SECTION V – EMERGENCY PROCEDURES

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GENERAL

Emergency situation possibilities are myriad in type and surrounding circumstances. For this reason the actual procedures used in a particular situation must be based on the emergency involved. The following procedures cover the common types of emergencies usually encountered. A thorough familiarization with these procedures should provide a basis for a corrective procedure for almost any specific emergency.

NOTE

Refer to figure 5-2 for location of miscellaneous emergency equipment.

GROUND EMERGENCIES

The following ground emergency situations and remedial procedures pertain only to ground operation since engine shutdown is the end result of the corrective action.

ENGINE FIRE DURING START

Engine fire on the ground is usually an induction system fire which develops during the starting operation. Indication of this type fire is usually an audible backfire followed by a rapid increase in carburetor air temperature. This type fire is usually due to overpriming or pumping the throttle. To combat this type fire, proceed as follows:

IF ENGINE STARTS—

1. Keep the engine operating if possible, then fire will be pulled into the engine induction system and extinguished.

IF ENGINE DOES NOT START OR IF ENGINE STARTS AND FIRE CONTINUES—

2. MIXTURES - IDLE CUT-OFF
3. ENGINE STARTER - ENGAGE (unless engine starts)
4. FUEL SELECTORS - OFF
5. THROTTLE - OPEN (unless engine is started)
6. MAGS - OFF
7. BATTERIES - OFF
8. FIRE EXTINGUISHER - SELECT AFFECTED ENGINE

NOTE

If fire does not extinguish, stop cranking the engine and order the fire guard to extinguish the fire. If the fire does not extinguish immediately, discharge the selected engine fire extinguishing system.

9. EVACUATE AIRCRAFT - STANDBY

TAKE-OFF EMERGENCIES

Should an emergency situation develop on take-off, the take-off should be aborted, if possible.

ENGINE FAILURE

The decision to abort or continue a take-off, in the event of engine failure, is dependent on factors such as gross weight, remaining runway, density altitude, speed, etc. Speed is the most important factor since it establishes aircraft MINIMUM SINGLE ENGINE CONTROL SPEED and aircraft SAFE SINGLE ENGINE SPEED. Minimum single engine control speed is approximately 80 knots and is the minimum speed at which aircraft directional control can be maintained with the gear and flaps down, one propeller windmilling, and the take-off (maximum) power on the operative engine. Safe single engine speed is approximately, 90 knots. At this speed in clean configuration the aircraft will have adequate directional control and will maintain a positive rate-of-climb of 100 feet per minute, with take-off power, under maximum gross weight, sea level standard conditions. See figure 5-1 for maximum gross weight and aircraft configuration required to maintain safe single engine operation.

SINGLE-ENGINE ON TAKE OFF

1. Determine if take-off is to be continued or aborted.

Take-Off Continued:

2. LANDING GEAR - UP (immediately when airborne)
3. THROTTLE - CLOSED (FAILED ENG)

NOTE

The landing gear warning horn may be silenced by turning the horn silencer switch toward the throttle for the inoperative engine, or by advancing the throttle after engine shut-down.

4. PROP - FEATHERED (FAILED ENG) propeller lever full aft and feathering button depressed
5. MIXTURE - IDLE CUT-OFF (FAILED ENG)
6. ENGINE FUEL SELECTOR - GOOD ENGINE
7. FIRE EXTINGUISHER - AS REQUIRED
8. MAGS - OFF (FAILED ENG)
9. OIL SHUTTERS - CLOSED (FAILED ENG) lever full down (HOT)
10. COWL FLAPS - CLOSED (FAILED ENG)
11. ELECTRICAL LOAD - REDUCE
12. AIRSPEED - MAINTAIN SAFE SINGLE-ENGINE SPEED approximately 90 KIAS

FAILURE OF BOTH ENGINES ON TAKE OFF

1. Normally, a straight-ahead landing will be accomplished.
2. LANDING GEAR - UP (DOWN if sufficient field length is available)
3. AIRSPEED - ESTABLISH GLIDE approximately 95 KIAS

IN-FLIGHT EMERGENCIES

Impending inflight emergency situations will usually be characterized by one or more symptoms which indicate imminent system or component malfunctions. In such instance the appropriate preventive action may be applied in time to circumvent an actual emergency condition. The following corrective procedures are applicable to the common types of emergencies encountered, however, some situations may require a variation from the normal corrective procedure in order to follow the least hazardous plan.

GLIDE DISTANCE

Maximum glide distance is obtained with the aircraft in clean configuration; gear and flaps up, both propellers feathered and cowl flaps closed. In this configuration a glide ratio of approximately 10 to 1 or 2 miles per thousand feet of altitude can be obtained with a no-wind condition. This distance can be obtained by maintaining an airspeed relative to aircraft gross weight, i.e., at a gross weight of 9200 pounds -- maintain 112 knots, at 8730 pounds -- maintain 108 knots, at 7500 pounds -- maintain 100 knots. This information is of value when a desired landing location is available and distance is a prime consideration.

ENGINE FIRE

IMMEDIATELY—

1. ENGINE FUEL SELECTOR - GOOD ENGINE
2. MIXTURES - RICH
3. PROPS - FULL INCREASE RPM
4. THROTTLES - OPEN
5. LANDING GEAR - UP
6. FLAPS - UP
7. COWL FLAPS - OPEN SLIGHTLY (for engine on fire)
8. FIRE EXTINGUISHER - SELECT AFFECTED ENGINE (and discharge the fire extinguishing system if needed)

ON AFFECTED ENGINE—

1. MIXTURE - IDLE CUT-OFF
2. THROTTLE - CLOSED
3. PROP - FEATHERED
4. MAG - OFF
5. GENERATOR - OFF
6. OIL SHUTTERS - CLOSED lever full down (HOT)
7. COWL FLAPS - CLOSED
8. NONESSENTIAL ELECTRICAL EQUIPMENT - OFF

CAUTION

Do not attempt restart of inoperative engine.

POWER		GEAR		FLAPS		INOP. ENGINE PROPELLER		GROSS WEIGHT
TAKE-OFF	NORMAL RATED	UP	DOWN	UP	11° DOWN	FEATHERED	WINDMILLING	(POUNDS)
✓			✓		✓		✓	7500
✓			✓	✓			✓	7900
✓			✓		✓	✓		7900
✓			✓	✓		✓		8340
	✓	✓		✓			✓	8330
	✓	✓		✓		✓		8840
✓		✓		✓			✓	9000
✓		✓		✓		✓		9450

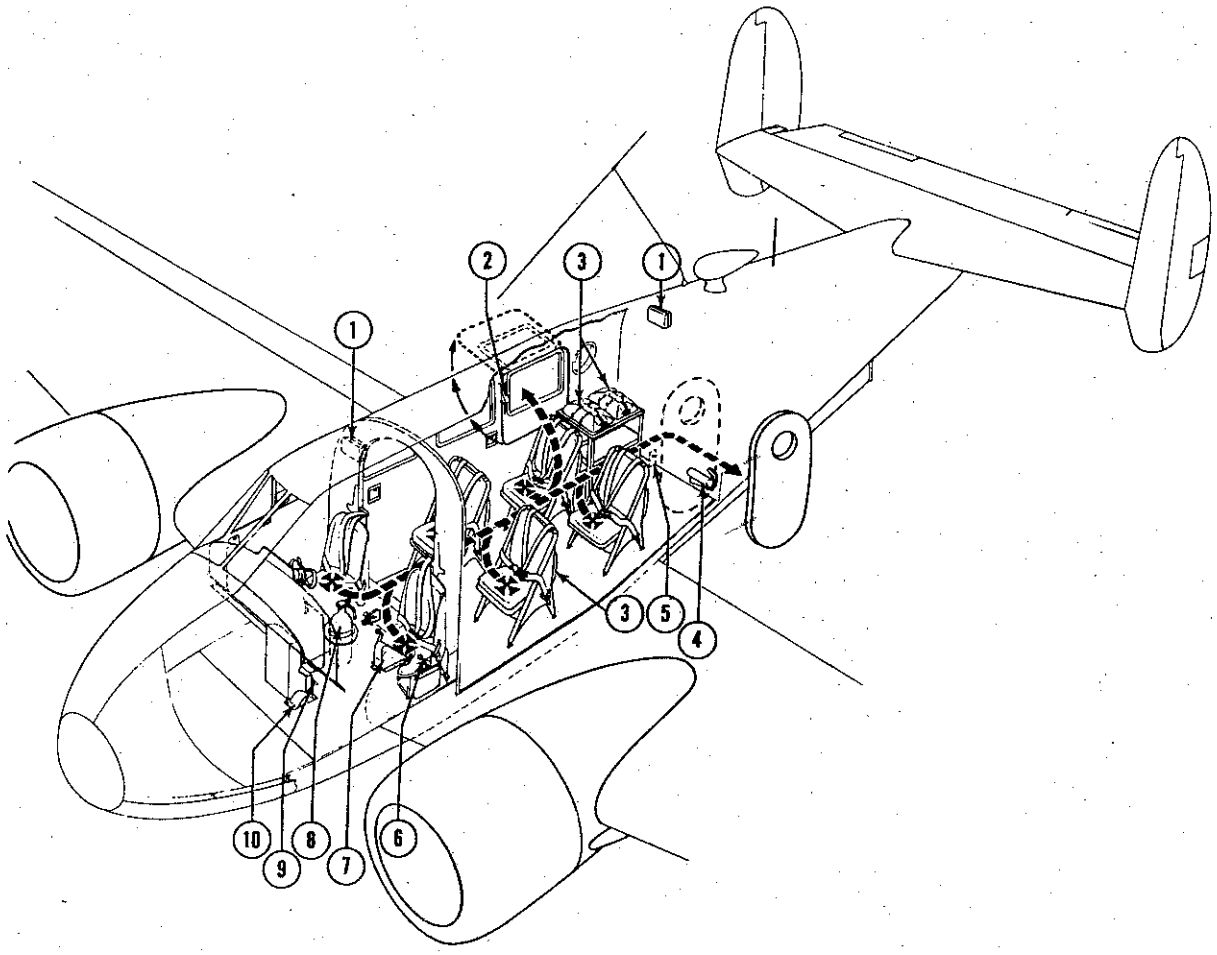
MAXIMUM GROSS WEIGHT AND CONFIGURATION REQUIRED TO MAINTAIN SAFE SINGLE-ENGINE SPEED AND 100 FPM RATE-OF-CLIMB AT SEA LEVEL STANDARD CONDITIONS (15° C AND DRY AIR). FOR OTHER THAN STANDARD CONDITIONS, OF TEMPERATURE AND HUMIDITY, REDUCE THE ABOVE GROSS WEIGHTS AS FOLLOWS:

		REQUIRED WEIGHT REDUCTION (POUNDS)
RELATIVE HUMIDITY (PERCENT) @ 27° C	0	100
	50	300
	100	540
RELATIVE HUMIDITY (PERCENT) @ 38° C	0	200
	50	580
	100	1030

NOTE

CRITICAL ENGINE ALTITUDE IS 16000 FEET FOR TAKE-OFF POWER AND 5000 FEET FOR NORMAL RATED POWER. FOR OTHER THAN STANDARD ATMOSPHERIC CONDITIONS, REDUCE MAXIMUM GROSS WEIGHT BY 100 POUNDS FOR EACH 1000 FEET OF ALTITUDE UP TO THE CRITICAL ALTITUDE OF THE ENGINE AND 250 POUNDS FOR EACH ADDITIONAL 1000 FEET ABOVE THE CRITICAL ALTITUDE.

Figure 5-1. Safe Single-Engine Configuration and Weight



1. FIRST AID KITS
2. EMERGENCY ESCAPE HATCH RELEASE
3. PARACHUTES
4. CO_2 HAND FIRE EXTINGUISHER
5. EMERGENCY DOOR RELEASE LEVER
6. SHOULDER-HARNESS LOCKS
7. LANDING GEAR AND WING FLAP HAND CRANK
8. ENGINE FIRE EXTINGUISHER CO_2 BOTTLE
9. ENGINE FIRE EXTINGUISHER CONTROLS
10. LANDING GEAR CLUTCH

Figure 5-2. Emergency Equipment and Escape Routes

NOTE

Monitor operative engine temperatures to assure that they are maintained within the operating limits.

FUSELAGE FIRE

Due to in-flight inaccessibility of potential fire areas and limited maneuvering room in which to combat a fuselage fire, this type of emergency is one of the most serious. If a fuselage fire should develop, transmit an emergency report and if over water, reduce altitude to allow a quick ditching if it becomes necessary. If over land, maintain sufficient altitude for bail out. Combat fuselage fire as follows:

NOTE

On RC-45J aircraft, personnel may use the oxygen system (select 100%) to avoid smoke and fume inhalation.

1. Turn OFF electrical equipment in fire area and any equipment suspected of causing fire.
2. Close windows and ventilating ducts.
3. Use hand CO_2 fire extinguisher.

WARNING

Avoid dangerous concentrations of CO_2 when using hand fire extinguisher. Open windows and vents fully after fire is extinguished to dissipate smoke and CO_2 fumes. (See smoke and fume elimination procedure.)

ELECTRICAL FIRE

Electrical fire probability is minimized by circuit breakers which de-energize a malfunctioning circuit. Proceed as follows in event of electrical fire.

NOTE

On RC-45J aircraft, personnel may use the oxygen system (on 100%) to avoid smoke and fume inhalation.

1. BATTERIES/GENERATORS - OFF
2. WINDOWS/VENTILATING DUCTS - CLOSED
3. HAND CO_2 FIRE EXTINGUISHER - AS REQUIRED
4. WINDOWS/VENTILATING DUCTS - OPEN to dissipate smoke and CO_2 fumes (see smoke and fume elimination procedure)
5. RADIOS/ELECTRICAL EQUIPMENT - OFF
6. CIRCUIT BREAKERS - PULLED
7. Isolate faulty compartment or circuit as follows:
   a. Turn ON each generator individually and check operation.
   b. Turn ON each battery individually and check operation.
   c. Re-energize components and systems individually using only systems necessary for safe flight operation. Check for recurrence of fire, smoke or smell indication.

CAUTION

If only the batteries can be used for electrical power, do not use the necessary systems until actually needed.

SMOKE AND FUME ELIMINATION

The most rapid method of eliminating smoke and fumes from the aircraft interior after a fire has been extinguished is to close all windows and vents and open the passenger compartment main entrance door. If smoke and/or fumes remain in the area, open the pilot's compartment side windows or the storm window for final elimination. On RC-45J aircraft, the oxygen system may be used (on 100%) to avoid smoke and/or fume inhalation.

NOTE

When the passenger compartment main entrance door is unlatched, it will trail open approximately 2 inches. For more rapid elimination the door may be held open up to 6 inches.

ENGINE FAILURE

Should an engine failure in flight occur determine definitely which engine has failed and proceed as follows:

IMMEDIATELY—

1. LANDING GEAR - UP
2. FLAPS - UP
3. MIXTURES - RICH
4. PROPS - FULL INCREASE RPM
5. THROTTLE - OPEN (GOOD ENG)
6. Analyze engine instruments to determine cause of engine failure. If fuel pump failure is indicated proceed as follows:
   a. Crack failed engine throttle.
   b. Actuate hand wobble pump to determine if fuel pressure can be maintained; if NOT, secure engine.
   c. If fuel pressure can be maintained:
      (1) Turn fuel crossfeed valve ON.
      (2) Check fuel consumption to determine if fuel valve leaks, and if fuel pressure is maintained.
      (3) If valve leaks, turn fuel crossfeed OFF and maintain fuel pressure with the hand wobble pump.

TO SECURE FAILED ENGINE—

1. MIXTURE - IDLE CUT-OFF
2. THROTTLE - CLOSED
3. PROP - FEATHERED
4. COWL FLAPS - CLOSED
5. OIL SHUTTERS - CLOSED lever full down (HOT)
6. MAG - OFF
7. GENERATOR - OFF
8. ENGINE FUEL SELECTOR - GOOD ENGINE

ENGINE RESTART AND PROPELLER UNFEATHERING

1. GENERATOR - ON
2. ENGINE FUEL SELECTOR - BOTH
3. MAG - ON

4. THROTTLE - CRACKED
5. PROP - FULL DECREASE RPM
6. PROP FEATHER BUTTON - PUSH (hold until 800 rpm is indicated on tachometer)
7. PROP - CRUISE RANGE (approximately one-half forward, then full forward for warm-up)
8. MIXTURE - RICH
9. THROTTLE - 20 INCHES MAP (after engine starts)

PROPELLER FAILURE

Propeller governing malfunctions will be in two categories, the condition where the propeller goes completely to the low pitch (high rpm) position, and those in which the propeller overspeed exceeds 2400 rpm. Due to blade angle stop settings, in either situation, the proper use of airspeed will still provide a positive and beneficial thrust condition. For this reason, if engine power is available, do not feather a propeller if engine power is required, i.e., if you are committed during a take-off, go-around, or other maximum performance maneuver. To regain control after a propeller governor failure has occurred resulting in an overspeed condition proceed as follows on the affected engine:

1. THROTTLE - RETARD
2. Establish a climb attitude to load overspeeding propeller.
3. MIXTURE - RICH
4. PROP LEVER - MANIPULATE (to restore possible governing control)
5. PROP FEATHER BUTTON - PUSH (momentarily to begin feathering cycle, then release. Repeat as required)
6. AIRSPEED - REDUCE (within limits, by reducing power)
7. If control cannot be maintained or 2400 rpm has been exceeded, secure engine using ENGINE FAILURE PROCEDURE.

FUEL TANK EXHAUSTION

Characteristics of individual aircraft liquidometer readings may on occasion be responsible for inadvertently allowing a fuel tank to run dry. In this event, proceed as follows:

1. THROTTLES - CRACKED
2. MIXTURES - RICH
3. AIRSPEED - MAINTAIN MINIMUM OF 95 KIAS (nose up slightly to prevent propeller and engine overspeed)
4. WOBBLE PUMP - OPERATE (if engines will not start after fuel pressure is regained, use primer as necessary)
5. After engines are operating smoothly, establish cruise power settings.

FUEL PUMP FAILURE

If engine failure occurs due to loss of fuel pressure, accomplish the fuel pump operational check-out procedures as follows:

1. THROTTLE - CRACKED
2. WOBBLE PUMP - OPERATE (to determine if fuel pressure can be maintained; if NOT, secure engine using Engine Failure shutdown procedures)
3. If engine fuel pressure can be maintained:
   a. Turn fuel crossfeed valve ON.
   b. Check fuel consumption to determine if fuel valve leaks, and if fuel pressure is maintained.
   c. If valve leaks, turn fuel crossfeed OFF and maintain fuel pressure with the hand wobble pump.

ELECTRICAL POWER FAILURE

In the event a generator becomes inoperative:

1. GENERATOR - ON (check)
2. CIRCUIT BREAKERS - RESET
3. VOLTAGE AND AMPERAGE - CHECK
4. If either or both generators remains inoperative or operate for a short time then fail again, turn the affected generators and as much electrical equipment as practicable OFF to conserve battery power.

AUTOPILOT SYSTEM DISENGAGE (RC-45J ONLY)

The P-1 type electrically operated automatic pilot system may be disengaged by any one of the following:

1. EMERGENCY HANDLE - PULL

NOTE

The autopilot system cannot be re-engaged in flight once the emergency disconnect handle is actuated.

2. PUSH-BUTTON (on pilot's control wheel) - DEPRESS
3. AC POWER CIRCUIT BREAKERS - PULLED

WING FLAP EMERGENCY OPERATION

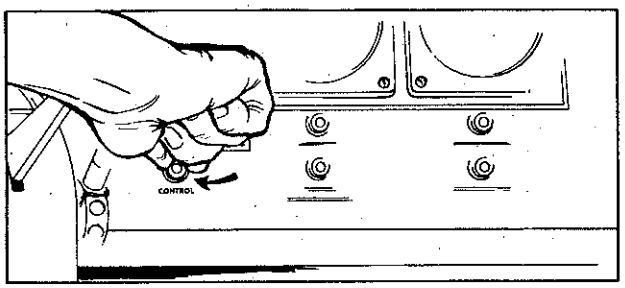
If a loss of electrical power occurs, and it is necessary to operate the wing flaps, proceed as follows:

1. FLAP SWITCH HANDLE - OFF
2. CIRCUIT BREAKER - PULLED
3. FLAP EMERGENCY HANDCRANK - ENGAGE AND CRANK (move crank toward pilot and turn forward at the top of the stroke to lower the flaps, and aft to raise the flaps), see figure 5-3.

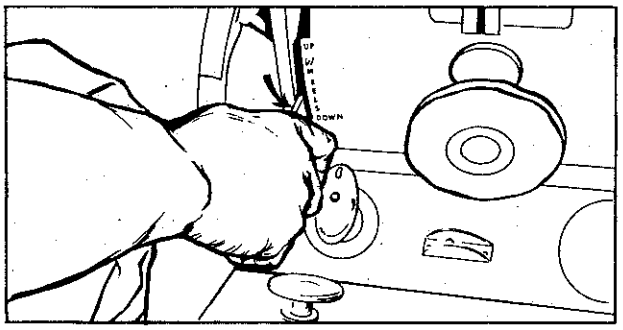
NOTE

Each complete handcrank revolution is equivalent to approximately 1-1/2 degrees of flap deflection. Approximately 30 turns of the hand crank are required for full flap travel. The jackscrew type flap actuators will hold the flaps in whatever position they are extended to.

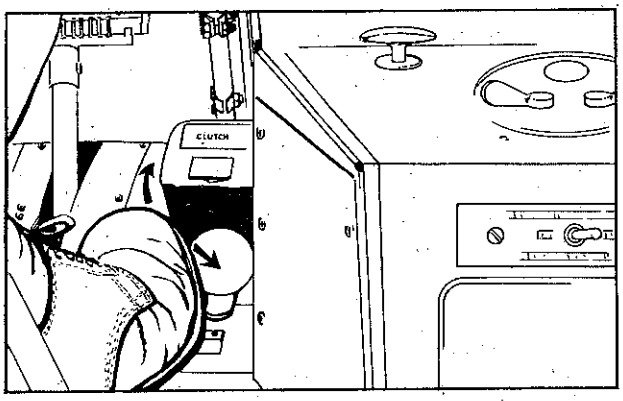
EMERGENCY LANDING GEAR OPERATION



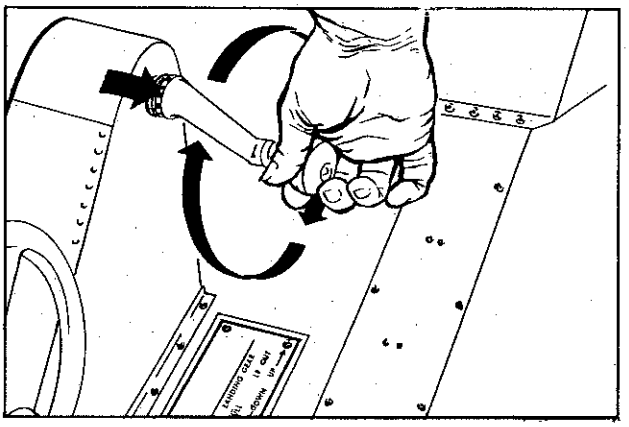
1. PULL OUT LANDING GEAR CONTROL CIRCUIT BREAKER.



2. PLACE LANDING GEAR HANDLE IN DOWN POSITION.

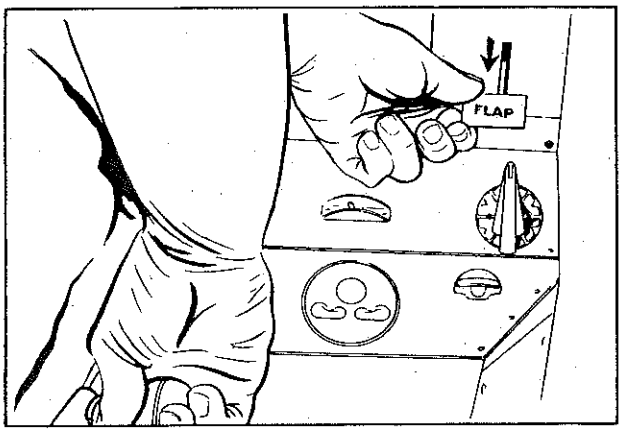


3. RAISE LANDING GEAR CLUTCH COVER.
4. DEPRESS CLUTCH PEDAL WITH TOE AND HOLD.
5. ALLOW GEAR TO FALL TO TRAIL POSITION.

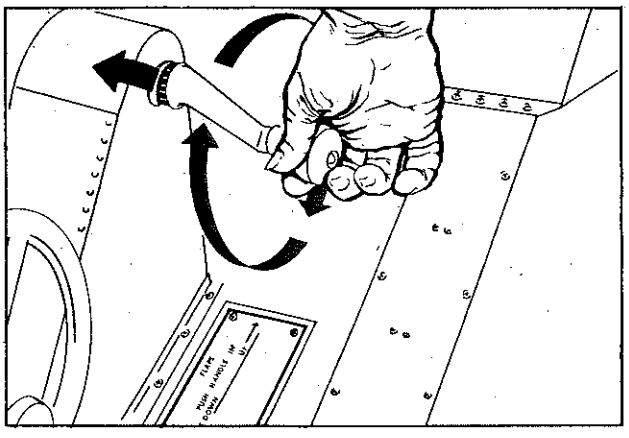


6. ENGAGE EMERGENCY HAND CRANK (MOVE CRANK AWAY FROM PILOT) AND TURN FORWARD AT TOP OF STROKE UNTIL CONSIDERABLE RESISTANCE IS FELT.
7. RELEASE CLUTCH.
8. ROCK HAND CRANK BACK AND FORTH SLIGHTLY UNTIL CLUTCH PEDAL IS ALL THE WAY BACK AGAINST THE FLOOR BOARDS.

EMERGENCY WING FLAP OPERATION



1. PLACE FLAP SWITCH IN OFF POSITION.
2. PULL CIRCUIT BREAKER



3. ENGAGE EMERGENCY HAND CRANK (PUSH IN TOWARD PILOT AND TURN FORWARD AT TOP OF STROKE TO LOWER AND OPPOSITE DIRECTION TO RAISE FLAPS.

Figure 5-3. Landing Gear and Wing Flap System Emergency Operation

BAIL OUT

The decision to bail out must be made by the pilot in command. It is also his responsibility to be certain that all crew-members and passengers are thoroughly indoctrinated on bail out procedure and use of equipment. Use the following procedure for normal bail out:

1. Receive verbal acknowledgement from all personnel on board "Ready".
2. Reduce airspeed as much as practicable (87 KIAS or less) and trim slightly nose down.
3. Head aircraft toward uninhabited area if possible
4. Transmit emergency report.
5. Instruct passengers to go aft to the main entrance door, ONE MAN AT A TIME for departure.
6. Unlock and jettison cabin door.
7. Disconnect radio cords.
8. Tighten parachute harness before leaving seat.
9. Attach parachute to harness.
10. Go aft and kneel before the cabin door. Actual departure is made by rolling or falling forward out the door head first.

WARNING

Do not jump from the main entrance door since bodily contact may be made with the empennage structure when leaving the aircraft in this manner.

AIRBORNE DAMAGED AIRCRAFT

If the aircraft is uncontrollable, bail out. However, if control can be maintained, proceed as follows:

1. Start a climb to at least 5000 feet and head toward a landing field.
2. Transmit emergency report and request a visual in-flight inspection.
3. Conduct test with landing gear extended and then with wing flaps down to determine aircraft flight characteristics and stability in landing configuration. Reduce airspeed in increments of 10 knots being careful not to reach a stall condition. This test should determine a safe minimum landing speed.
4. If all appears satisfactory, fly a wide easy approach; if a control problem exists fly a straight-in approach using an airspeed at least 10 knots above the minimum obtained during the flight characteristics check.

LANDING EMERGENCIES

Two types of landing emergencies will be encountered: Those which develop during the approach and actual landing where reaction and countermeasure time are minimized, and those which develop during the flight thereby allowing a specific landing procedure and technique to be applied. For those situations which develop during the landing approach, complete the landing if possible.

LANDING GEAR EMERGENCY OPERATION

If electrical powe does not operate the landing gear, it may be extended manually. However, due to the weight of the gear and location of the emergency handcrank it is not recommended that the gear be retracted manually. Proceed as follows for manual landing gear extension.

1. LANDING GEAR CIRCUIT BREAKER - CHECK (reset if necessary)
2. GENERATORS - CHECK (ON and operating)
3. LANDING GEAR - DOWN

IF LANDING GEAR WILL NOT EXTEND —

1. LANDING GEAR CIRCUIT BREAKER - PULLED
2. AIRSPEED - REDUCE (108 KIAS or less)
3. LANDING GEAR HANDLE - DOWN
4. LANDING GEAR EMERGENCY HANDCRANK - FREE
5. LANDING GEAR CLUTCH PEDAL - DEPRESSED Hold clutch pedal in the depressed position until the landing gear free-falls into the trail position. (see figure 5-3)

WARNING

When manually extending the landing gear, always depress the clutch pedal and allow the gear to free-fall in to the trail position before attempting to engage the landing gear emergency handcrank. If the handcrank is engaged prior to depressing the clutch pedal, the entire weight of the gear must be supported by the handcrank after the clutch pedal is depressed. In this configuration, the weight of the landing gear makes it difficult to hold and the handcrank will spin quite rapidly thereby resulting in possible injury to the operator.

6. LANDING GEAR EMERGENCY HANDCRANK - ENGAGE (with landing gear clutch pedal depressed, move crank away from pilot and crank).
7. LANDING GEAR CLUTCH PEDAL - RELEASE
8. LANDING GEAR EMERGENCY HANDCRANK - CRANK FORE AND AFT (until clutch pedal returns to the normal completely engaged position)
9. Check landing gear completely extended and locked as follows:
   a. Cross-shaft teeth meshed.
   b. Landing gear handle light OUT.
   c. Landing gear warning horn OFF.
   d. Check visually that the landing gear is extended and locked.

IF LANDING GEAR WILL NOT RETRACT —

1. If landing gear handle will not move to the UP position.
   a. Check landing gear circuit breakers.
   b. Landing gear handle - UP. Depress override plunger if necessary.

2. Landing gear handle moves to UP, but gear will not retract:
a. Check landing gear circuit breakers.
b. Do not manually retract the landing gear unless necessary to maintain flight.

NOTE

In event manual landing gear retraction is attempted, manually releasing the clutch pedal (removing toe pressure) will restrain the gear at any point in the retraction cycle.

FORCED LANDING

Proceed as follows for forced landing on land. Make the decision to land with the landing gear extended or retracted prior to establishing final approach angle and speed.

1. TRANSMIT MAYDAY
2. LANDING GEAR - UP or DOWN (if in doubt, land gear UP)
3. FUEL TANK SELECTOR - OFF
4. MAG MASTER - OFF
5. FLAPS - DOWN (maintain 85 KIAS)
6. BATTERIES - OFF
7. GENERATORS - OFF
8. SAFETY BELTS/SHOULDER HARNESS - LOCKED
9. Touchdown in open area at slowest speed possible under circumstance. Maintain directional control as long as possible.
10. Evacuate aircraft when all motion has stopped.

NOTE

If forced landing is being made due to low fuel supply, land before the fuel is completely exhausted in order to maintain a power controlled approach and landing.

DITCHING

Normally, the aircraft will not be equipped with a liferaft or other ditching survival equipment. If an overwater flight is to be made, the necessary survival equipment must be installed. If an emergency situation should develop on an overwater flight, the pilot must decide whether to ditch or bailout. Bail out should be considered only if surface vessels are present or there is no change to ditch successfully. Ditching keeps personnel together and any survival equipment onboard the aircraft will be available. The following ditching procedures will apply.

1. TRANSMIT MAYDAY
2. PASSENGERS and/or CREWMEMBERS - take DITCH STATIONS Standby to evacuate the aircraft with liferaft, emergency rations, spare parachutes, or any other useful items.
3. RADIO CORDS - DISCONNECT
4. SAFETY BELTS/SHOULDER HARNESS - LOCKED
5. EMERGENCY EXIT HATCH (on aft right side of passenger compartment) - Instruct passenger or crewmember to JETTISON after final touchdown.
6. BATTERIES - OFF
7. LANDING GEAR - UP
8. FLAPS - DOWN
9. Approach:
a. If both engines inoperative, feather both propellers prior to starting the flareout while airspeed and control are present.
b. If one or both engines are operative, use normal power during the approach. Touchdown in a slightly tail-low attitude, just above a stall.
10. Plan landing direction as follows:
a. Calm sea - Land into the wind.
b. Moderate swells - Land parallel to the swells (then if possible, turn into the wind)
c. High swells - Land into the wind attempting to contact the surface on the upwind side of a swell.
11. SAFETY BELTS/SHOULDER HARNESS - RELEASE after aircraft has come to a complete stop. Several impacts may be encountered.
12. EVACUATE AIRCRAFT (when all motion has stopped)

ESCAPE ROUTES

Emergency exit from the aircraft can be made through either the main entrance door or the emergency exit hatch (on the aft right side of the passenger compartment). The main entrance door has an emergency release lever located in the wall at the forward edge of the door (figure 5-2). To release or jettison the door, proceed as follows:

1. Unlatch the door as during normal opening.
2. Open the red spring loaded flap.
3. Lift up on the lever located under the flap. This will release the door hinge pins permitting the door to separate from the aircraft.

CAUTION

Do not operate the door emergency release mechanism in flight unless actual door jettison is desired. The aircraft's empennage section may be damaged when the door is released.

To open or jettison the emergency exit hatch, proceed as follows:

1. Lift the safetied red cover protecting the hatch release button.
2. Depress the hatch release button (this will release an upholstered lever (approximately 10 inches in length), at the forward edge of the door).
3. Pull the upholstered lever out and down. This will open or jettison the emergency exit hatch.

SINGLE-ENGINE LANDING

When it becomes necessary to make a single engine landing (figure 5-4), several basic rules of technique apply in addition to the procedural steps used, they are:

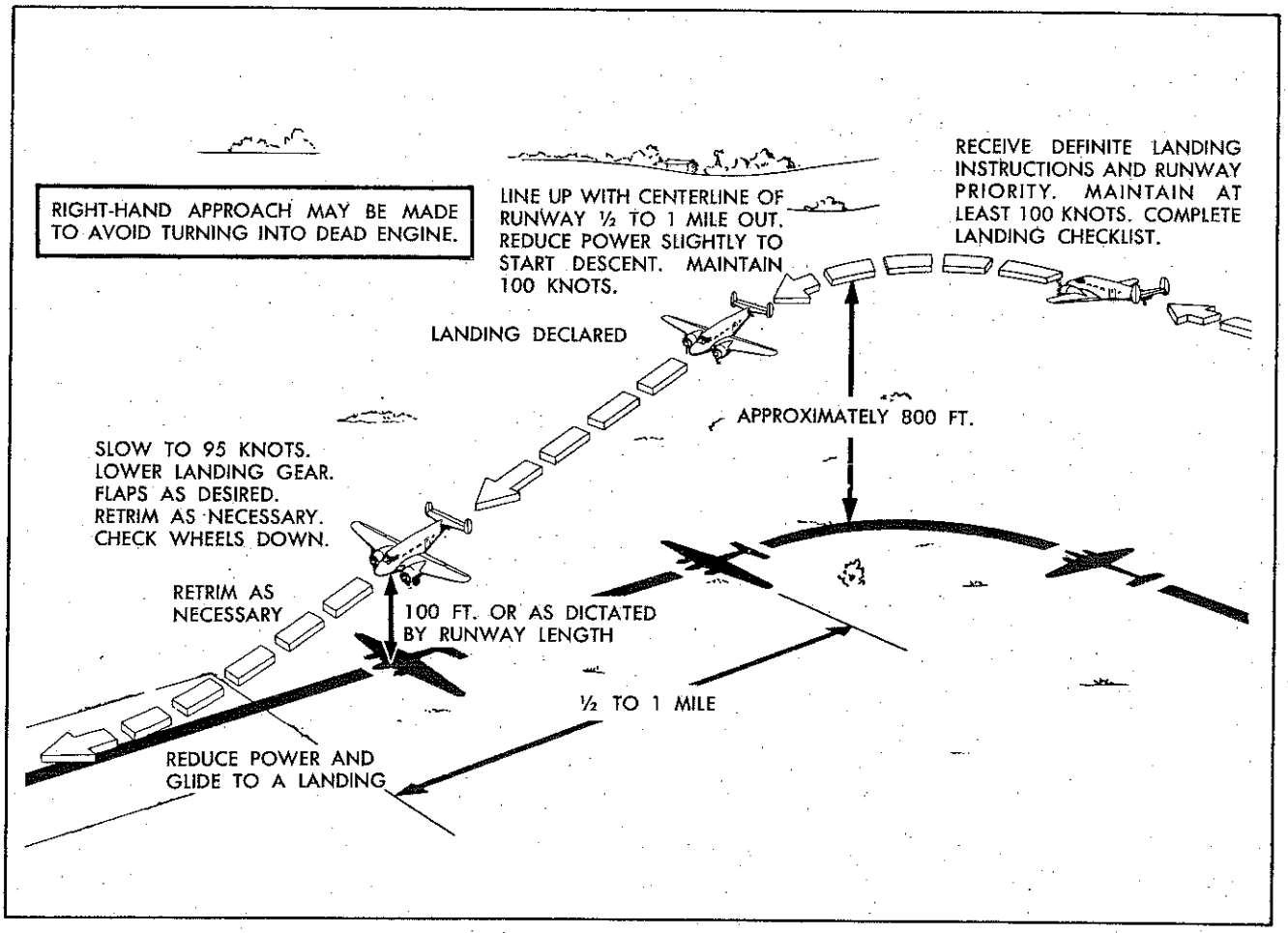


Figure 5-4. Single Engine Landing

1. Maintain a traffic pattern and final approach speed approximately 5 knots faster than normal.
2. Do not extend the landing gear until on final approach and a landing is assured. Keep in mind the effect of added drag on altitude and airspeed.
3. Do not lower more than 15° wing flaps until landing is assured since all added drag will reduce performance in the event of a go-around.
4. Maintain a higher than normal altitude on final. When possible, all pattern turns should be toward the operative engine since control is more positive. When landing is assured, reduce power, retrim, (full flaps if desired), and execute a normal landing.

CAUTION

Never allow airspeed to decrease below Minimum Single Engine Control Speed before the landing is assured and all possibilities of a go-around have been eliminated. Due to the decreased drag of the feathered propeller, the landing roll will be longer than normal. As speed decreases and power is reduced, a directional swerve may develop unless rudder trim is neutralized prior to the landing flare out. Lock the tail wheel during taxi operations to assist in maintaining directional control.

SINGLE ENGINE GO-AROUND

If it becomes necessary to make a single-engine go-around use the following procedures and techniques.

1. THROTTLE (GOOD ENG) - OPEN (Take-off or Maximum Power)
2. LANDING GEAR - UP
3. FLAPS - UP
4. COWL FLAPS - TRAIL
5. AIRSPEED - MAINTAIN SAFE SINGLE-ENGINE SPEED approximately 90 KIAS

If approach speed has been reduced below Safe Single Engine Speed or if the landing gear and wing flaps are fully extended, a go-around should not be attempted unless sufficient altitude is available to retract the landing gear and wing flaps, or Safe Single Engine Speed can be obtained.

NOTE

Safe Single Engine Speed should be attained without gaining altitude and if necessary and feasible, sacrifice a little altitude to attain this speed safely and quickly.

SECTION VI – ALL-WEATHER OPERATION

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TURBULENCE AND THUNDERSTORMS

Flight through a highly turbulent area or thunderstorm should be avoided if at all possible. Routine flight operations, however, will encounter a certain amount of this type flying since it is not always possible to avoid a storm area. At night it is especially difficult to locate the clear areas. When a flight operation is to be conducted into a zone of suspected or known turbulence, a penetration speed must be established. A usable speed can be found by adding 60 knots to the power on stall speed for the weight and configuration being flown. The power setting and pitch attitude for this speed should be established prior to entering an area of turbulence, and if maintained will result in a near constant average airspeed, regardless of any false airspeed indications.

APPROACHING TURBULENT AIR

Prior to actual storm or turbulent air entry, the aircraft should be prepared as follows:

1. LOOSE EQUIPMENT - Secure
2. AUTOPILOT - DISENGAGED (RC-45J only)
3. AIRSPEED - AS REQUIRED to maintain 60 knots above stall speed for weight and configuration being flown
4. PITOT HEAT - ON
5. MIXTURES - RICH
6. MANIFOLD HEAT - AS REQUIRED
7. VACUUM and GYRO INSTRUMENTS - Check
8. SAFETY BELTS - FASTENED (check with all personnel)
9. Turn OFF any radio equipment rendered useless by static.
10. Turn pilots compartment lights to full bright and turn ON pilot's compartment white dome lights to minimize blinding effect of lightning (during night operations).

CAUTION

Do not extend landing gear or lower wing flaps as they merely decrease aircraft aerodynamic efficiency.

11. NAVIGATION LIGHTS - ON
12. Select fullest fuel tank; preferably a MAIN tank.

FLIGHT IN TURBULENT AIR

Penetrate turbulent air as follows:

1. Maintain attitude by reference to the attitude indicators.

NOTE

Maintain power settings and pitch attitude (establish prior to entering the storm or turbulent air) throughout the storm.

2. Maintain original heading. Do not make any turns unless absoutely necessary.
3. Use as little elevator control as possible in maintaining attitude in order to minimize stresses imposed on the aircraft.
4. If heavy precipitation is encountered, close cowl flaps to prevent engines from cooling too rapidly.

COLD WEATHER OPERATION

Normally, cold weather operations and the applicable procedures are considered to be in effect at ambient temperatures of 0°C or less. The following discussions, operating techniques, and procedures are supplemental to the information contained in Section III, Normal Procedures and should be complied with when cold weather conditions are encountered.

CARBURETOR ICING

Carburetor icing is most probable under two common atmospheric conditions; visible freezing or subfreezing moisture, or high humidity conditions. During these conditions, moisture either in the form of ice particles or liquid enters the engine indication system where either due to its already solid state it causes a restriction, or due to the refrigeration effect of the carburetor, it is formed into ice which also causes a restriction. This restriction in carburetor air flow, if allowed to progress to a critical state, will be difficult, if not near impossible to remove with manifold heat. For this reason, preventative action rather than remedial action is emphasized.

CARBURETOR ICING INDICATION

Carburetor ice can usually be detected by a gradual loss of manifold pressure. Normally, ice formation is a relatively slow process, and for this reason, as power decreases slightly, the pilot may advance the throttles gradually by slight increments before realizing ice is being formed. There are extreme icing conditions when ice can form very rapidly. Such conditions, however, are usually rare local instances. Being alert to atmospheric conditions favorable to icing and the early use of manifold heat will normally eliminate ice formations.

CARBURETOR HEAT USE

If it is suspected that carburetor ice has already formed, use the following procedure:

1. MIXTURES - RICH (if below 5,000 feet)
2. MANIFOLD HEAT - HOT (down)
3. Check repeatedly to see if manifold pressure is restored by slowly returning the manifold heat lever to the COLD (up) position. If the rise in manifold pressure from full hot to full cold is consistent during several momentary cycles from HOT to COLD, the ice is gone.

NOTE

If heavy icing has occurred, the loss of power will be accompanied by a loss in manifold heat capacity so that full manifold heat may be required for longer periods. The effectiveness of manifold heat in eliminating the ice may be sharply reduced.

4. Adjust manifold heat levers to maintain carburetor mixture temperatures within the normal operating range.

CARBURETOR ICE PREVENTION

Prior to entering an area of known icing conditions, proceed as follows:

1. Change altitude or course if possible and practical.
2. MANIFOLD HEAT - HOT (down) at least 15 minutes, if possible, before entering icing conditions
3. Since some icing conditions are not as obvious as others, due to temperature, visible moisture, etc., a normal procedure would be to carry enough manifold heat to keep the induction system temperature a few degrees warmer than normal during any flight condition when possible icing may occur.

PREFLIGHT INSPECTION (EXTERIOR)

1. Check for removal of all snow, ice, and frost accumulations from wings, empennage, control surfaces and hinges, propellers, pitot tubes, and fuel and oil tank caps and vents. If hot air has been used, make sure that the areas are dry and ice-free.

CAUTION

Hot water should not be used to remove frost or ice unless the aircraft is sheltered in a warm area, as additional ice may form to aggravate the situation.

2. Check the oil Y-drains and oil tank sumps for free oil flow. If no oil flow is obtainable, preheat the engine, accessory section, and oil flow lines until oil flow is readily obtained.
3. Check the landing gear struts, slide tubes, actuating mechanism, wheels and brakes for freedom from snow, ice, mud, frost, etc. Check landing gear safety switch for freedom from ice. A coating of hydraulic fluid should be applied to the landing gear shock struts and retraction slide tubes.
4. Tires and landing gear shock struts for specified inflation.
5. Check all flight controls for freedom of movement. Check that the drain hole in the bottom of the elevator cone is open. If this hole is plugged, water may collect and freeze in the cone restricting or even blocking elevator travel.
6. Check for engine stiffness to determine when sufficient ground heat has been applied. When one man can rotate the propeller freely the engine is warm enough to start.
7. Check that external power is applied. All cold weather starts should be made with the assistance of an auxiliary power unit.
8. Complete the normal Preflight Preparation procedures established in Section III, Normal Procedures.

BEFORE STARTING ENGINES

Perform the following before starting the engines.

1. Check operation of all instruments which will function without engine operation.

2. Remove all ground heater ducts, engine covers etc. (if installed).
3. Pull the propellers through at least 10 blades by hand.
4. Complete the normal Pre-Start Checks established in Section III, Normal Procedures.

STARTING ENGINES

Except for the following variations, make cold weather starts, using the same procedure as used for normal starts.

NOTE

If a battery start must be made, reduce the electrical load to a minimum.

1. Set throttles approximately 1/8th open or less (approximately 800 rpm) to decrease backfiring tendency.
2. MANIFOLD HEAT - COLD (up)

CAUTION

Use of manifold heat during starting may result in serious damage and fire if the engine backfires. Manifold-heat levers will tend to move into HOT position during backfiring. Return levers to Cold but do not hold or lock in position.

3. OIL BY PASS - HOT (out)
4. Prime the engine immediately before starting and after the propeller starts to rotate. If primed prematurely, the gasoline will not vaporize. In extreme cold, operate the primer intermittently until regularity of engine firing results. It may be necessary to continue priming for a short time after starting to maintain smooth engine operation.

NOTE

If the engine fires and quits several times, ice is likely to form on the spark plug electrodes. When this is suspected, remove several front plugs and heat and dry the points before attempting a restart.

5. If there is no oil pressure after thirty seconds running or if pressure drops after a few minutes of ground operation, shut down and check for blown oil lines or radiators and for congealed oil or ice at Y-drain or oil tank sump drain.

NOTE

Oil pressure will be abnormally high immediately after starting. This is an allowable situation; but as oil temperature increases, the oil pressure should drop rapidly to normal. Do not increase engine rpm until oil temperature and pressure are within limits.

6. MANIFOLD HEAT - HOT (down) when engine is firing evenly. Return to COLD (up) when engine will operate smoothly
7. COWL FLAPS - OPEN at least 2/3rds to prevent overheating in engine accessory section

ENGINE WARM-UP

Warm up the engines as follows:

1. Oil shutters - HOT (down)
2. ENGINE SPEED - 1000 RPM until oil temperature reaches 40°C. Do not exceed oil pressure limits (use decreased engine RPM if necessary)
3. MANIFOLD HEAT - AS REQUIRED to improve fuel vaporization and prevent backfiring

NOTE

When subjected to excessive drain, storage batteries deteriorate rapidly in cold weather; therefore, none but essential electrical equipment should be used until generators are supplying current.

4. Check instrument operation.
5. Exercise propellers from low pitch (high rpm) to high pitch (low rpm) and back to low pitch several times to circulate warm oil through the propeller governing system.
6. When oil temperature reaches 20°C, move oil by-pass T-handle to COLD (in) position very slowly since congealed oil in radiator may block the flow and result in radiator failure. When the oil temperature reaches 20°C, the by-pass valve will be warmed sufficiently to allow oil to automatically by-pass the radiator if the radiator is blocked by congealed oil.

TAXI

Taxi the aircraft as follows:

1. Avoid taxiing through qater, slush, mud, etc if possible.
2. Use the same precautions regarding propeller wash as used during engine warm-up.
3. Watch for formation of frost on the wings.

BEFORE TAKE-OFF

Perform the following before take-off

1. Check control surfaces and trim tabs for full unrestricted travel.
2. FLAPS - CYCLE (to insure correct operation)
3. Check engine operating pressures and temperatures for normal indications.
4. Exercise propellers from low pitch (high rpm) to high pitch (low rpm) and back to low pitch several times to circulate warm oil through the propeller governing system.
5. PITOT HEAT - ON (for take-off)
6. DEICER BOOTS - CYCLE (to insure correct operation)

7. If deep or heavy snow interferes with take-off run but permits taxiing, move slowly up and down the take-off course several times to pack down the runway before attempting actual take-off.
8. TAILWHEEL - LOCKED, check with wheel brakes (frozen slush may prevent locking pin from engaging)

TAKE-OFF

Perform the following during take-off:

1. Run up engines using manifold heat to eliminate any carburetor ice.

NOTE

Manifold heat levers should be in the COLD (up) position for take-off.

2. Abort take-off immediately if full power is not developed.
3. After take-off from a snow or slush covered field, leave the landing gear extended for a few minutes until slush or moisture is either blown off or dries, then operate through several cycles to prevent freezing of the doors, actuator slide tube, etc.

DURING FLIGHT

During flight perform the following:

1. Use manifold heat as required to prevent formation of carburetor ice since prevention is more advisable than removal. Some carburetor heat should be used at all times if compatible with engine power requirements. Rough operation may occur at high power settings when full manifold heat is applied. Manifold heat temperature should be regulated between + 10°C and +38°C.
2. Periodically move throttle and manifold heat levers to prevent their freezing in one position.

NOTE

Should the carburetor air doors become frozen by ice, turn the propeller anti-icer on full flow. This will allow sufficient alcohol from the propeller blades to enter the induction system and loosen the ice accumulation.

3. Use anti-icing systems as required to prevent formation of ice on the windshield, propeller blades, and pitot heads.

CAUTION

Do not activate the deicer boots until at least 1/4 inch of ice has formed on the surfaces. Cycle the boots until all residual ice is removed.

4. Unusual stiffness of controls may indicate freezing of moisture in control hinges. If possible descend or climb into a warmer layer of air or move the controls frequently to prevent freezing.
5. Cycle the propeller periodically between 1600 and 2300 rpm to prevent oil from congealing in the propeller dome and either complicating or preventing propeller feathering.

NOTE

If propeller feathering is required and the feathering button "pops out" before the propeller is feathered, do not manually depress the button and hold. Excess pressure, due to the thick cold oil, is causing premature feathering button release followed by a tendency for the propeller to unfeather. Depress the button, let it release and then depress it again. Continue this procedure until the propeller is feathered. When feathering an engine, restart the engine before the oil temperature drops below +40°C (if a restart is planned). Temperatures below this limit will prevent the use of the engine for power until a significant warm-up period has lapsed.

APPROACH AND LANDING

Accomplish the following during approach and landing:

1. During descent, observe engine temperatures closely. Maintain cylinder head temperatures above 100°C by maintaining power and regulating cowl flaps. Use manifold heat to assure good fuel vaporization.

NOTE

Extend landing gear and lower partial flaps prior to approach, to check operation (while altitude remains). This will also permit use of more engine power which will reduce the possibility of carburetor ice.

2. DEICER BOOTS - OFF
3. If the aircraft is heavily iced, make approach at a higher than normal speed.
4. Turn off all electrical equipment possible at least one minute before final approach to save batteries when engine rpm is reduced below generator cut-in speed.
5. Use carburetor heat during landing so that if acceleration is necessary, heat will be available for fuel vaporization, regardless of cylinder head temperature. If full power is required for a go-around, be prepared to return the manifold heat levers to the COLD (up) position.

NOTE

When landing on runways covered with slush or large puddles, avoid using wing flaps. Heavy sprays of slush or water kicked up during landing might impose an excessive load on the flaps if they are extended. The use of wing flaps will not be necessary since the added resistance from the water will assist in braking airplane.

6. Use brakes sparingly and not until absolutely necessary during landing roll.
7. Turn OFF any anti-icing systems no longer required.
8. MANIFOLD HEAT - HOT (down, while taxiing).

PARKING

When the aircraft is to be parked for a period of time such as over night or longer when the temperature varies between thawing and hard freezing, place a double layer of paper, fabric, or other suitable insulation material under the wheels to prevent their freezing to the surface.

ENGINE SHUTDOWN

1. Normal engine shut down procedures apply.
2. If aircraft is to remain parked overnight, leave either of the pilot's compartment windows partially open to provide air circulation within the aircraft, otherwise windows may frost over on the inside of the aircraft.
3. Drain fuel and oil tank sumps and oil Y-drains to remove any water condensate before it freezes.
4. Remove any dirt and ice from the landing gear shock struts and actuator slide tubes.
5. Install any aircraft protective covering.
6. Approximately 30 minutes after engine shut-down, redrain fuel and oil tank sumps and oil Y-drains.

HOT WEATHER AND DESERT OPERATION

The main concern in hot weather and desert type climates is usually associated with aircraft ground operations. These difficulties are poor engine cooling, overheating of brakes, longer take-off and landing rolls (due to the less dense air), and the maintenance problems associated with blowing sand and dust and the general destructive effect of heat on the aircraft's systems. In addition to the normal procedures given in Section III, the following steps should be observed:

BEFORE ENTERING AIRCRAFT

1. Inspect landing gear shock struts, landing gear actuator slide tubes, and tires for cleanliness and/or proper inflation (landing gear actuator slide tubes for cleanliness). Use a dry cloth to remove sand and dust.
2. Carburetor air intake covers removed and any accumulations of dust and sand removed.
3. Check for fuel, oil and hydraulic fluid leaks.

ON ENTERING AIRCRAFT

1. Operate all movable flight control surfaces.
2. Clean any excessive dust accumulations on or around instrument dials, movable controls, or switches.

ENGINE WARM-UP AND GROUND TESTS

Keep engine ground operation time to a minimum. Complete all ground checks but accomplish this as rapidly as possible. Observe cylinder head and carburetor air temperatures. Do not exceed limits. If run-up area is dusty, make run-up so propeller wash is away from personnel, other aircraft, or ground installations.

TAKE-OFF

Take-off distances will be longer and acceleration will be slower. Observe the cylinder head temperatures and carburetor air temperatures closely in order to avoid exceeding limits.

CAUTION

Loss of power from detonation will probably occur if carburetor mixture temperature exceeds 15°C.

LANDING

Be alert for ground turbulence. The landing ground roll will be longer.

BEFORE LEAVING AIRCRAFT

1. Install wheel chocks and immediately release the brakes to prevent possible warping of the brake discs.
2. When engines have cooled, install protective covers.
3. If blowing sand or dust is not a hazard, leave windows and doors open to permit air circulation.

CAUTION

If the fuel tanks are to be completely filled, fuel expansion may cause fuel overflow thereby creating a fire hazard.