 9	INBOARD	10 8 6 4 2
(Rockets 7, 8, 9, and 10 are not installed when bombs are installed.)		

3. BOMBING EQUIPMENT.

a. DESCRIPTION.—An external, removable bomb rack may be installed under each wing. Each rack will hold one 100, 250, or 500-pound bomb. Chemical tanks or combat fuel tanks may be carried on the bomb racks when bombs are not installed. The tanks are released either by normal or salvo operation of the bomb control system. Two bomb salvo handles provide a selective mechanical release of bombs or tanks. The bomb system electrical controls consist of a

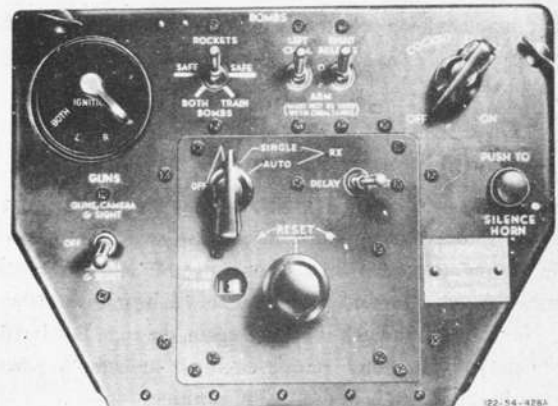


Figure 37—Front Switch Panel—Airplanes With Zero Rail Rocket Installation

bomb release switch on top of the control stick, and three bomb arming switches and a bomb release selector switch. (See figures 37 and 39.)

CAUTION

As neither the wing nor the bomb racks were designed for 1000-pound bombs, it is not recommended that they be installed. If this installation is necessary to accomplish particular missions, the airplane should be held to straight and level flight until the bombs are released.

b. OPERATION.

(1) GENERAL.—The electrical release of bombs is the normal release. The "SALVO" release is used only if the electrical release fails. The two "NOSE ARM" switches arm the nose fuse of the bombs on the left and right racks. The

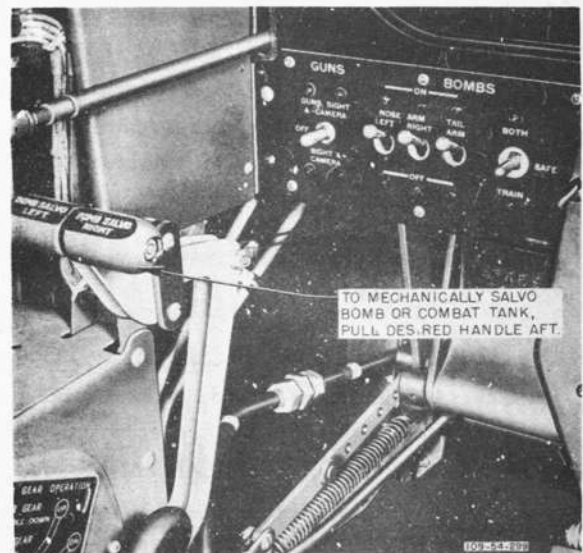


Figure 38—Bomb Controls—Early Airplanes

"TAIL ARM" switch arms the bomb tail fuse on both racks. The bomb release selector switch has the following positions: "BOTH," "SAFE," and "TRAIN."

Note

On early airplanes the selector switch "TRAIN" position is marked "SELECTIVE."

With the selector switch on "BOTH," the bombs will be released simultaneously when the release switch is pressed. When the selector switch is on "TRAIN" and the bomb release switch is pressed, the left bomb will be released; when the bomb release switch is pressed again, the right bomb will be released. The bomb release circuit is inoperative when the selector switch is in the "SAFE" position.

Note

Bombs may be released when the airplane is in any attitude of flight from a 30-degree climb to a vertical dive.

(2) INOPERATIVE POSITION OF CONTROLS.—

When the controls are not in use, position them as follows:

- (a) Bomb release selector switch in "SAFE."
- (b) Nose and tail arming switches "OFF."

(3) TRAIN RELEASE (Electrical).

- (a) Place arming switches in desired position.
- (b) Place bomb release selector switch on "TRAIN" ("SELECTIVE" on early airplanes).
- (c) Press bomb release switch button momentarily to release bomb on left rack.
- (d) Press bomb release button again to release bomb on right bomb rack.

(e) Bomb arming switches "OFF," bomb release selector switch to "SAFE."

(4) SIMULTANEOUS RELEASE (Electrical).

- (a) Place bomb arming switches in desired position.
- (b) Place bomb release selector switch on "BOTH."
- (c) Press bomb release switch; both bombs will release.
- (d) Bomb arming switches "OFF," bomb release selector switch to "SAFE."

Note

For emergency bomb release, pull back on both bomb salvo handles at left side of instrument panel.

(5) OPERATION OF CHEMICAL TANKS.

(a) On early airplanes, turn "ON" left and right-hand nose arming switches; then turn switches "OFF" when smoke appears.

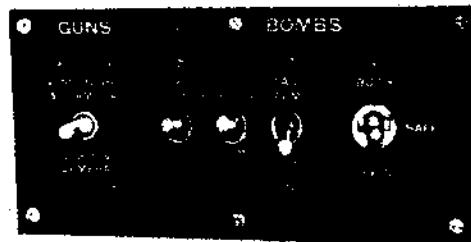


Figure 39—Armament Switch Panel—Late Airplanes

(b) On late airplanes, lift nose arming switches to "CHEM. RELEASE" (momentary position) and release switches when smoke appears.

4. COMMUNICATION EQUIPMENT.

a. GENERAL.—Various combinations of the following seven radio sets may be installed in these airplanes: the SCR-522-A, SCR-274-N, or AN/ARC-3 (late airplanes) command equipment; the SCR-695-A or the SCR-515 identification equipment; the AN/ARA-8 homing adapter; and the AN/APS-13 tail-warning radar equipment. On early airplanes equipped with a fuselage tank the command radio equipment only may be installed; however, both command and identification equipment may be installed if the fuselage tank is removed. On late airplanes which have the battery located forward of the firewall, the IFF SCR-695-A radio may be installed in addition to the SCR-522-A (or AN/ARC-3) and AN/APS-13 equipment. (See figure 43.) A Model 438 Detrola or BC-1206-A, B, or C receiver may be installed in conjunction with the SCR-522-A. Additional communication equipment includes a signal pistol, a signal lamp, and recognition lights.

b. COMMAND SET SCR-522-A.

(1) DESCRIPTION.—This set is a push-button controlled transmitter-receiver, operating on the 100 to 156 mc band. The control box is just aft of the right-hand switch panel in the cockpit. A transmit-receive button is on the throttle lever. On some airplanes a remote contactor is installed on the left side of the instrument panel. The contactor switches the transmitter from the "A," "B," or "C" band to the "D" band for 14 seconds of every minute. The pointer on the face of the contactor indicates when the switching action will take place. Normally, the clock switch on the contactor should not be touched in flight; it is set on the ground by the service crew.

(2) OPERATION.

Note

The "A-REM" switch has been lockwired in the "REM" position.

(a) To receive or transmit on channel "A," "B," "C," or "D," press corresponding channel selector button on control box. Tubes will require approximately 30 seconds to warm. Adjust headset volume with volume control on junction box and monitor the station to be contacted. On airplanes equipped with a remote contactor, check operation with switch in "OUT" and "IN" positions. Press throttle "press-to-talk" button and speak in a normal tone. To receive, release pressure on throttle button.

Note

Indicator lamp glare is controlled by the dimmer mask lever on the control box. The lamps behind the four green jewels indicate the channel in operation. The lamp behind the white jewel opposite the "T-R-REM" switch glows when the equipment is in the receive position.

(b) To turn set off, press "OFF" button on control box.

c. RANGE RECEIVER (Detrola Model 438 or BC-1206-A, B, or C).

(1) DESCRIPTION.—This receiver covers a frequency range of 200-400 kc and is mounted on the floor at the right side of the cockpit.

(2) OPERATION.

(a) Turn hexagonal control knob clockwise to turn set on and to increase volume. Tune in desired station with "tuning knob."

(b) Turn hexagonal control knob fully counter-clockwise to turn the receiver off.

d. COMMAND SET SCR-274-N.

(1) DESCRIPTION.

(a) GENERAL.—This set consists of two transmitters and three receivers with independent controls for each group, and an antenna switching relay. The control boxes are mounted at the right side of the cockpit.

(b) TRANSMITTER.—The transmitter control box contains three switches, marked "TRANS POWER," "TRANSMITTER SELECTOR," and "TONE-CW-VOICE." The switch marked "TRANSMITTER SELECTOR" has four divisions, two of which are used. Markings on the "TONE-CW-VOICE" switch indicate the type of signal being transmitted. With the switch turned to the "TONE" position, a signal is transmitted which is practically 100 percent modulated at 1000 cycles. With the switch turned to the "CW" position, a "continuous wave" or unmodulated signal will be transmitted. With the switch turned to the "VOICE" position, the microphone will be operative and voice will be transmitted when the push-to-talk button is pressed. For long-range communication, "CW" is most effective, "TONE" next, and "VOICE" least effective. The microphone is inoperative on both the "CW" and "TONE" positions, and code signals may be transmitted by a key on top of the transmitter control box. If desired, a separate key may be plugged into the jack marked "KEY."

(c) RECEIVER.—The receiver control box is divided into three sections. A signal of specific frequency is received by using the section of the receiver control box which controls the particular receiver involved.

(2) OPERATION.

(a) TRANSMISSION.—Switch "ON" transmitter power switch, select one of the two transmitters, and turn "TONE-CW-VOICE" switch to the desired position.

(b) RECEPTION.—Turn on switch in upper right-hand corner of the control box section used. This switch, in addition to having an "OFF" position, has two selective positions marked "CW" and "MCW," each of which is an on position and indicates the type of signal to be received. To increase the volume of the signal, turn the knob on the lower left corner of the control section in a clockwise direction.

e. COMMAND SET AN/ARC-3.

(1) DESCRIPTION.—The AN/ARC-3 set consists of a transmitter and receiver, a power supply and a control box. This equipment provides remote operation on eight frequency channels for airplane-to-airplane and airplane-to-ground communication. The control box is located on the radio control panel at the right side of the cockpit with eight red channel-selector buttons on the box designated by letters "A" through "H." A volume control, also on the panel, controls the audio output of the set.

(2) OPERATION.

(a) Push any one of the eight channel selector buttons on the control box and allow approximately 30 seconds for the set to warm up.

(b) To stop the operation of the equipment, depress the "OFF" button and the small metal locking button, located forward of the channel-selector buttons, at the same time.

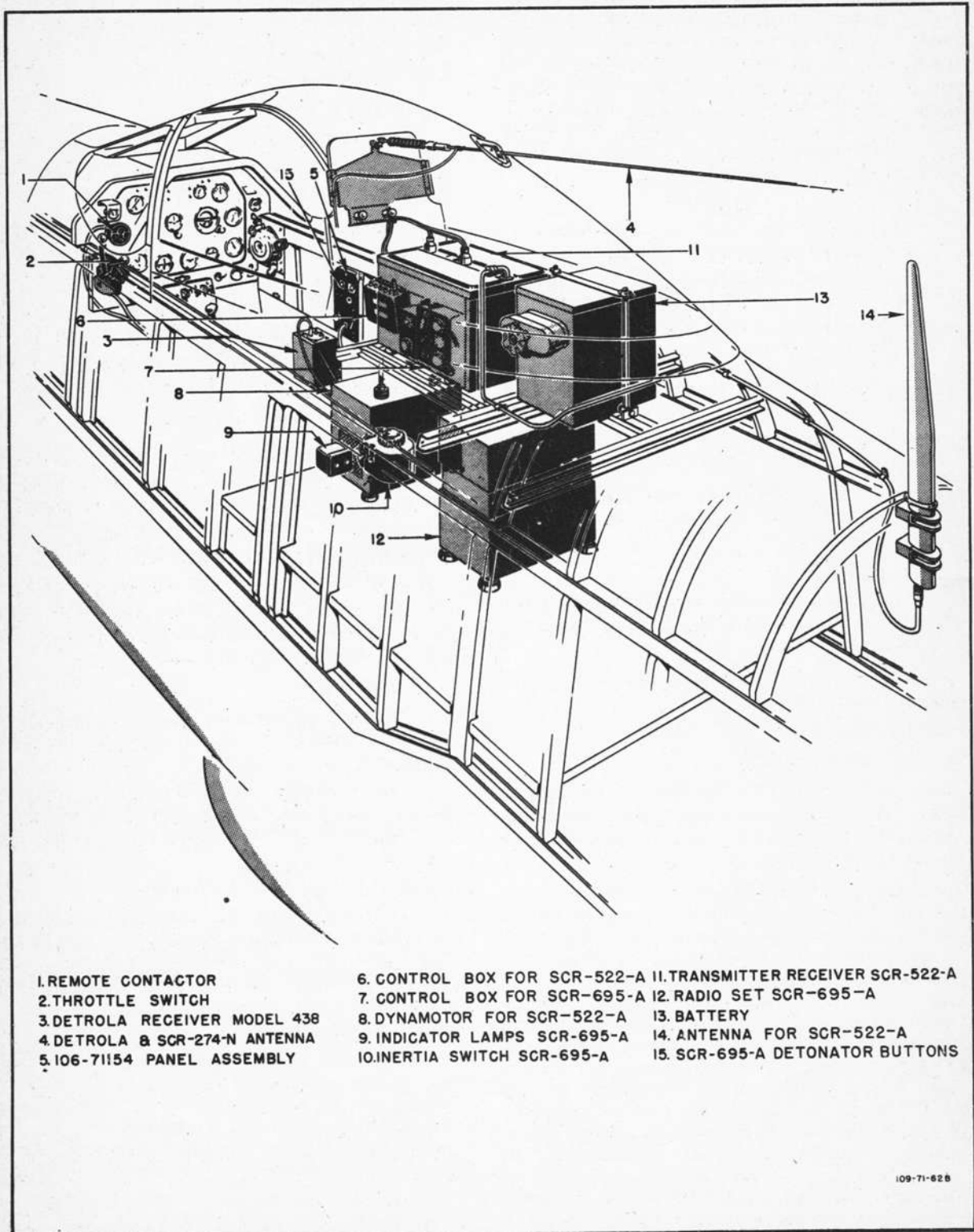
f. RADAR EQUIPMENT AN/APS-13.

(1) DESCRIPTION.—The radar equipment visibly and audibly warns the pilot of the approach of other aircraft from behind within a designated angle of protection. Controls for operating the equipment are located on the radio control panel at the right side of the cockpit.

(2) OPERATION.

(a) Move "ON-OFF" toggle switch to the "ON" position. After warming up for approximately 3 minutes the warning indicator light should illuminate and the warning bell should sound. The light and bell should always function whenever the equipment is operated on the ground and until the airplane reaches an altitude of approximately 3000 feet.

(b) To check the equipment during flight, move "TEST" switch to "ON" position, and hold. If indicator illuminates and warning bell rings, the set is functioning properly. Let the "TEST" switch drop to its normal position.



1. REMOTE CONTACTOR
 2. THROTTLE SWITCH
 3. DETROLA RECEIVER MODEL 438
 4. DETROLA & SCR-274-N ANTENNA
 5. 106-71154 PANEL ASSEMBLY

6. CONTROL BOX FOR SCR-522-A
 7. CONTROL BOX FOR SCR-695-A
 8. DYNAMOTOR FOR SCR-522-A
 9. INDICATOR LAMPS SCR-695-A
 10. INERTIA SWITCH SCR-695-A
 11. TRANSMITTER RECEIVER SCR-522-A
 12. RADIO SET SCR-695-A
 13. BATTERY
 14. ANTENNA FOR SCR-522-A
 15. SCR-695-A DETONATOR BUTTONS

109-71-628

Figure 40—SCR-522-A and SCR-695-A Radio Equipment—Early Airplanes

AN 01-60JE-1

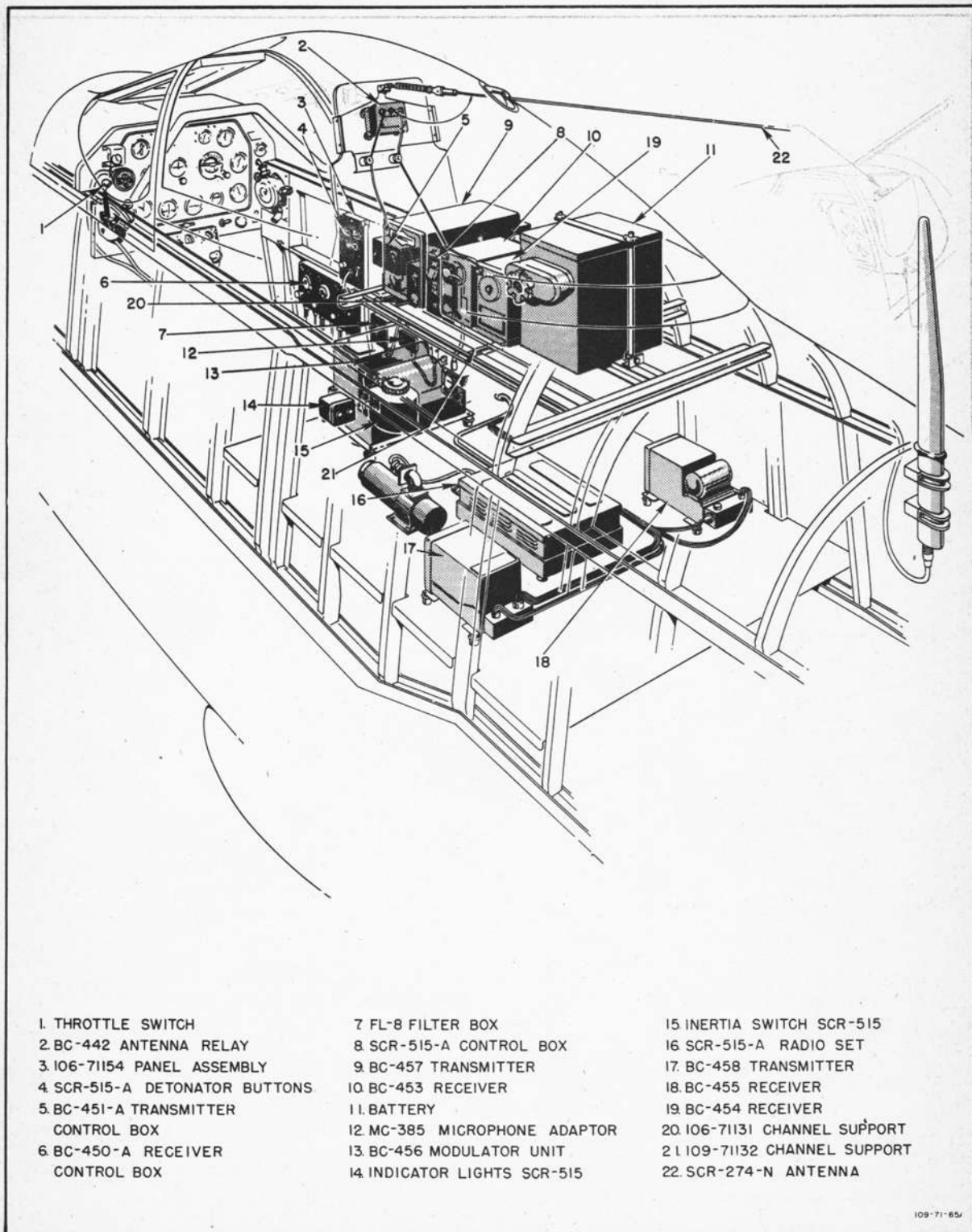
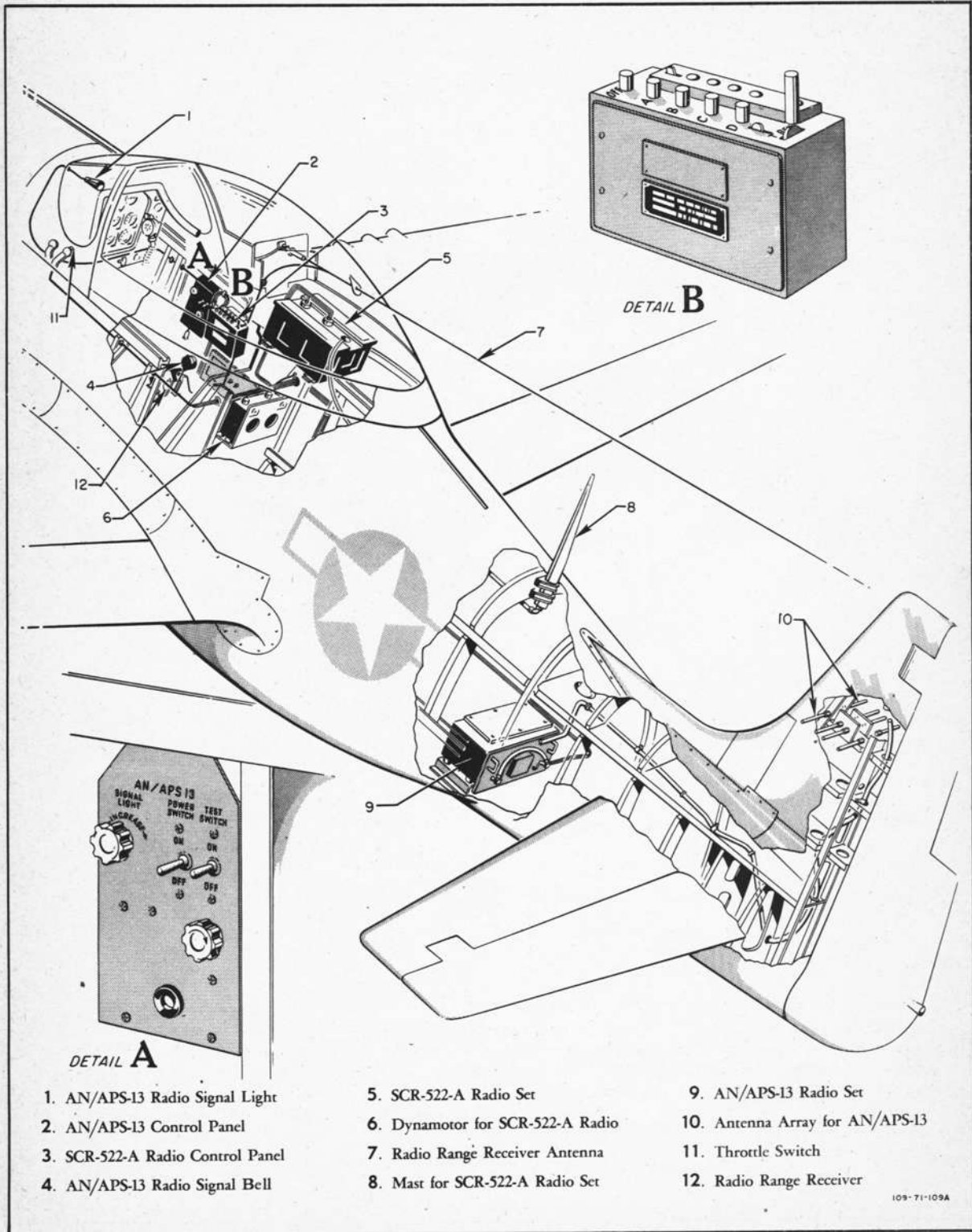


Figure 41—SCR-274-N and SCR-515 Radio Equipment—Early Airplanes

109-71-85J



- 1. AN/APS-13 Radio Signal Light
- 2. AN/APS-13 Control Panel
- 3. SCR-522-A Radio Control Panel
- 4. AN/APS-13 Radio Signal Bell

- 5. SCR-522-A Radio Set
- 6. Dynamotor for SCR-522-A Radio
- 7. Radio Range Receiver Antenna
- 8. Mast for SCR-522-A Radio Set

- 9. AN/APS-13 Radio Set
- 10. Antenna Array for AN/APS-13
- 11. Throttle Switch
- 12. Radio Range Receiver

109-71-109A

Figure 42—SCR-522-A and AN/APS-13 Radio Equipment—Late Airplanes

AN 01-60JE-1

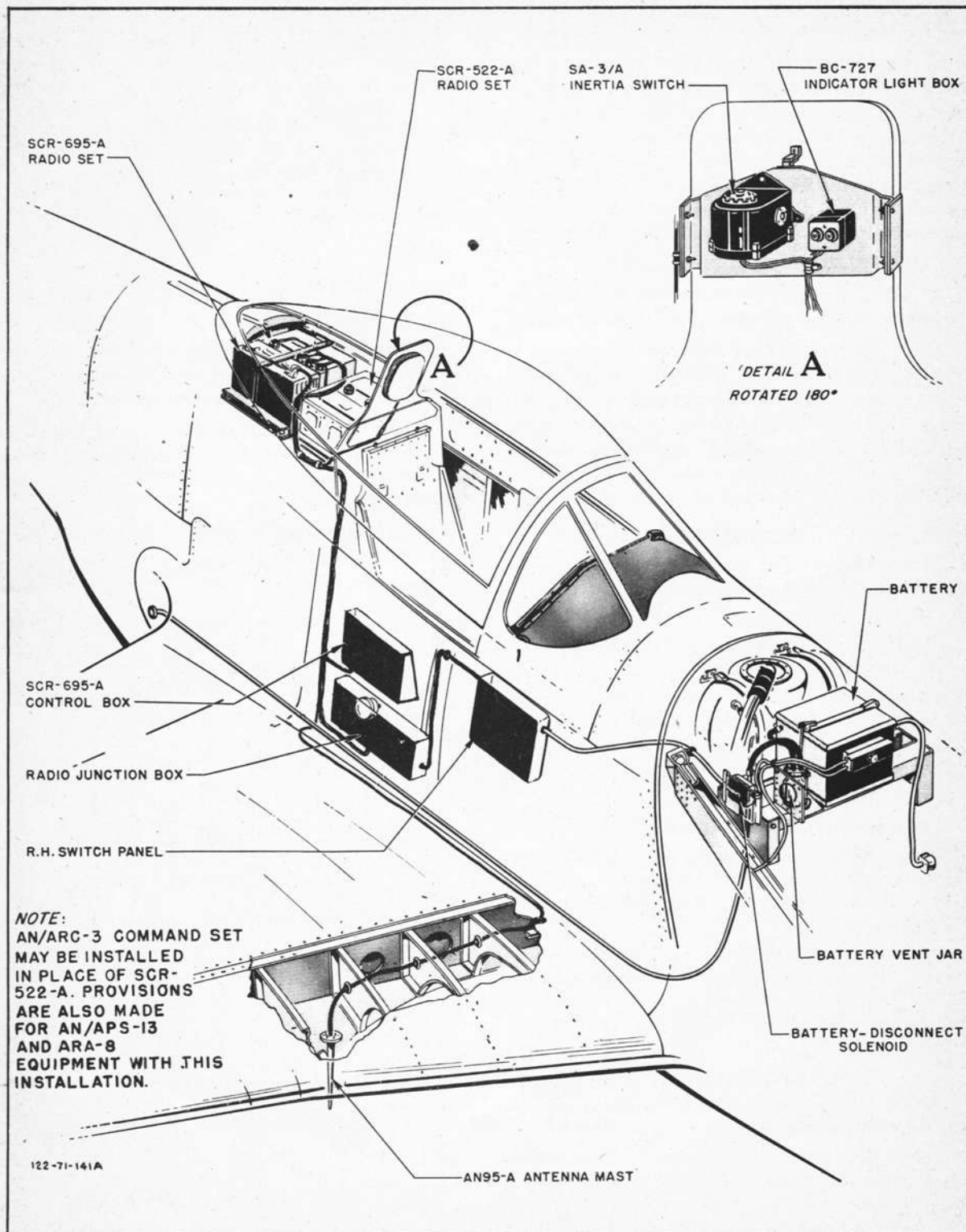


Figure 43—SCR-695-A and SCR-522-A Radio Equipment—Late Airplanes

g. HOMING ADAPTER AN/ARA-8.
(Late Airplanes).

(1) DESCRIPTION.—This adapter unit is used in conjunction with the AN/ARC-3 VHF equipment to permit homing on any transmitted carrier within the frequency range of 120 to 140 megacycles. In addition, this equipment may be used for air-to-air homing for purposes of rendezvous. Homing can be accomplished on CW, MCW, and audio pulse signals. Controls are provided above the VHF control box at the right side of the cockpit.

(2) OPERATION.

(a) To start operation of the equipment, move the "HOMING-COMM-TRANS" switch to the "HOMING" position.

(b) To stop operation of the equipment, move the "HOMING-COMM-TRANS" switch to the "COMM" position.

b. IDENTIFICATION EQUIPMENT.—The identification equipment is controlled from a box aft of the right-hand switch panel. For operating instructions, see the communications officer in charge. Detonator buttons and an inertia crash switch are provided with this equipment.

WARNING

Insert destructor plug only when the airplane is ready to take off. Remove plug immediately after landing.

i. PYROTECHNIC RECOGNITION SIGNAL PISTOL.

(1) DESCRIPTION.—An M-8 pyrotechnic pistol is stowed in a canvas holster strapped to the pistol cartridge stowage bag to the left of the seat. A pistol mount is next to the stowage bag. A cap, chained to the mount, covers the port when the pistol is not installed.

(2) OPERATION.

(a) Remove cover cap from mount.

(b) Insert muzzle of pistol in the mount so that the lugs on the pistol barrel slip into the slots; then, while depressing the mount release trigger, turn the pistol to right or left as far as it will go.

(c) To load pistol, press breech lock lever (behind the mount release trigger) and apply force on the butt until the breech opens. Then insert signal into the chamber and close breech. Pistol is cocked automatically when breech is closed.

WARNING

Do not load pistol except when it is in the mount, as no safety is provided.

j. SIGNAL LAMP.—On early airplanes, a Type AN3089 signal lamp may be stowed in a bracket on the left side of the cockpit floor. An electrical receptacle for the lamp is located behind the pilot's seat on the right side. Colored filters may be used with the lamp.

k. RECOGNITION LIGHTS.—For operation of recognition lights, see section II, paragraph 20. a. (5).

5. OXYGEN SYSTEM.

a. DESCRIPTION.—Oxygen is supplied from two Type D-2 and two Type F-2 low-pressure oxygen cylinders. See figure 45 for location of units. A Type A-14 mask is used with this equipment. The blinker flow indicator operates with the breathing of the wearer, indicating proper functioning of the system. The oxygen cylinders may be refilled without removal from the airplane by means of a filler valve located on the lower left side of the fuselage. Normal full pressure of the system is 400 pounds per square inch.

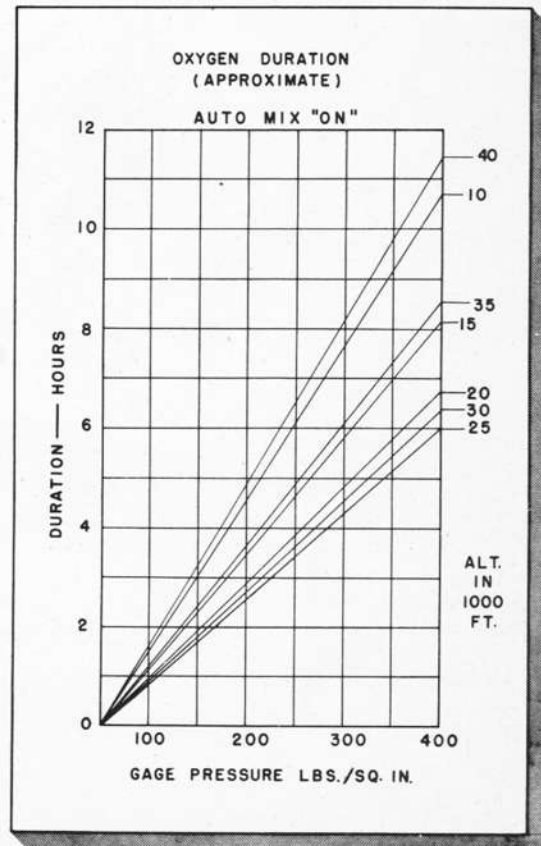
b. OPERATION.

(1) PREFLIGHT CHECK.

(a) See that mask is properly fitting and check for leakage by holding the thumb over the corrugated hose fitting and inhaling normally. See that mask is clean.

(b) Check mask fitting to see that gasket is in place; then insert fitting into end of tubing from regulator. Be sure the fit is snug and that a pull of at least 10 pounds is required to separate the two.

(c) Inspect mask regulator tubing for damage. Make sure all clamps are firmly in place.



THREE TYPE F-2 CYL'S
Figure 44—Oxygen Consumption Chart

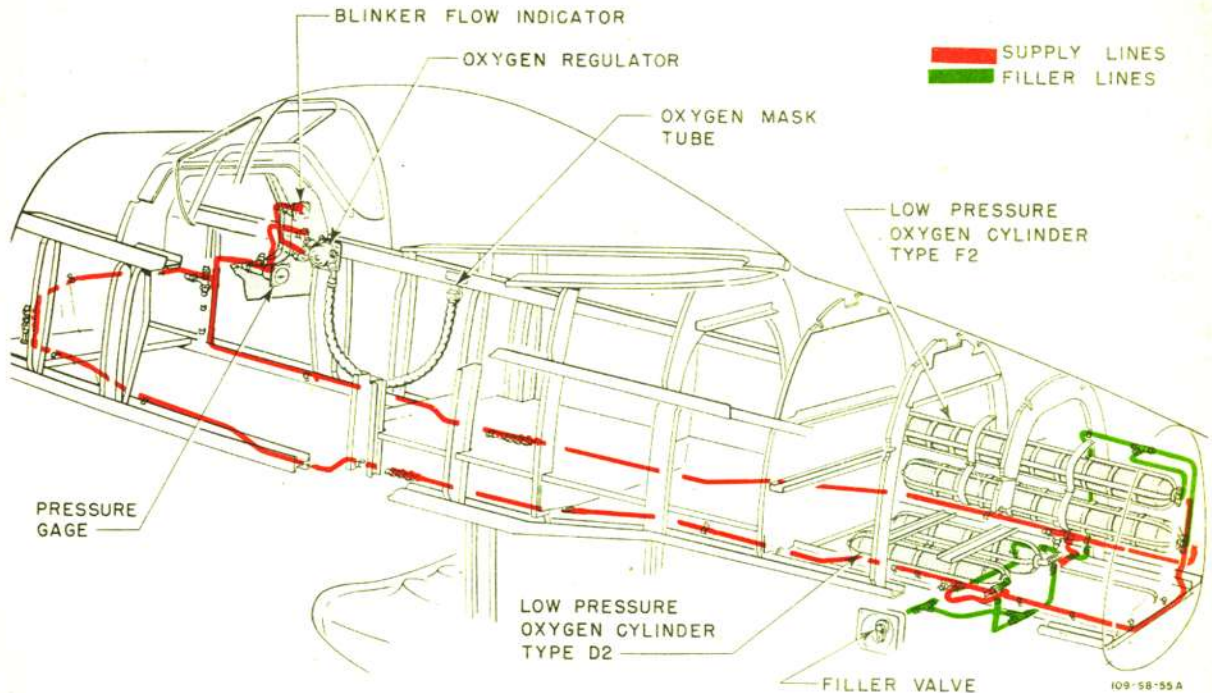


Figure 45—Oxygen System

(d) Attach the spring clip on the tubing to the clothing or parachute harness high up on the chest. It may be desirable to sew a tab of fabric or webbing to the clothing to accommodate the clip. Be sure that the attachment is high enough so that there is free movement of the head without kinking the mask hose.

(e) 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.

(f) Turn emergency knob "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.

(g) Turn the auto-mix to "OFF." Note on flow indicator that upon 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 auto-mix in this position.

(h) Check pressure of the system. It must not be less than 400 pounds per square inch. Before take-off, make certain that the pressure gage shows sufficient oxygen supply for the mission.

(2) DURING FLIGHT.

(a) If necessary, manipulate the mask at regular intervals to free it from ice.

(b) Be sure hose does not become kinked or twisted.

(c) If an insufficient amount of oxygen is being supplied, turn red emergency knob on regulator to "ON."

(d) Check pressure gage and flow indicator frequently.

(e) In any flight over 30,000 feet, pay particular attention to oxygen equipment. Be sure all units and instruments are functioning perfectly before attempting flight to extremely high altitudes. Any failure of the equipment may be fatal.

(3) AFTER FLIGHT.

(a) Be sure all oxygen equipment is in proper condition before leaving airplane. If any difficulties have developed during flight, take necessary steps to have them corrected.

(b) Wash mask with mild soap and water, dry thoroughly, and leave in a clean airy place out of the sunlight.

Note

The oxygen mask will not stand abuse. See that the mask is properly stored or hung up in the airplane when not in use. Exposure of the mask to sunlight causes rapid deterioration.

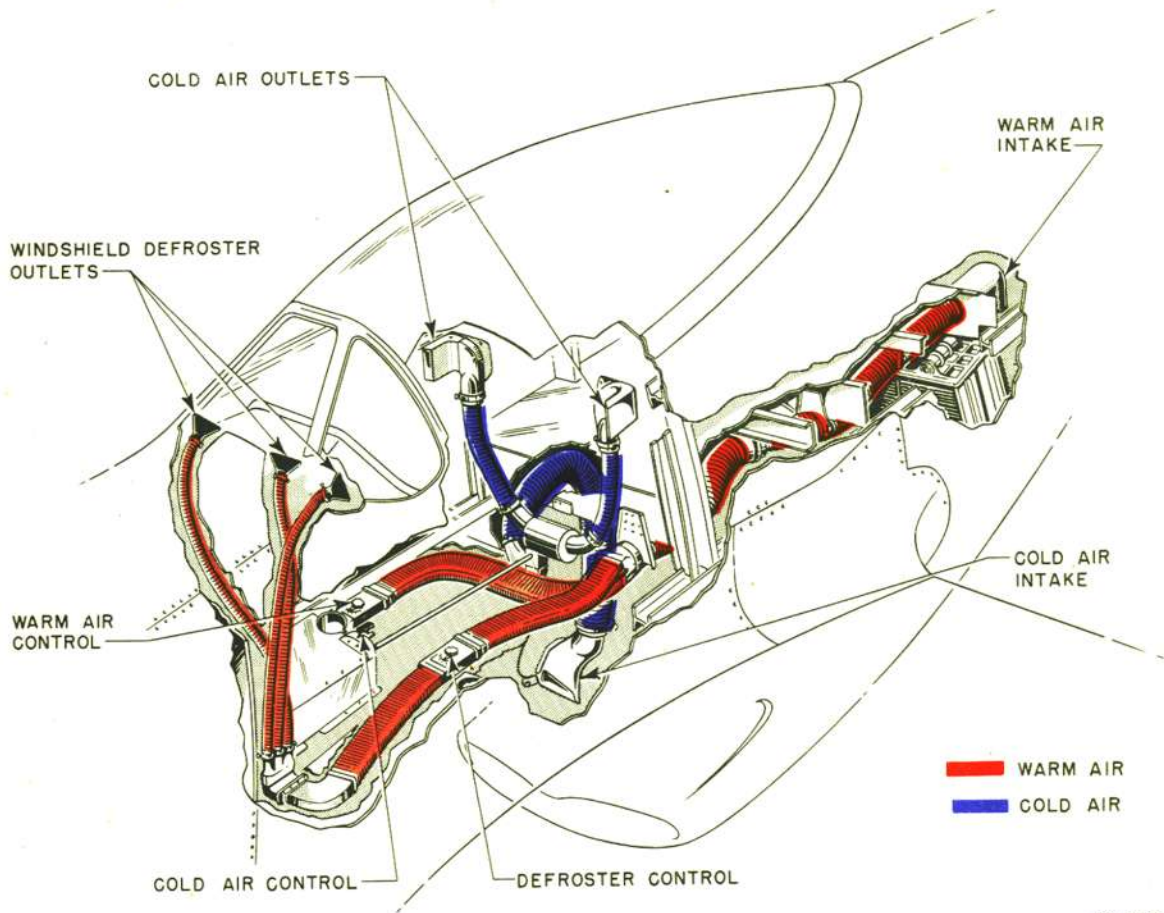


Figure 46—Heating, Ventilating, and Defrosting System

6. HEATING, VENTILATING, AND DEFROSTING SYSTEM.

a. COCKPIT HEATING AND DEFROSTING.—Warm air from aft of the coolant radiator is utilized to heat the cockpit and to defrost the front and left windshield panels. (See figure 46.) The cockpit hot air control is on the floor at the right of the control column; the defroster control is on the floor at the left of the control column. To admit warm air, turn desired control to the right, toward "ON."

b. COCKPIT VENTILATION.—Air from the forward section of the radiator air scoop is used to cool the cockpit. The cold air control is on the floor at the right side of the seat. Cold air outlets are located behind the seat.

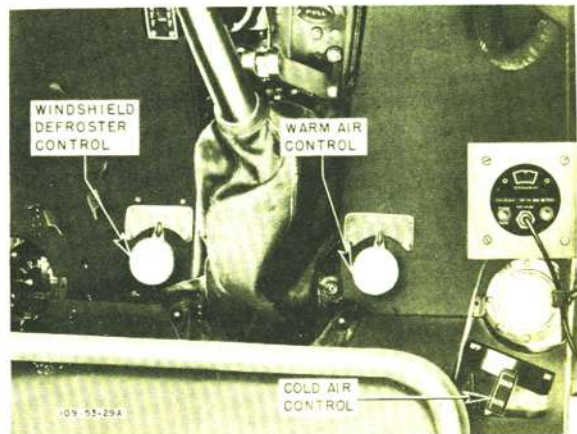
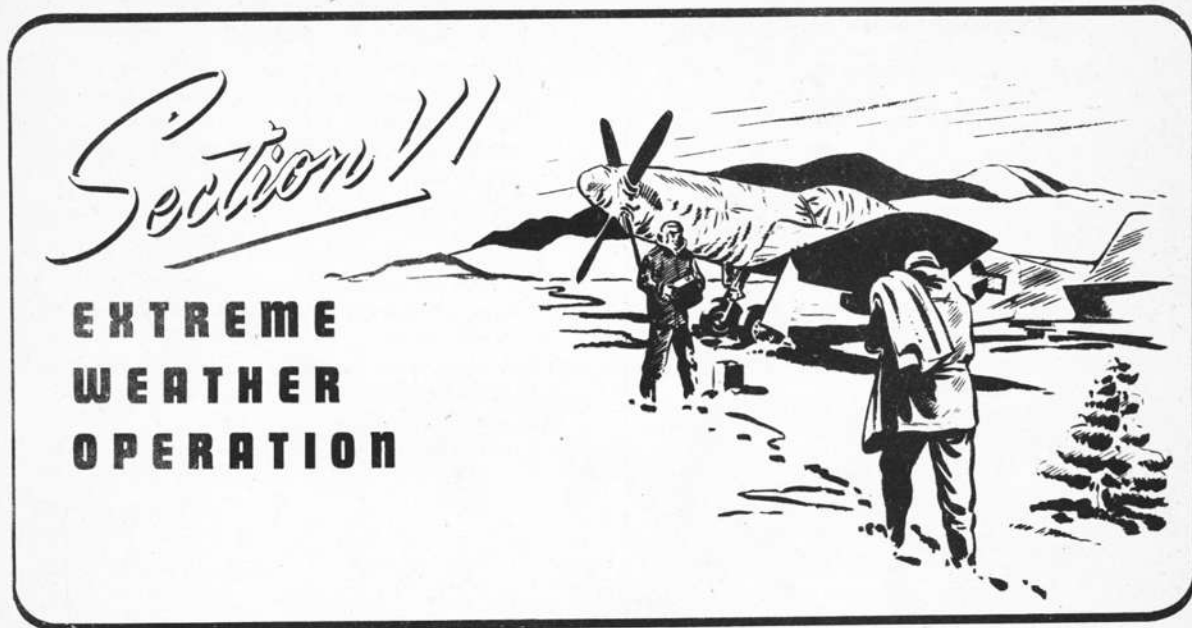


Figure 47—Heating, Ventilating, and Defrosting Controls



1. WINTER OPERATION.

a. DESCRIPTION.

(1) GENERAL.—The primary extreme weather provisions on the airplane are for winterization. These installations are described in the following paragraphs, with instructions for their use in the sequence they will be needed.

(2) OIL DILUTION SYSTEM.

(a) Operate engines at 1000 to 1200 rpm.

(b) Maintain oil temperature below 50°C and oil pressure above 15 pounds per square inch.

(c) Dilute as follows: 4° to -12°C (40° to 10°F) 3 minutes maximum.

(d) For temperatures below -12°C (10°F) it will be necessary to drain the oil system and refill with warm oil before flight.

(3) SURGE PROTECTION.—The self-thawing oil cooler is equipped with a surge protection valve for cold weather starting. The oil cooler exit flap is fully closing.

(4) CARBURETOR ICING PROTECTION.

(a) A carburetor ice guard screen is installed in the carburetor air intake duct. Should this screen ice over, a spring-loaded door will open automatically to admit air from the engine section to the carburetor.

(b) Blank doors, supplied as loose equipment, may be installed over the filtered air intakes on each side of the engine cowling in place of the perforated doors. When these doors are installed, engine compartment air will enter the induction system whenever the carburetor cold air control is placed in the "UNRAMMED FILTERED AIR" position. On late airplanes, movement of the hot air control to "HOT" will ensure that a maximum amount of heated air is entering the carburetor.

(5) CARBURETOR AIR TEMPERATURE GAGE.—The carburetor air temperature gage is mounted on the lower left corner of the instrument panel.

(6) WING, ENGINE, AND PROPELLER COVERS.—The airplane is provided with an engine and a cockpit cover. Wing and propeller covers will be furnished by the AAF.

(7) GUN HEATERS.—The electrical gun heaters are controlled by a switch on the right switch panel.

(8) COOLANT RADIATOR EXIT FLAP.—A spring-loaded baffle in the exit flap makes the flap fully closing. (See figure 48.) When not installed, the baffle is stowed in the airplane as loose equipment.

b. OPERATION.

(1) STARTING ENGINE.—A normal start should be made by following the procedure outlined in section II. The following supplementary instructions are to be followed if any difficulty is encountered when starting the engine.

(a) Preheat the engine and the instrument panel before attempting to start the engine. In extremely cold weather, it may be necessary to preheat the oil and coolant before starting.

Note

If the outside air temperature is -23°C (-10°F) or colder, an engine start without the use of ground heating facilities should not be attempted. Excessive priming and numerous unsuccessful attempts to start without the use of ground heat are detrimental to the engine and accessories.

(b) Use a portable generator instead of the conventional battery cart for starting the engine, as batteries quickly lose their charge at below freezing temperatures.

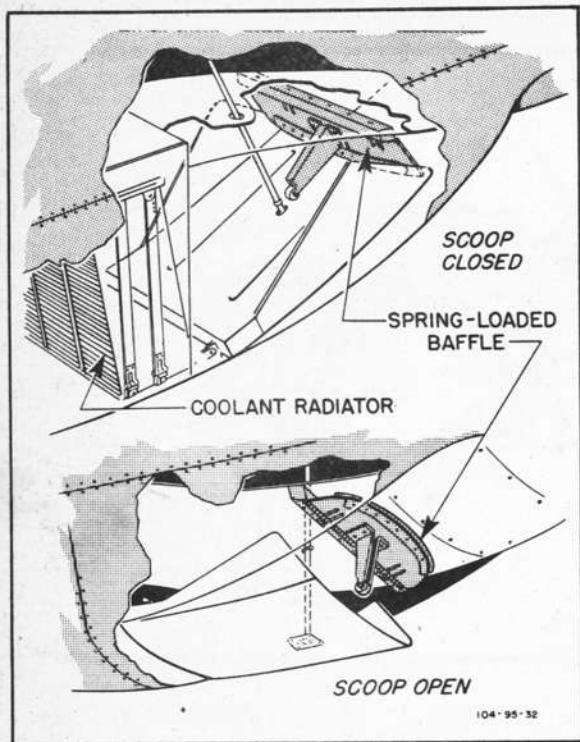


Figure 48—Coolant Radiator Outlet Duct Baffle

(c) Pull propeller through 5 or 6 revolutions by hand before engaging starter.

(d) When sub-zero weather makes starting difficult, move the mixture control from "IDLE CUT OFF" to "AUTO RICH" or "RUN" at the same time the starter is engaged with the engine. However, it is essential that the mixture control be moved back to the "IDLE CUT OFF" position if the engine does not start before the fourth revolution. Normally, the engine will start on the second or third revolution. However, if the engine does not start, turn "OFF" the ignition switch and pull the engine through by hand with the throttle fully opened to clear the engine of excess fuel.

(e) If the engine fails to start, moisture on the spark plugs may be the cause. Remove at least one plug from each cylinder and dry the points. Make another attempt to start the engine after replacing the plugs.

(f) Start the engine normally, without regard to the oil dilution system. After starting engine, if a heavy viscous oil is indicated by oil pressure that is too high, or by oil pressure that fluctuates or falls back when the engine rpm is increased, the dilution switch may be pushed "ON" (3 minutes maximum) to dilute the oil and correct this condition. This method should be used only if time and extreme temperature conditions do not permit normal engine warm-up.

CAUTION

When it is not known to what percentage the oil has been diluted, it is necessary to drain and refill the oil system before flight.

(g) Do not run the engine at more than 1300 rpm until the oil has reached a temperature of 15°C.

Note

If blank doors are installed on the filtered air intakes, engine warm-up may be facilitated by moving carburetor air control to "UNRAMMED FILTERED AIR." On late airplanes, move hot air control to "HOT."

(2) TAKE-OFF.

(a) Do not take off with snow, ice or frost on the wings. Even loose snow cannot be depended upon to blow off, and even a thin frost layer can cause loss of lift and very treacherous stalling characteristics. Since frost formation can be very rapid, it may be necessary to taxi out to the take-off position before removing the protective covers from the flight surfaces.



Note

When the outside air temperature is 0°C (32°F) or lower, it is advisable to use carburetor heat during take-off to improve vaporization of fuel.

(b) When taking off or landing on a narrow strip of clear ice, cross winds are particularly dangerous because of poor maneuverability caused by lack of traction. If the wind is gusty, the airplane may be blown completely off the ice before control can be regained.

(3) FLIGHT.

(a) After taking off from snow or slush-covered fields, operate the landing gear and flaps through several cycles to prevent them from freezing in the up position.

(b) Turn "ON" the pitot tube heater switch. This switch should not be "ON" with the airplane on the ground, as there is insufficient cooling in the pitot head to prevent overheating.

(c) When icing of the carburetor is indicated by irregular engine operation, and the airplane has blank doors over the filtered air intakes, move carburetor cold air control

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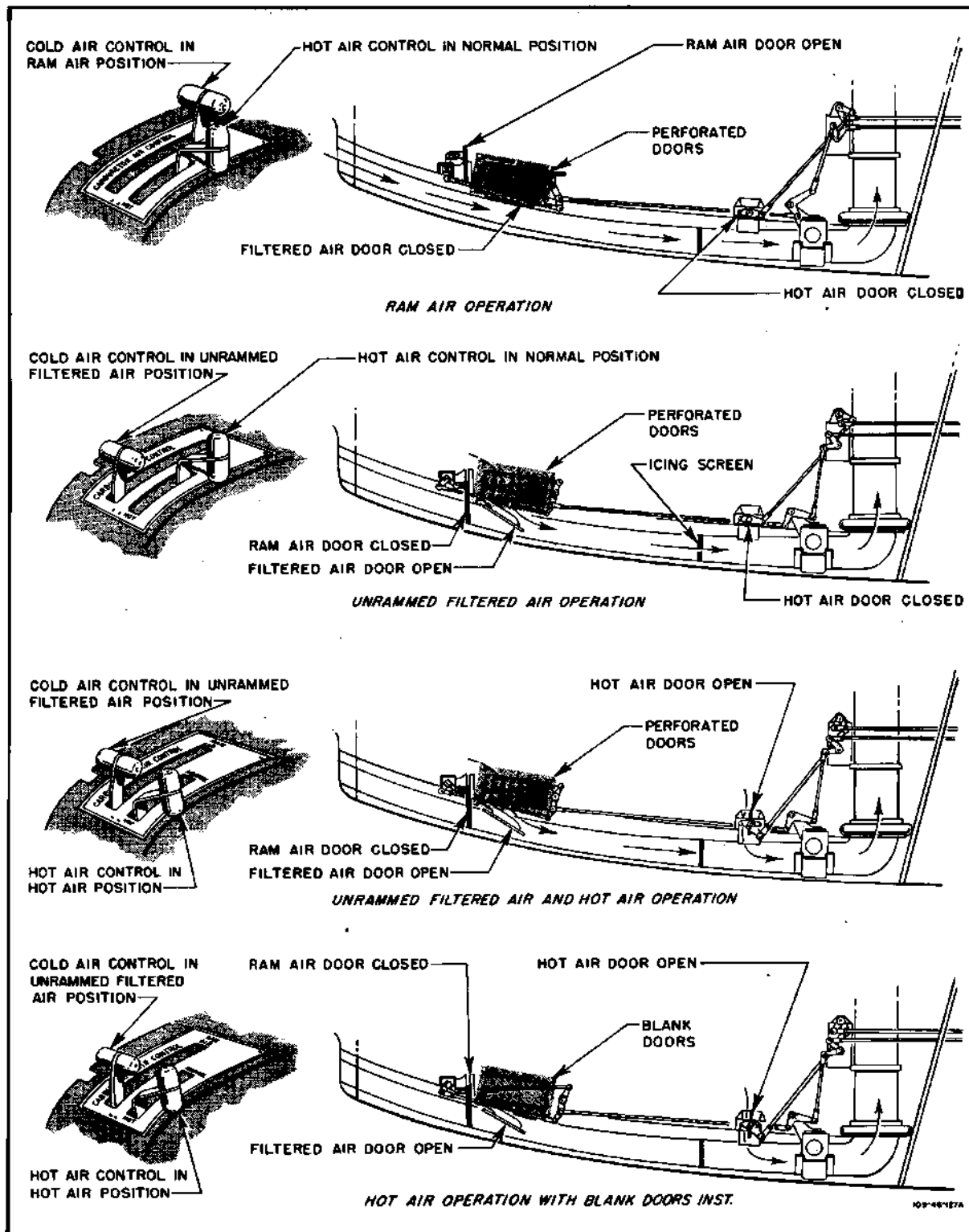


Figure 49—Operation of Carburetor Air Induction System

to "UNRAMMED FILTERED AIR." On late airplanes, move carburetor heat control to "HOT."

WARNING

Do not use carburetor heat on V-1650-3 and V-1650-7 engines above 12,000 feet unless flying in icing conditions. If carburetor heat is required above 12,000 feet, it should be used with discretion since excessive leaning of the fuel-air mixture may occur. The automatic altitude compensator in the carburetor is adversely affected by high temperature and low density conditions. If leaning becomes severe, as indicated by rough engine operation, power should be reduced or the use of heat discontinued.

CAUTION

Because of the constant-speed propeller governor and the automatic manifold pressure regulator, it is difficult to determine whether ice is forming other than by irregular engine operation, since neither the rpm nor the manifold pressure should change.

(d) Increase propeller speed momentarily by approximately 200 rpm every half-hour to assure continued governing at extremely low temperatures. Return to the desired cruising rpm as soon as the tachometer shows that the governor is functioning.

(e) Stay on a prearranged flight course as closely as possible, so that searchers will be able to find you if you are forced down. Except in extreme emergency, it is better to land or crash-land than to bail out.

(4) LANDING.—Temperature inversions are common in winter, and the ground may be 15° to 30°C (27° to 54°F) colder than that at altitude. Therefore, be careful to avoid excessive cooling when letting down. Lower the landing gear and use flaps to reduce air speed while descending. Retain considerable power, and if possible, maintain the oil temperature above 20°C and the coolant temperature

above 60°C during all letdowns. Lower readings than these may result in the engine cutting out or the failure of the engine to respond when the throttle is advanced.

Note

When the outside air temperature is 0°C (32°F) or lower, it is advisable to use carburetor heat during landing to obtain better vaporization of fuel. This also helps prevent the engine from cutting out.

(5) AFTER LANDING.—To obtain sufficient dilution of the oil to facilitate starting, idle or stop the engine to cool it before starting dilution. This will prevent rapid evaporation of the gasoline and ensure that the viscosity of the oil has been reduced sufficiently. In most cases it will be found that the engine has cooled sufficiently for dilution by the time the airplane reaches the flight line. Dilute oil as follows:

(a) Operate the engine at 1000 rpm and maintain an oil temperature of 50°C or less.

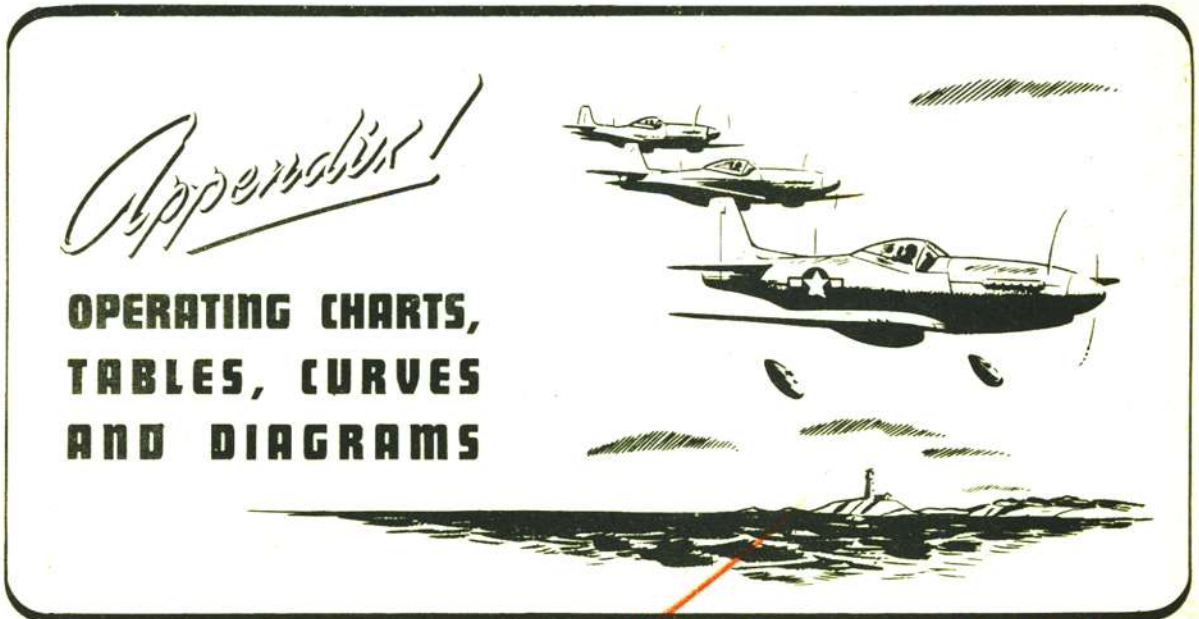
(b) For ground temperatures of 5°C (40°F) or less, hold oil dilution switch in the "ON" position for 3 minutes (maximum); then stop engine and release oil dilution switch.

Note

It has been determined through tests conducted on V-1650 engines that diluting the oil more than 10 percent will cause the scavenge system to fail. Therefore, restrict the period of oil dilution to a *maximum* of 3 minutes. When the outside air temperature is such that 3 minutes oil dilution is insufficient, drain the oil and refill the system with warm oil before starting the engine.

2. DESERT OPERATION.

Dust filters are installed in the air intake ducts, at each side of the engine compartment. When conditions warrant, or at the direction of the Operations Officer, use "UNRAMMED FILTERED AIR" for starting, take-off, and landing.

**A-1. ARMOR PROTECTION.**

Armor protection is illustrated in figure 50.

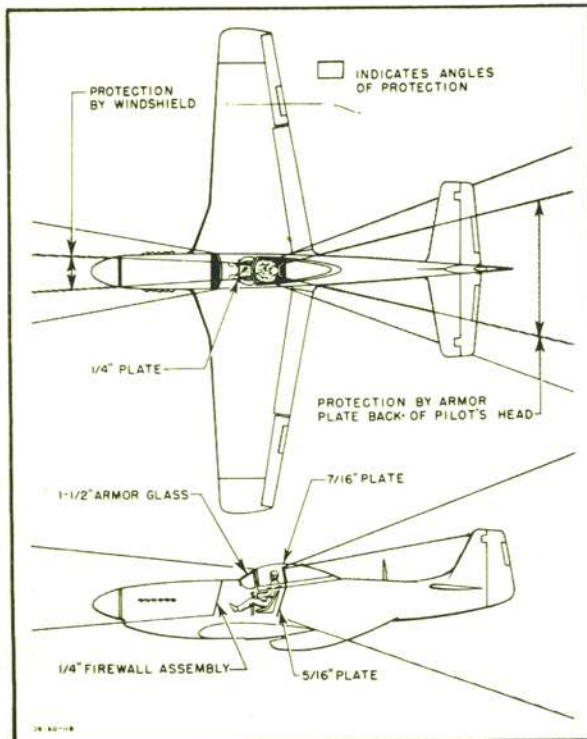


Figure 50—Armor Protection

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A-2. FLIGHT PLANNING.**A-3. GENERAL.**

A-4. A series of charts are provided on the following pages to aid in selecting the speeds and powers required to obtain various ranges. These charts are divided into two sets: (1) Take-off, Climb and Landing Chart, (2) Flight Operation Instruction Charts.

A-5. These charts are provided to give the pilot sufficient data to determine a safe and efficient flight plan. Inasmuch as the number of variables involved makes very accurate range predictions impossible the ranges and fuel flows quoted are conservative. For example, data based on flight test data (shown in black) are 5% conservative. The speeds quoted on any one chart are those obtained with gross weight equal to the high limit of the weight band shown on the chart. This policy along with the previously mentioned 5% conservatism makes allowances for differences in airplanes such as speeds, fuel flows, engine power output, pilot technique, etc. *No allowances* have been made for wind, navigational error, combat, formation flights, or endurance reserve. Appropriate allowances should be dictated by local policy.

A-6. The charts are arranged to give maximum facility for pre-flight and in-flight range planning. The following will be noted on inspection.

a. The climb chart gives fuel requirements for warm-up, take-off, and climb to any altitude for three typical weights. The fuel tabulated in the column labeled "at sea level" shows the allowance for warm-up, taxi, and take-off. Fuel requirements listed at other altitudes include this allowance plus the fuel required to climb from sea level. If it is desired to determine the fuel required to make an in-flight

climb from one altitude to another, i.e., 15,000 feet to 30,000 feet, the difference of the tabulated fuel required to climb to these two altitudes will be the climb fuel necessary.

b. Take-off and landing distances are shown for various combinations of gross weight, field altitude, winds, and type runways.

c. Seven Flight Operation Instruction Charts covering the various loading combinations for this airplane are presented.

d. Maximum to minimum practical fuel loadings are entered on each chart under the fuel column.

e. Data listed under Column I is for high speed cruising at max continuous (normal rated power). Columns II, III, IV, and V give progressive increases in range with a sacrifice in speed. Ranges shown in any column for a given fuel quantity can be obtained at various altitudes by using the power settings listed in the lower half of the chart in the same column.

f. Ranges shown on a given chart are based on fuel flows obtained by resetting power as gross weight changes to lower weight bracket on succeeding charts.

A-7. USE OF CHARTS.

A-8. The following sample problem based on a typical P-51D mission and employing actual chart values demonstrates how the charts should be used.

A-9. It is required that a P-51D be ferried to a base located 1750 miles from the factory. The first section (1000 miles) consists of climb to and cruise at 10,000 feet and the second section (750 miles) consists of climb from 10,000 feet to 15,000 feet and cruise at 15,000 feet to avoid mountainous terrain, and descent. Drop tanks will be carried all the way.

A-10. Write down the conditions of the problem and the questions to be answered.

Required range	1,750 miles
Weather	CAVU
Winds (at factory)	15 mph headwind at 10,000 ft.
Winds (1,000 miles out) ..	10 mph tailwind at 15,000 ft.
Aircraft basic weight	7,653 lb
(includes trapped fuel, oil, misc equipment)	
Crew weight (1)	200 lb
Oil (12.5 gal)	94 lb
Drop tanks (2—110 gal)	180 lb

Total weight (less fuel)	8,127 lb
Max fuel capacity (489 gal)	2,934 lb

Total gross weight11,061 lb.

A-11. Determination of the actual flight plan. Now that the conditions of the flight have been determined, it becomes necessary to establish a flight plan as follows:

a. The cruise will be started at 10,000 feet.

b. Determine the fuel available for flight planning by deducting the necessary fuel allowances and reserves from the actual fuel available.

General reserve for unexpected difficulties—53 gallons.

It will be noted that 53 gallons of fuel represent one

hour's flying time in Column V at a gross weight of 10,300 pounds to 8100 pounds (figure 55) at 15,000 feet. One hour's fuel reserve is considered sufficient for this type mission. The endurance is figured at the lightest weight because reserve fuel, obviously, will not be used until this light weight is reached. Fifteen thousands feet is the altitude at the end of the cruise due to terrain.

Wind reserve (1st section)—13 gallons.

This figure is arrived at as follows: the 1st section of the trip is 1,000 miles in length and, assuming it will be flown in Column IV, the airspeed will be 272 mph (find airspeed opposite the 10,000 foot entry in Column IV of the 12,200 pound to 10,300 pound chart). Therefore, the no-wind time of the 1st section will be $1,000/272=3.68$ hours. The actual time allowing for a 15 mph headwind is $1,000/(272-15)=3.89$ hours. The fuel required for the headwind at 62 gph is $(3.89-3.68) \times 62=13$ gallons.

Wind reserve (2d section)—0 gallons.

Normally, tailwinds are treated as a no-wind condition.

Warm-up, take-off, and climb to 10,000 feet—26 gallons.

Reference to Climb Data Chart shows 26 gallons are required for warm-up, take-off, and climb to 10,000 feet when the airplane weighs 11,000 pounds.

Climb from 10,000 feet to 15,000 feet—5 gallons.

After completing the 1st section, the airplane will be climbed to 15,000 feet to avoid terrain. The climb will not be made until the 1st section or 1,000 miles have been flown. Reference to the Climb Data Chart using an estimated gross weight of 10,000 pounds shows that 29 gallons are required to climb to 15,000 feet and that 24 gallons are required to climb to 10,000 feet. The difference between the quantities is 5 gallons or the amount of fuel necessary to climb from 10,000 feet to 15,000 feet.

Collecting all the required fuel allowances:

General reserve for unexpected difficulties	53 gal
Wind reserve (1st section)	13 gal
Wind reserve (2d section)	0 gal
Warm-up, take-off, and climb to 10,000 ft at 11,000 lb	26 gal
Climb from 10,000 ft to 15,000 ft	5 gal

Total Allowances97 gal

Therefore, the actual fuel for level flight cruising at zero wind is: $489-97=392$ gallons. Reference to the 12,200 pound to 10,300 pound chart (figure 55) shows that 1,770 miles can be flown with 400 gallons in Column IV. 1,750 miles will require approximately 396 gallons. This unconservative difference of 4 (396—392) gallons is negligible and this answer gives you a quick solution of the problem.

c. However, to ascertain that the mission is actually being flown in the most efficient manner, a more thorough analysis of the problem will have to be accomplished. It has been noted that the charts are divided into approximate 2,000 pound increments; and since the airplane weight will vary by more than 2,000 pounds, it will be necessary to divide the flight into several legs. (Note: the use of 333 gallons of fuel will reduce the airplane weight by 2,000 pounds.)

Leg	Fig.	Initial Wt.	Fuel Aboard	Condition	Altitude	Power Settings	Fuel Used	Distance
1	51	11,061	489	Warm-up, Take-off, and Climb	S.L. to 10,000 ft	2700 rpm 46 MP RUN	26	0

Entries whose derivation may not be clear are explained as follows:

INITIAL WEIGHT:

This was computed in paragraph A-10.

RPM, MP, MIXTURE, AND FUEL USED:

These items are read directly from the charts.

Note

Time consumed and distance covered in climbing

is considered negligible in this instance; however, these items should be considered in extremely long climbs.

The second leg of the flight will be accomplished at 10,000 feet in accordance with the information as contained in the 12,200-pound to 10,300-pound chart with Column IV conditions:

Leg	Fig.	Gross Wt.	Fuel Remaining	Power Settings	GPH	TAS	Ground Speed	Hours	Dist. Ground Miles	Fuel Used
2	55 Sheet 1	10,905	463	1950 RPM 37.5 MP RUN	62	272	257	1.63	418	101

Note: Length of leg 2 is determined by the time required for the gross weight to decrease to 10,300 pounds.

GROSS WEIGHT:

In using 156 pounds of fuel in warm-up, take-off, and climb, weight becomes $11,061 - 156 = 10,905$ pounds. (Use fuel weight as 6 pounds per gallon.)

FUEL REMAINING:

Fuel was reduced 26 gallons in leg 1.

RPM, MP, MIXTURE, GPH, AND TAS:

These items are read directly as entries opposite 10,000 feet in Column IV.

FUEL USED:

Calculated by subtracting upper weight limit of the following chart from the gross weight. ($10,905 - 10,300 = 605$ pounds or 101 gallons.)

HOURS:

The time was arrived at by dividing the fuel used by the fuel flow, i.e., $101/62 = 1.63$ hours.

GROUND SPEED:

This was determined by subtracting the headwind from the TAS, i.e., $272 - 15 = 257$ mph.

DISTANCE:

The mileage was calculated by multiplying the ground speed by the hours, i.e., $257 \times 1.63 = 418$ miles.

Now that the gross weight has been reduced to 10,300 pounds, the remainder of the flight will be flown on the basis of the information listed on the 10,300 pound to 8,100 pound chart.

Leg	Fig.	Gross Weight	Fuel Remaining	Power Settings	GPH	TAS	G.S.	Hours	Dist.	Fuel Used
3	55 Sheet 2	10,300	362	1750 RPM 35.5 MP RUN	54	259	244	2.38	582	129

Note: Length of leg 3 is determined by the distance remaining to the point at which the climb to 15,000 feet is started. $1,000 - 418 = 582$ miles (remaining distance).

GROSS WEIGHT:

In using 101 gallons or 605 pounds of fuel to fly leg 2, the weight becomes $10,905$ pounds - $605 = 10,300$ pounds.

FUEL REMAINING:

Fuel was reduced 101 gallons in leg 2.

RPM, MP, MIXTURE, GPH, TAS:

These items are read directly as entries opposite 10,000 feet in Column IV.

GROUND SPEED:

The speed was determined by subtracting the headwind from the true airspeed, i.e., $259 - 15 = 244$ mph.

HOURS:

The time was arrived at by dividing the remaining distance by the ground speed, i.e., $582/244 = 2.38$ hours.

FUEL USED

Multiply gph by hours = $54 \times 2.38 = 129$ gallons. Upon reaching the point 1,000 miles from the factory it is planned to climb to 15,000 feet:

Leg	Fig.	Gross Weight	Fuel Remaining	Condition	Altitude	Power Settings	Fuel Used
4	51	9,526	233	Climb	10,000 ft. to 15,000 ft.	2700 RPM 46 MP RUN	5

GROSS WEIGHT:

In using 774 pounds (129 gallons) of fuel to fly leg 3, the gross weight becomes $10,300 - 744 = 9,526$ pounds.

FUEL REMAINING:

Fuel was reduced 129 gallons in leg 3.

RPM, MP MIXTURE:

These items are read directly from the Climb Data Chart.

FUEL USED:

This quantity is determined from the Climb Data chart opposite 10,000 pounds gross weight. Subtract the amount of fuel used for climb to 15,000 feet from the amount of fuel used for climb to 10,000 feet ($29 - 24 = 5$ gallons). The time and distance are neglected in this case.

Leg	Fig.	Gross Weight	Fuel Remaining	Altitude	Power Settings	GPH	TAS	G.S.	Hr.	Dist.	Fuel Used
5	55 Sheet 2	9,496	228	15,000 ft.	2000 RPM FT RUN	59	279	279	2.69	750	159

Note: Leg 5 is the distance from the predetermined climb point to the destination.

GROSS WEIGHT:

In using 30 pounds (5 gallons) of fuel to fly leg 4, gross weight becomes $9,526 - 30 = 9,496$ pounds.

FUEL REMAINING:

Fuel was reduced 5 gallons in leg 4.

RPM, MP, MIXTURE, GPH, TAS:

These items are read directly as entries opposite 15,000 feet in Column IV.

GROUND SPEED:

This speed equals TAS for the last 750 miles as the tailwind is considered as no wind in this instance.

HOURS:

The time was computed by dividing the distance by the ground speed, i.e., $750/279 = 2.69$ hours.

FUEL USED:

Multiply gph by hours, i.e., $59 \times 2.69 = 159$ gallons.

Calculated fuel remaining at end of flight is $228 - 159 = 69$ gallons. The original allowance for contingencies was 53 gallons, so that an excess (due to more accurate step by step analysis) of 16 gallons above requirements is available.

A-12. Suppose that upon arrival at the destination, the field is closed in due to bad weather and an alternate field 250 miles farther on is selected. Reference to figure 55, sheet 2, Column V, indicates 200 mile maximum range at zero wind for 40 gallons. Sixty-nine gallons will allow approximately 350 miles. At 15,000 feet the TAS would be 261 mph. Ground speed would be the same or dependent upon wind. The time for flight is $250/261 = .96$ hours. Fuel required would be $53 \text{ gph} \times .96 \text{ hours} = 51$ gallons. This would leave 18 gallons in the tanks upon arrival at the alternate field, i.e., $69 - 51 = 18$ gallons. A slight advantage would be obtained by dropping external tanks and flying according to operating conditions as listed for the "clean" airplane on figure 52.

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For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND K		ENGINE MODEL(S) V-1650-7											
GROSS WEIGHT LB.		TAKE-OFF DISTANCE FEET											
		HARD SURFACE RUNWAY				SOD-TURF RUNWAY				SOFT SURFACE RUNWAY			
		AT SEA LEVEL		AT 6000 FEET		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET	
HEAD WIND M.P.H.	WIND KTS.	GROUND RUN		TO CLEAR 50' OBL.		GROUND RUN		TO CLEAR 50' OBL.		GROUND RUN		TO CLEAR 50' OBL.	
		MPH	KTS	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.
11,000	0	1600	2700	2000	3300	2000	2800	2100	3100	2400	3400	2300	3200
	17	1500	2600	1900	3200	1900	2700	2000	3000	2300	3100	2200	3000
	34	1400	2500	1800	3100	1800	2600	1900	2900	2200	3000	2100	2900
10,000	0	1600	2700	2000	3300	2000	2800	2100	3100	2400	3400	2300	3200
	17	1500	2600	1900	3200	1900	2700	2000	3000	2300	3100	2200	3000
	34	1400	2500	1800	3100	1800	2600	1900	2900	2200	3000	2100	2900
9000	0	1600	2700	2000	3300	2000	2800	2100	3100	2400	3400	2300	3200
	17	1500	2600	1900	3200	1900	2700	2000	3000	2300	3100	2200	3000
	34	1400	2500	1800	3100	1800	2600	1900	2900	2200	3000	2100	2900

CLIMB DATA		AT 10,000 FEET						AT 15,000 FEET						AT 25,000 FEET						AT 35,000 FEET					
GROSS WEIGHT LB.	BEST I.A.S. MPH	RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB			
		F.P.M.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.	F.P.M.	MIN.			
11,000	175	150	1450	15	175	150	1500	6.8	26	170	150	1450	10.5	31	165	145	1100	19	44	145	130	150	39	76	
10,000	175	150	1750	15	175	150	1800	5.6	24	170	150	1800	8.5	29	165	145	1400	15	40	145	130	450	27	58	
9000	175	150	2050	15	175	150	2100	4.8	23	170	150	2150	7.5	27	165	145	1800	13	36	145	130	750	20	48	

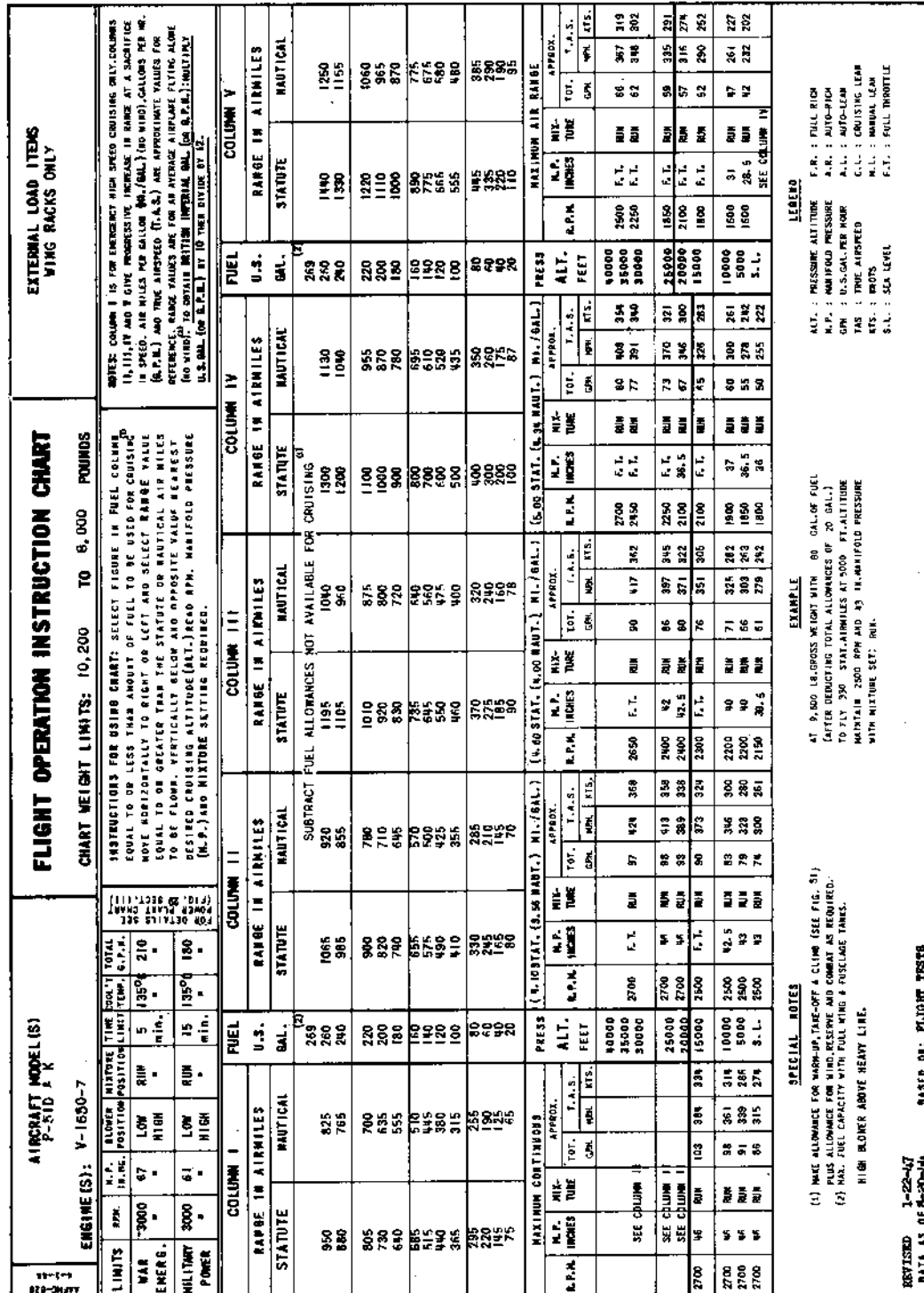
LANDING DISTANCE FEET		FIRM DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY									
GROSS WEIGHT LB.	BEST I.A.S. MPH	POWER OFF APPROACH		AT SEA LEVEL		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT SEA LEVEL		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT SEA LEVEL		AT 6000 FEET	
		KTS	MPH	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.	MIN.	CLIMB F.P.M.
10,000	130	115	130	115	1300	1600	1700	2800	1500	2600	1700	2800	1900	3000	4800	3900	5100	4400	5500	3900	5000	4400	5500
9000	130	115	130	115	1300	1600	1700	2800	1500	2600	1700	2800	1900	3000	4300	3500	4600	4300	5000	3500	4600	4300	5000
8000	130	115	130	115	1300	1600	1700	2800	1500	2600	1700	2800	1900	3000	3800	3100	4100	3800	4500	3100	4100	3800	4500

For use with V-1650-7 engine only regardless of airplane model.

Figure 51—Take-off, Climb, and Landing Chart

AN 01-60JE-1

For use with V-1650-7 engine only regardless of airplane model.



For use with V-1650-7 engine only regardless of airplane model.

Figure 52—Flight Operation Instruction Chart—Wing Racks

For use with V-1650-7 engine only regardless of airplane model.

AN 01-60JE-1

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL (S) P-51D & K		ENGINE(S): V-1650-7				FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 140 500 LB. BOMBS OR TWO 75 CAL. WING TANKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
LIMITS		M.P. BLOWER MIXTURE (TIME LIMIT TEMP. G.P.M.)		COOL. TOTAL		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FEEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE READS DESIRED CRUISING ALTITUDE (ALT., MEAN RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED).				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (60 MPH) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES FOR AN AVERAGE AIRPLANE FLYING ABOVE 10,000 FEET. TO OBTAIN STATUTE AIRMILES (STAT. AIR MILES) MULTIPLY M.P.G. (OR G.P.H.) BY 10 THEN DIVIDE BY 1.8.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
WAR	EMERG.	3000	67	LOW	HIGH	5	135°	210	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
MILITARY	POWER	3000	61	LOW	HIGH	15	135°	180	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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MIX-TURE</td> <td colspan="4">M.P. MIX-TURE</td> <td colspan="4">M.P. MIX-TURE</td> </tr> <tr> <td colspan="2">M.P. APPROX.</td> <td colspan="2">T.A.S.</td> <td colspan="2">M.P. APPROX.</td> <td colspan="2">T.A.S.</td> <td colspan="2">M.P. APPROX.</td> <td colspan="2">T.A.S.</td> <td colspan="2">M.P. APPROX.</td> <td colspan="2">T.A.S.</td> <td colspan="2">M.P. APPROX.</td> <td colspan="2">T.A.S.</td> </tr> <tr> <td>R.P.M.</td> <td>M.P.</td> <td>ALT.</td> <td>FEET</td> <td>R.P.M.</td> <td>M.P.</td> <td>ALT.</td> <td>FEET</td> <td>R.P.M.</td> <td>M.P.</td> <td>ALT.</td> <td>FEET</td> <td>R.P.M.</td> <td>M.P.</td> <td>ALT.</td> <td>FEET</td> <td>R.P.M.</td> <td>M.P.</td> <td>ALT.</td> <td>FEET</td> </tr> <tr> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> </tr> <tr> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> </tr> <tr> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> <td>2700</td> <td>46</td> <td>25000</td> <td>40000</td> </tr> </thead></table>																	COLUMN I				COLUMN II				COLUMN III				COLUMN IV				COLUMN V				RANGE IN AIRMILES		FUEL		RANGE IN AIRMILES		FUEL		RANGE IN AIRMILES		FUEL		RANGE IN AIRMILES		FUEL		RANGE IN AIRMILES		FUEL		U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	1390	1205	419	410	1290	1085	1315	1175	1515	1355	1485	1335	1460	1610	1495	1370	1795	1560	1995	1785	1320	1145	390	380	1260	1050	1315	1140	1485	1335	1460	1335	1460	1535	1425	1335	1795	1560	1895	1650	1250	1085	370	360	1175	1015	1315	1110	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			1185	1030	350	340	1140	980	1315	1075	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			1120	975	330	320	1100	945	1315	1040	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			1050	915	310	300	1060	910	1315	1005	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			985	855	290	280	1020	875	1315	970	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			915	795	270	260	980	840	1315	935	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			845	735	250	240	940	805	1315	895	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			780	675	230	220	900	770	1315	860	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			710	615	210	200	860	735	1315	825	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			645	555	190	180	820	700	1315	790	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			575	495	170	160	780	665	1315	755	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			510	435	150	140	740	630	1315	720	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560			MAXIMUM CONTINUOUS				PRESS				M.P. MIX-TURE				M.P. MIX-TURE				M.P. MIX-TURE				M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000	2700	46	25000	40000
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1050	915	310	300	1060	910	1315	1005	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
985	855	290	280	1020	875	1315	970	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
915	795	270	260	980	840	1315	935	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
845	735	250	240	940	805	1315	895	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
780	675	230	220	900	770	1315	860	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
710	615	210	200	860	735	1315	825	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
645	555	190	180	820	700	1315	790	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
575	495	170	160	780	665	1315	755	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
510	435	150	140	740	630	1315	720	1435	1290	1460	1335	1460	1460	1335	1305	1795	1560																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
MAXIMUM CONTINUOUS				PRESS				M.P. MIX-TURE				M.P. MIX-TURE				M.P. MIX-TURE																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.		M.P. APPROX.		T.A.S.																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET	R.P.M.	M.P.	ALT.	FEET																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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| **SPECIAL NOTES** (1) MAX. ALLOWANCE FOR WASH-TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. (2) MAX. FUEL CAPACITY WITH 2-75 GAL. WING, STD. WING TANKS & FUSelage TANKS. HIGH BLOWER ABOVE HEAVY LOBE **EXAMPLE** AT 10000 LB. GROSS WEIGHT WITH 210 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 800 STAT. AIRMILES AT 5000 FT. ALTITUDE WITH MIXTURE SET: 2700 RPM AND 47 IN. MANIFOLD PRESSURE WITH MIXTURE SET: 2700 RPM, WHEN WEIGHT REACHES 9,000 LBS. USE POWER SETTINGS SHEET 2, COLUMN 113. | | | | | | | | | | | | | | | | |
| **LEGEND** ALT.: PRESSURE ALTITUDE F.P.M.: FULL RICH M.P.: MANIFOLD PRESSURE A.R.: AUTO-RICH G.M.: U.S. GALLONS PER HOUR A.L.: AUTO-LEAN T.A.S.: TRUE AIRSPEED C.L.: CRUISING LEAN R.T.S.: ROOTS M.L.: MANUAL LEAN S.L.: SEA LEVEL F.T.: FULL THROTTLE | | | | | | | | | | | | | | | | |

For use with V-1650-7 engine only regardless of airplane model.

Figure 53 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

LIMITS	AIRCRAFT MODEL(S)			FLIGHT OPERATION INSTRUCTION CHART			CHART WEIGHT LIMITS: 9,600 TO 8,100 POUNDS			EXTERNAL LOAD ITEMS TWO 500 LB. BOMBS OR TWO 75 GAL. WING TANKS		
	WAR ENERGS.	MILITARY POWER	ENGINE(S): V-1650-7	R.P.M.	M.P.	LOWER POSITION	MIXTURE	TOTAL FUEL	WING	WING	WING	WING
950	825	1050	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
850	785	975	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180
815	710	900	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
785	645	825	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180
680	590	750	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
670	570	735	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180
545	475	600	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
475	415	525	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180
405	355	450	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
370	325	405	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180
205	180	225	67	LOW	LOW	5	MIN.	210	MIN.	15	1350	180
135	115	155	67	HIGH	HIGH	5	MIN.	210	MIN.	15	1350	180

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING... (Detailed instructions regarding fuel calculations and engine settings are provided within the chart area.)

COLUMNS	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL	U.S.	NAUTICAL
RANGE IN AIRMILES	280	1110	280	1110	280	1110	280	1110	280	1110
STATUTE	1380	5400	1380	5400	1380	5400	1380	5400	1380	5400
MIXTURE	65%	70%	65%	70%	65%	70%	65%	70%	65%	70%
R.P.M.	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
M.P.	85	95	85	95	85	95	85	95	85	95
WING	500	500	500	500	500	500	500	500	500	500

NOTE: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMN II, III, IV AND V GIVE PROGRESSIVE INCREASE IN BACK AS A SACRIFICE IN SPEED. AIR MILES PER GALLON (A.M.P.G.) (100 WIND) GALLONS PER HOUR (G.P.H.) AND TIME AIRMILES (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONG (100 WIND) TO OBTAIN MIXTURE 65% (M.P.) MANIFOLD PRESSURE (M.P.) (M.P.A.) BY 75 THEN DIVIDE BY 12.

EXAMPLE: AT 9,400 LB. GROSS WEIGHT WITH 100 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 420 STAT. AIRMILES AT 3000 FT. ALTITUDE MAINTAIN 2200 R.P.M. AND 10 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUM

REVISIONS: 1-21-47, DATA AS OF 9-10-44

BASED ON: FLIGHT TEST

For use with V-1650-7 engine only regardless of airplane model.

Figure 53 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AN 01-60JE-1

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K			FLIGHT OPERATION INSTRUCTION CHART	
ENGINE(S): V-1650-7			CHART WEIGHT LIMITS: 13,000 TO 11,000 POUNDS	
LIMITS	R.P.M.	MIXTURE POSITION	COOLANT TEMPERATURE	TOTAL FUEL CAPACITY
	WAR 3000	LOW HIGH	135°C 210	13,000 11,000
EMERG.	R.P.M.	LOW HIGH	MIN.	MIN.
	3000	61	15	180
MILITARY POWER			MIN.	MIN.
EXTERNAL LOAD ITEMS OR 6 SOCKETS + 1-10 GAL. WING TANKS + 1-10 GAL. WING TANKS + 1-1000 LB OR 6 SOCKETS + 2-1000 LB				
NOTES: COLUMN 1 IS FOR EMERGENCY HIGH SPEED CRUISING ONLY-COLUMNS 11, 14, 15 AND 17 GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLOW (M.P./GAL.) (DO WHO) CALLOW PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONG (DO WHO) TO OBTAIN MAXIMUM IMPERIAL GAL (ON G.P.H.) MULTIPLY BY 8.5 GAL (ON G.P.H.) BY 10 TO THEIR DIVIDE BY 12.				
COLUMN I		COLUMN II		COLUMN III
RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES
STATUTE NAUTICAL	STATUTE NAUTICAL	STATUTE NAUTICAL	STATUTE NAUTICAL	STATUTE NAUTICAL
489	489	489	489	489
INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT. HEAD RPM, MAX FOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING				
MAXIMUM CONTINUOUS PRESSURE				
R.P.M. (M.P.)	T.A.S.	M.P./GAL.	M.P./GAL.	M.P./GAL.
2700	2700	2700	2700	2700
MAXIMUM AIR RANGE				
R.P.M.	T.A.S.	M.P./GAL.	M.P./GAL.	M.P./GAL.
2700	2700	2700	2700	2700
LEGEND				
A.L.T. : PRESSURE ALTITUDE				
M.P. : MAX FOLD PRESSURE				
G.P.H. : U.S. GAL/PER HOUR				
T.A.S. : TRUE AIRSPEED				
R.T.S. : MIXTURE				
F.T.L. : FULL THROTTLE				

For use with V-1650-7 engine only regardless of airplane model.

Figure 54 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D & K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 6 INCHES x 27 1/2 GAL. WING LAMPS 6 INCHES x 27 1/2 GAL. WING LAMPS OR 6 INCHES x 27 1/2 GAL. WING LAMPS											
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 11,000 TO 8,900 POUNDS				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY; COLUMN II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILS PER GALLON (MI./GAL.) (60 WIND). GALLONS PER HR. (G.P.H.R.) AND THESE AIRPRESSED (A.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONG (NO WIND) TO OBTAIN MAXIMUM IMPERIAL GAL. (60 & P.M.): MULTIPLY U.S. GAL. (60 & P.M.) BY 10 THEN DIVIDE BY 12.											
LIMITS	R.P.M.	BLOWER POSITION	MIXTURE	TIME	COOLING	TOTAL	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V		
							RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES
WAR	3000	67	LOW	5	1350	210	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	
ENERG.	"	"	HIGH	"	"	"	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	
MILITARY	3000	61	LOW	15	1350	180	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	
POWER	"	"	HIGH	"	"	"	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	
1040	905	1170	1015	1115	1400	1275	1400	1115	1275	1400	1115	1275	1400	1115	1275	1400	
960	825	1170	925	1020	1275	1020	1170	1020	1275	1020	1170	1020	1275	1020	1170	1020	
855	745	980	835	1050	910	815	1050	910	1020	815	1050	910	1020	815	1050	910	
760	660	740	740	835	815	715	835	715	895	815	895	715	895	815	895	715	
665	580	745	645	700	610	510	700	610	765	610	765	510	765	610	765	510	
520	450	530	460	510	410	310	460	410	470	410	470	310	470	410	470	310	
475	415	370	370	370	370	370	370	370	370	370	370	370	370	370	370	370	
360	330	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	
285	250	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	
190	165	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	
95	83																
MAXIMUM CONTINUOUS																	
R.P.M.	M.P.	TOT.	T.A.S.	R.P.M.	M.P.	TOT.	T.A.S.	R.P.M.	M.P.	TOT.	T.A.S.	R.P.M.	M.P.	TOT.	T.A.S.	R.P.M.	M.P.
3000	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050
2700	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
2500	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
2300	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450
2100	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
1900	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
1700	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850
1500	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650
1300	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
1100	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
900	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

For use with V-1650-7 engine only regardless of airplane model.

Figure 54 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AN 01-60JE-1

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D & K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS OR ONE 1000 GPM WING TANK OR TWO 110 GALL. WING TANKS (OR TWO 5" ROCKETS)			
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 12,200 TO 10,300 POUNDS							
LIMITS	RPM	M.P. BLUENER POSITION (TIME COOL. TOTAL (H.R.G.) POSITION (TEMP. (P.P.S.))		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN, EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING, MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN, VERTICALLY SELECT APPROPRIATE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) HEAD RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.		COLUMN IV		COLUMN V	
		LOW	HIGH	LOW	HIGH	U.S.	NAUTICAL	U.S.	NAUTICAL
WAR	3000	67	LOW	HIGH	5	1350	210	1111	1800
EMERG.									
MILITARY	3000	61	LOW	HIGH	15	1350	190	1111	1800
POWER									
<p>NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED, AIR TRAIL PER GALLON (MIL./GAL.) (NO WIND), GALLONS PER MI. (G.P.M.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN MAXIMUM IMPERIAL GAL. (OR M.P.M.): MULTIPLE U.S. GAL. (OR G.P.M.) SET TO THEN DIVIDE BY 12.</p>									
<p>INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN, EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING, MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN, VERTICALLY SELECT APPROPRIATE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) HEAD RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.</p>									
<p>LEGEND ALT.: PRESSURE ALTITUDE F.F.: FULL RICH M.P.: MANIFOLD PRESSURE A.R.: AUTO-RICH G.P.M.: U.S. GAL. PER HOUR A.L.: AUTO-LEAN T.A.S.: TRUE AIRSPEED C.L.: CRUISING LEAN E.T.S.: E.T.S. S.W.T.S.: MANUAL LEAN S.L.: SEA LEVEL F.T.: FULL THROTTLE</p>									

For use with V-1650-7 engine only regardless of airplane model.

Figure 55 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS OR ONE 1000 LB. OR ONE 170 GAL. N. TANK OR TWO 170 GAL. N. TANKS (ON THE 5-INDEX)															
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 10,300 TO 8,100 POUNDS																			
LIMITS		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALL READ RPM, MIXTURE PRESSURE (ON P. 3-10) MIXTURE SETTING REQUIRED).				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.GAL.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES. REFERENCE RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN MAXIMUM IMPERIAL GAL. (ON P. 3-10) EFFICIENCY G.P.GAL. (ON P. 3-10) BY DIVIDING BY 12.															
WAR EMERG.		MILITARY POWER		LOWER MIXTURE LIMIT TEMP. (°P.P.H.)		TOTAL FUEL (GAL.)		W.P. (G.P.H.)		M.P.GAL.											
3000		3000		1350°		210		67		1114											
HIGH		HIGH		1205°		180		61		1114											
LOW		LOW		1205°		180		61		1114											
MIN.		MIN.		1205°		180		61		1114											
MIN.		MIN.		1205°		180		61		1114											
1320		1165		400		1505		1310		1700		1430		1650		400		1960		1720	
1195		1040		360		1355		1180		1530		1390		1820		360		1780		1545	
1060		920		320		1205		1045		1360		1190		1615		320		1585		1380	
930		810		280		1050		910		1190		1035		1325		280		1385		1205	
795		690		240		900		790		1020		885		1135		240		1190		1025	
645		580		200		750		650		850		740		945		200		990		860	
530		460		160		600		520		680		590		795		160		790		685	
400		350		120		450		380		510		445		565		120		595		515	
285		230		80		300		260		340		295		390		80		395		345	
135		115		40		150		130		170		150		165		40		200		175	
MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS	
M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES		M.P. INDEXES	
2700		2700		2700		2700		2700		2700		2700		2700		2700		2700		2700	
2700		2700		2700		2700		2700		2700		2700		2700		2700		2700		2700	
2700		2700		2700		2700		2700		2700		2700		2700		2700		2700		2700	

For use with V-1650-7 engine only regardless of airplane model.

Figure 55 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG. 51)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE REPLY LINE

LEGEND

ALT. : PRESSURE ALTITUDE P.P. : FULL RICH
M.P. : MIXTURE PRESSURE A.P. : AUTO-RICH
DPR : U.S. GAL. PER HOUR A.L. : AUTO-LEAD
TAS : TRUE AIRSPEED C.A.L. : CRUISING LEAD
STS. : KNOTS M.L. : MANUAL LEAD
S.L. : SEA LEVEL P.T. : FULL THROTTLE

EXAMPLE

AT 10,000 LB. GROSS WEIGHT WITH 120 GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.)
TO FLY 545 STAT. AIRMILES AT 5000 FT. ALTITUDE
MAINTAIN 1700 RPM MIX 35 18-MIXTURE PRESSURE
WITH MIXTURE SET: RW-

Figures 56-63, pages 61-74, deleted in revision, dated 7 May 1947

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		TAKE-OFF, CLIMB & LANDING CHART												ENGINE MODEL(S) V-1650-3															
GROSS WEIGHT LB.		HARD SURFACE RUNWAY				SOD-TURF RUNWAY				SOFT SURFACE RUNWAY				HARD SURFACE RUNWAY				SOD-TURF RUNWAY				SOFT SURFACE RUNWAY							
		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT 10,000 FEET		AT 15,000 FEET		AT 20,000 FEET		AT 25,000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT 10,000 FEET		AT 15,000 FEET		AT 20,000 FEET		AT 25,000 FEET	
		GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.	GROUND 50' OBL.	TO CLEAR 50' OBL.
9000	0 17 34 51	1350 1000 750 500	2000 1550 1150 850	1700 1300 950 650	2450 1950 1500 1100	1450 1050 750 500	1600 1200 850 600	2250 1800 1350 1000	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	1600 1200 850 600	1800 1350 1000 700	2500 2000 1550 1150	
11,000	0 17 34 51	1850 1350 1000 750	2700 2150 1600 1150	2250 1750 1300 900	3200 2450 2050 1500	1950 1450 1050 750	2100 1600 1200 850	2800 2300 1850 1400	2100 1600 1200 850	3400 2650 2250 1700	2100 1600 1200 850	2300 1800 1400 1050	3000 2300 1900 1400	2100 1600 1200 850	2300 1800 1400 1050	3000 2300 1900 1400	2100 1600 1200 850	2300 1800 1400 1050	3000 2300 1900 1400	2100 1600 1200 850	2300 1800 1400 1050	3000 2300 1900 1400	2100 1600 1200 850	2300 1800 1400 1050	3000 2300 1900 1400	2100 1600 1200 850	2300 1800 1400 1050		
13,000	0 17 34 51	2300 1800 1300 900	3600 2900 2300 1750	2900 2300 1750 1200	4300 3300 2700 2100	2450 1950 1450 1050	2650 2150 1650 1200	3700 3000 2400 1800	2650 2150 1650 1200	4500 3600 3000 2300	2650 2150 1650 1200	2850 2350 1850 1350	3900 3200 2600 2000	2650 2150 1650 1200	2850 2350 1850 1350	3900 3200 2600 2000	2650 2150 1650 1200	2850 2350 1850 1350	3900 3200 2600 2000	2650 2150 1650 1200	2850 2350 1850 1350	3900 3200 2600 2000	2650 2150 1650 1200	2850 2350 1850 1350	3900 3200 2600 2000	2650 2150 1650 1200	2850 2350 1850 1350		

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 10% + 10% 125% + 30% 150% + 40%
 BASED ON: FLIGHT TESTS
 OPTIMUM TAKE-OFF WITH 3000 RPM, 61 IN. HG. & 20 DEG. FLAP IS SHOWN ON CHART VALUES

CLIMB DATA

GROSS WEIGHT LB.	AT 5000 FEET				AT 10,000 FEET				AT 15,000 FEET				AT 20,000 FEET				AT 25,000 FEET												
	BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB		BEST I.A.S.		RATE OF CLIMB										
	MPH	F.P.M.	MIN.	F.P.M.	MPH	F.P.M.	MIN.	F.P.M.	MPH	F.P.M.	MIN.	F.P.M.	MPH	F.P.M.	MIN.	F.P.M.	MPH	F.P.M.	MIN.	F.P.M.									
9000	170	145	2200	15	170	145	2200	2.5	19	170	145	2250	5.0	23	170	145	2250	7.5	27	165	145	1900	10.0	31	160	140	1650	13.0	35
11,000	170	145	1500	15	170	145	1500	3.5	20	170	145	1500	10.5	32	165	145	1150	14.0	39	160	140	900	19.0	47	160	140	900	19.0	47
13,000	175	150	1000	15	175	150	950	5.5	23	175	150	850	17.0	42	170	145	550	23.0	55	165	145	300	37.0	75	165	145	300	37.0	75

POWER PLANT SETTINGS: DETAILS ON FIG. SECTION 11(1)
 DATA AS OF 5-8-45
 FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	HARD DRY SURFACE				FIRM DRY SOD				WET OR SLIPPERY																			
	BEST IAS APPROACH		POWER OFF POWER ON		BEST IAS APPROACH		POWER OFF POWER ON		BEST IAS APPROACH		POWER OFF POWER ON		BEST IAS APPROACH		POWER OFF POWER ON													
	MPH	KTS	MPH	KTS	MPH	KTS	MPH	KTS	MPH	KTS	MPH	KTS	MPH	KTS	MPH	KTS												
9000	130	115	130	115	1200	2300	1400	2400	1500	2600	1400	2400	1300	2200	1400	2400	1500	2600	1400	2400	1300	2200	1400	2400	1500	2600	1400	2400
8000	120	115	130	115	1100	2100	1300	2100	1400	2400	1300	2100	1200	2000	1300	2100	1200	2000	1300	2100	1200	2000	1300	2100	1200	2000	1300	2100

DATA AS OF 5-8-45
 REMARKS:
 LEGEND
 I.A.S. : INDICATED AIRSPEED
 M.P.H. : MILES PER HOUR
 KTS. : KNOTS
 F.P.M. : FEET PER MINUTE
 OPTIMUM LANDING IS SHOWN ON CHART VALUES

MIXTURE: USE "RUN" OR "AUTO RICH - AUTO LEAN"

For use with V-1650-3 engine only regardless of airplane model.

Figure 64—Take-off, Climb and Landing Chart

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-B1D AND P-B1K		EXTERNAL LOAD ITEMS WING RACKS				FLIGHT OPERATION INSTRUCTION CHART																															
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,000 TO 8,000 POUNDS				COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V		MAXIMUM AIR RANGE																					
LIMITS	RPM	M.P.	MIXTURE	CYL. POSITION	TOTAL G.P.M.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		PRESS	ALT.	M.P.M.	MIX-TIME	T.A.S.	M.P.	MIX-TIME	T.A.S.	M.P.	MIX-TIME	T.A.S.											
						U.S.	STATUTE	U.S.	STATUTE	U.S.	STATUTE	U.S.	STATUTE	U.S.	STATUTE												U.S.	STATUTE	U.S.	STATUTE	U.S.	STATUTE	U.S.	STATUTE			
WAR	3000	67	LOW	WAR	187	1130	860	1340	1600	1840	860	1340	1600	1840	289	1620	1410																				
EMERG			HIW	EMERG	168	1010	870	1200	1360	1200	870	1200	1360	290	1450	1260																					
MILITARY	3000	61	LOW	MILITARY	167	920	800	1100	1260	1100	800	1100	1260	220	1930	1150																					
POWER			HIW	POWER	158	780	680	1030	1030	800	680	1030	1030	180	1000	940																					
						510	560	800	800	600	560	800	800	180	970	840																					
						460	590	800	800	610	590	800	800	190	860	730																					
						380	700	800	800	600	700	800	800	120	730	630																					
						320	600	800	800	500	600	800	800	100	600	520																					
						280	500	800	800	430	500	600	600	80	500	420																					
						190	400	800	800	340	400	500	500	60	460	370																					
						130	300	800	800	260	300	400	400	40	360	280																					
							170	800	800	170	200	200	200	30	200	170																					
INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE BEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.						NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN INITIAL SPEED (M.P.) (NO WIND) DIVIDE BY 1.1. U.S. GAL. (OR G.P.H.) BY 10 TO GET DIVIDE BY 12.						LEGEND: ALT.: PRESSURE ALTITUDE F.P.: FULL PICH M.P.: MANIFOLD PRESSURE A.B.: AUTO-PICH G.P.: U.S.-GAL. PER HOUR A.L.: AUTO-LEAN T.A.S.: TRUE AIRSPEED C.L.: CRUISING LEAN M.TS.: MIXTURE SETTING M.A.L.: MANUAL LEAN S.L.: SEA LEVEL F.T.: FULL THROTTLE																									

For use with V-1650-3 engine only regardless of airplane model.

Figure 65—Flight Operation Instruction Chart—No External Load

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		ENGINE(S): V-1650-3				FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 500-POUND WING BOMBS		
LIMITS		M.P. BLOWER MIXTURE TIME		TOTAL		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		
WAR EMERG.	MILITARY POWER	R.P.M.	IN. HG.	POSITION	TEMP.	C.P.R.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
3000	3000	67	5	MIN	15	150	680	260	610	210	680	260	610	210	680	260	1040	1260
		61	15	MIN	150	150	610	900	780	620	810	720	650	590	530	470	1230	1060
		50	15	MIN	150	150	560	680	720	810	720	650	590	530	470	1130	980	840
		50	15	MIN	150	150	510	760	650	770	700	620	560	500	440	1020	890	750
		50	15	MIN	150	150	460	860	780	810	720	650	590	530	470	1080	930	800
		50	15	MIN	150	150	410	960	840	820	700	620	560	500	440	1020	890	750

MAXIMUM CONTINUOUS		PRESS		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]		[R.P.M. STAT. (3.0 NAUT.) MI./GAL.]	
R.P.M.	MIX. TUBE	ALT. FEET	T.A.S. KTS.	R.P.M.	MIX. TUBE	ALT. FEET	T.A.S. KTS.	R.P.M.	MIX. TUBE	ALT. FEET	T.A.S. KTS.	R.P.M.	MIX. TUBE	ALT. FEET	T.A.S. KTS.	R.P.M.	MIX. TUBE
2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46
2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46
2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46
2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46
2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46	10000	250	2700	46

For use with V-1650-3 engine only regardless of airplane model.

Figure 66 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—Two 500-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING...
LEGEND: ALT.: PRESSURE ALTITUDE; F.T.: FULL RICH; M.P.: MIXTURE PER HOUR; A.P.: AUTO-RICH; C.P.M.: C.P.M. PER HOUR; A.L.: AUTO-LEAN; TAS.: TRUE AIRSPEED; C.L.: CRUISING LEAN; KTS.: KNOTS; M.L.: MARSHAL LEAN; S.L.: SEA LEVEL; F.T.: FULL THROTTLE.
SPECIAL NOTES: (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR M.P.D., RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE
DATA AS OF 5-6-45 BASED ON: FLIGHT TEST DATA

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 2 - 500-LB. WING BOMBS																																																																																																			
ENGINE(S): Y-1650-3		CHART WEIGHT LIMITS: 10,000 TO 9000 POUNDS																																																																																																							
LIMITS	R.P.M.	MIXTURE POSITION		CYL. TOTAL	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR VALUE TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT., READ RPM, WATTFOLD PRESSURE (M.P.), AND MIXTURE SETTING REQUIRED.		NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILS PER GALLON (M.P.G.) AND WINDS, GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR B.P.M.): MULTIPLY U.S. GAL. (OR B.P.M.) BY 10 THEN DIVIDE BY 12.																																																																																																		
		LOW	HIGH		U.S.	IMPERIAL																																																																																																			
WAR EMERGENCY	8000	87	81GN	187	187	187	187																																																																																																		
MILITARY POWER	8000	61	81GN	158	158	158	158																																																																																																		
<p>MAXIMUM CONTINUOUS</p> <table border="1"> <tr> <th rowspan="2">R.P.M.</th> <th rowspan="2">M.P.</th> <th colspan="2">APPROX.</th> <th rowspan="2">PRESS</th> <th rowspan="2">RANGE IN AIRMILES</th> <th rowspan="2">FUEL</th> <th rowspan="2">RANGE IN AIRMILES</th> </tr> <tr> <th>TOT.</th> <th>T.A.S.</th> </tr> <tr> <td>2700</td> <td>46</td> <td>96</td> <td>365</td> <td>315</td> <td>2500</td> <td>184</td> <td>1000</td> </tr> <tr> <td>2700</td> <td>46</td> <td>119</td> <td>370</td> <td>320</td> <td>2000</td> <td>160</td> <td>870</td> </tr> <tr> <td>2700</td> <td>46</td> <td>115</td> <td>350</td> <td>305</td> <td>1500</td> <td>140</td> <td>750</td> </tr> <tr> <td>2700</td> <td>46</td> <td>110</td> <td>330</td> <td>285</td> <td>1000</td> <td>120</td> <td>660</td> </tr> <tr> <td>2700</td> <td>46</td> <td>106</td> <td>310</td> <td>270</td> <td>5000</td> <td>100</td> <td>560</td> </tr> <tr> <td>2700</td> <td>46</td> <td>101</td> <td>285</td> <td>265</td> <td>2300</td> <td>80</td> <td>470</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2000</td> <td>60</td> <td>380</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1500</td> <td>40</td> <td>300</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1000</td> <td>20</td> <td>200</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>500</td> <td>10</td> <td>100</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>200</td> <td>5</td> <td>50</td> </tr> </table>								R.P.M.	M.P.	APPROX.		PRESS	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	TOT.	T.A.S.	2700	46	96	365	315	2500	184	1000	2700	46	119	370	320	2000	160	870	2700	46	115	350	305	1500	140	750	2700	46	110	330	285	1000	120	660	2700	46	106	310	270	5000	100	560	2700	46	101	285	265	2300	80	470						2000	60	380						1500	40	300						1000	20	200						500	10	100						200	5	50
R.P.M.	M.P.	APPROX.		PRESS	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES																																																																																																		
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2700	46	96	365	315	2500	184	1000																																																																																																		
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2700	46	106	310	270	5000	100	560																																																																																																		
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<p>MAXIMUM AIR RANGE</p> <table border="1"> <tr> <th rowspan="2">R.P.M.</th> <th rowspan="2">M.P.</th> <th colspan="2">APPROX.</th> <th rowspan="2">PRESS</th> <th rowspan="2">RANGE IN AIRMILES</th> <th rowspan="2">FUEL</th> <th rowspan="2">RANGE IN AIRMILES</th> </tr> <tr> <th>TOT.</th> <th>T.A.S.</th> </tr> <tr> <td>25000</td> <td>45</td> <td>92</td> <td>360</td> <td>310</td> <td>2200</td> <td>610</td> <td>950</td> </tr> <tr> <td>25000</td> <td>45</td> <td>88</td> <td>340</td> <td>295</td> <td>2100</td> <td>620</td> <td>920</td> </tr> <tr> <td>25000</td> <td>45</td> <td>84</td> <td>325</td> <td>280</td> <td>2100</td> <td>630</td> <td>890</td> </tr> <tr> <td>25000</td> <td>45</td> <td>82</td> <td>310</td> <td>270</td> <td>2100</td> <td>640</td> <td>860</td> </tr> <tr> <td>25000</td> <td>45</td> <td>77</td> <td>290</td> <td>250</td> <td>2050</td> <td>650</td> <td>830</td> </tr> <tr> <td>25000</td> <td>45</td> <td>73</td> <td>275</td> <td>240</td> <td>2050</td> <td>660</td> <td>800</td> </tr> </table>								R.P.M.	M.P.	APPROX.		PRESS	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES	TOT.	T.A.S.	25000	45	92	360	310	2200	610	950	25000	45	88	340	295	2100	620	920	25000	45	84	325	280	2100	630	890	25000	45	82	310	270	2100	640	860	25000	45	77	290	250	2050	650	830	25000	45	73	275	240	2050	660	800																																								
R.P.M.	M.P.	APPROX.		PRESS	RANGE IN AIRMILES	FUEL	RANGE IN AIRMILES																																																																																																		
		TOT.	T.A.S.																																																																																																						
25000	45	92	360	310	2200	610	950																																																																																																		
25000	45	88	340	295	2100	620	920																																																																																																		
25000	45	84	325	280	2100	630	890																																																																																																		
25000	45	82	310	270	2100	640	860																																																																																																		
25000	45	77	290	250	2050	650	830																																																																																																		
25000	45	73	275	240	2050	660	800																																																																																																		
<p>LEGEND</p> <p>ALT.: PRESSURE ALTITUDE F.P.: FULL RICH M.P.: WATTFOLD PRESSURE A.R.: AUTO-RICH G.M.: U.S. GAL. PER HOUR A.L.: AUTO-LEAN T.S.: TRUE AIRSPEED C.A.L.: CRUISING LEAN R.S.: RPM'S B.M.: BRITISH LEAN S.L.: SEA LEVEL</p>																																																																																																									

For use with V-1650-3 engine only regardless of airplane model.

Figure 66 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 500-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D AND P-61K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 1000-POUND BOMBS								
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 12,000 TO 11,400 POUNDS																		
LIMITS WAR EMERG. MILITARY POWER	R.P.M. 3000 2000	M.P. INCHES 47 61	MIXTURE POSITION LOW HIGH	MIXTURE POSITION 5 15	MIL. INCHES 5 15	TOTAL FUEL (GAL.) 107 87 87 108	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V					
							U.S. GAL.	STATUTE	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	U.S. GAL.	STATUTE	NAUTICAL
INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE DEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.							INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE DEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.							NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN MIXTURE, MANIFOLD OR (M.P.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 AND DIVIDE BY 12.						
M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	M.P. INCHES TOT. G.P.H.	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V					
							U.S. GAL.	STATUTE	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	U.S. GAL.	STATUTE	NAUTICAL
MAXIMUM CONTINUOUS							PRESS (3.5 STAT. @ 0.55 NAUT.) M.P. (GAL.)							PRESS (3.5 STAT. @ 0.55 NAUT.) M.P. (GAL.)						
M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES				
TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.				
G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.				
M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES				
TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.				
G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.				
2700	46	RUN	96	250	305	33000														
2700	46	RUN	109	265	315	20000	2550	F.T.	2550	F.T.	2550	2550	2550	2550	2550	2550	2550			
2700	46	RUN	115	345	300	16000	2100	F.T.	2100	F.T.	2100	2100	2100	2100	2100	2100	2100			
2700	46	RUN	110	325	260	10000	2400	F.T.	2400	F.T.	2400	2400	2400	2400	2400	2400	2400			
2700	46	RUN	106	310	270	5000	2400	F.T.	2400	F.T.	2400	2400	2400	2400	2400	2400	2400			
2700	46	RUN	101	290	250	3000	2350	F.T.	2350	F.T.	2350	2350	2350	2350	2350	2350	2350			
MAXIMUM CONTINUOUS		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES				
TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.				
G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.				
M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES				
TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.				
G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.				
M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES				
TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.		TOT. T.A.S.				
G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.		G.P.H.				

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 12,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCE OF 10 GAL.) TO FLY 100 STAT. AIRMILES AT 8000 FT. ALTITUDE MAINTAIN 2800 RPM AND 5.1 IN. MANIFOLD PRESSURE WITH MIXTURE SET: **W**

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
G.P.H. : U.S. GAL. PER HOUR
T.A.S. : TRUE AIRSPEED
R.T.S. : MIXTURE SETTING
S.L. : SEA LEVEL

F.T. : FULL RICH
A.P. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.L. : FULL THROTTLE

For use with V-1650-3 engine only regardless of airplane model.

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

Figure 67 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—Two 1000-pound Bombs

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-61K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 2 - 1000-LB. BOMBS			
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,400 TO 10,400 POUNDS							
LIMITS	R.P.M.	M.P. IN. HG.	MIXTURE POSITION	CYCLE TIME		TOTAL G.P.H.	NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY (DO NOT USE I, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILLS PER GALLON (MI./GAL.) (60 WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEIR OWNAGE BY 12.		
				MIN.	MAX.				
WAR	3000	67	LOW	5	187	111	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE READ BEST DESIRED CRUISING ALTITUDE (ALT.) READ R.P.M., MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.		
MILITARY	3000	61	LOW	15	167	101			
POWER			HIGH		153	91			
COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
STATUTE		STATUTE		NAUTICAL		STATUTE		STATUTE	
550	440	680	570	780	680	900	780	184	810
460	380	580	500	680	590	780	680	160	710
400	340	500	440	580	520	680	590	140	620
380	290	430	370	510	440	580	510	120	530
280	240	360	310	420	370	480	420	100	440
230	190	280	250	340	300	390	340	80	350
170	140	220	250	250	220	280	250	60	260
110	100	140	170	150	150	200	170	40	200
60	50	80	80	70	70	100	80	20	100
MAXIMUM CONTINUOUS		(3.6 STAT. (3.1 NAUT.) MI./GAL.)		(4.25 STAT. (3.7 NAUT.) MI./GAL.)		(5.9 STAT. (5.2 NAUT.) MI./GAL.)		PRESS	
R.P.M.		T.A.S.		T.A.S.		T.A.S.		ALT.	
M.P. INCHES		M.P. INCHES		M.P. INCHES		M.P. INCHES		FEET	
MIXTURE		MIXTURE		MIXTURE		MIXTURE		M.P. INCHES	
R.P.M.		R.P.M.		R.P.M.		R.P.M.		R.P.M.	
2700	46	96	355	310	2550	40	330	285	40000
2700	46	119	365	315	2800	2550	305	300	35000
2700	46	115	345	300	2350	2200	325	280	30000
2700	46	110	325	280	2000	2150	305	265	25000
2700	46	106	305	265	1850	1850	275	240	20000
2700	46	101	290	250	1700	1650	270	235	15000
									10000
									8000
									6000
									4000
									2000
									1000
									500
									250
									100
									50
									25
									10
									5
									2.5
									1.25
									0.625

For use with V-1650-3 engine only regardless of airplane model.

Figure 67 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 1000-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WIND-UP-TAKE-OFF & CLIMB (SEE FIG. 1)

PLUS ALLOWANCE FOR WIND RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

LEGEND

ALT. : PRESSURE ALTITUDE F.P. : FULL RICH
M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
GPM : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
T.A.S. : TRUE AIRSPEED C.A.L. : CRUISING LEAN
R.T.S. : ROOTS M.L. : MANUAL LEAN
S.L. : SEA LEVEL F.T. : FULL THROTTLE

EXAMPLE

AT 16,000 LB. GROSS WEIGHT WITH 100 GAL. OF FUEL (AFTER REDUCTING TOTAL ALLOWANCES OF 96 GAL.) TO FLY 650 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2800 R.P.M. AND 7.1 IN. MANIFOLD PRESSURE WITH MIXTURE SET: WMM

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D AND P-51K		ENGINE(S): V-1650-3				FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 75-GALLON COMBAT TANKS			
LIMITS		R.P.M.		MIXTURE TIME		CYL. TOTAL		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
WAR	EMERG.	3000	3000	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1220	1170	1060	1010	960	910	860	810	1530	1480	1330	1270	1200	1140	1080	1020	960	900	840	780
1110	1050	980	930	880	830	780	730	1380	1320	1200	1140	1080	1020	960	900	840	780	720	660
930	880	820	760	710	660	610	560	1180	1130	1020	960	900	840	780	720	660	600	540	480
760	710	660	610	560	510	460	410	1180	1130	1020	960	900	840	780	720	660	600	540	480

MAXIMUM CONTINUOUS		PRESS		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.	
R.P.M.	M.P.	ALT.	ALT.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.
INCHES	INCHES	FEET	FEET	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46

RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
1220	1060	1010	960	910	860	810	760	710	660	1530	1480	1330	1270	1200	1140	1080	1020	960	900
1110	1050	980	930	880	830	780	730	680	630	1380	1320	1200	1140	1080	1020	960	900	840	780
930	880	820	760	710	660	610	560	510	460	1180	1130	1020	960	900	840	780	720	660	600
760	710	660	610	560	510	460	410	360	310	1180	1130	1020	960	900	840	780	720	660	600

MAXIMUM CONTINUOUS		PRESS		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.		0.6 STAT. (2.1 HADT.) MI./GAL.	
R.P.M.	M.P.	ALT.	ALT.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.
INCHES	INCHES	FEET	FEET	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46
2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46	100	385	335	3000	2700	46

For use with V-1650-7 engine only regardless of airplane model.

Figure 68 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—Two 75-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

LEGEND
 ALT. : PRESSURE ALTITUDE
 M.P. : MANIFOLD PRESSURE
 G.M. : U.S. GAL. PER HOUR
 T.A.S. : TRUE AIRSPEED
 M.P.S. : MILES PER HOUR
 S.L. : SEA LEVEL
 F.T. : FULL THROTTLE
 F.R. : FULL RICH
 A.P. : AUTO-RICH
 A.L. : AUTO-LEAN
 C.L. : CRUISE LEAN
 M.L. : MANUAL LEAN

EXAMPLE
 AT 11,000 LB. GROSS WEIGHT WITH 300 GAL. OF FUEL
 (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.)
 TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE
 MAINTAIN 2000 RPM AND F.T. IN MANIFOLD PRESSURE
 WITH MIXTURE SET: **W**

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG. 1)
 PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		ENGINE(S): V-1650-3		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 2 - 75-GALLON COMBAT TANKS									
LIMITS		R.P.M.		M.P. BLOWER MIXTURE TIME (MIN.)		CYL. TOTAL POSITION (INCHES)		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR VALUE TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE REARREST DESIGNED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN 1 IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS 11, 111, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (NO WIND) GALLONS PER HR. (G.P.H.R.) AND TIME AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.R.) MULTIPLY U.S. GAL. (OR G.P.H.R.) BY 10 THEN DIVIDE BY 12.					
WAR EMERG.		MILITARY POWER		LOW		HIGH		LOW		HIGH		LOW		HIGH			
RPM	M.P.	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH		
3000	67	5	187	5	187	5	187	5	187	5	187	5	187	5	187		
3000	61	15	167	15	167	15	167	15	167	15	167	15	167	15	167		
COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V		FUEL		RANGE IN AIRMILES		RANGE IN AIRMILES			
RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		STATUTE		NAUTICAL			
STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		
790	690	990	860	1210	1050	1420	1270	1160	1010	269	240	1490	1290	1320	1150		
710	610	810	770	1080	940	1080	950	1180	1050	220	200	1210	1050	1100	960		
650	560	710	640	860	780	900	820	1000	870	200	180	1100	960	880	860		
590	510	670	580	810	700	850	750	950	830	180	160	980	860	770	770		
530	460	630	550	720	620	780	680	850	740	160	140	880	770	710	710		
470	410	570	450	630	550	740	640	850	740	140	120	770	670	640	670		
410	360	520	440	550	470	640	550	750	640	120	100	660	570	570	570		
350	310	480	380	470	390	530	450	630	530	100	80	550	480	480	480		
290	250	430	320	450	370	530	450	530	450	80	60	440	380	380	380		
240	200	380	280	360	310	420	320	520	420	60	40	340	290	290	290		
180	150	320	220	270	230	320	210	420	320	40	20	280	240	240	240		
120	100	260	190	230	180	270	210	320	210	20	10	220	190	190	190		
MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		MAXIMUM CONTINUOUS		PRESS		MAXIMUM AIR RANGE		MAXIMUM AIR RANGE			
R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	ALT.	ALT.	R.P.M.	MIX-TUBE	TOT. T.A.S.	R.P.M.	MIX-TUBE	TOT. T.A.S.
2700	46	2700	46	2700	46	2700	46	2700	46	40000	40000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	35000	35000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	30000	30000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	25000	25000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	20000	20000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	15000	15000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	10000	10000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	5000	5000	2700	46	2700	46	2700	46
2700	46	2700	46	2700	46	2700	46	2700	46	S.L.	S.L.	2700	46	2700	46	2700	46

For use with V-1650-3 engine only regardless of airplane model.

Figure 68 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 75-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

LEGEND
 ALT. : PRESSURE ALTITUDE F.P. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.P. : AUTO-RICH
 G.P.H. : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
 T.A.S. : TRUE AIRSPEED C.L. : CRUISING LEAN
 M.T.S. : MIXTURE SETTING M.L.L. : MANUAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

EXAMPLE
 AT 10,000 LB. GROSS WEIGHT WITH 2000 GAL. OF FUEL
 (AFTER DEDUCTING TOTAL ALLOWANCES OF 100 GAL.)
 TO FLY 1500 STAT. AIRMILES AT 10,000 FT. ALTITUDE
 MAINTAIN 1900 RPM AND 1.1 IN. MANIFOLD PRESSURE
 WITH MIXTURE SET: **W**

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF AND CLIMB (SEE FIG. 1)
 PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
RICH BLOWER ABOVE READY LINE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AFRC-528 1-1-58		AIRCRAFT MODEL(S) P-51D AND P-51K				EXTERNAL LOAD ITEMS 2 - 110-GALLON COMBAT TANKS			
		ENGINE(S): V-1650-3							
		LIMITS				CHART WEIGHT LIMITS: 11,600 TO 10,200 POUNDS			
WAR EMERG.	MILITARY POWER	RPM	M.P. INCHES	LOW MIN.	HIGH MIN.	LOW MIN.	HIGH MIN.	LOW MIN.	HIGH MIN.
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700

RANGE IN AIRMILES	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
1410	4220	1740	1540	2100	1820	2490	2120	2120	2120	2120
1380	1760	1940	1420	1980	1720	2310	2000	2000	2000	2000
1270	1700	1570	1360	1900	1640	2210	1920	1920	1920	1920
1210	1050	1810	1300	1850	1570	2120	1840	1840	1840	1840
1150	1000	1430	1240	1730	1500	2020	1750	1750	1750	1750
1100	950	1380	1180	1640	1430	1930	1670	1670	1670	1670
1040	900	1290	1110	1580	1360	1830	1580	1580	1580	1580
980	850	1220	1050	1480	1280	1730	1490	1490	1490	1490
920	800	1150	990	1390	1210	1630	1400	1400	1400	1400
870	750	1080	930	1310	1140	1540	1310	1310	1310	1310
810	700	1010	870	1220	1060	1450	1220	1220	1220	1220
760	650	940	810	1140	990	1360	1140	1140	1140	1140

R.P.M.	M.P. INCHES	MIX. TUBE	TOT. RPM	T.A.S.	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
					STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
2700	46	RUN	100	375	325	30000	30000	30000	30000	30000	30000	30000	30000	30000
2700	46	RUN	98	355	310	25000	25000	25000	25000	25000	25000	25000	25000	25000
2700	46	RUN	119	365	315	20000	2550	2150	2150	2150	2150	2150	2150	2150
2700	46	RUN	115	345	300	2400	42	2400	42	2400	42	2400	42	2400
2700	46	RUN	110	325	280	10000	2400	10000	2400	10000	2400	10000	2400	10000
2700	46	RUN	106	310	270	5000	2400	5000	2400	5000	2400	5000	2400	5000
2700	46	RUN	101	295	255	S.L.	2400	42	2400	42	2400	42	2400	42

For use with V-1650-3 engine only regardless of airplane model.

Figure 69 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—Two 110-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

LEGEND
 ALT. : PRESSURE ALTITUDE
 F.P. : FULL RICH
 M.P. : MANIFOLD PRESSURE
 A.P. : AUTO-RICH
 G.P. : U.S.-GAL. PER HOUR
 A.L. : AUTO-LEAN
 T.A.S. : TRUE AIRSPEED
 C.L. : CRUISING LEAN
 R.T.S. : RPM
 M.L. : MANUAL LEAN
 S.L. : SEA LEVEL
 F.T. : FULL THROTTLE

EXAMPLE
 AT 11,600 LB. GROSS WEIGHT WITH 140 GAL. OF FUEL
 (AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.)
 TO FLY 2100 STAT. AIRMILES AT 20,000 FT. ALTITUDE
 MAINTAIN 2150 RPM AND F.T. 14. MANIFOLD PRESSURE
 WITH MIXTURE SET: RW

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP TAKE-OFF & CLIMB (SEE FIG.)
 PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D AND P-51K				FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS				
ENGINE(S): V-1650-3				CHART WEIGHT LIMITS: 10,200 TO 8000 POUNDS										2 - 110-GALLON COMBAT TANKS				
LIMITS	RPM	M.P. INCHES	MIXTURE POSITION	CYL. POSITION	TOTAL LIMIT TEMP.	C.O.M.P.		C.O.M.P.		C.O.M.P.		C.O.M.P.		C.O.M.P.		C.O.M.P.		
						LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
WAR ENRG	2000	87	LOW	LOW	5	167	169	167	169	167	169	167	169	167	169	167	169	
MILITARY POWER	3000	81	LOW	HIGH	16	167	169	167	169	167	169	167	169	167	169	167	169	
<p>INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FEEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.), AND MIXTURE SETTING REQUIRED.</p> <p>NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER MI. (G.P.M.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.) MULTIPLY U.S. GAL. (OR G.P.M.) BY 10 THEN DIVIDE BY 12.</p>																		
<p>AT 10,000 LB. GROSS WEIGHT WITH 200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 80 GAL.) TO FLY 1000 STAT. AIRMILES (1500 NAUT. AIRMILES) MAINTAIN 2300 RPM AND F.T. H. MANIFOLD PRESSURE WITH MIXTURE SET: RUN</p>																		
<p>LEGEND: ALT.: PRESSURE ALTITUDE F.P.R.: FULL RICH M.P.: MANIFOLD PRESSURE A.P.R.: AUTO-RICH G.M.: U.S. GAL. PER HOUR A.L.: AUTO-LEAN T.A.S.: TRUE AIRSPEED C.L.: CRUISING LEAN R.T.S.: ROTS S.L.: SEA LEVEL F.T.: FULL THROTTLE</p>																		
<p>SPECIAL NOTES: (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH BLOWER ABOVE HEAVY LINE</p>																		
<p>DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA</p>																		

For use with V-1650-3 engine only regardless of airplane model.

Figure 69 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 110-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART					EXTERNAL LOAD ITEMS 10 ROCKETS				
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,000 TO 30,000 POUNDS					COLUMN V				
LIMITS	R.P.M.	BLOWER POSITION	MIXTURE	TIME	CYL. POSITION	TOTAL TEMP.	U.S. GAL.	RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES
								STATUTE	NAUTICAL		
WAR ENRG.	3000	47	LOW	5	187	187	240	1080	1300	268	1130
MILITARY POWER	3000	51	HIGH	16	147	147	240	860	1180	240	1010
		51	HIGH	16	147	147	240	860	1180	240	1010
		51	HIGH	16	147	147	240	860	1180	240	1010
		51	HIGH	16	147	147	240	860	1180	240	1010
		51	HIGH	16	147	147	240	860	1180	240	1010

LIMITS	R.P.M.	BLOWER POSITION	MIXTURE	TIME	CYL. POSITION	TOTAL TEMP.	U.S. GAL.	RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES
								STATUTE	NAUTICAL		
740	660	650	580	690	770	770	930	1080	1230	268	1130
660	660	650	580	690	770	770	930	1080	1230	240	1010
610	550	530	480	720	660	660	800	860	920	220	820
550	500	480	430	750	590	590	720	830	890	180	760
440	390	360	290	840	460	460	550	640	740	180	670
380	330	340	290	860	400	400	480	560	660	140	580
280	220	240	240	900	330	330	350	400	460	100	420
220	170	190	170	920	280	280	280	320	370	80	340
170	110	140	140	940	200	200	210	240	280	40	250
110	60	100	100	960	130	130	140	180	180	30	170

R.P.M.	M.P.	APPROX.		M.P. INCHES	T.A.S.	M.P. INCHES	T.A.S.	M.P. INCHES	T.A.S.	M.P. INCHES	T.A.S.
		TOT. GPH.	MIX. TUBE								
2700	46	96	350	295	25000	2400	F.T.	37	1900	1650	F.T.
2700	46	119	350	295	20000	2300	F.T.	40	1900	1650	F.T.
2700	46	115	335	290	16000	2150	F.T.	42	1900	1650	F.T.
2700	46	96	350	295	25000	2400	F.T.	37	1900	1650	F.T.
2700	46	119	350	295	20000	2300	F.T.	40	1900	1650	F.T.
2700	46	115	335	290	16000	2150	F.T.	42	1900	1650	F.T.
2700	46	110	315	275	10000	2400	F.T.	42	1900	1650	F.T.
2700	46	106	300	260	5000	2400	F.T.	42	1900	1650	F.T.
2700	46	101	280	245	3000	2400	F.T.	42	1900	1650	F.T.

LEGEND
 ALT. : PRESSURE ALTITUDE
 M.P. : MANIFOLD PRESSURE
 GPM : U.S. GAL. PER HOUR
 TAS : TRUE AIRSPEED
 KTS. : KNOTS
 F.T. : FEET
 S.L. : SEA LEVEL

EXAMPLE
 AT 10,500 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL
 (AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.)
 TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE
 MAINTAIN 2150 RPM AND F.T. IN MANIFOLD PRESSURE
 WITH MIXTURE SET: **W**

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG. 1)
 PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

Figure 70—Flight Operation Instruction Chart—10 Rockets

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS ROCKETS AND 2 - 500-LB. BOMBS									
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 11,000 POUNDS													
LIMITS	RPM	M.P. IN. HG.	MIXTURE	TIME CYL. POSITION	TOTAL CYL. LIMIT	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
						STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
WAR	3000	67	LOW	5	187	850	730	1010	860	1170	1050	268	1230	1060	
EMERG.			HIGH	18	188										
MILITARY POWER	3000	61	LOW	15	187	760	650	910	790	1040	910	240	1100	950	
			HIGH	18	188										
						700	600	830	720	980	830	220	1010	870	
						630	550	760	660	870	760	200	920	800	
						570	490	680	590	790	680	180	830	720	
						510	440	610	530	700	610	160	740	640	
MAXIMUM CONTINUOUS		PRESS		ALT.		FEET		PRESS		ALT.		FEET		PRESS	
R.P.M.	MIX-TURE	TOT.	T.A.S.	APPROX.											
INCHES	TURE	GN.	MPH.	R.TS.											
46	RUN	96	330	285	25000										
2700	46	RUN	119	345	300	20000	2600	2600	2600	2600	2600	20000			
2700	46	RUN	115	325	280	15000	2500	2500	2500	2500	2500	15000			
2700	46	RUN	110	305	265	10000	2500	2500	2500	2500	2500	10000			
2700	46	RUN	106	290	250	5000	2500	2500	2500	2500	2500	5000			
2700	46	RUN	101	275	240	3000	2500	2500	2500	2500	2500	3000			

Figure 71 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 500-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 TO GET DIVIDE BY 12.

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OF LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

LEGEND
 ALT. : PRESSURE ALTITUDE F.P. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.P. : AUTO-RICH
 GPM : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
 T.A.S. : TRUE AIRSPEED C.L. : CRUISING LEAN
 R.TS. : ROOTS M.L. : MANUAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
 HIGH BLOWER ABOVE HEAVY LINE
 DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 500-LB. BOMBS									
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 10,000 POUNDS				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILLS PER GALLON (MI./GAL.) (NO APPROX.) GALLONS PER HOUR (G.P.H.) AND TIME AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONG DOWNWIND TO OBTAIN BEST FUEL ECONOMY. (ON A.P.M.): MILITARY U.S. GAL. (ON W.P.M.): BY 10 THEN DIVIDE BY 12.									
LIMITS	RPM	M.P. (H.P.)	MIXTURE POSITION	TIME (MIN.)	TOTAL CRUISE ALTITUDE (FEET)	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
						U.S. GAL.	W.P.M. GAL.	U.S. GAL.	W.P.M. GAL.	U.S. GAL.	W.P.M. GAL.	U.S. GAL.	W.P.M. GAL.	U.S. GAL.	W.P.M. GAL.
WAR	3000	67	LOW	5	187	690	510	700	810	700	184	850	740		
EMERG.		67	HIGH	10	188	510	440	610	530	610	160	740	640		
MILITARY POWER	3000	61	LOW	15	187	460	390	530	460	530	140	650	560		
		61	HIGH	20	188	360	280	400	330	400	120	560	480		
		61	LOW	25	187	320	250	360	300	360	100	460	400		
		61	HIGH	30	188	280	220	330	260	330	80	370	320		
		61	LOW	35	187	240	170	290	230	290	60	280	240		
		61	HIGH	40	188	200	130	250	190	250	40	190	160		
		61	LOW	45	187	160	90	210	150	210	20	150	130		
		61	HIGH	50	188	120	60	170	110	170	10	110	90		

For use with V-1650-7 engine only regardless of airplane model.

Figure 71 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 500-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

LEGEND

ALT.: PRESSURE ALTITUDE F.P.: FULL RICH
M.P.: MANIFOLD PRESSURE A.P.: AUTO-RICH
G.M.: U.S. GAL. PER HOUR A.M.: AUTO-LEAN
T.A.S.: TRUE AIRSPEED C.L.: CRUISING LEAN
KTS.: KNOTS M.L.: MANUAL LEAN
S.L.: SEA LEVEL F.T.: FULL THROTTLE

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG. 1)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
FLY LOWER ABOVE HEAVY LANE

EXAMPLE

AT 11,000 L.B. GROSS WEIGHT WITH 160 GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.)
TO FLY 600 STAT. AIRMILES AT 20,000 FT. ALTITUDE
MAINTAIN 2160 RPM AND F.T. IN MANIFOLD PRESSURE
WITH MIXTURE SET: **W**

DATA AS OF 5-8-45 **SHEET NO. 1** **FLIGHT TEST DATA**

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For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S)		FLIGHT OPERATION INSTRUCTION CHART		EXTERNAL LOAD ITEMS					
P-51D AND P-51K		CHART WEIGHT LIMITS: 12,500 TO 12,000 POUNDS		6 ROCKETS PLUS 2 - 1000-LB. BOMBS					
ENGINE(S): V-1650-3		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. NOTE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN, VERTICALLY BELOW OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ WPM, MANIFOLD PRESSURE (M.P.), AND MIXTURE SETTING REQUIRED.							
LIMITS	W.P. BLOWER POSITION, CRUISING ALTITUDE, CRUISING ALTITUDE, CRUISING ALTITUDE, CRUISING ALTITUDE, CRUISING ALTITUDE, CRUISING ALTITUDE, CRUISING ALTITUDE	LOW	HIGH	LOW	HIGH				
WAR ERG.	3000 87	RPM	RPM	RPM	RPM				
MILITARY POWER	3000 61	RPM	RPM	RPM	RPM				
COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
710	620	830	710	980	830	1090	940	268	980
630	550	740	640	680	740	980	840	240	880
590	510	690	590	680	680	800	780	220	810
530	460	620	530	620	620	820	710	200	730
470	420	560	480	560	560	740	640	180	680
420	370	500	430	500	500	660	570	160	590
MAXIMUM CRUISING		MAXIMUM CRUISING		MAXIMUM CRUISING		MAXIMUM CRUISING		MAXIMUM CRUISING	
R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.	R.P.M.	M.P.
48	30	48	30	48	30	48	30	48	30
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
2700	2700	2700	2700	2700	2700	2700	2700	2700	2700

For use with V-1650-3 engine only regardless of airplane model.

Figure 72 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 1000-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 1000-LB. BOMBS										
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 12,000 TO 11,000 POUNDS														
LIMITS	RPM	M.P. BLOWER MIXTURE POSITION	MIXTURE TIME (MIN.)	CYL. POSITION	TOTAL TEMP. (°C./°F.)	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V		
						U.S. GAL.	NAUTICAL	U.S. GAL.	NAUTICAL	U.S. GAL.	NAUTICAL	U.S. GAL.	NAUTICAL	U.S. GAL.	NAUTICAL	U.S. GAL.
WAR EMERG.	3000	67	LOW	5	187	570	400	580	430	500	660	500	660	570	184	680
MILITARY POWER	3000	61	HIGH	15	187	500	430	500	380	500	580	440	570	140	580	520
					153	430	370	320	310	370	430	370	370	430	120	440
						250	310	270	270	310	360	310	360	370	100	370
						280	250	290	220	250	290	250	290	280	80	290
						140	190	220	160	190	220	160	190	210	60	220
						90	120	140	110	140	160	110	140	140	40	150
						50	60	70	50	60	70	60	70	70	20	80

R.P.M.	M.P. INCHES	M.P. TUBE	M.P. TUBE	R.P.M.	R.P.M.	R.P.M.	R.P.M.	R.P.M.	R.P.M.	R.P.M.	MAXIMUM CONTINUOUS		MAXIMUM AIR RANGE		
											ALT. FEET	PRESS.	ALT. FEET	PRESS.	
2700	46	RUN	118	315	275	2500	2350	2150	2050	1900	1800	40000	35000	30000	25000
2700	46	RUN	118	315	275	2500	2350	2150	2050	1900	1800	40000	35000	30000	25000
2700	46	RUN	118	315	275	2500	2350	2150	2050	1900	1800	40000	35000	30000	25000
2700	46	RUN	118	315	275	2500	2350	2150	2050	1900	1800	40000	35000	30000	25000
2700	46	RUN	118	315	275	2500	2350	2150	2050	1900	1800	40000	35000	30000	25000

For use with V-1650-3 engine only regardless of airplane model.

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OF LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE AIR MILES DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTINGS REQUIRED.

LEGEND:
 ALT. : PRESSURE ALTITUDE F.P. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 RPM : U.S. GAL. PER HOUR C.L. : AUTO-LEAN
 T.S. : TRUE AIRSPEED G.L. : CRUISING LEAN
 S.L. : SEAS LEVEL M.L. : MANUAL LEAN
 F.T. : FULL THROTTLE

EXAMPLE:
 AT 11,500 LB. GROSS WEIGHT WITH 140 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 98 GAL.) TO FLY 500 STAT. AIRMILES AT 15,000 FT. ALTITUDE MAINTAIN 2600 RPM AND 1.1 IN. MANIFOLD PRESSURE WITH MIXTURE SET: **▣**

SPECIAL NOTES:
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
RICH BLOWER ABOVE HEAVY LINE

DATA AS OF 5-8-45 BASED ON: **FLIGHT TEST DATA**

For use with V-1650-3 engine only regardless of airplane model.

Figure 72 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 1000-pound Bombs

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 75-GALLON COMBAT TANKS									
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,500 TO 10,000 POUNDS				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TIME AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR (R.P.M.) AND FUEL AIRSPEED (F.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN MIXTURE IMPROVED GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THE DIVIDE BY 12.									
LIMITS		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE READ DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (R.P.) AND MIXTURE SETTING REQUIRED.				FUEL									
RPM	M.P. IN. HG.	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
3000	67	LOW HIGH	MIN. 5	187	160	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
3000	61	LOW HIGH	15	187	152	STATUTE		STATUTE		STATUTE		STATUTE		STATUTE	
			MIN. 15	187	152	NAUTICAL		NAUTICAL		NAUTICAL		NAUTICAL		NAUTICAL	
			MIN. 15	187	152	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾	
			MIN. 15	187	152	U.S. GAL.		U.S. GAL.		U.S. GAL.		U.S. GAL.		U.S. GAL.	
2700	46	RUN	100	345	300	1140	990	1320	1150	1600	1390	1660	1600	1460	1890
2700	46	RUN	110	305	265	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	115	325	280	1140	990	1260	1040	1460	1260	1660	1600	1460	1890
2700	46	RUN	115	325	280	1140	990	1260	1040	1460	1260	1660	1600	1460	1890
2700	46	RUN	110	305	265	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	106	290	250	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	101	275	240	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	101	275	240	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	101	275	240	1140	990	1260	1100	1530	1390	1770	1600	1460	1890
2700	46	RUN	101	275	240	1140	990	1260	1100	1530	1390	1770	1600	1460	1890

LEGEND
 ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 G.M. : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
 T.A.S. : TRUE AIRSPEED C.A.L. : CRUISING LEAN
 R.T.S. : RPM'S M.L. : MANUAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP TAKE-OFF & CLIMB (SEE FIG. 1)
 PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
BIG BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 11,500 LB. GROSS WEIGHT WITH 300 GAL. OF FUEL
 (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.)
 TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE
 MAINTAIN 2150 RPM APP. T. IN MANIFOLD PRESSURE
 WITH MIXTURE SET: M

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

Figure 73 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 75-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS							
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,600 TO 9200 POUNDS				6 ROCKETS AND 2 - 75-GALLON COMBAT TANKS							
LIMITS	RPM	BLOWER MIXTURE		TIME (CYC. LIMIT) TEMP. (C.P.M.)	TOTAL FUEL POSITION		TOTAL FUEL POSITION		FUEL U.S. GAL.	RANGE IN AIRMILES		RANGE IN AIRMILES	
		LOW	HIGH		LOW	HIGH	STATUTE	NAUTICAL		STATUTE	NAUTICAL		
WAR ENRG.	3000	67	MIN	MIN	87	87	87	87	269	1040	1280	1040	1280
MILITARY POWER	3000	61	MIN	MIN	87	87	87	87	240	940	1140	940	1140
740	660	640	570	770	860	770	770	770	269	1040	1280	1040	1280
600	550	520	480	700	640	700	700	700	220	860	1040	860	1040
480	380	430	380	580	550	580	580	580	180	740	950	740	950
320	360	380	330	380	440	380	380	380	160	620	760	620	760
260	220	240	200	240	320	240	240	240	100	550	660	550	660
180	160	140	120	150	200	150	150	150	80	470	570	470	570
110	100	100	100	100	100	100	100	100	30	390	470	390	470

R.P.M.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	MAXIMUM AIR RANGE	
													ALT. FEET	PRESS. S.L.
2700	46	46	350	305	46	46	350	305	46	46	350	305	46	46
2700	46	46	315	280	46	46	315	280	46	46	315	280	46	46
2700	46	46	270	240	46	46	270	240	46	46	270	240	46	46
2700	46	46	230	200	46	46	230	200	46	46	230	200	46	46
2700	46	46	190	160	46	46	190	160	46	46	190	160	46	46

R.P.M.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	M.P. INCHES	M.P. INCHES	T.A.S. FT.	T.A.S. KTS.	MAXIMUM AIR RANGE	
													ALT. FEET	PRESS. S.L.
2700	46	46	350	305	46	46	350	305	46	46	350	305	46	46
2700	46	46	315	280	46	46	315	280	46	46	315	280	46	46
2700	46	46	270	240	46	46	270	240	46	46	270	240	46	46
2700	46	46	230	200	46	46	230	200	46	46	230	200	46	46
2700	46	46	190	160	46	46	190	160	46	46	190	160	46	46

For use with V-1650-3 engine only regardless of airplane model.

Figure 73 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 75-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K	ENGINE(S): V-1650-3		FLIGHT OPERATION INSTRUCTION CHART		EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 110-GALLON COMBAT TANKS											
	CHART WEIGHT LIMITS: 11,000 TO 8500 POUNDS		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.), AND MIXTURE SETTING REQUIRED.		NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS 1, 11, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND). GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.											
LIMITS MAR ENGR. MILITARY POWER	R.P.M. 3000 3000	BLOWER POSITION LOW HIGH	MIXTURE MIN. MAX.	TIME 5 15	TOTAL CRUISE G.P.H.	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V		
						U.S. GAL.	STATUTE	NAUTICAL	U.S. GAL.	STATUTE	NAUTICAL	U.S. GAL.	STATUTE	NAUTICAL	U.S. GAL.	STATUTE
710 640	67 61	LOW HIGH	MIN. MAX.	5 15	187 159	620 550	680 770	750 670	1020 910	890 780	1180 1050	1030 920	289 240	1820 1060	1060 850	
560 480	61	LOW HIGH	MIN. MAX.	15	167 153	510 410	610 580	610 500	840 680	690 590	870 780	940 690	220 180	1000 820	870 710	
420 370 320	61	LOW HIGH	MIN. MAX.	15	167 153	370 290	440 380	440 330	530 480	530 400	700 630	810 460	160 120	730 950	830 470	
260 210 160 110	61	LOW HIGH	MIN. MAX.	15	167 153	230 170 80	280 220 190 130	330 260 230 150	380 300 230 150	440 350 280 180	330 260 200 130	440 350 280 180	100 80 60 30	150 360 270 180	390 320 240 160	
2700 2700 2700 2700 2700	46 46 46 46 46	LOW HIGH LOW HIGH	MIN. MAX. MIN. MAX.	5 15 5 15	2550 2450 2400 2400	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285	285 285 285 285

For use with V-1650-3 engine only regardless of airplane model.

Figure 74 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 110-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

LEGEND

- ALT. : PRESSURE ALTITUDE
- M.P. : MANIFOLD PRESSURE
- GPM : U.S. GAL. PER HOUR
- TAS : TRUE AIRSPEED
- R.T.S. : RPM
- S.L. : SEA LEVEL

EXAMPLE

AT 11,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.) TO FLY 950 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND F.T. 11. MANIFOLD PRESSURE WITH MIXTURE SET: **MIN**

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

LEGEND

- F.A. : FULL RICH
- A.A. : AUTO-RICH
- A.L. : AUTO-LEAN
- C.L. : CRUISING LEAN
- M.L. : MANUAL LEAN
- F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

AN 01-60JE-1

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,900 TO 11,000 POUNDS		EXTERNAL LOAD ITEMS 1 - 110-GALLON COMBAT TANK AND 1 - 1000-LB. BOMB			
LIMITS	RPM	M.P. BRIDGE POSITION	MIXTURE POSITION	TIME LIMIT, MIN.	LEVEL	TOTAL G.P.M.	NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) ⁽¹⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 1.2.		
								WAR	EMERG.
LOW	HIGH	LOW	HIGH	5	187	12336			
LOW	HIGH	LOW	HIGH	15	167	12132			
LOW	HIGH	LOW	HIGH	153	153	10122			
INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY FLOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.									
COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V	
RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES	
STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL
1080	940	1320	1140	1580	1370	1830	1590	1830	1670
1030	890	1250	1080	1500	1300	1740	1510	1840	1590
970	840	1190	1030	1420	1230	1650	1430	1740	1510
910	790	1120	970	1350	1170	1550	1340	1640	1420
860	740	1050	910	1250	1080	1460	1270	1540	1330
800	690	980	850	1170	1010	1360	1180	1440	1250
740	640	910	790	1090	950	1270	1100	1340	1160
MAXIMUM CONTINUOUS		PRESS (3.45 STAT. (3.0 NAUT.) M.P./GAL.) (H. I. STAT. (2.55 STAT.) M.P./GAL.) (G. 75 STAT. (G. 10 NAUT.) M.P./GAL.)		PRESS		MAXIMUM AIR RANGE		PRESS	
M.P. INCHES	MIX-TURE	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE
48	350	2500	2700	42	350	2500	2700	35	350
46	365	2000	2550	40	315	2000	2450	35	280
46	345	1500	2450	40	280	1500	2300	36	270
46	310	1000	2400	40	255	1000	2200	36	250
46	270	500	2400	40	220	500	2100	36	210
46	250	S.L.	2400	40	200	S.L.	2000	36	195

For use with V-1650-3 engine only regardless of airplane model.

Figure 75 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—One 110-gallon Tank and One 1000-pound Bomb

LEGEND
 ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 GPM : U.S.-GAL. PER HOUR A.L. : AUTO-LEAN
 TAS : TRUE AIRSPEED C.L. : CRUISING LEAN
 R.P.M. : RPM M.L. : MARIAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WIND-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
 BTCH BLOWER ABOVE HEAVY LINE
 WITH MIXTURE SET: RUN

EXAMPLE
 AT 11,500 LB. GROSS WEIGHT WITH 200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.) TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2800 RPM AND 1.7 M. MANIFOLD PRESSURE WITH MIXTURE SET: RUN

DATA 45 OF 5-R-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-81D AND P-51K		ENGINE(S): V-1650-3				FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS 1 - 110-GALLON COMBAT TANK AND 1 - 1000-LB. BOMB									
LIMITS		CHART WEIGHT LIMITS: 11,000 TO 9600 POUNDS				INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING AND MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY DOWN AND OPPOSITE VALUE RELEASES DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND) GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO CARRY ONE 110-GALLON COMBAT TANK (OR 8 P.M.L.) MULTIPLE U.S. GAL. (OR 8 P.M.L.) BY 10 THE OTHERS BY 12.									
MILITARY POWER	RPM	M.P.	MIXTURE POSITION	TIME LIMIT	C.L.	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V					
						U.S. GAL.	STATUTE	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	RANGE IN AIRMILES	STATUTE	NAUTICAL	FUEL U.S. GAL.	RANGE IN AIRMILES	STATUTE
WAR EMERG.	3000	67	LOW	5	187	670	820	820	820	820	820	820	820	820	820	269	1390	1210	
			HIGH	15	188	840	840	840	840	840	840	840	840	840	840	240	1240	1060	
			LOW	15	187	770	770	770	770	770	770	770	770	770	770	220	1140	990	
			HIGH	15	188	700	700	700	700	700	700	700	700	700	700	200	1030	900	
			LOW	15	187	630	630	630	630	630	630	630	630	630	630	180	890	810	
			HIGH	15	188	560	560	560	560	560	560	560	560	560	560	160	830	720	
			LOW	15	187	490	490	490	490	490	490	490	490	490	490	140	770	690	
			HIGH	15	188	420	420	420	420	420	420	420	420	420	420	120	710	640	
			LOW	15	187	350	350	350	350	350	350	350	350	350	350	100	650	590	
			HIGH	15	188	280	280	280	280	280	280	280	280	280	280	80	590	540	
			LOW	15	187	210	210	210	210	210	210	210	210	210	210	60	530	490	
			HIGH	15	188	140	140	140	140	140	140	140	140	140	140	40	470	440	
			LOW	15	187	70	70	70	70	70	70	70	70	70	70	20	410	390	
			HIGH	15	188	0	0	0	0	0	0	0	0	0	0	0	0	310	270
			LOW	15	187	0	0	0	0	0	0	0	0	0	0	0	0	210	180
			HIGH	15	188	0	0	0	0	0	0	0	0	0	0	0	0	110	100

For use with V-1650-3 engine only regardless of airplane model.

Figure 75 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—One 110-gallon Tank and One 1000-pound Bomb

For use with V-1650-3 engine only regardless of airplane model.

LEGEND
 ALT. : PRESSURE ALTITUDE F.P. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 G.M. : U.S.-GAL. PER HOUR A.L. : AUTO-LEAN
 T.S. : TRUE AIRSPEED C.L. : CRUISING LEAN
 KTS. : KNOTS M.L. : MANUAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

EXAMPLE
 AT 11,000 LB. GROSS WEIGHT WITH 200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.) TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE WITH 2400 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: **W**

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WAKE-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

Figure 51—Take-off, Climb, and Landing Chart

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

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Appendix I

AIRCRAFT MODEL(S) P-51D AND K		TAKE-OFF, CLIMB & LANDING CHART																ENGINE MODEL(S) V-1650-7		
TAKE-OFF DISTANCE																		FEET		
GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY								SOD-TURF RUNWAY				SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.		
11,000	0	0	1800	2700	2000	3000	2300	3300	2000	2800	2100	3100	2400	3400	2300	3200	2500	3400	2800	3900
	17	15	1400	2100	1500	2300	1800	2600	1500	2200	1600	2400	1900	2700	1700	2500	1900	2700	2200	3100
	34	30	1000	1600	1100	1800	1300	2100	1100	1700	1200	1900	1400	2100	1200	1900	1400	2100	1600	2400
10,000	0	0	1600	2400	1800	2500	2000	2800	1700	2400	1800	2600	2100	3000	1900	2700	2100	2900	2400	3200
	17	15	1200	1800	1300	2000	1500	2300	1300	1900	1400	2100	1600	2400	1400	2100	1600	2300	1800	2500
	34	30	900	1400	1000	1500	1100	1800	900	1400	1000	1600	1200	1800	1000	1600	1200	1700	1300	2000
9000	0	0	1400	2000	1500	2200	1700	2500	1400	2100	1600	2300	1800	2500	1600	2300	1800	2500	2000	2800
	17	15	1000	1600	1200	1700	1300	2000	1100	1600	1200	1800	1400	2000	1200	1800	1300	1900	1500	2200
	34	30	700	1200	800	1300	1000	1500	800	1200	900	1400	1000	1500	900	1300	1000	1400	1100	1700
51	45	500	800	600	1000	700	1100	500	700	600	1000	700	1100	600	900	700	1000	800	1200	

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%
 DATA AS OF 8-20-44 BASED ON: FLIGHT TESTS OPTIMUM TAKE-OFF WITH 3000 RPM, 6 IN. HC. & 20 DEG. FLAP IS BOX OF CHART VALUES

CLIMB DATA																													
GROSS WEIGHT LB.	AT SEA LEVEL				AT 5000 FEET				AT 10,000 FEET				AT 15,000 FEET				AT 25,000 FEET				AT 35,000 FEET								
	BEST I.A.S.		RATE OF CLIMB		BAL. OF FUEL USED		FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB		FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB		FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB		FROM SEA LEVEL				
	M.P.H.	KTS.	F.P.M.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.				
11,000	175	150	1450	15	175	150	1500	3.4	20	175	150	1500	6.8	26	170	150	1450	10.5	31	165	145	1100	19	44	145	130	150	39	76
10,000	175	150	1750	15	175	150	1750	2.8	20	175	150	1800	5.6	24	170	150	1800	8.5	29	165	145	1400	15	40	145	130	150	27	58
9000	175	150	2050	15	175	150	2100	2.4	19	175	150	2150	4.8	23	170	150	2150	7.5	27	165	145	1800	13	36	145	130	150	20	48

POWER PLANT SETTINGS: [DETAILS ON FIG. 29, SECTION III]; MAX. CONTINUOUS POWER
 DATA AS OF 2-26-47 BASED ON: FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE																								FEET				
GROSS WEIGHT LB.	BEST IAS APPROACH				HARD DRY SURFACE								FIRM DRY SOD								WET OR SLIPPERY							
	POWER OFF		POWER ON		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	M.P.H.	KTS.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.		
10,000	130	115	130	115	1300	2500	1600	2600	1700	2800	1500	2600	1700	2800	1900	3000	3500	4800	3900	5100	4400	5500						
9000	130	115	130	115	1200	2300	1400	2400	1500	2600	1400	2400	1600	2600	1700	2800	3200	4300	3500	4600	3900	5000						
8000	130	115	130	115	1100	2100	1200	2200	1400	2400	1300	2200	1400	2400	1500	2600	2900	3800	3100	4100	3300	4500						

DATA AS OF 8-20-44 BASED ON: FLIGHT TESTS OPTIMUM LANDING IS BOX OF CHART VALUES

REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12

LEGEND
 I.A.S. : INDICATED AIRSPEED
 M.P.H. : MILES PER HOUR
 KTS. : KNOTS
 F.P.M. : FEET PER MINUTE

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS WING RACKS ONLY																											
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 10,200 TO 8,000 POUNDS																																					
LIMITS	RPM	M.P. INCH.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL'G TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																											
WAR	EMERG.	MILITARY POWER						FOR STATUTE RANGE (U.S. AIR MILES)				FOR NAUTICAL RANGE (NAUTICAL AIR MILES)																											
3000	67	LOW	RUN	5	135°	210																																	
"	"	HIGH	"	"	"	"																																	
3000	61	LOW	RUN	15	135°	180																																	
"	"	HIGH	"	"	"	"																																	
COLUMN I		FUEL			COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V																										
RANGE IN AIRMILES		U.S. GAL.			RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES																										
STATUTE	NAUTICAL				STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			STATUTE	NAUTICAL																									
950	825	269	SUBTRACT FUEL ALLOWANCES			1065	920	1195	1040	1300	1130	269	1440	1250																									
880	765	260	NOT AVAILABLE FOR CRUISING			985	855	1105	960	1200	1040	260	1390	1155																									
805	700	220			900	780	1010	875	1100	955	220	1220	1060																										
730	635	200			820	710	920	800	1000	870	200	1110	965																										
640	555	180			740	645	830	720	900	780	180	1000	870																										
585	510	160			655	570	735	640	800	695	160	890	775																										
515	445	140			575	500	645	560	700	610	140	775	675																										
440	380	120			490	425	550	475	600	520	120	665	580																										
365	315	100			410	355	460	400	500	435	100	555	480																										
295	255	80			330	285	370	320	400	350	80	445	385																										
220	190	60			245	210	275	240	300	260	60	335	290																										
145	125	40			165	145	185	160	200	175	40	220	190																										
75	65	20			80	70	90	78	100	87	20	110	95																										
MAXIMUM CONTINUOUS				PRESS. ALT.				(4.00 STAT. (3.56 NAUT.) MI./GAL.)				PRESS. ALT.																											
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			APPROX.				APPROX.				APPROX.																									
TOT. GPH.	M.P.	T.A.S.	TOT. GPH.	M.P.	T.A.S.	TOT. GPH.	M.P.	MIX-TURE	TOT. GPH.	M.P.	MIX-TURE	TOT. GPH.	M.P.	MIX-TURE	TOT. GPH.	M.P.	MIX-TURE	TOT. GPH.	M.P.	MIX-TURE	TOT. GPH.	M.P.	MIX-TURE																
SEE COLUMN I			40000	2700	F.T.	RUN	97	424	368	2650	F.T.	RUN	90	417	362	2700	F.T.	RUN	80	408	354	40000	2500	F.T.	RUN	66	367	319											
SEE COLUMN I			35000													2450	F.T.	RUN	77	391	340	35000	2250	F.T.	RUN	62	348	302											
SEE COLUMN I			30000													2100	F.T.	RUN	67	346	300	30000	2000	F.T.	RUN	59	335	291											
2700	46	RUN	103	384	334	15000	2500	F.T.	RUN	90	373	324	2300	F.T.	RUN	76	351	305	2100	F.T.	RUN	45	326	283	15000	1800	F.T.	RUN	52	290	262								
2700	46	RUN	98	361	314	10000	2500	42.5	RUN	83	346	300	2200	40	RUN	71	325	282	1900	37	RUN	60	300	261	10000	1600	31	RUN	47	261	227								
2700	46	RUN	91	339	285	5000	2500	43	RUN	79	323	280	2200	40	RUN	66	303	263	1850	36.5	RUN	55	278	242	5000	1600	28.5	RUN	42	232	202								
2700	46	RUN	86	315	274	S.L.	2500	42	RUN	74	300	261	2150	30.5	RUN	61	279	242	1800	26	RUN	50	255	222	S.L.	SEE COLUMN IV													
SPECIAL NOTES										EXAMPLE										LEGEND																			
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51)										AT 9,600 LB. GROSS WEIGHT WITH 80 GAL. OF FUEL										ALT.: PRESSURE ALTITUDE										F.R.: FULL RICH									
(2) MAX. FUEL CAPACITY WITH FULL WING & FUSLAGE TANKS.										[AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.]										M.P.: MANIFOLD PRESSURE										A.R.: AUTO-RICH									
HIGH BLOWER ABOVE HEAVY LINE.										TO FLY 390 STAT. AIRMILES AT 5000 FT. ALTITUDE										GPH.: U.S. GAL. PER HOUR										A.L.: AUTO-LEAN									
										MAINTAIN 2500 RPM AND 45 IN. MANIFOLD PRESSURE										TAS.: TRUE AIRSPEED										C.L.: CRUISING LEAN									
										WITH MIXTURE SET: RUN.										M.P.: MANIFOLD PRESSURE										M.L.: MANUAL LEAN									
																				S.L.: SEA LEVEL										F.T.: FULL THROTTLE									
REVISED 1-22-47																																							
DATA AS OF 8-20-44										BASED ON: FLIGHT TESTS																													

For use with V-1650-7 engine only regardless of airplane model.

Figure 52—Flight Operation Instruction Chart—Wing Racks

Figure 53 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

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Appendix 1

RE-1-14 REVISED		AIRCRAFT MODEL(S) P-51D & K										FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS TWO 500 LB. BOMBS OR TWO 75 CAL. WING TANKS																			
		ENGINE(S): V-1650-7										CHART WEIGHT LIMITS: 11,200 TO 9,800 POUNDS																													
LIMITS	RPM	N.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL'G TEMP.	TOTAL G.P.M.	FUEL MIXTURE SET RANGE PLAT CHART (FIG. 29 SECT. 11)			INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (N.P.) AND MIXTURE SETTING REQUIRED.										NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ⁽¹⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																				
WAR EMERG.	3000	67	LOW	RUN	5 min.	135°	210																																		
MILITARY POWER	3000	61	LOW	RUN	15 min.	135°	180																																		
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V																													
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES																													
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL																						
1390	1205	419		1485	1290	1685	1465	1610	1450	419		1995	1735	1320	1145	390	1430	1240	1600	1390	1765	1535	390	1895	1650																
1250	1085	370		1350	1175	1515	1315	1670	1450	370		1795	1560	1120	975	330	1200	1040	1350	1490	1295	330	1600	1380	1050	910	310	1130	980	1265	1100	1400	1220	310	1500	1305					
985	855	290		1050	915	1180	1050	1305	1125	290		1400	1220	845	735	250	900	785	1015	885	1115	970	250	1200	1045	780	675	230	830	720	1030	895	230	1110	965						
710	615	210		755	655	850	740	995	820	210		1010	880	575	500	170	610	530	690	600	765	665	170	820	715	510	445	150	540	470	605	525	675	585	150	720	625				
MAXIMUM CONTINUOUS		PRESS		(2.80 STAT. (3.13 NAUT.) MI./GAL.)		(4.05 STAT. (3.52 NAUT.) MI./GAL.)		(4.90 STAT. (4.90 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE																													
R.P.M.	N.P. INCHES	MIX- TURE	APPROX.			ALT. FEET	R.P.M.	N.P. INCHES	MIX- TURE	APPROX.			ALT. FEET	R.P.M.	N.P. INCHES	MIX- TURE	APPROX.			ALT. FEET																					
			TOT.	T.A.S.					TOT.	T.A.S.							TOT.	T.A.S.																							
			GPH.	MPH.	KTS.				GPH.	MPH.	KTS.						GPH.	MPH.	KTS.																						
						40000						40000					2000	F.T.	RUN	63	315	274																			
						35000						35000					2500	F.T.	RUN	60	306	265																			
						30000						30000					2000	F.T.	RUN	57	294	256																			
						25000	2700	46	RUN	98	377	328	2650	44	RUN	90	367	319	2300	F.T.	RUN	75	341	297	25000	2100	F.T.	RUN	60	306	265										
						20000	2700	46	RUN	98	366	309	2500	44	RUN	85	344	299	2150	38	RUN	70	319	277	20000	2200	F.T.	RUN	57	294	256										
						16000	2600	44.5	RUN	97	349	303	2400	F.T.	RUN	80	327	284	2200	F.T.	RUN	68	303	263	15000	1950	F.T.	RUN	57	277	241										
						10000	2600	44.5	RUN	91	328	284	2300	41	RUN	75	304	264	2000	38	RUN	63	281	244	10000	1650	34.5	RUN	52	252	219										
						5000	2600	44	RUN	84	304	264	2300	41	RUN	70	283	246	1950	37.5	RUN	58	260	226	5000	1600	34	RUN	46	230	200										
						S.L.	2650	44	RUN	78	282	245	2250	NO. 5	RUN	65	262	228	1900	37	RUN	53	239	208	S.L.	1600	31	RUN	42	202	175										
SPECIAL NOTES																				EXAMPLE										LEGEND											
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 53) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.																				AT 10000 LB. GROSS WEIGHT WITH 210 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 850 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2300 RPM AND 41 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN. WHEN WEIGHT REACHES 9,800 LBS. USE POWER SETTINGS SHEET 2, COLUMN III.										ALT. : PRESSURE ALTITUDE N.P. : MANIFOLD PRESSURE GPH. : U.S. GAL. PER HOUR TAS : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL F.R. : FULL RICH A.R. : AUTO-RICH A.L. : AUTO-LEAN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE											
(2) MAX. FUEL CAPACITY WITH 2-75 GAL. WING, STD. WING TANKS & FUSELAGE TANKS. HIGH BLOWER ABOVE HEAVY LIRE																																									
REVISED 1-21-47 DATA AS OF 9-10-46																				BASED ON: FLIGHT TEST																					

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS TWO 500 LB. BOMBS OR TWO 75 GAL. WING TANKS													
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 0,800 TO 8,100 POUNDS																							
LIMITS	RPM	M.P. IN. HG.	SLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL. TEMP.	TOTAL G.P.W.	DETAILS SEE FIG. 51, SECTION I	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN, VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.												
	WAR ENERG.	3000	67	LOW	RUN	5	135°									210									
MILITARY POWER	3000	61	LOW	RUN	15	135°	180																		
COLUMN I		FUEL		COLUMN II				COLUMN III		COLUMN IV		FUEL		COLUMN V											
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES				RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES											
STATUTE		NAUTICAL		STATUTE		NAUTICAL		STATUTE		NAUTICAL		BAL.		STATUTE		NAUTICAL									
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁶¹																									
950	825	280	1050	915	1070	1020	1275	1110	280	1380	1200														
880	785	250	975	845	1090	945	1185	1030	260	1280	1110														
815	710	240	900	785	1005	875	1090	945	240	1185	1030														
745	645	220	825	715	920	800	1000	870	220	1085	945														
680	590	200	750	650	835	725	910	790	200	990	860														
610	530	180	675	585	755	655	820	715	180	890	775														
545	475	160	600	520	670	580	730	635	160	790	685														
475	415	140	525	455	585	510	635	550	140	690	600														
405	350	120	450	380	500	435	545	475	120	590	515														
340	295	100	375	325	420	365	455	395	100	495	430														
270	235	80	300	260	335	290	365	315	80	395	345														
205	180	60	225	195	250	220	275	240	60	295	255														
135	115	40	150	130	165	145	180	155	40	195	170														
MAXIMUM CONTINUOUS		PRESS		(2.75 STAT. (2.25 NAUT.) MI./GAL.)				(4.18 STAT. (3.24 NAUT.) MI./GAL.)				PRESS		MAXIMUM ALT RANGE											
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.					
			TOT. GPH.	T.A.S. MPH.					TOT. GPH.	T.A.S. MPH.				TOT. GPH.	T.A.S. MPH.					TOT. GPH.	T.A.S. MPH.				
					40000						2700	F.T.	RUN	80	370	322	40000	2450	F.T.	RUN	65	327	284		
					35000						2500	F.T.	RUN	79	360	313	35000	2300	F.T.	RUN	65	328	283		
					30000																				
					25000	2700	46	RUN	96	377	328	2450	42.5	RUN	87	362	319	25000	2100	F.T.	RUN	62	311	270	
					20000	2700	46	RUN	93	355	308	2400	42.5	RUN	80	337	293	20000	2000	F.T.	RUN	58	294	256	
2700	46	RUN	103	356	309	15500	2550	43	RUN	91	341	298	2350	F.T.	RUN	79	322	280	1900	1800	F.T.	RUN	55	272	236
2700	46	RUN	98	333	289	10000	2500	43	RUN	83	316	275	2200	40	RUN	71	298	259	1950	1600	34	RUN	50	251	218
2700	46	RUN	91	311	270	5000	2450	42.5	RUN	77	293	255	2200	40	RUN	65	276	240	1900	1600	32.5	RUN	46	229	199
2700	46	RUN	85	291	253	S.L.	2450	42.5	RUN	72	273	237	2150	39.5	RUN	61	256	222	1850	1600	29.5	RUN	41	200	174

SPECIAL NOTES

- (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH SLOWER ABOVE HEAVY LINE

EXAMPLE

AT 9,400 LB. GROSS WEIGHT WITH 100 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 420 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2200 RPM AND 40 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND

- ALT.: PRESSURE ALTITUDE
- M.P.: MANIFOLD PRESSURE
- GPH.: U.S. GAL. PER HOUR
- TAS.: TRUE AIRSPEED
- KTS.: KNOTS
- S.L.: SEA LEVEL
- F.R.: FULL RICH
- A.R.: AUTO-RICH
- A.L.: AUTO-LEAN
- C.L.: CRUISING LEAN
- M.L.: MANUAL LEAN
- F.T.: FULL THROTTLE

REVISED 1-21-47
DATA AS OF 9-10-44

BASED ON: FLIGHT TEST

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

Figure 53 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS TWO 500 LB. BOMBS OR TWO 75 GAL. WING TANKS												
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 0,800 TO 8,100 POUNDS																						
LIMITS	RPM	M.P. IN HG.	SLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL. TEMP.	TOTAL G.P.W.	DETAILS SEE FIG. 51, SECTION I	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN, VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 1.06 THEN DIVIDE BY 12.											
	WAR ENERG.	3000	67	LOW	RUN	5	135°									210								
MILITARY POWER	3000	61	LOW	RUN	15	135°	180																	
COLUMN I		FUEL		COLUMN II				COLUMN III		COLUMN IV		FUEL		COLUMN V										
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES				RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES										
STATUTE NAUTICAL		BAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		BAL.		STATUTE NAUTICAL										
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁶¹																								
950	825	280	1050	915	1070	1020	1275	1110	280	1380	1200													
880	785	250	975	845	1090	945	1185	1030	260	1280	1110													
815	710	240	900	785	1005	875	1090	945	240	1185	1030													
745	645	220	825	715	920	800	1000	870	220	1085	945													
680	590	200	750	650	835	725	910	790	200	990	860													
610	530	180	675	585	755	655	820	715	180	900	775													
545	475	160	600	520	670	580	730	635	160	790	685													
475	415	140	525	455	585	510	635	550	140	690	600													
405	350	120	450	380	500	435	545	475	120	590	515													
340	295	100	375	325	420	365	455	395	100	495	430													
270	235	80	300	260	335	290	365	315	80	395	345													
205	180	60	225	195	250	220	275	240	60	295	255													
135	115	40	150	130	165	145	180	155	40	195	170													
MAXIMUM CONTINUOUS		PRESS		(2.75 STAT. (2.25 NAUT.) MI./GAL.)				(4.18 STAT. (3.24 NAUT.) MI./GAL.)				PRESS		MAXIMUM ALT RANGE										
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		TOT. GPH.	T.A.S. MPH.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		TOT. GPH.	T.A.S. MPH.	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.					
			ALT. FEET	ALT. FEET							ALT. FEET	ALT. FEET												
SEE COLUMN IV SEE COLUMN III			10000 35000 50000				2650		F.T. RUN		90 361 321		2500		F.T. RUN		80 370 322		60000 35000 20000					
SEE COLUMN III SEE COLUMN I			25000 20000 15000		2700 46 RUN 96 377 328		2450 42.5 RUN 87 362 318		2300 F.T. RUN 75 342 297		20000 2100 F.T. RUN 70 348 276		15000 1800 F.T. RUN 66 300 261		10000 1600 F.T. RUN 61 278 242		5000 1600 32.5 RUN 55 256 222		3000 1600 29.5 RUN 51 236 205					
2700	46	RUN	103	356	309	15000	2550	43	RUN	91	341	298	2350	F.T.	RUN	79	322	280	2150	F.T.	RUN	86	300	261
2700	46	RUN	98	333	289	10000	2500	43	RUN	83	316	275	2200	40	RUN	71	298	260	1950	37	RUN	61	278	242
2700	46	RUN	91	311	270	5000	2450	42.5	RUN	77	293	255	2200	40	RUN	65	276	240	1900	37	RUN	55	256	222
2700	46	RUN	85	291	253	S.L.	2450	42.5	RUN	72	273	237	2150	39.5	RUN	61	256	222	1850	37	RUN	51	236	205

SPECIAL NOTES

- (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH SLOWER ABOVE HEAVY LINE

EXAMPLE

AT 9,400 LB. GROSS WEIGHT WITH 100 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 420 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2200 RPM AND 40 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND

- ALT.: PRESSURE ALTITUDE
- M.P.: MANIFOLD PRESSURE
- GPH.: U.S. GAL. PER HOUR
- TAS.: TRUE AIRSPEED
- KTS.: KNOTS
- S.L.: SEA LEVEL
- F.R.: FULL RICH
- A.R.: AUTO-RICH
- A.L.: AUTO-LEAN
- C.L.: CRUISING LEAN
- M.L.: MANUAL LEAN
- F.T.: FULL THROTTLE

REVISED 1-21-47
DATA AS OF 9-10-44

BASED ON: FLIGHT TEST

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

Figure 53 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

Figure 5d (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-61D & K										FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS+2-75 GAL. WING TANKS OR 6 ROCKETS+2-110 GAL. WING TANKS OR 6 ROCKETS+1-110 GAL. W. TANK+2-1000# BOMB OR 6 ROCKETS+2-1000# BOMB			
ENGINE(S): V-1650-7										CHART WEIGHT LIMITS: 13,000 TO 11,000 POUNDS													
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL. TEMP.	TOTAL G.P.M.	FOR DETAILS SEE FIG. 55 (SEE PAGE 11)		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE MANIFOLD PRESSURE DESIRED. CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.										NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.			
COLUMN I		FUEL		COLUMN II				COLUMN III				COLUMN IV				FUEL		COLUMN V					
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES				RANGE IN AIRMILES				RANGE IN AIRMILES				U.S. GAL.		RANGE IN AIRMILES					
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL						
		489 ⁽²⁾		SUBTRACT FUEL ALLOWANCES				NOT AVAILABLE FOR CRUISING						489 ⁽²⁾									
1490	1295	480	1590	1380	1740	1510	1860	1620	1390	1730	1505	1860	1620	1390	1730	1505	1860						
1395	1210	450	1485	1290	1625	1440	1730	1505	1390	1690	1475	1860	1620	1390	1730	1505	1860						
1300	1130	420	1380	1200	1510	1310	1690	1475	1390	1600	1420	1860	1620	1390	1730	1505	1860						
1205	1045	390	1280	1110	1390	1210	1600	1420	1390	1510	1375	1860	1620	1390	1730	1505	1860						
1110	965	360	1175	1020	1275	1110	1510	1375	1390	1420	1345	1860	1620	1390	1730	1505	1860						
1015	880	330	1070	930	1160	1010	1420	1345	1390	1375	1320	1860	1620	1390	1730	1505	1860						
925	805	300	970	845	1055	915	1330	1320	1390	1310	1270	1860	1620	1390	1730	1505	1860						
830	720	270	875	760	950	825	1240	1270	1390	1210	1190	1860	1620	1390	1730	1505	1860						
740	645	240	780	680	840	730	1150	1220	1390	1110	1110	1860	1620	1390	1730	1505	1860						
645	560	210	680	590	740	645	1060	1140	1390	1020	1060	1860	1620	1390	1730	1505	1860						
555	480	180	585	510	630	550	970	1060	1390	930	970	1860	1620	1390	1730	1505	1860						
460	400	150	485	420	525	455	880	970	1390	840	880	1860	1620	1390	1730	1505	1860						
370	320	120	390	340	420	365	790	880	1390	750	790	1860	1620	1390	1730	1505	1860						
MAXIMUM CONTINUOUS				(3-24 STAT. (2.82 NAUT.) M./GAL.)				(3-51 STAT. (3.05 NAUT.) M./GAL.)				(3-70 STAT. (3.22 NAUT.) M./GAL.)				MAXIMUM AIR RANGE							
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT. FEET			
			TOT. GPH.	T.A.S. MPH.	KTS.					TOT. GPH.	T.A.S. MPH.	KTS.					TOT. GPH.	T.A.S. MPH.	KTS.				
			10000			10000						10000							10000				
			15000			15000						15000							15000				
			20000			20000						20000							20000				
			25000			25000						25000							25000				
2700	46	RUN	103	322	280	10000	2700	46	RUN	98	302	262	10000	2700	46	RUN	98	302	262	10000			
2700	46	RUN	91	283	246	5000	2700	46	RUN	91	283	246	5000	2700	46	RUN	91	283	246	5000			
2700	46	RUN	86	265	230	S.L.	2700	46	RUN	86	265	230	S.L.	2700	46	RUN	86	265	230	S.L.			

For use with V-1650-7 engine only regardless of airplane model.

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Appendix

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS + 2-75 GAL. WING TANKS OR 8 ROCKETS + 2-110 GAL. WING TANKS OR 6 ROCKETS + 3-110 GAL. WING TANKS + (1000) BOMB OR 3 ROCKETS + 2-1000 BOMB													
ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 11,000 TO 8,900 POUNDS																							
LIMITS		R.P.M.	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL'G TEMP.	TOTAL G.P.M.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ R.P.M., MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.			NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ¹ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.													
WAR EMERG.	3000	67	LOW	RUN	5	135°	210	FOR DETAILS SEE SECTION 1111																	
MILITARY POWER	3000	61	LOW	RUN	15	135°	180																		
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V													
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES													
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			STATUTE	NAUTICAL												
1040	905	330	1170	1015	1285	1115	1400	1220	330	1440	1250														
950	825	300	1065	925	1170	1020	1275	1110	300	1310	1190														
855	745	270	960	835	1050	910	1150	1000	270	1180	1025														
760	660	240	850	740	935	815	1020	885	240	1050	915														
665	580	210	745	645	820	715	895	775	210	915	795														
520	450	180	640	555	700	610	765	665	180	785	680														
475	415	150	530	460	585	510	635	550	150	655	570														
380	330	120	425	370	470	410	510	445	120	525	455														
285	250	90	320	280	350	305	380	330	90	390	425														
190	165	60	215	185	235	205	255	220	60	260	226														
95	83	30	105	91	115	100	125	110	30	130	115														
MAXIMUM CONTINUOUS		PRESS		(2.55 STAT. (3.08 NAUT.) MI./GAL.)		(3.50 STAT. (3.99 NAUT.) MI./GAL.)		(4.25 STAT. (4.70 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE													
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	T.A.S. MPH	KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	T.A.S. MPH	KTS.							
												40000													
												35000													
												30000													
SEE COLUMN II			25000	2700	46	RUN	98	350	304	2350	F.T.	RUN	81	322	280	2150	F.T.	RUN	84	276	240	25000			
SEE COLUMN II			20000	2850	45.5	RUN	81	327	284	2300	F.T.	RUN	77	309	263	2000	F.T.	RUN	83	273	237	20000			
			15000	2500	F.T.	RUN	89	316	275	2300	F.T.	RUN	74	292	254	2100	F.T.	RUN	83	269	234	15000			
2700	46	RUN	103	332	288																				
2700	46	RUN	98	311	270	10000	2500	43	RUN	89	295	256	2150	38-5	RUN	88	273	237	1900	87	RUN	60	252	220	10000
2700	46	RUN	91	290	252	5000	2450	42.5	RUN	77	273	237	2100	39	RUN	85	252	219	1850	38-5	RUN	55	233	202	5000
2700	46	RUN	86	272	236	S.L.	2400	42	RUN	71	254	221	2050	38-5	RUN	57	233	202	1600	36	-RUN	80	212	184	1600

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
 HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 10,600 LB. GROSS WEIGHT WITH 270 GAL. OF FUEL (AFTER REDUCTING TOTAL ALLOWANCES OF 76 GAL.) TO FLY 1150 STAT. AIRMILES AT 10000 FT. ALTITUDE MAINTAIN 1900 R.P.M. AND 57 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN.

LEGEND
 ALT. : PRESSURE ALTITUDE
 M.P. : MANIFOLD PRESSURE
 G.P.H. : U.S. GAL. PER HOUR
 T.A.S. : TRUE AIRSPEED
 KTS. : KNOTS
 S.L. : SEA LEVEL
 F.W. : FULL RICH
 A.R. : AUTO-RICH
 A.L. : AUTO-LEAN
 C.L. : CRUISING LEAN
 M.L. : MANUAL LEAN
 F.T. : FULL THROTTLE

REVISED 1-23-47
 DATA AS OF 12-1-46
 BASED ON: FLIGHT TEST

For use with V-1650-7 engine only regardless of airplane model.

Figure 54 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

Figure 55 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

AN 01-603E-1

Appendix 1

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 700 1000# BOMBS OR ONE 1000# BOMB & ONE 110 GALL. W. TANK OR TWO 110 GALL. WING TANKS (OR TEN 5" ROCKETS)																			
ENGINE(S): Y-1650-7		CHART WEIGHT LIMITS: 12,200 TO 10,300 POUNDS																													
LIMITS	RPM	M.P. (B.P.)	BLOWER POSITION	MIXTURE POSITION	TIME (L.H.)	COOL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.					NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.G.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR B.P.M.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																		
COLUMN I		FUEL		COLUMN II			COLUMN III			COLUMN IV			FUEL		COLUMN V																
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			U.S.		RANGE IN AIRMILES																
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL																
		480 ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽²⁾						480																					
1500	1300	480		1745	1516	1955	1700	2145	1865	480		2250	1965																		
1455	1265	440		1595	1385	1785	1550	1960	1700	440		2055	1760																		
1325	1160	400		1445	1255	1615	1405	1770	1540	400		1855	1610																		
1190	1035	360		1295	1125	1445	1255	1580	1370	360		1660	1440																		
1060	920	320		1145	995	1275	1110	1390	1210	320		1460	1270																		
925	805	280		1000	870	1115	970	1220	1060	280		1260	1110																		
795	690	240		855	745	955	830	1045	910	240		1095	960																		
660	575	200		715	620	795	690	870	755	200		915	795																		
530	460	160		570	495	635	550	695	605	160		730	635																		
MAXIMUM CONTINUOUS				PRESS. (2.57 STAT. (3.10 NAUT.) MI./GAL.)				PRESS. (2.00 STAT. (2.46 NAUT.) MI./GAL.)				PRESS. (4.35 STAT. (5.70 NAUT.) MI./GAL.)																			
M.P. (B.P.)				M.P. (B.P.)				M.P. (B.P.)				M.P. (B.P.)																			
MIXTURE				MIXTURE				MIXTURE				MIXTURE																			
APPROX. T.A.S.				APPROX. T.A.S.				APPROX. T.A.S.				APPROX. T.A.S.																			
GPH. MPH. KTS.				GPH. MPH. KTS.				GPH. MPH. KTS.				GPH. MPH. KTS.																			
40000				40000				40000				40000																			
35000				35000				35000				35000																			
30000				30000				30000				30000																			
25000				25000				25000				25000																			
20000				20000				20000				20000																			
15000				15000				15000				15000																			
10000				10000				10000				10000																			
5000				5000				5000				5000																			
S.L.				S.L.				S.L.				S.L.																			
2700	48	RUN	103	352	308	15000	2600	44	RUN	85	343	298	2400	F.T.	RUN	81	322	280	2150	F.T.	RUN	66	291	259	16000	2000	F.T.	RUN	59	271	236
2700	46	RUN	86	327	285	10000	2560	44	RUN	69	317	276	2250	40.5	RUN	74	287	256	1950	37.5	RUN	62	272	236	10000	1800	35	RUN	56	253	220
2700	46	RUN	81	308	268	5000	2500	44	RUN	62	296	259	2250	40.5	RUN	69	278	242	1950	37.5	RUN	56	254	221	5000	1650	34.5	RUN	49	225	195
2700	46	RUN	84	288	250	S.L.	2560	44	RUN	79	279	242	2250	40.5	RUN	65	260	228	1950	37.5	RUN	54	235	204	S.L.	1600	34	RUN	46	210	182

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
 (2) MAX. FUEL CAPACITY WITH 2-110 GAL. WING TANKS, ST'D. WING TANKS & FUSELAGE TANKS.
 HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 11,000 LB. GROSS WEIGHT WITH 280 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 1270 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 1950 RPM AND 37.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN. WHEN WEIGHT REACHES 10,300 LBS. USE POWER SETTING SHEET 2, COLUMN IV.

LEGEND
 ALT.: PRESSURE ALTITUDE F.R.: FULL RICH
 M.P.: MANIFOLD PRESSURE A.R.: AUTO-RICH
 GPH.: U.S. GAL. PER HOUR A.L.: AUTO-LEAN
 TAS.: TRUE AIRSPEED C.L.: CRUISING LEAN
 KTS.: KNOTS M.L.: MANUAL LEAN
 S.L.: SEA LEVEL F.T.: FULL THROTTLE

REVISED 1-24-47
 DATA AS OF 9-10-46
 BASED ON: FLIGHT TEST

Figure 55 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

AN 01-603E-1

AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 700 1000# BOMBS OR ONE 1000# BOMB & ONE 110 GAL. W. TANK OR TWO 110 GAL. WING TANKS (OR TEN 5" ROCKETS)														
ENGINE(S): Y-1650-7		CHART WEIGHT LIMITS: 12,200 TO 10,300 POUNDS																								
LIMITS	RPM	M.P. (B.P.C.)	BLOWER POSITION	MIXTURE POSITION	TIME (L.S.M.T.)	COOL'G TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P.GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.														
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V														
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES														
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL													
		480 ⁽¹⁾		SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽³⁾						480																
1500	1380	480		1745	1616	1955	1700	2145	1865	480		2250	1965													
1455	1265	440		1595	1385	1785	1550	1960	1700	440		2055	1760													
1325	1160	400		1445	1255	1615	1405	1770	1540	400		1855	1610													
1190	1035	360		1295	1125	1445	1255	1580	1370	360		1660	1440													
1060	920	320		1145	995	1275	1110	1390	1210	320		1460	1270													
925	805	280		1000	870	1115	970	1220	1060	280		1260	1110													
795	690	240		855	745	955	830	1045	910	240		1095	960													
660	575	200		715	620	795	690	870	755	200		915	795													
530	460	160		570	495	635	550	695	605	160		730	635													
MAXIMUM CONTINUOUS				PRESS. (2.57 STAT. (3.10 NAUT.) MI./GAL.)				PRESS. (2.00 STAT. (2.46 NAUT.) MI./GAL.)				PRESS. (1.35 STAT. (1.70 NAUT.) MI./GAL.)														
N.P. MIX- APPROX.				ALT. FEET				N.P. MIX- APPROX.				ALT. FEET														
R.P.M.	INCHES	MIX-TURE	TOT. T.A.S.	R.P.M.	INCHES	MIX-TURE	TOT. T.A.S.	R.P.M.	INCHES	MIX-TURE	TOT. T.A.S.	R.P.M.	INCHES	MIX-TURE	TOT. T.A.S.											
			GPH. MPH. KTS.				GPH. MPH. KTS.				GPH. MPH. KTS.				GPH. MPH. KTS.											
				40000								40000														
				35000								35000														
				30000								30000														
				25000	2700	46	MIX 30	370	322	2500	43.5	MIX 69	356	309	2260	F.T.	MIX 72	313	272	25000						
				20000	2700	46	MIX 31	348	302	2500	43.5	MIX 68	335	291	2150	37.5	MIX 70	304	264	20000	2200	F.T.	MIX 59	260	243	
2700	48	MIX 103	362	306	15000	2600	44	MIX 35	343	298	2400	F.T.	MIX 81	322	280	2160	F.T.	MIX 66	291	250	16000	2000	F.T.	MIX 59	271	246
2700	46	MIX 86	327	284	10000	2560	44	MIX 69	317	276	2250	40.5	MIX 74	287	256	1950	37.5	MIX 82	272	236	10000	1800	35	MIX 56	253	220
2700	46	MIX 81	308	268	5000	2560	44	MIX 82	296	259	2250	40.5	MIX 69	278	242	1950	37.5	MIX 96	294	221	5000	1650	34.5	MIX 49	225	195
2700	46	MIX 84	288	250	S.L.	2560	44	MIX 79	279	242	2250	40.5	MIX 65	260	228	1950	37.5	MIX 54	235	204	S.L.	1600	34	MIX 46	210	182

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) MAX. FUEL CAPACITY WITH 2-110 GAL. WING TANKS, ST'D. WING TANKS & FUSELAGE TANKS.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 11,000 LB. GROSS WEIGHT WITH 280 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 1270 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 1950 RPM AND 37.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RICH WHEN WEIGHT REACHES 10,300 LBS. USE POWER SETTING SHEET 2, COLUMN IV.

LEGEND

ALT.: PRESSURE ALTITUDE
M.P.: MANIFOLD PRESSURE
GPH.: U.S. GAL. PER HOUR
TAS.: TRUE AIRSPEED
KTS.: KNOTS
S.L.: SEA LEVEL

F.R.: FULL RICH
A.R.: AUTO-RICH
A.L.: AUTO-LEAN
C.L.: CRUISING LEAN
M.L.: MANUAL LEAN
F.T.: FULL THROTTLE

REVISED 1-24-47
DATA AS OF 9-10-46

BASED ON: FLIGHT TEST

For use with V-1650-7 engine only regardless of airplane model.

LIMITS	RPM	M.P. (S.G.)	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (P. 10, 29 SECT. 111)	AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART				EXTERNAL LOAD ITEMS TWO 1000 BOMBS OR ONE 1000 BOMB + ONE 110 GAL. H. TANK OR TWO 110 GAL. HING. TANKS (ON TEN 5" ROCKETS)																																																																																																																
									ENGINE(S): V-1650-7				CHART WEIGHT LIMITS: 10,300 TO 8,100 POUNDS																																																																																																																		
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.	135°C	210		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ¹⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) ²⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																																																																																																																		
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.	125°C	180																																																																																																																								
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V		FUEL		COLUMN V																																																																																																															
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES																																																																																																															
STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL																																																																																																															
				SUBTRACT FUEL ALLOWANCES				NOT AVAILABLE FOR CRUISING ³⁾																																																																																																																							
1330	1165	400	1505	1310	1700	1480	1895	1650	400	1980	1720																																																																																																																				
1195	1040	360	1355	1180	1530	1330	1705	1480	360	1780	1545																																																																																																																				
1060	920	320	1205	1045	1360	1180	1515	1315	320	1585	1380																																																																																																																				
930	810	280	1050	910	1190	1035	1325	1150	280	1385	1205																																																																																																																				
795	690	240	900	780	1020	885	1135	985	240	1190	1035																																																																																																																				
665	580	200	750	650	850	740	945	820	200	990	860																																																																																																																				
530	460	160	600	520	680	590	755	655	160	790	685																																																																																																																				
400	350	120	450	380	510	445	565	490	120	595	515																																																																																																																				
265	230	80	300	260	340	295	380	330	80	395	345																																																																																																																				
135	115	40	150	130	170	150	190	165	40	200	175																																																																																																																				
MAXIMUM CONTINUOUS				PRESS. (3.78 STAT. (3.27 NAUT.) MI./GAL.)				PRESS. (4.25 STAT. (3.60 NAUT.) MI./GAL.)				PRESS. (4.73 STAT. (4.14 NAUT.) MI./GAL.)				MAXIMUM AIR RANGE																																																																																																															
APPROX.				APPROX.				APPROX.				APPROX.				APPROX.																																																																																																															
R.P.M.		M.P.		MIX-TURE		TOT.		T.A.S.		R.P.M.		M.P.		MIX-TURE		TOT.		T.A.S.		R.P.M.		M.P.		MIX-TURE		TOT.		T.A.S.																																																																																																			
		INCHES				GAL.		MPH.		KTS.				INCHES		GAL.		MPH.		KTS.				INCHES		GAL.		MPH.		KTS.																																																																																																	
40000				2700				F.T.				RUN				96				363				335				2600				F.T.				RUN				87				368				320				2350				F.T.				RUN				68				320				287																																																							
35000				2700				48				RUN				98				372				323				2400				F.T.				RUN				82				348				303				2290				F.T.				RUN				47				318				276																																																							
30000				2650				45.5				RUN				91				347				302				2300				40.5				RUN				77				325				282				2000				33.5				RUN				61				296				257																																																							
2700				48				RUN				103				351				305				13000				2500				F.T.				RUN				88				235				291				2300				F.T.				RUN				73				311				270				2000				F.T.				RUN				58				278				242																															
2700				46				RUN				98				330				287				10000				2400				42				RUN				81				310				289				2150				38				RUN				68				288				250				1750				35.5				RUN				54				258				234				10000				1900				32.5				RUN				48				238				208			
2700				46				RUN				81				308				268				5000				2400				42				RUN				75				288				250				2100				39				RUN				65				267				232				1700				35				RUN				50				238				208				5000				1600				30.5				RUN				44				215				187			
2700				46				RUN				86				289				251				S. L.				2400				42				RUN				71				268				233				2050				38.5				RUN				57				246				214				1600				33.5				RUN				45				215				186				S. L.				(SEE COLUMN IV)																							
SPECIAL NOTES												EXAMPLE												LEGEND																																																																																																							
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH BLOWER ABOVE HEAVY LINE												AT 10,000 LB. GROSS WEIGHT WITH 120 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 565 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 1700 RPM AND 35 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN-												ALT. : PRESSURE ALTITUDE M.P. : MANIFOLD PRESSURE GPH : U.S. GAL. PER HOUR TAS : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL F.P. : FULL RICH A.R. : AUTO-RICH A.L. : AUTO-LEAN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE																																																																																																							
REVISED 1-22-47 DATA AS OF 9-10-44												BASED ON: FLIGHT TEST																																																																																																																			

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

Figure 55 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

For use with V-1650-7 engine only regardless of airplane model.

LIMITS	RPM.	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	COOL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (P. 10, 29 SECT. 111)	AIRCRAFT MODEL(S) P-51D & K		FLIGHT OPERATION INSTRUCTION CHART		EXTERNAL LOAD ITEMS TWO 1000 BOMBS OR ONE 1000 BOMB + ONE 110 GAL. H. TANK OR TWO 110 GAL. HING. TANKS (ON TEN 5" ROCKETS)																																																															
									ENGINE(S): V-1650-7		CHART WEIGHT LIMITS: 10,300 TO 8,100 POUNDS		NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) ¹⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																																																															
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.	135°C	210		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ²⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.																																																																			
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.	125°C	180																																																																					
COLUMN I			FUEL		COLUMN II			COLUMN III			COLUMN IV		FUEL		COLUMN V																																																													
RANGE IN AIRMILES			U.S.		RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES																																																													
STATUTE		NAUTICAL	GAL.		STATUTE		NAUTICAL	STATUTE		NAUTICAL	STATUTE		NAUTICAL	STATUTE		NAUTICAL																																																												
SUBTRACT FUEL ALLOWANCES			NOT AVAILABLE FOR CRUISING ³⁾																																																																									
1330	1165	400	1505	1310	1700	1480	1895	1650	400	1980	1720																																																																	
1195	1040	360	1355	1180	1530	1330	1705	1480	360	1780	1545																																																																	
1060	920	320	1205	1045	1360	1180	1515	1315	320	1585	1380																																																																	
930	810	280	1050	910	1190	1035	1325	1150	280	1385	1205																																																																	
795	690	240	900	790	1020	885	1135	985	240	1190	1035																																																																	
665	580	200	750	650	850	740	945	820	200	990	860																																																																	
530	460	160	600	520	680	590	755	655	160	790	685																																																																	
400	350	120	450	390	510	445	565	490	120	595	515																																																																	
265	230	80	300	260	340	295	380	330	80	395	345																																																																	
135	115	40	150	130	170	150	190	165	40	200	175																																																																	
MAXIMUM CONTINUOUS			PRESS.			(3.78 STAT. (3.27 NAUT.) MI./GAL.)			(4.25 STAT. (3.60 NAUT.) MI./GAL.)			(4.73 STAT. (4.14 NAUT.) MI./GAL.)			PRESS.			MAXIMUM AIR RANGE																																																										
APPROX.			ALT.			APPROX.			APPROX.			APPROX.			ALT.			APPROX.																																																										
R.P.M.		INCHES	MIX-TURE	TOT.		T.A.S.		R.P.M.		INCHES	MIX-TURE	TOT.		T.A.S.		R.P.M.		INCHES	MIX-TURE	TOT.		T.A.S.																																																						
				GPH		MPH		GPH		MPH	KTS.	GPH		MPH		KTS.		GPH		MPH	KTS.	GPH																																																						
SEE COLUMN I			40000			2700			F.T.			RUN			96		363		335		2600			F.T.			RUN			87		368		320		2350			F.T.			RUN			68		320		287																											
SEE COLUMN II			25000			2700			48			RUN			98		372		323		2400			F.T.			RUN			82		348		303		2200			F.T.			RUN			61		296		257																											
SEE COLUMN III			20000			2650			45.5			RUN			91		347		302		2300			40.5			RUN			77		325		282		2000			33.5			RUN			61		296		257																											
2700			48	RUN	103		351		305		13000			2500			F.T.			RUN			88		325		291		2300			F.T.			RUN			73		311		270		2000			F.T.			RUN			58		278		242																			
2700			46	RUN	98		330		287		10000			2400			42			RUN			81		310		289		2150			38			RUN			68		288		250		1750			35.5			RUN			54		258		234		10000			1900			32.5			RUN			48		239		208	
2700			46	RUN	81		308		268		5000			2400			42			RUN			75		288		250		2100			39			RUN			65		267		232		1700			35			RUN			50		238		208		5000			1600			30.5			RUN			44		215		187	
2700			46	RUN	66		289		251		2400			42			RUN			71		268		233		2050			38.5			RUN			57		246		214		1600			33.5			RUN			45		215		186		S. L.			(SEE COLUMN IV)																	
SPECIAL NOTES													EXAMPLE													LEGEND																																																		
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 51) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH BLOWER ABOVE HEAVY LINE													AT 10,000 LB. GROSS WEIGHT WITH 120 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 565 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 1700 RPM AND 35 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN-													ALT. : PRESSURE ALTITUDE M.P. : MANIFOLD PRESSURE GPH : U.S. GAL. PER HOUR TAS : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL F.P. : FULL RICH A.R. : AUTO-RICH A.L. : AUTO-LEAN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE																																																		
REVISED 1-22-47 DATA AS OF 9-10-44													BASED ON: FLIGHT TEST																																																															

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-7 engine only regardless of airplane model.

Figure 55 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart

AIRCRAFT MODEL(S) P-51D AND P-51K		TAKE-OFF, CLIMB & LANDING CHART												ENGINE MODEL(S) V-1650-3						
TAKE-OFF DISTANCE FEET																				
GROSS WEIGHT LB.	HEAD WIND M.P.H. KTS.	HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY						
		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		
		GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	
9000	0	0	1350	2000	1500	2200	1700	2450	1450	2100	1600	2250	1800	2500	1600	2250	1750	2450	2000	2750
	17	15	1000	1550	1150	1700	1300	1950	1050	1600	1200	1800	1350	2000	1200	1750	1350	1900	1500	2200
	34	30	750	1150	800	1300	950	1500	750	1200	850	1350	1000	1550	850	1300	950	1400	1100	1650
11,000	0	0	1850	2700	2000	2950	2250	3300	1950	2800	2100	3050	2400	3400	2250	3150	2400	3400	2800	3800
	17	15	1350	2150	1500	2300	1750	2650	1450	2200	1600	2400	1850	2700	1700	2450	1900	2700	2150	3100
	34	30	950	1600	1100	1750	1300	2050	1050	1850	1200	1850	1400	2100	1200	1850	1400	2050	1600	2300
13,000	0	0	2300	3600	2500	3800	2800	4300	2450	3700	2650	3950	3000	4550	2900	4300	3200	4800	3600	5300
	17	15	1700	2800	1900	3050	2200	3400	1850	2900	2050	3200	2350	3600	2200	3300	2400	3700	2800	4200
	34	30	1200	2050	1400	2300	1650	2700	1350	2150	1500	2400	1750	2850	1600	2450	1800	2850	2100	3200
51	45	850	1550	1000	1750	1200	2100	900	1600	1050	1800	1300	2250	1100	1700	1300	2100	1550	2700	

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75% + 10%; 100% + 20%; 125% + 30%; 150% + 40%
 DATA AS OF 5-8-45 BASED ON: FLIGHT TESTS OPTIMUM TAKE-OFF WITH 3000 RPM, 61 IN. HG. & 20 DEG. FLAP 15 DEG. OF CHART VALUES

CLIMB DATA																													
GROSS WEIGHT LB.	AT SEA LEVEL			AT 5000 FEET			AT 10,000 FEET			AT 15,000 FEET			AT 20,000 FEET			AT 25,000 FEET													
	BEST I.A.S.	RATE OF CLIMB	GAL. OF FUEL USED	BEST I.A.S.	RATE OF CLIMB	FROM SEA LEVEL TIME MIN.	BEST I.A.S.	RATE OF CLIMB	FROM SEA LEVEL TIME MIN.	BEST I.A.S.	RATE OF CLIMB	FROM SEA LEVEL TIME MIN.	BEST I.A.S.	RATE OF CLIMB	FROM SEA LEVEL TIME MIN.	BEST I.A.S.	RATE OF CLIMB	FROM SEA LEVEL TIME MIN.											
																			F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	F.P.M.	
9000	170	145	2200	15	170	145	2200	2.5	19	170	145	2250	5.0	23	170	145	2250	7.5	27	165	145	1900	10.0	31	160	140	1650	13.0	35
11,000	170	145	1500	15	170	145	1500	3.5	20	170	145	1500	7.0	26	170	145	1500	10.5	32	165	145	1150	14.0	39	160	140	900	19.0	47
13,000	175	150	1000	15	175	150	950	5.5	23	175	150	900	11.0	32	175	150	850	17.0	42	170	145	550	23.0	55	165	145	300	37.0	75

POWER PLANT SETTINGS: (DETAILS ON FIG. SECTION 1111);
 DATA AS OF 5-8-45 BASED ON: FLIGHT TESTS FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET																							
GROSS WEIGHT LB.	BEST IAS APPROACH		HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY								
	POWER OFF	POWER ON	AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET				
			MPH	KTS	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.			
9000	130	115	130	115	1200	2300	1400	2400	1500	2600	1400	2400	1600	2600	1700	2800	3200	4300	3500	4600	3900	5000	
8000	130	115	130	115	1100	2100	1200	2200	1400	2400	1300	2200	1400	2400	1500	2600	2900	3800	3100	4100	3400	4500	

DATA AS OF 5-8-45 BASED ON: FLIGHT TESTS OPTIMUM LANDING 15 DEG. OF CHART VALUES

REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12

MIXTURE: USE "RUN" OR "AUTO RICH - AUTO LEAN"

LEGEND
 I.A.S. : INDICATED AIRSPEED
 M.P.H. : MILES PER HOUR
 KTS. : KNOTS
 F.P.M. : FEET PER MINUTE

For use with V-1650-3 engine only regardless of airplane model.

Figure 64—Take-off, Climb and Landing Chart

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AFMC-328 4-1-43		AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART												EXTERNAL LOAD ITEMS WING RACKS															
ENGINE(S): V-1650-3				CHART WEIGHT LIMITS: 10,000 TO 8500 POUNDS																											
LIMITS	RPM	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. ¹⁰ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.					NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ¹¹ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																		
WAR EMERG	3000	67	LOW HIGH	RUN	5 MIN.	187 168	FOR DETAILS SEE POWER PLANT CHART (FIG. 1-11)																								
MILITARY POWER	3000	61	LOW HIGH	RUN	16 MIN.	167 158																									
COLUMN I			FUEL			COLUMN II				COLUMN III				COLUMN IV				FUEL			COLUMN V										
RANGE IN AIRMILES			U.S.			RANGE IN AIRMILES				RANGE IN AIRMILES				RANGE IN AIRMILES				U.S.			RANGE IN AIRMILES										
STATUTE			NAUTICAL			STATUTE		NAUTICAL		STATUTE		NAUTICAL		STATUTE		NAUTICAL		GAL.			STATUTE		NAUTICAL								
880		750	269		1130	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ¹¹				1580		1340	269		1620	1410			1620		1410										
770		670	240		1010	980		1340	1170		1360	240		1450	1260			1450		1260											
700		610	220		920	800		1100	950		1260	220		1330	1150			1330		1150											
640		580	200		840	730		1000	870		1160	200		1210	1050			1210		1050											
580		500	180		780	680		900	780		1030	180		1090	940			1090		940											
510		440	160		670	580		800	680		920	160		970	840			970		840											
450		390	140		590	510		700	610		800	140		850	730			850		730											
380		330	120		500	440		600	520		690	120		730	630			730		630											
320		280	100		420	380		500	430		570	100		500	520			500		520											
260		220	80		340	290		400	350		460	80		460	420			460		420											
190		170	60		260	220		300	260		340	60		360	310			360		310											
130		110	40		170	150		200	170		230	40		240	210			240		210											
MAXIMUM CONTINUOUS				PRESS			(9.2 STAT. (9.65 NAUT.) MI./GAL.)				(5.0 STAT. (4.36 NAUT.) MI./GAL.)				(5.75 STAT. (5.0 NAUT.) MI./GAL.)				PRESS			MAXIMUM AIR RANGE									
R.P.M.	M.P. INCHES	MIX- TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX- TURE	APPROX.			R.P.M.	M.P. INCHES	MIX- TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX- TURE	APPROX.								
			TOT. GPH.	T.A.S. MPH	KTS.					TOT. GPH.	T.A.S. MPH	KTS.				TOT. GPH.	T.A.S. MPH	KTS.					TOT. GPH.	T.A.S. MPH	KTS.						
2700	F.T.	RUN	90	420	265	40000						2500	F.T.	RUN	80	395	250	40000						2700							
2700	46	RUN	100	425	270	35000						2350	F.T.	RUN	79	395	245	35000						2700							
2700	46	RUN	98	395	245	25000	2600	45	RUN	83	395	245	2200	38	RUN	75	370	230	2000	37	RUN	58	320	280	15000						
2700	46	RUN	110	405	250	20500	2450	F.T.	RUN	90	380	330	2300	F.T.	RUN	72	365	280	2050	F.T.	RUN	55	315	275	20000	1900	F.T.	RUN	48	280	285
2700	46	RUN	115	380	230	15000	2300	41	RUN	86	360	310	2100	F.T.	RUN	68	335	290	1900	F.T.	RUN	53	300	260	15000	1700	F.T.	RUN	46	270	225
2700	46	RUN	110	360	210	10000	2300	41	RUN	80	325	290	2050	32	RUN	63	315	275	1750	35	RUN	50	285	285	10000	1600	31	RUN	44	260	225
2700	46	RUN	106	390	295	5000	2300	41	RUN	75	315	275	2050	39	RUN	59	285	255	1700	35	RUN	47	265	230	5000	1600	31	RUN	41	245	215
2700	46	RUN	101	320	280	S.L.	2300	41	RUN	73	300	260	2050	39	RUN	57	290	245	1700	35	RUN	44	250	215	S.L.	1600	31	RUN	38	230	200

SPECIAL NOTES

- (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 10,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.)
TO FLY 1280 STAT. AIRMILES AT 10,000 FT. ALTITUDE
MAINTAIN 2000 RPM AND 82 IN. MANIFOLD PRESSURE
WITH MIXTURE SET: **MM**

LEGEND

ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE A.B. : AUTO-RICH
GPH : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED C.L. : CRUISING LEAN
KTS. : KNOTS M.L. : MANUAL LEAN
S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

Figure 65—Flight Operation Instruction Chart—No External Load

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AN 01-601E-1

Appendix 1

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 500-POUND WING BOMBS																									
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 10,000 POUNDS																																			
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.N.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																									
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		M7 M8	FOR DETAILS SEE POWER PLANT SECT. (FIG. 1)																													
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		M7 M8																														
COLUMN I		FUEL		COLUMN II				COLUMN III				COLUMN IV				FUEL		COLUMN V																			
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES				RANGE IN AIRMILES				RANGE IN AIRMILES				U.S. GAL.		RANGE IN AIRMILES																			
STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL																			
700 680		269		1000 870		1200 1040		1380 1180		269 1440		1250		700 610		240		900 780		1070 930		1230 1060		240 1200		1120											
640 590		220 200		830 760		980 900		850 770		1130 1020		880 800		220 200		1100 1080		1020 930		630 570		180 160		580 530		840 810		920 820		800 710		180 160		980 870		840 750	
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾																																					
MAXIMUM CONTINUOUS						PRESS (3.6 STAT. (3.0 NAUT.) MI./GAL.)						PRESS (4.4 STAT. (3.80 NAUT.) MI./GAL.)						PRESS (5.1 STAT. (4.45 NAUT.) MI./GAL.)																			
R.P.M.		M.P. INCHES		MIX-TURE		APPROX. TOT. G.P.H.		T.A.S. MPH KTS.		ALT. FEET		R.P.M.		M.P. INCHES		MIX-TURE		APPROX. TOT. G.P.H.		T.A.S. MPH KTS.		ALT. FEET		R.P.M.		M.P. INCHES		MIX-TURE		APPROX. TOT. G.P.H.		T.A.S. MPH KTS.		ALT. FEET			
2700		46		RUN		96 360		340		25000		2200		30		RUN		76 285		280		25000		2000		2700		46		RUN		109 370		320		20000	
2700		46		RUN		115 350		305		15000		2700		46		RUN		99 355		310		2300		20000		2700		46		RUN		115 350		305		15000	
2700		46		RUN		110 340		285		10000		2700		46		RUN		92 335		275		2100		10000		2700		46		RUN		110 340		285		10000	
2700		46		RUN		106 310		270		5000		2700		46		RUN		82 295		255		2100		5000		2700		46		RUN		106 310		270		5000	
2700		46		RUN		101 295		255		S.L.		2700		46		RUN		78 280		245		2100		S.L.		2700		46		RUN		101 295		255		S.L.	

SPECIAL NOTES

- (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 11,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.) TO FLY 1100 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2050 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND

ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
G.P.H. : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED C.L. : CRUISING LEAN
KTS. : KNOTS M.L. : MANUAL LEAN
S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

Figure 66 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 500-pound Bombs

LIMITS		AIRCRAFT MODEL(S) P-61D AND P-61K					FLIGHT OPERATION INSTRUCTION CHART					EXTERNAL LOAD ITEMS 2 - 500-LB. WING BOMBS													
		ENGINE(S): V-1650-3					CHART WEIGHT LIMITS: 10,000 TO 9400 POUNDS																		
RPM	M.P.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ¹⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.					NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) ²⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.): MULTIPLY U.S. GAL. (OR G.P.M.) BY 10 THEN DIVIDE BY 12.													
WAR EMERG.	8000	87	LOW HIGH	5 MIN.	187	188																			
MILITARY POWER	3000	61	LOW HIGH	15 MIN.	187	158																			
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V													
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES													
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL												
					SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ³⁾																				
540	470	184	700	610	830	720	950	820	184	1000	860														
470	410	160	610	530	720	620	820	710	160	870	750														
410	360	140	530	460	630	540	720	630	140	760	660														
350	300	120	460	400	540	470	620	540	120	650	560														
280	250	100	380	330	450	390	510	450	100	540	470														
230	200	80	300	280	360	310	410	360	80	430	380														
180	150	60	230	200	270	230	310	270	60	320	280														
120	100	40	150	130	180	160	210	180	40	220	190														
60	50	20	80	70	90	80	100	90	20	110	90														
MAXIMUM CONTINUOUS					(3.8 STAT. (3.3 NAUT.) MI./GAL.)					(4.5 STAT. (3.9 NAUT.) MI./GAL.)					(5.1 STAT. (4.4 NAUT.) MI./GAL.)										
APPROX.					APPROX.					APPROX.					APPROX.										
R.P.M.	M.P.	MIX-TURE	TOT.	T.A.S.	R.P.M.	M.P.	MIX-TURE	TOT.	T.A.S.	R.P.M.	M.P.	MIX-TURE	TOT.	T.A.S.	R.P.M.	M.P.	MIX-TURE	TOT.	T.A.S.						
			GPH.	MPH.	KTS.				GPH.	MPH.	KTS.				GPH.	MPH.	KTS.			GPH.	MPH.	KTS.			
2700	46	RUN	96	365	315	25000	2600	45	RUN	92	360	310	2200	39	RUN	75	335	290							
2700	46	RUN	119	370	320	20000	2500	F.T.	98	350	305	2300	F.T.	73	330	285	2100	F.T.	57	290	250	20000			
2700	46	RUN	115	350	305	15000	2300	41	RUN	84	325	280	2100	F.T.	68	305	265	1900	F.T.	54	275	240	15000		
2700	46	RUN	110	330	285	10000	2300	41	RUN	82	310	270	2100	39	RUN	64	290	250	1750	36	RUN	51	260	225	10000
2700	46	RUN	106	310	270	5000	2300	41	RUN	77	290	250	2050	39	RUN	60	270	235	1750	36	RUN	48	245	210	5000
2700	46	RUN	101	295	265	S. L.	2300	41	RUN	73	275	240	2050	39	RUN	57	255	220	1750	36	RUN	45	230	200	S. L.

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 10,000 LB. GROSS WEIGHT WITH 140 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 96 GAL.) TO FLY 700 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2600 RPM AND F.T. 10. MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND
 ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 GPH. : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
 TAS : TRUE AIRSPEED C.L. : CRUISING LEAN
 KTS. : KNOTS M.L. : MANUAL LEAN
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

LIMITS		R.P.M.	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.M.	FOR DETAILS SEE POWER PLANT CHART (FIG. 112)		INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ⁽¹⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) HEAD R.P.M. MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.	NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.G./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ⁽²⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.): MULTIPLY U.S. GAL. (OR G.P.M.) BY 10 THEN DIVIDE BY 12.											
WAR EMERG.	3000	47	LOW HIGH	MIN	5 MIN.		97 268																
MILITARY POWER	3000	41	LOW HIGH	MIN	15 MIN.		87 193																
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V											
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES											
STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL											
770 670		200		900 830		1170 1010		1200 1120		200		1360 1180											
690 600		240		860 750		1040 900		1160 1010		240		1210 1050											
630 550		220		700 680		900 820		1000 920		220		1120 970											
570 490		200		720 620		860 750		970 840		200		1020 880											
520 450		180		650 560		770 670		870 750		180		920 800											
480 380		160		580 500		690 590		780 680		160		820 710											
MAXIMUM CONTINUOUS		PRESS		(3.5 STAT. (2.05 NAUT.) MI./GAL.)		(4.1 STAT. (2.56 NAUT.) MI./GAL.)		(4.7 STAT. (3.1 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE											
APPROX.		ALT. FEET		APPROX.		APPROX.		APPROX.		ALT. FEET		APPROX.											
R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.		R.P.M. M.P. MIX-TURE TOT. T.A.S.											
GPH. MPH. KTS.		GPH. MPH. KTS.		GPH. MPH. KTS.		GPH. MPH. KTS.		GPH. MPH. KTS.		GPH. MPH. KTS.		GPH. MPH. KTS.											
2700 46 RUN 96 250 305		25000		2500 41 RUN 81 330 285		25000		2500 41 RUN 81 330 285		25000		25000											
2700 46 RUN 119 265 315		20000		2700 46 RUN 79 325 280		20000		2150 F.T. RUN 61 285 295		20000		20000											
2700 46 RUN 115 345 300		15000		2400 42 RUN 89 310 270		2200 40 RUN 76 310 279		2000 F.T. RUN 60 290 295		15000		15000											
2700 46 RUN 110 325 280		10000		2400 42 RUN 89 310 270		2200 40 RUN 79 295 255		1950 38 RUN 58 270 235		10000		1750 35 RUN 50 285 215											
2700 46 RUN 106 310 270		5000		2400 42 RUN 85 295 255		2150 40 RUN 66 275 290		1950 38 RUN 55 255 220		5000		1750 35 RUN 48 235 205											
2700 46 RUN 101 290 250		S.L.		2350 42 RUN 78 275 290		2150 40 RUN 68 290 225		1950 37 RUN 52 240 210		S.L.		1750 36 RUN 47 225 195											
SPECIAL NOTES												EXAMPLE				LEGEND							
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.												AT 12,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 100 GAL.) TO FLY 1000 STAT. AIRMILES AT 30,000 FT. ALTITUDE MAINTAIN 2100 R.P.M. AND F.T.B. MANIFOLD PRESSURE WITH MIXTURE SET: MIN				ALT. : PRESSURE ALTITUDE M.P. : MANIFOLD PRESSURE GPH. : U.S. GAL. PER HOUR TAS : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL				F.R. : FULL RICH A.R. : AUTO-RICH A.L. : AUTO-LEARN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE			
HIGH BLOWER ABOVE HEAVY LINE																							
DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA																							

Figure 67 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—Two 1000-pound Bombs

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 1000-LB. BOMBS				
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,400 TO 10,400 POUNDS														
LIMITS	R.P.M.	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ R.P.M., MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COUMS I, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.), AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.				
WAR EMERG.	3000	67	LOW	RUN	5		187	FOR DETAILS SEE POWER PLANT CHART (FIG. 111)								
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		167									153
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V				
RANGE IN AIR MILES		U.S.		RANGE IN AIR MILES		RANGE IN AIR MILES		RANGE IN AIR MILES		U.S.		RANGE IN AIR MILES				
STATUTE	NAUTICAL	GAL.		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾																
530	440	184		660	570	780	680	900	780	184		940	810			
460	380	160		580	500	680	590	780	680	160		820	710			
400	340	140		500	440	590	520	690	590	140		710	620			
340	290	120		430	370	510	440	590	510	120		610	530			
290	240	100		360	310	420	370	490	420	100		510	440			
230	190	80		290	250	340	300	390	340	80		410	350			
170	140	60		220	190	250	220	290	250	60		310	260			
110	100	40		140	120	170	150	200	170	40		200	180			
60	50	20		70	60	80	70	100	80	20		100	90			
MAXIMUM CONTINUOUS				PRESS. (3.6 STAT. (3.1 NAUT.) MI./GAL.)				M.25 STAT. (9.7 NAUT.) MI./GAL.)				M.9 STAT. (4.25 NAUT.) MI./GAL.)				
APPROX.				APPROX.				APPROX.				APPROX.				
R.P.M.	M.P. INCHES	MIX-TURE	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	ALT. FEET	
2700	46	RUN	96 355 310	25000				2250	40	RUN	70 330 285				25000	
2700	48	RUN	119 365 315	20000	2500	F.T.		2350	F.T.	77 325 280	2100	F.T.	58 280 245		20000	
2700	48	RUN	115 345 300	15000	2350	41		2200	F.T.	74 310 270	1950	F.T.	56 270 235		15000	
2700	46	RUN	710 325 280	10000	2350	41	RUN	84 305 265	2150	40	RUN	70 290 250	1850	36	RUN	54 260 225
2700	46	RUN	106 305 265	5000	2350	41	RUN	81 290 250	2150	40	RUN	67 275 240	1850	36	RUN	51 245 210
2700	46	RUN	101 290 250	S.L.	2350	41	RUN	77 275 240	2150	40	RUN	62 260 225	1850	37	RUN	49 235 205
SPECIAL NOTES																
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.																
HIGH BLOWER ABOVE HEAVY LINE																
EXAMPLE																
AT 11,000 LB. GROSS WEIGHT WITH 100 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 96 GAL.) TO FLY 650 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2100 R.P.M. AND 41 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN																
LEGEND																
ALT. : PRESSURE ALTITUDE				F.P. : FULL RICH												
M.P. : MANIFOLD PRESSURE				A.R. : AUTO-RICH												
G.P.H. : U.S. GAL. PER HOUR				A.L. : AUTO-LEAN												
T.A.S. : TRUE AIRSPEED				C.L. : CRUISING LEAN												
K.T.S. : KNOTS				M.L. : MANUAL LEAN												
S.L. : SEA LEVEL				F.T. : FULL THROTTLE												
DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA																

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

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Appendix I

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 75-GALLON COMBAT TANKS																				
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 10,000 POUNDS																														
LIMITS	RPM	M.P. IN. HG.	SLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.N.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALDME (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.N.): MULTIPLY U.S. GAL. (OR G.P.N.) BY 10 THEN DIVIDE BY 12.																				
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		187 188 189																									
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		167 168 169																									
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V																				
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES																				
STATUTE NAUTICAL				STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL				STATUTE NAUTICAL																				
1220 1170	1060 1010	419 400		1530 1480	1330 1270	1870 1790	1620 1540	2190 2090	1900 1820	419 400		2270 2170	1970 1880																			
1110 1050 990	960 910 860	380 360 340		1390 1320 1250	1200 1140 1080	1700 1610 1520	1470 1390 1320	1990 1890 1790	1730 1640 1550	380 360 340		2060 1960 1850	1790 1700 1610																			
930 880 820	710 760 710	320 300 280		1180 1100 1030	1020 950 890	1430 1350 1260	1240 1160 1090	1680 1580 1480	1480 1380 1280	320 300 280		1750 1640 1540	1510 1420 1330																			
760	660	260		960	830	1170	1010	1380	1200	260		1490	1240																			
MAXIMUM CONTINUOUS				PRESS		0.6 STAT. (3.1 NAUT.) MI./GAL.				1.4 STAT. (6.8 NAUT.) MI./GAL.				5.1 STAT. (4.9 NAUT.) MI./GAL.				PRESS		MAXIMUM AIR RANGE												
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.									
			TOT.	T.A.S.						TOT.	T.A.S.					TOT.	T.A.S.						TOT.	T.A.S.								
2700	46	RUN	100	385	335	40000 35000 30000						2400	F.T.	RUN	81	355	310	40000 35000 30000														
2700	46	RUN	96	360	310	25000						2200	39	RUN	76	325	290	25000														
2700	46	RUN	119	370	320	20000	2550	F.T.	RUN	99	355	310	2300	F.T.	RUN	74	325	280	20000	2050	F.T.	RUN	55	275	240	20000						
2700	46	RUN	115	350	305	15000	2400	42	RUN	94	335	290	2150	F.T.	RUN	70	310	270	15000	1900	F.T.	RUN	54	270	235	15000						
2700	46	RUN	110	330	285	10000	2350	42	RUN	87	315	275	2100	39	RUN	65	290	250	10000	1750	35	RUN	50	255	220	10000	1600	33	RUN	47	235	205
2700	46	RUN	106	310	270	5000	2350	41	RUN	82	295	255	2100	39	RUN	63	275	240	5000	1750	35	RUN	48	240	210	5000	1600	33	RUN	43	225	195
2700	46	RUN	101	295	255	S.L.	2350	41	RUN	78	280	245	2100	39	RUN	60	260	225	S.L.	1750	36	RUN	45	230	200	1600	33	RUN	45	215	185	
SPECIAL NOTES										EXAMPLE										LEGEND												
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.										AT 11,000 LB. GROSS WEIGHT WITH 300 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.) TO FLY 8000 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 3050 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: W										ALT. : PRESSURE ALTITUDE F.R. : FULL RICH M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH G.P.H. : U.S. GAL. PER HOUR A.L. : AUTO-LEARN T.A.S. : TRUE AIRSPEED C.L. : CRUISING LEAN KTS. : KNOTS M.L. : MANUAL LEAN S.L. : SEA LEVEL F.T. : FULL THROTTLE												
HIGH BLOWER ABOVE HEAVY LINE																																
DATA AS OF 5-8-45										BASED ON: FLIGHT TEST DATA																						

For use with V-1650-3 engine only regardless of airplane model.

Figure 68 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—Two 75-gallon Tanks

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 75-GALLON COMBAT TANKS													
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,000 TO 9800 POUNDS																							
LIMITS	RPM	M.P. (M.H.G.)	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	SEE FIG. 68 (SHEET 1 OF 2) FOR DETAILS OF THIS CHART				INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.I./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.									
WAR EMERG.	3000	67	LOW	RICH	5 MIN.	187	168																		
MILITARY POWER	2000	61	LOW	RICH	15 MIN.	167	153																		
COLUMN I		FUEL			COLUMN II				COLUMN III				FUEL		COLUMN V										
RANGE IN AIRMILES		U.S. GAL.			RANGE IN AIRMILES				RANGE IN AIRMILES				U.S. GAL.		RANGE IN AIRMILES										
STATUTE NAUTICAL					STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL										
790 710	680 610	269 240	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING		990 890	880 770	1210 1080	1050 940	1420 1270	1240 1100	269 240	1480 1320	1290 1150												
650 590 530	560 510 460	220 200 180	810 740 670	710 640 580	990 900 810	860 780 700	1160 1080 950	1010 920 830	1180 1080 950	1010 920 830	220 200 180	1210 1100 990	1050 960 860												
470 410 350 290	410 360 310 250	160 140 120 100	590 520 440 370	510 450 380 320	720 630 540 450	620 550 470 390	850 740 640 530	740 640 550 460	850 740 640 530	740 640 550 460	160 140 120 100	880 770 660 550	770 670 570 480												
240 180 120	200 150 100	80 60 40	300 220 150	260 190 130	380 270 180	310 230 160	420 320 210	370 280 180	420 320 210	370 280 180	80 60 40	440 330 220	380 290 190												
MAXIMUM CONTINUOUS					PRESS. ALT. FEET					PRESS. ALT. FEET					MAXIMUM AIR RANGE										
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		TOT. GPH.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		TOT. GPH.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		TOT. GPH.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		TOT. GPH.					
2700	F.T.	RUN	90	380	330	40000									40000										
2700	46	RUN	100	385	335	35000									35000										
						30000																			
2700	46	RUN	96	360	310	25000									25000										
2700	46	RUN	119	370	320	20000	2500	F.T.	RUN	97	355	310	2300	F.T.	RUN	72	325	280	1950	F.T.	RUN	52	270	235	20000
2700	46	RUN	115	350	305	15000	2350	41	RUN	90	330	285	2100	F.T.	RUN	68	305	265	1850	F.T.	RUN	51	265	230	15000
2700	46	RUN	110	330	285	10000	2350	41	RUN	84	310	270	2100	39	RUN	65	290	250	1700	35	RUN	49	255	220	10000
2700	46	RUN	106	310	270	5000	2350	41	RUN	82	295	255	2050	39	RUN	60	270	235	1650	35	RUN	47	240	210	5000
2700	46	RUN	101	285	255	S.L.	2350	41	RUN	77	280	245	2050	39	RUN	56	255	220	1650	35	RUN	43	225	195	S.L.

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 10,000 LB. GROSS WEIGHT WITH 2200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 200 GAL.) TO FLY 1150 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 1960 RPM AND 71 IN. MANIFOLD PRESSURE WITH MIXTURE SET: **RICH**

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AN 01-601E-1

Appendix 1

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 110-GALLON COMBAT TANKS										
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,800 TO 10,200 POUNDS																				
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS I, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.) MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.										
WAR EMERG.	3000	87	LOW HIGH	RUN	5 MIN.		187 168															
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		187 158															
COLUMN I		FUEL		COLUMN II				COLUMN III				COLUMN IV		FUEL		COLUMN V						
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES				RANGE IN AIRMILES				RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES						
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL					
1410	1220	480		1740	1510	2100	1820	2450	2120	480		2540	2210									
1330	1160	480		1640	1420	1980	1720	2310	2000	460		2400	2080									
1270	1100	440		1570	1360	1900	1640	2210	1920	440		2300	2000									
1210	1050	420		1500	1300	1810	1570	2120	1840	420		2200	1910									
1150	1000	400		1430	1240	1730	1500	2020	1750	400		2100	1830									
1100	950	380		1380	1180	1640	1430	1930	1670	380		2000	1740									
1040	900	360		1290	1110	1560	1360	1830	1590	360		1900	1650									
980	850	340		1220	1050	1480	1280	1730	1500	340		1800	1570									
920	800	320		1150	990	1390	1210	1640	1420	320		1700	1480									
870	750	300		1080	930	1310	1140	1540	1340	300		1600	1390									
810	700	280		1010	870	1220	1080	1450	1250	280		1500	1300									
750	650	260		940	810	1140	1000	1350	1170	260		1400	1220									
MAXIMUM CONTINUOUS				PRESS (2.5 STAT. (3.05 NAUT.) MI./GAL.)				PRESS (4.2 STAT. 6.65 NAUT.) MI./GAL.)				PRESS (4.8 STAT. (4.16 NAUT.) MI./GAL.)				PRESS MAXIMUM AIR RANGE						
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	TOT. GPH	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. GPH	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. GPH	T.A.S. MPH	KTS.	
2700	46	RUN	100 375 325							2400	F.T.	RUN	69 245 300									
2700	46	RUN	98 355 310							2350	41	RUN	81 235 290									
2700	46	RUN	119 365 315	2550	F.T.	RUN	98 350 305	2350	F.T.	RUN	77 325 280	2150	F.T.	RUN	62 290 250	2000	F.T.	RUN	59 280 245			
2700	46	RUN	115 345 300	2400	42	RUN	94 330 285	2200	F.T.	RUN	75 310 270											
2700	46	RUN	110 325 280	2400	42	RUN	93 315 275	2200	40	RUN	71 295 255	1900	37	RUN	56 265 230	10000	1700	35	RUN	50	285	210
2700	46	RUN	106 310 270	2400	42	RUN	84 295 255	2100	40	RUN	65 275 240	1900	37	RUN	53 250 215	5000	1700	35	RUN	48	335	205
2700	46	RUN	101 295 255	2400	42	RUN	80 280 245	2100	40	RUN	62 260 225	1950	37	RUN	52 240 210	S.L.	1750	36	RUN	45	325	195

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 3) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 11,500 LB. GROSS WEIGHT WITH 400 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.) TO FLY 2100 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND
 ALT. : PRESSURE ALTITUDE
 M.P. : MANIFOLD PRESSURE
 GPH : U.S. GAL. PER HOUR
 TAS : TRUE AIRSPEED
 KTS. : KNOTS
 S.L. : SEA LEVEL
 F.R. : FULL RICH
 A.R. : AUTO-RICH
 A.L. : AUTO-LEAN
 C.L. : CRUISING LEAN
 M.L. : MAXIMAL LEAN
 F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 2 - 110-GALLON COMBAT TANKS																	
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,200 TO 9000 POUNDS																											
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.M.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ⁽¹⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ⁽²⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.W.) MULTIPLY U.S. GAL. (OR G.P.M.) BY 10 THEN DIVIDE BY 12.																	
WAR EMERG	3000	67	LOW HIGH	RUN	5 MIN.		107 168																						
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		107 158																						
COLUMN I			FUEL		COLUMN II				COLUMN III				FUEL		COLUMN V														
RANGE IN AIRMILES			U.S.		RANGE IN AIRMILES				RANGE IN AIRMILES				U.S.		RANGE IN AIRMILES														
STATUTE NAUTICAL			GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL														
770 680			269 240		970 880		840 750		1180 1050		1030 920		1400 1280		269 240		1450 1300		1260 1120										
630 570 510			220 200 180		790 720 650		690 620 560		970 880 790		840 760 690		1190 1040 940		220 200 180		1190 1090 970		1030 940 840										
480 400 340			180 140 120		580 500 430		500 440 370		700 620 530		610 530 460		830 730 620		180 140 120		860 760 660		750 660 560										
290 230 170 110			100 80 60 40		360 290 220 140		310 250 190 120		440 360 280 180		380 310 230 150		520 420 310 210		100 80 60 40		590 490 320 220		470 370 280 190										
MAXIMUM CONTINUOUS			PRESS		(3.6 STAT. G.) NAUT. MI./GAL.				(4.4 STAT. G.) NAUT. MI./GAL.				(5.2 STAT. G.) NAUT. MI./GAL.		PRESS														
R.P.M. M.P. MIX-TURE			APPROX. ALT. FEET		R.P.M. M.P. MIX-TURE				R.P.M. M.P. MIX-TURE				R.P.M. M.P. MIX-TURE		R.P.M. M.P. MIX-TURE														
TOT. G.P.H. T.A.S. MPH. KTS.					TOT. G.P.H. T.A.S. MPH. KTS.				TOT. G.P.H. T.A.S. MPH. KTS.				TOT. G.P.H. T.A.S. MPH. KTS.		TOT. G.P.H. T.A.S. MPH. KTS.														
2700 F.T. 46 RUN 90 375 325			40000 35000 30000		2250 F.T. 79 RUN 79 350 305				2150 F.T. 54 RUN 54 275 290				25000 20000 15000		1600 30 RUN 93 225 195														
2700 46 RUN 119 365 315			20000 15000		2400 42 RUN 84 330 285				2150 F.T. 70 RUN 70 305 265				1950 F.T. 52 RUN 52 285 230		1800 30 RUN 90 215 185														
2700 46 RUN 115 345 300			15000		2350 41 RUN 85 310 270				2100 38 RUN 67 280 250				1850 F.T. 51 RUN 51 260 225		1600 30 RUN 86 205 180														
2700 46 RUN 110 330 285			10000 5000		2350 41 RUN 85 290 250				2100 38 RUN 61 270 235				1850 34 RUN 48 250 215		10000 5000 1600 30														
2700 46 RUN 106 310 270			5000		2350 41 RUN 80 270 235				2100 38 RUN 58 255 220				1850 34 RUN 48 230 190		S.L. 1600 31 RUN 86 205 180														
2700 46 RUN 101 290 250			S.L.		2350 41 RUN 75 275 240				2100 38 RUN 58 255 220				1850 34 RUN 48 230 190		S.L. 1600 31 RUN 86 205 180														
SPECIAL NOTES										EXAMPLE										LEGEND									
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.										AT 10,000 LB. GROSS WEIGHT WITH 200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 30 GAL.) TO FLY 1100 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2300 RPM AND F.T. 11. MANIFOLD PRESSURE WITH MIXTURE SET: RUN										ALT. : PRESSURE ALTITUDE F.R. : FULL RICH M.P. : MANIFOLD PRESSURE A.P. : AUTO-RICH GPH : U.S. GAL. PER HOUR A.L. : AUTO-LEAN TAS : TRUE AIRSPEED C.L. : CRUISING LEAN KTS. : KNOTS M.L. : MANUAL LEAN S.L. : SEA LEVEL F.T. : FULL THROTTLE									
HIGH BLOWER ABOVE HEAVY LINE																													
DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA																													

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 10 ROCKETS													
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 10,000 TO 9000 POUNDS																							
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING ⁽¹⁾ MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.			NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ⁽²⁾ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 40 THEN DIVIDE BY 12.														
WAR EMERG.	3000	67	LOW RICH	RUN	5 MIN.		187 188	FOR DETAILS SEE POWER PLANT CHART (FIG. 10, SEC. III)																	
MILITARY POWER	3000	61	LOW RICH	RUN	15 MIN.		187 159																		
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V													
RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES													
STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL													
740 680	650 580	200 240	890 790	770 680	1080 960	930 830	1230 1100	1080 980	280 260	1300 1180	1130 1010														
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾																									
610 550 500	530 480 430	220 200 180	720 660 590	630 570 510	880 800 720	780 680 620	1010 920 830	880 800 720	220 200 180	1080 970 870	820 840 760														
440 390 330	380 340 290	180 140 120	530 460 400	460 400 340	640 560 480	550 490 420	740 640 550	640 560 480	180 140 120	770 680 580	670 590 500														
280 220 170 110	240 190 140 100	100 80 60 40	330 280 200 130	290 230 170 110	400 320 240 160	350 280 210 140	480 370 280 180	400 320 240 160	100 80 60 40	480 390 290 190	420 340 250 170														
MAXIMUM CONTINUOUS		PRESS		(2.3 STAT. (2.8 NAUT.) MI./GAL.)		(4.0 STAT. (3.45 NAUT.) MI./GAL.)		(4.6 STAT. (4.0 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE													
R.P.M.	M.P. INCHES	MIX- TURE	APPROX.			R.P.M.	M.P. INCHES	MIX- TURE	APPROX.			R.P.M.	M.P. INCHES	MIX- TURE	APPROX.										
			TOT. GPH.	T.A.S. MPH	KTS.				TOT. GPH.	T.A.S. MPH	KTS.				TOT. GPH.	T.A.S. MPH	KTS.								
2700	F.T.	RUN	90	345	300	50000									40000										
2700	46	RUN	100	360	310	35000			2400	F.T.	RUN	84	335	290	35000										
2700	46	RUN	96	340	295	25000			2300	41	RUN	81	320	280	23000	F.T.	RUN	63	285	250	25000				
2700	46	RUN	119	350	305	20000	2550	F.T.	RUN	104	340	295	2350	F.T.	RUN	79	315	275	2150	F.T.	RUN	61	275	240	20000
2700	46	RUN	115	335	290	15000	2450	42	RUN	97	320	280	2150	F.T.	RUN	74	295	255	2000	F.T.	RUN	59	285	230	15000
2700	48	RUN	110	315	275	10000	2400	42	RUN	90	300	260	2150	40	RUN	71	280	245	1900	37	RUN	56	255	220	10000
2700	46	RUN	106	300	260	5000	2400	42	RUN	86	285	245	2150	40	RUN	67	265	230	1900	37	RUN	53	240	210	5000
2700	46	RUN	101	280	245	S.L.	2400	42	RUN	82	270	235	2150	40	RUN	62	250	215	1900	37	RUN	51	230	200	S.L.

SPECIAL NOTES
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 10,500 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.)
TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE
MAINTAIN 2150 RPM AND F.T. IN MANIFOLD PRESSURE
WITH MIXTURE SET: **RUN**

LEGEND

ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
GPH. : U.S. GAL. PER HOUR A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED C.L. : CRUISING LEAN
KTS. : KNOTS M.L. : MANUAL LEAN
S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 500-LB. BOMBS													
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,600 TO 11,000 POUNDS																							
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. 111)	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.										NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE - AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.						
WAR EMERG.		2000	67	LOW	RUN	5 MIN.	187	188	COLUMN I		COLUMN II		COLUMN III		COLUMN IV		COLUMN V								
MILITARY POWER		2000	61	LOW	RUN	15 MIN.	167	163	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES								
		U.S. GAL.		STATUTE		NAUTICAL		U.S. GAL.		STATUTE		NAUTICAL		U.S. GAL.		STATUTE		NAUTICAL							
		720	620		260	850	730		1010	880		1170	1050		280	1230	1060								
		840	580		240	760	650		910	790		1040	910		240	1100	950								
		590	510		220	700	600		830	720		860	830		220	1010	870								
		540	460		200	630	550		760	660		870	760		200	920	800								
		480	420		180	570	490		680	590		790	680		180	830	720								
		430	370		160	510	440		610	530		700	610		160	740	640								
MAXIMUM CONTINUOUS		PRESS. ALT. FEET		(3.4 STAT. (2.7 NAUT.) MI./GAL.)			(3.7 STAT. (3.2 NAUT.) MI./GAL.)			(4.3 STAT. (3.7 NAUT.) MI./GAL.)			PRESS. ALT. FEET		MAXIMUM AIR RANGE										
R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH	KTS.	R.P.M.	M.P. INCHES	MIX-TURE	TOT. G.P.H.	T.A.S. MPH	KTS.		
2700	46	RUN	96	330	285	25000						2450	43	RUN	85	315	275								
2700	46	RUN	119	345	300	20000	2600	F.T.	RUN	107	335	290	2450	F.T.	RUN	85	315	275	2150	F.T.	RUN	63	270	235	20000
2700	46	RUN	115	325	280	15000	2500	43	RUN	103	320	280	2250	40	RUN	81	300	260	2050	F.T.	RUN	63	270	235	15000
2700	46	RUN	110	305	265	10000	2500	43	RUN	98	300	260	2250	40	RUN	78	280	245	2000	38	RUN	59	255	220	10000
2700	46	RUN	106	290	250	5000	2500	43	RUN	94	285	245	2250	41	RUN	74	270	235	2000	38	RUN	58	245	210	5000
2700	46	RUN	101	275	240	S.L.	2500	43	RUN	90	270	235	2250	41	RUN	70	255	220	2000	38	RUN	54	230	200	S.L.

For use with V-1650-3 engine only regardless of airplane model.

AN 01-60JE-1

Appendix I

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 11,600 LB. GROSS WEIGHT WITH 200 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 90 GAL.) TO FLY 950 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND
 ALT. : PRESSURE ALTITUDE F.R. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 GPH : U.S. GAL. PER HOUR A.L. : AUTO-LEAM
 TAS : TRUE AIRSPEED C.L. : CRUISING LEAM
 KTS. : KNOTS M.L. : MANUAL LEAM
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

Figure 71 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 500-pound Bombs

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 500-LB. BOMBS													
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 10,000 POUNDS																							
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL C.P.M.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMNS EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.M.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.													
WAR EMERG.	3000	47	LOW	RUN	5 MIN.	187																			
MILITARY POWER	3000	51	LOW	RUN	15 MIN.	167																			
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V													
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES													
STATUTE NAUTICAL				STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL				STATUTE NAUTICAL													
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁽¹⁾																									
400	430	184	590	510	700	610	810	700	184	850	740														
430	370	160	510	440	610	530	700	610	160	740	640														
370	320	140	460	390	530	480	620	530	140	650	560														
320	280	120	360	330	460	400	530	460	120	560	480														
270	230	100	320	280	360	330	440	380	100	460	400														
210	180	80	250	220	300	260	360	310	80	370	320														
180	140	60	190	170	230	200	260	230	60	280	240														
110	90	40	130	110	150	130	180	150	40	190	160														
50	50	20	60	60	80	70	90	80	20	90	80														
MAXIMUM CONTINUOUS			PRESS (3.2 STAT. (2.8 NAUT.) M./GAL.)			PRESS (3.8 STAT. (3.3 NAUT.) M./GAL.)			PRESS (4.8 STAT. (4.3 NAUT.) M./GAL.)			MAXIMUM AIR RANGE													
APPROX.			APPROX.			APPROX.			APPROX.			APPROX.													
M.P. INCHES MIX-TURE TOT. G.P.H. M.P.H. KTS.			ALT. FEET			R.P.M. INCHES MIX-TURE TOT. G.P.H. M.P.H. KTS.			R.P.M. INCHES MIX-TURE TOT. G.P.H. M.P.H. KTS.			R.P.M. INCHES MIX-TURE TOT. G.P.H. M.P.H. KTS.													
			40000 35000 30000									40000 35000 30000													
2700	46	RUN	96	335	290	25000																			
2700	46	RUN	119	345	300	20000	2600	F.T.	RUN	105	335	290	2400	F.T.	RUN	83	315	275	2150	F.T.	RUN	81	270	235	20000
2700	46	RUN	115	325	280	15000	2450	43	RUN	89	315	275	2250	40	RUN	80	300	260	2000	F.T.	RUN	60	265	230	15000
2700	46	RUN	110	310	270	10000	2400	42	RUN	91	295	255	2200	40	RUN	74	280	245	1950	37	RUN	58	255	220	10000
2700	46	RUN	106	290	250	5000	2400	42	RUN	87	280	245	2200	40	RUN	70	265	230	1950	37	RUN	55	240	210	6000
2700	46	RUN	101	275	240	S.L.	2400	42	RUN	83	265	230	2200	40	RUN	65	250	215	2000	38	RUN	53	230	200	S.L.

For use with V-1650-7 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AN 01-601E-1

SPECIAL NOTES
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF A CLIMB (SEE FIG. 71) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
AT 11,000 LB. GROSS WEIGHT WITH 140 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 9% GAL.) TO FLY 600 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND
ALT. : PRESSURE ALTITUDE F.T. : FULL RICH
M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
G.P.H. : U.S. GAL. PER HOUR A.L. : AUTO-LEAK
T.A.S. : TRUE AIRSPEED C.L. : CRUISING LEAN
KTS. : KNOTS M.L. : MANUAL LEAN
S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS PLUS 2 - 1000-LB. BOMBS									
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 12,600 TO 12,000 POUNDS																			
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING HOPE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.					NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALOFT (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.								
WAR EMERG.	3000	67	LOW	RUN	5 MIN.	187															
MILITARY POWER	3000	61	LOW	RUN	15 MIN.	157															
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V									
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES									
STATUTE NAUTICAL				STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL				STATUTE NAUTICAL									
710 620		269		830 710		960 830		1090 940		269		1130 980									
830 550		240		740 640		860 740		980 840		240		1010 880									
580 530		220 200		580 530		700 720		880 820		220 200		930 850 810 730									
470 420		180 160		560 500		480 430		650 580		180 160		780 680 680 590									
MAXIMUM CONTINUOUS		PRESS		(3.0 STAT. (2.6 NAUT.) MI./GAL.)		(3.5 STAT. (3.05 NAUT.) MI./GAL.)		(3.9 STAT. (3.5 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE									
R.P.M. M.P. INCHES MIX-TURE APPROX. TOT. T.A.S. G.P.H. MPH KTS.		ALT. FEET		R.P.M. M.P. INCHES MIX-TURE APPROX. TOT. T.A.S. G.P.H. MPH KTS.		R.P.M. M.P. INCHES MIX-TURE APPROX. TOT. T.A.S. G.P.H. MPH KTS.		R.P.M. M.P. INCHES MIX-TURE APPROX. TOT. T.A.S. G.P.H. MPH KTS.		ALT. FEET		R.P.M. M.P. INCHES MIX-TURE APPROX. TOT. T.A.S. G.P.H. MPH KTS.									
2700 46 RUN 96 810 270 25000		30000 25000 20000		2600 F.T. RUN 105 320 280 2150		2150 F.T. RUN 86 300 260		2100 F.T. RUN 67 260 225		20000		20000 15000									
2700 46 RUN 119 330 285 20000		15900		2650 43 RUN 100 305 285 2250		41 RUN 81 285 245		2100 39 RUN 63 250 215		10000 1950 38 RUN 58 235 205		1950 38 RUN 56 225 195									
2700 46 RUN 115 315 275 15900		2500 43 RUN 98 290 250 2300		41 RUN 80 275 240		2100 39 RUN 62 240 210		5000 1950 38 RUN 53 215 185		2700 46 RUN 106 285 245 5000		S.L. 2500 48 RUN 88 280 225 2250 41 RUN 70 245 215 2100 39 RUN 59 230 200									
2700 46 RUN 110 300 260 10000		S.L. 2500		SPECIAL NOTES		EXAMPLE		LEGEND		2700 46 RUN 101 270 235 S.L. 2500											
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.		HIGH BLOWER ABOVE HEAVY LINE		AT 12,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 80 GAL.) TO FLY 900 STAT. AIRMILES AT 15,000 FT. ALTITUDE MAINTAIN 2100 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN		ALT. : PRESSURE ALTITUDE F.R. : FULL RICH M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH GPH : U.S. GAL. PER HOUR A.L. : AUTO-LEAN TAS : TRUE AIRSPEED C.L. : CRUISING LEAN KTS. : KNOTS M.L. : MANUAL LEAN S.L. : SEA LEVEL F.T. : FULL THROTTLE															
DATA AS OF 3-8-45 BASED ON: FLIGHT TEST DATA																					

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

AN 01-60JF-1

Appendix I

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 1000-LB. BOMBS						
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 12,000 TO 11,000 POUNDS																
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALOFT (NO WIND). ¹ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.						
WAR EMERG.	3000	67	LOW	RUN	5 MIN.		187 168											
MILITARY POWER	3000	61	LOW	RUN	15 MIN.		167 153											
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V						
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES						
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			STATUTE	NAUTICAL					
490	420	184		570	490	660	570	750	650	184		780	680					
420	370	180		500	430	580	500	660	570	180		680	580					
370	320	140		430	380	500	440	570	500	140		590	520					
320	280	120		370	320	430	370	490	430	120		510	440					
280	230	100		310	270	360	310	410	360	100		420	370					
210	180	80		250	220	290	250	330	280	80		340	290					
160	140	60		190	160	220	190	250	210	60		260	220					
110	90	40		120	110	140	120	160	140	40		170	150					
50	50	20		60	50	70	60	80	70	20		80	70					
MAXIMUM CONTINUOUS		PRESS		(3.7 STAT. (2.7 NAUT.) MI./GAL.)		(3.6 STAT. (3.0 NAUT.) MI./GAL.)		(4.1 STAT. (3.55 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE						
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			
			TOT.	T.A.S.					TOT.	T.A.S.					TOT.	T.A.S.		
			GPH.	MPH.	KTS.				GPH.	MPH.	KTS.				GPH.	MPH.	KTS.	
2700	46	RUN	96	315	275	25000												
2700	46	RUN	119	335	290	20000	2550	F.T.	RUN	103	320	280	2400	F.T.	RUN	84	300	260
2700	46	RUN	115	315	275	15000	2450	F.T.	RUN	99	305	265	2250	F.T.	RUN	79	285	245
2700	46	RUN	110	300	260	10000	2450	43	RUN	95	290	250	2250	40	RUN	77	275	240
2700	46	RUN	106	285	245	5000	2450	43	RUN	91	275	240	2250	40	RUN	73	260	225
2700	46	RUN	101	270	235	S. L.	2450	43	RUN	84	260	225	2250	40	RUN	68	245	215
2050	38	RUN	61	250	215	10000	1900	37	RUN	55	235	195	2050	38	RUN	55	225	185
2050	38	RUN	58	240	210	5000	1900	37	RUN	51	225	185	2050	38	RUN	51	215	185
2050	38	RUN	55	225	195	S. L.	1900	37	RUN	51	215	185	2050	38	RUN	51	215	185

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES

(3) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 11,500 LB. GROSS WEIGHT WITH 140 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.) TO FLY 500 STAT. AIRMILES AT 15,000 FT. ALTITUDE MAINTAIN 2500 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: **W**

LEGEND

- ALT. : PRESSURE ALTITUDE
- M.P. : MANIFOLD PRESSURE
- GPH. : U.S. GAL. PER HOUR
- T.A.S. : TRUE AIRSPEED
- KTS. : KNOTS
- S.L. : SEA LEVEL
- F.R. : FULL RICH
- A.R. : AUTO-RICH
- A.L. : AUTO-LEAN
- C.L. : CRUISING LEAN
- M.L. : MANUAL LEAN
- F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

Figure 72 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 1000-pound Bombs

Figure 73 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 75-gallon Tanks

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 75-GALLON COMBAT TANKS																				
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,600 TO 10,000 POUNDS																														
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.N.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR B.P.N.): MULTIPLY U.S. GAL. (OR G.P.N.) BY 10 THEN DIVIDE BY 12.																				
WAR EMERG.		3000	57	LOW	RUN	5 MIN.	187																									
MILITARY POWER		3000	61	LOW	RUN	15 MIN.	187																									
COLUMN I			FUEL		COLUMN II				COLUMN III				COLUMN IV		FUEL		COLUMN V															
RANGE IN AIRMILES			U.S.		RANGE IN AIRMILES				RANGE IN AIRMILES				RANGE IN AIRMILES		U.S.		RANGE IN AIRMILES															
STATUTE		NAUTICAL	GAL.		STATUTE		NAUTICAL		STATUTE		NAUTICAL		STATUTE		NAUTICAL	GAL.		STATUTE		NAUTICAL												
1140			890		419		1320		1150		1600		1390		1860		419		1940		1690											
1090			850		400		1260		1100		1530		1330		1770		400		1860		1620											
1030			800		380		1200		1040		1450		1260		1690		380		1770		1540											
980			850		360		1140		990		1380		1200		1600		360		1680		1460											
820			810		340		1080		930		1310		1140		1510		340		1590		1380											
870			760		320		1020		880		1230		1070		1430		320		1500		1300											
820			710		300		950		830		1180		1010		1340		300		1410		1230											
760			670		280		890		770		1080		940		1260		280		1320		1150											
710			620		260		830		720		1010		880		1170		260		1230		1070											
MAXIMUM CONTINUOUS				PRESS.		(3.1 STAT. (2.70 NAUT.) MI./GAL.)				(3.7 STAT. (3.2 NAUT.) MI./GAL.)				(4.3 STAT. (3.75 NAUT.) MI./GAL.)				PRESS.		MAXIMUM AIR RANGE												
R.P.M.		M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET		R.P.M.		M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET		R.P.M.		M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET		R.P.M.		M.P. INCHES	MIX-TURE	APPROX.		ALT. FEET		
				TOT. GPH. MPM. KTS.		T.A.S. GPH. MPM. KTS.																										
2700		46	RUN	100 345 300		40000 35000 30000																										
2700		46	RUN	86 330 285		25000																										
2700		46	RUN	119 345 300		20000		2600		F.T.	RUN	107 335 290		2450		F.T.	RUN	85 315 275		2150		F.T.	RUN	63 270 235		20000						
2700		46	RUN	115 325 280		15000		2500		43	RUN	103 320 280		2250		40	RUN	81 300 260		2050		F.T.	RUN	63 270 235		15000						
2700		46	RUN	110 305 265		10000		2500		43	RUN	98 300 260		2250		40	RUN	76 280 245		2000		38	RUN	58 255 220		10000		1800	36	RUN	53 235 205	
2700		46	RUN	106 290 250		5000		2500		43	RUN	94 285 245		2250		41	RUN	74 270 235		2000		38	RUN	58 245 210		5000		1850	36	RUN	52 230 200	
2700		46	RUN	101 275 240		S.L.		2500		43	RUN	90 270 235		2250		41	RUN	70 255 220		2000		38	RUN	54 230 200		S.L.		1900	37	RUN	50 220 190	
SPECIAL NOTES										EXAMPLE										LEGEND												
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED. HIGH BLOWER ABOVE HEAVY LINE										AT 11,500 LB. GROSS WEIGHT WITH 300 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 70 GAL.) TO FLY 1500 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND 7.1 IN. MANIFOLD PRESSURE WITH MIXTURE SET: <input type="checkbox"/>										ALT. : PRESSURE ALTITUDE M.P. : MANIFOLD PRESSURE GPH. : U.S. GAL. PER HOUR TAS. : TRUE AIRSPEED KTS. : KNOTS S.L. : SEA LEVEL F.R. : FULL RICH A.R. : AUTO-RICH A.L. : AUTO-LEAN C.L. : CRUISING LEAN M.L. : MANUAL LEAN F.T. : FULL THROTTLE												
DATA AS OF 5-8-45										BASED ON: FLIGHT TEST DATA																						

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

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Appendix I

For use with V-1650-3 engine only regardless of airplane model.

Figure 73 (Sheet 2 of 2 Sheets)—Flight Operation Instruction Chart—6 Rockets and Two 75-gallon Tanks

LIMITS		RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. 171)	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.	NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). ¹ TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.		
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		167 168						
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		167 168						
<p>AIRCRAFT MODEL(S) P-51D AND P-51K</p> <p>ENGINE(S): V-1650-3</p> <p>FLIGHT OPERATION INSTRUCTION CHART</p> <p>CHART WEIGHT LIMITS: 10,800 TO 9200 POUNDS</p> <p>EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 75-GALLON COMBAT TANKS</p>													
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V	
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES	
STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL		STATUTE NAUTICAL		STATUTE NAUTICAL		GAL.		STATUTE NAUTICAL	
740 660		640 570		269 240		860 770		1040 940		1200 1060		1040 940	
600 550 490		520 480 430		220 200 180		700 640 580		860 780 700		960 900 810		860 780 700	
440 380 330		380 330 280		160 140 120		510 460 380		520 550 470		770 630 540		620 550 470	
270 220 180 140 110		240 180 140 100		100 80 60 40		320 260 190 130		300 310 230 160		450 360 270 180		300 310 230 160	
MAXIMUM CONTINUOUS		PRESS		(3.2 STAT. (2.75 NAUT.) MI./GAL.)		(3.9 STAT. (3.4 NAUT.) MI./GAL.)		(4.5 STAT. (3.9 NAUT.) MI./GAL.)		PRESS		MAXIMUM AIR RANGE	
R.P.M. M.P. MIX-TURE		APPROX. ALT. FEET		R.P.M. M.P. MIX-TURE		R.P.M. M.P. MIX-TURE		R.P.M. M.P. MIX-TURE		APPROX. ALT. FEET		R.P.M. M.P. MIX-TURE	
2700 46 RUN		100 350 305		40000 35000 30000		2400 F.T. RUN		84 330 285		40000 35000 30000		1850 F.T. RUN	
2700 46 RUN		96 330 285		26000		2350 F.T. RUN		81 315 275		25000		1700 35 RUN	
2700 46 RUN		119 345 300		20000		2350 F.T. RUN		79 310 270		20000		1700 35 RUN	
2700 46 RUN		115 325 280		15000		2200 F.T. RUN		76 295 255		15000		1700 35 RUN	
2700 46 RUN		110 310 270		10000		2200 F.T. RUN		78 290 295		10000		1700 35 RUN	
2700 46 RUN		106 290 250		5000		2200 F.T. RUN		69 265 230		5000		1700 35 RUN	
2700 46 RUN		101 275 240		S.L.		2200 F.T. RUN		64 250 215		S.L.		1700 35 RUN	

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF A CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
AT 10,000 LB. GROSS WEIGHT WITH 230 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 10 GAL.) TO FLY 1000 STAT. AIRMILES AT 16,000 FT. ALTITUDE MAINTAIN 2700 RPM AND 61 IN. MANIFOLD PRESSURE WITH MIXTURE SET: RUN

LEGEND
ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 110-GALLON COMBAT TANKS													
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 12,200 TO 11,000 POUNDS																							
LIMITS	RPM.	M.P. (B.NE.)	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)			INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW ADD OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.			NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M./GAL.) (NO WIND), GALLONS PER HOUR (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONG (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.											
WAR EMERG.	3000	97	LOW	RUN	5 MIN.		167 168																		
MILITARY POWER	3000	91	LOW	RUN	15 MIN.		167 153																		
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V													
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES													
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			STATUTE	NAUTICAL												
1300 1220	1130 1060	400 460		1520 1430	1320 1240	1760 1660	1620 1430	2010 1890	1740 1640	489 460		2100 1980	1820 1720												
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING																									
1170 1110 1010	1010 970 880	440 420 360		1370 1310 1180	1180 1130 1020	1590 1620 1440	1370 1310 1280	1810 1790 1640	1570 1500 1430	440 420 400		1890 1810 1780	1640 1570 1490												
860 800 850	830 780 740	360 340 320		1120 1060 1000	970 920 880	1370 1300 1230	1180 1120 1090	1660 1600 1400	1380 1290 1210	360 360 340		1640 1580 1400	1420 1340 1270												
800 740 690	800 850 800	300 280 260		830 870 810	810 750 700	1160 1080 1010 940	1060 970 870 810	1320 1230 1150 1070	1140 1070 1000 930	320 300 280 260		1380 1290 1210 1120	1190 1120 1040 970												
MAXIMUM CONTINUOUS			PRESS.			(S. STAT. & NAUT.) M./GAL.			(S. STAT. & NAUT.) M./GAL.			(S. STAT. & NAUT.) M./GAL.			PRESS.			MAXIMUM ALT. RANGE							
R.P.M.	M.P. (INCHES)	MIXTURE	TOT. (GPH.)	T.A.S. (MPH.)	ALT. (FEET)	R.P.M.	M.P. (INCHES)	MIXTURE	TOT. (GPH.)	T.A.S. (MPH.)	ALT. (FEET)	R.P.M.	M.P. (INCHES)	MIXTURE	TOT. (GPH.)	T.A.S. (MPH.)	ALT. (FEET)	R.P.M.	M.P. (INCHES)	MIXTURE	TOT. (GPH.)	T.A.S. (MPH.)	ALT. (FEET)		
2700	46	RUN	100	335	290																				
2700	46	RUN	95	320	280	2500												2500							
2700	46	RUN	118	340	295	2690	F.T.	RUN	106	330	285	2450	F.T.	RUN	88	310	270	2250	F.T.	RUN	68	270	235	1980	
2700	46	RUN	115	320	280	1594	2450	43	RUN	100	310	270	2250	41	RUN	82	295	255	2100	F.T.	RUN	64	265	230	1800
2700	46	RUN	110	305	265	1604	2400	43	RUN	96	295	255	2300	41	RUN	79	280	245	2050	39	RUN	62	255	220	1694
2700	46	RUN	106	280	250	6400	2450	43	RUN	82	280	245	2250	41	RUN	74	265	230	2050	39	RUN	60	245	215	5400
2700	46	RUN	101	275	240	S.L.	2450	43	RUN	86	265	230	2250	41	RUN	76	250	215	2050	39	RUN	56	230	200	S.L.

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR MAN-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 12,000 LB. GROSS WEIGHT WITH 400 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 80 GAL.) TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2200 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET:

LEGEND
 ALT. : PRESSURE ALTITUDE F.T. : FULL RICH
 M.P. : MANIFOLD PRESSURE A.R. : AUTO-RICH
 GPH. : U.S. GAL. PER HOUR A.L. : AUTO-LEAD
 TAS : TRUE AIRSPEED C.L. : CRUISING LEAD
 KTS. : KNOTS M.L. : MANUAL LEAD
 S.L. : SEA LEVEL F.T. : FULL THROTTLE

DATA AS OF 5-8-43 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

LIMITS		RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.N.	FOR DETAILS SEE POWER PLANT CHART (FIG. 1-111)	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.	NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.P./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.N.): MULTIPLY U.S. GAL. (OR G.P.N.) BY 10 THEN DIVIDE BY 12.							
MAR EMERG.		3000	67	LOW HIGH	RUN	5 MIN.	187 168	187 168										
MILITARY POWER		3000	61	LOW HIGH	RUN	15 MIN.	167 153	167 153										
<p>AIRCRAFT MODEL(S) P-51D AND P-51K</p> <p>ENGINE(S): V-1650-3</p> <p>FLIGHT OPERATION INSTRUCTION CHART</p> <p>CHART WEIGHT LIMITS: 11,000 TO 9500 POUNDS</p> <p>EXTERNAL LOAD ITEMS 6 ROCKETS AND 2 - 110-GALLON COMBAT TANKS</p>																		
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V							
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES							
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL						
710 640	620 550	269 240		680 770	750 670	1020 910	890 790	1180 1050	1030 920	289 240	1220 1080	1060 950						
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING ⁶¹																		
580 530 480	510 460 410	220 200 180		700 640 580	610 560 500	840 760 680	690 660 590	870 800 790	840 760 690	220 200 180	1000 910 820	870 790 710						
420 370 320	370 320 280	160 140 120		510 450 380	440 390 330	610 530 480	530 460 400	700 620 530	610 530 460	160 140 120	730 640 550	630 550 470						
260 210 160 110	230 180 140 90	100 80 60 40		320 280 190 130	280 220 170 110	380 300 230 150	330 260 200 130	440 350 260 180	380 310 230 150	100 80 60 40	450 360 270 180	390 320 240 160						
MAXIMUM CONTINUOUS PRESS. (3.2 STAT. (2.8 NAUT.) MI./GAL.) (3.8 STAT. (3.3 NAUT.) MI./GAL.) (4.8 STAT. (3.6 NAUT.) MI./GAL.)																		
R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			R.P.M.	M.P. INCHES	MIX-TURE	APPROX.			
			TOT. GPH.	T.A.S. MPH.	KTS.				TOT. GPH.	T.A.S. MPH.	KTS.				TOT. GPH.	T.A.S. MPH.	KTS.	
2700	46	RUN	100	345	300				2400	F.T.	RUN	84	320	280				
2700	46	RUN	96	330	285	25000			2400	42	RUN	83	310	270	25000			
2700	46	RUN	119	340	295	20000	2550	F.T.	RUN	104	330	285	2400	F.T.	RUN	80	305	265
2700	46	RUN	115	320	280	15000	2450	42	RUN	97	310	270	2200	40	RUN	76	290	250
2700	46	RUN	110	305	265	10000	2450	42	RUN	94	295	255	2200	40	RUN	73	275	240
2700	46	RUN	106	290	250	5000	2400	42	RUN	85	275	240	2200	40	RUN	69	260	225
2700	46	RUN	101	275	240	S.L.	2400	42	RUN	80	260	225	2200	40	RUN	64	245	215
2700	46	RUN	119	340	295	20000	2550	F.T.	RUN	104	330	285	2400	F.T.	RUN	80	305	265
2700	46	RUN	115	320	280	15000	2450	42	RUN	97	310	270	2200	40	RUN	76	290	250
2700	46	RUN	110	305	265	10000	2450	42	RUN	94	295	255	2200	40	RUN	73	275	240
2700	46	RUN	106	290	250	5000	2400	42	RUN	85	275	240	2200	40	RUN	69	260	225
2700	46	RUN	101	275	240	S.L.	2400	42	RUN	80	260	225	2200	40	RUN	64	245	215

For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 11,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 40 GAL.) TO FLY 950 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2150 RPM AND 42 IN. MANIFOLD PRESSURE WITH MIXTURE SET: **RUN**

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH. : U.S. GAL. PER HOUR
TAS. : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 1 - 110-GALLON COMBAT TANK AND 1 - 1000-LB. BOMB																											
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,900 TO 11,000 POUNDS																																					
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY RFLW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.I./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALOFT (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.																											
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		187 168																																
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		167 158																																
COLUMN I		FUEL			COLUMN II		COLUMN III		COLUMN IV		FUEL			COLUMN V																									
RANGE IN AIRMILES		U.S.			RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.			RANGE IN AIRMILES																									
STATUTE	NAUTICAL	GAL.			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.			STATUTE	NAUTICAL																								
1080	940	379			1320	1140	1580	1370	1830	1590	379			1830	1670																								
1030 970	890 840	360 340			1250 1190	1080 1030	1500 1420	1300 1230	1740 1650	1510 1430	360 340			1840 1740	1590 1510																								
910 850	790 740	320 300			1120 1050	970 910	1350 1250	1170 1080	1550 1450	1340 1270	320 300			1840 1640	1420 1330																								
800 740	690 640	280 260			980 910	850 790	1170 1090	1010 950	1380 1270	1180 1100	280 260			1440 1340	1250 1160																								
MAXIMUM CONTINUOUS				PRESS. (3.45 STAT. (3.0 NAUT.) MI./GAL.)				PRESS. (4.1 STAT. (3.5 NAUT.) MI./GAL.)				PRESS. (4.75 STAT. (4.1 NAUT.) MI./GAL.)				MAXIMUM AIR RANGE																							
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.			ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.			ALT. FEET																			
			TOT. GPH.	MPH.	KTS.				TOT. GPH.	MPH.	KTS.						TOT. GPH.	MPH.	KTS.																				
						40000 35000 30000							40000 35000 30000							40000 35000 30000																			
2700	46	RUN	96	350	305	25000							25000																										
2700	46	RUN	119	365	315	20000	2550	F.T.	RUN	101	350	305	2400	F.T.	RUN	81	330	285	2100	F.T.	RUN	60	280	245	20000														
2700	46	RUN	115	345	300	15000	2450	43	RUN	99	335	290	2200	F.T.	RUN	75	310	270	2000	F.T.	RUN	59	275	240	15000														
2700	46	RUN	110	325	280	10000	2450	42	RUN	95	315	275	2200	40	RUN	73	295	255	1900	37	RUN	57	265	230	10000														
2700	45	RUN	106	310	270	5000	2400	42	RUN	86	295	255	2200	40	RUN	69	285	245	1950	37	RUN	55	255	220	5000														
2700	46	RUN	101	290	250	S.L.	2400	42	RUN	82	280	245	2200	40	RUN	65	265	230	1950	37	RUN	52	240	210	S.L.														
SPECIAL NOTES																				EXAMPLE										LEGEND									
(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 1) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.																				AT 11,500 LB. GROSS WEIGHT WITH 320 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.) TO FLY 1500 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2100 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: RUN										ALT.: PRESSURE ALTITUDE M.P.: MANIFOLD PRESSURE GPH.: U.S. GAL. PER HOUR TAS.: TRUE AIRSPEED KTS.: KNOTS S.L.: SEA LEVEL F.R.: FULL RICH A.R.: AUTO-RICH A.L.: AUTO-LEAN C.L.: CRUISING LEAN M.L.: MANUAL LEAN F.T.: FULL THROTTLE									
HIGH BLOWER ABOVE HEAVY LINE																																							
DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA																																							

For use with V-1650-3 engine only regardless of airplane model.

Figure 75 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—One 110-gallon Tank and One 1000-pound Bomb

For use with V-1650-3 engine only regardless of airplane model.

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Appendix I

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 1 - 110-GALLON COMBAT TANK AND 1 - 1000-LB. BOMB						
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,900 TO 11,000 POUNDS																
LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY REFLW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.I./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALOWE (NO WIND). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.						
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		187 168											
MILITARY POWER	3000	61	LOW HIGH	RUN	15 MIN.		167 158											
COLUMN I		FUEL		COLUMN II		COLUMN III		COLUMN IV		FUEL		COLUMN V						
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES						
STATUTE	NAUTICAL			STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL			STATUTE	NAUTICAL					
1080	940	379		1320	1140	1580	1370	1830	1590	379		1830	1670					
1030 970	890 840	360 340		1250 1190	1080 1030	1500 1420	1300 1230	1740 1650	1510 1430	360 340		1840 1740	1590 1510					
910 850	790 740	320 300		1120 1050	970 910	1350 1250	1170 1080	1550 1450	1340 1270	320 300		1840 1640	1420 1330					
800 740	690 640	280 260		980 910	850 790	1170 1090	1010 950	1380 1270	1180 1100	280 260		1440 1340	1250 1160					
MAXIMUM CONTINUOUS		PRESS.		(3.45 STAT. (3.0 NAUT.) MI./GAL.)		(4.1 STAT. (3.5 NAUT.) MI./GAL.)		(4.75 STAT. (4.1 NAUT.) MI./GAL.)		PRESS.		MAXIMUM AIR RANGE						
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. T.A.S.			
			TOT. GPH.	MPH.	KTS.				TOT. GPH.	MPH.	KTS.				TOT. GPH.	MPH.	KTS.	
					40000 35000 30000										40000 35000 30000			
2700	46	RUN	96	350	305	25000						25000						
2700	46	RUN	119	365	315	20000	2550	F.T.	RUN	101	350	305	2400	F.T.	RUN	81	330	285
2700	46	RUN	115	345	300	15000	2450	43	RUN	99	335	290	2200	F.T.	RUN	75	310	270
2700	46	RUN	110	325	280	10000	2450	42	RUN	95	315	275	2200	40	RUN	73	295	255
2700	45	RUN	106	310	270	5000	2400	42	RUN	86	295	255	2200	40	RUN	69	285	245
2700	46	RUN	101	290	250	S.L.	2400	42	RUN	82	280	245	2200	40	RUN	65	265	230
1900	37	RUN	57	265	230	10000	1700	35	RUN	48	245	205	2100	F.T.	RUN	60	280	245
1900	37	RUN	55	255	220	5000	1750	35	RUN	45	235	205	2100	F.T.	RUN	59	275	240
1900	37	RUN	52	240	210	S.L.	1750	36	RUN	45	225	195	2100	F.T.	RUN	52	240	210

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE

AT 11,500 LB. GROSS WEIGHT WITH 320 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 50 GAL.) TO FLY 1500 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2100 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET: **RM**

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH. : U.S. GAL. PER HOUR
TAS. : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.

Figure 75 (Sheet 1 of 2 Sheets)—Flight Operation Instruction Chart—One 110-gallon Tank and One 1000-pound Bomb

For use with V-1650-3 engine only regardless of airplane model.

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Appendix I

AIRCRAFT MODEL(S) P-51D AND P-51K		FLIGHT OPERATION INSTRUCTION CHART										EXTERNAL LOAD ITEMS 1 - 110-GALLON COMBAT TANK AND 1 - 1000-LB. BOMB					
ENGINE(S): V-1650-3		CHART WEIGHT LIMITS: 11,000 TO 9600 POUNDS															
LIMITS	RPM	M.P. (A.H.G.)	SLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.R.	INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.				NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (M.I./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALOFT (NO WIND) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.					
WAR EMERG.	3000	67	LOW HIGH	RUN	5 MIN.		187 168										
MILITARY POWER	3000	81	LOW HIGH	RUN	15 MIN.		167 153										
COLUMN I		FUEL		COLUMN II				COLUMN III				FUEL		COLUMN V			
RANGE IN AIRMILES		U.S. GAL.		RANGE IN AIRMILES				RANGE IN AIRMILES				U.S. GAL.		RANGE IN AIRMILES			
STATUTE	NAUTICAL			STATUTE	NAUTICAL			STATUTE	NAUTICAL			STATUTE	NAUTICAL			STATUTE	NAUTICAL
770 690	670 600	268 240	940 840	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING		820 730	1130 1010	980 870	1320 1170	1140 1020	268 240	1390 1240	1210 1080				
630 570 510	550 500 450	220 200 180	770 700 630	670 610 550	820 840 760	800 730 660	1080 980 880	930 850 760	1080 980 880	220 200 180	1140 1030 930	990 900 810					
460 400 340	400 350 300	160 140 120	560 490 420	480 430 360	670 590 500	580 510 440	780 690 590	680 590 510	780 690 590	160 140 120	830 720 620	720 630 540					
290 230 170 110	250 200 150 100	100 80 60 40	350 280 210 140	300 240 180 120	420 340 250 170	360 290 220 150	490 390 290 200	420 340 250 170	490 390 290 200	100 80 60 40	620 410 310 210	450 360 270 180					
MAXIMUM CONTINUOUS				PRESS (3.5 STAT. (3.0 NAUT.) MI./GAL.)				PRESS (4.2 STAT. (3.65 NAUT.) MI./GAL.)				PRESS (4.9 STAT. (4.2 NAUT.) MI./GAL.)					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. ALT. FEET		
			40000 35000 30000				40000 35000 30000				40000 35000 30000				40000 35000 30000		
2700	46	RUN	96 355 310	2500			2300	49	RUN	89 335 290	2500				2300		
2700	46	RUN	110 365 315	2000	F.T.	RUN	100 350 305	2350	F.T.	RUN	86 330 285	2100	F.T.	RUN	59 285 245		
2700	46	RUN	115 345 300	1500	2400	42	RUN	95 330 285	2200	F.T.	RUN	78 310 270	1950	F.T.	RUN	57 275 240	
2700	46	RUN	110 325 280	1000	2400	42	RUN	89 310 270	2200	40	RUN	72 295 255	1900	37	RUN	55 265 230	
2700	46	RUN	106 310 270	5000	2400	42	RUN	86 295 255	2150	40	RUN	66 275 240	1800	37	RUN	52 250 215	
2700	46	RUN	101 290 250	S.L.	2400	42	RUN	82 280 245	2150	40	RUN	62 260 225	1850	37	RUN	49 235 205	

Figure 75 (Sheet 2 of 2 Sheets)-Flight Operation Instruction Chart-One 110-gallon Tank and One 1000-pound Bomb
 For use with V-1650-3 engine only regardless of airplane model.

For use with V-1650-3 engine only regardless of airplane model.

SPECIAL NOTES
 (1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
HIGH BLOWER ABOVE HEAVY LINE

EXAMPLE
 AT 11,000 LB. GROSS WEIGHT WITH 220 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 70 GAL.) TO FLY 1000 STAT. AIRMILES AT 20,000 FT. ALTITUDE MAINTAIN 2400 RPM AND F.T. IN MANIFOLD PRESSURE WITH MIXTURE SET:

LEGEND
 ALT. : PRESSURE ALTITUDE
 M.P. : MANIFOLD PRESSURE
 GPH : U.S. GAL. PER HOUR
 TAS : TRUE AIRSPEED
 KTS. : KNOTS
 S.L. : SEA LEVEL
 F.R. : FULL RICH
 A.R. : AUTO-RICH
 A.L. : AUTO-LEAN
 C.L. : CRUISING LEAN
 M.L. : MANUAL LEAN
 F.T. : FULL THROTTLE

DATA AS OF 5-8-45 BASED ON: FLIGHT TEST DATA

For use with V-1650-3 engine only regardless of airplane model.