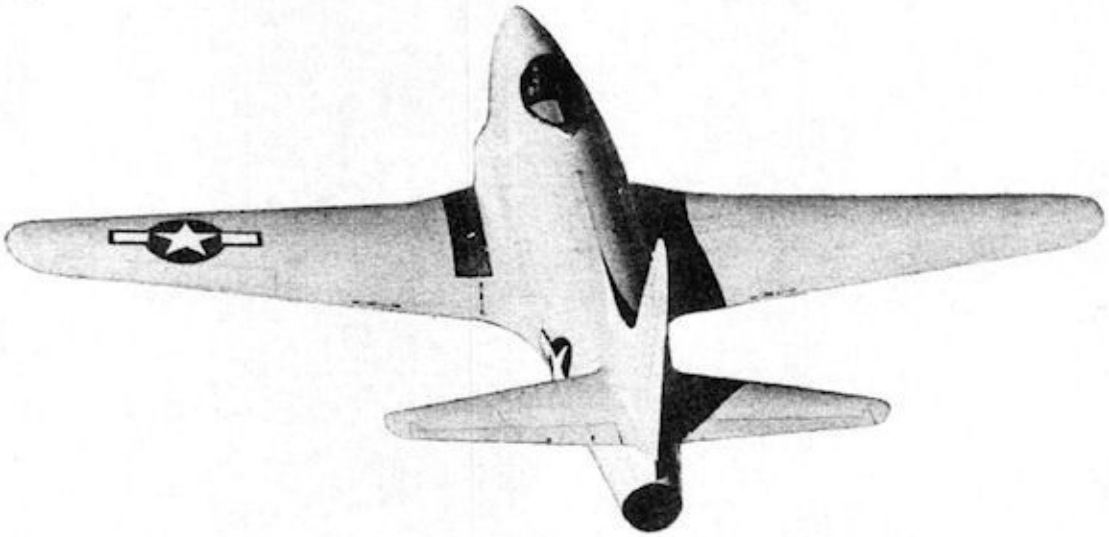
PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

ARMY MODEL

P-80A-1 AIRPLANE



This publication replaces AN 01-75FJ-1 dated 5 March 1945.

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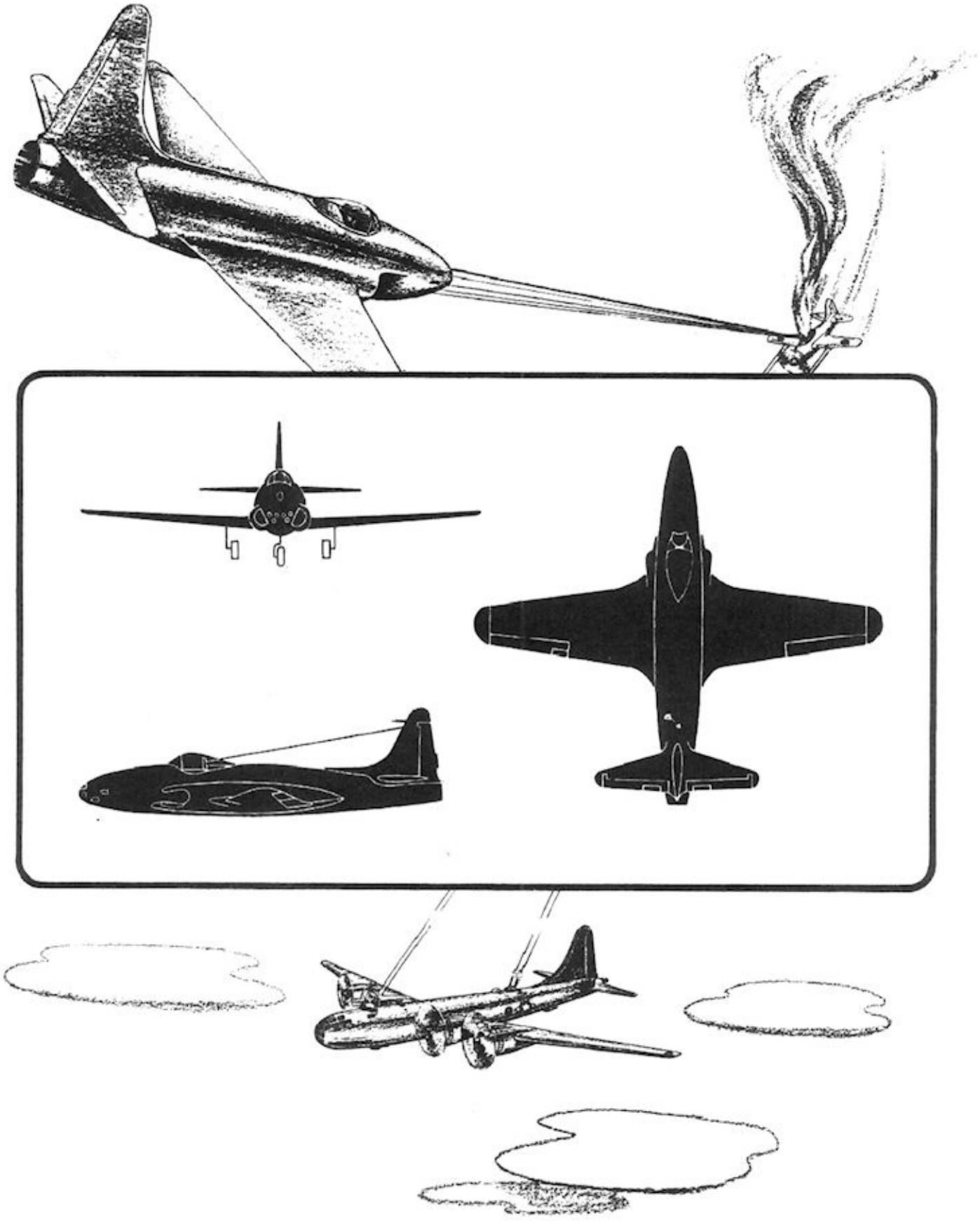
TABLE OF CONTENTS



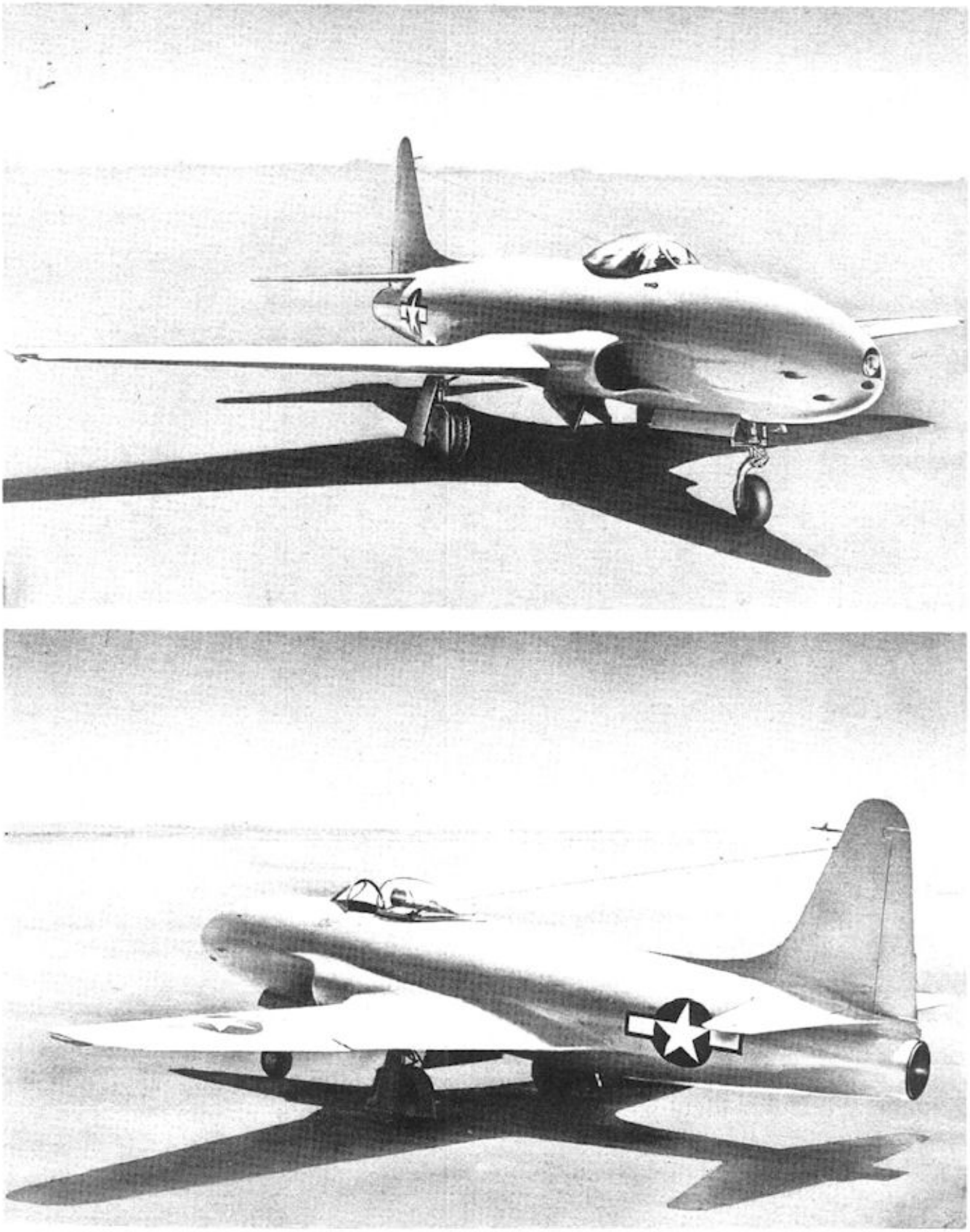
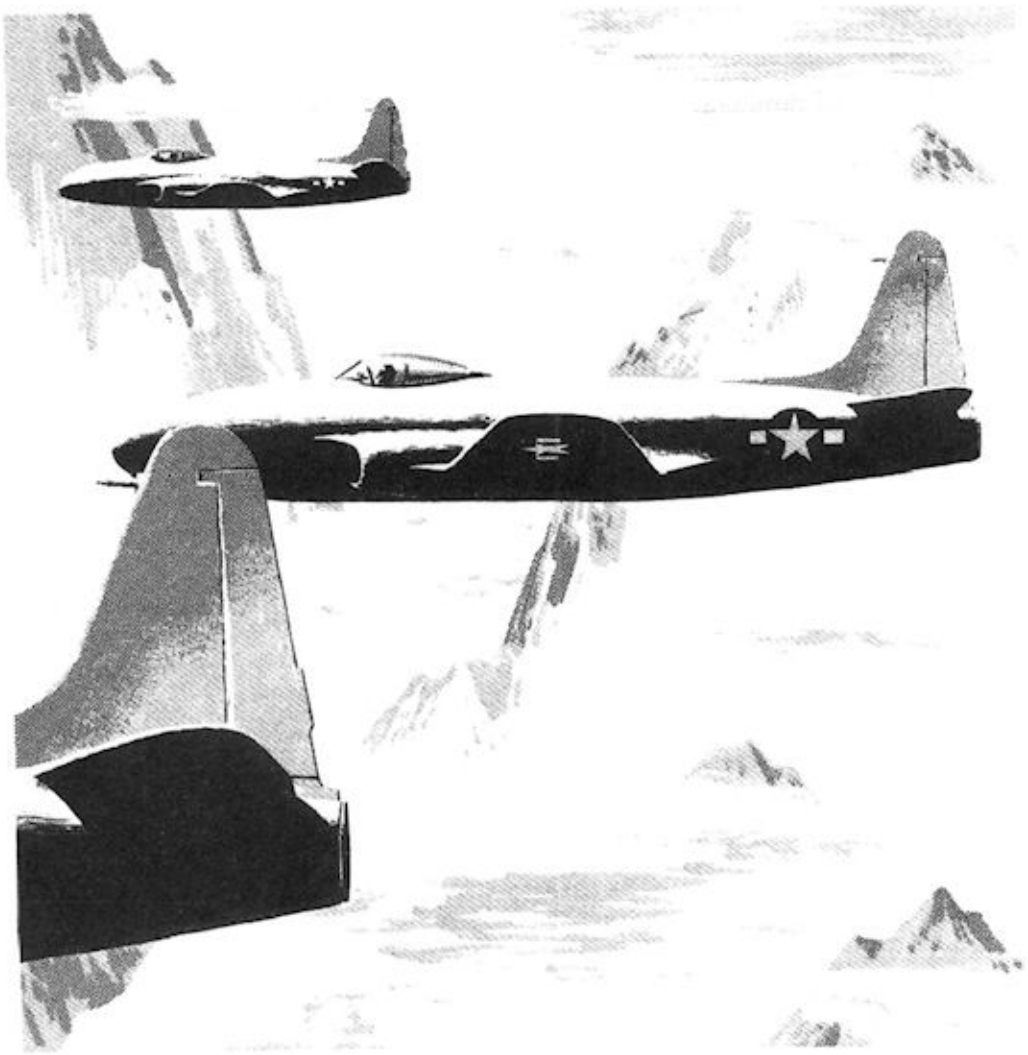


Figure 1 — The Airplane



Section I Description

1. GENERAL.

a. The P-80A is a single place, jet propelled fighter airplane.

b. The approximate overall dimensions of the airplane are as follows:

(1) Wing span—39 ft.

(2) Fuselage length—34 ft. 6 in.

(3) Height (to top of rudder)—11 ft. 4 in.

c. The airplane gross weight runs between 8,000 pounds (empty) and 14,000 pounds (with max. fuel load).

d. The power plant, referred to hereafter as the engine, is a General Electric I-40 jet propulsion unit.

2. FLIGHT CONTROLS.

a. CONTROL SURFACES.

(1) The aileron forces are reduced by a hydraulic aileron booster unit. (See section I, paragraph 6.) The ailerons are spring loaded to the neutral position. Aileron, elevator, and rudder controls are conventional.

(2) The elevator forces are reduced by the elevator spring tab and the elevator servo tab.

(a) A spring in the elevator control system acts to assist holding the elevator in either the up or the down position. This arrangement gives a peculiar feel to the control on the ground. That is, considerable force will be required to lift the elevator. After it has passed the 20° up position, the elevator will stay up of its own accord. The presence of the spring is not noticeable in flight.

(b) The spring loaded elevator tab acts to assist the pilot whenever the pull on the control stick reaches approximately 10 pounds. When the pull on the control stick reaches approximately 30 pounds, the spring tab is fully deflected.

(3) The rudder is spring loaded toward the neutral position.

b. CONTROL SURFACE LOCK.

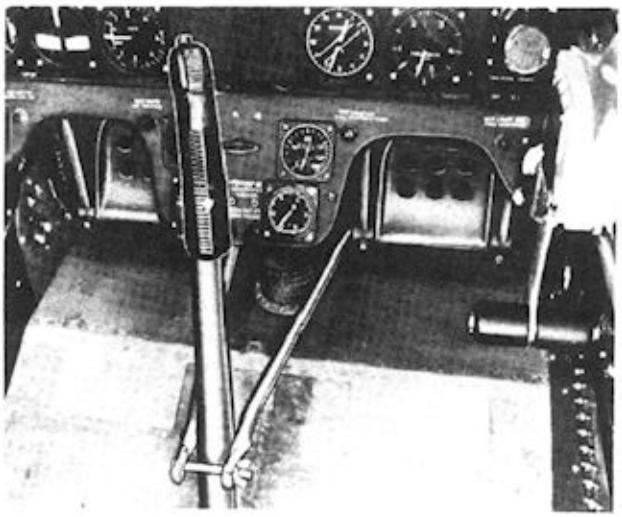


Figure 2 — Control Surface Lock

c. TRIM TABS.

(1) Trim tabs on the left aileron and on the elevator are electrically operated. The electric motors are controlled by switches in the cockpit.

(a) Aileron tab switch (figure 6-2).

(b) Elevator tab switch (figure 7-19).

(2) An indicator light (figure 7-29) glows when the elevator tabs are in the neutral position.

(3) The rudder tab is not controllable from the cockpit.

CAUTION

The tab motors and the wing flap motors coast for about 3 seconds after the switches are turned off. Do not reverse these motors without allowing time for them to stop rotating.

d. WING FLAPS.

(1) The wing flaps are operated by two electric motors, one for each flap. The wing flap position indicator (figure 6-13) shows the position of the flaps at all times.

(2) The left and right wing flaps are interconnected so that either motor may operate both flaps if the other motor should fail. There is no emergency wing flap extension system on this airplane.

KEEP FOREIGN OBJECTS OUT OF INTAKE DUCTS

3. LANDING GEAR CONTROLS.

a. Normally, the landing gear is retracted or extended by raising or lowering the landing gear control lever (figure 6-26).

b. In an emergency, it is possible to pump the landing gear down by using the hand pump (figure 8-18) with the landing gear emergency selector (figure 8-19) in the *emergency* position and the landing gear control (figure 6-26) *down.*

c. LANDING GEAR POSITION INDICATOR.

(1) Two lights (figure 7-26) indicate the landing gear position. The green light is on whenever the landing gear is down and locked. The red light comes on, and a warning horn sounds if the throttle is closed when the landing gear is not down and locked. The horn may be silenced by pushing the switch (figure 6-15). The switch is automatically reset when the throttle is opened.

4. BRAKE CONTROLS.

a. The brakes are operated by conventional toe brake pedals. A parking brake (figure 7-25) locks the brakes for extended periods. There are no emergency braking provisions on this airplane.

5. HYDRAULIC SYSTEM CONTROLS.

(See figure 3.)

a. The electrically operated hydraulic pump motor runs on power from the engine generator. The hydraulic pump is in operation whenever the generator is on; it cannot be operated on power from the airplane battery.

b. Hydraulic power is used to operate the aileron booster, the landing gear and the dive flaps.

6. AILERON BOOSTER CONTROLS.

a. The aileron booster is a source of power which assists the pilot in the operation of the ailerons. The pilot supplies approximately 1/15 of the force required and the booster supplies the rest. This system does not destroy the "feel" of the aileron control as it supplies only a fixed portion of the total force required. The remaining force applied by the pilot changes normally with changes in speed and rate of roll.

b. The aileron booster shut-off valve is automatic and operates whenever the system pressure drops below approximately 250 lb/sq in. The manual shut-off valve cannot be operated from the cockpit.

c. The aileron booster may be shut off in flight by turning the generator switch off and thereby stopping the hydraulic pump motor.

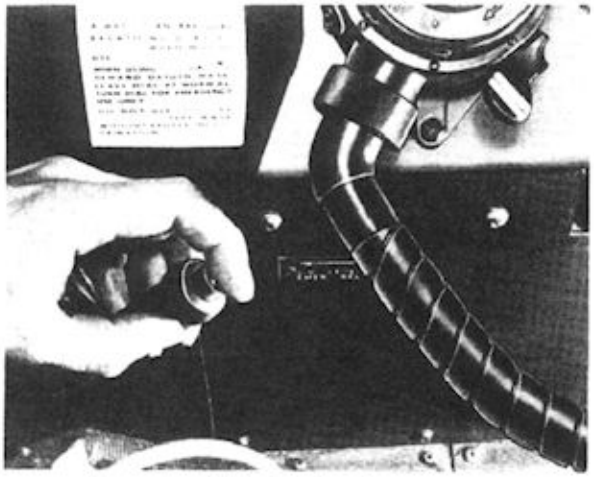
7. DIVE FLAP CONTROLS.

(If installed)

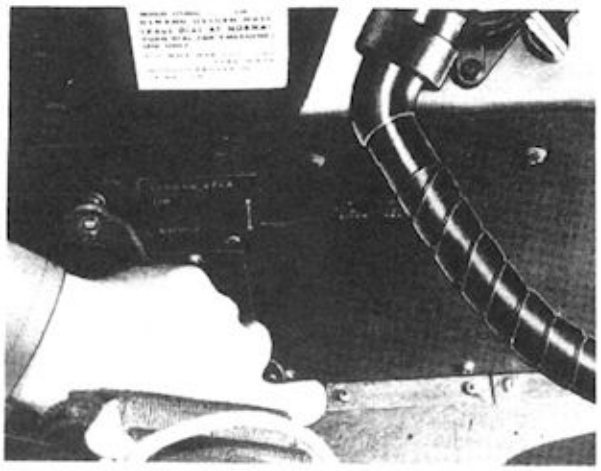
a. The dive flaps are controlled by a switch (figure 6-11), which operates an electrically actuated hydraulic valve. It is not possible to stop the dive flaps in any intermediate position; they must be either full up or full down.

NORMAL OPERATION

Landing gear control.

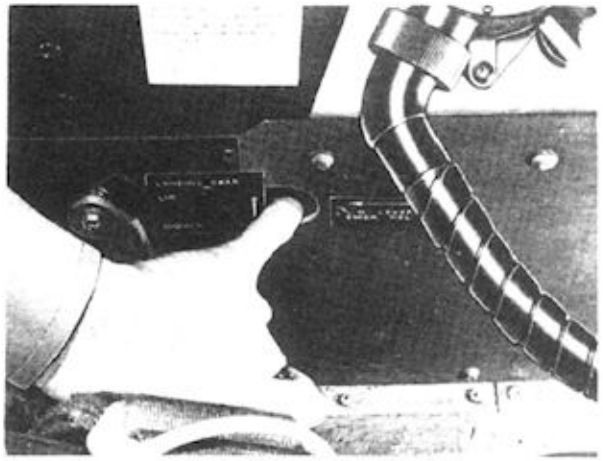


Control position for landing gear up.

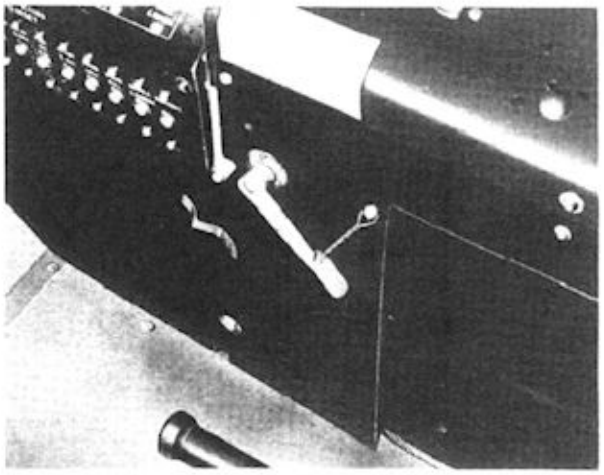


Control position for landing gear down.

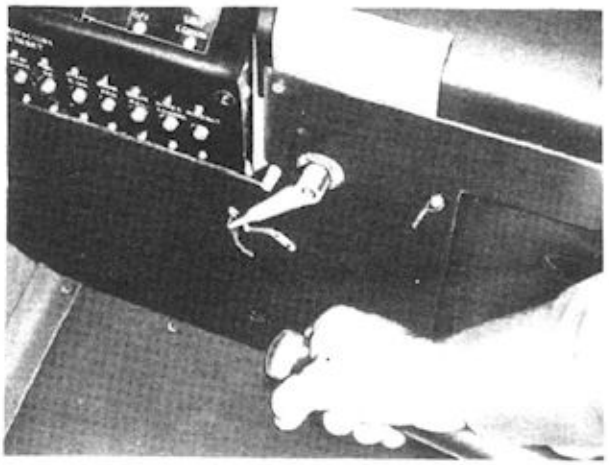
EMERGENCY OPERATION



If the landing gear control will not move out of the down position, push the control lock release aft and then move the control.



Break safety wire on the emergency bypass valve control and push the control to emergency.



Operate the hand pump until the gear is down.

Figure 3 — Hydraulic System Controls Diagram

8. ELECTRICAL CONTROLS.

a. GENERAL.

(1) The electrical system is in operation whenever the battery switch (figure 8-3) and the generator switch (figure 8-4) are in the on position.

b. CIRCUIT BREAKERS.

(1) Each electrical circuit in the airplane is protected by a thermal circuit breaker (figure 6-10). The circuit breakers may be reset by pushing the button for the circuit that has failed. The generator and hydraulic pump circuit breaker is not accessible to the pilot in flight.

c. EXTERNAL POWER SUPPLY CONNECTION.

(1) The external power supply plugs into a socket in the aft end of the right wing fuselage fillet.

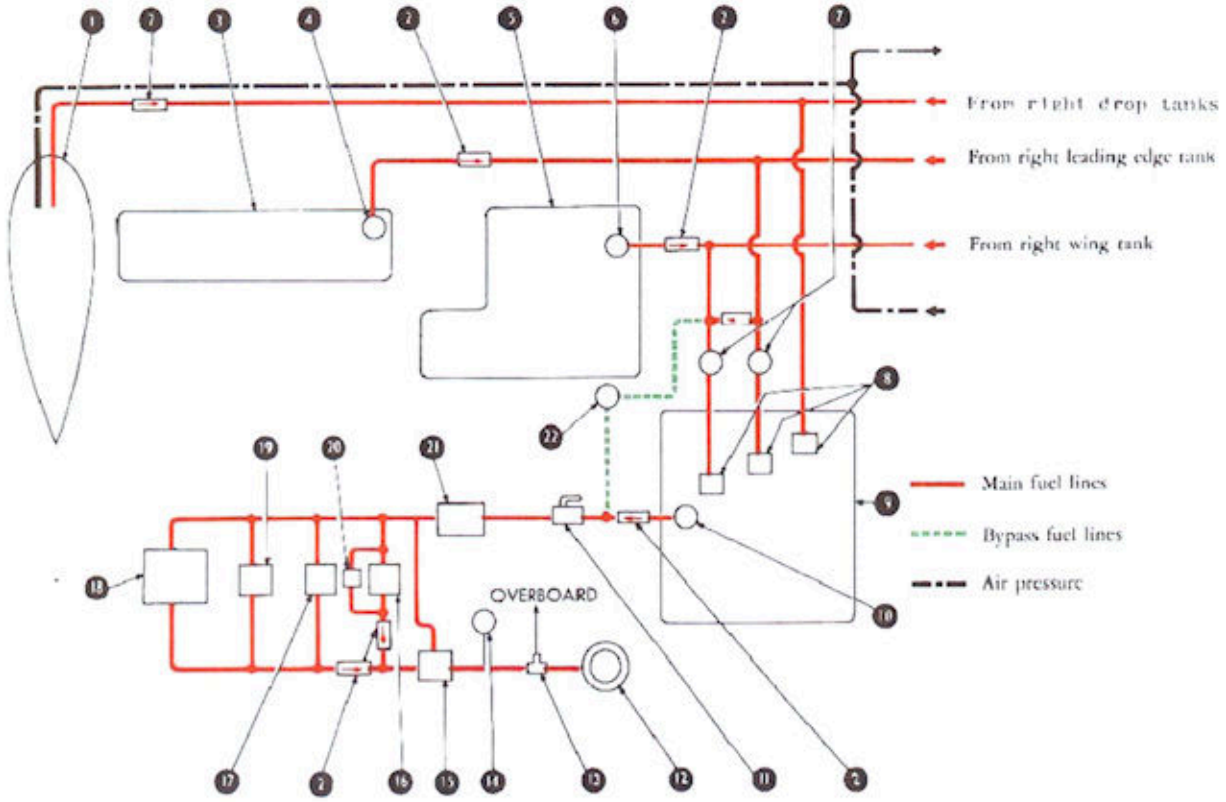
9. FUEL SYSTEM CONTROLS.

(See figure 5.)

a. Under normal conditions, all the fuel is transferred to the main tank before being fed to the engine. This transfer is accomplished first from the droppable tanks, next, from the leading edge tanks, and last, from the wing tanks. All the transferring operation is automatic if the fuel tank selector switches (figure 6-18; 6-19; 6-21; 6-22) are properly set.

b. FUEL TANK SELECTOR SWITCHES.

(1) DROPPABLE TANKS. *(See figure 6-22.)*— This switch opens an electrically operated valve admitting air pressure from the engine into the droppable tanks. This pressure forces fuel through a float valve, into the main tank. The main tank is kept full until the droppable tanks are empty.



1. Droppable tank (capacity 165 U.S. gal.) (137 Imperial gal.)
2. Check valve
3. Leading edge tank (capacity 48 U.S. gal. in each wing) (40 Imperial gal.) (With self-sealing tanks installed)
4. Leading edge tank transfer pump
5. Wing tank (capacity 65 U.S. gal. in each wing) (54 Imperial gal.)
6. Wing tank transfer pump
7. Bypass valves
8. Float valves
9. Fuselage tank (capacity 207 U.S. gal.) (172 Imperial gal.)
10. Fuselage tank booster pump
11. Manual shut-off valve
12. Burner ring
13. Drip valve
14. Fuel pressure gage
15. Engine control valve (throttle)
16. Starting fuel pump
17. Governor
18. Engine driven fuel pump
19. Barometric control
20. Relief valve
21. Filter
22. Bypass valve

Figure 4 — Fuel Flow Diagram

(2) LEADING EDGE TANKS. *(See figure 6-21.)* —This switch operates an electric transfer pump in each group of leading edge tanks. These pumps force fuel through another float valve, located about one inch below the droppable tank float valve, in the main tank. The fuel level in the main tank is maintained at the level of the leading edge tank float until these tanks are empty.

(3) WING TANKS. *(See figure 6-19.)* — This switch operates an electric transfer pump in each group of wing tanks. These pumps feed fuel to the main tank through another float valve located about one inch below the leading edge tank float valve. The fuel in the main tank is maintained at this level until the wing tanks are empty.

(4) MAIN TANK. *(See figure 6-18.)*—This is a two position, momentary contact switch. It serves the following purposes:

(a) When held in the up position for two or three seconds, this switch starts the fuel booster pump, located in the main fuel tank, and at the same time, sets the main tank bypass valves for normal operation.

(b) When held in the down position for two or three seconds, this switch shuts off the fuel booster pump and sets the main tank bypass valves for emergency operation.

(c) The indicator light (figure 6-17) above the main tank selector switch is on whenever the booster pump is on.

c. FUEL TANK INDICATOR LIGHTS.

(1) Indicator lights (figure 6-24) for wing, leading edge, and droppable tanks operate from pressure switches within the fuel lines from each group of tanks. These lights come on to indicate that the tanks are empty.

(a) The pilot should turn the tank selector switch off soon after the indicator light comes on. This will save the booster pump motors and, in the case of droppable tanks, will prevent robbing the engine of air.

d. FUEL QUANTITY INDICATOR.—The fuel gage (figure 7-23) indicates the quantity of fuel in the main tank only. The low level warning light (figure 7-22) comes on when there are approximately 100 U.S. gallons (83 Imperial gallons) remaining in the main tank.

10. THROTTLE CONTROL.

a. The throttle (figure 6-9) is the only power control on this airplane. The throttle regulates the fuel pressure to the burner fuel jets of the engine, and the resulting fuel pressure determines the rpm of the engine.

b. In the shut off position, the throttle completely stops the flow of fuel to the engine.

c. To obtain constant rpm engine operation at all altitudes, the burner ring fuel pressure must be decreased as the altitude is increased. A barometric control is installed in the airplane to accomplish this reduction in fuel pressure automatically, however this unit has not yet been perfected and action on the part of the pilot is occasionally required.

(1) In unusual cases, when engine rpm cannot be reduced sufficiently at altitude, it will be necessary to open the *altitude idle valve* which is located on the cockpit floor. This action will reduce the fuel pressure obtained by any given throttle setting and thus will allow the engine rpm to be regulated as desired.

Note

When the airplanes are delivered from the factory, the altitude idle valve is installed but is not operative. The valve may be connected to operate as above if desired.

(2) The altitude idle valve must be closed at low altitudes. Failure to observe this precaution will result in low fuel pressure, and probable engine failure when the throttle is set to idle. Note section II, paragraph 1, *a*, (4).

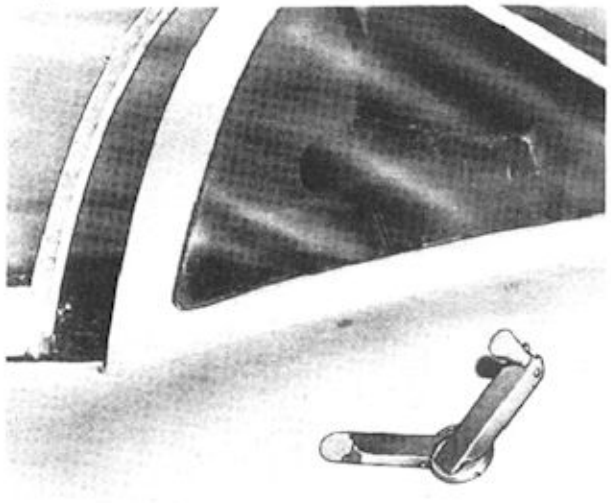
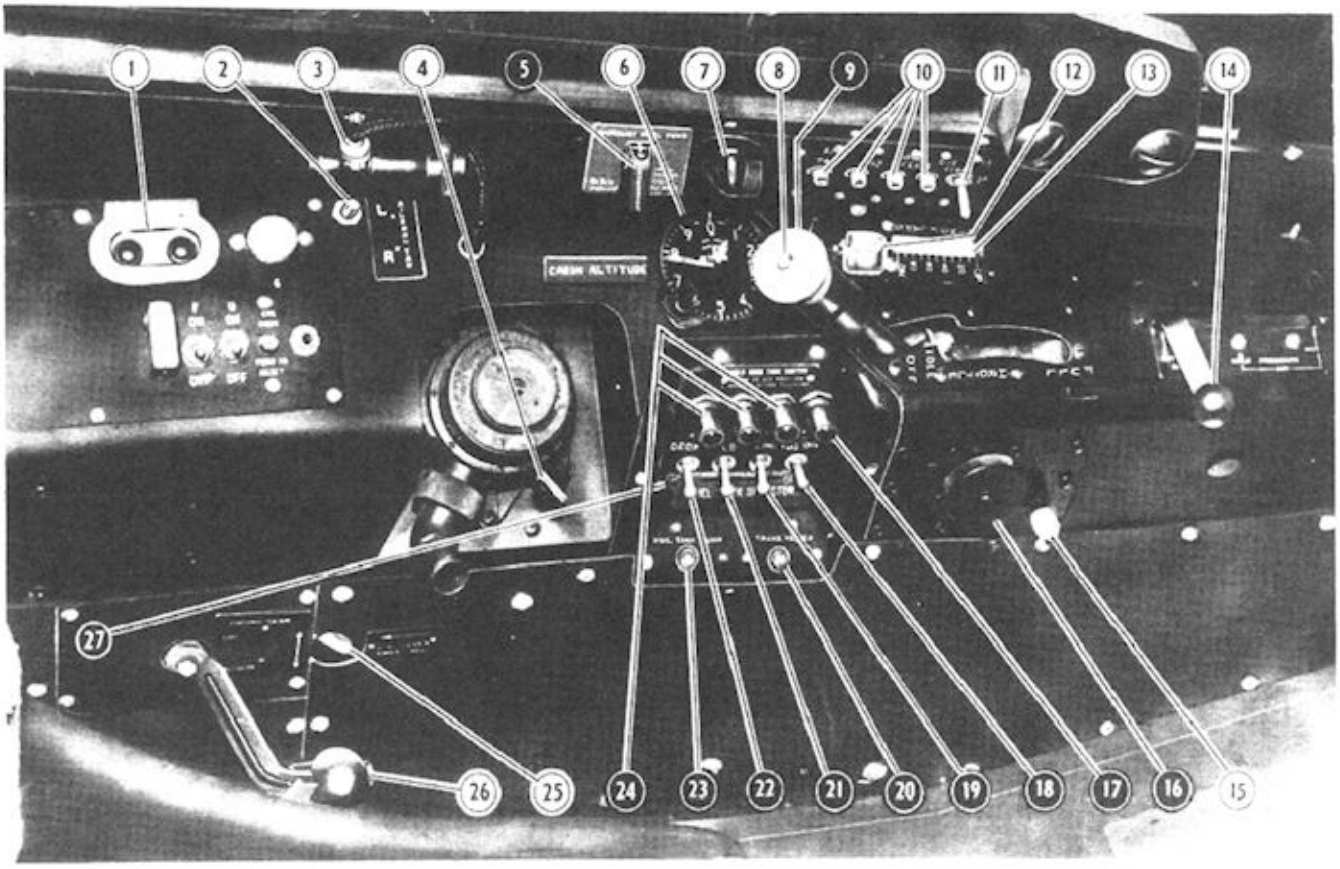
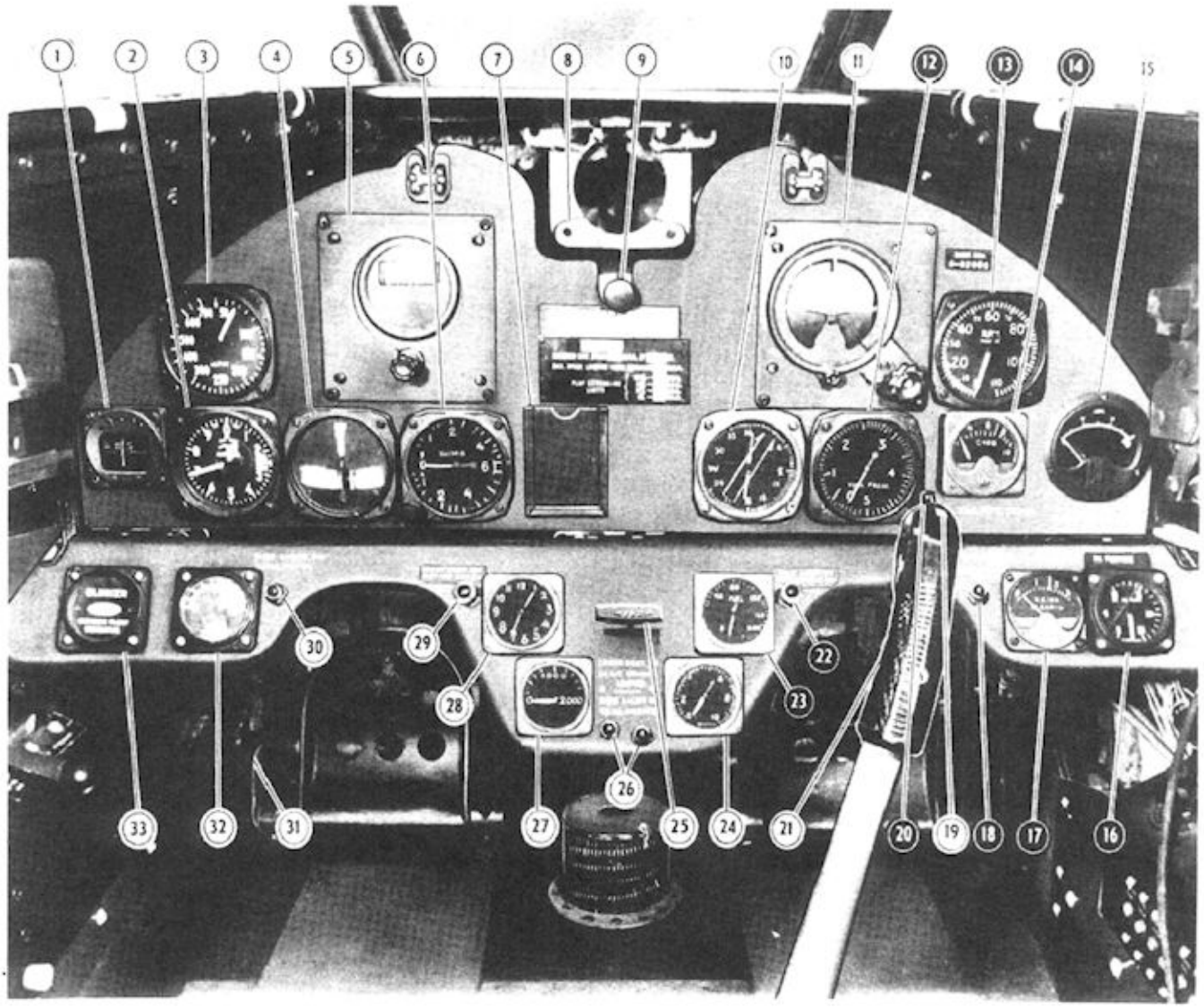


Figure 5 — External Canopy Crank



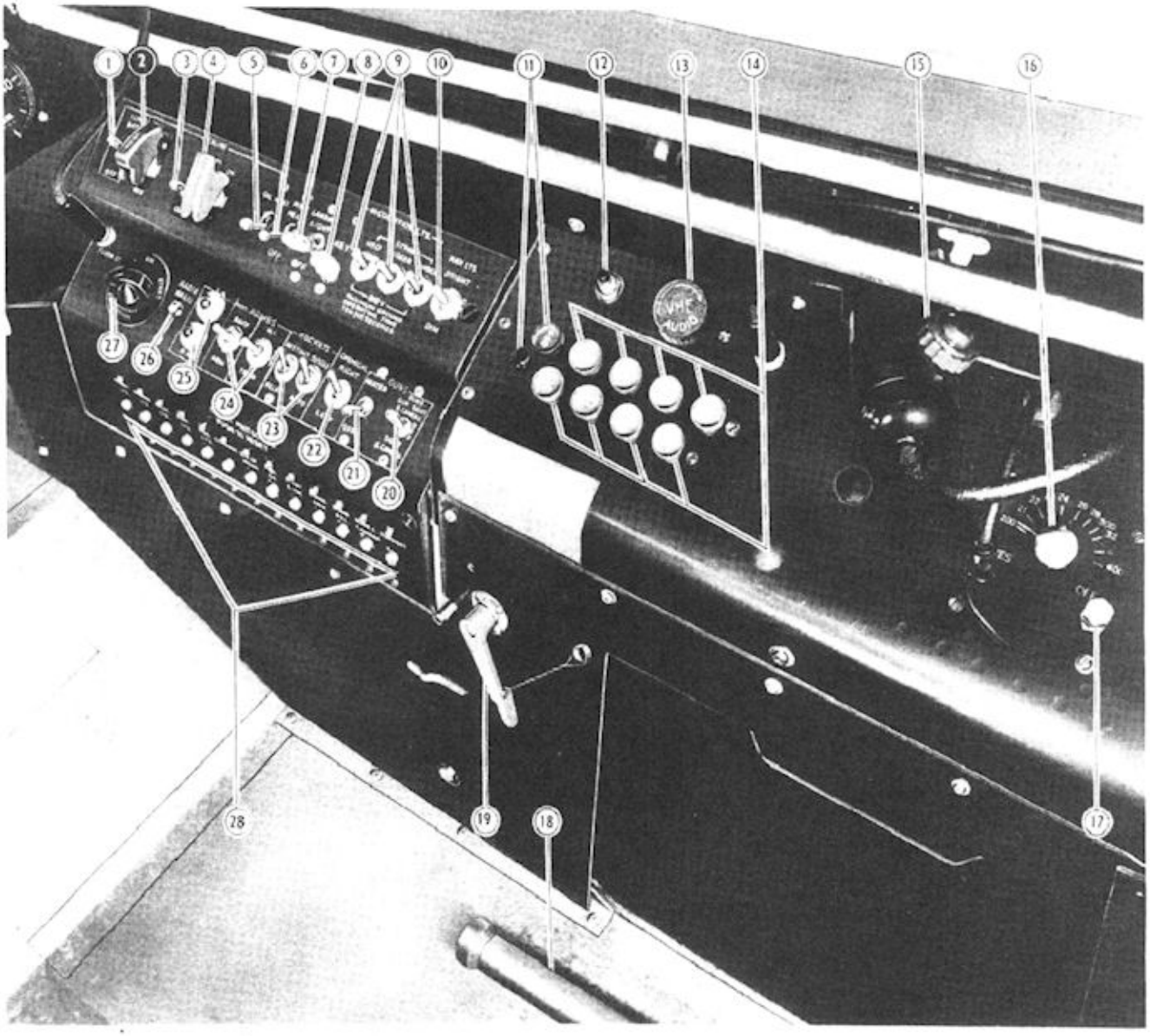
1. SCR 695 Radio control panel
2. Aileron tab switch
3. Fluorescent light
4. Oxygen diluter lever
5. Emergency fuel pump switch
6. Cabin altimeter
7. Fluorescent light switch
8. Microphone button
9. Throttle
10. Circuit breaker re-set buttons
11. Dive flap switch
12. Wing flap switch
13. Wing flap position indicator
14. Cabin pressurization-ventilation control
15. Throttle warning horn shut-off switch
16. Throttle friction control
17. Main tank booster pump indicator light
18. Main tank switch
19. Wing tank selector switch
20. Emergency bypass valve circuit breaker re-set button
21. Leading edge tank selector switch
22. Droppable tank selector switch
23. Main tank booster pump circuit breaker re-set buttons
24. Fuel tank indicator lights
25. Landing gear lever down lock release
26. Landing gear lever
27. Fuel tank selector bar

Figure 6 — Cockpit, Left-hand Side



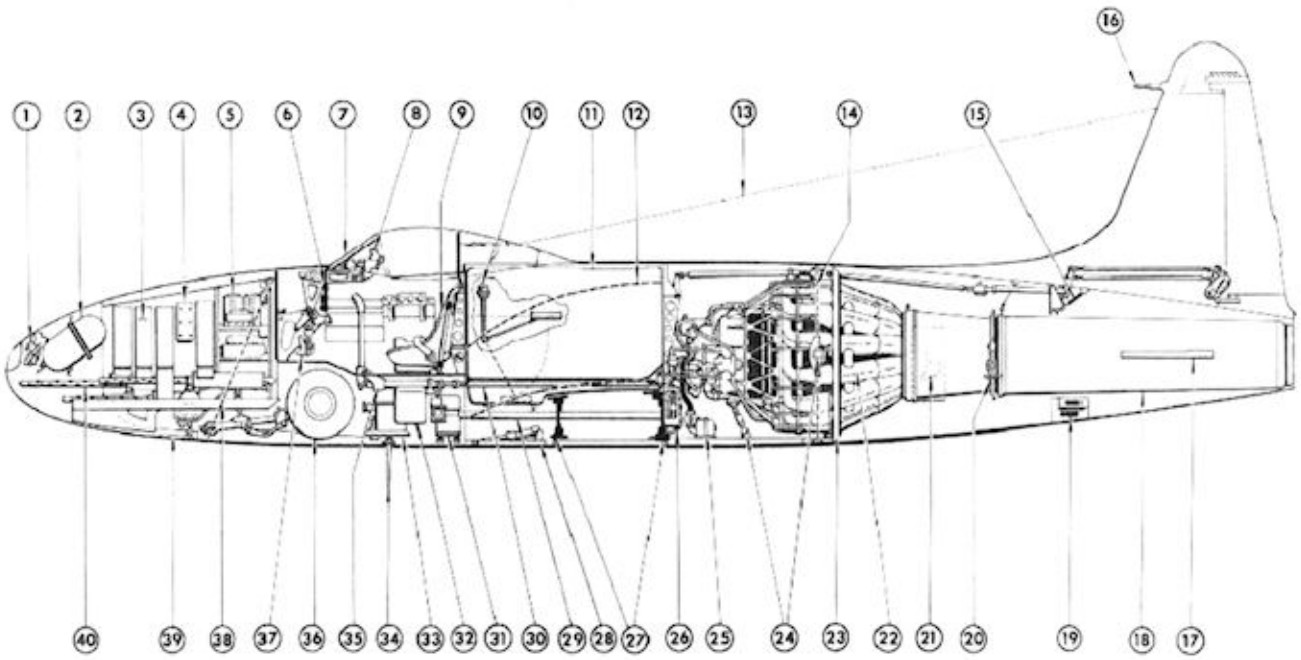
1. Stand-by compass
2. Altimeter
3. Air speed
4. Turn and bank
5. Directional gyro
6. Rate of climb
7. Compass correction card
8. Gun-sight mount
9. Landing light position control
10. Remote compass indicator
11. Gyro-horizon
12. Burner ring fuel pressure
13. Engine tachometer
14. Jet temperature
15. Ammeter
16. Engine oil pressure
17. Rear bearing temperature
18. Fire warning light
19. Elevator tab switch
20. Droppable tank (bomb) release
21. Control stick
22. Main tank low level warning light
23. Main tank fuel quantity
24. Instrument pressure
25. Parking brake handle
26. Landing gear position lights
27. Hydraulic pressure
28. Clock
29. Elevator tab neutral light
30. Emergency fuel pump indicator light
31. Rudder pedal ratchet release
32. Oxygen pressure
33. Oxygen flow indicator

Figure 7 — Instrument Panel



1. Ignition booster switch
2. Starter switch
3. Battery master switch
4. Generator switch
5. Oil heat switch
6. Pitot heat switch
7. Landing light switch
8. Recognition light key
9. Recognition light switches
10. Navigation light switch
11. V.H.F. radio "OFF" switches
12. Radio tone key
13. Radio audio (volume) control
14. V.H.F. frequency selector button
15. Fluorescent light
16. Beacon receiver tuning knob
17. Beacon receiver volume control
18. Emergency hydraulic hand pump
19. Landing gear emergency selector
20. Gun-camera switch
21. Gun heater switch
22. Chemical tank switch
23. Rocket switches
24. Bomb switches
25. Bomb indicator lights
26. Radio receiver circuit breaker re-set button
27. Fluorescent light switch
28. Circuit breaker re-set buttons

Figure 8 — Cockpit, Right-hand Side



1. Landing light
2. Oxygen cylinder
3. Ammunition box
4. Armament junction box
5. Command radio
6. Instrument panel
7. Bullet-proof windshield
8. Gun sight
9. Pilot's seat
10. Fuel gage transmitter
11. Main fuel tank
12. Air intake duct
13. Command radio antenna
14. Aft fuselage joint
15. Elevator spring
16. Air speed pitot
17. Tail pipe support track
18. Tail pipe
19. Remote compass
20. Tail pipe clamp
21. Elevator tab motor
22. Engine
23. Air intake seal
24. Engine mounts
25. Fuel filter
26. Aileron booster
27. Wing spars
28. Dive flaps
29. Aileron torque tube
30. Elevator push-pull tube
31. Identification radio
32. Electrical junction box
33. Battery
34. Identification radio antenna
35. Elevator-aileron control
36. Nose wheel
37. Rudder pedals
38. Nose section joint
39. Shell case ejection doors
40. Machine guns — .50 cal.

Figure 9 — Fuselage Contents Arrangement

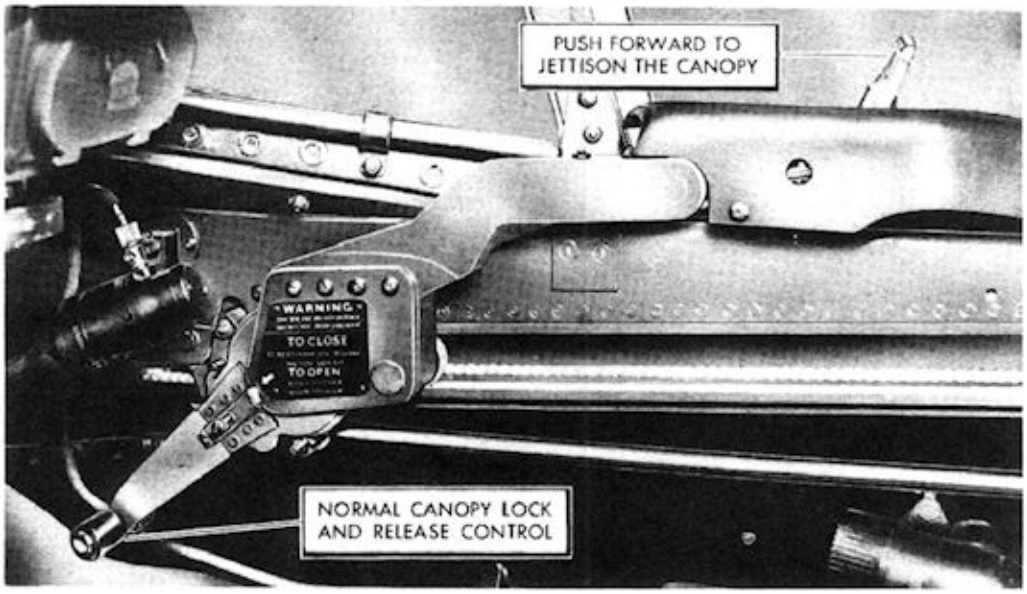


Figure 10 — Canopy Controls

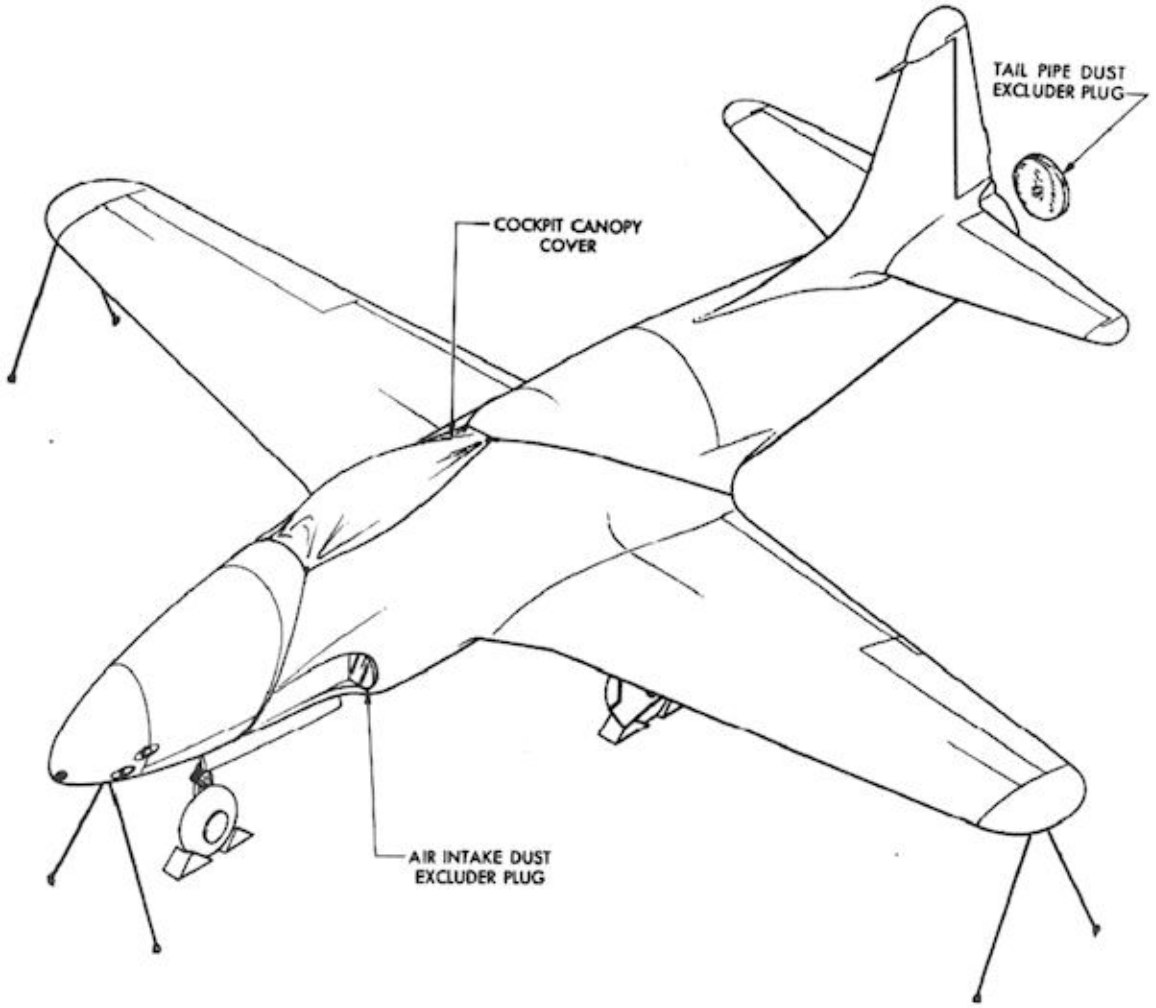


Figure 11 — Mooring Diagram

Section II Flight Operation Instructions

1. BEFORE ENTERING PILOT'S COMPARTMENT.

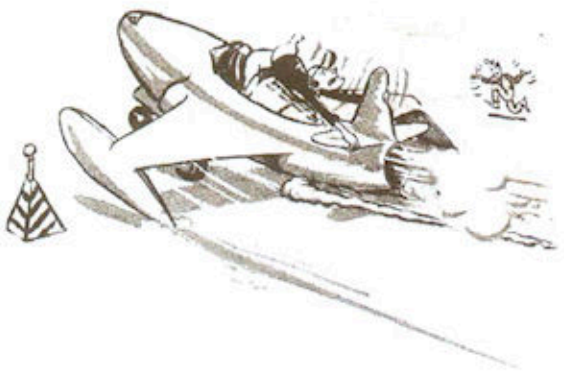
a. RESTRICTIONS.

(1) FLIGHT RESTRICTIONS.

(a) Inverted flying, or any other maneuver resulting in negative acceleration, is prohibited. There is, at present, no means of insuring a continuous flow of fuel in this attitude.

Note

It is possible to obtain a center of gravity position far aft of the rear limit by loading the airplane with full droppable tanks and no ammunition. *Do not attempt take-off in this condition.*



DON'T ATTEMPT TO TAKE OFF WITH DROPPABLE TANKS FULL, AND AMMUNITION BOXES EMPTY!

(2) TAXIING RESTRICTIONS.—Brakes must be used for steering as there is no slip stream over the rudder.

(3) AIR-SPEED LIMITATIONS. *(Indicated.)*

(a) Maximum allowable air speed — .80 Mach number or 560 mph indicated, whichever is slower, until further information is available.

Note

Mach number is defined as the ratio of the airplane true speed to the speed of sound in the undisturbed air through which it passes.

IF THE MACH NUMBER INDICATOR IS NOT INSTALLED, USE THE FOLLOWING INDICATED SPEEDS AS DIVE LIMITS:

Altitude (feet)	*Max. Dive Speed (IAS) (mph)*
S.L.	560
5000	540
10000	520
15000	475
20000	430
25000	390
30000	350
35000	315
40000	280

Note

If aileron compressibility buzz (see section II, paragraph 15) occurs below .8 Mach number, limit speed to that at which the buzz occurs.

(b) Wing flaps extended 100%—200 mph.

(c) Wing flaps extended 50%—230 mph.

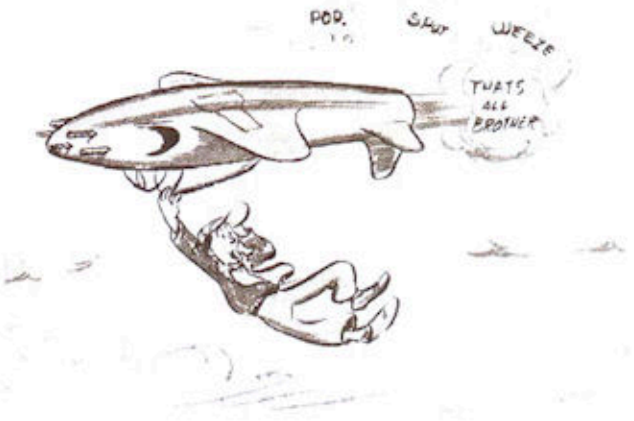
(d) Wing flaps extended 25%—270 mph.

(e) Landing gear extended—225 mph.

(4) FUEL PRESSURE RESTRICTIONS.—Do not allow the burner ring fuel pressure (figure 7-12) to go below 50 lb/sq in. at any altitude. At pressures below 50 lb/sq in., the engine fire may go out causing a gradual loss of rpm and, if corrective action is not taken, complete failure of the engine.

CAUTION

Release empty droppable tanks one at a time, in a skid with the tank to be released on the trailing wing.

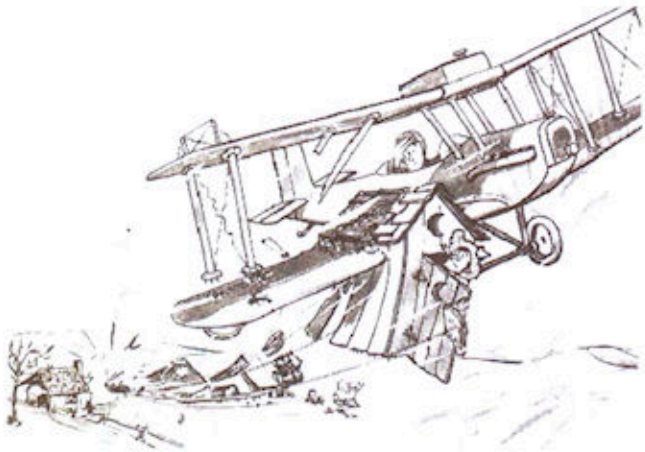


IT WON'T RUN LONG UPSIDE DOWN!

b. TAKE-OFF GROSS WEIGHT AND BALANCE.

(1) The normal take-off gross weight is 12000 pounds. The alternate gross weight (with droppable tanks full) is 14,000 pounds.

(2) The center of gravity position will be near the forward limit, at take-off, unless the droppable tanks are on and full. That is, approximately 22% mac without droppable tanks; approximately 26% mac with full droppable tanks, assuming that a full ammunition load is being carried.



C-G WASN'T SO IMPORTANT IN THOSE DAYS!

c. HOW TO GAIN ENTRANCE.

(1) Release the external canopy hand crank and crank the canopy open.

(2) Get on the wing over the leading edge and enter the cockpit from the right-hand side. Hand holds or foot holds have not yet been located but should be in production after the first few airplanes of this series.

2. ON ENTERING THE PILOT'S COMPARTMENT.

a. CHECK FOR ALL FLIGHTS.

Note

Check that the guns have been charged. There are no charging provisions in the cockpit.

(1) Check weight and balance Form F.

(2) Check Form 1.

(3) Diluter lever (figure 6-4) *normal oxygen.*

(4) Oxygen regulator altitude dial *normal.*

(5) Cabin pressurization control (figure 6-14) *outside air.*

(6) Oxygen pressure (figure 7-32) 400 to 450 lb/sq in.

(7) Set the clock and altimeter.

(8) Battery switch (figure 8-3) *off.*

(9) Generator switch (figure 8-4) *on.*

(10) Pitot heat switch (figure 8-6) *off.*

(11) External power source connected.

(12) Gun-camera switch (figure 8-20) to *camera.*

b. SPECIAL CHECK FOR NIGHT FLYING.

(1) Landing light (figure 8-7) *not more than five seconds for test.*

(2) Fluorescent lights (figure 8-27 and 6-7).

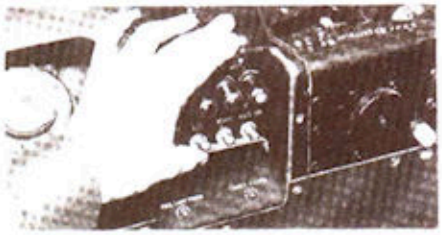
(3) Recognition lights (figure 8-9).

(4) Navigation lights (figure 8-10).

(5) Portable spotlight.

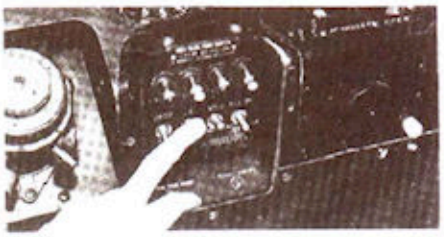
3. FUEL SYSTEM MANAGEMENT.

a. NORMAL OPERATION.



Before Take-off

BEFORE TAKE-OFF.—Hold selector bar up for at least two seconds.



In Flight

IN FLIGHT

When each tank is empty, as shown by the indicator light coming on, turn the tank selector switch off.

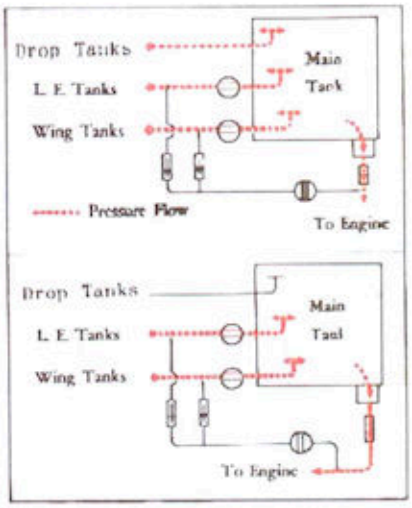


Figure 12 — Fuel System Controls (Normal Operation)

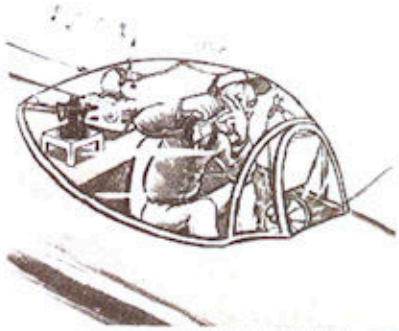
b. EMERGENCY OPERATION.

(1) ELECTRICAL FAILURE.

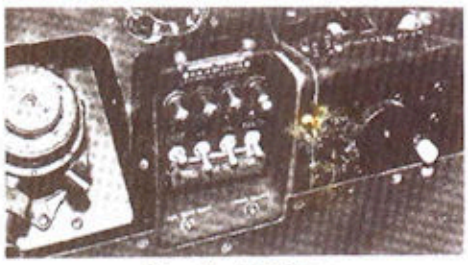
GENERATOR FAILURE WILL IMMEDIATELY BE INDICATED BY AILERON STIFFNESS!

Note

Failure of the airplane's generator will immediately be indicated by aileron stiffness due to the pressure loss in the aileron booster hydraulic system, and may be verified by a zero reading on the ammeter.



IF GENERATOR FAILS, TURN OFF ALL UNNECESSARY ELECTRICAL EQUIPMENT!



Electrical Failure

ELECTRICAL FAILURE.—Turn the wing and leading edge tank selector switches off. Then land before main tank is empty.

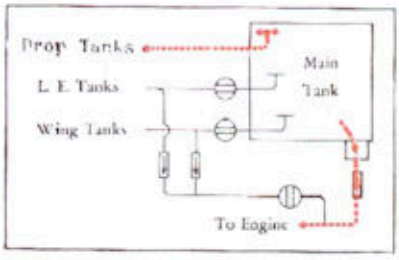
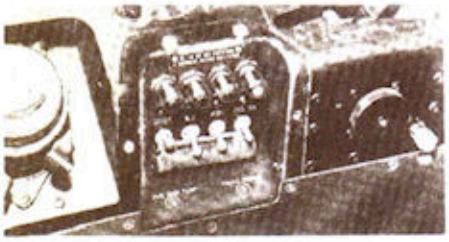


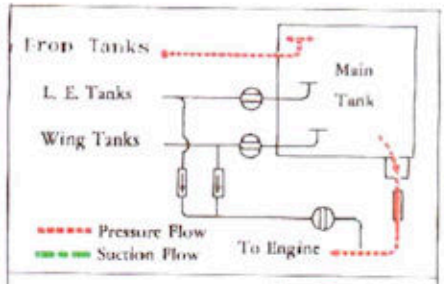
Figure 13 — Fuel System Controls (Electrical Failure)

(2) EXTREME LEAKAGE OF MAIN FUEL TANK. *(Due to enemy action, etc.)*



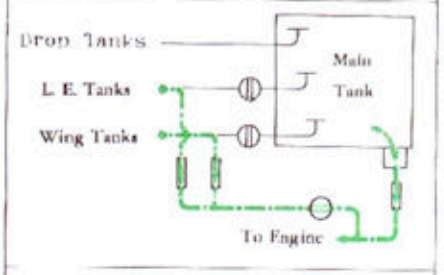
Main Tank Leakage — Step 1

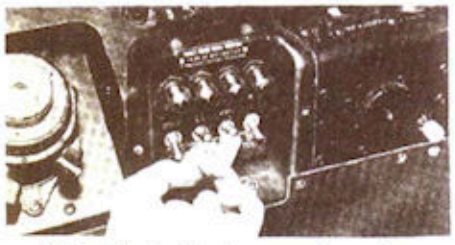
MAIN TANK LEAKAGE.— Step 1. Turn L.E. and wing tank selector switches off until the main tank is almost empty, then;



Main Tank Leakage — Step 2

Step 2.—Turn the droppable tank selector switch off and hold the main tank selector switch down for at least two seconds, then;





Main Tank Leakage — Step 3

Step 3.—Turn the wing and leading edge tank selector switches on.

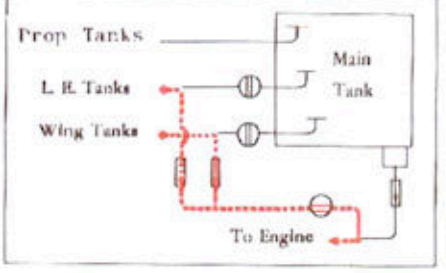
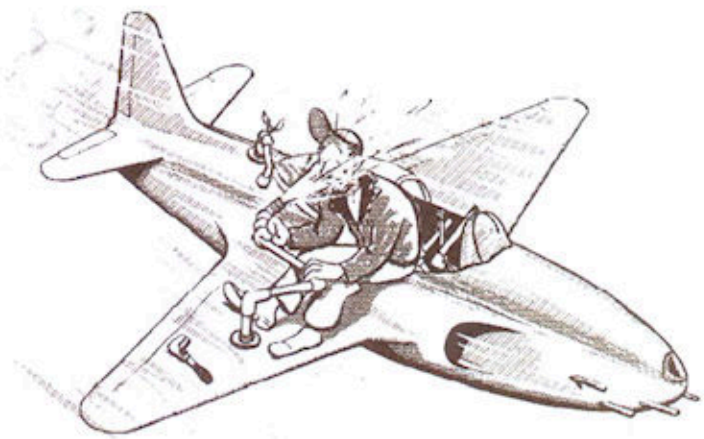


Figure 14 — Fuel System Controls (Main Tank Leakage)

Note

With this setting of the controls, the wing and leading edge tank transfer pumps are acting as booster pumps and feeding fuel from these tanks directly to the engine fuel pump. Any fuel remaining in the droppable tanks and the main tank cannot be used.



KNOW YOUR FUEL SYSTEM!

c. NORMAL SEQUENCE OF FUEL TANK USE.
(Automatic)

(1) Droppable tanks.

(2) Leading edge tanks.

(3) Wing tanks.

(4) Main tank.

4. STARTING THE ENGINE.

a. POSITIONING OF CONTROLS.

(1) Altitude idle valve *closed.* (If connected)

(2) Hold the fuel tank selector bar up (figure 6-27) for at least two seconds.

Note

The droppable tank indicator light will go out after the engine is started if there is fuel in the droppable tanks.

(3) If the droppable tanks are either empty or not installed, turn the droppable tank selector switch (figure 6-22) *off.*

(4) Check fuel quantity gage (figure 7-23).

b. DETAIL STARTING PROCEDURE.

(1) Push the starter switch (figure 8-2).

CAUTION

Hold the starter switch continuously until the engine has attained a speed of 17% rpm. If the starter should be accidentally released before this speed is reached, allow the engine to stop turning before attempting to re-engage the starter.

(2) At not less than 9% rpm, *quickly* place the throttle (figure 6-9) in the full open position until the burners light, then pull the throttle back to the idle position as rapidly as possible. *Do not release the starter switch.*

(3) Wait approximately 3 seconds, until the jet temperature starts falling off, then advance the throttle slowly until the engine reaches 50% rpm. Keep the jet temperature below 800° C if possible. Never allow the jet temperature to exceed 1,000° C. Release the starter switch at approximately 17% rpm.

CAUTION

If "light up" does not occur within 5 seconds after the throttle is open, release the starter switch and pull the throttle back to shut-off. Always release the starter switch first.

(4) Check the oil pressure to be not less than 2 lb/sq in. at idling and between 20 and 25 lb/sq in. at take-off rpm.

(5) Check the idling speed to be about 35% rpm with a jet temperature not over 600° C.

(6) Disconnect the external power supply and turn the battery switch (figure 8-3) *on.*

c. INSTRUCTIONS IN CASE OF FIRE.

(1) There are no fire extinguishers on this airplane. If fire does occur during the starting operation:

(a) Release the starter switch.

(b) Pull the throttle back to the *shut-off* position.

(c) Turn all the tank selector switches *off.*

5. WARM-UP AND GROUND TEST.

Note

No warm-up period is required. If the oil pressure is up and the engine will turn up to 100% rpm, take-off may be made immediately.

a. ACCESSORY CHECKS.

(1) Check aileron tab operation (figure 6-2) and set the tab in the neutral position. Left aileron only.

(2) Check dive flap operation (figure 6-11).

(3) Check wing flap operation (figure 6-12).

(4) Check the elevator tab operation (figure 7-19).

(5) Check for freedom of all surface controls.

(6) At not less than 70% engine rpm, check:

(a) Instrument pressure (figure 7-24) for 4 or 5" Hg.

(b) Hydraulic pressure (figure 7-27) for approximately 1,100 lb/sq in.

(c) Ammeter (figure 7-15) for charge.

6. TAXIING INSTRUCTIONS.

a. The airplane will start to move when the engine speed is increased to about 45% rpm. Speed should be maintained in turns of short radius. It is difficult to start moving with the nose wheel turned sharply or on soft ground. Brakes must be used for steering.

b. Forward visibility is good.

c. Taxi time should be cut to the absolute minimum. The fuel consumption while taxiing is about the same, in gallons per hour, as the fuel consumption during maximum range cruising at 35,000 feet.

(1) A good rule to remember here is: *Every minute spent on the ground taxiing subtracts about 7 miles from the cruising range of the airplane.*

CUT TAXI-TIME TO AN ABSOLUTE MINIMUM!

7. TAKE-OFF.

Note

The take-off center of gravity of this airplane, with full ammunition load, is near the forward limit unless the droppable tanks are on and full. It is important that this condition be present at take-off so that the center of gravity with ammunition gone will not be too far aft for landing.

WARNING

Do not take off without ammunition or suitable ballast (about 200 pounds) in the nose compartment. This is especially important when the droppable tanks are full.

a. NORMAL TAKE-OFF TECHNIQUE.

(1) Wing flaps (figure 6-12) *down 80%.*

(2) Tab position during take-off is not important; however, it is best to use *neutral* tab if the droppable tanks are on and full; *nose up* if the droppable tanks are off or empty.

(3) Taxi a few feet straight down the runway so that the nose wheel will be centered when the brakes are released.

(4) Close and lock the canopy. Push the canopy forward and swing the locking handle (figure 10) forward and up.

(5) Turn the emergency fuel pump (figure 6-5) on.

(6) Hold the brakes.

(7) Open the throttle slowly to 100% rpm.

(8) Release the brakes.

(9) Maintain directional control by a minimum use of the brakes until the rudder becomes effective. Rudder control will begin to be effective at about 75 mph indicated air speed.

(10) Let the airplane roll until take-off speed is reached, then pull back hard on the control stick.

(a) It is possible to take off at any speed above 110 mph if drop tanks are not installed or 120 mph if drop tanks are installed. With *forward* CG positions, stick forces will be reduced if take-off is made at speeds approximately 10 mph higher than the values quoted above.

(11) At the instant the main wheels break ground, there is a tendency for the airplane to nose up and this tendency must be checked by a slight forward motion of the stick.

(12) Landing gear (figure 6-26) *up*, as soon as the airplane is airborne.

(13) Wing flaps (figure 6-12) *up* between 150 and 200 mph.

(14) Level off over the obstacles and accelerate to about 300 mph before starting the climb.

(15) Turn the emergency fuel pump (figure 6-5) *off*.

8. ENGINE FAILURE DURING TAKE-OFF.

a. If the engine should fail before leaving the ground, close the throttle immediately and use the brakes as required. If there is insufficient runway for braking, jettison the droppable tanks and retract the landing gear. (See figure 3 emergency gear retraction.)

b. If total engine failure occurs soon after leaving the ground, release the droppable tanks, bomb switch to all pull the throttle to shut-off and land *straight ahead*. Leave the landing gear up if it is not possible to land on the runway. Leave the wing flaps extended.

c. If the engine rpm should drop to about 90%, release the droppable fuel tanks, retract landing gear and flaps immediately and go around as circumstances dictate. A partial power failure, as described above, indicates failure of the governor, the barometric unit, or the engine driven fuel pump. The engine will, however, continue to run on the emergency fuel pump and will develope sufficient thrust to fly the airplane with the landing gear and flaps down if the droppable tanks are released.

9. CLIMB.

a. The speeds for best climb are given in the Take-off, Climb, and Landing chart in appendix I.

b. The most economical climb can be obtained at 100% rpm. Do not operate at this power for more than 15 minutes at any one time. If more than 15 minutes will be required to reach operating altitude, the first part of the climb should be made at maximum continuous (96%) rpm. Refer to climb allowance charts.

10. GENERAL FLYING CHARACTERISTICS.

The advantage of this airplane lies in its speed. At altitude, its best climbing speed is greater than the top speed of most conventional fighters. The maximum range cruising speed at altitude is also greater than the top speed of some conventional equipment.

The disadvantage of this airplane lies in its slow acceleration from low speeds at altitude. However, once the airplane is in the air, there is ordinarily no reason to allow the speed to go below the best climbing speed or

APPROACH CRUISING ALTITUDE FROM ABOVE!

the maximum range cruising speed until approaching the field for landing. The acceleration is comparable to conventional fighters at an indicated speed of approximately 160 mph at sea level. Above this speed, the acceleration of the P-80A is greater.

a. STABILITY.

(1) The airplane is directionally and longitudinally stable at all approved center of gravity positions.

(2) Laterally, the airplane is neutrally stable; therefore, attention is required to hold the wings level particularly when flying in rough air.

(3) With droppable tanks installed, the airplane has a reverse rolling tendency when attempting to lift a wing with the rudder. That is, a bank cannot be corrected for by using opposite rudder, but should be corrected for by use of the ailerons.

b. TRIM CHANGES.

(1) Since there is no torque effect from the power plant of this airplane, the rudder forces are zero for all speed and power conditions if the rudder tab is properly adjusted on the ground. Many pilots find it more convenient to fly with their feet off the rudder pedals most of the time.

(2) The elevator tab must be adjusted occasionally in flight to compensate for changes in the center of gravity and airspeed.

(3) The trim change due to lowering the landing gear or flaps or changing engine power is negligible.

c. CHANGING POWER IN FLIGHT.

(1) Move the throttle slowly forward or aft.

(2) Adjust the altitude idle valve if necessary to bring the desired power within the available throttle travel.

CAUTION

Always operate the throttle slowly except in an emergency. That is: full throttle travel in approximately 5 seconds. If the throttle is opened too rapidly, excess fuel will be supplied to the engine and the jet temperature may exceed the limit.

d. CRUISING. (See appendix I.)

e. DUCT RUMBLE.

(1) At the present time, duct rumble is inherent in this airplane. This rumbling and vibration occurs, apparently in the intake ducts, whenever the air speed becomes too great for the rpm being used.

Whenever the rumble is noticed, immediately *increase* the engine rpm *or reduce the air speed* until the rumble disappears.

DUCT RUMBLE MAY OCCUR AT HIGH SPEED.

(2) At high speed and high rpm, a vibration may occur which has some resemblance to duct rumble but is of a higher frequency and not quite as noticeable. This vibration will disappear if airspeed is reduced appreciably.

11. WAR EMERGENCY OPERATION (combat emergency).

At the present time, there is no War Emergency rating on this engine. 100% power may be used for a maximum of 15 minutes without danger of damage to the engine.

TAKE-OFF R.P.M. IS FAST ENOUGH UNTIL A WAR EMERGENCY RATING IS ISSUED.

12. STALLS.

a. The stall is preceded by noticeable mushing and by buffeting which gives at least 10 mph warning. In a complete stall with power on or off, one wing may drop. If the stick is held back after the stall, the airplane will fall into a steep spiral and will probably spin.

Recovery from a stall is made by releasing the back pressure on the stick and lifting the down wing *with the ailerons.* The rudder is not effective in lifting a dropping wing.

b. The stall will occur at the following indicated air speeds at the gross weight noted:

Gross weight (pounds)	8000	11000	14000
	IAS at Stall (mph)		
Landing gear and flaps *up.*	95	110	125
Landing gear and flaps *down.*	80	95	105

13. SPINS.

a. DESCRIPTION.

(1) It is not probable that a spin will occur unless the stick is held full back after the stall, and full rudder is applied.

(2) The spin is erratic and rather violent and may tend to reverse direction. A definite pause occurs between each turn and each turn is made with a whipping action accompanied by considerable buffeting and snatching at the controls. The attitude of the airplane becomes steeper and the speed of rotation increases as the spin progresses.

(3) In a spin with rearward C.G. (32%) the control forces are lighter and the spin is less steep than in the spin with forward C.G.

(4) Full rudder and up-elevator must be held in order to keep the airplane in the spin.

b. RECOVERY.

(1) CHARACTERISTICS.

(a) The spin recovery characteristics of this airplane are excellent, recovery being effected in from 1/4 to 3/4 of a turn. If recovery is started during a pause it is more rapid than if started during a turn.

(b) With rearward center of gravity (32%), approximately one full turn is required to stop rotation.

(2) PROCEDURE.

(a) For all forward and normal center of gravity positions apply full opposite rudder and push the control stick to neutral.

(b) For a rearward C.G. position (32%) apply full opposite rudder and push the control stick full forward. As the rotation stops, alternate left and right rudder must be applied, until the air speed increases, to prevent falling into a spin in the opposite direction.

WARNING

Do not spin this airplane with droppable tanks installed.

14. PERMISSIBLE ACROBATICS.

CAUTION

Cage all gyro instruments before engaging in acrobatics.

a. All acrobatics, except those requiring negative acceleration, are permissible. Under negative acceleration conditions, fuel will not be fed to the engine and the engine fire may go out.

b. The pilot is cautioned to use extreme care in maneuvers which require a downward recovery, as the loss of altitude in downward recovery is very rapid. In general, acrobatics should not be attempted below 10,000 feet until the pilot becomes familiar with the speed at which the airplane can gain and lose altitude.

WARNING

Recovery from a vertical stall may require more than 10,000 feet altitude. This maneuver is not recommended at *any* altitude.

15. DIVING.

Dive tests have not yet been completed on this airplane.

a. It is known that there is no trouble up to a Mach number of .80 and it is strongly recommended that this limit be observed until further information is available. Complete diving data, maximum Mach number, control forces and any peculiar characteristics will be issued as soon as tests are completed.

b. Up to the Mach number of .80, control forces are normal. The force required to hold the nose down increases with speed up to a Mach number of approximately .75 and then starts to drop off slightly. The elevator force may go slightly negative at the .80 Mach number which has been set as the limit.

c. There is no noticeable buffeting of the airplane at these speeds. Duct rumble, occurs when airspeed becomes too great for r p m used and must be stopped by increasing rpm or decreasing speed.

WE DON'T KNOW WHAT WILL HAPPEN OVER "ABOUT .8" MACH NO.!

WARNING

Aileron compressibility buzz is a high frequency vibration which occurs *on some airplanes* at speeds as low as .76 Mach number. Do not exceed the speed at which this buzz is first apparent.

d. The dive flaps may be extended at any time and at any speed, however it is recommended that they be extended before entering the dive.

16. NIGHT FLYING.

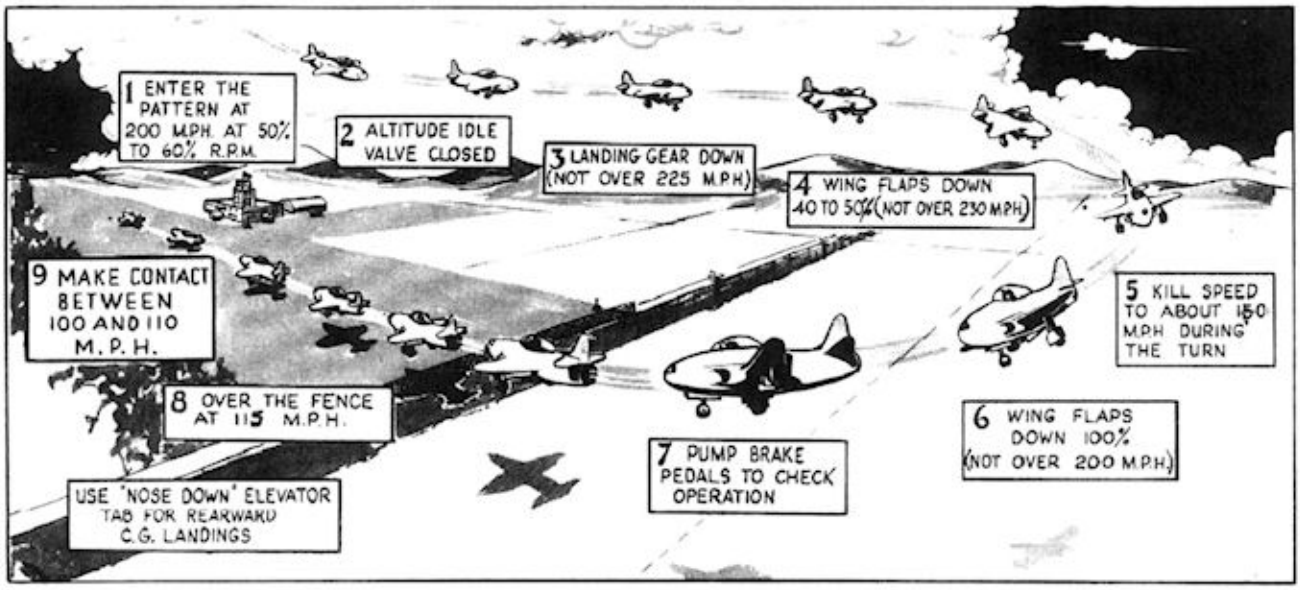
a. The landing light normally points down at an angle suitable for landing but may also be used as a spot light. By pulling the landing light lever (figure 7-9), the angle of the light is changed so that it points straight ahead along the flight path of the airplane.

b. Cockpit, navigation, and recognition lights are conventional.

17. APPROACH AND LANDING.

CAUTION

If wing heaviness, due to uneven fuel transfer from the droppable tanks should be encountered, it is recommended that the tanks be dropped before landing. The airplane has been landed with one tank full and one tank empty but full aileron was required and the airplane was difficult to manage on the ground.



Note

Side slips, fish tailing, and "S" turns may be used as desired. These maneuvers should be practiced in normal landings so that they may be used more effectively in case of an emergency "dead-stick" landing.

a. GENERAL.

(1) The landing technique is similar to that for conventional tricycle landing geared airplanes, and the landing attitude is about the same; that is, main wheels first, tail slightly down.

Note

Extreme tail low landings, possible only with landing flaps up, may cause the tail to strike the runway.

(2) With the landing gear down and wing flaps 50% extended, start the approach at 135 mph indicated air speed. When the landing is assured, extend full flaps and start flaring off. Come over the end of the runway at 110 mph and wait for contact. If the landing is being made with an appreciable load of fuel or ammunition, the above airspeeds should be increased in proportion to the load.

Keep the engine at 50% to 60% rpm during the approach so that power may be applied more quickly if it should become necessary to go around.

(3) If, for some reason, the flaps cannot be lowered, land approximately 20 mph faster and allow for more flare off and a *much flatter gliding angle.*

IT HAS BEEN LANDED WITH ONE TANK FULL, BUT IT'S TOUGH!

b. NORMAL LANDING.

(1) Altitude idle valve (if connected) *closed.*

(2) Landing gear (figure 6-26) *down* (not over 225 mph).

Note

Due to the drop in hydraulic pressure while the landing gear is in motion, the aileron booster will not operate until the gear is down.

(3) Wing flaps (figure 6-12) *down* (not over 200 mph).

(4) Engine speed—50% to 60% rpm.

(5) Wing flaps *up* before taxiing.

c. CROSS WIND LANDING.

Same as a normal landing. The tricycle gear reduces the danger of landing in a reasonably strong cross wind. If the drift appears excessive, the up wind wing may be lowered until just before contact.

d. TAKE-OFF IF LANDING IS NOT COMPLETED.

The ability of this airplane to take off in the event the landing is not completed is slightly inferior to that of conventional single engine fighters. If the landing cannot be completed, the decision to go around should be made as early as possible.

Proceed as follows:

(1) Open the throttle to 100% power as slowly as circumstances will allow.

(2) Retract the landing gear immediately, as soon as the airplane is airborne.

Figure 15 — Left Cockpit Floor

WARNING

Once the airplane touches the ground, do not attempt to take off unless there is plenty of runway available.

(3) Retract the flaps to 50% until the air speed indicates over 140 mph, then retract them all the way.

(4) Accelerate to approximately 165 mph before starting to climb.

18. STOPPING THE ENGINE.

a. Idle the engine between 35% and 50% rpm.

b. Pull the throttle control to *shut-off*.

c. Turn all switches *off*.

19. BEFORE LEAVING THE PILOT'S COMPARTMENT.

a. Lock the surface controls.

b. Set the parking brakes by applying the toe brakes, pulling the parking brake handle (figure 7-25) *out*, and releasing the toe brakes. Setting brakes when hot may cause brakes to freeze.

SECTION III
FLIGHT OPERATING DATA

ENGINE OPERATING DATA

AIRPLANE MODEL P-80A

CONDITION	OIL PRESS. Lb/Sq in.	BEARING TEMP. °C	JET TEMP. °C
MAXIMUM	25 (AT 100% rpm)	150	640
MINIMUM	2 (IDLE)	——	——

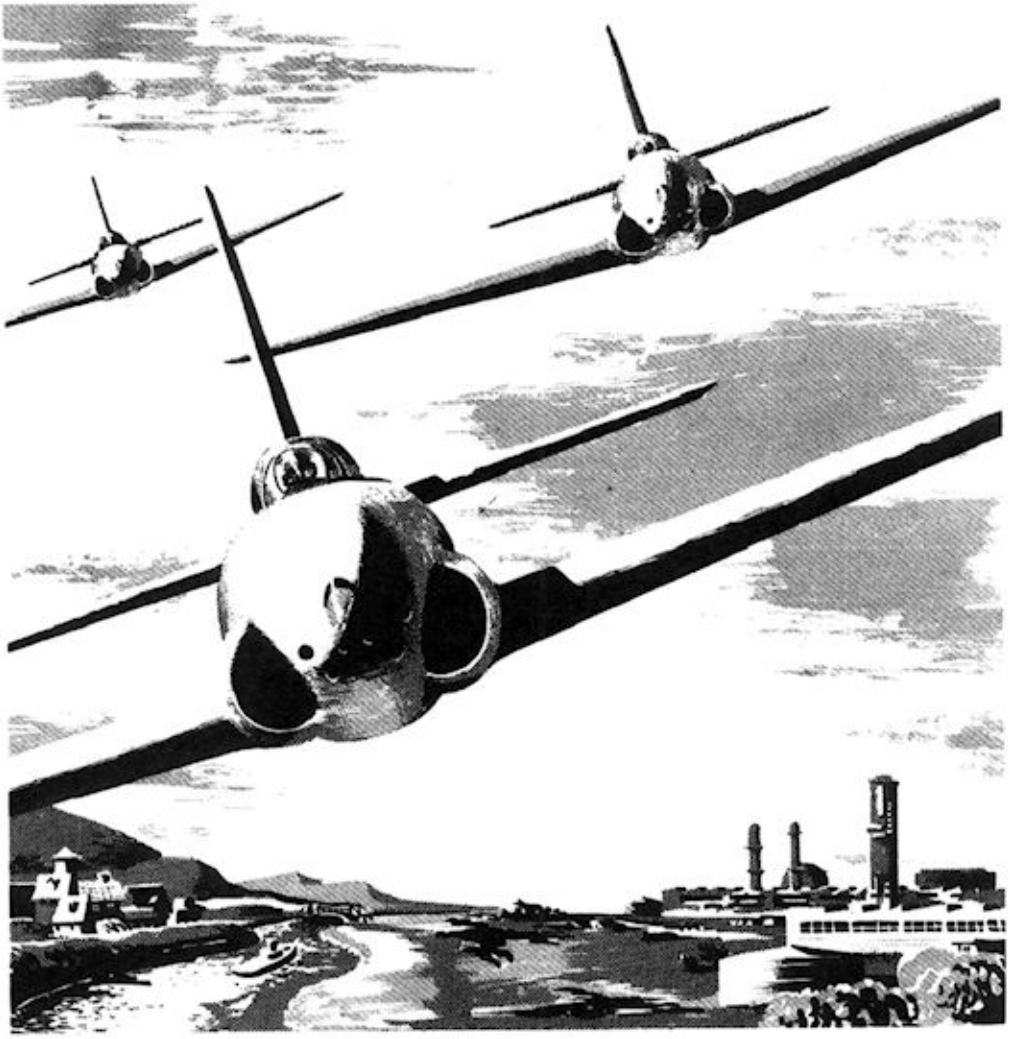
ENGINE MODEL I-40

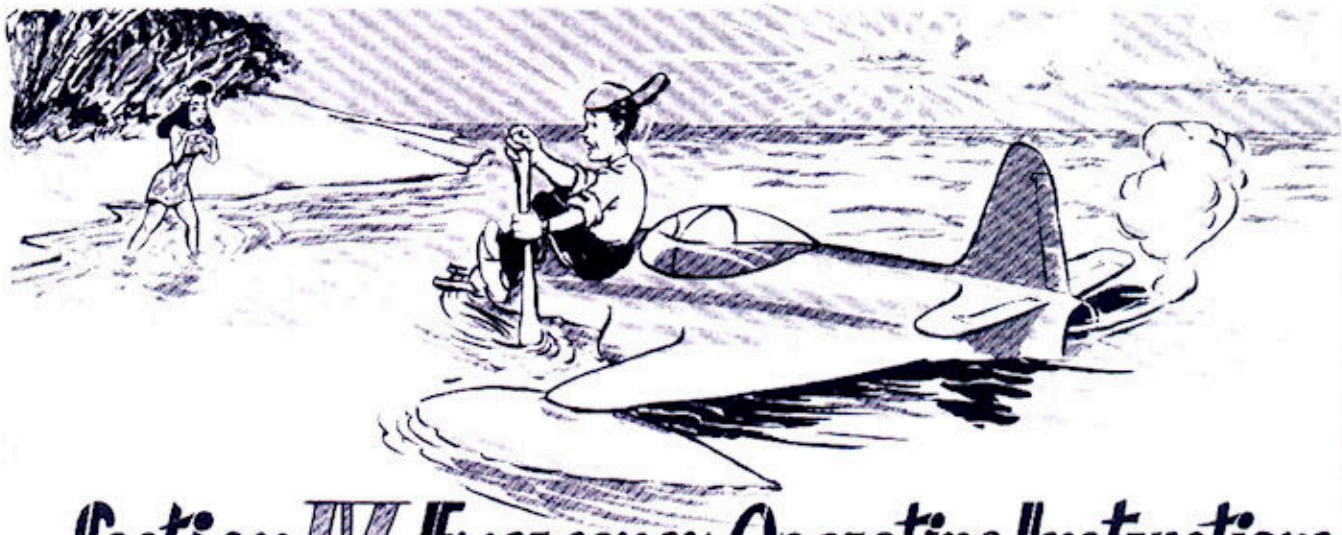
FUEL GRADE AN-F-32 OIL GRADE 3580 GRADE M

OPERATING CONDITION	R. P. M.	REMARKS
TAKE-OFF	100%	15 MINUTE LIMIT
MILITARY	100%	15 MINUTE LIMIT
MAX. CONTINUOUS	96%	NO LIMIT

AIR SPEED CORRECTION TABLE

SHIP I.A.S.	CORRECT I.A.S. (gear and flaps up)					CORRECT I.A.S. (gear and flaps down)
	S.L.	10,000	20,000	30,000	40,000	S.L.
100						105
125						128
150	152	152	151	150	148	152
175	177	176	175	147	171	177
200	201	200	199	197	194	201
225	226	224	223	220	216	
250	250	249	246	243	238	
275	274	273	270	265	258	
300	299	297	293	287	278	
325	324	320	316	309		
350	348	344	339	330		
375	373	368	361			
400	397	391	384			
425	422	415	406			
450	446	438				
475	471	462				
500	495	485				
525	520					
550	545					





Section IV Emergency Operating Instructions

1. EMERGENCY EXIT.

a. If the airplane is still controllable:

(1) Slow down as much as possible.

(2) Open the canopy.

(3) Crawl out of the cockpit over either side.

b. An alternate method is to roll the airplane on its back, release the safety belt and push clear of the airplane.

c. If the airplane is not controllable, release the canopy by pushing the emergency release lever (figure 10-2) and bail out.

WARNING

Bend forward and lower the head when pulling the canopy release handle to avoid injury from the released canopy.

2. FIRE.

a. A fire warning system is provided. Burning of the fire warning light (figure 7-18) indicates exhaust leakage, a fuel fire, or a short in the warning system electrical circuit.

b. There is no fire extinguishing system on this airplane. If the fire warning light comes on, move the throttle to the *shut-off* position.

c. If the light does not go out and a sustained fire is indicated, abandon the airplane as described in paragraph 1 above.

d. Even if the light does go out the engine will be dead and it will be necessary to prepare for an emergency landing. Refer to section IV, paragraph 7, for landing with wheels retracted.

3. ENGINE FAILURE DURING FLIGHT.

The starting procedure depends on the cause of the failure.

a. If the engine failure was the result of loss of fuel pressure caused by inverted flying or by inadvertently running out of fuel in the main tank, a normal ground start may be made after the cause of failure has been corrected; that is, after transferring fuel to the main tank or after the inverted flying has been discontinued.

b. If the engine should fail for no apparent reason, it must be assumed that either the barometric unit, the governor, or the main fuel pump has failed and the following procedure may be used for starting:

(1) Starter switch (figure 8-2) *on*.

(2) When the engine reaches approximately 9% rpm, turn the emergency fuel pump (figure 6-5) *on* and set the throttle to its wide open position.

(3) Pull the throttle to *idle* when the burners ignite and proceed as in a normal start. Leave the emergency fuel pump *on*.

(4) Turn the starter switch *off* at approximately 17% rpm.

DON'T GET CAUGHT AT LOW SPEED!

4. BOMB OR DROPPABLE TANK EMERGENCY RELEASE.

Two manual controls (figure 15) are connected directly to the wing tip bomb shackles. If the electric release mechanism fails, pull the manual controls out hard.

5. WING FLAP EMERGENCY OPERATION.

Either of the two wing flap motors will extend the flaps. If both motors should fail, or in case of electrical failure, the airplane must be landed with flaps up. Refer to section II, paragraph 17 *a* (3).

6. LANDING GEAR EMERGENCY OPERATION.

a. Put the landing gear control (figure 6-26) in the *down* position.

b. Break the safety wire and turn the emergency landing gear selector (figure 8-19) to *emergency*.

c. Operate the hand pump (figure 8-18) until the landing gear is down and locked (approximately 60 strokes).

CAUTION

Never operate the hand pump in flight without first turning the emergency landing gear control to *emergency*. If this is not observed, the emergency system hydraulic fluid will be pumped out into the main system and emergency landing gear extension will be impossible.

7. LANDING WITH WHEELS RETRACTED.

a. Release the droppable tanks. bomb switch (fig. 24-8) to all.

b. Slide the cockpit canopy open.

CAUTION

Extend full wing flaps (full flaps will prevent wing tip from digging into ground with resultant ground loops).

c. Make sure that the shoulder harness is locked and that the parachute is unbuckled.

d. Before contact with the ground:

(1) Pull the throttle to *shut-off*.

(2) Turn the battery and generator switches *off*.

e. Make a normal approach at 10 to 15 mph above the stalling speed and let the airplane touch the ground slightly before the stall is reached.

8. LANDING IN WATER (Ditching).

a. When anticipating a water landing due to lack of fuel, do not descend near the water to check conditions. The fuel remaining in the airplane will give at least 2½ times more range at 35,000 feet than it will at sea level. Stay at altitude until the fuel is all gone. After the fuel is gone, the decision to bail out or attempt a landing on the water may be made.

b. If the decision is to land:

(1) Release the droppable tanks.

(2) Jettison the cockpit canopy.

(3) Make sure the landing gear is up and the wing flaps are down.

WARNING

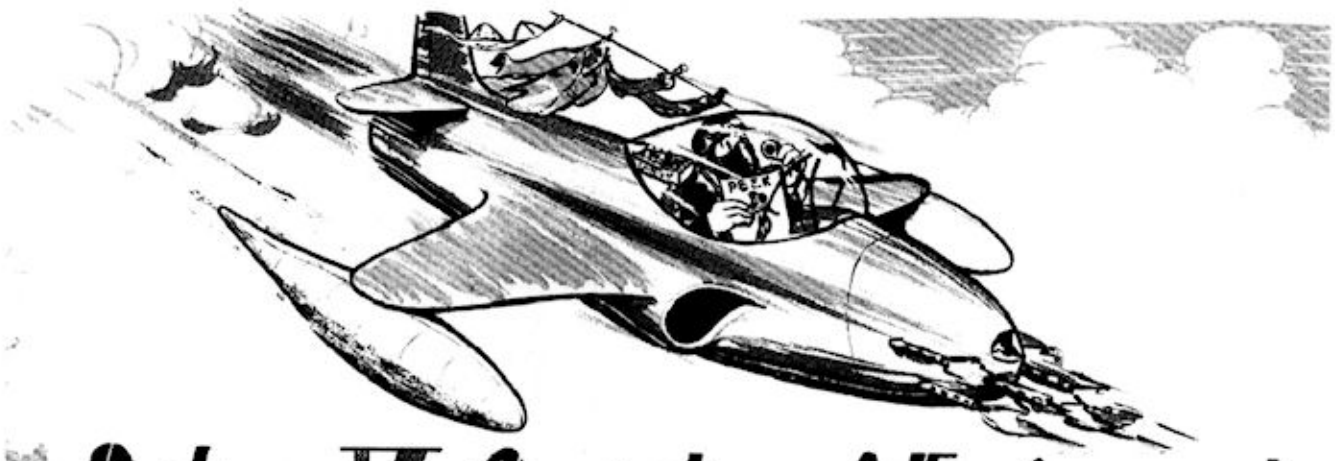
Do not attempt a water landing with the landing gear extended.

(4) Make sure the shoulder harness is locked.

(5) Unbuckle the parachute harness.

(6) Hold the airplane just above the surface of the water until it is about to stall, then touch the water as gently as possible.

(7) After the airplane comes to rest, get out of the cockpit immediately.



Section V Operational Equipment

1. HEATING, VENTILATING, AND PRESSURIZING.

a. VENTILATING.

(1) Outside air is supplied to the cockpit through a scoop in the left engine intake duct when the cockpit pressurization control (figure 6-14) is set to *outside air.*

b. PRESSURIZATION AND HEATING.

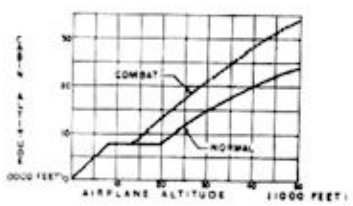
(1) Air under pressure, taken from the engine blower section, is used to pressurize the cockpit.

(2) When hot air is required, this engine blower section air is routed through a heat exchanger on the tail pipe before entering the cockpit.

(3) To pressurize the cockpit, set the cockpit pressurization control (figure 6-14) to pressurized air—hot or cold or to any intermediate position as desired.

(a) When this setting of the controls is made, the cockpit will be pressurized to the *normal* pressure (4 lb/sq in. above the outside air) if the gun-camera switch is turned *off.* The cockpit pressure will be reduced to the *combat* setting (2 lb/sq in. above the outside air) when the gun-camera switch is set to either *guns and camera* or to *camera alone.*

(4) Cockpit altitude is indicated on the altimeter (figure 6-6).



(5) Although the cockpit pressurization system has not been tested, the characteristics shown on the preceding curve are anticipated.

c. DEFROSTING.

A defroster tube is located around the base of the three front windshield panels. This tube is operated whenever the cockpit pressurization control is set to *pressurized air.*

For emergency defrosting, such as may be necessary when descending with a dead engine, slide the canopy part way open and keep the air speed below 250 mph indicated.

2. OXYGEN SYSTEM.

a. This is a standard low pressure oxygen system having an installation of a diluter demand oxygen pressure breathing regulator. Use with reference to cockpit altimeter.

b. Normal oxygen pressure (figure 7-32) is 400 to 450 lb/sq in.

APPROXIMATE OXYGEN DURATION

(400 lb/sq in. initial pressure)
Altitude dial set to normal

Cockpit Altitude (feet)	*Time (hours) Diluter lever setting*	
	Normal oxygen	*100% oxygen*
10,000	14.8	
15,000	11.2	
20,000	9.2	
25,000	8.1	
30,000	8.6	
35,000	11.6	
40,000	15.7	

3. ARMAMENT.

a. GUNNERY EQUIPMENT.

(1) The six—.50 caliber guns each carry 300 rounds of ammunition when fully loaded.

(2) A gun camera, mounted in the lip of the right engine intake duct, operates with the guns or separately.

(3) To operate the guns and the camera, set the gun-camera switch (figure 8-20) to *guns and camera* and operate the control stick trigger.

(4) To operate the camera alone, set the gun-camera switch to *camera* and operate the control stick trigger.

(5) The gun sight should be in operation at full speed during take-off and landing to reduce the possibility of damage resulting from shocks.

4. COMMUNICATIONS EQUIPMENT.

a. An AN/ARC-3 Radio receiver-transmitter is standard equipment in this airplane. The controls for this set are shown in figure 8, items 11 through 14.

(1) To turn the radio on, press any of the frequency selector push buttons and wait about one minute for the set to warm up.

(2) To transmit, press the microphone button (figure 6-8) and speak.

(3) To transmit code, use the tone control button (figure 8-12) as a key.

(4) To turn the equipment off, press both the off buttons (figure 8-11) simultaneously.

b. A beacon receiver, BC-1206, covers frequencies between 200 and 400 K.C. Controls for this set are shown in figure 8, items 16 and 17.

c. An SCR 695 identification radio is standard equipment. The controls for this set are shown in figure 6-1.

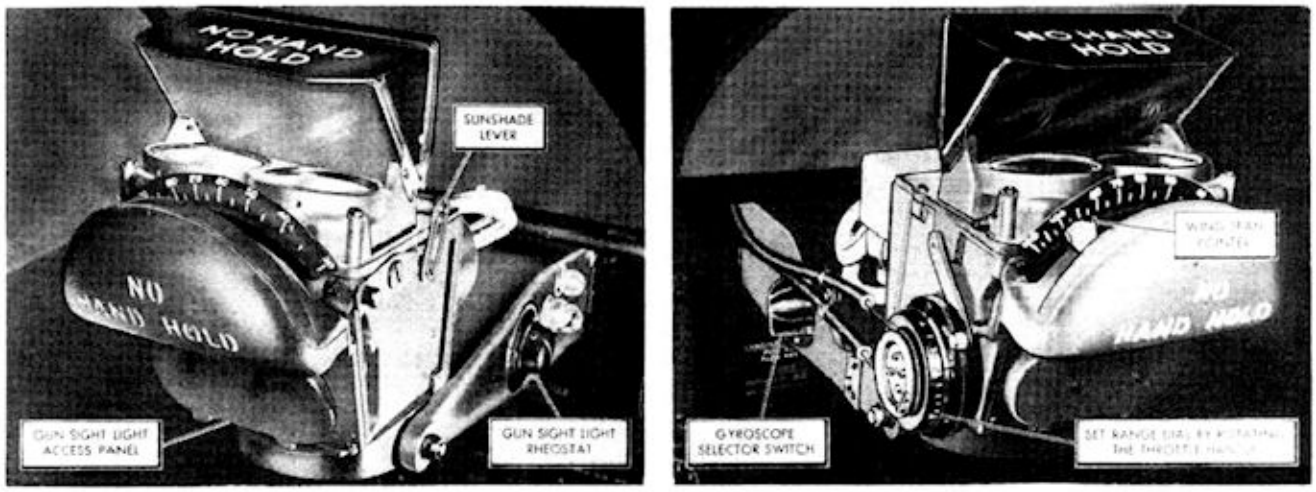


Figure 16 — K-14 Gunsight Controls

(a) Turn the gun sight on (by turning the gun-camera switch to *camera* or *guns and camera)* before starting the engine and leave it in operation until after landing.

Note

Approximately 15 minutes is required for the gun sight gyro to reach its operating rpm. It must be turned on at least 15 minutes before using.

b. BOMBING EQUIPMENT.

(1) To release bombs individually, place bomb switch to train, then press button on top of stick grip successively. To release bombs simultaneously place bomb switch to all.

c. ROCKETS AND CHEMICAL TANKS. — The rocket and chemical tank installations have not yet been flight tested.

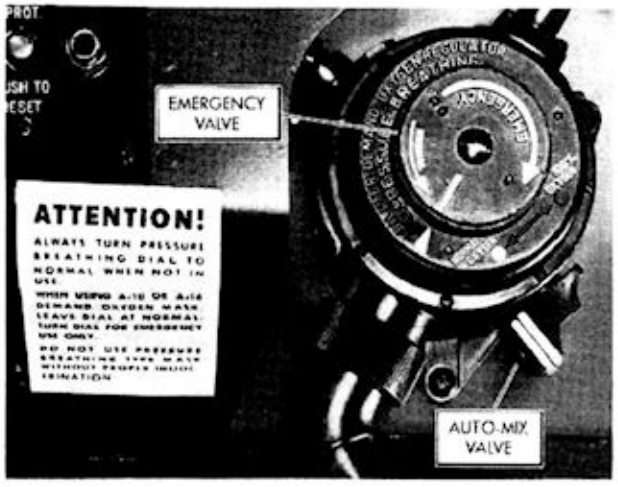


Figure 17 — Oxygen Controls

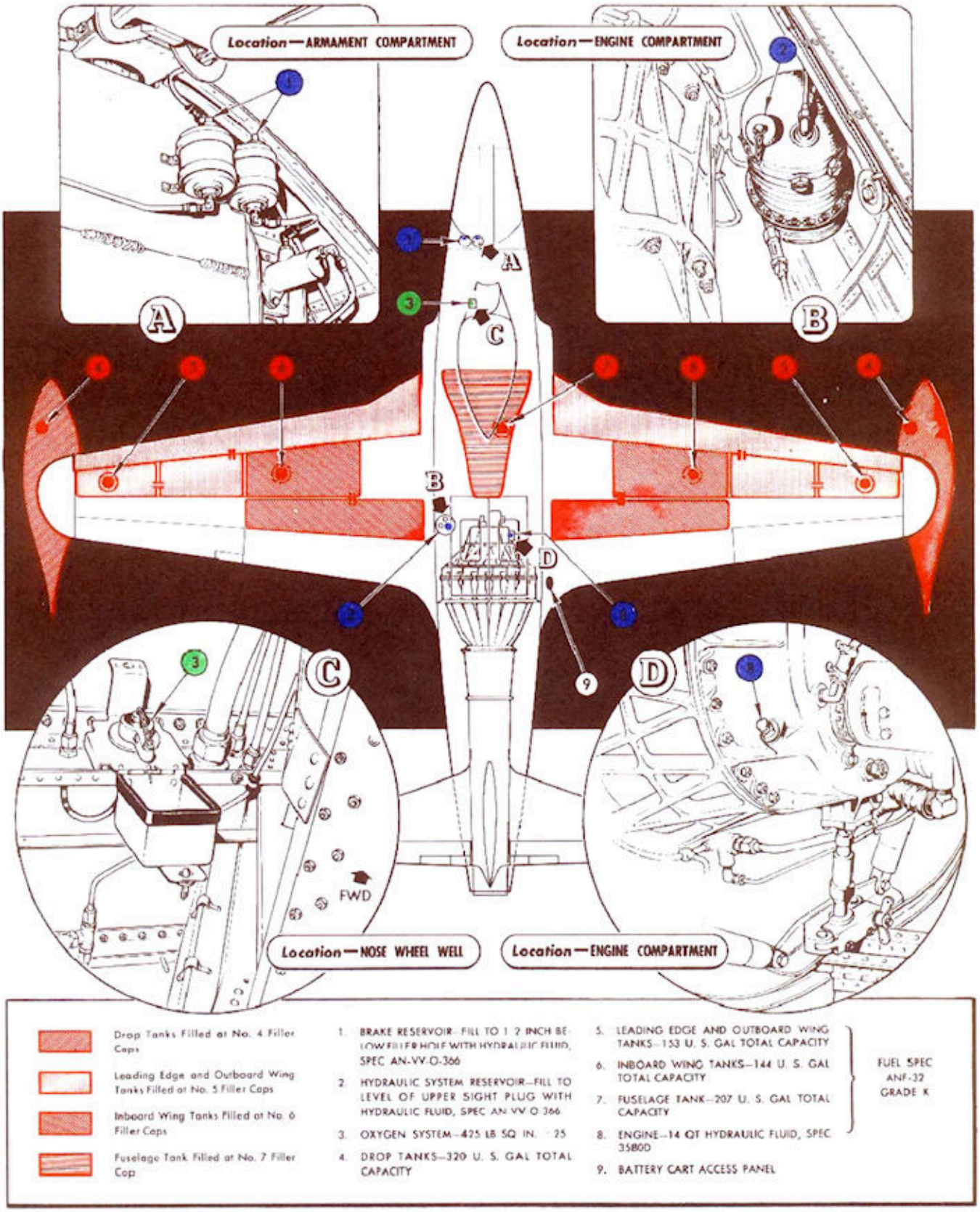


Figure 18 — Replenishment Diagram

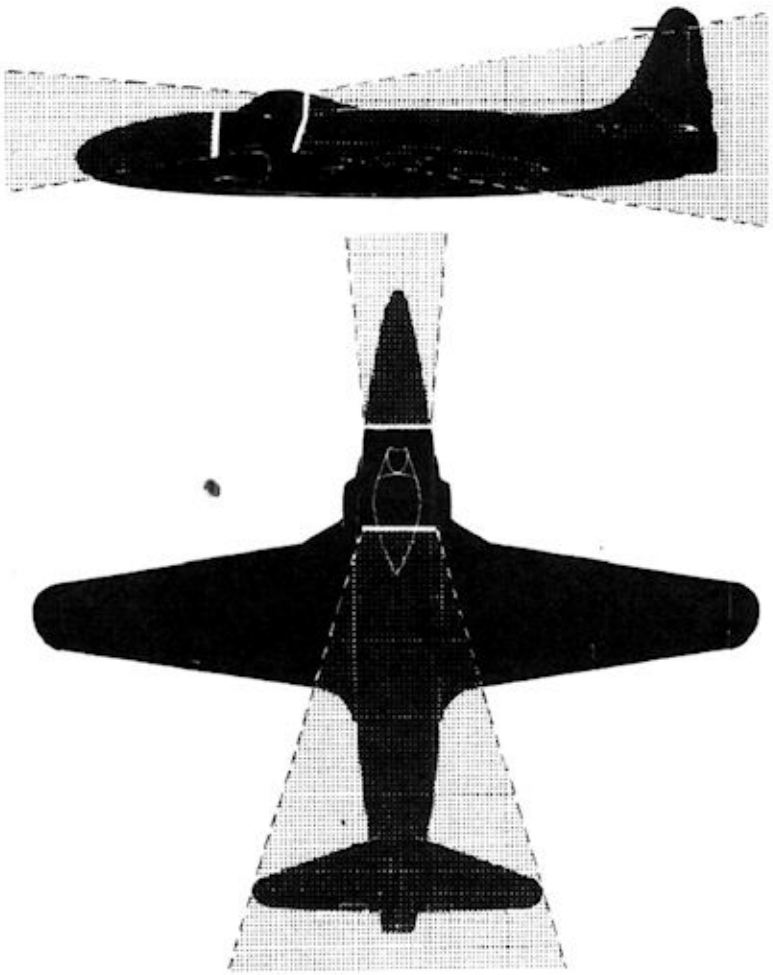


Figure 19 — Armor Protection Diagram

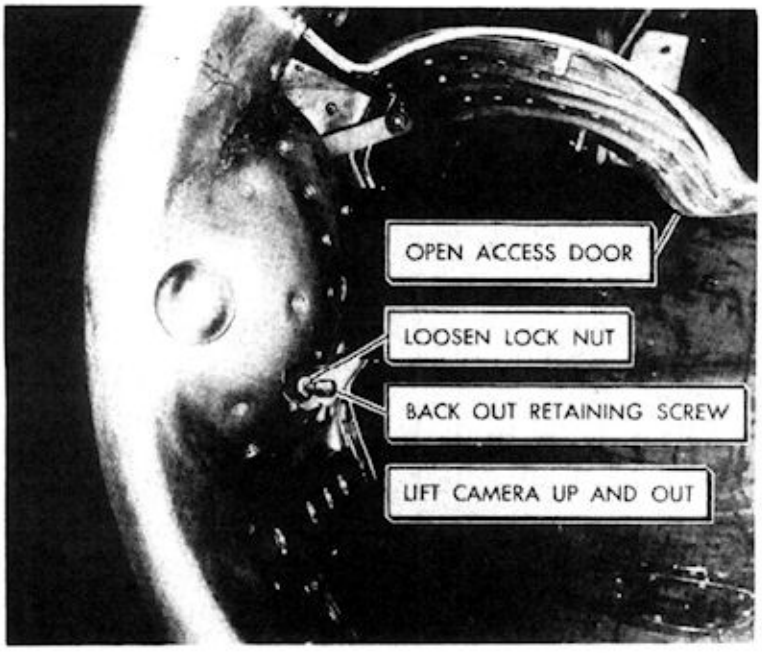


Figure 20 — Gun Camera Removal

APPENDIX I

FLIGHT OPERATING DATA

CAUTION

The flight operation instruction charts presented in this appendix are calculated on the assumption that the airplane's fuel tanks will hold 800 gallons of fuel. That is, 330 gallons in the droppable tanks and 470 gallons within the wings and fuselage. Since only a few of these airplanes will hold this amount of fuel, a careful check of the capacity of the internal tanks must be made before attempting to use these charts in planning any flight. If the airplane in question does not hold 470 gallons in its internal tanks, add the difference between the actual capacity and the theoretical 470 gallons to the reserve fuel requirements for the flight.

1. FLIGHT OPERATION INSTRUCTION CHART.

a. The flight operation instruction charts are made up to show the actual range of the airplane while cruising at altitude; however, the fuel used during take-off and climb is taken into account.

(1) The distances covered during straightaway climb and descent are not included in the ranges quoted on these charts.

b. FUEL QUANTITIES. — Allowance for fuel required for descent and landing are not made on the charts.

(1) The fuel required for take-off and initial climb to cruising altitude has been considered in computing the charts; however, any distance covered is not included in the given range.

c. SUMMARY.—Ranges quoted on the Flight Operation Instruction charts are the distance between the point at which the climb is completed and the point at which only the reserve fuel remains in the airplane. Thus, the range quoted opposite NO RESERVE is the distance between the point at which the climb is completed and the point at which the airplane will run out of fuel at cruising altitude.

Note

If the air-speed shown on the chart cannot be maintained without exceeding 96% rpm, hold 96% rpm until the weight decreases to a point at which the required air-speed is available.

2. USE OF THE PERFORMANCE CHARTS.

a. From the flight plan, determine the cruising altitude, the distance to be flown, and estimate the combat requirements.

b. From the Allowance charts for Climb, Combat, and Descent, determine the amount of fuel required for combat and landing. The fuel required for take-off and the initial climb to altitude is already considered in the Flight Operation Charts. Add the amount of fuel desired for reserve to the amount necessary for combat and descent to obtain the total reserve fuel requirements for the flight.

c. Find the Flight Operation Chart applicable to the airplane configuration and the flight plan and enter this chart on the reserve fuel line which is equal to or greater than the reserve fuel requirement determined above.

d. Opposite the reserve fuel required, read the air miles which can be flown at the cruising altitude in the Maximum Continuous Power or in the Maximum Range column.

e. From the Allowance chart for Climb, Combat, and Descent, find the number of miles which can be covered in a climb to the cruising altitude and descent from the cruising altitude. Add this number of miles to the range quoted in the Flight Operation Instruction Chart. The resulting figure represents the total miles which can be covered on the flight plan in question.

KEEP IT CLEAN AND SMOOTH
FOR MAXIMUM PERFORMANCE!

3. EXAMPLE OF USE OF THE CHARTS.

a. FLIGHT PLAN.

(1) Fly a total of 1400 miles at 35,000 feet and anticipate approximately five minutes of combat time.

(2) Take-off weight is 14,000 pounds, all tanks are full and the droppable tanks are to be released as soon as they are empty.

(3) Find the power at which the mission may be flown and the reserve which will be available after completion of the mission.

b. SOLUTION.

(1) From the Allowance chart for Climb, Combat and Descent, read the following: (See page 33.)

(a) Distance covered during climb to 35,000 feet—140 miles.

(b) Distance covered during deseent from 35,000 feet—105 miles.

(c) Fuel required for descent from 35,000 feet—30 gallons.

(d) Fuel required for five minutes combat at 35,000 feet—25 gallons.

(e) Add desired reserve fuel. (For this example 45 gals. will be used.)

(f) Total reserve fuel required—100 gallons.

(g) Total miles covered during climb and descent—245 miles.

(2) Enter the flight operation chart (page 36) for 14,000 pounds take-off weight, droppable tanks to be released when empty, on the line marked "100 gallon reserve" and read, on the maximum range side of the chart, that 1250 miles can be covered at the cruising altitude. Add the 245 miles available during climb and descent to find that 1495 miles may be covered on this flight plan.

(3) Since this distance is 95 miles farther than the cruising range necessary for the flight, the mission is possible at maximum range conditions.

(4) Climb and descent should be made at the speeds and power settings shown on page 33. A speed of 260 ias, as shown on page 36, should be used at 35,000 ft. cruising altitude.

PLAN FLIGHTS AT HIGH ALTITUDE;
IT WON'T GO FAR AT SEA LEVEL!

Fuel required for take-off and the initial climb to altitude has been computed in the Flight Operation charts. Do not add the take-off and climb fuel to the reserve fuel requirements. No allowance has been included, however, for the fuel required to taxi to the end of the runway in preparation for take-off.

ALLOWANCE CHARTS FOR CLIMB, COMBAT, AND DESCENT

CLIMB ALLOWANCE CHART

	WITH DROPPABLE TANKS					WITHOUT DROPPABLE TANKS				
Cruising altitude (feet)	Fuel required (U.S. Gal.) Includes take-off* fuel	Use engine speed 96% below altitude shown. Use engine speed 100%, above altitude shown	Range in climb (miles)	Best indicated air-speed for climb 100% rpm	Best indicated air-speed for climb 96% rpm	Fuel required (U.S. Gal.) Includes take-off* fuel	Use engine speed 96% below altitude shown. Use engine speed 100%, above altitude shown	Range in climb (miles)	Best indicated air-speed for climb 100% rpm	Best indicated air-speed for climb 96% rpm
S. L.	20	S. L.	0	320	300	20	S. L.	0	370	320
10,000	55	S. L.	20	305	290	45	S. L.	15	350	310
20,000	90	S. L.	45	285	270	75	S. L.	40	320	290
30,000	130	S. L.	90	260	250	105	S. L.	75	285	260
35,000	170	15,000	140	250	240	120	S. L.	100	265	250
40,000	225	30,000	235	235	230	150	15,000	145	235	225

*Does not include fuel required to taxi to end of runway in preparation for take-off.

COMBAT ALLOWANCE CHART

At altitude (feet)	Combat at 100% rpm Droppable tanks off
	Fuel required U.S. Gal/Min
10,000	10
20,000	7
30,000	5
35,000	5
40,000	4

DESCENT ALLOWANCE CHART

From altitude (feet)	Descent at .50 Mach number Burner ring fuel pressure 50 Lb/Sq In. (Recommended descent)		Descent at 177 mph indicated air-speed to cover maximum range without power (Out of fuel)	
	Fuel required (U.S. Gallons)	Distance covered Droppable tanks off	Distance covered Droppable tanks on	Distance covered Droppable tanks off
S. L.	0	0	0	0
10,000	10	20	25	30
20,000	15	40	55	65
30,000	25	75	85	95
35,000	30	105	105	115
40,000	35	140	115	130

AIRCRAFT MODELS
P-80A-1

FLIGHT OPERATION CHART

EXTERNAL LOAD ITEMS
NONE

ENGINE
G.E. I-40

TAKE-OFF WEIGHT 12,000 LBS.

INSTRUCTIONS FOR USING CHART: Determine the reserve fuel requirements and enter the chart on the line for the required reserve. Read the range available, after take-off and climb, under the proposed cruising altitude. Add the distance which will be covered during climb and descent as determined from the "Allowance Chart". The resulting figure represents the range available on the flight plan in question. The lower half of the chart represents the air miles which can be covered with a given amount of fuel remaining in the tanks after the airplane is at altitude. No allowance for climb, descent, or landing is made in this half of the chart.

MAXIMUM CONTINUOUS POWER — FULL FUEL (470 U.S. GAL.) LESS ALLOWANCE FOR TAKE-OFF AND CLIMB — MAXIMUM RANGE CONDITION

RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE						RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE				
10000	20000	30000	35000	40000	ALTITUDE (FEET)	10000	20000	30000	35000	40000
450	550	675	750	850	NO RESERVE FUEL	500	625	800	875	925
425	500	625	700	775	25 GAL. RESERVE	450	600	725	825	850
400	475	575	650	700	50 GAL. RESERVE	425	550	675	750	775
350	400	475	525	575	100 GAL. RESERVE	375	475	575	625	625
275	325	400	425	450	150 GAL. RESERVE	325	400	450	500	475
225	275	300	325	325	200 GAL. RESERVE	250	300	350	375	350
RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)						RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)				
500	650	850	1000	1225	470 GAL. REMAINING (DROP TANKS EMPTY)	550	750	1000	1175	1350
350	475	625	725	900	337 GAL. REMAINING (LEADING EDGE TANKS EMPTY)	400	550	725	850	975
225	275	375	450	550	207 GAL. REMAINING (WING TANKS EMPTY)	250	325	450	525	600
150	200	275	325	400	150 GAL. REMAINING	175	250	325	375	425
100	150	175	225	275	100 GAL. REMAINING	125	150	225	250	300
75	100	125	150	200	75 GAL. REMAINING	75	125	175	200	225
50	75	100	100	125	50 GAL. REMAINING	50	75	100	125	150
25	25	50	50	75	25 GAL. REMAINING	25	50	50	75	75
OPERATING CONDITIONS						OPERATING CONDITIONS				
96%	96%	96%	96%	96%	% RPM	x	x	x	x	x
xx	xx	xx	xx	xx	INDICATED AIR SPEED (M.P.H.)	395	340	285	260	230
470	355	260	220	175	FUEL CONSUMPTION (U.S. GAL PER HR.) AT 12000 LBS. GR. WT.	370	270	210	180	155

x Use the rpm required to maintain the indicated air speed shown.
xx Indicated air speed varies with the airplane weight.

AIRCRAFT MODELS
P-80A-1

FLIGHT OPERATION CHART

EXTERNAL LOAD ITEMS
DROPPABLE TANKS ALL THE WAY

ENGINE
G.E. I-40

TAKE-OFF WEIGHT 14,000 LBS.

INSTRUCTIONS FOR USING CHART: Determine the reserve fuel requirements and enter the chart on the line for the required reserve. Read the range available, after take-off and climb, under the proposed cruising altitude. Add the distance which will be covered during climb and descent as determined from the "Allowance Chart". The resulting figure represents the range available on the flight plan in question. The lower half of the chart represents the air miles which can be covered with a given amount of fuel remaining in the tanks after the airplane is at altitude. No allowance for climb, descent, or landing is made in this half of the chart.

MAXIMUM CONTINUOUS POWER — FULL FUEL (800 U.S. GAL.) LESS ALLOWANCE FOR TAKE-OFF AND CLIMB — MAXIMUM RANGE CONDITION

RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE						RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE				
10000	20000	30000	35000	40000	ALTITUDE (FEET)	10000	20000	30000	35000	40000
700	925	1200	1300	1425	NO RESERVE FUEL	750	1000	1300	1375	1450
675	900	1150	1225	1350	25 GAL. RESERVE	725	975	1250	1300	1375
650	875	1100	1175	1300	50 GAL. RESERVE	700	950	1200	1250	1325
600	800	1025	1075	1175	100 GAL. RESERVE	650	875	1100	1125	1175
550	725	925	975	1050	150 GAL. RESERVE	600	800	1000	1025	1050
525	675	850	875	925	200 GAL. RESERVE	550	725	900	925	925
RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)						RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)				
450	625	850	950	1175	470 GAL. REMAINING (DROP TANKS EMPTY)	475	675	925	1025	1200
325	450	600	700	850	337 GAL. REMAINING (LEADING EDGE TANKS EMPTY)	350	475	675	750	875
200	275	375	425	525	207 GAL. REMAINING (WING TANKS EMPTY)	200	300	400	475	525
150	200	275	300	375	150 GAL. REMAINING	150	225	300	350	400
100	125	175	200	250	100 GAL. REMAINING	100	150	200	225	250
75	100	125	150	200	75 GAL. REMAINING	75	100	150	175	200
50	75	100	100	125	50 GAL. REMAINING	50	75	100	125	125
25	25	50	50	75	25 GAL. REMAINING	25	25	50	50	75
OPERATING CONDITIONS						OPERATING CONDITIONS				
96%	96%	96%	96%	96%	% RPM	x	x	x	x	x
xx	xx	xx	xx	xx	INDICATED AIR SPEED (M.P.H.)	395	340	285	260	230
470	355	260	220	175	FUEL CONSUMPTION (U.S. GAL PER HR.) AT 14000 LBS. GR. WT.	435	315	235	215	175

x Use the rpm required to maintain the indicated air speed shown.
xx Indicated air speed varies with the airplane weight.

AIRCRAFT MODELS
P-80A-1

FLIGHT OPERATION CHART

EXTERNAL LOAD ITEMS
DROPPABLE TANKS
DROPPED WHEN EMPTY

ENGINE
G.E. I-40

TAKE-OFF WEIGHT 14,000 LBS.

INSTRUCTIONS FOR USING CHART: Determine the reserve fuel requirements and enter the chart on the line for the required reserve. Read the range available, after take-off and climb, under the proposed cruising altitude. Add the distance which will be covered during climb and descent as determined from the "Allowance Chart". The resulting figure represents the range available on the flight plan in question. The lower half of the chart represents the air miles which can be covered with a given amount of fuel remaining in the tanks after the airplane is at altitude. No allowance for climb, descent, or landing is made in this half of the chart.

MAXIMUM CONTINUOUS POWER					FULL FUEL (800 U.S. GAL.) LESS ALLOWANCE FOR TAKE-OFF AND CLIMB	MAXIMUM RANGE CONDITION				
RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE						RANGE (U.S. MILES) AFTER CLIMB TO ALTITUDE				
10000	20000	30000	35000	40000	ALTITUDE (FEET)	10000	20000	30000	35000	40000
750	**975**	**1225**	**1350**	**1500**	NO RESERVE FUEL	**825**	**1100**	**1375**	**1500**	**1600**
725	**925**	**1175**	**1275**	**1425**	25 GAL. RESERVE	**800**	**1050**	**1325**	**1450**	**1525**
700	**900**	**1125**	**1225**	**1375**	50 GAL. RESERVE	**750**	**1000**	**1275**	**1375**	**1450**
650	**825**	**1050**	**1125**	**1225**	100 GAL. RESERVE	**700**	**925**	**1150**	**1250**	**1300**
600	**775**	**950**	**1025**	**1100**	150 GAL. RESERVE	**650**	**850**	**1050**	**1125**	**1150**
550	**700**	**850**	**900**	**975**	200 GAL. RESERVE	**600**	**775**	**950**	**1000**	**1025**
RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)						RANGE REMAINING AFTER AIRPLANE IS AT ALTITUDE (NO RESERVE)				
SEE CHART FOR NO DROPPABLE TANKS						SEE CHART FOR NO DROPPABLE TANKS				
OPERATING CONDITIONS						OPERATING CONDITIONS				
96%	**96%**	**96%**	**96%**	**96%**	% RPM	**x**	**x**	**x**	**x**	**x**
xx	**xx**	**xx**	**xx**	**xx**	INDICATED AIR SPEED (M.P.H.)	**395**	**340**	**285**	**260**	**230**
470	**355**	**260**	**220**	**175**	FUEL CONSUMPTION (U.S. GAL PER HR.) AT 14000 LBS. GR. WT.	**435**	**315**	**235**	**215**	**175**

x Use the rpm required to maintain the indicated air speed shown.
xx Indicated air speed varies with the airplane weight.

AAFMC-527
4-1-44

AIRCRAFT MODEL(S)
P-80A-1

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S)
I-40

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	HARD SURFACE RUNWAY AT SEA LEVEL GROUND RUN	HARD SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 3000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 6000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT SEA LEVEL GROUND RUN	SOD-TURF RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 3000 FEET GROUND RUN	SOD-TURF RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 6000 FEET GROUND RUN	SOD-TURF RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT SEA LEVEL GROUND RUN	SOFT SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 3000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 6000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.
12000 Without Droppable Tanks	0		3800	4500	4550	5350	5350	6300	4050	4800	4900	5750	5800	6800	4950	5800	6050	7050	7350	8550
	15		3150	3750	3800	4500	4500	5300	3400	4000	4100	4800	4900	5750	4100	4800	5050	5900	6300	7200
	30		2550	3050	3100	3700	3750	4400	2750	3250	3350	3950	4050	4750	3350	3900	4150	4850	5150	6000
14000 With Droppable Tanks	0		5300	6350	6450	7600	7750	9100	5850	6900	7100	8300	8550	9950	7500	8700	8350	1100	11650	13400
	15		4550	5350	5500	6450	6650	7800	4950	5800	6000	7050	7300	8500	6300	7350	7900	9150	9950	11450
	30		3750	4450	4600	5400	5600	6550	4100	4800	5000	5850	6150	7200	5250	6050	6600	7650	8400	9650

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 20%; 100°F + 20%; 125°F + 30%; 150°F + 40% OPTIMUM TAKE-OFF WITH ____ RPM, ____ IN. HG. & ____ DEG. FLAP IS 60% OF CHART VALUES

DATA AS OF BASED ON:

CLIMB DATA

GROSS WEIGHT LB.		AT SEA LEVEL BEST I.A.S. MPH	AT SEA LEVEL BEST I.A.S. KTS	AT SEA LEVEL RATE OF CLIMB F.P.M.	AT SEA LEVEL GAL. OF FUEL USED	AT 10,000 FEET BEST I.A.S. MPH	AT 10,000 FEET BEST I.A.S. KTS	AT 10,000 FEET RATE OF CLIMB F.P.M.	AT 10,000 FEET FROM SEA LEVEL TIME MIN.	AT 10,000 FEET FROM SEA LEVEL FUEL USED	AT 20,000 FEET BEST I.A.S. MPH	AT 20,000 FEET BEST I.A.S. KTS	AT 20,000 FEET RATE OF CLIMB F.P.M.	AT 20,000 FEET FROM SEA LEVEL TIME MIN.	AT 20,000 FEET FROM SEA LEVEL FUEL USED	AT 30,000 FEET BEST I.A.S. MPH	AT 30,000 FEET BEST I.A.S. KTS	AT 30,000 FEET RATE OF CLIMB F.P.M.	AT 30,000 FEET FROM SEA LEVEL TIME MIN.	AT 30,000 FEET FROM SEA LEVEL FUEL USED	AT 35,000 FEET BEST I.A.S. MPH	AT 35,000 FEET BEST I.A.S. KTS	AT 35,000 FEET RATE OF CLIMB F.P.M.	AT 35,000 FEET FROM SEA LEVEL TIME MIN.	AT 35,000 FEET FROM SEA LEVEL FUEL USED	AT 40,000 FEET BEST I.A.S. MPH	AT 40,000 FEET BEST I.A.S. KTS	AT 40,000 FEET RATE OF CLIMB F.P.M.	AT 40,000 FEET FROM SEA LEVEL TIME MIN.	AT 40,000 FEET FROM SEA LEVEL FUEL USED
14000 With Drop Tanks	RPM 96%	305		2350	20	300		1750	5	60	285		1150	12	105	265		500	24	165	250		250	37	215	—		—	—	—
	100%	355		3350	20	340		2600	3	55	315		1850	8	90	285		1100	15	130	265		750	20	155	240		350	29	190
12000 Without Drop Tanks	96%	320		2850	20	310		2200	4	55	290		1500	9	90	265		850	18	130	250		550	25	160	230		200	37	205
	100%	370		4300	20	350		3400	3	45	320		2550	6	75	285		1650	11	105	265		1250	14	120	240		800	19	140

POWER PLANT SETTINGS: (DETAILS ON FIG. ____ SECTION ____):

DATA AS OF BASED ON:

FUEL USED (U.S. GAL.) INCLUDES TAKE-OFF ALLOWANCE BUT NOT TAXI ALLOWANCE.

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	HARD DRY SURFACE AT SEA LEVEL GROUND ROLL	HARD DRY SURFACE AT SEA LEVEL TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 3000 FEET GROUND ROLL	HARD DRY SURFACE AT 3000 FEET TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 6000 FEET GROUND ROLL	HARD DRY SURFACE AT 6000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT SEA LEVEL GROUND ROLL	FIRM DRY SOD AT SEA LEVEL TO CLEAR 50' OBJ.	FIRM DRY SOD AT 3000 FEET GROUND ROLL	FIRM DRY SOD AT 3000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT 6000 FEET GROUND ROLL	FIRM DRY SOD AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT SEA LEVEL GROUND ROLL	WET OR SLIPPERY AT SEA LEVEL TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 3000 FEET GROUND ROLL	WET OR SLIPPERY AT 3000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 6000 FEET GROUND ROLL	WET OR SLIPPERY AT 6000 FEET TO CLEAR 50' OBJ.
8000	120		120		1400	2900	1500	3150	1600	3350	1550	3100	1700	3300	1850	3550	4050	5550	4400	6000	6050	7750
12000	145		145		2050	4150	2200	4450	2400	4800	2250	3150	2450	4700	2550	5100	6100	8250	6650	8900	7250	9700

DATA AS OF BASED ON:

OPTIMUM LANDING IS 60% 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

RESTRICTED