Pilot's Handbook

for

NAVY MODEL
HRP-1
HELICOPTERS

**THIS PUBLICATION SUPERSEDES AN 01-250HA-1
DATED 15 JUNE 1949 REVISED 1 OCTOBER 1949**

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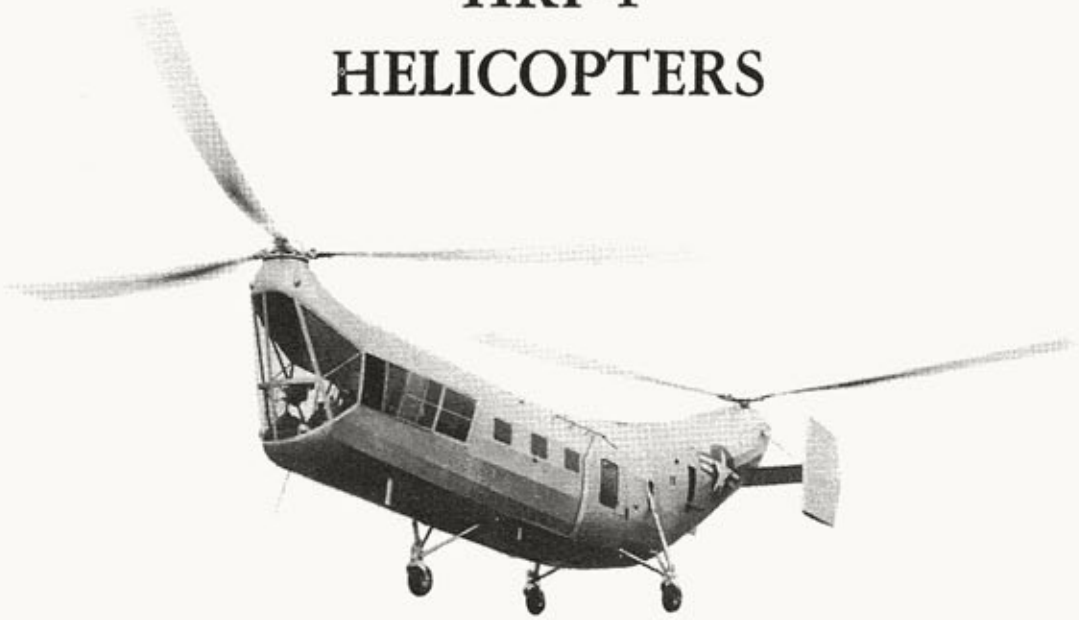

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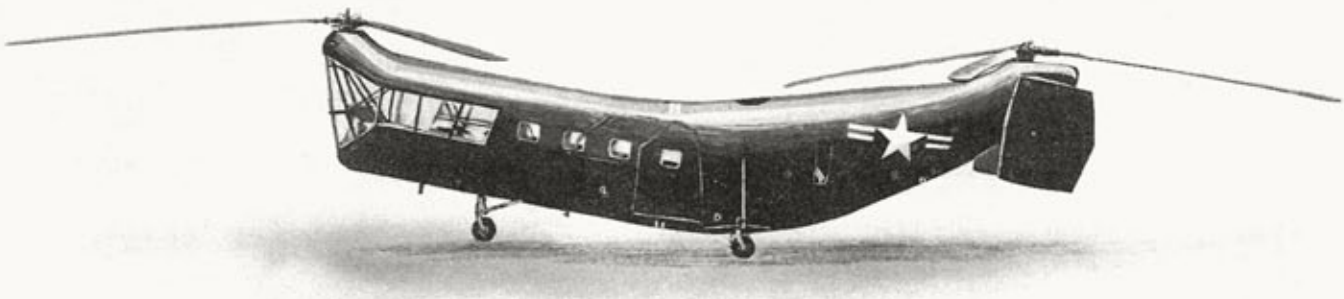


Figure A. HRP-1 Helicopter—Side View

Figure B. HRP-1 Helicopter, Side View, Blades Folded

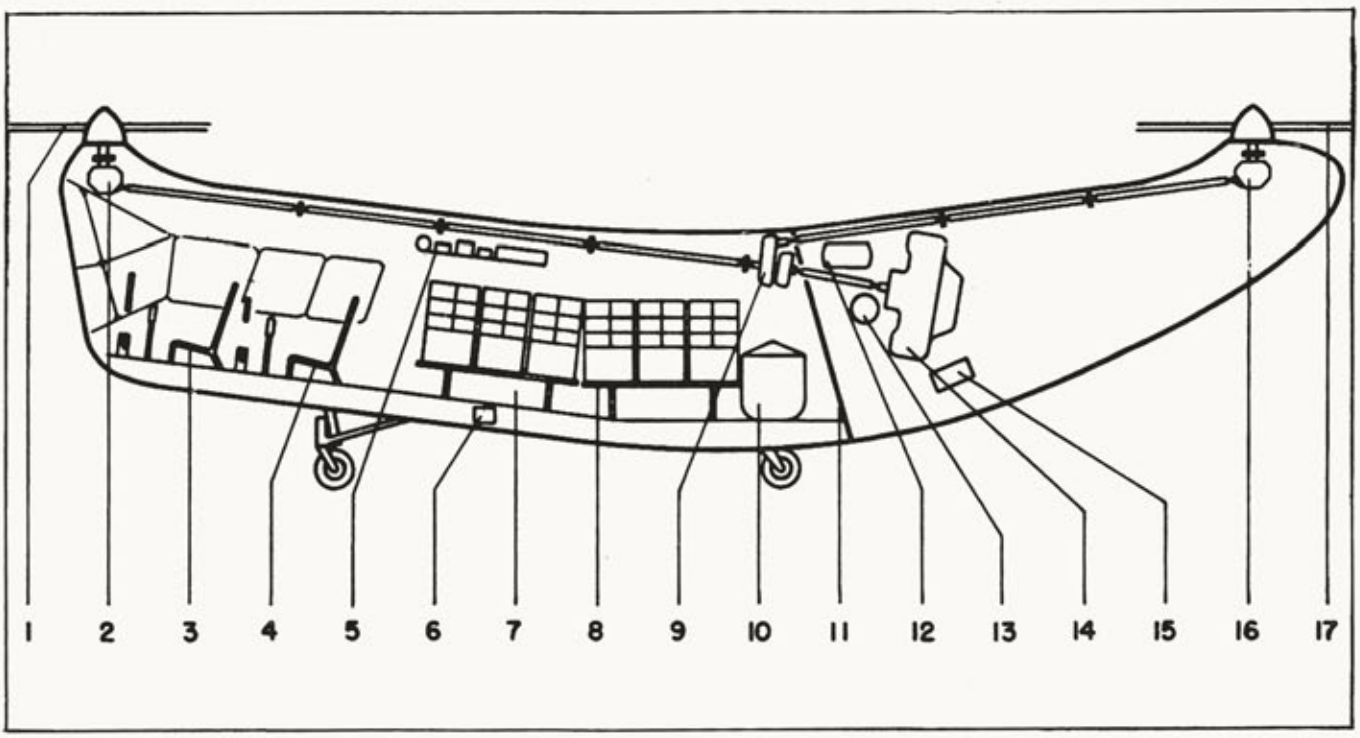
SECTION 1
DESCRIPTION

1-1. GENERAL.

1-2. POWER AND DIMENSIONS. The Model HRP-1 is a ten place general purpose cargo-transport helicopter manufactured by the Piasecki Helicopter Corporation and powered with a Pratt & Whitney R-1340-AN-1 air cooled nine-cylinder radial engine. The engine simultaneously drives two three-bladed 41-foot diameter rotors longitudinally disposed. The fuselage is 47'1¾" long; the over-all length with rotor blades turning is 83'4"; width with blades folded is 11'0". Cargo space is provided within the fuselage which can be adapted for carrying eight passengers or six litters.

1-3. GROSS WEIGHT and C. G. LIMITS. The normal design gross weight is 6900 pounds. For center of gravity limits see Weight and Balance Handbook Data AN 01-1B-40.

1-4. FUEL AND OIL SPECIFICATIONS:
Fuel: AN-F-48 Grade 91/98 (or higher).
Oil: AN-O-8 Grade 1120 (Warm Weather).
AN-O-8 Grade 1100 (Cold Weather).



1 Front Rotor
2 Front Transmission
3 Pilot's Seat
4 Co-Pilot's Seat
5 Radio Installation
6 Battery
7 Cargo Compartment
8 Cargo Compartment Seats (two not shown)
9 Mid Transmission
10 Fuel Tank
11 Fire Wall
12 Oil Tank
13 Oil Cooler
14 Engine
15 Battery Junction Box with External Electrical Receptacle
16 Rear Transmission
17 Rear Rotor

Figure 1-1. Interior Arrangement, Full View

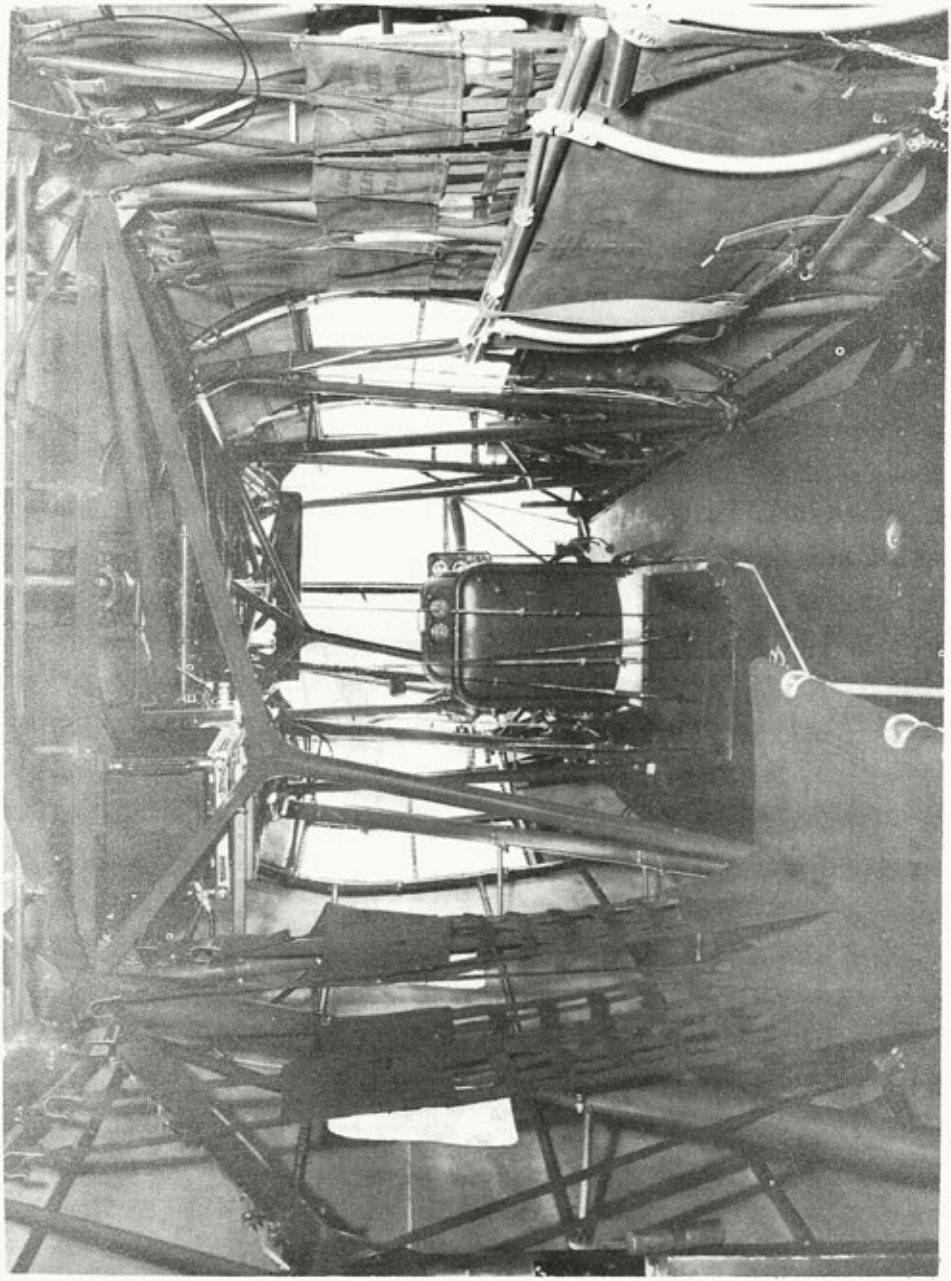
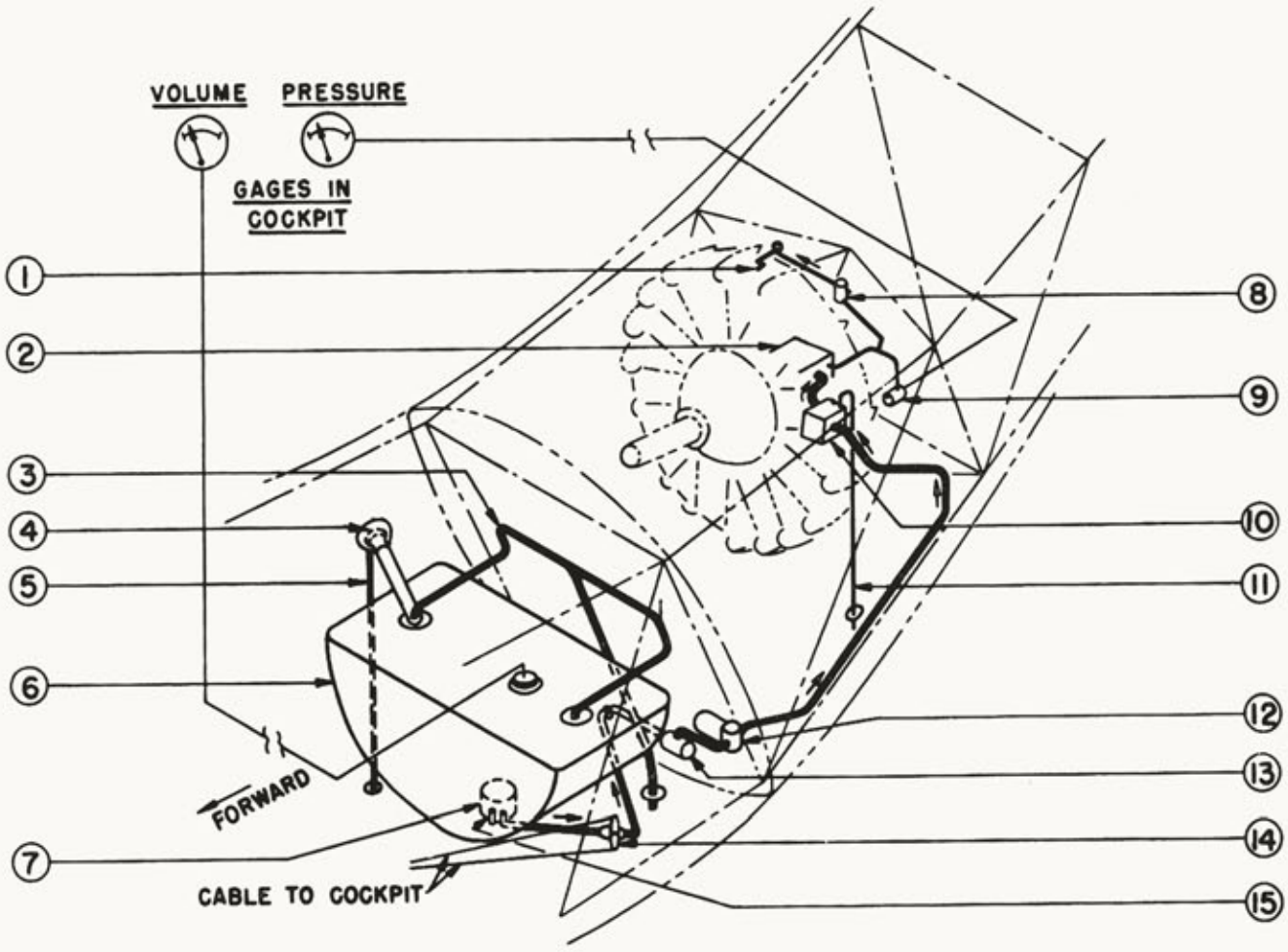


Figure 1-2. Interior View



1 Engine Primer
2 Carburetor
3 Fuel Tank Vent Line
4 Filling Cap
5 Scupper Drain
6 Fuel Tank
7 Sump
8 Primer Valve-Solenoid
9 Pressure Transmitter
10 Engine Pump
11 Vent
12 Auxiliary Pump
13 Strainer
14 Fuel Line Shut-off Valve
15 Sump Drain

Figure 1-3. Fuel System

1-5. FUEL SYSTEM.

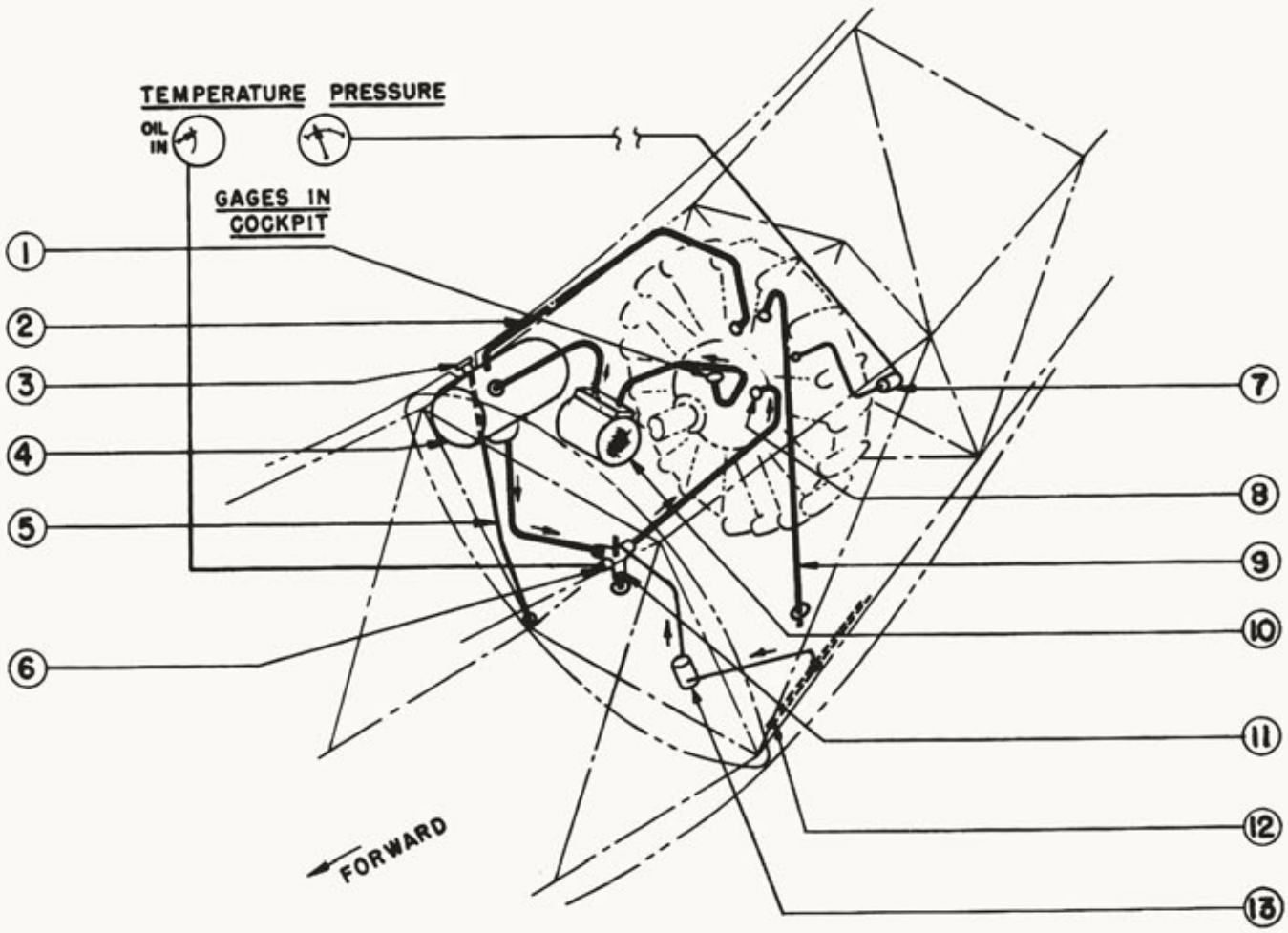
(See Figure 1-3.)

1-6 NORMAL LOADING: 100 U. S. Gallons.

1-7. OVERLOAD: None.

Note

No fuel tank calibration plate is provided in the helicopter, since the change in attitude of the fuselage at various forward speeds does not affect the fuel quantity gage readings appreciably.



1 Oil Outlet
2 Crankcase to Oil Reservoir Vent Line
3 Filler Neck
4 Oil Tank
5 Scupper Drain
6 Thermometer Bulb
7 Oil Pressure Transmitter
8 Oil Intake
9 Crankcase Vent Line
10 Oil Cooler
11 "Y" Drain
12 Fuel Line
13 Valve — Oil Dilution Solenoid

Figure 1-4. Oil System

1-8. OIL SYSTEM.

(See Figure 1-4.)

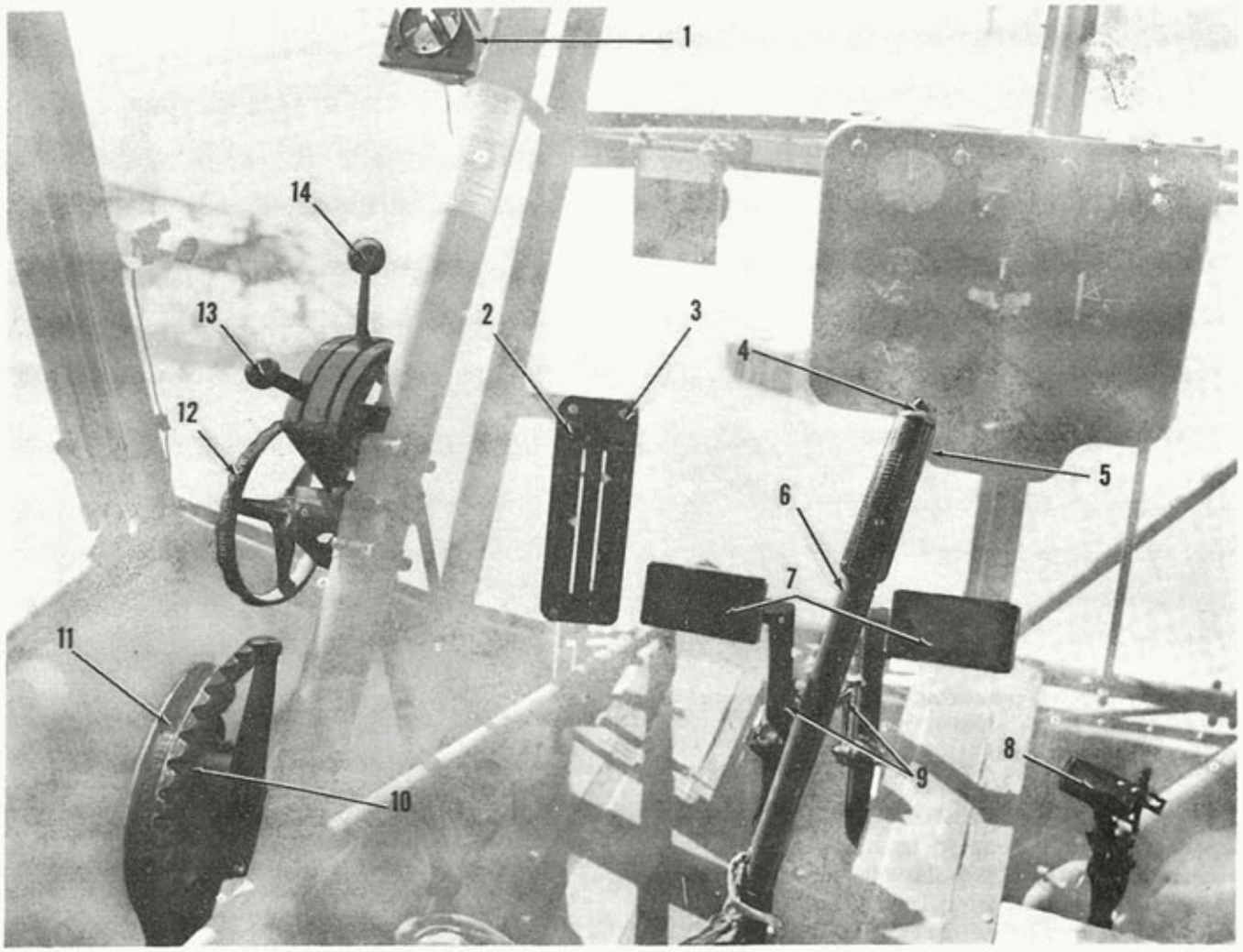
1-9. CAPACITY: 8.5 gallons (U. S.).

1-10. EXPANSION SPACE: 2.5 gallons (U. S.)

1-11. ENGINE CONTROLS.

1-12. THROTTLE CONTROL. The throttle action is synchronized with collective pitch control lever. Raising up on the collective pitch lever will increase the amount of throttle. Conversely, the lowering of the collective pitch lever will decrease the amount of throttle. However, the throttle may also be controlled independently if the occasion demands. A hand grip finger-actuated throttle control is located at the end of the collective pitch control lever. (See figure 1-5.) To increase power, move the throttle forward; to decrease, move the throttle back. The friction control consists of a screw type knob at the center of the quadrant which is adjustable by the pilot.

1-13. MIXTURE CONTROL. The mixture control is on a quadrant located to the left and forward of the pilot. Full forward position of the



1 Ignition Switch
2 Trim Indicator
3 Collective Pitch Indicator
4 Rescue Hoist Control
5 Radio Microphone Transmitter Switch
6 Cyclic Stick Control
7 Rudder Pedals
8 Wheel Brake Pedal
9 Rudder Pedal Adjustment Controls
10 Throttle Control
11 Collective Pitch Control Quadrant
12 Trim Control
13 Mixture Control
14 Carburetor Air Heat Control (Bunos 111819 & UP)

Figure 1-5. Pilot's Flight and Engine Controls

mixture control lever is full "RICH"; full aft is "IDLE CUTOFF." (See figure 1-5.)

1-14. CARBURETOR AIR HEAT CONTROL. This control is located on a longitudinal member above and to the left of the pilot's head. The control can be reached with the left hand. Full forward position of the control lever is "COLD"; full aft is "HOT." (See figure 1-6.) On HRP-1 BuNos 111819 and up, this control will be located on the mixture control quadrant. (See figure 1-5.)

1-15. PRIMER. The primer is actuated by a push button located on the switch panel to the right of the pilot. (See figure 1-7.)

1-16. IGNITION SWITCH. The ignition switch is located on the diagonal tube forward and to the left of the pilot. (See figure 1-5.)

1-17. FUEL VALVE. The fuel valve is located to the left of the pilot, adjacent to the collective pitch lever. (See figure 1-10.)

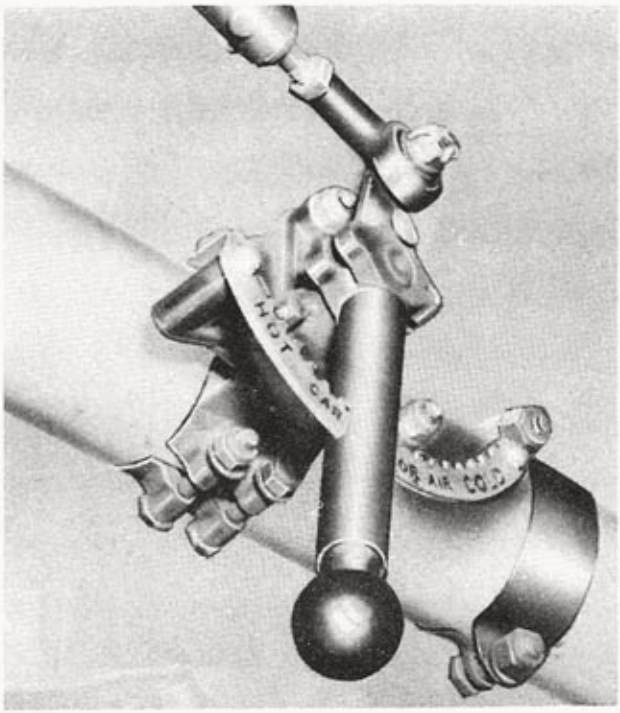
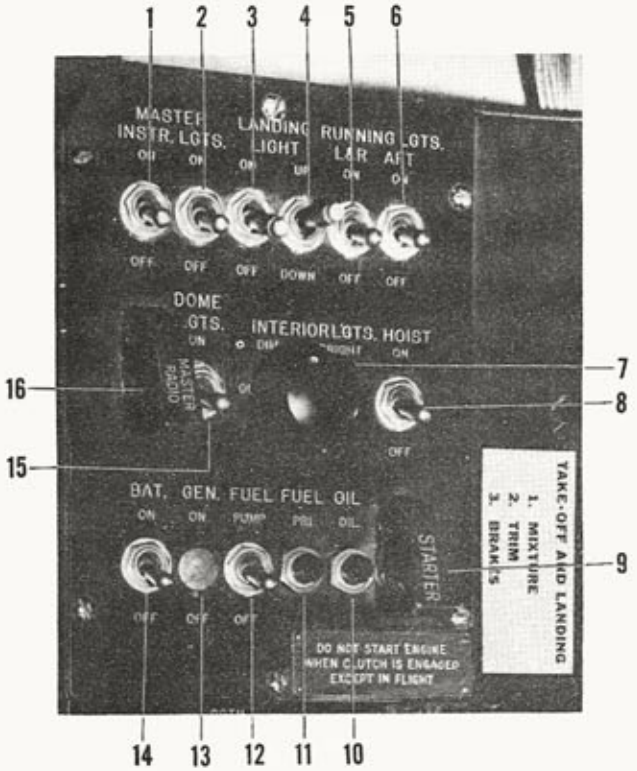


Figure 1-6. Carburetor Air Heat Control
(Bunos 111809-111818 only)



1 **Master Instruments Power Switch**
2 **Master Lights Switch**
3 **Landing Light "ON-OFF" Switch**
4 **Landing Light "UP-DOWN" Switch**
5 **Running Lights Switch, Left and Right**
6 **Running Light Switch, Aft**
7 **Interior Lights "OFF-DIM-BRIGHT" Switch**
8 **Hoist Switch**
9 **Starter Switch**
10 **Oil Dilution Switch**
11 **Fuel Primer Switch**
12 **Booster Fuel Pump Switch**
13 **Generator Switch Eliminated**
14 **Battery Switch**
15 **Dome Lights Switch**
16 **Master Radio Switch**

Figure 1-7. Pilot's Switch Console

1-18. ELECTRICAL SYSTEM.

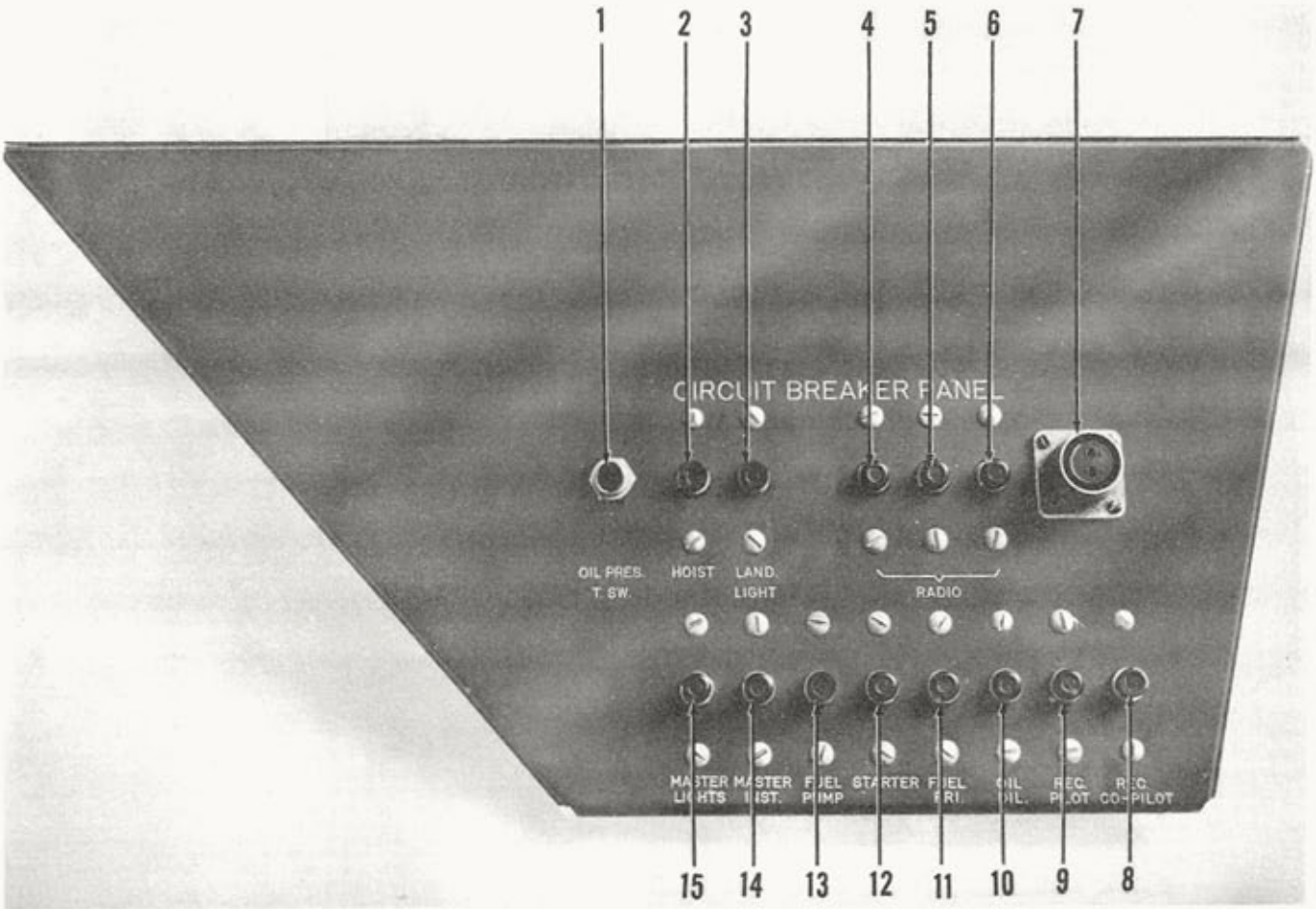
1-19. GENERAL DESCRIPTION. The electrical power for the helicopter is supplied through a single bus system by a 24-volt, 34-ampere hour battery and a generator furnishing 50 amperes at 28.5 volts. For external power an auxiliary power receptacle is located on the left side of the engine compartment. A generator voltage-regulator is provided to prevent changes in generator voltage caused by variations in generator load and speed. Three inverters change the direct current of the battery or generator into alternating current for the instruments requiring this current. The starter relay allows full power to flow from battery to engine starter and a battery relay completes the circuit from battery to the electrical system of the helicopter. To prevent the battery from short-circuiting through the generator, when the engine is operating at low rpm and the generator output is below that of the battery, a reverse current relay (cut-out) is installed. All switches for the electrical system are located on the main switch console to the right of the pilot (see Figures 1-7 and 1-9).

1-20. CIRCUIT BREAKERS. Circuit breakers for the electrical system are located on the vertical face of the switch console (see Figures 1-8 and 1-9). When a circuit is broken due to overload, the circuit breaker button pops "Out." To reset, push button in.

1-21. ELECTRICAL RECEPTACLES. Two standard electrical receptacles are provided. One on the circuit breaker panel and one to the left of the co-pilot's seat.

1-22. RADIO.

1-23. LOCATION OF CONTROLS. On the main switch console (see figure 1-9) is located the remote control panel of an AN/ARC-1 VHF autotune transmitter-receiver. This set accommodates ten channels. A channel selector switch is pro-



1 Oil Pressure Test Switch
2 Hoist C. B.
3 Landing Light C. B.
4 Radio Power C. B. 15 Amp. ARC-1 Transmitter-Receiver
5 Radio Power C. B. 5 Amp. ICS Amplifier
6 Radio Power C. B. 5 Amp. ARC-5 Receiver
7 Pilot Power Receptacle
8 Co-Pilot Receptacle C. B.
9 Pilot Receptacle C. B.
10 Oil Dilution C. B.
11 Fuel Primer C. B.
12 Starter C. B.
13 Fuel Pump C. B.
14 Master Instruments C. B.
15 Master Lights C. B.

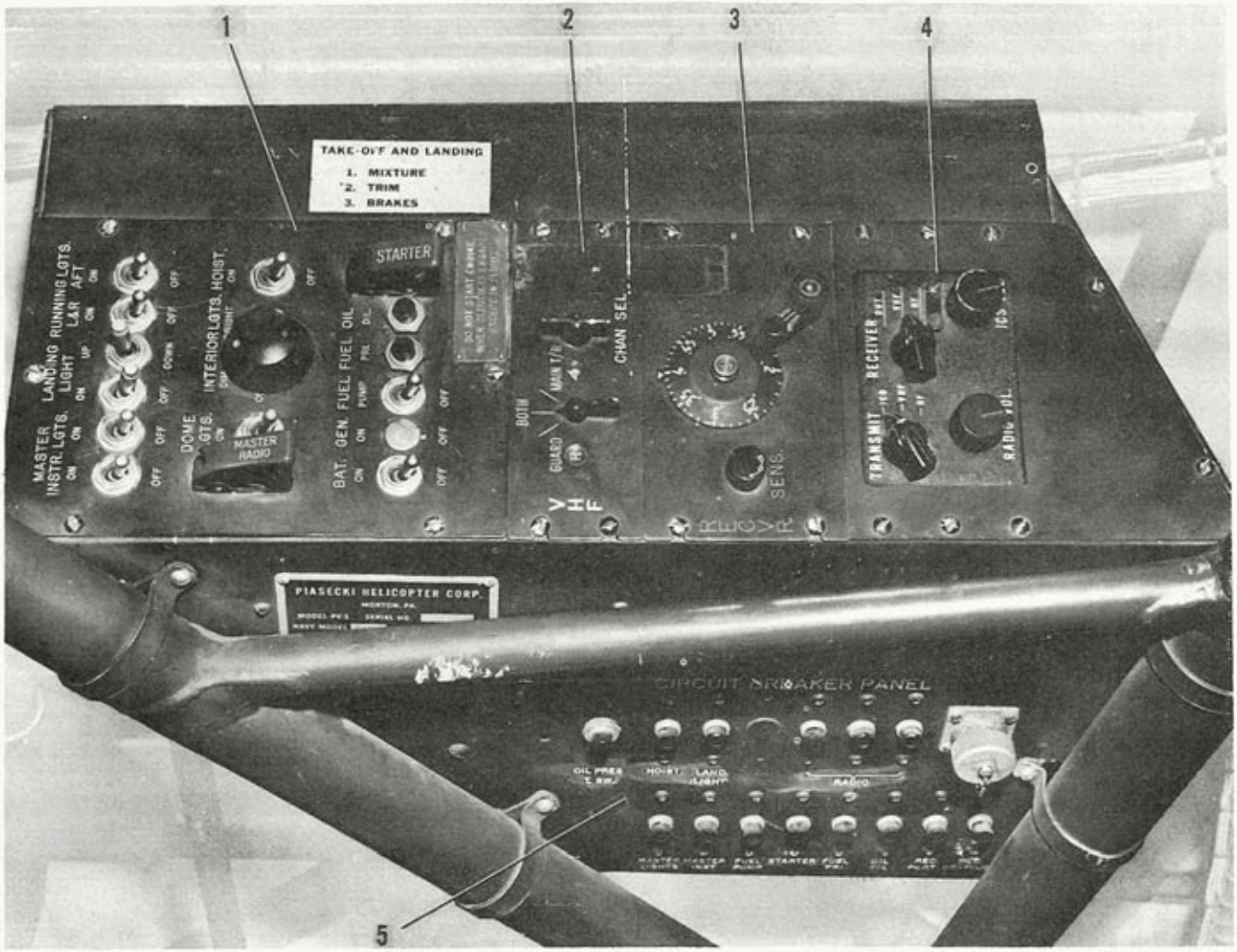
Figure 1-8. Circuit Breaker Panel

vided. A remote control panel for the AN/ARC-5 range receiver is also located on the main switch panel. AN/AIC-4 interphone communication facilities are available to the pilot, co-pilot, and cargo compartment. C-173/AIC-4 station boxes with volume control are provided for co-pilot and crew member. The pilot is provided with a C-174/AIC-4 selector unit used as a selector panel and a J-22/ARC-5 jack box.

1-24. LIGHTS.

1-25. COCKPIT LIGHTS. Red instrument lights are mounted on the instrument panel inside oval-shaped reflectors. When lights are on, the amount of coverage of the light in respect to the instrument panel illumination can be adjusted by pulling the light in or out. The instrument lights are controlled by a console switch. A circuit breaker is also provided on the circuit breaker panel for the instrument lights. A hooded light located on the diagonal, to the pilot's left, is provided for the pilot to facilitate map reading. One red dome light is provided for general illumination. A rheostat on the console switch panel controls all the interior red lights. Lights should be kept low to prevent glare. The main battery switch must be on before lights will function. On HRP-1 Helicopters, BuNos 111811 to 111828, indirect reflector type instrument lighting is incorporated, replacing the individual oval-shaped reflectors.

1-26. CARGO COMPARTMENT. One dome light is located overhead in cargo compartment.



1 Switch Panel
2 Control Unit (C-115/ARC-1)
3 Control Unit (C-125/ARC-5)
4 Control Unit (C-174/AIC-4)
5 Circuit Breaker Panel

Figure 1-9. Switch Console

1-27. EXTERIOR LIGHTS. Running lights including port, starboard, and tail lights are provided.

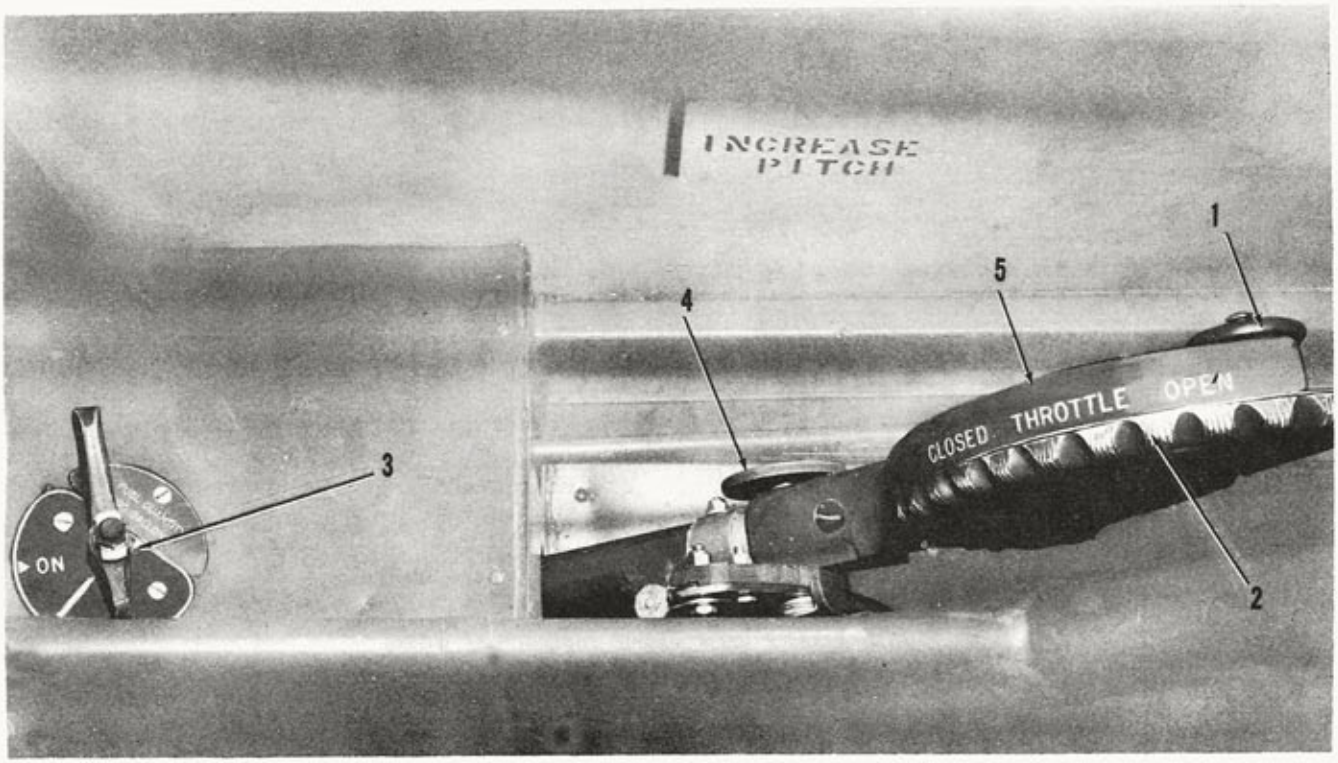
1-28. LANDING LIGHT. One extendable landing light is mounted on the underside of the fuselage approximately mid point between nose wheel landing gear assembly and the main landing gear assembly. All lights are controllable at the main switch panel. (See figure 1-7.)

1-29. PILOT'S FLIGHT CONTROLS.

1-30. COLLECTIVE PITCH AND THROTTLE CONTROL.

1-31. The collective pitch control is a lever located to the left of the pilot (see figure 1-10). When the control is in the "down" position, the blades are in minimum pitch. When the control is in the "up" position, the blades are in maximum pitch. Synchronization of the throttle acts as follows: pulling the control up opens (increases) the throttle; pushing the control down closes (decreases) the throttle.

1-32 The pitch indicator is located below and to the left of the instrument panel. (See figure 1-5.)



1 Throttle Control Friction Knob
2 Throttle Grip Quadrant
3 Fuel Selector Valve
4 Collective Pitch Friction Adjustment Knob
5 Pilot's Collective Pitch Grip Assembly

Figure 1 - 10. Collective Pitch Lever and Throttle Control

1-33. A plunger type pin lock is provided for the purpose of locking the pitch stick in the full down, or minimum pitch position. The lock operating handle is located on the right side of the pilot's seat and is operated by placing the collective pitch stick in the full down position, inserting the pin by turning the lock operating handle and pushing "IN." The lock must be locked in the "IN" position or locked in the unlocked, or "OUT" position to prevent the inadvertent locking or unlocking of the collective pitch lever. The pin lock is locked in either position by turning the lock operating handle counterclockwise (viewing face of handle).

CAUTION

The pilot should determine by feel, the engagement of the down-lock plunger pin through the collective pitch slide and lever. To do this it is necessary to reach to the lower left of the seat at the position of the pin engagement point, and actually feel the protruding part of the pin. Failure to have the lever securely locked in place may result in engine overrevving if the collective pitch should inadvertently raise to the full up position.

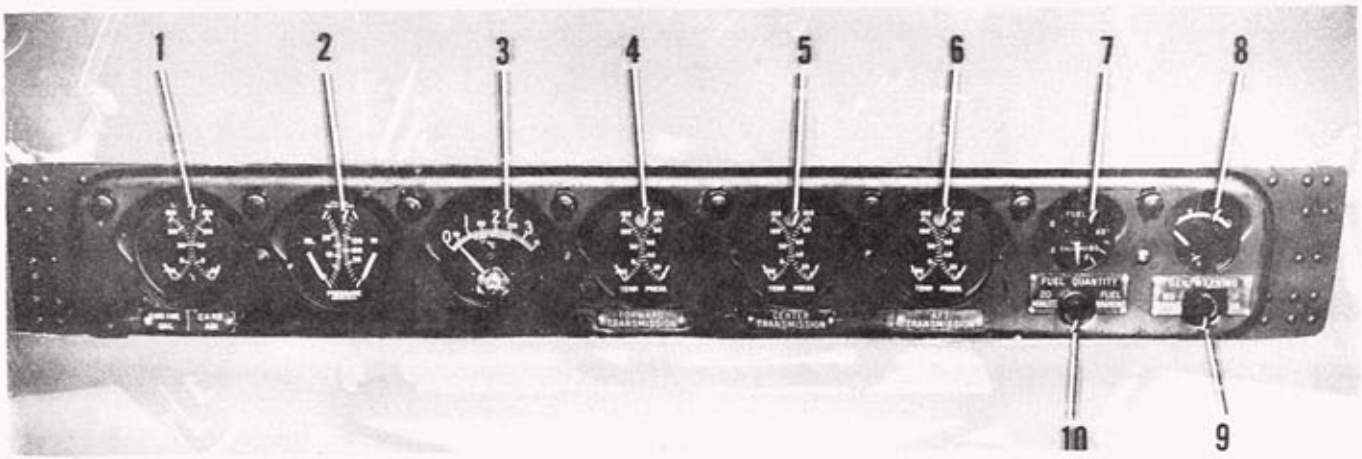
WARNING

At low or no rotor RPM there is considerable up-load on the collective pitch lever, therefore, the pin lock should be placed and *kept* in the "locked" position when there is less than 100 RPM on the rotors.

1-34. A friction device is incorporated on the collective pitch lever to permit adjustment in control friction to suit the individual pilot.

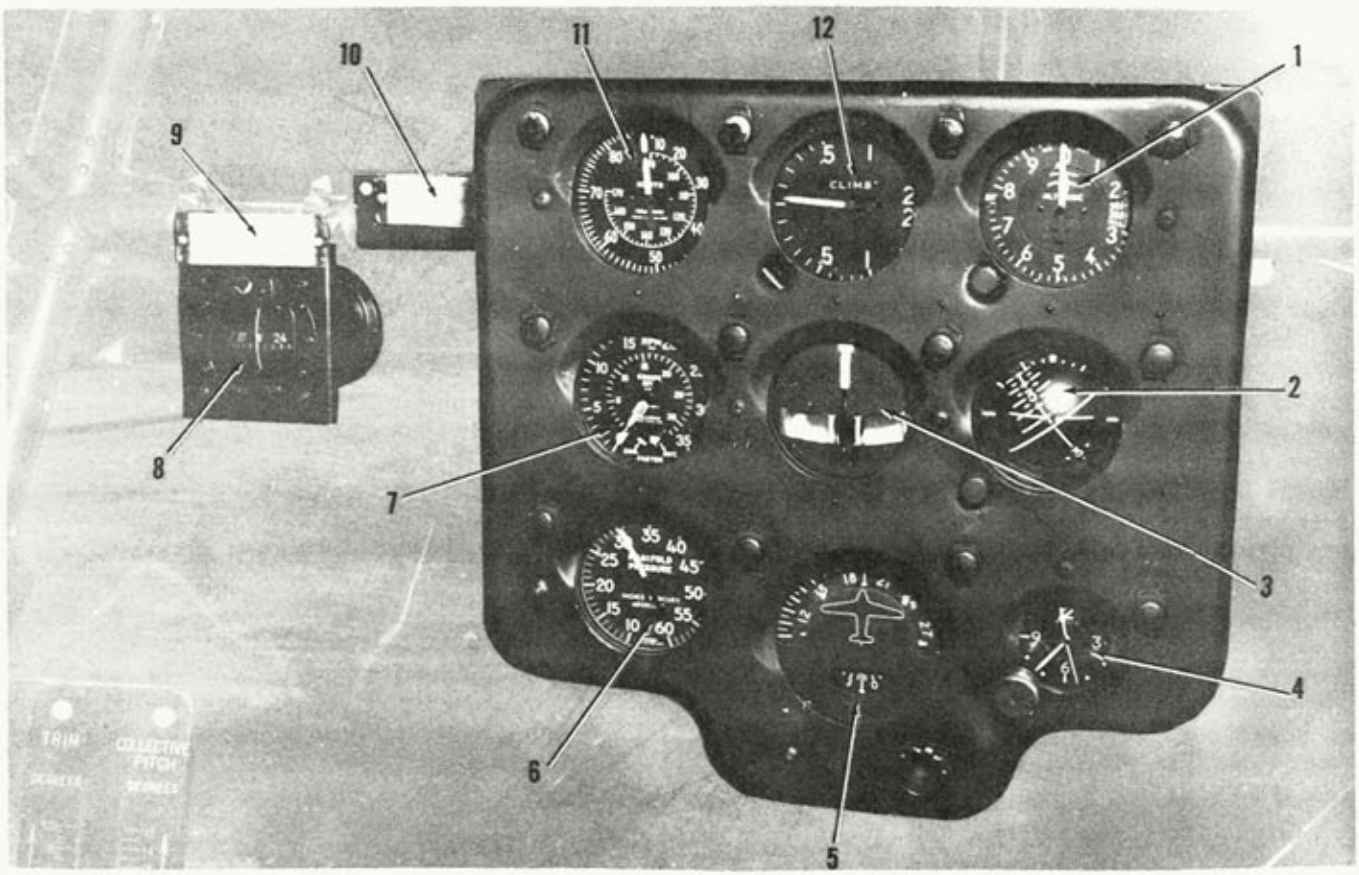
1-35. A bungee load compensator is provided in the collective pitch control system to relieve the down load at the collective pitch lever.

1-36. CONTROL STICK. The cyclic control stick is conventionally located between the pilot's knees. (See figure 1-5.)



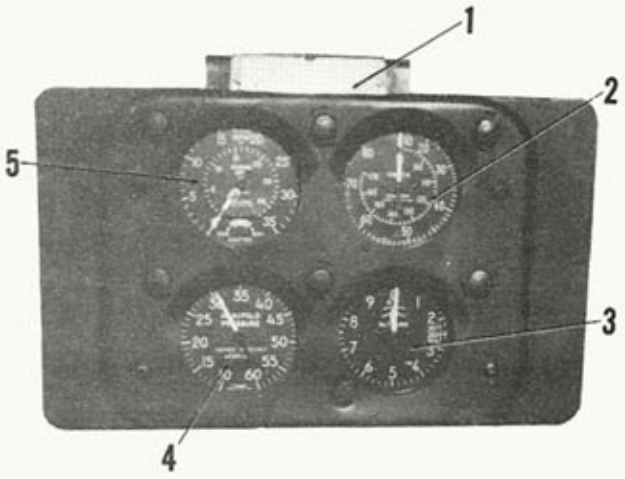
1 Engine Oil and Carburetor Air Temperature Gauge
2 Fuel and Oil Pressure Indicator
3 Cylinder Head Temperature Indicator
4 Forward Rotor Transmission Oil Temperature and Pressure Indicator
5 Center Rotor Transmission Oil Temperature and Pressure Indicator
6 Aft Rotor Transmission Oil Temperature and Pressure Indicator
7 Fuel Quantity Indicator
8 Voltmeter
9 Generator Warning Light
10 Fuel Warning Light

Figure 1-11. Pilot's Upper Instrument Panel



1 Altimeter
2 Attitude Gyro Indicator
3 Turn and Bank Indicator
4 Clock
5 Directional Gyro Indicator
6 Manifold Pressure Indicator
7 Rotor and Engine Tachometer Indicator
8 Compass
9 Compass Correction Card
10 Airspeed Correction Card
11 Airspeed Indicator
12 Climb Indicator

Figure 1-12. Pilot's Lower Instrument Panel



1 Airspeed Correction Card
2 Airspeed Indicator
3 Altimeter
4 Manifold Pressure Indicator
5 Engine and Rotor Tachometer Indicator

Figure 1-13. Co-pilot's Instrument Panel

1-37. TRIM CONTROL. The trim control is located on the diagonal tube to the left and forward of the pilot. The trim control indicator is located to the left of the pilot's left rudder pedal. (See figure 1-5.) This control provides longitudinal trim to permit the pilot to center the cyclic stick for various center of gravity conditions. The trim control is not a device to eliminate small stick forces which may be present but serves as a cyclic stick positioner only. (See paragraph 2-6.)

1-38. MAIN ROTOR CLUTCH AND BRAKE LEVER. The main rotor clutch and brake lever extends from the deck forward and to the right of the pilot. When the lever is against the stop, approximately half of total travel, the friction clutch is fully engaged. When the lever is completely forward the jaw clutch is fully engaged. With the lever completely aft, the friction and jaw clutch are both disengaged.

1-39. The friction clutch may be used as a rotor brake to slow or stop the rotors after the engine is stopped. A slow movement of the lever into friction position will apply braking action to the rotor system.

1-40. An automatic free-wheeling unit is incorporated in the clutch mechanism. In case of engine failure or power-off flight, the free-wheeling unit allows autorotation of the blades without engine drag.

1-41. RUDDER CONTROL.

1-42. Rudder pedals (see figure 1-5) are provided for directional control and conventionally located at the pilot's feet.

1-43. The rudder pedals are mounted on the pivot below the floorboards and are adjusted individually by pressing the heel latch below the pedal. (See figure 1-5.)

1-44. WHEEL BRAKES.

1-45. PARKING BRAKES. Hydraulic parking wheel brakes are provided on the wheels of the main landing gear. No brake is provided for the nose wheel. Except on carrier modified helicopters the wheels do not have individual controls but are actuated by the single brake pedal in the pilot's compartment. To apply brakes, press on brake pedal with the right foot. To release the brake, press the release on the side of the pedal. (See figure 1-5.)

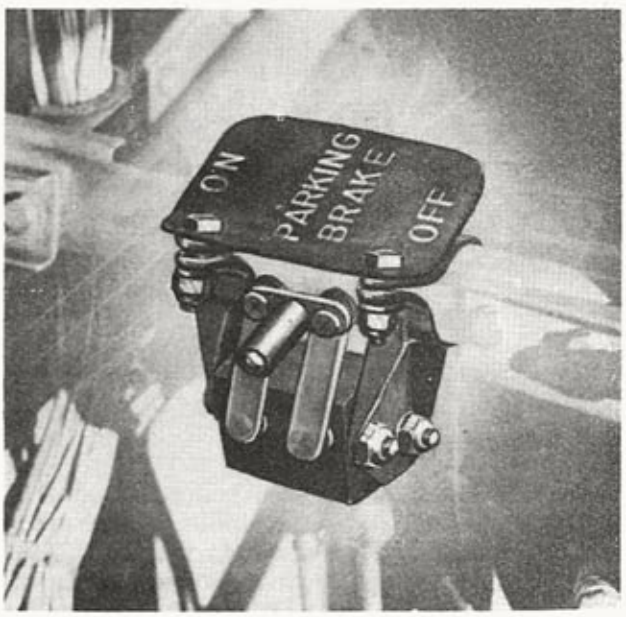


Figure 1-14. Parking Brake Control
(BuNos 111816 through 111820 and 111824 only)

1-46. Helicopters BuNos 111816 through 111820 and 111824 have been modified for carrier operation. On these helicopters the parking brake control is located on the pilot's right, above and aft of the radio console. (See Figure 1-13A.) The parking brakes are placed in the "ON" position by pressing both toe brakes (paragraph 1-47) and moving the control to "ON" position. To release the brakes, move the control to "OFF" position. The parking brake described in paragraph 1-45 is not installed in the carrier modified HRP-1 helicopters.

1-47. TOE BRAKES. Toe brakes (See figure 1-13B) are installed on the pilot's rudder pedals of carrier modified helicopters. Braking action is obtained on each main wheel by applying pressure on the corresponding brake pedal. These brakes are installed primarily for operation on

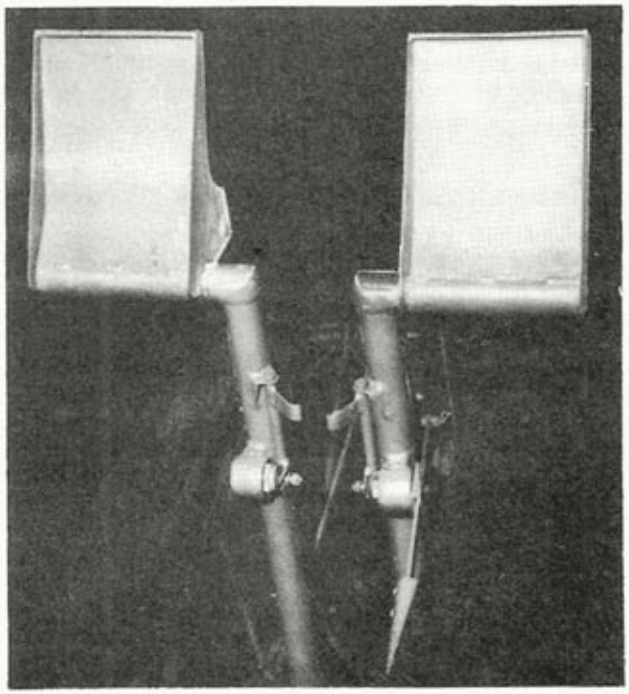


Figure 1-15. Pilot's Toe Brakes
(BuNos 111816 through 111820 and 111824 only)

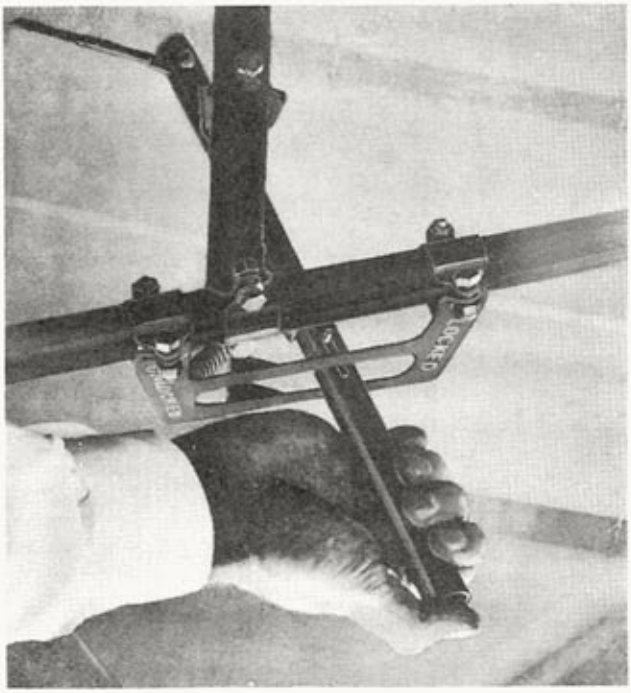


Figure 1-16. Nose Wheel Lock Control
(BuNos 111816 through 111820 and 111824 only)

carrier decks and are not to be used for fast taxiing.

1-48. NOSE WHEEL LOCK.

1-49. On the carrier modified helicopters, BuNos 111816 through 111820 and 111824, a nose wheel lock is provided. This prevents the main landing gear nose wheel from swiveling when the helicopter is landing or resting on the rolling deck of a ship. Without the lock engaged, nothing will prevent the nose wheel from swiveling and permitting the helicopter to swing about on the main wheels. The locking lever (see figure 1-13C) is located to the right of the pilot, on the main structure forward of the switch console. To lock the nose wheel depress the thumb release on the locking lever and move lever forward. To unlock depress the thumb release and move the lever aft.

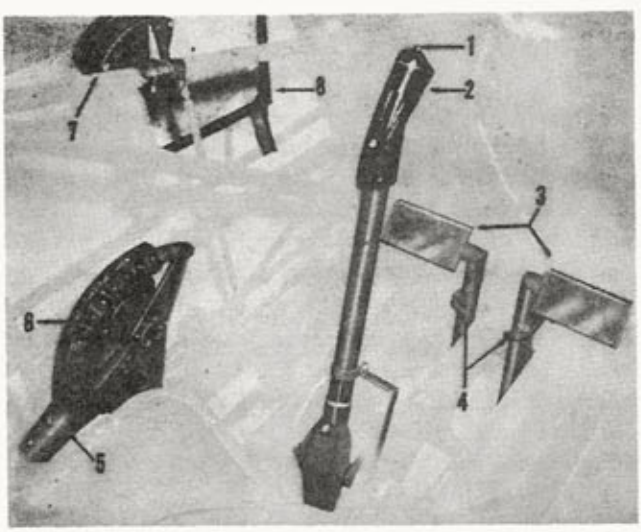
1-50. CO-PILOT'S FLIGHT CONTROLS.

1-51. MAIN ROTOR PITCH CONTROL. The co-pilot's collective pitch control is similar to that of the pilot's except that no friction device or down lock is provided. (See figure 1-14.)

1-52. CONTROL STICK. The control stick is similar to that of the pilot's. (See figure 1-14.)

1-53. MAIN ROTOR CLUTCH AND BRAKE LEVER. None provided for co-pilot. (See figure 1-14.)

1-54. RUDDER CONTROLS. Similar to that of pilot's controls and adjustment of the controls is accomplished in the same manner. (See figure 1-14.)



1 Transmitter Switch
2 Cyclic Control Stick
3 Rudder Pedal Control
4 Rudder Adjustment
5 Collective Pitch Lever
6 Engine Throttle Control
7 Mixture Control
8 Plotting Board

Figure 1-17. Co-pilot's Flight and Engine Controls

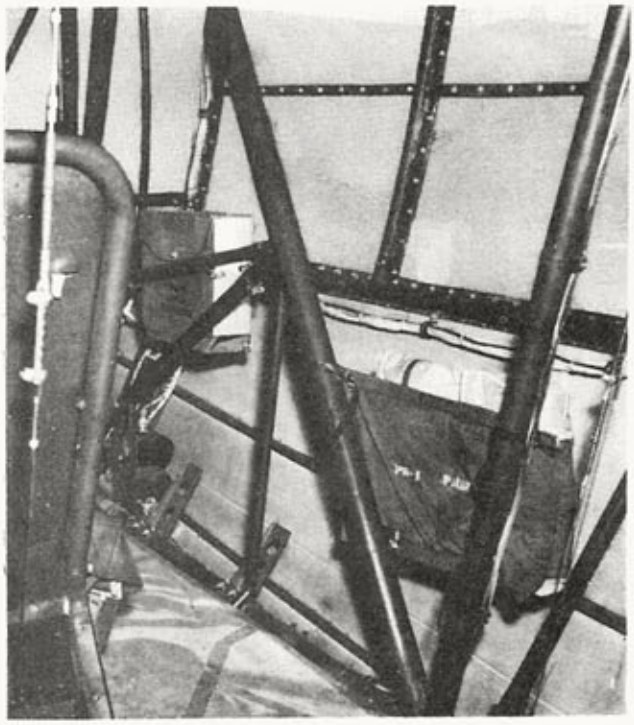


Figure 1-18. Pilot's Map Kit and Packet Raft Case

1-55. PILOT COMFORT.

1-56. RUDDER PEDAL ADJUSTMENT. Adjustment of the rudder pedals provides adaptation for comfort.

1-57. MISCELLANEOUS EQUIPMENT

1-58. SAFETY BELT. A lap type safety belt, NAF Standard 1201-2, is furnished for each member of the crew.

1-59. MAP CASE. A map case and flight report holder is located to the right of the pilot just aft of the circuit breaker panel. (See figure 1-15.)

1-60. MARK 6A CHART. A Mark 6A chart and plotting board is located in the co-pilot's compartment to the left of the co-pilot's instrument panel. (See figure 1-14.)

1-61. PR-1 PACKET RAFT CASE. A PR-1 packet raft case is located in the co-pilot's compartment to the right of the co-pilot. (See figure 1-15.)

1-62. FIRST AID KIT. A First Aid Kit, Bu Med 9-196-650, is located on the underside of the radio shelf in the cargo compartment. (See figure 4-2.)

1-63. OPERATIONAL EQUIPMENT.

1-64. The operational equipment consists of a rescue hoist and communication equipment. (See section IV.)

SECTION II

NORMAL OPERATION INSTRUCTIONS

2-1. BEFORE ENTERING THE PILOT'S COMPARTMENT.

2-2. FLIGHT LIMITATIONS AND RESTRICTIONS. The following maneuvers are prohibited:

Aerobatics. Practice autorotation.

Speed. Do not exceed 85 kts IAS in any flight attitude.

Anything other than normal flight maneuvers.

The maximum recommended gross weight is 6900 pounds.

These limitations and restrictions are subject to change and latest service directives and orders must be consulted.

2-3. CAUTIONS TO BE OBSERVED.

Do not engage in maneuvers which require large and/or rapid lateral motions or reversals of the cyclic pitch control. The reason for this caution is to avoid the possibility of the rotor blades hitting the droop stops, resulting in possible injury to the blades.

A visual inspection of the aircraft should be made to insure that all blade tie down socks are removed from blades and that all obstructions are well clear of the rotors such as checkstands, ladders, etc.

Obtain the take-off and landing gross weights and center of gravity locations for the contemplated flight. For normal operation, do not exceed the maximum gross weights and center of gravity limits specified in the Handbook of Weight and Balance Data, ANO1-1B-40.

2-4. ACCESS TO PILOT'S COMPARTMENT. Access to the pilot's compartment is gained through the cargo (or passenger) compartment.

2-5. ON ENTERING THE PILOT'S COMPARTMENT.

2-6. STANDARD CHECK FOR ALL FLIGHTS.

a. Inspect interior of ship to determine that no loose equipment, i.e., rags, etc., are lying about.

b. Fasten safety belt.

c. Adjust rudder pedals for proper length.

d. Check collective pitch lever: full down position (low pitch) and locked with the pin lock.

e. Check controls for free and full movement.

f. Wheel brakes "ON."

g. Main clutch, "DISENGAGED (clutch lever full aft).

h. Ignition switch "OFF."

i. Battery switch "ON."

j. Main instrument switch "ON."

k. Master radio switch "ON." (See Section IV for communication set up instructions.)

l. Check fuel quantity warning light by pressing.

m. Check fuel quantity gage for fuel loading.

n. Set altimeter.

o. Set trim at zero degrees.

CAUTION

Improper use of the trim could, under certain flight conditions where maximum longitudinal control is necessary, result in insufficient longitudinal control under certain center of gravity conditions. For example, with the C.G. at its most forward permissible condition and with the trim set full nose down, it would be difficult to perform a quick stop or sharp autorotative flare due to the reduction of aft longitudinal control caused by improper use of the trim. The proper procedure would be to set trim at zero, then take off to a hovering condition. The cyclic stick would probably be slightly aft of neutral position due to the forward C.G. condition. Nose up trim would then be applied to center the cyclic stick to insure full longitudinal control in either direction. Once the trim setting has been established, do not re-trim unless a considerable change in loading has been made. Normal loading conditions do not necessitate the use of the trim.

Note

All instruments with electrical connections are in a functional condition when the battery and instrument switches are "ON."

2-7. SPECIAL CHECK FOR NIGHT FLIGHTS.

a. Check instrument lights.

b. Check landing light (with engine running only).

c. Check running lights.

2-8. FUEL SYSTEM MANAGEMENT.

2-9. NORMAL CONDITIONS.

a. Fuel valve: "ON."

b. Auxiliary fuel pump: "ON"

c. When engine is firing evenly, turn the auxiliary fuel pump "OFF."

2-10. EMERGENCY CONDITIONS. In the event the fuel pressure drops below four pounds per square inch, turn the auxiliary fuel pump "ON."

2-11. STARTING ENGINE.

CAUTION

Before starting engine be sure clutch is disengaged.

a. PITCH CONTROL: Minimum pitch position and down lock pin "IN."

b. USE OF BATTERY CART. If battery cart is available, with the ignition switch in the "OFF" position, turn the engine four or five revolutions with the starter. If the battery cart is not available, the engine should be turned over manually to clear the combustion chambers.

c. FUEL VALVE: "ON."

d. MIXTURE: RICH.

e. CARBURETOR HEAT: COLD.

f. THROTTLE: Cracked open — equivalent to approximately 1000 RPM.

g. AUXILIARY FUEL PUMP: "ON."

h. IGNITION SWITCH: On "BOTH."

i. PRIMER SWITCH: "ON," as necessary.

CAUTION

Avoid excessive priming which may flood the engine causing difficulty in starting; this is also an additional fire hazard.

j. STARTER: "ON."

k. GENERATOR. Check generator output on voltmeter. If generator is not functioning, the red indicator will light.

l. A standard oil dilution switch is provided to facilitate starting the engine in extremely cold weather. A valve is located on the oil dilution system in the engine compartment and must be "ON" before the system will operate.

CAUTION

With the clutch disengaged, the throttle is extremely sensitive. If held open, it will cause excessive engine speed while engine is still cold. Stop engine immediately if oil pressure is not indicated within 30 seconds after starting.

2-12. STARTING ROTORS.

No minimum warm-up of the engine is required before rotor engagement. A qualified pilot who is fully instructed and authorized to warm up the engine should be at the controls at the time the rotors are engaged.

2-13. FOR NORMAL WIND. (Up to 15 MPH.)

a. The aircraft should be headed into the wind if not already heading in that direction.

WARNING

When the rotor is to be engaged, be sure the blades are free and clear with no tie-down socks on, or ladders or other obstructions in the way.

b. Be sure the wheel brakes are on.

c. Throttle: 1200 rpm.

CAUTION

Do not engage rotors at over **1400** engine rpm.

d. Main rotor pitch control: Minimum and locked.

e. Cyclic stick and rudder pedals neutral.

f. To engage the rotors depress the thumb release on the clutch lever and advance the lever with a positive motion to the first stop. The engagement of the friction discs during this operation will be recognized by a definite resistance in the clutch lever. When the engine and rotor rpm become synchronized, release the thumb button and allow the clutch lever to travel forward to the second stop. Upon contacting the second stop again depress the thumb release button and allow the clutch lever to travel forward to the fully engaged position.

CAUTION

Engine and rotor rpm must be synchro-

nized before moving clutch lever beyond first stop. Entering positive drive before synchronizing will bend the rotor blades. The torque-limiting clutch cannot relieve this shock load at low rotor rpm.

Note

A rapid engagement of the friction clutch is preferred, since a slow engagement tends to produce "squealing".

CAUTION

If rotor blades are not turning or no resistance is felt in the clutch lever as the first stop is reached, the actuating mechanism in the friction disc clutch is not operating. This may occur as a result of a partial disengagement of the clutch after a previous flight. If this should occur, do not move the clutch past the first stop but immediately *disengage* the clutch with a *rapid* motion and attempt another engagement.

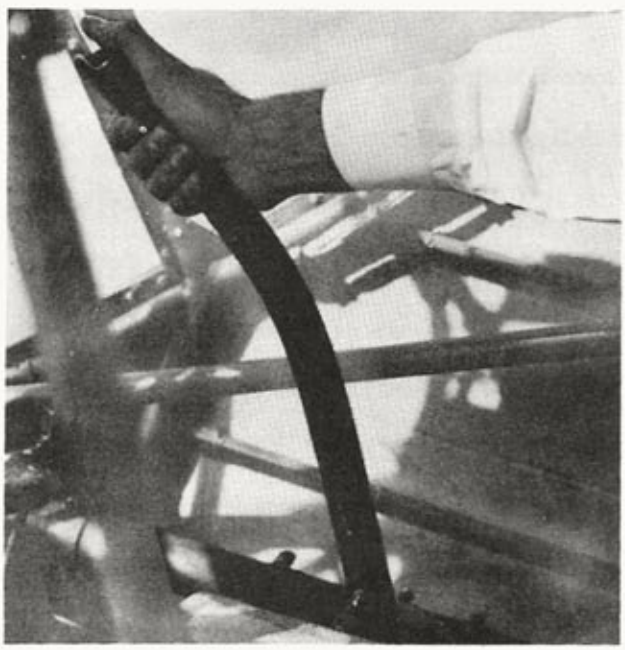


Figure 2-1. Clutch Lever

2-14. HIGH WIND OR GUSTS (OVER 15 MPH). When starting rotors in high winds, the normal procedure as outlined in paragraph 2-13 f applies, except that the rotor speed should be increased as soon as possible after the jaw clutch has been engaged. During the entire rotor engaging procedure, care should be taken to position the cyclic stick and rudder pedals to prevent the rotor blades from striking the droop stops.

CAUTION

Disengage rotors immediately if oil pressures are not indicated in the front, center, and rear transmissions within approximately two minutes. A red warning light on the pilot's instrument panel will light if the pressures are less than 20 lbs. or more than 75 lbs. Warning lights may function during the warm-up or idling periods due to reduced oil pressures at low rpm's.

2-15. ENGINE WARM-UP AND ACCESSORY CHECK.

a. ENGINE WARM-UP. Warm up engine between 1200 and 1400 rpm until the oil temperature reaches 40° C. It is then safe to take off provided the oil pressure remains between 70 and 90 pounds per square inch at 2000 rpm.

b. FUEL PRESSURE. Fuel Pressure should be at least 4 pounds per square inch.

c. GENERATOR. Check for proper generator operation.

2-16. SCRAMBLE TAKE-OFF.

2-17. TAKE-OFF MINIMUMS.

a. Fuel pressure: 4 pounds.

b. Oil pressure: 70 pounds.

c. Oil temperature: 40° C.

d. Cylinder head temperature: 120° C.

e. Transmission temperatures: no minimum.

f. Transmission pressure: 20 pounds.

2-18. ENGINE AND ACCESSORIES OPERATION GROUND TEST WITH ROTORS ENGAGED.

2-19. ENGINE RPM. Bring engine rpm to 1800.

2-20. MAGNETO CHECK. Check both magnetos by momentarily switching from "BOTH" to "LEFT" and then from "BOTH" to "RIGHT"; then back to "BOTH."

Note

The normal drop in engine rpm should not be more than 75 rpm. If the drop is more than 100 rpm, or if either magneto shows no drop, the ignition system should be checked.

2-21. ACCESSORIES CHECK.

a. Fuel pressure: 4 pounds minimum; 6 pounds maximum.

b. Oil pressure: 70 to 90 pounds.

c. Oil temperature: 40° C. (minimum).

d. Cylinder head temperature: 120 degrees C (minimum).

e. Carburetor heat: "COLD."

f. Generator output: Voltmeter: 28 volts.

g. Dual tachometer: Engine and rotor needles should coincide. Rotation of the synchroscope or spread of the needles indicates clutch slippage and should be checked before take-off.

2-22. TAXIING INSTRUCTIONS.

2-23. GENERAL. The helicopter can be readily taxied. The necessary thrust to move the helicopter, forward or backward, is obtained from the rotor system. The cyclic stick is used for fore, aft and lateral control; the rudders for directional control. It is not advisable to attempt taxiing over rough terrain. Under such conditions, it is more practical to fly the helicopter to the desired position.

2-24. PROCEDURE

a. With nose wheel unlocked and wheel brakes released, increase the collective pitch to approximately 5°, and the engine rpm to 1800.

b. Displace the cyclic stick in the direction it is desired to taxi.

c. Use rudder to control the direction of the fuselage.

d. Use throttle and amount of deflection of the cyclic stick to control speed. (Care should be taken to avoid hitting droop stops with the blades. This can be readily recognized by a heavy thumping.)

e. To slow or stop the helicopter, displace the cyclic stick rearward and at the same time increase collective pitch and rotor RPM. Here again care should be taken to avoid hitting the droop stops. Return cyclic stick to neutral and reduce collective pitch and rotor RPM when helicopter stops.

f. When taxiing or turning in strong cross winds caution must be exercised to prevent the wind from getting under the rotors and upsetting the helicopter. Should a rolling-over tendency appear the helicopter must be airborne immediately. The best practice is to keep the lateral cyclic well into the wind and maintain a high rotor rpm. Maintaining a high rpm will allow take-off power to be more rapidly applied.

CAUTION

Do not use wheel brakes to slow or stop the helicopter, (except Bunos 111816 through 111820 and 111824. These are provided with toe brakes) as damage may occur to the system due to pressure overloading.

2-25. TAKE-OFF.

2-26. STARTING RUN-UP. Keeping the collective pitch control at a minimum pitch, i.e., full down position, slowly open the throttle to about 1500 RPM. This RPM setting should be varied according to the load, air temperature, and wind. Conditions of high loading, no wind, and high temperature will require higher RPM settings since more power is required under these conditions. The helicopter should be kept headed into the wind by use of the rudders (cross wind and down wind take-offs may be accomplished but should be attempted only by experienced pilots). The helicopter should be kept from rolling by use of the cyclic control stick.

2-27. OPERATION OF COLLECTIVE PITCH STICK. Release the pin lock on the collective pitch lever. Keeping a firm grip on the lever, increase the pitch moderately, watching the engine tachometer. Due to the throttle-pitch synchronization, the rotor RPM will increase to 250 at about 7° pitch. Increase the pitch until the helicopter is airborne. Minor variations of the hand throttle setting may be necessary to prevent over or under "revving."

2-28. TAKE-OFF TO HOVERING POSITION. Careful attention should be paid to keeping the helicopter steady as it leaves the ground. Do not hold the helicopter in "half-flight" condition, that is, with the shock struts extended but with the wheels still on the ground.

2-29. TRIM. Adjust trim for neutral or centered stick position while in hovering flight. It is *important* that the cyclic stick be longitudinally centered by the use of the trim device to allow full longitudinal control in either direction. The cyclic stick is centered when perpendicular to the deck of the helicopter, this can be visually checked by the pilot.

CAUTION

Do not operate at take-off power (2250 RPM, 36" Hg. manifold pressure) for more than five minutes.

Note

Check engine fuel and oil pressures, transmission pressures and temperatures, while in hovering flight immediately after leaving the ground.

2-30. TRANSITION FROM HOVERING TO FORWARD, BACKWARD, SIDEWARD FLIGHT.

2-31. TRANSITION TO FORWARD FLIGHT. In order to prevent the slight loss in altitude when moving off the ground cushion into forward or sideward flight, it may be necessary to

increase the pitch slightly until translational lift is attained.

2-32. FORWARD FLIGHT. The control stick should be displaced slightly forward. As the ship gains forward speed, and translational lift is attained, the control stick should be neutralized or positioned for climbing or cruising.

WARNING

DO NOT OPERATE ROTORS AT LESS THAN 200 RPM. This figure represents the minimum rpm necessary to maintain a safe coning angle of the rotor blades.

2-33. BACKWARD AND SIDEWARD FLIGHT. The HRP-1 helicopter can be readily flown in rearward or sideward flight by proper deflection of the control stick in the desired direction. However, flying in both of these directions should be done at slow speeds (17 Kts-IAS) and only when it is necessary.

CAUTION

Since the tip path of the rear rotor will extend approximately 60 feet behind the pilot, and because backward visibility is limited, it is mandatory that the pilot thoroughly check the area to be sure there are no obstructions before attempting rearward or sideward flight.

2-34. GENERAL. Only under extreme conditions of load, no wind, and high air temperatures should full power be necessary for hovering or maneuvering close to the ground. Under average conditions, the pilot should be able to maintain a 20% reserve of power for emergency operation.

2-35. ENGINE FAILURE DURING TAKE-OFF.

2-36. UNDER 10 FEET. If engine failure occurs during hovering under 10 feet, the inertia of the rotors will be sufficient to obviate an unreasonably hard landing. A rapid increase of collective pitch should reduce the landing shock to a minimum.

2-37. EMERGENCY OPERATING INSTRUCTIONS. See Emergency Operating Instructions for procedure to be followed for engine failure between 10 and 530 feet.

2-38. CLIMB.

2-39. SETTINGS FOR BEST CLIMB. The best rate of climb at sea level is achieved at 47 knots, 2200 engine RPM and 34.5" Hg. manifold pressure, mixture rich.

2-40. CRUISING.

2-41. SETTINGS FOR BEST CRUISE. For smoothest cruise use 225 to 230 motor RPM. Recommended engine settings for cruising are 29 inches of mercury with an engine RPM of 2050. For maximum range, cruise at 75 knots. Cruise at 56 knots for maximum duration.

WARNING

Normal operating oil pressures of the front, center, and rear transmission are 35 pounds per square inch. However, the pressure will vary with conditions and it is permissible to operate within the ranges of from 20 to 75 pounds per square inch pressure. Normal operating temperatures of the transmissions are 65-70° C. However, the operating temperatures vary with the outside temperature and it is permissible to operate at a stabilized temperature as high as 95° C. A red warning light indicator is incorporated in each transmission instrument. If a red light goes on, it indicates that either the oil pressure is too high or too low, or the temperature is above maximum permissible operating limits for that transmission. The indicator hands of the instrument will determine whether the difficulty is temperature or pressure. Land immediately if transmission red warning lights go on. It is also recommended that a landing be effected if a sudden raise in transmission temperature is noted or erratic pressures are indicated.

A fuel quantity warning light is located on the right side of the instrument panel. When there is only a 20 minute supply of fuel remaining the red warning light will function.

2-42. GENERAL FLYING CHARACTERISTICS

2-43. STABILITY. The HRP-1 helicopter cannot be flown "Hands Off" for extended periods. For normal operation, the control stick should be held for all rotor operation, both in the air and on the ground.

2-44. TRIM. The trim wheel (see paragraph 1-37) enables the pilot to position the longitudinal control stick into a neutral position to compensate for variations in longitudinal balance. This trim is not to be used to reduce or "trim out" control forces that may be present.

2-45. STALLS.

2-46. FLIGHT CONDITIONS. If sufficient engine RPM is maintained, the helicopter will not stall under any conditions. However, considering the possibility of engine failure, it is not good practice to hover between 10 and 530 feet. When the ship is hovering up to approximately 10 feet, considerable lift will be evident due to "Ground Cushion." Considerable additional lift is also evident when forward flight of approximately 15 knots is achieved (translational lift).

2-47. SPINS.

2-48. 360° TURNS. The HRP-1 helicopter is not subject to uncontrolled conventional spins. In fact, a controlled maneuver can be made while hovering by applying rudder in either direction causing the fuselage to rotate about the vertical axis.

2-49. DIVING. During dives the HRP-1 helicopter should not exceed 85 knots IAS.

2-50. HOVERING. the helicopter may be hovered at zero airspeed under normal load.

CAUTION

Do not hover at zero airspeed between 10 and 530 feet altitude. In the event of engine failure while at zero airspeed between 10 and 530 feet exceptional technique will be necessary to avoid a hard landing.

2-51. DOWNWIND TURNS AT LOW ALTITUDE.

2-52. LOSS OF TRANSLATIONAL LIFT. While the helicopter will not stall or spin, loss of airspeed due to downwind turns will result in loss or "translational lift." When flying at low altitude, the pilot tends to judge with reference to the ground rather than to his true airspeed. Therefore, when downwind turns are made at low altitudes, the pilot should be certain to maintain airspeeds above 17 Kts. (IAS) or be prepared to apply pitch and power at a rapid rate to prevent an unintentional landing.

2-53. RESERVE POWER. Under normal flying conditions, the pilot should be able to conduct all maneuvers, hovering, etc., close to the ground with considerably less than full power. If this condition is observed, reserve power will be available in case of emergencies caused by turbulent air or severe maneuvers.

2-54. POWER-ON-GLIDE. A power-on-glide is accomplished by reducing pitch for the desired rate of descent, being careful to maintain a safe rotor RPM (between 220 and 250 RPM).

2-55. POWER OFF DESCENT.

2-56. EMERGENCY AUTOROTATIVE DESCENT. In case of power failure it is of utmost importance to reduce the collective pitch to autorotative angles (3 to 4 degrees) *immediately* upon power failure. This pitch should be determined by closely watching the rotor tachometer maintaining the pitch that will obtain approximately 240 rotor RPM. The range of collective pitch between powered flight and autorotative flight must be passed through quickly to prevent loss of rotor RPM, caused by high pitch and no power.

CAUTION

Practice autorotative descent is not permitted due to the possibility of the free wheeling unit (over running clutch) failing to operate properly. Should this occur a sufficient surge of power may be transmitted through the drive system to damage the rotor blades.

2-57. POWER FAILURE AT HIGH SPEED. Should a power failure occur at high forward speeds of over 60 kts. IAS, the cyclic stick should be moved rearward and a partial cyclic flare effected simultaneously with a decrease in collective pitch. This will aid in maintaining rotor RPM and reduce the airspeed to the best autorotative speed for opimum rate of descent and control.

Note

Above 70 kts. IAS in autorotation, the helicopter is difficult to turn. This is due to reduced effective rudder control at high autorotative speeds. The best maneuvering speeds in autorotation are from 40 to 70 kts. IAS. However, if high speeds in autorotation are inadvertently encountered and lack of rudder control is present, reduce air speed to 40 to 70 kts. immediately by application of aft cyclic control.

2-58. ALTITUDE LIMITS FOR AUTOROTATION. For autorotative safety, the limits outlined in Figure 2-2 (Power Off Autorotative Landing Chart) must be observed.

2-59. ROTOR RPM IN AUTOROTATION. The best total pitch angle for autorotative descent is

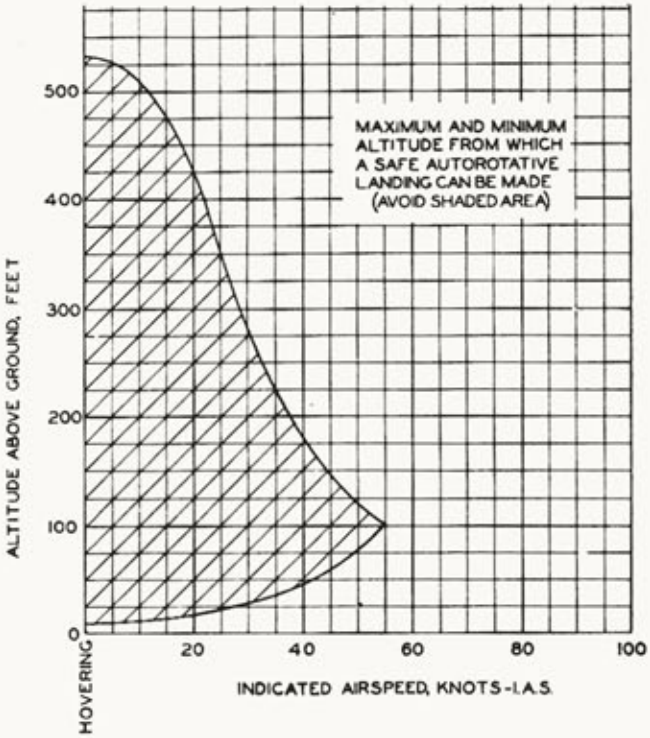


Figure 2-2. Power Off Autorotative Landing Chart

that angle which will maintain a 240 rpm on the rotors. Rotor RPM is affected by collective pitch, airspeed, and weight of the ship. For minimum rate of descent, the helicopter should be kept between 45 and 50 knots airspeed, with the rotors at a minimum of 220 RPM and a maximum of 285 RPM. Best rate of descent is obtained at 47 kts. IAS and 240 rotor rpm.

2-60. POWER OFF LANDING. Two major types of power off landings may be accomplished:

2-61. RUNNING LANDING, WITH FORWARD SPEEDS BETWEEN 17 AND 30 KTS. (IAS): this type of landing should be attempted only on smooth surfaced areas with adequate space for a relatively long easy flare-out. The technique to accomplish this type of landing should be as follows:

Note

The nose wheel should be locked, on helicopter equipped with locking devices, to prevent nose wheel shimmy when making run on landings at high forward speed.

2-62. As the ground is approached (approximately 75 to 100 feet), the cyclic control stick should be brought rearward slowly, causing the flight path to flatten. A gradual reduction in airspeed will accompany this maneuver. At the same time, collective pitch should be increased gradually by raising the main pitch lever in order to lessen the rate of descent. By the time the helicopter has slowed down to between 17 and 34 Kts. (IAS), the wheels should be on the ground and the landing effected. The helicopter should be brought to a stop by continued application of rearward cyclic stick.

2-63. FLARED, STALL TYPE LANDING: the second type of landing may be accomplished on relatively rough terrain if necessary. In order to accomplish this type of landing the technique to be used should be as follows:

2-64. As the ground is approached (approximately 75 to 100 feet), a cyclic flare as in the first case should be started. However, in this case, the flare should be more positive so that the forward speed will be reduced to less than 10 MPH at a point approximately ten feet above the ground. In this case, the flare should be accomplished with cyclic stick only, maintaining maximum rotor RPM as long as possible. As the helicopter arrives at the end of the flare, collective pitch should be applied rapidly, but smoothly. At the same time, the cyclic stick should be brought forward to prevent a "tail low" landing.

CAUTION

When recovery from an emergency autorotative descent is conducted, power, if available, should be applied gradually and smoothly until rotor and engine RPM are synchronized. This will avoid shock loads caused by sudden synchronization. Although a torque limiting device is provided to prevent damage to the drive system and rotor blades if power is applied suddenly, shock loads to the system should be avoided.

2-65. NIGHT FLYING. Instrument, running and landing lights are provided for night flying. However, because it is difficult to maintain steady flight condition without ground reference, night flying under conditions of low visibility is not recommended.

2-66. APPROACH AND LANDING.

2-67. APPROACH.

a. Mixture Control: "RICH."

b. Engine RPM: 2250.

c. Airspeed: Airspeed should be reduced to zero gradually.

d. Angle of Approach: Approaches to landing areas may be made long and low or nearly vertical as the terrain demands.

2-68. TRANSITION FROM APPROACH TO HOVERING.

a. Stick: Ease the cyclic control stick rearward until the helicopter slows down to the desired rate and then neutralize it.

b. Main Pitch Lever: Decrease collective pitch to prevent climbing. The more abrupt the stop, the more decrease of total pitch will be required.

c. The transition from approach to hovering should be made at least 10 feet above the ground.

2-69. DESCENT FROM HOVERING TO THE GROUND.

a. Collective Pitch: Decrease slightly.

b. Engine: Maintain 2250 engine RPM.

c. Allow helicopter to become stabilized in hovering position before contacting the ground.

d. As soon as the wheels are on the ground, decrease collective pitch and throttle promptly. Do not maintain a condition of "HALF FLIGHT."

2-70. CROSS WIND AND DOWN WIND LANDINGS. Cross wind and down wind landings may be effected if care is taken to prevent drift.

2-71. TAKE-OFF IF LANDING IS NOT COMPLETED.

2-72. TECHNIQUE. If excessive drift or swinging is evident as the helicopter touches down, power and pitch should be applied, the helicopter lifted free of the ground, the aircraft stabilized and a new landing made.

2-73. STOPPING OF ENGINE.

a. Wheel brakes: "ON."

b. Main Pitch control: "MINIMUM" pitch position and "LOCKED" with pin lock.

c. Throttle: "CLOSED."

d. Mixture control: "IDLE CUTOFF."

Note

Cylinder head temperature should be less than 160 degrees C.

e. Ignition switch: "OFF" when the engine has stopped.

f. Declutch to the "FULL AFT" position of the clutch lever.

g. "DECELERATE" the rotor blades. The clutch on the HRP-1 is used as a rotor brake. To decelerate the rotors, partially re-engage the clutch. This is accomplished by moving the clutch lever forward, with the thumb button depressed, as rapidly as desired. It is not advisable to engage past the first stop.

Note

In high winds it is desirable to stop the rotors as soon as possible to prevent excessive flapping and possible resultant damage to the blades or rotor hub. To accomplish this, declutch to the "FULL AFT" position, then immediately engage clutch to the first stop. The cyclic stick and rudder pedals should be positioned to prevent the blades from striking the droop stops.

h. Fuel valve: "OFF."

2-74. BEFORE LEAVING THE PILOT'S COMPARTMENT.

a. All switches: "OFF."

b. Radio: "OFF."

2-75. TYING DOWN.

2-76. BRAKES. Set wheel brakes and chock the main landing-gear wheels both fore and aft.

2-77. ROTORS "SECURED." Put on blade socks and tie to weights or stakes on ground. Lines should be snug but blades should not be deflected downward. Weights or stakes should be located slightly inboard from rotor tips to keep the socks on.

	Rotor RPM	Engine RPM	Manif. Press.	IAS (Knots)
Take-Off	250	2250	32-36	0
Hover	250	2250	32-36	0
Climb	240	2200	34.5	47
Cruise	220-230	2000-2100	29-34.5	65-80
Glide	240-250	2200-2250	15-20	40-60
Autoro-tation	240-260	1500+	....	40

Note—Power settings vary with load and weather conditions.

Figure 2-3. Normal Power Setting Chart

SECTION III
EMERGENCY OPERATING INSTRUCTIONS

3-1. ENGINE FAILURE.

3-2. PARTIAL FAILURE. If the engine is missing or shows lack of power, the pilot must decide whether or not a power-on landing can be made. An attempt should be made to get over a suitable landing area in any event.

3-3. COMPLETE FAILURE. Reduce collective pitch to autorotative position and proceed with autorotative descent and landing as described under paragraphs 2-55 through 2-64.

If the situation warrants and sufficient altitude permits, an attempt should be made to restart the engine. After establishing autorotative flight the following procedure should be used.

a. Check engine controls for proper position for starting. (See paragraph 2-11.)

b. Auxiliary fuel pump: "ON".

c. Starter: "ON".

Note

When attempting to restart the engine in the air do not disengage the clutch.

3-4. AT TAKE-OFF, HOVERING OR SLOW FLIGHT UNDER 10 FEET ALTITUDE. Increase collective pitch as rapidly as possible and keep ship level.

3-5. BETWEEN ALTITUDES 10 AND 530 FEET. Instantly reduce collective pitch to autorotative angles and obtain forward speed. Turn into the wind if altitude permits and perform a normal autorotative landing. Vertical autorotation is possible but forward speed will reduce the rate of descent. The time available for making an autorotative landing under the above conditions is very short. Therefore all control motions must be conducted with precision and rapidity.

3-6. TRANSMISSION FAILURE.

3-7. Incipient trouble in any one of the forward, mid or rear transmissions can be identified by excessively high temperatures or excessively high or low pressures, as indicated on the gages and warning lights. Should the indicators warn of difficulty, a landing should be made immediately with minimum use of power, autorotating if practical. Should a warning occur over water or unlandable terrain, the pilot should attempt to reach the closest landable area at minimum altitude (10′ to 25′) and slow airspeed (20 to 40 knots). It should be borne in mind that the use of minimum power applied will relieve the failing part and may considerably delay complete failure. If over water with a helicopter equipped with floatation gear a landing should be made immediately.

3-8. Failure of the rotor drive system resulting in the severence of the interconnecting shafts should be considered as an extreme emergency condition. Failure of the drive system will be noticeable to the pilot by either a runaway engine or an unequal distribution of lift between the rotors. If at altitudes sufficient for parachute descent (over 500′) immediate egress from the helicopter should be made. If at low altitudes immediately reduce the collective pitch to a minimum pitch position, shut off engine and autorotate to a landing.

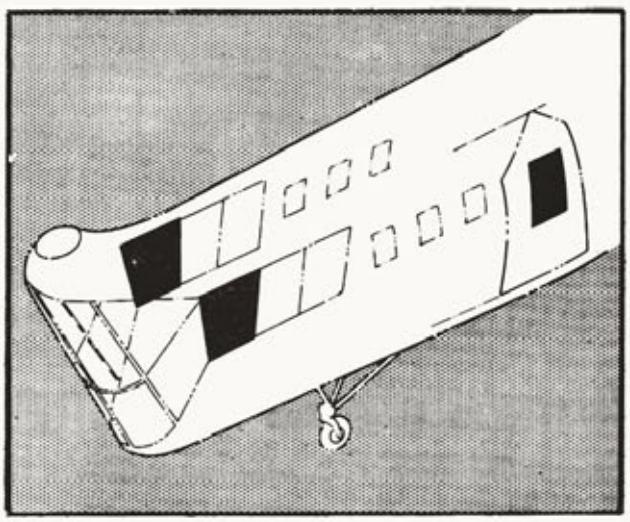


Figure 3-1. Emergency Exits

3-9. EMERGENCY EXIT OR ENTRANCE.

3-10. ESCAPE HATCHES. A sliding window panel is provided on each side of the pilot. For rapid emergency exit, the windows can either be slid open (preferably, before ditching) or pushed out by applying pressure in the center of the panel. Normally the pilot will use the exit on his right and the co-pilot will use the exit on his left, or the main entrance door which has a jettisonable panel.

3-11. EMERGENCY EXIT FOR CREW. The main entrance door, which is sliding and has a jettisonable panel will provide exit for the crew under emergency conditions.

3-12. BAILOUT.

3-13. ALTITUDES. The following altitudes and speeds provide ample time for a parachute to open: at 350′ with 0 airspeed, at 300′ with 20 kts forward speed, at 250′ with 50 kts and 220′ with 80 kts. These figures do not include time for the individual to react to the emergency, which requires from 3 to 6 seconds, and bail out of the helicopter. Therefore, for general conditions, 500 feet is the minimum safe altitude for bailout.

3-14. PROCEDURE. In the event the helicopter is in a spiral, jump away from the turns if practical, to avoid the possibility of contact with the falling helicopter. After bailout a short free fall should be made before opening parachute, to prevent it from fouling in the helicopter.

3-15. DITCHING.

3-16. Should a forced landing become necessary at sea, a normal approach to the surface should be made. During descent the pilots' windows and main entrance door should be completely opened to expedite escape. Just prior to contact the helicopter should be "dumped" to the right so that the rotor blades will be stopped by contact with the water. Exit should be made quickly through the main entrance door and pilots windows.

3-17. FIRE.

3-18. FIRE WHILE STARTING ENGINE. Hold the starter switch "ON". Leave the ignition switch "ON". Make every attempt to complete the start. This procedure will normally draw the fire into the engine and thereby extinguish it. If the fire continues for a dangerous length of time turn the ignition switch off and use a CO_2 bottle.

3-19. FIRE DURING FLIGHT.

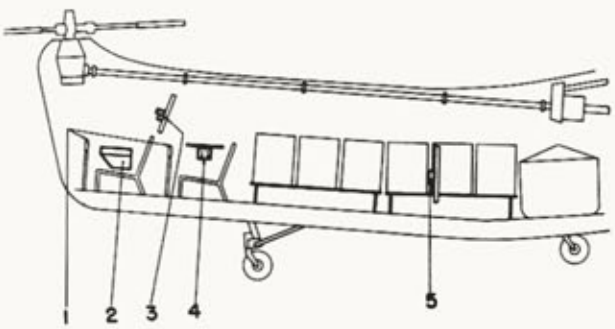
a. Reduce pitch.
b. Close throttle.
c. Mixture to idle cut off.
d. Close fuel valve.
e. Cut magnetos.
f. Autorotate to landing, if below 500′. Above 500′ it is left to the pilot's discretion whether to bail out or autorotate to a landing.

SECTION IV
OPERATIONAL EQUIPMENT

4-1. REMOTE COMPARTMENTS.

4-2. LOCATION OF STATION CONTROL BOX. In the cargo compartment opposite the door is located an intercommunication C-173/AIC-4 station control box for the communication of passengers or additional crew members with the pilot or co-pilot.

4-3. COMMUNICATION EQUIPMENT.



1 Pilot and Co-Pilot Transmitter Switches
2 Radio Selector and Operating Switches
3 Pilot's Station Control Box
4 Co-Pilot's Station Control Box
5 Cargo Compartment Station Control Box

Figure 4-1. Location of Radio Controls

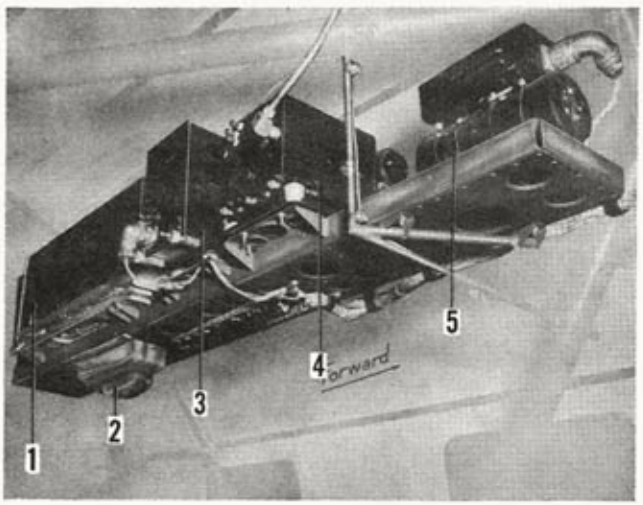
4-4. LIST AND LOCATION OF COMMUNICATION EQUIPMENT.

One AN/ARC-1 VHF Autotune transmitter-receiver.

One AN/AIC-4 interphone unit with one C-174/AIC-4 operator's control box for pilot and two C-173/AIC-4 station boxes and one J-22/ARC-5 jackbox.

One R-23/ARC-5 range receiver.

All radio equipment is turned on when MASTER radio switch is thrown to "ON" position. A circuit breaker is provided for each equipment. The circuit breakers are in the circuits between the MASTER radio switch and the radio equipment.



1 Radio-Transmitter-Receiver (RT-18/ARC-1)
2 First Aid Kit
3 Interphone Amplifier (AM 40/AIC)
4 Radio Range Receiver (R-23/ARC-5)
5 Inverter (R88-I-4250)

Figure 4-2. Radio Installation

4-5. LOCATION OF COMMUNICATION EQUIPMENT.

The AN/ARC-1 VHF autotune transmitter-receiver, the R-23/ARC-5 range receiver, and the AN/AIC-4 interphone unit are mounted in the forward part of the cargo compartment on the left side. (See figure 4-2.)

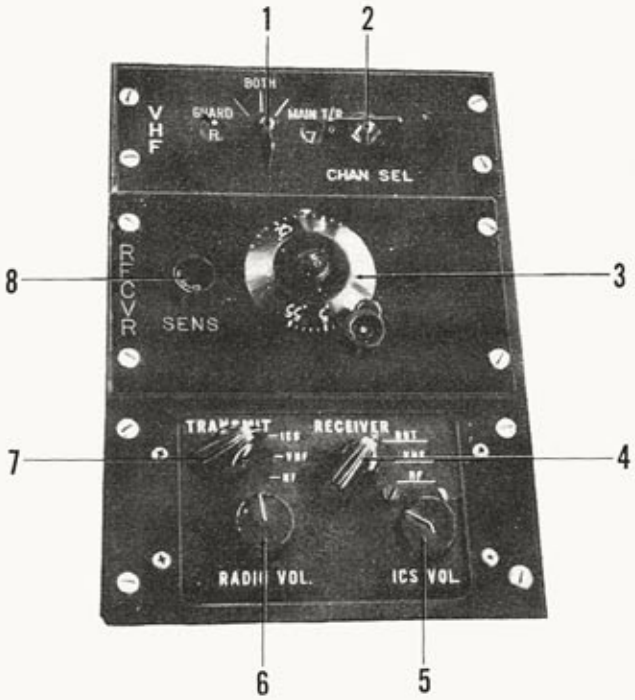
The C-174/AIC-4 selection unit is located on the pilot's console. (See figure 4-3.) The J-22/ARC-5 jackbox is mounted on a diagonal member to the left of the pilot. (See figure 4-5.)

One C-173/AIC-4 station box is located in the co-pilot's compartment on the left side and the other station box is located on the left side of the cargo compartment adjacent to the door. (See figures 4-4 and 4-6.)

4-6. OPERATING INSTRUCTIONS FOR COMMUNICATION EQUIPMENT.

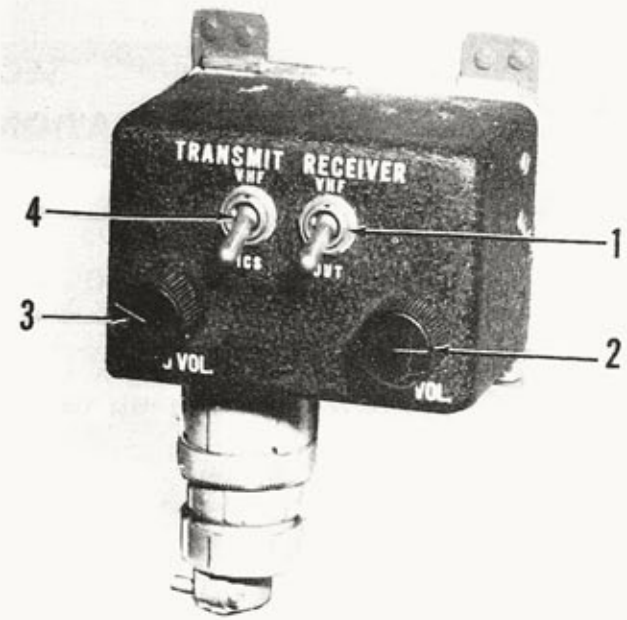
Note

These instructions are subject to local limitations regarding radio silence.



1 Guard — Both — Main T/R Switch
2 Channel Selector Switch
3 Low Frequency Tuning Dial
4 Receiver Selector Switch
5 ICS Volume Control
6 Radio Volume Control
7 Transmitter Selector Switch
8 Sensitivity Control

Figure 4-3. Pilot's Radio Controls



1 Receiver Switch
2 Intercommunication Volume Control
3 Radio Volume Control
4 VHF and ICS Transmitter Selector Switch

Figure 4-4. Co-Pilot's Station Control Box

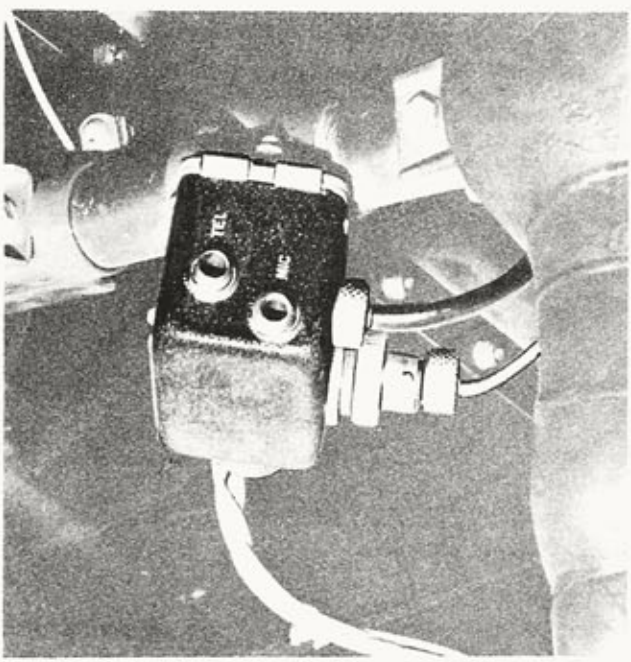
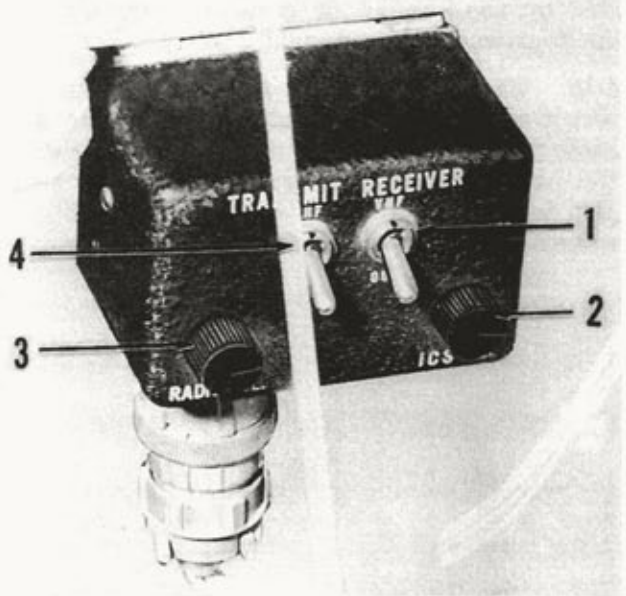


Figure 4-5. Pilot's J-22/ARC-5 Jack Box

4-7. The VHF Control Unit C-115/ARC-1 on the pilot's console (see figure 4-3), contains a channel selector switch for selecting one of the nine main channels and a guard channel. On the same control unit a selector switch provides monitoring of guard, both or main T/R channels as desired.

4-8. Upon entering the cockpit the pilot will turn on the master radio switch located on the switch console. (See figure 1-7.) Plug in head set and microphone in pilot's jack box located to the left of the seat. (See figure 4-5.) Place transmit selector switch located on C-174/AIC-4 panel to "ICS" in order to operate the intercommunication system. The pilot's transmitter switch for all communication is a trigger switch on the cyclic control stick. Upon entering the co-pilot's cockpit, plug head set and microphone in the station control box located to the left of the co-pilot. To transmit on the ICS system the co-pilot and crew member must use the transmit switch on the station control box provided for ICS transmitting. The crew member will plug his microphone and head set in the station control box in the cargo compartment opposite the door.



1 Receiver Switch
2 Intercommunication Volume
3 Radio Volume Control
4 VHF and ICS Transmitter Selector Switch

Figure 4-6. Cargo Compartment Station Control Box

4-9. To operate the VHF system, turn the selector switch on the VHF panel to the "BOTH" position. Select the desired channel and place the TRANSMIT and RECEIVER switch on the AN/AIC-4 pilot's "selector" C-174/AIC-4 unit to "VHF." Selector switches are provided at the co-pilot's and crew member's station control boxes for VHF communication.

4-10. The station control units in the co-pilot's compartment and cargo compartment are provided with switches enabling these stations to receive VHF communication in addition to interphone transmissions. (See figure 4-4.) All stations are provided with volume controls for "ICS" and "VHF" receiving.

4-11. The R-23/ARC-5 range receiver is operated by placing the master radio switch in the "ON" position, and on the "RECVR" panel tune in the desired frequency on the dial. Rotate the SENS control clockwise to obtain a usable volume level.

Note

The SENS control should be kept at a minimum clear reception to avoid wrong course indication.

4-12. RESCUE HOIST.

4-13. The hydraulically operated rescue hoist is mounted above the main entrance door. When not in use the hoist boom is normally swung inside and attached to the overhead superstructure; for hoisting operations it will be extended outside the door. A hook, harness, or chair can be attached to the hoist's 100 foot cable. The system is designed to lift a maximum of 400 pounds.

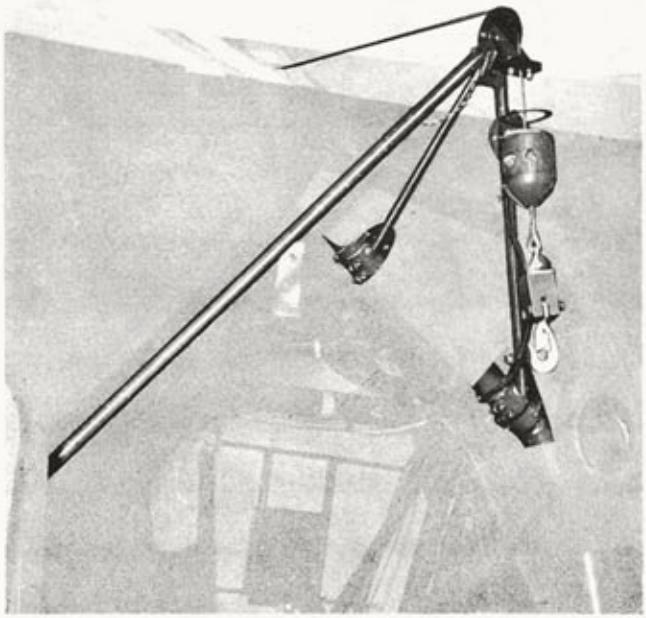
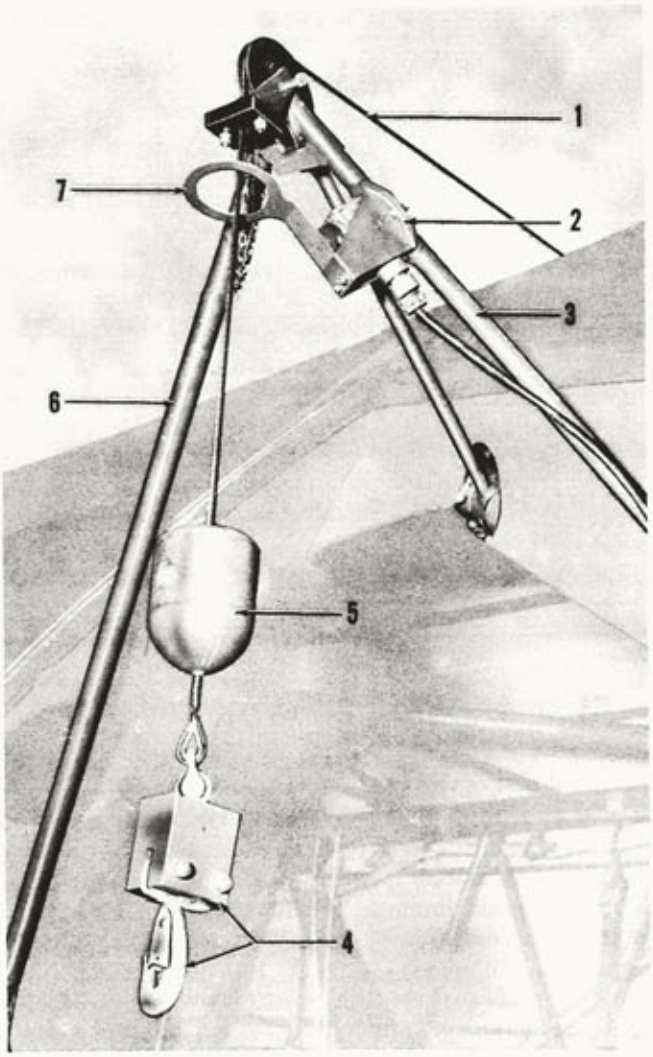


Figure 4-7. Hoist, General Arrangement

4-14. The motor and cable drum assembly are driven by a hydraulic pump mounted on the engine. This pump remains in continuous operation at all times when the engine is running. Between the pump and the motor is a four-way valve which starts and stops the hydraulic motor. This valve is controlled by a solenoid, which is in turn operated by the pilot. The four-way valve can also be operated manually by a crew member at the door, in which case the solenoid is overridden by the manual control. (See figure 4-9.)

4-15. The pilot may operate the system through his controls. He has a master switch located on the switch console which puts the entire system in or out of operation. (See figure 1-7.) When the master switch is "ON," the hoist is controlled by an "up and down" switch on top of the control stick. (See figure 1-5.) This switch automatically returns to neutral from either the "UP" or "DOWN" position, stopping the hoist as soon as the pressure on the switch is released.

4-16. If an overload is present in the electrical system, the circuit breaker on the switch console



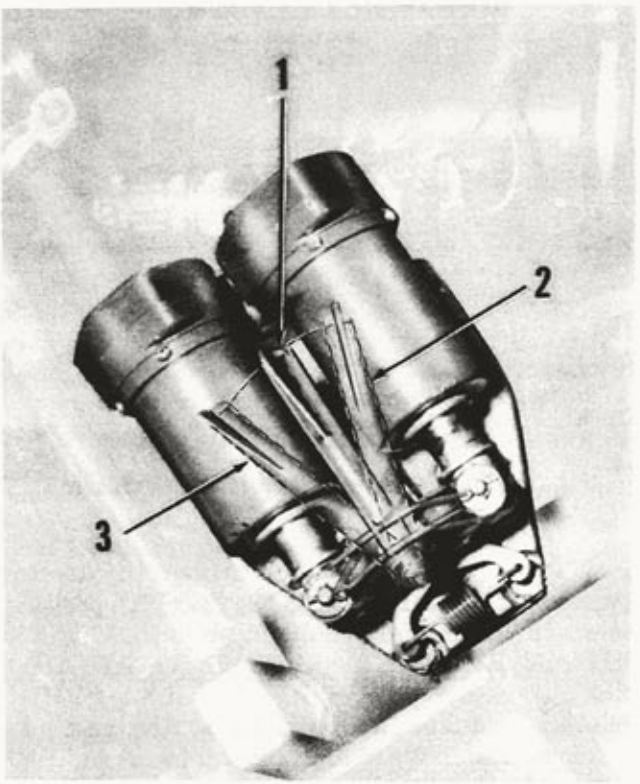
1 Hoist Cable
2 Up-Limit Switch
3 Main Hoist Boom
4 Hook and Weight
5 Bobbin
6 Removable Hoist Boom
7 Up-Limit Switch Acuator

Figure 4-8. Hoist, Detailed View

will "pop" out. This can be reset by the pilot on the circuit breaker panel. (See figure 1-8.) In the event that the overload remains in the system, the hoist can be operated with the manual control on the four-way valve by a crew member.

4-17. The most desirable method is for the crew member to operate the system through his manual control. During hoisting operations the screw member must remain in constant radio contact with the pilot to achieve best coordination. Also in the event an emergency arises, radio contact is necessary for concerted action. On BuNos 111819 to 111828, the pilot's electrical controls for operating the hoist are removed. The hoist is operated by the co-pilot or crew member by using the four-way valve manual control.

4-18. There is a bobbin mounted on the cable which aids the pilot in judging the length of the cable paid out, and helps in "aiming" the chair or the hook. When raising the cable this bobbin also trips an "up" limit switch which stops the system before the load hits the hoist boom.



1 Manual Operating Switch—"NEUTRAL" Position
2 Manual Operating Switch—"UP" Position
3 Manual Operating Switch—"DOWN" Position

Figure 4-9. Hoist Controls Cargo Compartment

CAUTION

There is no "down" limit switch on the system. Therefore, when 100 feet of cable is paid out, it begins to rewind around the cable drum in a reverse direction, causing damage to the hoist system and to the fabric by the door. Therefore, it is important that the pilot stop the hoist before 100 feet of cable has been lowered. The length of cable paid out can be estimated by noting the position of the bobbin.

SECTION V
EXTREME WEATHER OPERATION

5-1. VARIOUS CONDITIONS.

5-2. RAIN AND SNOW. It is permissible to fly the HRP-1 in snow and rain, due to the steel leading edge protecting the blade. Flight in very heavy rain or snow is not recommended unless necessary.

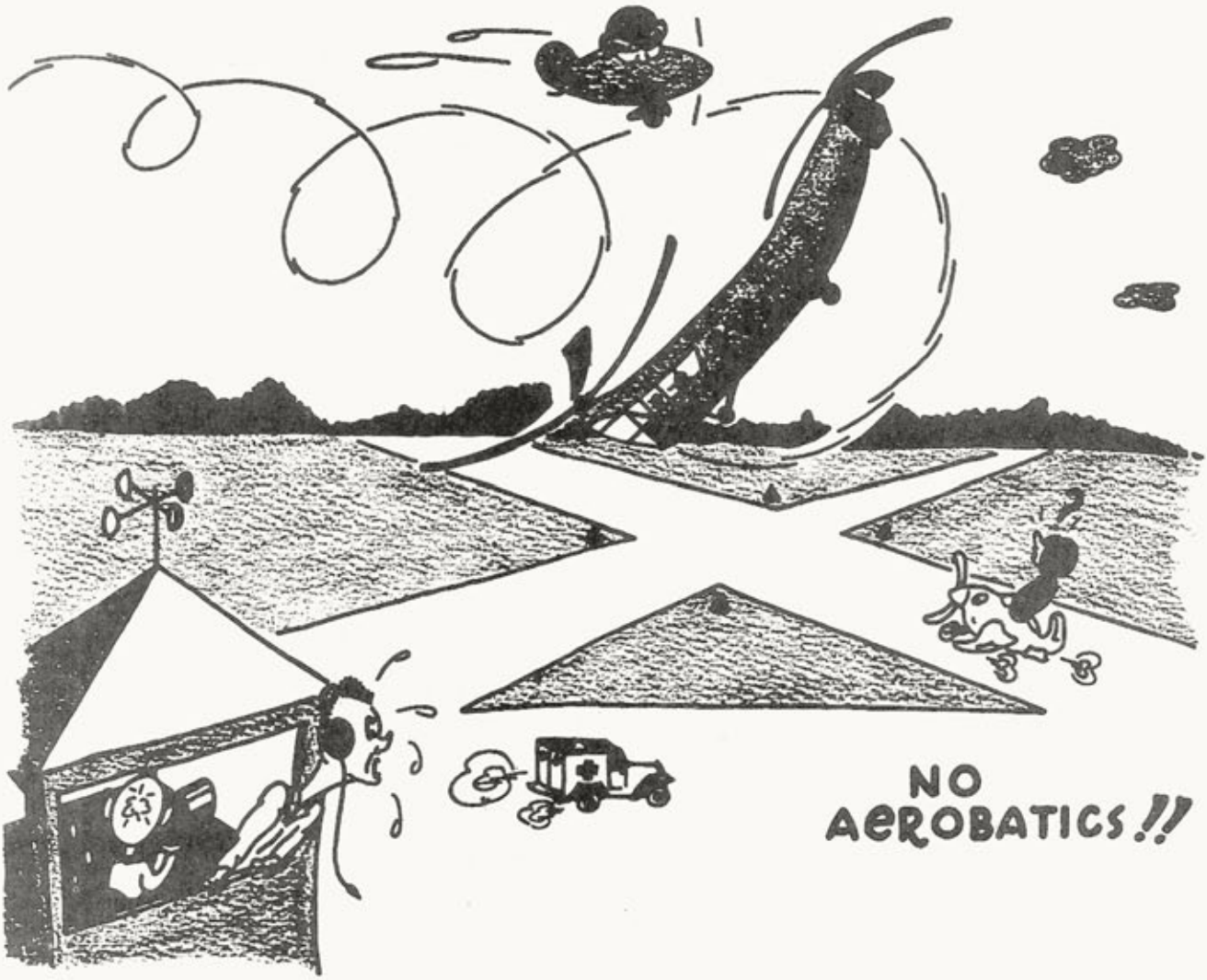
5-3. TURBULENCE. Thunder storms and extreme turbulence are to be avoided. Flight in moderate turbulence can be maintained, however, less buffeting will be encountered if the IAS is kept below 80 kts.

5-4. LOW CEILING AND VISIBILITY. Because it is difficult to maintain steady flight conditions without ground reference, flight under conditions of very low ceiling and visibility is not recommended.

5-5. ICING CONDITIONS. When icing conditions are present the carburetor heat and pitot heat must be applied. (See Carburetor Air Temperature ranges Chart A7A.)

CAUTION

Since no blade de-icing equipment is provided, flights under icing conditions should be avoided.


NO
AEROBATICS!!

APPENDIX I

OPERATING CHARTS AND TABLES

A-1. AIR SPEED CORRECTION TABLE.

This calibration represents the airspeed head (pitot tube) position error and gives the corrected indicated air speed for a given reading of the cockpit air speed indicator assuming zero scale error for the instrument itself.

I. A. S.	Correction
20 Knots	Add 6 Knots
30 Knots	Add 5 Knots
40 Knots	Add 4 Knots
50 Knots	Add 4 Knots
60 Knots	Add 3 Knots
70 Knots	Add 2 Knots
80 Knots	Add 1 Knot
90 Knots	Add 0 Knots
100 Knots	Subtract 1 Knot
110 Knots	Subtract 2 Knots

Air Speed Correction Table

A-2. USE OF CHARTS.

A series of charts on the following pages is provided to assist the pilot in flight planning.

Density Altitude Chart (Figure A-1). Accuracy is favored by entering the tables with density altitude, which can be determined from pressure altitude and outside air temperature by means of the graph provided in this book. A satisfactory estimate of density altitude can be made by adding to pressure altitude 1000 feet for each 10°C by which outside air temperature exceeds standard temperature (or by subtracting from pressure altitude 1000 feet for each 10°C by which outside air temperature is less than standard temperature). For example, if the pressure altitude at sea-level is zero but the outside air temperature is 35°C (95°F) the density altitude at sea-level is approximately 2000 feet, since the outside air temperature is 20°C higher than standard temperature.

The Schedule for Manual Leaning (Figure A-2) describes when it is permissible to utilize manual leaning in order to realize optimum fuel consumption.

The Power Plant Chart (Figure A-3) shows fuel consumption at various power settings.

The Engine Operating Limits Curve (Figure A-4) can be used to set operating conditions or to determine engine power at any operation within the recommended limits of the engine.

Figures A-5 and A-6 are provided to guide in selecting the proper power to obtain the optimum range for this helicopter.

A-3. FLIGHT PLANNING.

In Flight Operation Instruction Chart (Figure A-6) select a figure in the fuel column in the upper section of the chart, equal to, or less than the amount to be used for cruising flight. (Make allowance for warm-up, take-off and climb and hovering at destination if applicable.) Move horizontally to the right or left and select a range figure equal to or greater than the range of the contemplated flight with a "no wind' condition. Vertically below, in lower section of the chart, are the engine operating values for the highest possible cruising speeds for the desired range. In the event of flight plan changes enroute, the chart will show the remaining range available at various cruising powers.

A-4. SAMPLE PROBLEM.

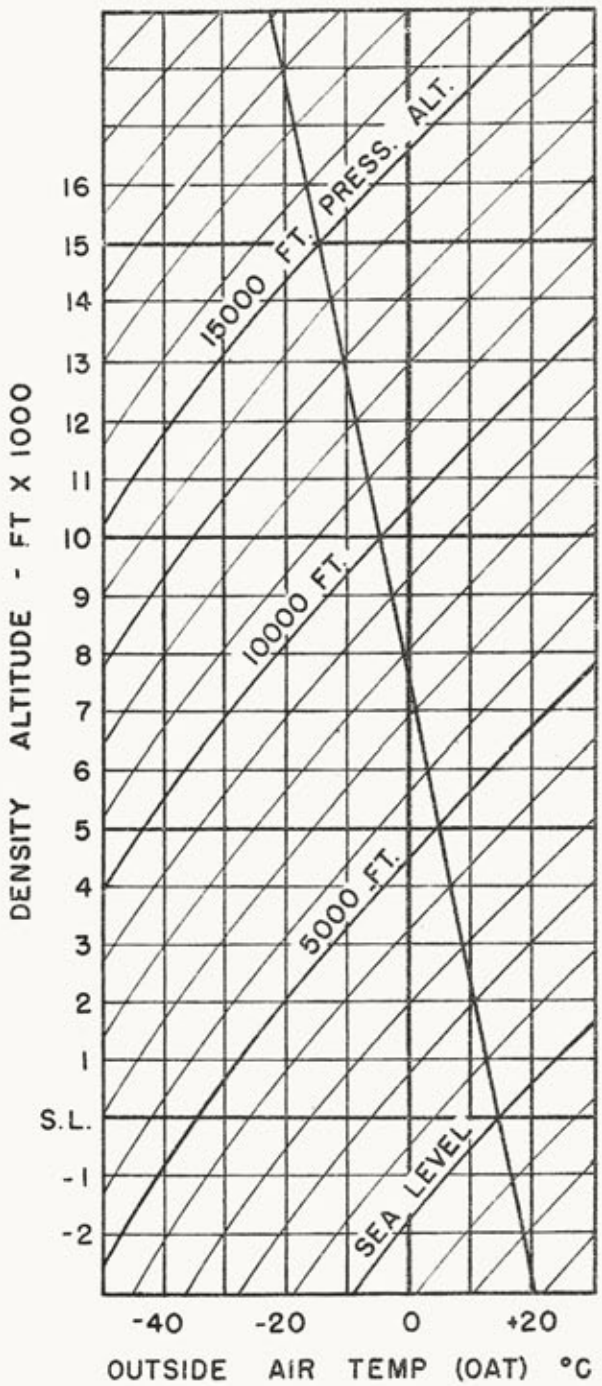
With helicopter at 6900 pounds gross weight (pilot and co-pilot and 100 gallons of fuel — no baggage), fly at sea level 134 miles on a rescue mission, pick up 6 survivors and then return to base. Allow 5 minutes hovering at scene and 20 minutes reserve fuel.

a. Reference to Power Plant Chart (Figure A-3) shows that 4 gallons of fuel will be used to hover at rescue scene.

b. Reference to Flight Operation Instruction Chart (Figure A-6) Column V shows that 11 gallons of fuel are needed for a cruising reserve of 20 minutes.

c. From a. and b., 85 gallons of fuel are available for cruising.

d. Returning to Flight Operation Instruction Chart (Figure A-6) Column V, it can be seen the helicopter can fly 317 miles on 100 gallons of fuel. From c. 85 gallons of fuel are available for cruising, or 268 miles. The radius is therefore, 134 miles.



EXPLANATION AND USE OF DENSITY ALTITUDE GRAPH

1. EXPLANATION OF LINES.

a. PRESSURE ALTITUDE LINES: Inclined upward to the right (marked Press. Alt.)

b. DENSITY ALTITUDE LINES: Run horizontally.

c. OUTSIDE AIR TEMPERATURE (OAT) LINES: Run vertically.

2. TO DETERMINE DENSITY ALTITUDE.

a. Enter graph with pressure Altitude and OUTSIDE AIR TEMPERATURE (OAT).

b. Locate intersection of the two lines.

c. Read off DENSITY ALTITUDE.

3. EXAMPLES.

Number 1

PRESSURE ALTITUDE=6,000 feet.
OUTSIDE AIR TEMPERATURE (OAT)=20°C.
READ DENSITY ALTITUDE=8,000 feet.

Number 2

PRESSURE ALTITUDE=9,500 feet.
OUTSIDE AIR TEMPERATURE (OAT)=5°C.
READ DENSITY ALTITUDE=10,500 feet.

Note

Pressure altitude is read directly from an altimeter when the altimeter index (in window) is set to 29.92 in. Hg.

Figure A-1. Density Altitude Chart

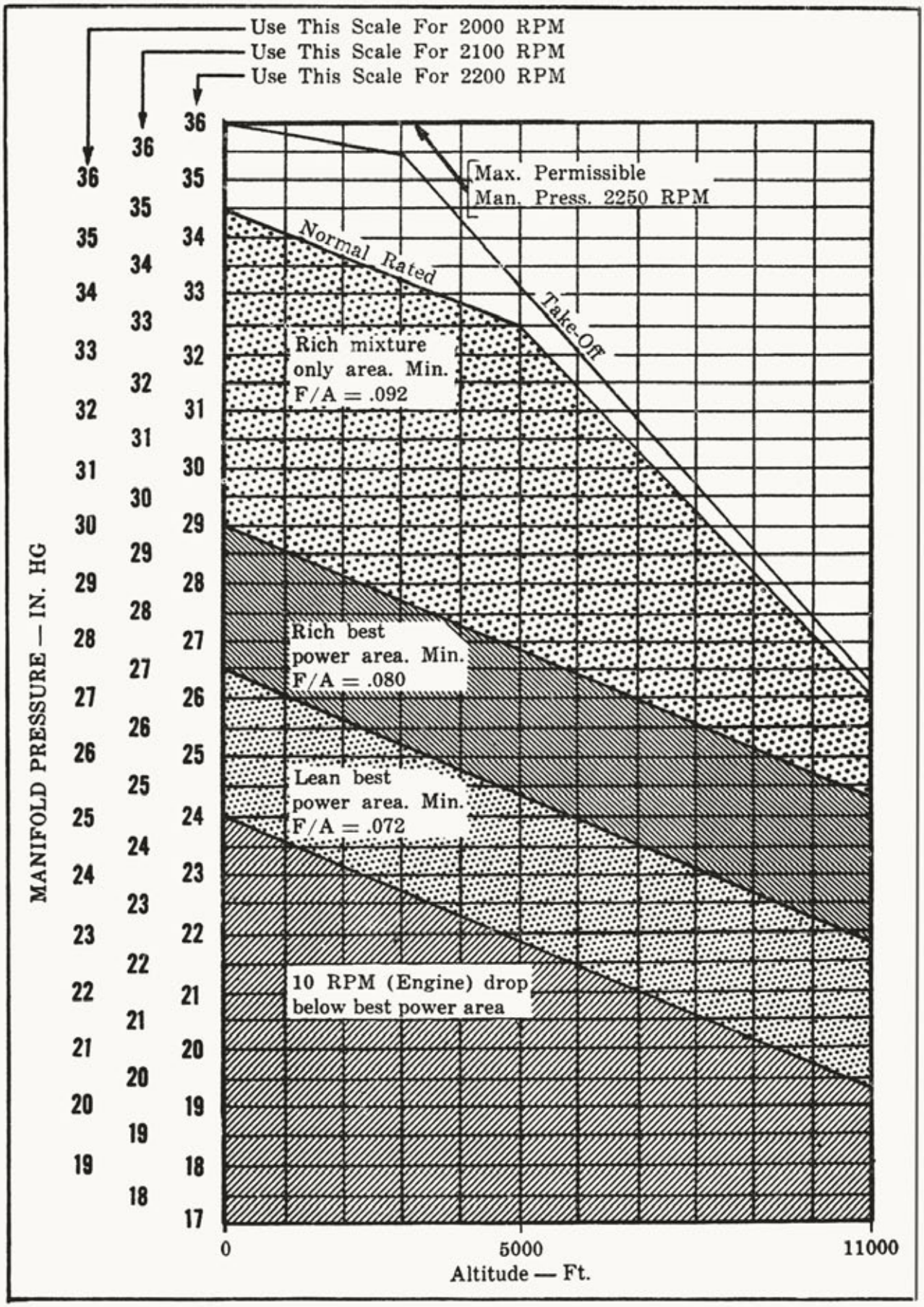


Figure A-2. Schedule for Manual Leaning

POWER PLANT CHART

Aircraft Model: HRP-1 **Engine Model: R-1340-AN-1**

Gauge Reading	Fuel Pressure	Oil Pressure	Oil Temp. ° C	Coolant Temp.	Oil Cons.[1]
Desired	4-6	60-90	60-75	air	2.5
Maximum	6	90	82	cooled	
Minimum	4	60	40		
Idling	3	15			

Max. Permissible Diving RPM: 2800
Min. Recommended Cruise RPM: 2000
Oil Grade: (S) 1120, (W) 1100
Fuel Grade: 91/98, Spec. AN-F-48

MILITARY POWER (Non-Combat Emergency)			OPERATING CONDITION			NORMAL RATED (Maximum Continuous)			OPTIMUM CRUISE (Normal Operation)		
One Minute 260° C			Time Limit Max. Cyl. Hd. Temp.			Unlimited 260° C			Unlimited 232° C		
RICH 2250			MIXTURE R.P.M.			RICH 2200			RICH BEST POWER NOTED		
Manif. Press.	Super Charger	Fuel[2] Gal./Min.	Std. Temp. ° C	Pressure Altitude	Std. Temp. ° F	Manif. Press.	Super Charger	Fuel GPH[3]	Manif. Press.	R.P.M.	Fuel GPH[3]
			—28.6	22,000 Ft.	—19.4						
F. T.		.6	—24.6	20,000 Ft.	—12.3						
F. T.		.634	—20.7	18,000 Ft.	— 5.2						
F. T.		.68	—16.7	16,000 Ft.	2.0						
F. T.		.72	—12.7	14,000 Ft.	9.1						
F. T.		.77	— 8.8	12,000 Ft.	16.2						
F. T.		.83	— 4.8	10,000 Ft.	23.4	F. T.		46	24	2200	38
F. T.		.89	— 0.8	8,000 Ft.	30.5	F. T.		49	24.5	2200	37
F. T.		.95	3.1	6,000 Ft.	37.6	F. T.		53	25.5	2150	34
F. T.		1.03	7.1	4,000 Ft.	44.7	34.5		55	26	2100	32
35.0		1.05	11.0	2,000 Ft.	51.8	34.5		55	26.5	2050	30
36.0		1.05	15.0	SEA LEVEL	59.0	34.5		55	27	2050	27

GENERAL NOTES

[1] Oil Consumption: Max. U. S. quart per hour per engine.
[2] Gal./Min.: Approx. U. S. gallon per minute per engine.
[3] GPH: Approx. U. S. gallon per hour per engine.
F. T.: Means full throttle operation.
Values are for level flight with Ram.

Note: To determine consumption in British Imperial Units, multiply by 10 then divide by 12.

TAKE-OFF CONDITIONS:	CONDITIONS TO AVOID:
2250 RPM and 36″ Hg.	Operation below 1810 RPM (200 Rotor RPM)

SPECIAL NOTES

1. The Mixture Control is not automatic and must be adjusted manually to obtain smooth engine operation and best range.

Figure A-3. Power Plant Chart

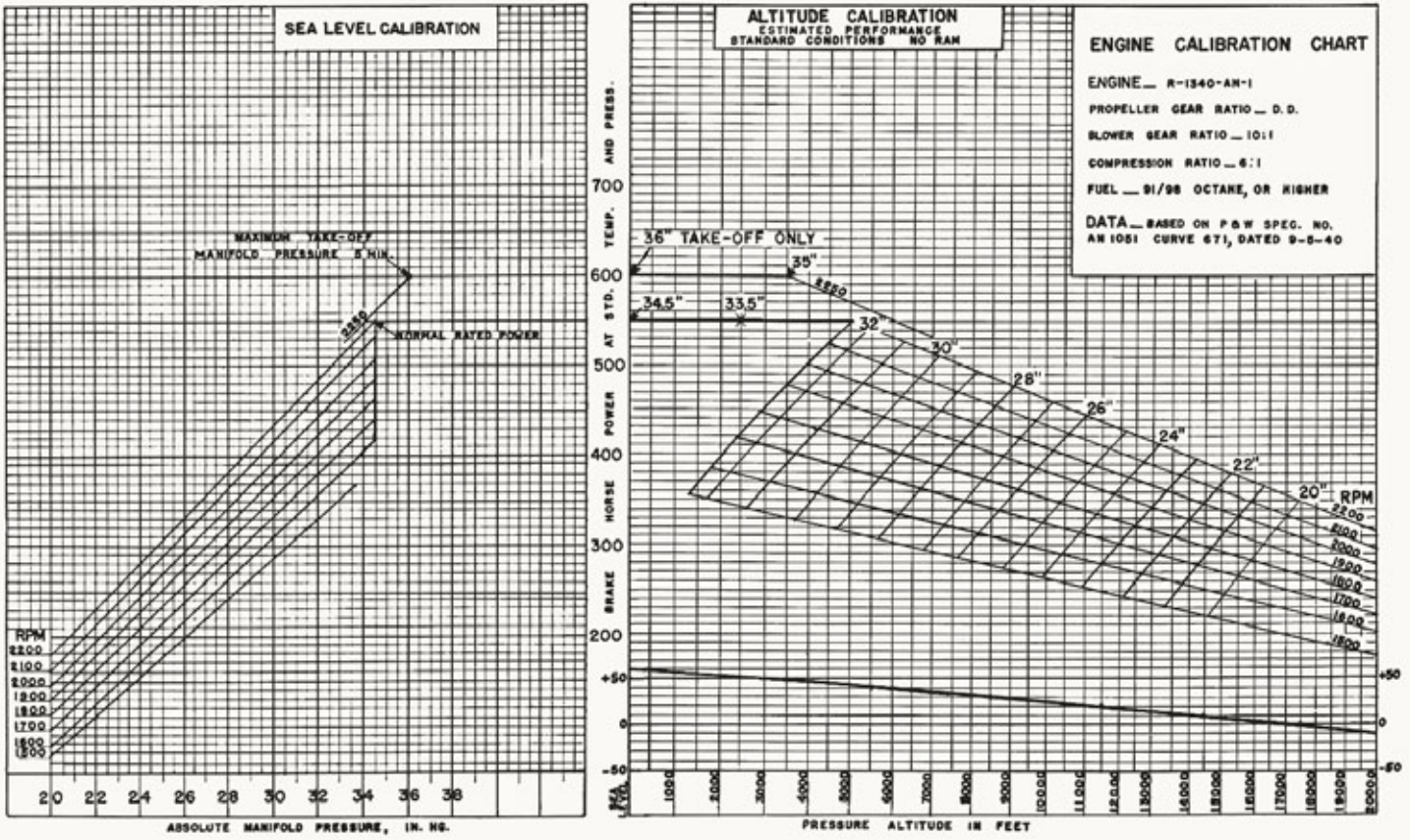


Figure A-4. Engine Calibration Chart

AIRCRAFT MODEL
HRP-1

TAKE-OFF, CLIMB & LANDING CHART

TAKE-OFF TIME — SECONDS
TAKE-OFF DISTANCE — FEET

ENGINE MODEL
R-1340-AN-1

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	NORMAL TAKE-OFF AT SEA LEVEL TIME ON LAND	NORMAL TAKE-OFF AT SEA LEVEL RUN ON LAND	NORMAL TAKE-OFF AT SEA LEVEL DIST. TO CLEAR 50' OBJ.	NORMAL TAKE-OFF AT 3000 FEET TIME ON LAND	NORMAL TAKE-OFF AT 3000 FEET RUN ON LAND	NORMAL TAKE-OFF AT 3000 FEET DIST. TO CLEAR 50' OBJ.	AT SEA LEVEL TIME ON WATER	AT SEA LEVEL RUN ON WATER	AT SEA LEVEL DIST. TO CLEAR 50' OBJ.	AT 3000 FEET TIME ON WATER	AT 3000 FEET RUN ON WATER	AT 3000 FEET DIST. TO CLEAR 50' OBJ.	AT SEA LEVEL TIME ON WATER	AT SEA LEVEL RUN ON WATER	AT SEA LEVEL DIST. TO CLEAR 50' OBJ.	AT 3000 FEET TIME ON WATER	AT 3000 FEET RUN ON WATER	AT 3000 FEET DIST. TO CLEAR 50' OBJ.
6200	0	0	0	0	0	0	0	0													
	12	10	0	0	0	0	0	0													
	23	20	0	0	0	0	0	0													
	35	30	0	0	0	0	0	0													
6500	0	0	0	0	0	0	0	0													
	12	10	0	0	0	0	0	0													
	23	20	0	0	0	0	0	0													
	35	30	0	0	0	0	0	0													
6900	0	0	0	0	0	0	0	0													
	12	10	0	0	0	0	0	0													
	23	20	0	0	0	0	0	0													
	35	30	0	0	0	0	0	0													

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%
DATA AS OF 8-18-50 BASED ON: FLIGHT TEST

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. WITH-OUT JATO	AT SEA LEVEL GAL. OF FUEL USED	AT 5000 FEET BEST I.A.S. MPH	AT 5000 FEET BEST I.A.S. KTS	AT 5000 FEET RATE OF CLIMB F.P.M.	AT 5000 FEET FROM SEA LEVEL TIME MIN.	AT 5000 FEET FROM SEA LEVEL 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 15,000 FEET BEST I.A.S. MPH	AT 15,000 FEET BEST I.A.S. KTS	AT 15,000 FEET RATE OF CLIMB F.P.M.	AT 15,000 FEET FROM SEA LEVEL TIME MIN.	AT 15,000 FEET FROM SEA LEVEL FUEL USED	AT ___ FEET BEST I.A.S. MPH	AT ___ FEET BEST I.A.S. KTS	AT ___ FEET RATE OF CLIMB F.P.M.	AT ___ FEET FROM SEA LEVEL TIME MIN.	AT ___ FEET FROM SEA LEVEL FUEL USED	AT ___ FEET BEST I.A.S. MPH	AT ___ FEET BEST I.A.S. KTS	AT ___ FEET RATE OF CLIMB F.P.M.	AT ___ FEET FROM SEA LEVEL TIME MIN.	AT ___ FEET FROM SEA LEVEL FUEL USED
6200	52	45	1380	9	53	46	1360	3.7	3.4	53	46	890	8.3	6.7	54	47	450	15	11										
6500	54	47	1250	9	55	48	1215	4.1	3.8	54	47	770	9.2	7.4	55	48	330	17	12										
6900	58	49	1090	9	57	49	1060	4.7	4.3	57	49	605	10.9	8.8	57	49	170	21	15										

POWER PLANT SETTINGS: (DETAILS ON FIG. A-5 SECTION III):
DATA AS OF 1-21-49 BASED ON: CALCULATIONS AND ESTIMATES
TIME MIN. DOES NOT INCLUDE TIME REQ'D FOR TAKE-OFF.
FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE — FEET

GROSS WEIGHT LB.	BEST IAS APPROACH POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	CALM WATER AT SEA LEVEL RUN ON LAND	CALM WATER AT SEA LEVEL TO CLEAR 50' OBJ.	CALM WATER AT 3000 FEET RUN ON LAND	CALM WATER AT 3000 FEET TO CLEAR 50' OBJ.	10 KNOTS HEADWIND (12 MPH) AT SEA LEVEL RUN ON LAND	10 KNOTS HEADWIND (12 MPH) AT SEA LEVEL TO CLEAR 50' OBJ.	10 KNOTS HEADWIND (12 MPH) AT 3000 FEET RUN ON LAND	10 KNOTS HEADWIND (12 MPH) AT 3000 FEET TO CLEAR 50' OBJ.	20 KNOTS HEADWIND (23 MPH) AT SEA LEVEL RUN ON LAND	20 KNOTS HEADWIND (23 MPH) AT SEA LEVEL TO CLEAR 50' OBJ.	20 KNOTS HEADWIND (23 MPH) AT 3000 FEET RUN ON LAND	20 KNOTS HEADWIND (23 MPH) AT 3000 FEET TO CLEAR 50' OBJ.	30 KNOTS HEADWIND (35 MPH) AT SEA LEVEL RUN ON LAND	30 KNOTS HEADWIND (35 MPH) AT SEA LEVEL TO CLEAR 50' OBJ.	30 KNOTS HEADWIND (35 MPH) AT 3000 FEET RUN ON LAND	30 KNOTS HEADWIND (35 MPH) AT 3000 FEET TO CLEAR 50' OBJ.
6900	54	47	54	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DATA AS OF 8-18-50 BASED ON: FLIGHT TEST
OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS: * NORMAL LANDING (FINAL PHASE) IS VERTICAL DESCENT WITH POWER ON.

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

Figure A-5. Take-Off, Climb and Landing Chart

AIRCRAFT MODEL HRP-1

ENGINE : R-1340-AN-1

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 6200 TO 6900 POUNDS

EXTERNAL LOAD ITEMS

NUMBER OF ENGINES OPERATING:

LIMITS	RPM	M.P. IN. HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2250	36	—	F.R.	1 MIN.	260°	63

FOR DETAILS OF POWER PLANT CHART SEE A.N. SECT. 01-

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISE[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.

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.

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	
STAUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
200	175	100	244	211	291	252	303	262	100	317	275
158	137	80	195	169	233	202	242	210	80	254	221
119	103	60	146	127	174	151	182	158	60	191	165
79	69	40	96	85	114	99	121	105	40	127	110

SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]

MAXIMUM CONTINUOUS						PRESS ALT. FEET	(2.4 STAT. (2.1 NAUT.) MI./GAL.)						(2.9 STAT. (2.6 NAUT.) MI./GAL.)						(3.0 STAT. (2.6 NAUT.) MI./GAL.)						PRESS ALT. FEET	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.
						40000 35000 30000																				40000 35000 30000						
						25000 20000 15000																				25000 20000 15000						
2200	34	F.R.	88	109	95	10000 5000 S.L.	2000	34	M.L.	43	106	91	2000	32	M.L.	35	102	89	2000	31	M.L.	33	100	87	10000 5000 S.L.	2000	30	M.L.	31	98	85

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM UP, TAKE OFF & CLIMB (SEE FIG. A-5) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED

(2) FOR MAXIMUM ENDURANCE MAINTAIN 52 MPH

(3) FUEL CONSUMPTION WHILE HOVERING 516 POUNDS PER HOUR

EXAMPLE

AT 6400 LB. GROSS WEIGHT WITH 85 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 15 GAL.) TO FLY 225 STAT. AIRMILES AT SL. FT. ALTITUDE, MAINTAIN 2000 RPM AND 32 IN. MANIFOLD PRESSURE WITH MIXTURE SET: M.L.

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 1-21-48 BASED ON: CALCULATIONS AND ESTIMATIONS

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure A-6. Flight Operation Instruction Chart

AIR SPEED INDICATOR

- 85 Knots Maximum permissible IAS

MANIFOLD PRESSURE

- 26″ to 36″ Hg. Desired
- 36″ Hg. Maximum

DUAL TACHOMETER

Rotor

- 200 RPM Minimum
- 220 to 250 RPM Desired
- 285 RPM Maximum Autorotation

Engine

- 1000 RPM Minimum Idling
- 2050 to 2250 RPM Desired
- 2250 RPM Maximum Operating

ENGINE FUEL AND OIL PRESSURE

Fuel

- 4 PSI Minimum
- 4 to 6 PSI Desired
- 6 PSI Maximum

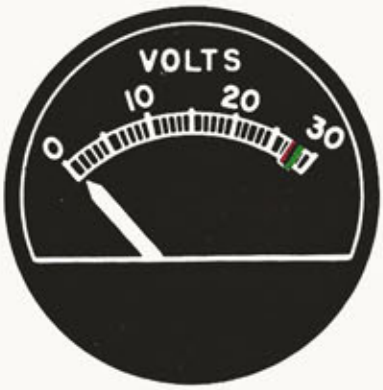
Oil

- 60 PSI Minimum
- 60 to 90 PSI Desired
- 90 PSI Maximum

Figure A-7. Instrument Operating Range Chart

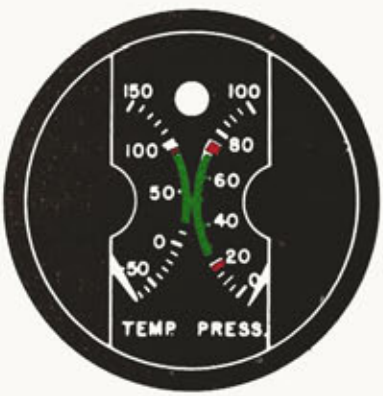
CYLINDER HEAD TEMPERATURE GAUGE

- 120° C Minimum
- 150° C to 260°C Desired
- 260° C Maximum



VOLTMETER

- 27 volts minimum
- 28 volts normal operating



FORWARD, CENTER OR AFT TRANSMISSION TEMPERATURES AND PRESSURES

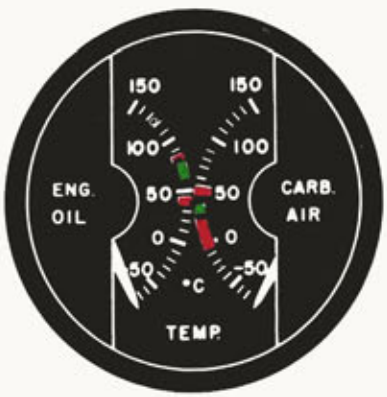
Temperatures

No Minimum as long as temperature indicated

- 20° C to 90° C Desired
- 95° C Maximum

Pressures

- 20 PSI Minimum
- 75 PSI Maximum



ENGINE OIL TEMPERATURE AND CARBURETOR AIR TEMP. GAUGES

Oil

- 40° C Minimum
- 60° to 80° C Desired
- 82° C Maximum

Carburetor Air Temp.

- — 5° C to +32° C Danger
- +32° C to +38° C Desired
- +50° C Maximum

Figure A-7A. Instrument Operating Range Chart