SECTION II

NORMAL PROCEDURES

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PREPARATION FOR FLIGHT

FLIGHT RESTRICTIONS.

For flight restrictions on the aircraft, refer to Section V of this Flight Manual.

FLIGHT PLANNING.

Preflight planning data, such as required fuel, airspeed, power settings, etc, to complete the proposed mission should be determined, using the operating data contained in Appendix of this Flight Manual. Refer to Section V for alternate fuel grade limits.

WEIGHT AND BALANCE.

Check the aircraft weight and balance (refer to the Handbook of Weight and Balance). Refer to Section V of this handbook for the weight, limitations of the aircraft, and check the take-off and anticipated landing gross weights. Make certain that the weight and balance clearance is current and correct. Make certain that the weight, grades of fuel, oil, and any special equipment carried are suited to the mission to be performed.

CHECKLISTS.

The Flight Manual now contains only amplified checklists; the abbreviated checklists have been issued as separate publications. The checklists presented in this Section are depicted showing personnel normally responsible for execution of the required action or assuring that such action is completed. P & CP denote Pilot & Co-pilot. The Co-pilot will read the checklist and accomplishment of each item will be indicated by the proper response.

NOTE

The term "climatic" as used in the checklists indicates equipment operation or settings which may be necessary for other than daylight VFR conditions. This includes IFR, night, cold weather, tropic, and desert conditions. The equipment operation or setting will vary depending on the prevailing conditions. In practice, the response to climatic items will be the required switch or control position.

ENTRANCE. (See figure 3-5).

PREFLIGHT CHECKS.

It shall be the responsibility of the pilot to insure that an interior and exterior visual inspection as outlined, and a PREFLIGHT inspection as required by the Handbook of Inspection Requirements, have been performed. It shall also be the responsibility of the pilot to insure that each crew member has accomplished his individual inspection requirement as outlined in this Section and in Section VIII.

NOTE

The air crew visual inspection procedures outlined in this section are predicated on the assumption that maintenance personnel have completed all the requirements of the Manual of Inspection Requirements. Therefore, duplicate inspections and operational checks of systems by air crew members have been eliminated, except for certain items required in the interest of flying safety.

THRU FLIGHT CHECKLIST.

The thru-flight checklist is to be accomplished only when immediate stops are performed by the same flight crew and **no** maintenance is performed during these stops. Thru-flight checklist items are indicated by an asterisk (*). After first complete engine runup on training flights and thru-flights, provided the engines have not been subsequently stopped, only item 5 of engine runup checklist need be accomplished. The remaining items may be accomplished at the direction of the flight crew. All items under BEFORE TAKE-OFF and subsequent checks must be accomplished for all flights.

AIRCRAFT STATUS.

Check for the status of the aircraft and determine that the maintenance pre-flight has been accomplished. The pilot will make certain that the inspection as outlined by the Handbook of Inspection Requirements has been performed.

INTERIOR INSPECTION.

1. Aft CO_2 Extinguisher - CHECKED/SAFTIED.
2. Toilet Compartment - CHECKED.
3. Tail Cone - CHECKED.
4. Access Door - CLOSED.
5. Gibson Girl - AS REQUIRED.
6. First Aid Kit - CHECKED.

7. Emergency Exits - SECURED.

8. Cabin (Load Secured, Cleanliness, Weight & Balance) - CHECKED.

9. Forward Fire Extinguisher - CHECKED/ SAFTIED.

10. Crash Axe and Dip Stick - CHECKED.

11. Forward Entrance Door - SECURED.

12. Aux. Hyd. Oil Supply - CHECKED.

13. Over-head Escape Hatch - SECURED.

14. Battery and Ignition - OFF.

15. Clear Vision Windows - SECURED.

16. Landing Gear Latch Lever - POSITIVE LOCK

17. Trim Tabs - CHECKED AND NEUTRAL.

18. Circuit Breakers and Fuses - CHECKED.

19. Log Book (Examine the log book previous discrepancies. Note that proper disposition has been made of those items, and advise Captain of the condition of the aircraft).

NOTE

1. Interior Inspection is normally made by First Officer while getting dip stick.

2. Check for other emergency equipment such as parachutes, survival gear, etc. As required by mission.

EXTERIOR INSPECTION.

Start from main passenger or cargo door and work clockwise around the aircraft inspecting and checking the following:

1. Wing Flaps

   a. For dents, damage, or distortion.

   b. Flap actuating cylinders for leaks (hydraulic) and secureness.

2. Wing Attachment Bolts.

3. Aileron

   a. For holes, damage, or distortion.

   b. Static wicks.

   c. Aileron hinges bonding, and trim tab for secureness.

NOTE

Place aileron in approximately 3/4" droop and on passing to right side, check right aileron for desired droop.

4. Wing Tip

   a. Wing tip for damage.

   b. Wing tip light and reflector.

5. Leading Edge of Wing

   a. General wing area for any damage, note condition of de-icer boots when such are installed.

   b. Move in toward left nacelle continuing to check wing - check all inspection panels for secureness.

   c. Note landing light and reflector for secureness, any possible damage, and drain hole open.

   d. Move up to the left nacelle.

6. Left Engine

   a. Exhaust Stacks - Condition and Security.

   b. Fuel and Oil leaks.

   c. General condition.

   d. Engine drain lines.

   e. Cowling for security.

7. Left Propeller

   a. Check for nicks and cracks.

   b. Oil leaks around blades and dome.

   c. Prop dome retainer ring saftied.

   d. C-clip on front of prop dome.

   e. Slinger ring.

   f. Prop governor and control cable.

   g. Oil delivery lines.

8. Left Nacelle

a. Landing gear down lock pin for binding.

b. Landing gear strut extension and condition.

c. Fittings.

d. Tire condition and slippage mark.

e. Brakes and hydraulic lines.

NOTE

High friction brakes are designated by the "EA 908" stencilled on the brake housing. All brakes must be of the SAME type on the aircraft.

f. Oil coolers and doors.

g. "Y" drain saftied.

h. Cables and plumbing.

i. Firewall shutoff valves.

j. Electrical connections.

k. CB Extinguisher pressure and connections.

9. Fuselage

a. Check pitot masts - check pitot covers OFF, and static holes clean.

b. Battery compartment and drain.

c. Check hydraulic leaks.

(i) Check pitot heaters.
(ii) Check anti-icing equipment in anticipated cold weather operations.

d. Nose access panel secured.

e. Check antennas and radio wires.

f. Check fuel tank drain for water.

g. Stress plates.

h. Fire extinguishers thermal discharge disks.

10. Fuel Booster Pumps

Check all fuel booster pumps under pressure (designate one qualified person to operate fuel pumps and selectors from cockpit - this can be performed by copilot, or maintenance personnel. It is not mandatory to perform this inspection and check if qualified aircraft mantenance personnel confirm that it has already been performed. The station maintenance personnel will normally perform these pre-flight checks. However, it is particularly important that pilots understand this procedure.) Also check boost pump drain for leaks.

11. Right engine

a. Same as for left engine.

12. Right propeller

a. Same as for left propeller.

13. Right Nacelle

a. Same as for left nacelle.

14. Leading Edge of right Wing.

a. Same as for left wing.

15. Right Wing Tip

a. Same as left wing tip.

16. Right Aileron

a. Same as left aileron.

17. Wing Flaps

a. Same as left side

18. Fuselage

a. Check for damage to skin

b. Check tail wheel axle bolt saftied.

19. Tail Section (Empennage)

Check and inspect outward along leading edge horizontal stabilizer.

a. Check for damage - check condition of de-icer boots.

b. Check elevators for full-throw note torque & hinges, etc. for damage or looseness.

c. Check rudder for full throw - check for damage.

d. Note radio antenna wires at top of tail fin.

e. Check static dischargers.

f. Check trim tabs hinges and bonding, tail lights/rotating beacon.

g. Continue inspection clockwise around tail section to fuselage thence forward to main cabin door.

h. Check Tailwheel Cone Area
(i) Check tire inflation & slippage
(ii) Check grounding wire
(iii) Check oleo-strut
(iv) Check tail wheel fittings

i. Check for damage to skin

j. Door pins, jettison handle secured-saftied.

20. First Officer

Completes the following duties:

a. Dips fuel tanks for quantity.

b. Checks oil quantity

c. Assures fuel and oil caps are secure.

d. Checks the general condition of top of wings and engine nacelles.

e. Removes, stows and secures control locks and pitot covers.

PRE-FLIGHT.

1. Visual Internal & External Check - COMPLETED.

2. Circuit Breakers and Fuses - CHECKED.

3. Control Locks and Pitot Covers - REMOVED & STOWED.

4. Logbook, Papers and Flight Kit - ABOARD.

BEFORE STARTING ENGINES.

*Denotes Thru Flight Checklist items.

NOTE

Prior to the Before Starting Engine Checklist the Captain will assure that he or his designee has briefed the passengers on the applicable portions of the Passenger Briefing Checklist in Section VIII.

1. Seats and Rudder Pedals - ADJUSTED - P. CP

* 2. Landing gear latch lever - POSITIVE LOCK - P.

* 3. Hydraulic fluid level - CHECKED - P.

4. Autopilot emergency shutoff valve - OFF - P.

5. Star Valve - OFF - P.

* 6. Wing Flap lever - NEUTRAL - P.

7. Hydraulic handpump & pressure - CHECKED - CP (operate the handpump until landing gear pressure is within limits.)

* 8. Landing gear lever - NEUTRAL - P.

NOTE

The landing gear lever should be moved rapidly to NEUTRAL position in order to trap landing gear down pressure.

9. Fire extinguisher switches/handles - SET - P.

10. Firewall shutoff switches/handles - SET - P.

11. Autopilot - OFF - P.

*12. Parking brakes - SET - P.

13. Radio & electrical switches - OFF - P

14. Alarm bell - CHECKED - P.

*15. Battery/External power - ON/OFF - P.

CAUTION

Damage to electrical system components could occur if the battery switch is placed ON while external power is used.

NOTE

A minimum battery voltage of approx. 18 volts is required to close the battery relay. The battery relay must be closed before the generators can recharge the battery.

*16. No smoking/Seat belt signs - ON - P.

17. Lights - SET - P, CP.

*18. Ignition switches - check individual switches OFF, set master ON - P.

19. Fire detection system - CHECKED - P.

20. Static selector - NORMAL - CP.

*21. Fuel quantity - CHECKED - CP.

CAUTION

The selector must be turned clockwise to prevent jamming.

*22. Fuel tank selectors - SET (main or fullest tank) - P, CP.

23. Oil coolers - COLD - P.

24. Carburetor Air - RAM/COLD - CP check doors visually (if applicable.)

25. Mixtures - IDLE CUT-OFF - CP.

26. Throttles - SET - P.

27. Props - FORWARD - P.

*28. Manifold pressure - CHECKED - P check gage reading and state inches of Hg.

*29. Fire guard - CLEAR 2 - CP check fire guard posted and prop clear for start.

STARTING ENGINES.

The pilot will start the right engine and the copilot will start the left engine. It is recommended that the right engine be started first.

NOTE

For ground operation at density altitudes above 6,000 feet, refer to HIGH ALTITUDE PROCEDURES in Section IX.

* 1. Propellers clear, fire guard posted. P. CP.

* 2. Fuel booster pump switch - ON:

* 3. Starter switch - ENGAGE. P, CP.

NOTE

If inertia-direct cranking starters are installed, the energize switch should be engaged a minimum of 10 seconds before the mesh switch is engaged.

CAUTION

To clear the engine and insure proper lubrication, pull the propellers through 15 blades with continuous starter operation. Fifteen blades are required for any start made after a 2 hr. shutdown period. Eight blades will insure elimination or detection of hydraulic lock of engine starts made within 2 hours of last shutdown. If inertia starters are installed and the engine has been shut down 2 hours or more, the propeller will be turned through with the starter by engaging the energize and mesh switches simultaneously.

* 4. Ignition switch - BOTH. P, CP.

* 5. Prime - AS REQUIRED. P. CP.

CAUTION

If the engine does not start, continuous use of the engine starter should be limited to 60 sec. Allow 5 to 10 minute cooling periods between attempted starts, based on existing temperature and wind conditions.

6. Oil Pressure - WITHIN LIMITS. P, CP.

CAUTION

If oil pressure is not indicated within 30 seconds, stop the engine and determine the reason.

7. Mixture Control - AUTO-RICH. P, CP.
After engine RPM stabilizes at 1000 RPM with steady prime, move mixture control from IDLE CUT-OFF to AUTO-RICH. When a drop in RPM is noted, stop priming.

*8. Throttle – ADJUSTED. P, CP.

Operate the engine at 1100 to 1200 rpm until oil temperature and oil pressure are within limits.

CAUTION

Prolonged idling below 800 rpm may damage the spark plug elbow insulation, as the cylinder head temperature will rise quickly and may exceed limits.

*9. Fuel booster pump switch – OFF. P, CP

Turn the booster pump OFF after the engine is running smoothly.

*10. Fuel pressure – WITHIN LIMITS. P, CP

*11. Vacuum pressure – CHECK. P

*12. Hydraulic system pressure – CHECK. P

Check the right engine hydraulic pump by lowering the flaps. Observe a decrease in hydraulic pressure as the flaps are lowered. When the flaps reach the full down position, the hydraulic system pressure should increase to within limits.

*13. Gear safety pins - REMOVED. P.
Pilot will signal for ground crew to remove the safety pins.

*14. External power-DISCONNECTED. P.
The pilot will signal the ground crew to disconnect the power unit and will observe the unit is clear of the aircraft before proceeding.

*15. Battery Switch - ON. P.

Do not turn battery switch ON until ground power is disconnected.

*16. Start the left engine repeating steps 1 thru 10. - CP.

*17. Starting Engines Check-COMPLETED. CP.

BEFORE TAXIING.

*1. Safety Belt. P, CP.

*2. External Power - REMOVED. P.

*3. Battery Switch - ON. P.

4. Generators - ON. CP.

*5. Booster Pumps - OFF. CP.

*6. Hydraulic System Pressure - CHECKED. P.

*7. Inverters - CHECKED/SET check spare and leave Main On. CP.

*8. Radios - CHECKED/SET. CP.

9. Fuel Tank Selectors - CHECK. P, CP.
Check by operating the engines on OFF position momentarily and for three min. each on all other positions. Check crossfeed if installed, then OFF.

NOTE

This check will be initiated at this point and completed prior to initiating the ENGINE RUNUP check.

*10. Engine Instruments - CHECKED. P, CP.

11. Flight Instruments - CHECK/UNCAGED. P, CP.

12. Ignition Grounding - CHECKED. P.

*13. Gear Pins - STOWED. P.

*14. Chocks - REMOVED. P, CP.

*15. Doors & Hatches - SECURED. P, CP.

TURNING RADIUS DIAGRAM

OUTER MAIN GEAR . . . . . 18 FT 6 IN.
INNER WING TIP . . . . . 39 FT 8 IN.
HORIZONTAL STABILIZER. . . . 49 FT 4 IN.
OUTER WING TIP. . . . . 57 FT 6 IN.

VERTICAL CLEARANCES

PROPELLERS. . . . . 12 FT 4 IN.
WING TIP . . . . . 9 FT 4 IN.
FUSELAGE . . . . . 16 FT. 11 1/2 IN.

Figure 2-1

TAXIING.

* 1. Brakes & pressure - CHECKED - P, CP.

CAUTION

Do not turn the aircraft with the brakes fully applied to one wheel, since this may damage the tire.

NOTE

Roll the aircraft forward to relieve the tailwheel locking pin from possible side load before releasing the tailwheel.

* 2. Flight instruments - CHECKED - P, CP.

a. Magnetic compass - FREE.

b. Turn & slip indicator - NEEDLE INDICATING PROPER DIRECTION, BALL FREE.

c. Directional indicators - PROPER TURN INDICATION.

ENGINE RUNUP.

Head the aircraft into the wind as much as possible for runup. If the aircraft is not headed into the wind, the power and magneto check may be affected. Maintain aileron and rudder controls in neutral position and elevator control aft of neutral to prevent a possible nose over during runup.

* 1. Tail wheel - LOCK. P, CP.

* 2. Parking brakes - SET. P.

* 3. Manifold valve - BLEED. P.

4. Auto-pilot - BLEED. P.

* 5. Engine Instruments - WITHIN LIMITS. P, CP.

CAUTION

Cooling of the cylinder heads, barrels and ignition harness is insufficient for prolonged periods of ground operation above 1400 RPM. Do not allow cylinder head temperature to exceed 232°C. See Section V.

6. Fuel tank selectors - MAIN or FULLEST TANK, crossfeed - OFF. P, CP.

Main tank selection is preferred on Company aircraft.

7. Propellers - EXERCISED. P.

With engines operating at 1700 RPM, move propeller controls to DECREASE RPM, then to full INCREASE RPM (minimum governing speed is 1200 ± 25 RPM). Repeat this procedure three times during cold weather.

8. Generators - CHECKED. CP.
Check ammeters for parallel; check paralleling during RPM decrease and increase.

9. Propeller feathering check (1700 RPM) - CKD. P, CP.

Push right feathering button and allow for 200 RPM drop. then pull out feathering button (check ammeter for change during feathering). Check left propeller feathering using same procedure.

Propellers - EXERCISED. P.

To insure warm oil for propeller governing by replacing cold oil put in by feathering action.

10. Carburetor air and deicer alcohol - CHECKED & COLD. P, CP.

a. Carburetor air - HOT - Note increase on carburetor air temperature gage.

b. Carburetor deicer alcohol - ON.
Note decrease on carburetor air temperature; then OFF.

c. Return carburetor air to - RAM/COLD.

*11. Power and ignition check - CHECKED. P, CP.

This check will be performed on one engine at a time to prevent nose-up and brake slipping accidents. Retard one throttle to 1100 RPM. and advance opposite throttle to a manifold pressure equal to field barometric pressure. On aircraft equipped with paddle blade propellers. the tachometer should read as indicated in the Temperature VS RPM Table below. On aircraft equipped with narrow blade propeller. the tachometer should read 2350 ± 50 RPM. Turn the ignition switch from BOTH to LEFT then back to BOTH then from BOTH to RIGHT then back to BOTH pausing at each position to allow RPM to stabilize. Observe RPM drop (65 RPM maximum, 25

RPM normal). Retard throttle to ~~1100~~ 1000 RPM. and repeat check on other engine. If RPM drop exceeds ~~65~~ 165 RPM on either magneto of either engine. the difference in drop between magnetos on either engine exceeds 40 RPM. or excessive engine vibration exists. shutdown the engines and inspect for malfunction.

NOTE

At a CAT of 30°c. the RPM limits are 2425 ± 50 RPM. Each increase or decrease of 10°c CAT will result in a corresponding increase or decrease of 15 RPM.

Temp Vs RPM Table

CAT (°C)	Min. RPM	Max
60°	2420	2520
50°	2405	2505
40°	2390	2490
30°	2375	2475
20°	2360	2460
10°	2345	2445
0°	2330	2430
-10°	2315	2415
-20°	2300	2400
-30°	2285	2385
-40°	2270	2370

NOTE

When heading into the wind. add approximately two rpm for each one mph wind velocity; when training into the wind subtract approximately two rpm for each one mph wind velocity. Cross winds will cause buffeting and rpm surging.

CREW BRIEFING-TYPICAL.

Crew briefing - COMPLETE. The Captain will brief the First Officer. AFS and AFD on the following:

1. Type take-off
2. Power application and abort procedures.
3. Oral and visual. signals for gear retraction and power reductions.
4. Emergency procedures.
5. Departure instructions.
6. Advise reaching V_2 speed.

BEFORE TAKE-OFF.

* 1. Flaps - UP - CP.

* 2. Engine & Flight Instruments - CKD. - P, CP.

* 3. Mixtures - AUTO-RICH - CP.

* 4. Props - FORWARD - P.

* 5. Trim - SET - P.

* 6. Radios - SET - P, CP.

* 7. Crew briefing - COMPLETED - P.

* 8. Fuel booster pumps - ON - CP.

* 9. Anti-collision light - ON - CP.

*10. Flight controls - FREE & FULL TRAVEL - P.

*11. Tail wheel - LOCKED - P.

WARNING

Extreme directional control difficulties and possible loss of aircraft control may be experienced during take-off if the tail-wheel is unlocked

RT. FRONT RUGS
LEFT REAR "

HIGH TENSION
LOW ALT.

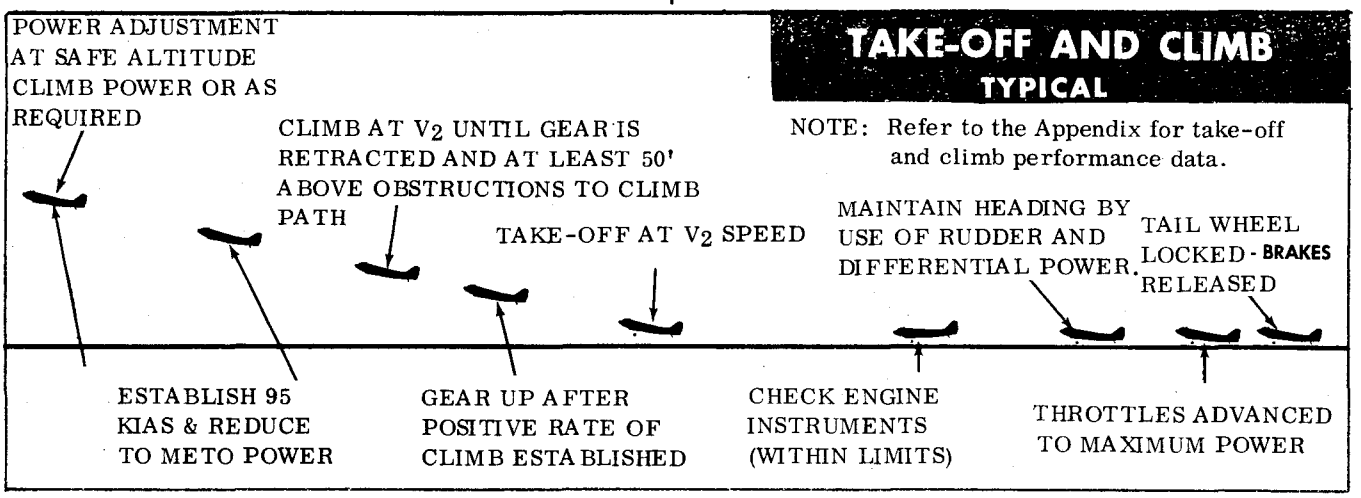


Figure 2-2

TAKE-OFF

Release the brakes and advance throttles to maximum power. As the brakes are released a slight change in heading may occur; correct by use of differential power and rudder application. It is not recommended to use brakes to maintain directional control unless it is absolutely necessary. Allow the aircraft to accelerate without operating the elevator control, and the tail will rise to level flight attitude between 43 and 52 knots. Continue accelerating and initiate elevator back pressure to fly off at V_2. During takeoffs at light gross weights, it will not be practicable to hold the aircraft on the ground until V_2; however, lift off must not occur prior to Vmc. After the gear is retracted and the initial climb is established, command METO power.

The First Officer will follow up on the throttles during takeoff, and make minor adjustments of the throttles to maintain MAP within limits. He will also adjust the friction lock as briefed by the Captain, and, when commanded to do so, make all power adjustments. He will advise the Captain when reaching V_2 speed.

AFTER TAKE-OFF

1. Landing Gear - RETRACT - CP.
   a. Gear Latch Lever - LATCH RAISED
   b. Gear Lever - UP
2. METO Power - MAP 42.5, - RPM 2550 - CP.
3. Temperatures & Pressures - CHECKED - P, CP.
4. Landing Gear Lever - NEUTRAL, after gear is fully retracted.

NOTE

The landing gear latch lever will automatically return to SPRING LOCK position.

5. Climb Power - SET - CP.

NOTE

Climb power (850 BHP) is recommended during climb to prevent high CHT; however, lower powers may be used when necessary. Refer to appendix for climb performance.

If CHT cannot be maintained within limits during climb, increase airspeed or adjust power as necessary.

6. Engines, wings and fuel syphoning - CHECKED - P, CP.

NOTE

When remaining in a closed traffic pattern, the landing crew briefing should be accomplished prior to takeoff and only the first 5 items of the After Takeoff Climb check should be performed. In this event the Cruise & Descent check need not be performed.

7. No smoking/seat belt signs - AS REQUIRED - P.
8. Fuel Booster Pumps - OFF
   Check fuel pressures and turn booster pumps OFF one at a time after reaching a safe altitude.

FLIGHT OPERATIONS CIRCULAR

REF. NO OP-C-69-013

DATE: 24 April 1969

THIS CIRCULAR IS TO BE INSERTED IN AAM C-47 MANUAL, SECTION 2 IN FRONT OF PAGE 11

SUBJECT: MINIMUM RUN TAKEOFF (C-47)

For minimum run takeoffs, position wing flaps to 1/4, hold brakes and apply power to 35" MAP. Holding back pressure on the control column, release brakes and apply maximum power. Release back pressure on the control column keeping the aircraft in a tail low attitude and the aircraft will become airborne at 52 to 61 knots. When aircraft is safely airborne and clear of obstacles, establish normal climb.

This CIRCULAR is self deleting upon receipt of Manual Revision.

Distribution: All C-47 Manual Holders

MINIMUM RUN TAKEOFF

For minimum run takeoffs hold brakes and apply power to 35" MAP. Holding back pressure on the control column, release brakes and apply maximum power. Release back pressure on the control column and at approximately 39 knots lower ¼ flaps. Keep the aircraft in a tail low attitude and the aircraft will become airborne at 52 to 61 knots. When the aircraft is safely airborne, raise the landing gear and establish a normal climb.

WARNING

Lift-off can be made at speeds less than Vmc. It must be remembered that in the event of engine failure power will have to be reduced on the operative engine to maintain directional control.

CROSS-WIND TAKEOFF.

In addition to the procedures and techniques used in a normal takeoff, lead with the upwind throttle sufficiently to correct for weather cocking tendencies. The application of aileron into the wind is effective in maintaining directional control.

CAUTION

Do not allow the aircraft to skip along the ground. Make a clean break with the runway. otherwise. severe side loads may collapse or damage the landing gear.

NOTE

It is recommended that brake application, to maintain directional control. be used only when absolutely necessary.

CRUISE.

Level off upon reaching cruising altitude and maintain the climb power setting until the desired cruising airspeed is attained. Refer to the Appendix and set power to obtain the cruise conditions desired. For Supercharger Operation, Refer to Section VII.

1. Cruise power - SET - CP.
   Normal cruise power is 600 BHP. Set according to Chart in Part Two of Appendix.
2. Engine instruments - WITHIN LIMITS. - CP.
3. Mixture controls - AS REQUIRED - CP.

   Cruise Check - COMPLETED - CP.

FLIGHT CHARACTERISTICS.

Refer to Section VI for detailed information on aircraft flight characteristics.

DESCENT.

The rate of descent is determined by altitude. distance from the field, terrain, and weight of the aircraft. The rate of descent should be held constant. During descent from enroute flight the First Officer or pilot not flying the airplane will call out:

a. Approaching 10,000 feet.
b. Approaching 5.000 feet.
c. 1,000 ft above initial approach altitude, or 1,000 feet above field elevation (VFR approaches.)

CAUTION

If flying conditions in descent require a large reduction in power, reduce rpm as well as manifold pressure. For descents or other low power maneuvers, or perhaps a simulated engine failure, it is important to cushion the high inertia loads on the master rod bearings which occur at conditions of high rpm and low manifold pressure. As a rule of thumb, it is well to remember that each 100 rpm requires at least 1 inch Hg manifold pressure; for example, 23 inches Hg at 2300 rpm. Operation at high rpm and low manifold pressure should be kept to a minimum.

1. Approach & landing data - CHECKED - P, CP. Check landing gross weights, approach minimums, field elevation, runway length & condition. and wind conditions.

NOTE

On final approach after reaching 500 feet above field elevation the First Officer or pilot not flying will call out:

a. Altitude (repeated when altitude deviates from programmed altitude)
b. Airspeed (repeated when airspeed deviates from programmed airspeed)
c. Rate of descent (repeated when it deviates from programmed rate)
d. 100 feet above minimums
e. Minimums
f. Runway in sight.

2. Altimeters - SET - P, CP set altimeter setting when passing through transition altitude if used.

3. Fuel tank selectors - SET - P, CP. place on FULLEST tank but Company policy perfers MAIN tanks.

4. Autopilot/Emergency shutoff valve - OFF - P.

5. Hydraulic fluid level - CHECKED - P.

6. Mixtures - AS REQUIRED - CP.

7. Magnetos - CHECKED - P.

NOTE

Company policy requires that a magneto check be performed during the descent. This will be accomplished at cruise power with the mixtures AUTO-RICH. During this check if it is determined that a magneto is malfunctioning, a landing will not be made at an airfield where company maintenance is not usually performed, unless in the Captains opinion a greater emergency would exist by complying with this policy.

BEFORE LANDING.

1. No smoking/seat belt signs - ON - CP.

2. Carburetor air - COLD - CP.

3. Fuel booster pumps - ON - CP.

4. Mixtures - AUTO-RICH - CP.

5. Landing gear - DOWN/POSITIVE LOCK - CP.

When the landing gear has reached the extended position and gear hydraulic pressure has built up to equal system pressure, move the landing gear lever rapidly to NEUTRAL, check the green indicator light ON, and the red warning light OFF. Position the landing gear latch lever to POSITIVE LOCK and visually check that the gear is down.

6. Propellers - RPM 2350 - CP.

7. Brakes/System pressures - CHECKED - CP.

8. Landing Gear Lights - GREEN - CP.

9. Flaps - AS REQUIRED - CP.

NOTE

As soon as main gear is on the ground First Officer should advance props to full FORWARD.

LANDING.

Normal Landing. (See figure 2-3.)

Touch down main wheels first in a slight tail low attitude. When the main wheels contact runway, check power off, relax pressure, flaps up. As the aircraft decelerates, lower the tail wheel gently on the runway. Maintain directional control utilizing rudder, differential power, and brakes, as necessary. Maintain back pressure on column until landing roll is completed. When landing at gross weights above 26,000 pounds, touch down at less than 300 fpm rate of descent in a tail-high attitude.

CAUTION

- Landing gross weight should be limited on the basis of single-engine performance in the same manner that weight is limited for takeoff. At high temperature or elevations, adequate single-engine performance is assured only if the airplane is operated in accordance with performance charts in the Appendix.

- Use extreme care when applying brakes immediately after touchdown, or at any time when there is considerable lift on the wings, to prevent skidding the tires and causing flat spots. Heavy brake pressure can result in locking the wheel more easily immediately after touchdown, than when the same pressure is applied after the full weight of the aircraft is on the wheels. A wheel, once locked in this manner immediately after touchdown, will not become unlocked as the load is increased, as long as brake pressure is maintained. Proper braking action cannot be expected until the tires are carrying heavy loads.

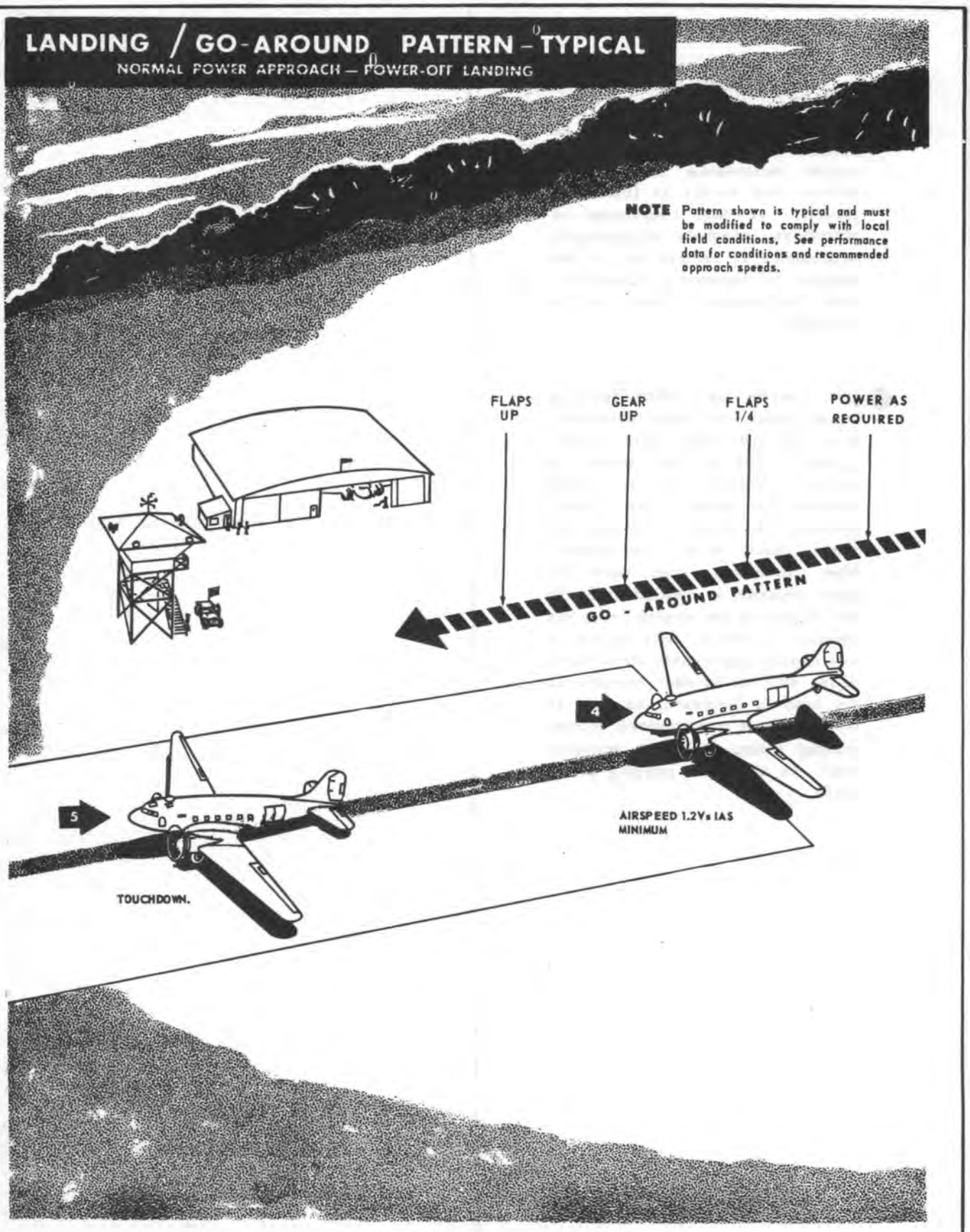


Figure 2-3 (Sheet 1 of 2)

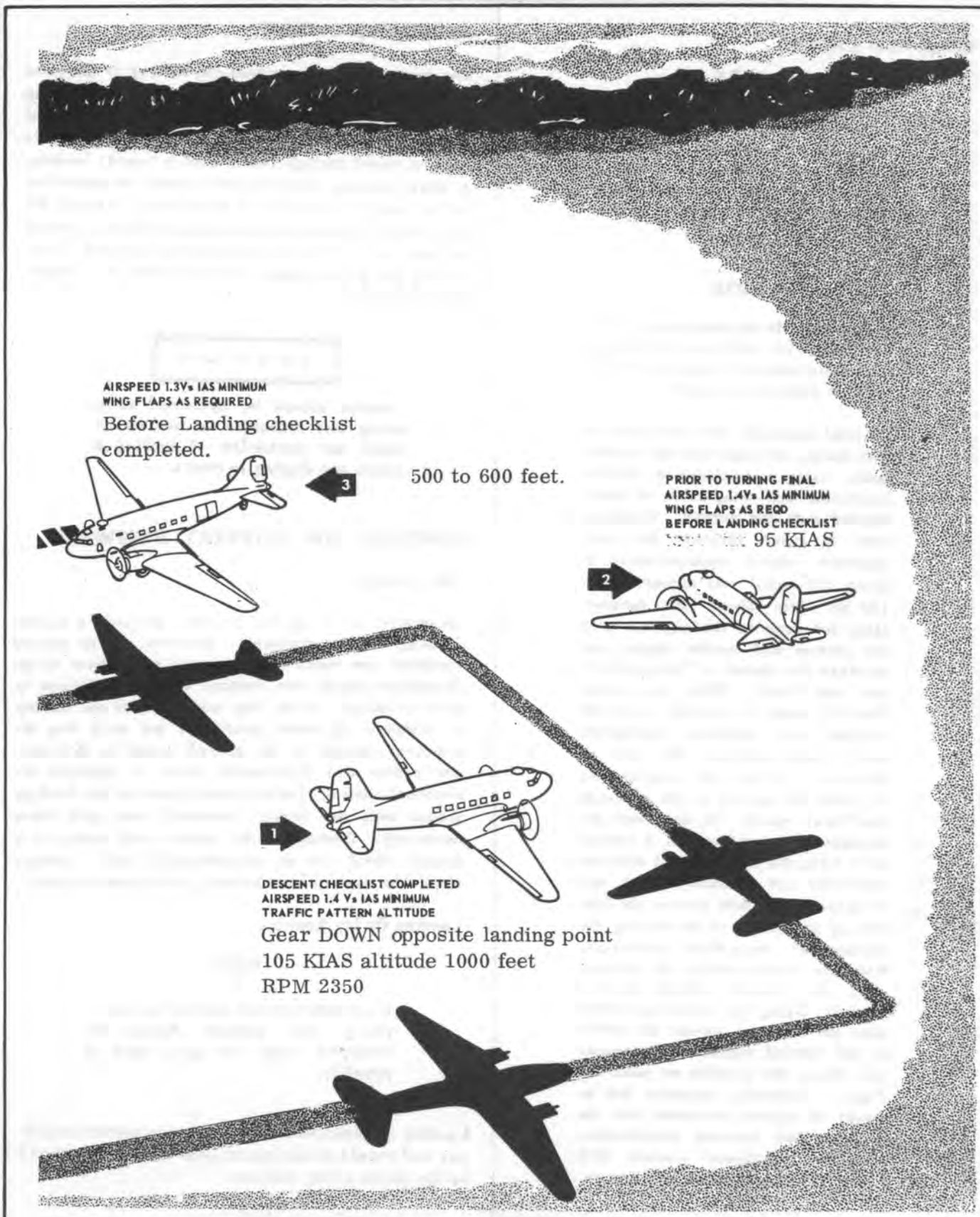


Figure 2-3 (Sheet 2 of 2)

CROSS-WIND LANDING.

NOTE

Landing distance over a 50-foot height and landing ground roll will be increased during crosswind landings. Refer to the Takeoff and Landing Crosswind Chart in the Appendix, and determine the minimum touchdown speed.

NOTE

Maximum tailwind component will be determined by reference to Landing Ground Run charts in Appendix VI for specific airport concerned.

On final approach, use half flaps or less during the approach and touchdown, using a combination of drift correction and wing-down to keep aligned with the runway. When the wind is gusty, increase the final approach speed approximately 8 knots (10 mph). At approximately 100-200 feet above the runway, align the nose of the airplane with the runway with rudder control and increase the amount of "wing-down" into the wind. When the normal flare-out point is reached, slow the airplane to minimum touchdown speed and decrease the rate of descent. Allow the airplane to fly onto the runway at the minimum touchdown speed. Do not allow the airplane to touchdown in a lateral drift; keep the nose aligned with the runway by use of rudder control, and compensate for drift across the runway by increasing or decreasing the amount of wing-down correction. When the wheels contact the runway, ease the control column forward slightly, flying the downwind wheel onto the runway. Adjust the power of the upwind engine as necessary and direct the co-pilot to raise the flaps. Gradually increase the amount of aileron pressure into the wind as the airplane decelerates. Maintain directional control with rudder, differential power and brakes.

THE ONLY CORRECT X-WIND PROCEDURE.

MINIMUM RUN LANDING.

The procedure for a minimum run landing is the same as for a normal power-on approach - power-off landing, except for the following differences: Under most minimum run landing conditions, it is preferable to make a wheel landing rather than a 3-point landing. A wheel landing allows better control for immediate use of brakes to come to a quick stop. Retract the wing flaps immediately upon contact with the ground at least to $\frac{1}{4}$. This will prevent the aircraft from leaving the ground again and thus make the brakes more effective.

CAUTION

Caution should be exercised when using this technique on sod fields since the possibility of locking a wheel and digging in exists.

LANDING ON SLIPPERY RUNWAY.

Wet Landing.

Generally, if a runway is well drained, a normal landing can be executed. However, if the runway contains low spots or is covered with water of undetermined depth, use reduced wing flap settings to prevent damage to the flap surfaces. If the runway is slippery, or water conditions are such that directional control of the aircraft might be difficult, use rudder and differential power to maintain directional control. During initial phase of the landing ground roll, use brakes cautiously and only when necessary. Overuse of the brakes could result in a locked wheel and an uncontrollable skid. Brakes should be applied intermittently with equal pressure.

Landing On Icy Runway.

NOTE

If operation on icy runway is anticipated, the aircraft should be equipped with ice grip tires if possible.

Landing on ice-covered runway is considered hazardous and should be attempted only when necessitated by the nature of the mission.

AFTER LANDING.

1. Flaps - UP, then NEUTRAL after checking indicator - CP.
2. Props - FORWARD - CP.
3. Hydraulic pressure - CHECKED - CP.
4. Inverters - OFF - CP.
5. Fuel booster pumps - OFF - CP.
6. Pitot heat - OFF - CP.
7. Anti-collision light after clear of runway - OFF - CP
8. Radios - (Not in use) - OFF - CP.
9. Trim tabs - NEUTRAL - CP.
10. Heaters - OFF - CP.
11. Oil coolers - COLD - CP.

NOTE

The after landing check will only be accomplished after turning off the runway except for Props and Flaps.

TOUCH AND GO LANDINGS.

CAUTION

Touch-and-go landings introduce a significant element of risk because of the many rapid actions which must be executed while rolling on the runway at high speed. Furthermore, because of the varied technique that may be used, it is impossible to predict with accuracy the length of runway that will be required. Touch-and-go landings should be made only when authorized or directed by the major command concerned. Before starting the final approach, brief the co-pilot to assure that he knows his duties. Use the approach and landing procedure for the type landing desired. After established on final and prior to touchdown, props full increase RPM.

When the airplane is on the runway, the co-pilot accomplishes the following:

1. Props - FULL FORWARD - CP.
2. Wing Flaps - UP - CP.
3. Elevator trim - ZERO - CP.

The co-pilot advises the pilot when these actions are completed. The pilot then advances power and continues with a normal takeoff.

4. Touch and Go Landing Check - COMPLETED. CP

CAUTION

If power is applied rapidly at a high airspeed, propellers may overspeed. To avoid exceeding limits, advance throttles slowly until the governors "stabilize", then advance power normally.

For AFTER TAKEOFF – CLIMB and BEFORE LANDING (after touch and go), normal procedures apply.

TWO-ENGINE GO-AROUND.

If the pilot considers it necessary to make a go-around, he will accomplish the following:

a. **Give the command, "Go around", to the co-pilot.**
b. Apply power as required.
c. At the pilot's direction the co-pilot will position the flaps at ¼, provided more than ¼ flaps were extended at time of decision to go around.
d. As soon as the pilot determines that the aircraft will not be touched down, or after breaking ground if contact is made, he will direct the co-pilot to retract the landing gear.
e. After the aircraft has reached safe speed, the pilot will direct the co-pilot to retract the remaining ¼ flaps.
f. Accelerate to best climb speed (See Appendix, Part IV).
g. Proceed with normal takeoff.

POST FLIGHT ENGINE CHECK.

Following the final flight of the day and before engine shutdown, perform the following checks for the purpose of determining and reporting any malfunctioning system or units. These checks should be made with the aircraft headed into the wind.

1. Tail wheel – LOCKED. CP, P
2. Parking brake – SET. P
3. Idle speed and mixture check – CHECK. P
   a. Propeller control – FULL INCREASE.
   b. Cylinder head temperature – WITHIN LIMITS.
   c. Oil temperature – WITHIN LIMITS.
   d. Mixture control – AUTO-RICH.
   e. Throttle – IDLE RPM (500 rpm± 50).
   f. Move mixture control slowly and evenly toward IDLE CUT-OFF.

NOTE

"Slowly" may be defined as the rate of movement which would require 12 to 15 seconds to move the mixture control lever from AUTO-RICH to IDLE CUT-OFF position. This slow movement of the lever is necessary so that the engine can respond to the change in fuel-air ratio and an accurate reading can be obtained as the best power mixture is reached.

   g. If a rise of more than 10 rpm or a drop in manifold pressure exceeding ¼ inch Hg is noted, the IDLE rpm fuel-air ratio is too rich. If no rise in rpm is noted, the IDLE rpm fuel-air ratio is too lean. After maximum rpm rise has been obtained and rpm starts to decrease with further movement of the mixture control, return the mixture control to AUTO-RICH position.

NOTE

The IDLE rpm fuel-air ratio must check according to the above procedure to prevent spark plug fouling.

4. Ignition grounding check – CHECK. P

Perform ignition grounding check as shown under Before Taxiing.

5. Bleed manifold pressure – STATION PRESSURE NOTED. P
6. Power and ignition check – CHECK. P

Perform Power and Ignition Check as outlined under Engine Runup.

CAUTION

Heat damage to ignition system components and oil seals may result if engines are shut down when CHT is above 200°C. If necessary run engine at 1200 rpm to lower CHT.

7. Post Flight Engine Check - COMPLETED. CP

PARKING

1. Tailwheel - LOCKED. P.
2. Parking brakes - SET. P.
3. Throttles - RPM 1200. P.
   After post flight engine check is completed if required.
4. Mixtures - Right engine first - IDLE CUT - OFF. CP.
   (Do not advance throttle.)
   a. Check vacuum pressure on left engine.
   b. Check left engine hydraulic pump by lowering and raising flaps.
   c. Left engine mixture - IDLE CUT-OFF. CP.
5. Ignition switches - OFF. P when props have stopped.
6. Radios - OFF. CP.
7. Fuel tank selectors - OFF. P, CP.
8. Wheel chocks - INSTALLED. P, CP.
9. Brakes - OFF. P.
10. All switches (Except generators) - OFF, P, CP.
11. Gear & Flap levers - SPLIT. CP.

12. Log book & papers - COMPLETED. P, CP.

13. Windows, hatches & doors - SECURED. P, CP.

14. Gear pins, control locks & pitot covers - INSTALLED. P, CP.

CAUTION

In addition to the established requirements for reporting any system defects. unusual and excessive operations. the flight crew will also make entries to indicate when any limits in the Flight Manual have been exceeded.

SECTION III

EMERGENCY PROCEDURES

TABLE OF CONTENTS

INTRODUCTION.

This section describes procedures for meeting emergencies that can reasonably be expected to occur. No attempt has been made to cover every conceivable malfunction or emergencies that are complicated by failure of other systems. A sound knowledge of these procedures and the basic airplane systems will, however, provide the necessary background to properly evaluate and cope with multiple emergencies and those situations not covered herein.

In any emergency situation, contact should be established with an appropriate ground and the Company station as soon as possible after completing the initial corrective action. Include position, altitude, course ground speed, and the nature of the emergency and pilot's intentions in the first transmission and thereafter keep the ground station informed of the progress of the flight and of any changes or developments in the emergency.

The pilot should make full use of the co-pilot and other crew members in combating an emergency so that his primary attention may be directed to the control of the airplane. Although certain items require immediate action, the difficulty may be compounded by hurried commands to the crew. Analyze the situation carefully before taking any corrective action and give the proper commands clearly and concisely, allowing time for acknowledgement and execution before issuing further instructions. Certain actions are of such urgency that they must be performed immediately, from memory, to prevent further damage and avoid aggrevating the emergency. These "Immediate Action" items are printed in bold face capital letters. The remaining steps are considered to be less urgent and must be accomplished by direct reference to the checklist.

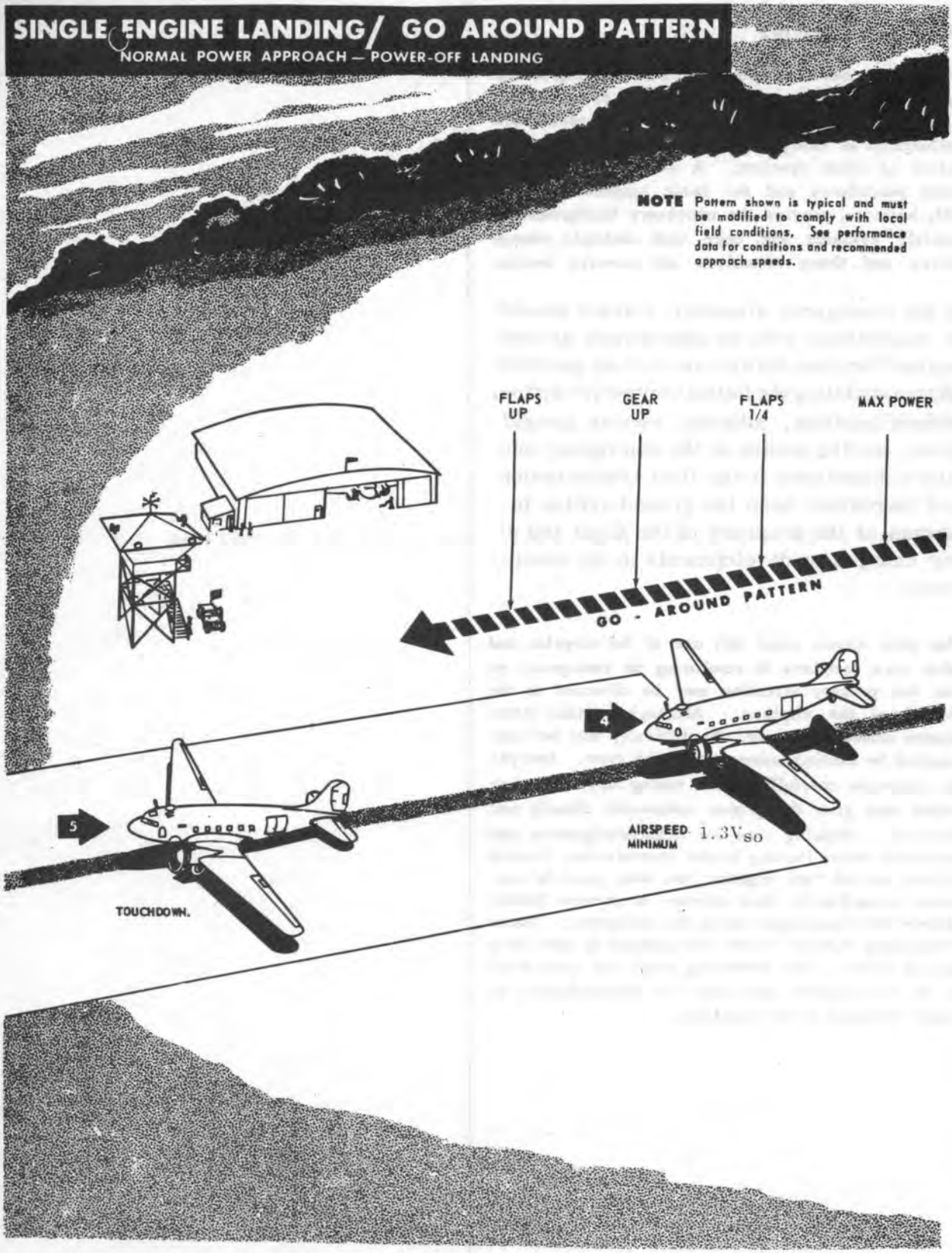


Figure 3-1. (Sheet 1 of 2).

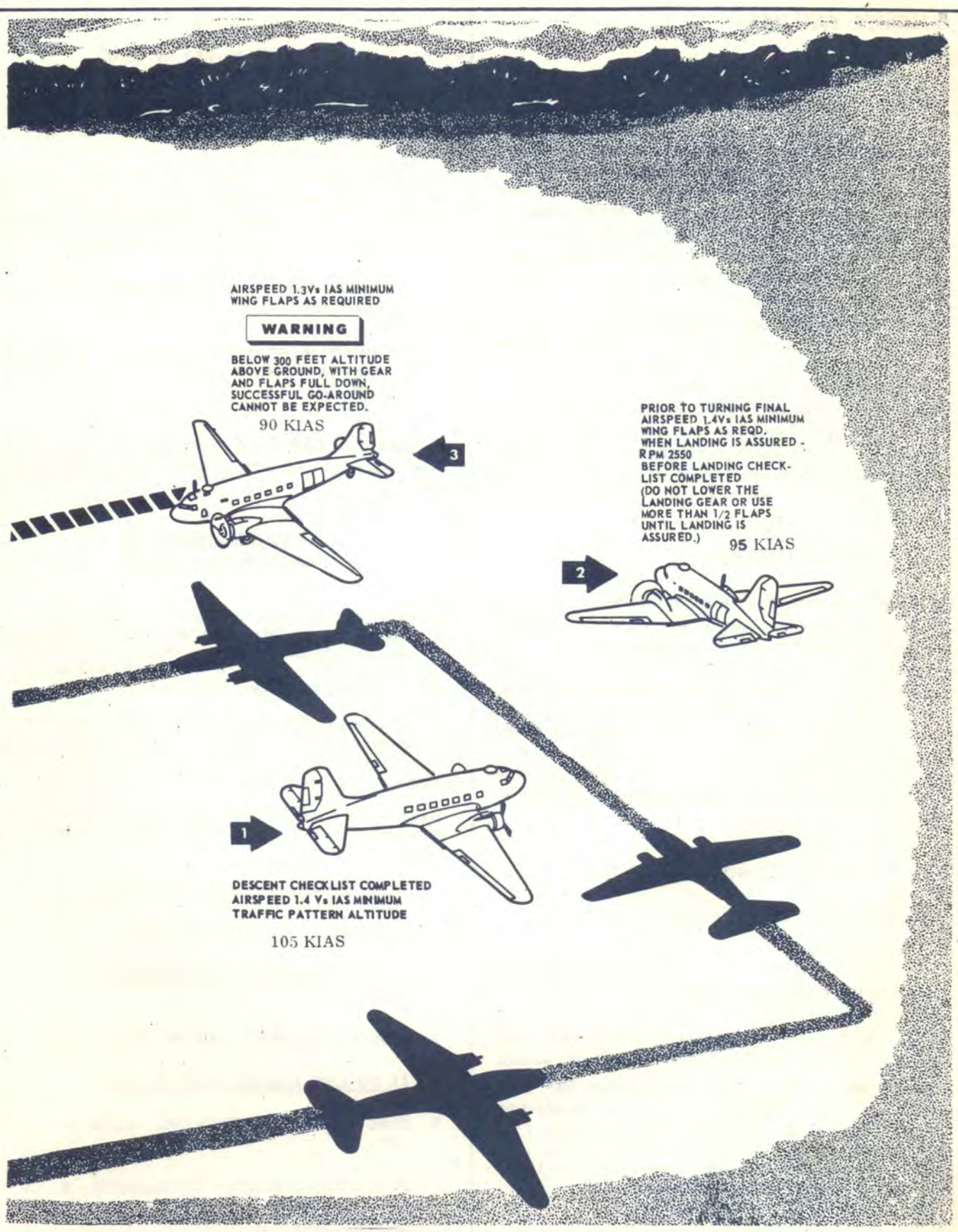


Figure 3-1. (Sheet 2 of 2).

ENGINE FAILURE.

FLIGHT CHARACTERISTICS UNDER PARTIAL POWER CONDITIONS.

With the proper understanding of single-engine procedures and single engine flight principles, the aircraft can be flown and landed safely with one engine inoperative. Single engine performance is reduced during operation at high altitude, high temperature, and high humidity. The maximum gross weight that will permit safe operation will vary widely. You must therefore, consider the effect of non-standard atmospheric conditions upon the performance of the airplane prior to flight and adjust the gross weight to provide adequate single-engine performance, not only for takeoff, but also for en-route terrain clearance and landing. The propeller of the inoperative engine must be feathered for the airplane to obtain the results shown in the single-engine performance charts. If the propeller is not feathered, the best that can be expected is a controlled descent.

MINIMUM CONTROL SPEED.

Minimum control speed (MCS) is that speed required to provide sufficient control to enable the airplane to fly a straight flight path over the ground when one engine has failed. This MCS is based on takeoff configuration, propeller on dead engine windmilling, with maximum power on the good engine and no more than 5 degrees of bank angle away from the failed engine. It may be necessary to sacrifice altitude for airspeed while putting the aircraft in a clean configuration and obtaining sufficient airspeed to climb.

NOTE

MINIMUM CONTROL SPEED in flight is 76 knots IAS.

SAFE SINGLE ENGINE SPEED.

Safe single engine speed (SSE) is that speed that will permit the airplane to maintain 100'/minute rate of climb after clean configuration has been established and the propeller on the inoperative engine is feathered. This speed is based on Sea Level Standard Atmosphere. Operation on hot days and at higher altitudes will result in a deterioration of aircraft performance. Refer to the appendix for single engine performance.

NOTE

SAFE SINGLE-ENGINE SPEED is 84 KIAS.

ENGINE FAILURE INDICATION.

The first indication of engine failure will probably be the change in directional trim. The aircraft has a tendency to yaw towards the failed engine. Engine failure may also be detected by the following:

A. A drop in manifold pressure, rpm, and cylinder head temperature.

B. Observing the affected engine for roughness, spewing of oil, or evidence of fire or smoke (see figure 3-4).

ENGINE FAILURE/FIRE IN FLIGHT.

(See Figure 3-4 for engine smoke and flame identification.)

WARNING

In the event of engine fire, the first action shall be to actuate the feathering switch. This is mandatory because the greatest degree of effectiveness from the fire extinguishing agent will only be attained after the propeller has been feathered.

In the event fuel pressure drops and the engine continues to operate normally, the first action shall be to move the mixture control to IDLE CUTOFF. (Omit Item 1, and accomplish Item 2 prior to Item 1.

Maintain controlled flight, reduce drag, set power as required on good engine, then perform the following steps:

1. FEATHER PROPELLER - BUTTON IN - P.
2. MIXTURE - IDLE CUT-OFF - CP.
3. CHECK PROPELLER FEATHERED - BUTTON OUT - CP.
4. CHECK FOR FIRE - FIRE/NO FIRE - P, CP.

   IF NO FIRE EXISTS: OMIT #5 & 6.

5. FIREWALL SHUTOFF VALVE - CLOSED - P, CP.
6. FIRE EXTINGUISHER - DISCHARGED - P, CP.
7. Ignition - OFF - P.

8. Carburetor Alcohol - OFF - CP.
9. Propeller Alcohol - OFF - CP.
10. Fuel Booster Pump - OFF - CP.
11. Fuel Tank Selector - OFF - CP.
12. Propeller Control - AFT - CP.
13. Generator Switch - OFF - CP.
14. Flap & Gear Controls - NEUTRAL - CP.

NOTE

For SC-47 only, position fuel tank fuel crossfeed and fuel dump controls to dump excess fuel immediately after completing item #8.

CAUTION

In the event of engine fire, spill valves on the failed engine side must be placed to SPILL and the mixing chamber valve to HOT.

ENGINE RESTART DURING FLIGHT.

1. Airspeed - 117 KIAS or below - P.
2. Firewall Shutoff Valve - OPEN - P. CP.
3. Starter Switch - ENGAGE TO CHECK FOR LIQUID LOCK - CP.

NOTE

Crank propeller through 8 blades for a shutdown of up to two hours. Crank through 15 blades if engine has been shutdown over two hours.

4. Fuel Tank Selector - AS REQUIRED - (to supply fuel to the engine being started) - CP.
5. Carburetor Air - COLD - CP.
6. Throttle - CLOSED - CP.
7. Propeller Control - AFT - CP.
8. Ignition Switch - BOTH - CP.
9. Fuel Booster Pump - ON - CP.
10. Feathering Button - PUSH IN (until 800 to 1000 RPM) - CP.

NOTE

If the feathering button is held in, overspeeding could occur. When engine speed reaches 800 to 1000 RPM, release the feathering button and allow governor to take over.

11. Propeller Governing - RPM 1200 - CP.
12. Mixture - AUTO-RICH - CP.
13. Warm Engine - RPM 1500 MAP 15" (to insure complete oil circulation), then increase power to desired settings - CP.
14. Generator Switch - ON - CP.
15. Fuel Booster Pump - OFF - CP.

MAXIMUM GLIDE.

The minimum glide angle for the aircraft, power off and both propellers feathered, is computed to be 3.88 degrees and will result in the maximum glide range. This angle may be obtained, regardless of the gross weight of the aircraft, by maintaining the airspeeds for the given gross weights listed on the Maximum Glide chart (figure 3-2). The chart lists the glide ranges resulting from the various altitudes when these glide speeds are maintained. The rate of sink at 20,000 pounds gross weight is approximately 680 feet per minute (11.3 feet per second) at 5000 feet; at a gross weight of 29,000 pounds, the rate of sink is approximately 815 feet per minute (13.5 feet per second) at 5000 feet.

MAXIMUM GLIDE

Conditions:
1. Power Off
2. Both Propellers Feathered
3. Gear and Flaps Up
4. No Wind

GROSS WEIGHT (POUNDS)	INDICATED GLIDE-SPEED IN MPH	[illegible]
20,000	106	92
23,000	114	99
26,000	120	104
29,000	127	110

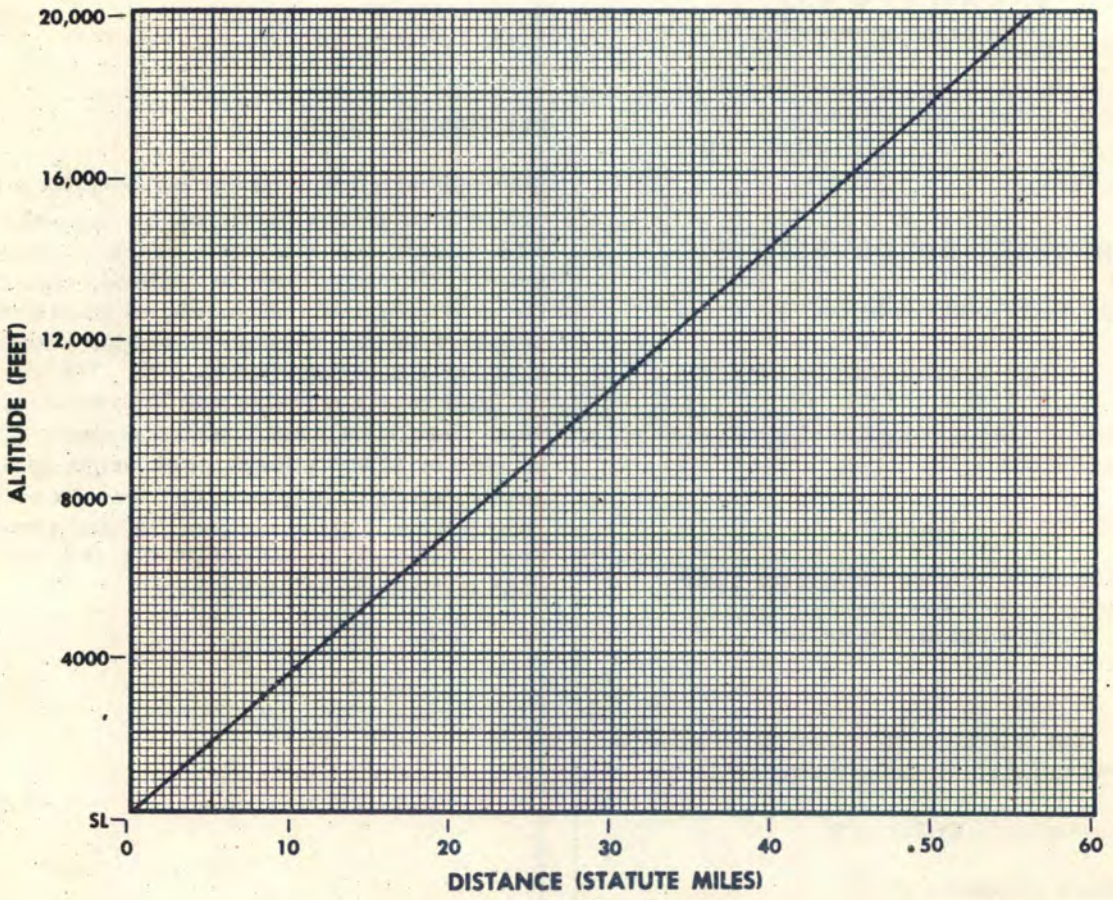


Figure 3-2.

SINGLE-ENGINE LANDING.

Single-engine landings are made in the same way as normal power-off landings except for the following (see Figure 3-1):

1. Landing gear – DOWN (when landing is assured).
2. Wing flaps – as required.
   Do not use more than one-half flaps until landing is assured.

WARNING

Never allow the airspeed to drop below minimum control speed before a power-off landing is assured and all possibilities of a go-around have been eliminated; however, due to the decreased drag of the feathered propeller, caution should be exercised to prevent overshooting.

SINGLE-ENGINE GO-AROUND.

WARNING

Below 300 feet altitude above the ground with gear and flaps full down, a successful go-around cannot be expected.

If it becomes necessary to make a single-engine go-around, refer to figure 3-1 and use the following procedure.

1. **COMMAND "GO-AROUND".**

   The pilot gives the command "Go-Around" to the co-pilot.

2. **APPLY MAXIMUM POWER.**

3. **WING FLAPS – RETRACT TO 1/4.**

   At the pilot's direction, the co-pilot will position the flaps at 1/4, provided that 1/4 or more flaps were extended at time of decision to Go-Around.

4. **LANDING GEAR – UP. CP**

   As soon as the pilot determines that the aircraft will not be touched down, he will direct the co-pilot to retract the landing gear.

5. **WING FLAPS – UP. CP**

   After the aircraft has reached safe single engine climb speed, the pilot will direct the co-pilot to retract the remaining 1/4 flaps.

NOTE

Single engine climb speed 84 KIAS should be attained without gaining altitude and, if necessary and feasible, sacrifice a little altitude. Attain the single engine climb speed as safely and quickly as possible.

6. Power – As required. Reduce power, if practicable, and continue climb-out. P

CAUTION

CHT should not exceed limits during any phase of single engine operation. If necessary, to maintain CHT within limits, increase airspeed by reducing the rate of climb or, if feasible, sacrifice a little altitude.

SINGLE-ENGINE PRACTICE MANEUVERS.

To become thoroughly familiar with the single-engine characteristics of the aircraft, practice the procedures and maneuvers listed in the following paragraphs.

NOTE

All practice single engine maneuvers will be accomplished only by simulating engine out condition.

CAUTION

When maneuvering with low power or during descents with low power, it is important to cushion the high inertia loads on the master rod bearings which occur at high rpm and low manifold pressure. As a rule of thumb, each 100 rpm requires at least 1 inch Hg manifold pressure. Use high rpm and low manifold pressure only when necessary.

FAILURE OF ONE ENGINE ON TAKE-OFF — BEFORE MINIMUM CONTROL SPEED.

Simulate take-off conditions at altitude, using METO power, gear down, at 61 to 65 knots IAS. Reduce power on one engine and note that to maintain directional control it is necessary to reduce power on the good engine, with a consequent loss of altitude that would require discontinuing take-off.

FAILURE OF ONE ENGINE ON TAKE-OFF AT MINIMUM CONTROL SPEED AND MINIMUM RECOMMENDED SINGLE-ENGINE SPEEDS.

Simulate take-off at altitude using METO power. Practice this maneuver using the two different configurations: minimum control speed (76 knots) - gear down; and minimum recommended single - engine speed (84 knots) - gear down. With power reduced on one engine, apply METO power on the other engine, gear up (flaps up when practicing single-engine go-around). Simulate engine feathering by applying 1500 rpm and 15 inches Hg on the bad engine, and go through the motions of completing the steps listed under Engine Failure During Take-Off, but do not actually complete the action. Practice in these maneuvers and procedures will demonstrate the capabilities of both the aircraft and the pilot, and will be helpful in making a decision when engine failure is encountered during actual conditions.

Single-engine turns can be made safely in either direction if safe single-engine airspeed is maintained.

a. Roll into the turn smoothly and slowly.

b. Maintain a constant airspeed throughout the turn. The importance of maintaining a constant airspeed cannot be over-emphasized, as it is the key to safe single-engine turns. With a constant airspeed, the thrust of the one engine is balanced by the trimmed rudder and aileron.

c. Practice turns in both directions at shallow and medium angles of bank.

EFFECT OF PROPELLER PITCH ON TRIM.

If it is impossible to feather the propeller, much of the drag can be removed by moving the dead engine propeller rpm control to full DECREASE RPM. To determine the effect on trim from an unfeathered propeller, retard one throttle and propeller rpm control to full decrease position, good engine at 2550 rpm and 41 inches Hg, and trim the aircraft. Advance the dead engine propeller rpm control to 2550 rpm. As the propeller changes toward low pitch, the additional drag causes the aircraft to turn toward the dead engine, necessitating a change in trim.

EFFECT OF AIRSPEED ON TRIM.

The importance of airspeed in single-engine flight may be demonstrated as follows: Simulate single-engine flight and trim the aircraft at a constant airspeed and power setting. With feet on the floor, ease back on the control column. As the airspeed decreases, the trim becomes less effective because of decreased air flow over the control surfaces, and the aircraft will turn toward the dead engine. Push the control column forward until the original airspeed is exceeded and, as the trim becomes more effective with the increased air flow over the control surfaces, the aircraft will turn toward the good engine.

EFFECT OF POWER REDUCTION ON TRIM.

Practice directional control on single-engine by using the throttle only. Simulate single-engine flight and trim the aircraft. Place feet on floor and pull control column back slowly. As speed decreases, gradually reduce power on the good engine to prevent the aircraft from turning into the dead engine. It is possible to maintain directional control in this manner up to the point of stall. This demonstrates the importance of reducing power to maintain directional control in case of engine failure during take-off or slow flying when the airspeed is below safe single-engine airspeed.

SINGLE-ENGINE STALLS.

The aircraft can be stalled with one engine operating, provided the principle of reducing power to maintain directional control is observed.

CAUTION

This aircraft has stall characteristics which allow the outer wing tip to stall before the center wing, and, if the tips stall unsymmetrically, it will cause the aircraft to roll violently. Minimum altitude for practicing approach to stalls is 5000 feet above terrain.

SIMULATED SINGLE-ENGINE LANDING.

Practice single-engine landings at a safe altitude, applying the principles discussed in the previous paragraphs.

SIMULATED SINGLE-ENGINE GO-AROUND.

Practice simulated single-engine approaches and go-arounds at a safe altitude.

a. Set up landing approach.

b. At 500 feet above simulated field elevation, start go-around by applying maximum power to the good engine.

c. Wing flaps – Retract to 1/4.

d. Landing gear – UP.

e. Accelerate to safe single engine speed. Never allow airspeed to drop below minimum control speed.

f. Wing flaps – UP.

Note that when proper technique is used, very little altitude is lost.

To demonstrate an attempt to go around below 300 feet with full flaps and below minimum control speed:

a. Set up landing approach.

b. At 300 feet above simulated field elevation, lower full flaps, reduce power, and slow aircraft below minimum control airspeed.

c. Start go-around by applying power to the good engine, but not enough to lose directional control; maintain heading.

d. Raise the gear and flaps, and accelerate to safe single-engine airspeed as soon as possible.

e. Note loss of altitude; 500 to 600 feet will probably be lost, which should emphasize the importance of maintaining safe single-engine airspeed and using only half flaps until landing is assured.

PROPELLER FAILURE.

HUNTING OR SURGING.

To correct hunting or surging and to bring it back into synchronization, use the following procedure:

1. Propeller control – DECREASE RPM. CP

   After reaching a safe altitude, decrease RPM on malfunctioning engine.

2. Fuel booster pump switch – ON. CP

   Check fuel pressure and supply; change to another tank and turn the fuel booster pump – ON.

3. Propeller control – INCREASE RPM; then DECREASE RPM. CP

   Adjust propeller control of the malfunctioning propeller to INCREASE RPM and then DECREASE RPM 3 or 4 times.

4. If malfunction is not corrected – Shut down engine. CP

   If the malfunction has not been corrected, and the hunting and surging is excessive, feather the propeller and shut down the engine according to the procedure listed under ENGINE FAILURE/FIRE DURING FLIGHT, this section.

CAUTION

The propeller feathering circuits are not protected. If the feathering action does not occur in 90 seconds, pull out the feathering button.

PROPELLER FAILURE TO FEATHER.

WARNING

- In a clean configuration the aircraft will not maintain altitude with a windmilling propeller, even at weights below normal landing gross weights.
- **If a propeller fails to completely feather and is still windmilling, open the firewall shutoff valve to supply oil to the engine, after making sure no fire hazard exists.**

1. Minimum control speed. P

   Slow aircraft to nearly minimum control speed.

2. Mixture control – IDLE CUT-OFF. CP

3. Propeller control – FULL DECREASE RPM. CP

4. Throttle – Full OPEN. CP

5. Propeller – Feather. CP

   If appreciable reduction in RPM is realized, make further attempt to feather the propeller.

5a. Propeller control - INCREASE RPM then DECREASE RPM.

6. If still unable to completely feather propeller, the pilot must evaluate all circumstances involved and make the decision to:

   (a) Land at the nearest installation.

   (b) Bail out passengers and crew.

   (c) Crash land or ditch aircraft.

   (d) Attempt any combination of the above.

WARNING

Attempt to freeze the engine by oil starvation only as a last resort. Freezing the engine may result in an uncontrollable fire or in separation of the engine and/or propeller from the airplane. If the left propeller separates, it will probably come through the cockpit.

RUNAWAY PROPELLER.

If the propeller cannot be controlled with the propeller control lever, it is considered a runaway propeller.

1. REDUCE AIRSPEED - NOT BELOW SAFE SINGLE ENGINE SPEED V_2 - P.
2. THROTTLE - RETARD - P.
3. PROPELLER CONTROL - AFT - P.
4. FEATHER BUTTON - INTERMITTENTLY IN (to below 2700 RPM) - CP.

NOTE

If single engine climb performance cannot be maintained to clear obstacles, intermittently push feathering button IN and then pull it OUT to hold engine RPM within limits.

5. FEATHER - BUTTON IN (if governor control not established) - CP.

NOTE

At a safe altitude, feather the engine if the governor does not take hold after two or three attempts to bring RPM within limits with the feathering button.

6. LAND AS SOON AS PRACTICABLE.

OVERSPEEDING.

An overspeeding propeller is one that has exceeded 2700 RPM but is controllable by the propeller control lever. At the first indication of overspeeding, move the propeller control lever toward DECREASE. If this is ineffective, it is considered to be a runaway propeller.

PROPELLER CONTROL FAILURE.

If the propeller controls become disconnected from propeller governor, the governor is spring loaded so that the propeller RPM will be maintained between 2000 and 2200.

OVERSPEEDING CAUSED BY STARVATION.

Overspeeding sometimes occurs after a fuel tank has been run dry, or while changing fuel supply from one tank to another, with the usual result of a momentary power loss that is followed by the return to full power.

When overspeeding is caused by fuel starvation, accomplish the following:

1. THROTTLE - CLOSE. P
2. FUEL BOOSTER PUMP - ON. CP
3. FUEL TANK SELECTOR - CHANGE TO FULLEST TANK. CP
4. MIXTURE CONTROL - AUTO-RICH. CP
5. IF OVERSPEEDING CONTINUES, SHUTDOWN ENGINE USING ENGINE FAILURE/FIRE IN FLIGHT PROCEDURES. CP

FIRE.

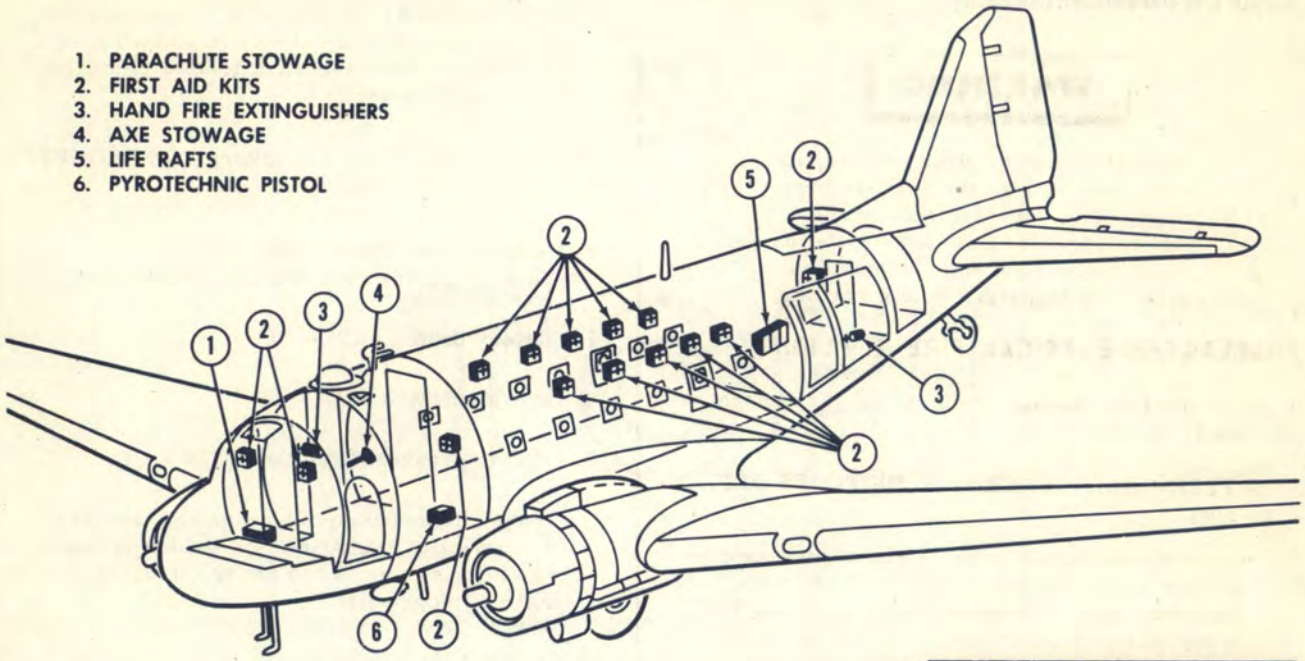
ENGINE FIRE ON THE GROUND.

If an engine fire occurs on the ground, stop the aircraft (if taxiing) and alert the Control Tower. Advance the throttle and attempt to blow out the fire. If fire persists shut down engines and use fire extinguishing equipment as required. If an engine fire develops during starting procedures, continue cranking, discontinue prime and perform the following: (The copilot will accomplish the items, on direction of the pilot, when starting the left engine).

1. MIXTURE CONTROL - IDLE CUT-OFF. (KEEP THE ENGINE TURNING WITH THE STARTER IF FIRE OCCURRED DURING START.
2. THROTTLE - OPEN.
3. IGNITION SWITCH - OFF.
4. FUEL BOOSTER PUMP SWITCH - OFF.
5. FUEL TANK SELECTOR VALVE - OFF.
6. FIREWALL SHUTOFF VALVE - CLOSED.
7. SIGNAL GROUND STANDBY CREW TO COMBAT THE FIRE.
8. FIRE EXTINGUISHER - DISCHARGE AGENT (IF NECESSARY).

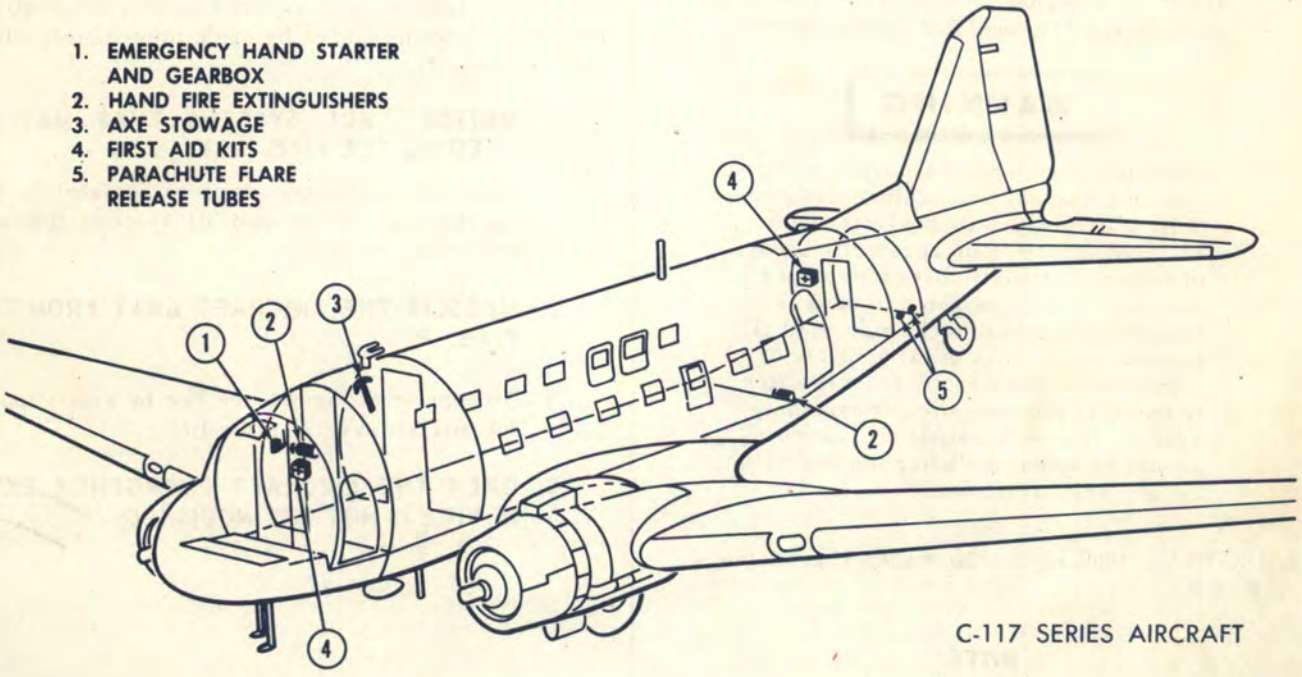
C-47 AND R4D SERIES AIRCRAFT

1. PARACHUTE STOWAGE
2. FIRST AID KITS
3. HAND FIRE EXTINGUISHERS
4. AXE STOWAGE
5. LIFE RAFTS
6. PYROTECHNIC PISTOL



MISCELLANEOUS EMERGENCY EQUIPMENT

1. EMERGENCY HAND STARTER AND GEARBOX
2. HAND FIRE EXTINGUISHERS
3. AXE STOWAGE
4. FIRST AID KITS
5. PARACHUTE FLARE RELEASE TUBES



C-117 SERIES AIRCRAFT

Figure 3-3.

If the ground crew is not successful in extinguishing the fire, discharge the engine fire extinguisher and notify the tower and Company.

WARNING

Do not attempt to restart the engine until the cause of the fire has been determined and corrected. If the fire extinguishing system has been used, the system and contaminated area must be purged before starting.

FUSELAGE/ELECTRICAL FIRE IN FLIGHT.

In the event of a fuselage or electrical fire inflight, proceed as follows:

1. **BATTERY AND GENERATOR SWITCHES OFF. P. CP.**

   If the fire is known to be of electrical origin and the source is unknown, turn the battery, generator, and APP switches OFF. If the fire is not of electrical origin, or if the electrical source is discovered immediately, leave the battery, generator, and APP switches ON and pull the circuit breaker for the unit affected.

2. **ALERT CREW: DESIGNATE CREW MEMBER TO DIRECT FIRE FIGHTING - P.**

   Normally Company aircraft have carbon tetrchloride and CO_2 hand fire extinguishers.

   WARNING

   Repeated or prolonged exposure to high concentrations of bromochloromethane (CB) or decomposition products should be avoided. CB is an anesthetic agent of moderate intensity but of prolonged duration. It is considered to be less toxic than carbon tetrachloride, methyl bromide, or the less usual products of combustion. In other words, it is safer to use than previous fire extinguishing agents. However, normal precautions should be taken, including the use of oxygen when available.

3. OXYGEN - 100% (or smoke masks if available) - P, CP.

   NOTE

   Oxygen is not usually available on company aircraft.

4. VENTILATION - AS REQUIRED - P, CP.

   If fire is extinguished, ventilate the aircraft. Refer to SMOKE ELIMINATION, this section. If fire was of electrical origin, and affected circuit has not been isolated, restore electrical power as follows:

5. All Switches/Circuit Breakers - OFF/TRIPPED - P, CP.

6. Generator Switches - ON - CP.
   Turn generator switches on one at a time.

7. Battery Switch - ON - CP.

8. Inverter Switch - ON - CP.

9. Circuit Breakers/Switches - ON - CP.

   Reset circuit breakers as required, one at a time, monitor loadmeters for sudden increase or watch for smoke. When faulty circuit is detected, leave it inoperative.

10. Isolate Fire/Smoke Cause

11. Land as soon as practicable.

WING FIRE.

There are no provisions installed for combating wing fire. If the following procedure fails to extinguish the fire and a landing cannot be made immediately, abandon the aircraft.

1. **SHUTOFF ALL SYSTEMS THAT MAY BE FEEDING THE FIRE. ALL**

   Take the necessary steps to isolate the fire by shutting off any and all systems that may be feeding the fire.

2. **SIDESLIP THE AIRCRAFT AWAY FROM THE FIRE. P**

   Attempt to extinguish the fire by side-slipping the aircraft away from the fire.

3. **OPEN THE AIRCRAFT EMERGENCY EXITS IF FIRE IS NOT EXTINGUISHED.**

ENGINE SMOKE AND FLAME IDENTIFICATION CHART

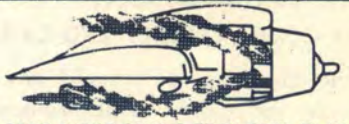
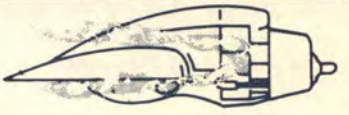
CAUSE	ACTION	
Detonation, afterfire, and backfire. Also fouled plugs or failing valves. If fuel pump drive shaft is broken, engine receives insufficient fuel and mixture leans excessively. Indicated generally by high CHT, high CAT, fluctuating MAP, and fuel pressure drop. Lean mixtures cause high CHT. High CAT, above 40 C (104 F), produces detonation. Fluction in MAP and fuel flow will result from violent backfire. If detonation continues, engine failure and fire are imminent.	Decrease CAT and CHT and enrich mixture, checking for proper rpm and MAP correlation. Increase airspeed.	 PUFFS OF BLACK SMOKE FROM EXHAUST. ROUGH ENGINE.
Oil leaking onto exhaust stacks and vaporizing. Not a dangerous condition if oil leak is not excessive. No instrument indications except for possible drop in oil quantity.	Normally, no action is necessary unless fire developes. If fire occurs, shut down engine, removing source of heat and fuel, and fire should go out.	 THIN WISPS OF BLUISH-GREY SMOKE FROM COWL FLAPS AND EXHAUST AREAS.
Cylinder failure, exhaust stack failure. If condition results in blown cylinder head or open exhaust stack, fire and black smoke will appear in exhaust stream.	During takeoff or when more than single engine power is required for safety, reduce power slightly and let engine operate until safe altitude and airspeed are obtained, then feather engine.	 GREY SMOKE COMING FROM COWL FLAP OR FORWARD ENGINE SECTION
On ground at idling speeds indicates too rich mixture. In flight, usually at high power settings, this can occur and indicates too rich mixture. There will be no instrument indications.	On ground, increase throttle and blow fire out. In flight, move mixture control slightly to lean mixture.	 LIGHT ORANGE-COLORED FIRE COMING FROM EXHAUST.
Induction fire. Instruments will indicate sudden drop of MAP and rpm CAT is not reliable indicator because instrument records temperature of air flowing through carburetor, not induction system heat.	Perform engine failure fire procedure. Fire should burn itself out without damaging engine.	 HEAVY BLACK SMOKE FROM EXHAUST.
Induction fire in advanced stages. Very dangerous condition. CAT will rise rapidly to maximum reading.	Action in above should have been taken to extinguish fire before it reaches this stage. Use engine failure/fire procedures. Alert crew for bail out. If fire does not go out within 30 seconds, it maybe best to order crew to bail out as fire will probably cause explosion in wing.	 DENSE WHITE SMOKE FROM EXHAUST AND/OR COWL FLAP AREAS.
Oil fire in accessory section. Fire warning light should come on. CAT will be abnormally high, accompanied by loss of power.	Use engine failure/fire procedures.	 BLACK SMOKE FROM ACCESSORY SECTION.
Fuel fire in accessory section generally caused by broken fuel line. Low fuel pressure and abnormally high CHT are instrument indications. Fire warning light will come on. Engine operation may be erratic, depending upon malfunction.	Shut off fuel as quickly as possible and use engine failure/fire procedures. Prepare to abandon aircraft if fire does not go out.	 BLACK SMOKE AND ORANGE FLAME FROM ACCESSORY SECTION.

Figure 3-4.

EMERGENCY DESCENT.

The possibility exists that an emergency could arise which would require as rapid a descent from altitude as possible. The action items listed below are considered best for an overall procedure for an expedited descent.

1. GEAR & FLAPS UP Descend at 180 KIAS.
2. GEAR & FLAPS DOWN Descend at 97 KIAS (Max).
3. PROPS - FULL INCREASE RPM - CP.
4. THROTTLES - CLOSED - P.

NOTE

For training purposes RPM 1700 MAP 18".

SMOKE ELIMINATION.

FLIGHT COMPARTMENT AND CABIN.

Under no circumstance should any hatch or door, other than the clear vision windows and the main cargo door, be opened during an inflight fire for smoke elimination.

NOTE

The pilot's and co-pilot's clear vision windows must be opened before opening the main cargo door, to reduce smoke and flame induction.

WARNING

The person opening the main cargo door will be secured to the interior of the aircraft fuselage.

BATTERY FUMES.

If battery fumes are detected, turn the battery switch OFF and use 100% oxygen.

TAKEOFF AND LANDING EMERGENCIES (EXCEPT DITCHING).

In this section the term "decision speed" is used to denote that speed and/or point during the takeoff where the pilot elects to continue or to abort the takeoff. The term is used so that emergency procedures refer to the moment of decision regardless of the concept used.

ABORT.

Any crew member who observes a hazardous malfunction before "decision speed" is reached will call out ABORT. The takeoff will be aborted as follows:

1. THROTTLES - CLOSED. P
2. BRAKES - APPLIED. P

NOTE

If it is impossible to stop on the runway, it may be desirable to ground loop the aircraft or to retract the landing gear to obtain a more sudden stop.

3. After landing check – COMPLETED. CP

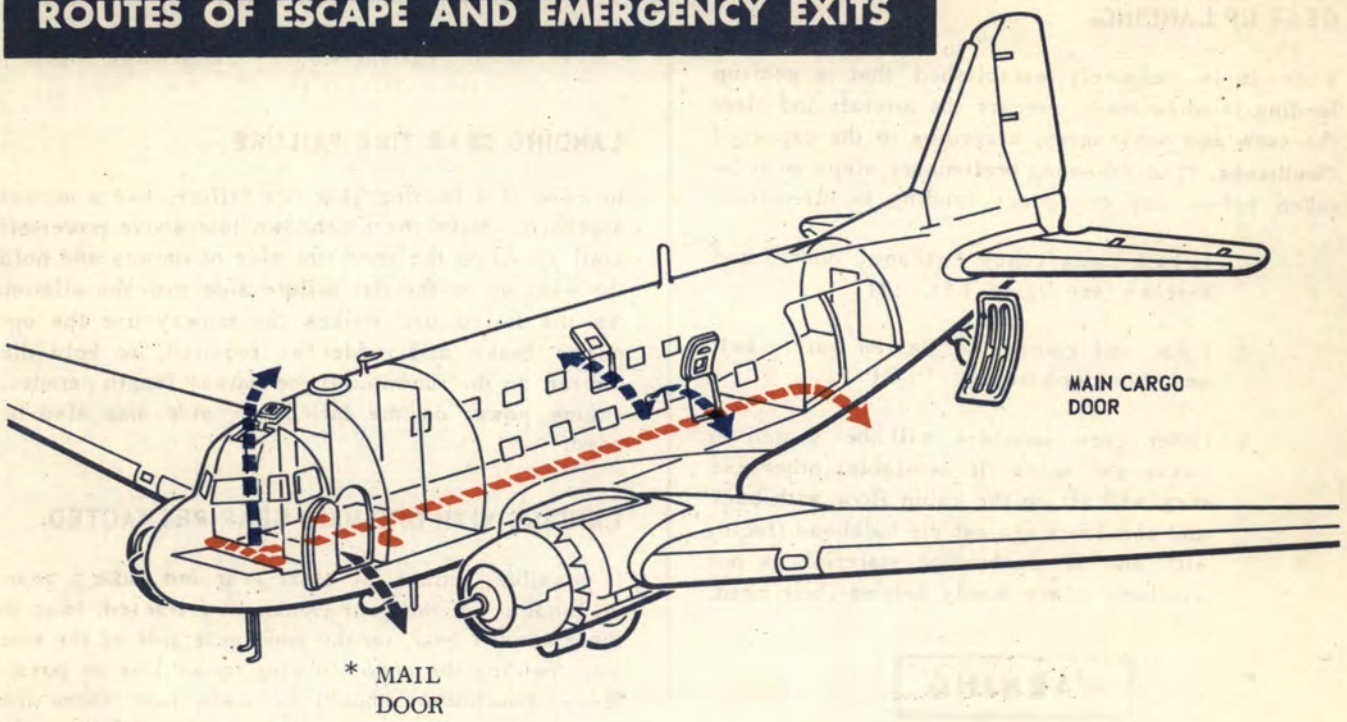
AFTER REACHING DECISION SPEED.

After reaching decision speed, continue the takeoff and the malfunction will be treated as an inflight emergency. (Refer to ENGINE FAILURE/FIRE IN FLIGHT this section.)

WARNING

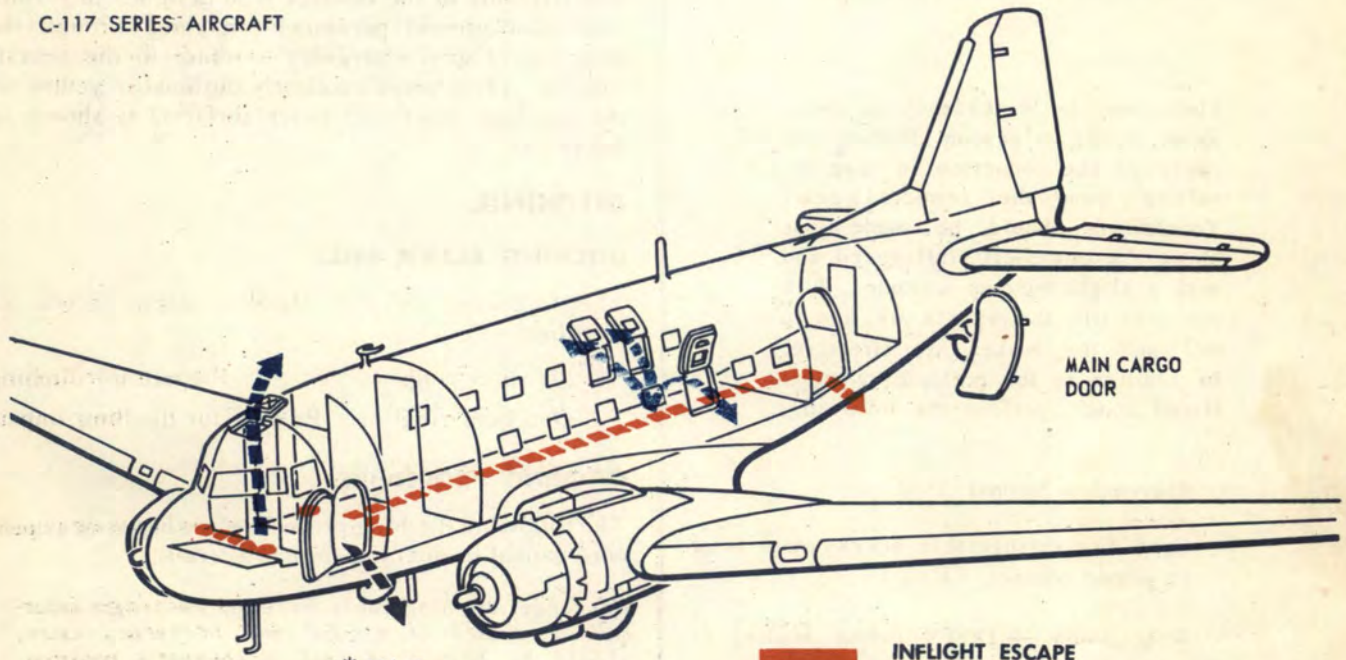
If an engine failure occurs during takeoff before minimum safe single engine speed is attained, the aircraft will not accelerate with the failed engine windmilling and the landing gear extended. Under these conditions the takeoff should be discontinued. Single engine flight is not possible until the landing gear is fully retracted, the propeller is feathered and safe single engine speed is attained.

ROUTES OF ESCAPE AND EMERGENCY EXITS



C-47 AND R4D SERIES AIRCRAFT

C-117 SERIES AIRCRAFT



INFLIGHT ESCAPE

ALTERNATE GROUND ESCAPE

* FOR GROUND ESCAPE ENGINE NOT OPERATING

Figure 3-5.

GEAR UP LANDING.

When it is definitely established that a gear-up landing is to be made, prepare the aircraft and alert the crew and passengers, according to the expected conditions. The following preliminary steps must be taken before any emergency landing is attempted.

1. Unlock emergency escape doors and hatches (see figure 3-5). FM
2. Pilot and co-pilot – Fasten safety belt and shoulder harness. P, CP
3. Other crew members will be seated in passenger seats (if available) otherwise they will sit on the cabin floor with back and shoulders against the bulkhead (facing aft) and if cushioning material is not available place hands behind their head. FM

WARNING

If passenger seats are available extra crew members will use them during landing.

4. Passengers – Fasten safety belts.

There may be a tendency to overshoot during a gear-up landing because of the reduction in drag resulting from the retracted gear. Touchdown should be made just above the power-off stall speed and with a slight nose-up attitude. With the gear UP, the wheels are free to roll and the brakes are effective. In addition to the preliminary steps listed above, perform the following:

5. Approach – Normal. P
6. Open fire extinguisher access door prior to ground contact. CP
7. Wing flaps — DOWN (when landing is assured). CP
8. Throttles – CLOSE (after crossing field boundary). P
9. Fuel booster pump switches – OFF. CP
10. Ignition and battery switches – OFF. CP
11. Fire extinguisher – Discharge agent (if fire exists). CP

LANDING GEAR TIRE FAILURE.

In case of a landing gear tire failure, use a normal approach. Make the touchdown just above power-off stall speed on the good tire side of runway and hold the wing up on the tire failure side with the aileron. As the failed tire strikes the runway use the opposite brake and rudder as required, to hold the aircraft on the runway. If the runway length permits, engine power on the failed tire side may also be used.

LANDING WITH ONE MAIN GEAR RETRACTED.

If possible, retract the other gear and make a gear-up landing. If the gear cannot be retracted, land on the extended gear, on the good gear side of the runway, holding the opposite wing up as long as possible. Touchdown should be made just above the power-off, stall speed. Use gear up landing procedures.

EMERGENCY ENTRANCE.

The structure of the fuselage is so designed in various areas that ground personnel can chop through the structure to gain emergency entrance to the aircraft interior. These areas are clearly outlined in yellow on the fuselage inner and outer surfaces, as shown in figure 3-6.

DITCHING.

DITCHING ALARM BELL.

The following are the standard alarm signals for ditching:

Six short rings	Prepare for ditching
One long ring	Prepare for ditching impact

DITCHING PROCEDURE.

The following ditching procedures are based on experience gained in ditching similar aircraft.

Passenger ditching cards outlining passenger information, routes of escape and emergency exits, should be posted at each passenger's position.

Ditching an aircraft requires more coordination on the part of each crew member than does any other emergency procedure. In order to develop coordination, the pilot must require each crew member to demonstrate his knowledge of ditching duties by

answering oral questions prior to departure from the home base. Circumstances permitting, an effort should be made prior to the day of departure to conduct trial-run ditching drills during which all crew members actually perform their assigned duties *(see figure 3-7, 3-8, and 3-9).*

EMERGENCY EQUIPMENT.

Ditching equipment should be in readiness at all times when flying over water. Prior to each overwater flight, the pilot will make sure that the following equipment is aboard, in serviceable condition, and stowed in the proper places:

Life Rafts.

A sufficient quantity of life rafts will be aboard to accommodate maximum authorized cabin capacity plus crew.

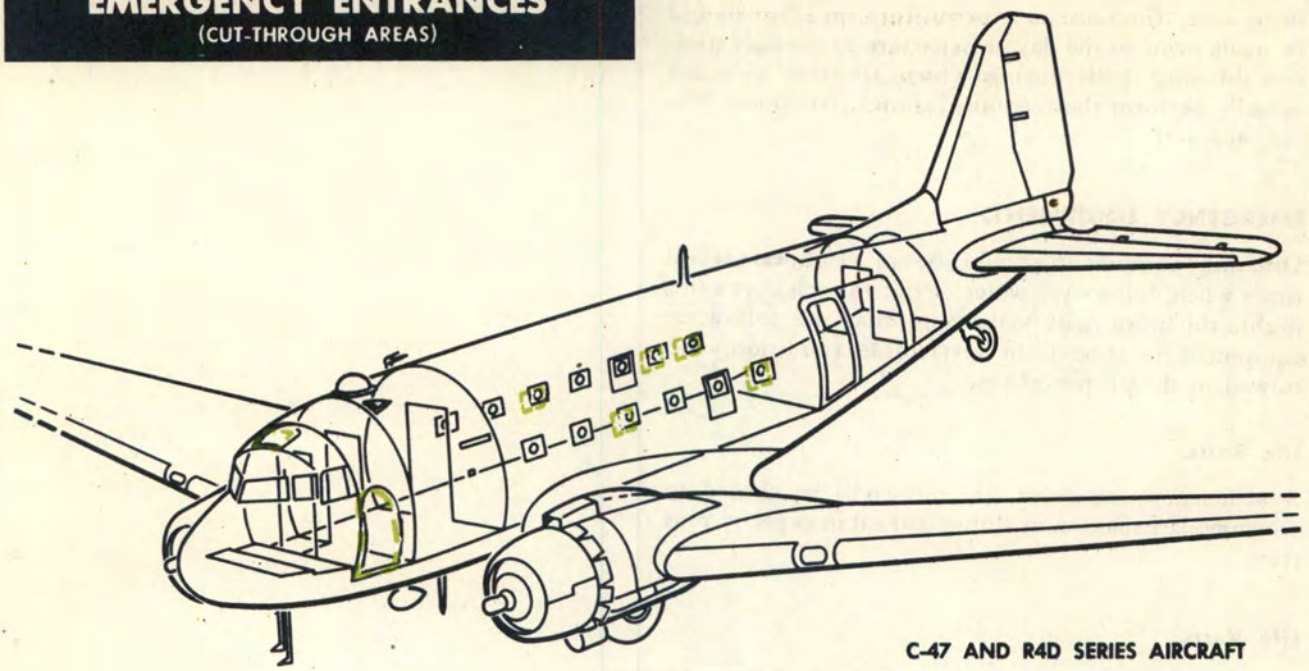
Life Vests.

One life vest will be conveniently located for each person on board. Each crew member will make sure that his life vest and CO_2 cartridges are in serviceable condition before each flight.

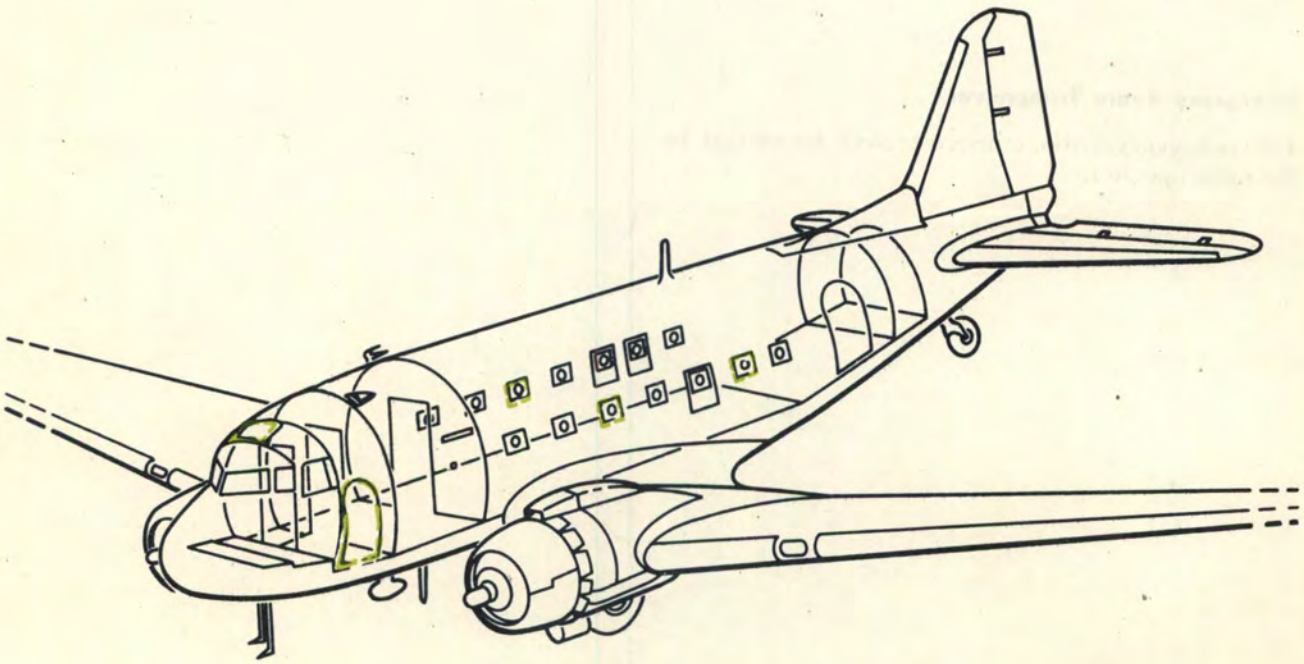
Emergency Radio Transceiver.

The emergency radio transceiver will be carried by the radio operator.

EMERGENCY ENTRANCES
(CUT-THROUGH AREAS)



C-47 AND R4D SERIES AIRCRAFT

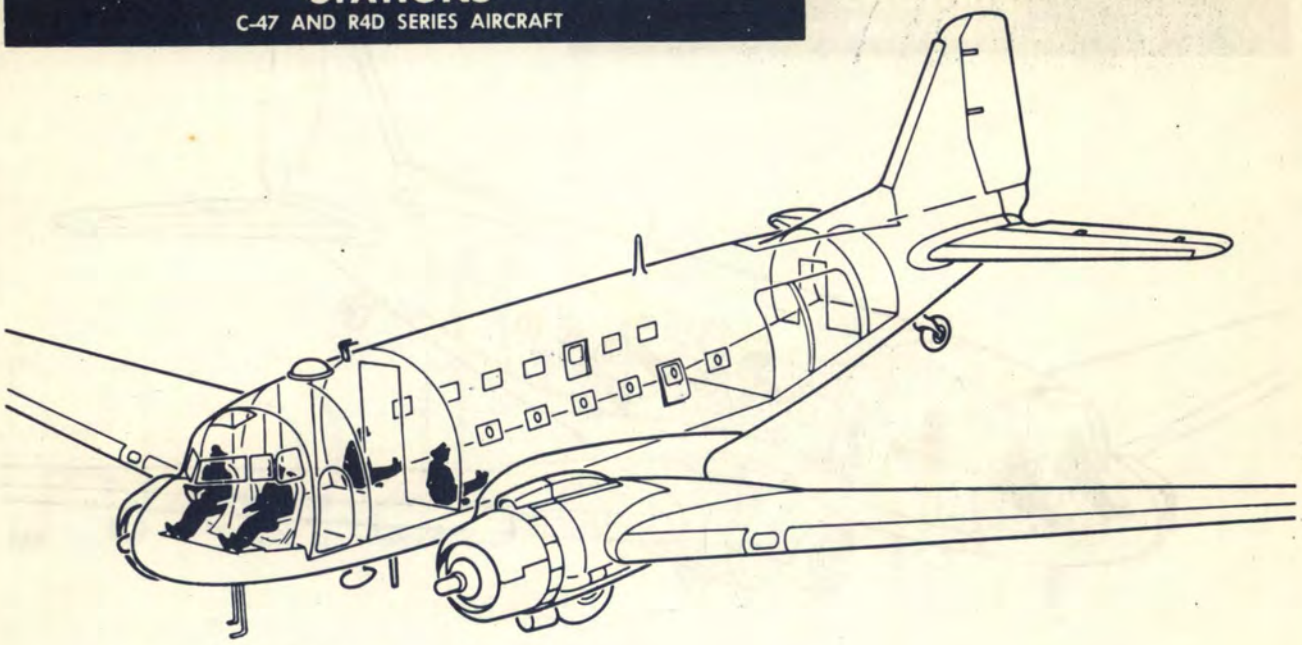


DC-3 AND C-117 SERIES AIRCRAFT

Figure 3-6.

DITCHING AND CRASH LANDING STATIONS

C-47 AND R4D SERIES AIRCRAFT



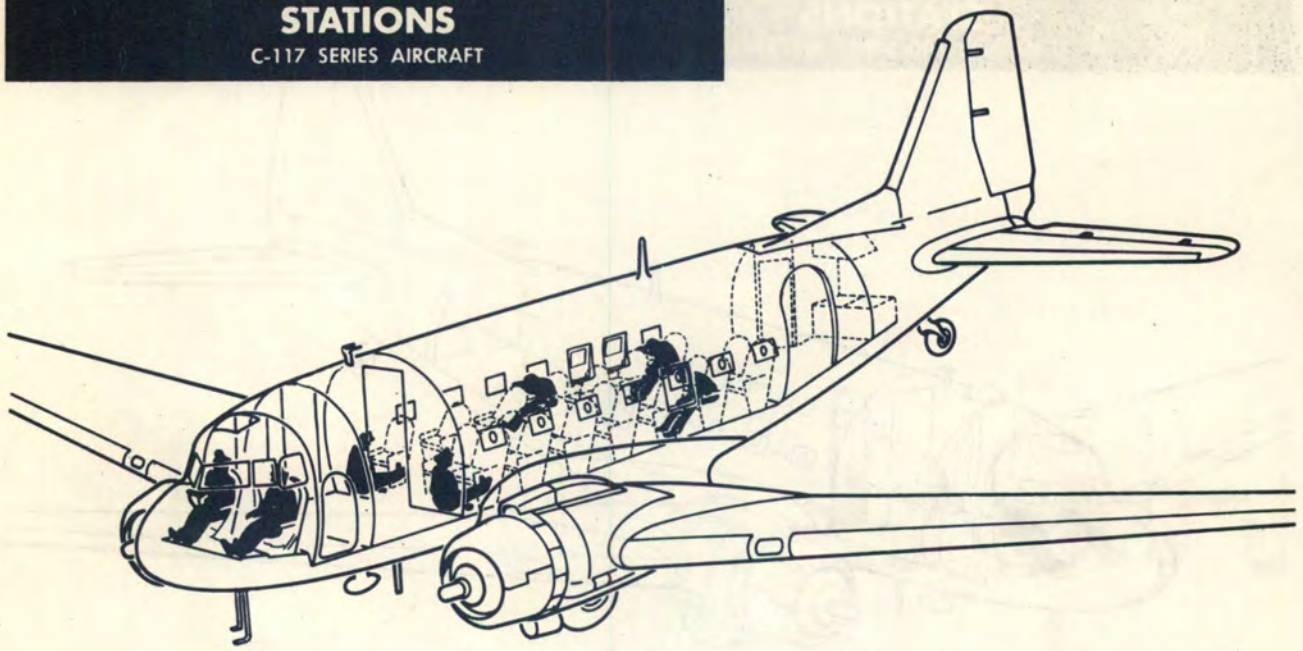
CREW POSITIONS PRIOR TO DITCHING

BOARDING THE LIFE RAFTS

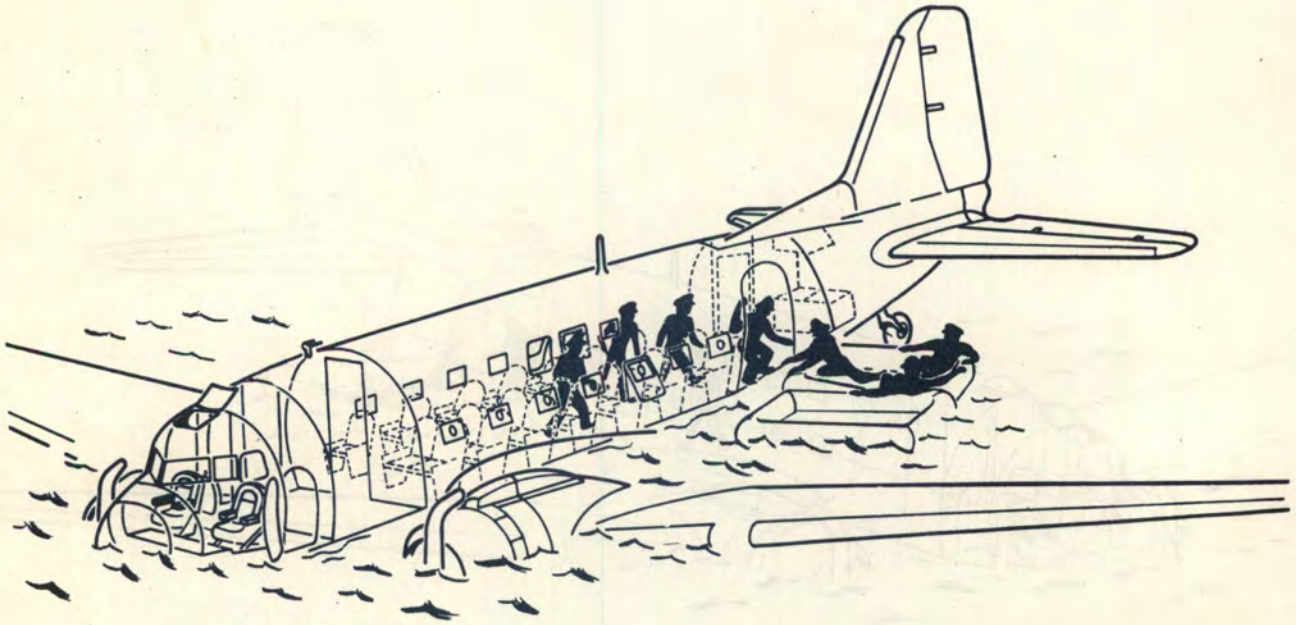
Figure 3-7.

DITCHING AND CRASH LANDING STATIONS

C-117 SERIES AIRCRAFT



CREW POSITIONS PRIOR TO DITCHING



BOARDING THE LIFE RAFTS

Figure 3-8.

Antiexposure Suits.

One antiexposure suit will be conveniently located for each person on board.

ASSIGNMENT OF EVACUATION CONTROLLER.

When passengers are being carried, the pilot will appoint, before take-off, one crew member as an evacuation controller. On C-117 series aircraft, the steward will assume the duties of evacuation controller. This crew member will be responsible for briefing the passengers before flight on the use of emergency equipment. This briefing should be done in a calm, professional manner so as to instill confidence in the passengers and forestall apprehension of an emergency.

PREPARATION FOR DITCHING.

(See figures 3-7, 3-8, and 3-9.)

Wind Speeds and Directions.

Surface winds are fairly predictable from the way they affect the water. Use the following reference for estimating the surface wind velocity.

a. Sea like a mirror.....Less than 1 knot
b. Ripples with the appearance of scales are formed, but without foam crest.....1 to 3 knots
c. Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break.....4 to 6 knots
d. Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered whitecaps.....7 to 10 knots
e. Small waves, becoming longer; fairly frequent whitecaps.....11 to 16 knots
f. Moderate waves, taking a more pronounced form; many whitecaps.....17 to 21 knots
g. Large waves begin to form; the white foam crests are more extensive. (Probably some spray).....22 to 27 knots
h. Sea heaps up and white foam from breaking waves begins to be blown in well-marked streaks along the direction of the wind.....28 to 33 knots
i. Moderately high waves of great length; edges of crests break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.....34 to 40 knots
j. High waves. Dense streaks of foam along the direction of the wind. Sea begins to roll.....41 to 47 knots
k. Very high waves with long overhanging crests. Foam is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes a white appearance.....48 to 55 knots

Plans for ditching cannot be made without taking the wind direction into consideration. Waves move downwind, and the spray from wave crests is also blown downwind. Swells, however, do not always indicate wind directions and can be very large even when the wind is calm. Over a sea, a pilot must be more exacting and alert when judging height.

Flight Compartment.

At the time the "Prepare for Ditching" order is given by the pilot, the crew assignments will be:

Pilot and co-pilot will don antiexposure suits and life vests, and remain in their seats to fly the aircraft.

The radio operator will don an antiexposure suit and life vest, and stand by his radio to transmit any necessary emergency signals.

On C-47 and R4D series aircraft, the flight mechanic, or on DC-3 and C-117 series aircraft, the steward, will place essential equipment, crew water, first aid kits, Very pistol, signal flares, and smoke signals in the emergency equipment bag. He then stows this equipment until, after ditching. Upon completion of these duties, he will put on his antiexposure suit and life vest and take his station for ditching (figures 3-7 and 3-8).

Main Cabin Compartment.

When the necessity for ditching is evident, the pilot will alert the crew by giving the command "Prepare for ditching" over the interphone. (This alert should not be confused with the six short rings of the alarm bell, which are the signal to assume ditching positions.) Upon receiving the command "Prepare for Ditching," a crew member designated by the pilot, or the steward on DC-3 and C-117 series aircraft, will accomplish the following:

Advise passengers of the impending emergency.

Jettison as much cargo as possible.

See that all doors which may take in water are closed and latched.

Open all accessible emergency escape hatches.

Loosen his tie, don an antiexposure suit and life vest, and make certain that the passengers are prepared in the same manner. After the above procedures have been accomplished, he notifies the pilot over the interphone that the passengers are prepared for ditching.

Upon hearing six short rings of the alarm bell, or when receiving signal over interphone, he checks that all passengers are properly seated and have their safety belts fastened. Upon hearing one long ring of the alarm bell or signal over interphone, he checks that all passengers assume the "Brace for Ditching" position.

DITCHING CHART

CREW MEMBER/DUTY

PILOT

Warn crew to prepare for ditching. Order evacuation controller to assume duties. Order radio operator to start emergency procedures. Order all on board to secure themselves in ditching position.

CO-PILOT

As directed by pilot.

FLIGHT MECHANIC

Assume evacuation controller duties.

Supervise preparation of passengers.

Stow essential navigation equipment and crew water tank in emergency equipment bag.

Jettison main cargo door.

NAVIGATOR

Passes information on speed, course, altitude, position, estimated ditching position, and distance to nearest land to radio operator for inclusion in distress signal. Then passes this information on to all crew members. Assumes duties as assistant evacuation controller.

RADIO OPERATOR

Send emergency signal (SOS) giving position, altitude, course, speed, and intention of aircraft pilot as to ditching.

LOADMASTER

Assume evacuation controller duties, supervise preparation of passengers, jettison and/or tie down cargo, stow essential navigation equipment and crew water tank in emergency equipment bag and secure hatches and doors for ditching.

NOTE: On company aircraft the co-pilot will perform the duties listed for the navigator and radio operator if possible. The AFS will perform the duties listed for Flight Mechanic and Loadmaster.

Figure 3-9 (Sheet 1 of 2).

When ditching is imminent (10 minutes left), each crew member and passenger will don antiexposure suit and life vest

PROVIDE	POSITION	EXIT
Flashlight	Pilot's seat	Main cargo door
Emergency radio transceiver	Co-pilot's seat	Main cargo door
Life rafts Emergency radio transceiver	If seat is not available, seated on floor of main cabin, forward bulkhead	Main cargo door
Emergency equipment bag	If seat is not available, seated on floor of main cabin, forward bulkhead	Main cargo door
Life raft Emergency radio transceiver	If seat is not available, seated on floor of main cabin, forward bulkhead	Main cargo door
Lift raft Emergency radio transceiver	If seat is not available, seated on floor of main cabin, forward bulkhead	Main cargo door

Figure 3-9 (Sheet 2 of 2).

ABANDONING AIRCRAFT.

Evacuation of the aircraft in an orderly manner after ditching should be accomplished in the shortest time possible. This cannot be done well without practice. Far less can it be expected in a dark fuselage filling with water, unless the drill is perfect. Practice makes perfect. A very large number of crews have thus saved themselves and have finally been rescued by surface craft. The crew and passengers must not leave ditching positions until the aircraft comes to rest. Directly after the aircraft comes to rest, the additional necessary emergency equipment must be collected and equally distributed to the groups on both sides of the main cabin compartment. Each group of passengers, plus the crew, must evacuate the aircraft in the correct order, through the exit previously assigned to them, carrying the equipment that has been allotted to them. They must also see to it that each piece of equipment for use in the raft is secured by lines to prevent its being lost overboard in passing from aircraft to raft.

Flight Compartment.

When it is certain that the aircraft has come to a complete stop, each crew member performs the following duties:

The radio operator insures that the rafts have been properly launched, inflated, and secured to the aircraft. After he has ascertained that all equipment is properly stowed aboard rafts, he boards raft. The flight mechanic or steward, as applicable, retrieves the emergency equipment bag and hands it to the radio operator in the raft. He then joins the radio operator in the raft. The pilot and co-pilot will check on each other to see if either one has been injured. It is quite possible for the pilots to receive severe blows on the head or other parts of the body, making it impossible for them to leave the aircraft under their own power.

The pilot and co-pilot will leave through the main cargo door and join the other crew members in the raft.

Main Cabin Compartment.

The smooth, orderly, and expeditious evacuation of passengers depends upon how well the duties are performed. The crew member designated will insure that all additional emergency equipment is equally distributed, and that orderly evacuation is immediately effected.

When it is certain that the aircraft has come to a complete stop, he will proceed with the following duties:

a. Life rafts will be launched, with the aid of the passengers if necessary. The CO_2 release should not be pulled until after the raft is in the water.

   The first raft should be tied to the escape rope, the second raft tied to the first, and so on, to prevent them from drifting apart and away from the aircraft.

b. Each group will exit through the main cargo door in the assigned order, taking along their emergency equipment, and board a raft.

DITCHING TECHNIQUES.

Normal Power-On Ditching.

Experience gained in ditching similar aircraft has shown that the best results are obtained by following the procedure outlined below:

a. If possible, use up most of the fuel supply to lighten the aircraft and reduce stalling speed. Empty tanks also contribute to flotation.

b. Ditch while power is available. Power will allow you to choose the spot for ditching that affords the best possible sea conditions and the most favorable landing position and attitude.

c. Radio Low Altimeter – ON.

d. Use flap setting of half-down.

e. Ditch at 10 knots above stalling speed, which will give an approximate angle of ditching of slightly above level flight. Under no circumstances should the aircraft be stalled in, since this will result in severe impact and cause the aircraft to nose into the sea.

f. In daylight, it is recommended that the aircraft be ditched along the top of the swell, parallel to the rows of the swells, if the wind does not exceed 30 knots. In high winds, it is recommended that ditching be conducted upwind to take advantage of lowered forward speed. However, it must be remembered that the possibility of ramming nose-on into a wave is increased, as is the possibility of striking the tail on a wave crest and nosing in.

Partial Power Failure Ditching.

In ditching with one engine inoperative, the following should be borne in mind:

a. Use power as required to give flattest approach and a forward speed of 10 knots above stalling speed.

b. On letdown with an engine inoperative, it is advisable to hold speed 20 knots above stalling speed until flare-out, at which time speed will be reduced to 10 knots above stalling speed.

Cross-Wind Ditching.

The basic rules for ditching, listed in Normal Power-On Ditching, will still apply, in addition to the following:

a. Crab the aircraft to kill drift.

b. Land on the downwind side of the swell or wave.

Upwind Ditching.

The basic rules for ditching, listed in "Normal Power-on Ditching," will still apply, in addition to the following:

a. Maintain nose-up condition — avoid nose striking wave face.

b. Touch down immediately before the crest of a rising wave.

c. Hold the nose up after first impact.

Night Ditching.

a. Night ditching will be conducted with the aid of instruments to establish proper attitude of aircraft.

b. Make an instrument letdown, holding the airspeed 20 knots above stalling speed and at the lowest possible rate of descent.

c. Use landing lights as necessary.

d. Hold wings level to avoid digging a wing into the water and cartwheeling the aircraft.

e. Land at 10 knots above stalling speed, using flap setting of half-down.

Note

If no power is used, no flaps should be employed.

PILOT.

First Actions.

1. Warn crew to prepare for ditching, giving approximate time remaining.
2. IFF/SIF – EMERGENCY.
3. Order crew members to assist in briefing passengers.
4. Order the radio operator to transmit a distress signal and position report and continue to do so.
5. Order co-pilot to don antiexposure suit and life vest, and fasten safety belt and harness.
6. Loosen tie, don life vest and antiexposure suit, and fasten shoulder harness and safety belt.
7. Take over controls from co-pilot and prepare to ditch.

When Ditching Is Imminent (10 Minutes Left).

1. Alert cabin personnel; six short rings on alarm bell, or give signal over interphone.
2. Order the radio operator to send final distress signal.
3. Order the co-pilot to assist him as required.
4. Orders all crew members and passengers to turn on emergency flashlights connected to life vests.

   This procedure will provide light after ditching and will aid in locating persons injured during ditching.
5. Order all on board to secure themselves in ditching position.
6. If at night, turns on formation lights.
7. Immediately before ditching, give signal No. 2: "Brace for Impact" or give signal over interphone.

Ditching Station — Pilot's seat.

After Ditching.

1. Leave the aircraft through the main cargo door and assist with the life rafts. Take command.

CO-PILOT.

First Actions.

1. Take over the controls while the pilot adjusts his equipment.
2. Loosen tie, and don antiexposure suit and life vest.
3. Fasten shoulder harness and safety belt.

When Ditching Is Imminent (10 Minutes Left).

1. Assists pilot.

Ditching Station — Co-pilot's seat.

After Ditching.

1. Leave through the main cargo door.

NAVIGATOR

First Actions.

1. Give speed, course, altitude, position, and estimated ditching position to the radio operator for inclusion in the distress signal.
2. Loosen tie, and don antiexposure suit and life vest.
3. Stow essential equipment (Very pistol, signal flares, smoke signals, navigation aids, crew water tank, etc) in emergency bag, and stow the bag in the lavatory.

When Ditching Is Imminent (10 Minutes Left).

1. Assist pilot as directed.

Ditching Station - If seat not available, seated on floor, back braced against main cabin forward bulkhead.

After Ditching.

Pass out the emergency equipment bag and leave through the main cargo door.

STEWARD OR FLIGHT MECHANIC.

First Actions.

1. Assist and brief passengers.
2. Loosen tie, and don antiexposure suit and life vest.
3. Stow essential emergency equipment in emergency bag, and stow the bag in the lavatory.

When Ditching Is Imminent (10 Minutes Left).

1. Assist pilot as directed.
2. Make certain the passengers are prepared.
3. Jettison main cargo door.

Ditching Station - If seat is not available, seated on floor of main cabin, back braced against main cabin forward bulkhead.

After Ditching.

Pass out the emergency equipment bag and leave through the main cargo door.

RADIO OPERATOR.

First Actions.

1. On pilot's orders, send an emergency signal (SOS), followed as soon as possible by an emergency message giving position, flight time, nature of the emergency, and any other information available.
2. Obtain Direction Finding Service, bearing, etc, on normal air ground frequency if possible.
3. Loosen tie, don antiexposure suit and life vest, and fasten shoulder harness and safety belt.
4. Continue the outlined emergency procedure every 10 minutes.

When Ditching Is Imminent (10 Minutes Left).

1. Send final distress signal (SOS), position, altitude, course, speed, and intention of pilot as to ditching.
2. Screw the emergency key down.

Ditching Station - If seat is not available, seated on floor of main cabin, back braced against main cabin forward bulkhead.

After Ditching.

a. Launches life raft through main cargo door.

b. Leaves through main cargo door.

LOADMASTER.

First Actions.

1. Monitor interphone.
2. Acknowledge pilot's verbal order.
3. Passengers - prepared for ditching; loosen ties, don anti-exposure suits, life vests, and fasten seat belts.
4. Cargo jettisoned if time permits; remaining cargo tied down.
5. Emergency/survival equipment in place and tied down.
6. Hatches and doors - close doors that may take in water, open all others.

When Ditching Is Imminent (10 Minutes Left).

1. Monitor interphone.
2. Passengers/crew - assume ditching positions and fasten seat belts; flash lights on life vests turned on.
3. Pilot notified on interphone - cabin prepared for ditching.

Ditching Station - If seat is not available, seated on floor, back braced against main cargo compartment forward bulkhead.

AFTER DITCHING.

1. Life rafts launched and inflated through main cargo door.
2. Passengers evacuated.
3. Emergency/survival equipment aboard rafts.
4. Board raft.
5. Disconnect raft from aircraft as soon as all possible crew and passengers are aboard rafts.
6. Secure all emergency/survival equipment to raft.

MALFUNCTIONS OF MULTI-GENERATOR D-C ELECTRICAL SYSTEM

	FAILED GENERATOR AMMETER	FAILED GENERATOR WARNING LIGHT	OTHER GENERATOR AMMETER	OTHER GENERATOR WARNING LIGHT	RESULTS AND CAUSES OF D-C ELECTRICAL SYSTEM FAILURE
1.	ZERO	ON	ABOVE NORMAL	OFF	GENERATOR MECHANICAL FAILURE, ARMATURE OPEN, BROKEN BRUSH, REVERSE CURRENT RELAY NOT CLOSING, ONE POLE OF GENERATOR SWITCH OPEN.
2.	ZERO	OFF	ABOVE NORMAL	OFF	MAIN BUS OPEN TO REVERSE CURRENT RELAY, GENERATOR FAILURE WITH WARNING LIGHT FAILURE, OPEN GENERATOR SWITCH, REVERSE CURRENT RELAY MAIN COIL NOT CLOSING.
3.	ZERO	OFF	NORMAL	OFF	AMMETER CIRCUIT OPEN.
4.	LOW	OFF	ABOVE NORMAL	OFF	IMPROPER PARALLELING, EQUALIZER COIL IN REGULATOR NOT WORKING, REGULATOR SET LOW OR STICKING.
5.	ABOVE NORMAL	OFF	LOW — OR ZERO	OFF	EQUALIZER COIL NOT WORKING, REGULATOR MALFUNCTION.
6.	OFF SCALE HIGH	OFF	OFF SCALE HIGH OR ABOVE NORMAL	OFF	MAIN BUS GROUNDED.
7.	OFF SCALE HIGH	OFF	LOW — OR ZERO	OFF	REGULATOR MALFUNCTION.
8.	OFF SCALE HIGH	OFF	ZERO	ON	OVERVOLTAGE DUE TO REGULATOR MALFUNCTION OR FIELD TO ARMATURE LEAD SHORTED.
9.	NORMAL	ON	NORMAL	OFF	FAILURE OF WARNING LIGHT RELAY CIRCUIT.
10.	REVERSED AND PEGGED	OFF	OFF SCALE HIGH OR ABOVE NORMAL	OFF	REVERSE CURRENT RELAY WELDED WITH GENERATOR LEAD GROUNDED. FAILED REVERSE CURRENT RELAY COIL.
11.	OFF SCALE HIGH TO GENERATOR FAILURE THEN TO ZERO.	OFF THEN ON	HIGH UNTIL FAILURE OF OTHER GENERATOR, THEN ABOVE NORMAL. MAY NOT GO AS HIGH AS FAILED GENERATOR. MAY GO LOW AFTER OTHER GENERATOR FAILURE DUE TO BURNED-OUT LOADS.	OFF	OVERVOLTAGE.
12.	OFF SCALE LOW AND PEGGED THEN TO ZERO.	ON	OFF SCALE HIGH THEN BACK TO ABOVE NORMAL.	OFF	GENERATOR FEEDER GROUNDED.

NOTES:

1. GENERATOR SWITCH CONTROLS: REVERSE CURRENT RELAY, VOLTAGE REGULATOR EQUALIZING WINDING CROSS CONNECTION, WARNING LIGHT POWER CONNECTION.
2. ALL AIRCRAFT HAVE ONE WARNING LIGHT PER GENERATOR, OPERATED BY A LIGHT RELAY. THE LIGHT COMES ON WHEN THE GENERATOR SWITCH IS POSITIONED TO ON AND GENERATOR REVERSE CURRENT RELAY IS NOT CLOSED. THE LIGHT GOES OFF WHEN THE GENERATOR REVERSE CURRENT RELAY PILOT COIL IS ENERGIZED AND OPERATES THE LIGHT RELAY.

3a. DO NOT REMOVE VOLTAGE REGULATOR EXCEPT IN AN EMERGENCY.

b. MAKE CERTAIN THE ELECTRICAL SYSTEM (REGULATOR, GENERATOR, REVERSE CURRENT RELAY, AND WARNING LIGHT CIRCUIT) IS FUNCTIONAL AFTER ANY INSPECTION OR OVERHAUL WHICH MAY AFFECT THE ELECTRICAL SYSTEM.

c. WHEN CHECKING THE ELECTRICAL SYSTEM, TURN OFF ALL ELECTRICAL EQUIPMENT (BATTERY, RADIO, RADAR LIGHTS, ETC) WHICH WOULD BE AFFECTED BY OVERVOLTAGE. EVERY EFFORT SHOULD BE MADE TO KEEP VOLTAGE BELOW 35 VOLTS.

d. IN EVENT AN ELECTRICAL SYSTEM MALFUNCTION TRIPS ONE OR BOTH GENERATORS OF BUS, TURN OFF.

Figure 3-10 (Sheet 1 of 2).

MALFUNCTIONS OF MULTI-GENERATOR D-C ELECTRICAL SYSTEM

IMMEDIATE ACTION	CORRECTIVE ACTION
PLACE FAILED GENERATOR SWITCH IN OFF POSITION. (SEE NOTE 3f.)	1. PLACE GENERATOR SWITCH TO ON POSITION AND SEE IF GENERATOR PICKS UP LOAD. IF AMMETER DOES NOT SHOW LOAD, PLACE GENERATOR SWITCH TO THE OFF POSITION.
PLACE GENERATOR SWITCH TO OFF THEN ON. IF GENERATOR DOES NOT SHOW LOAD, PLACE SWITCH IN THE OFF POSITION. (SEE NOTE 3f.)	2. NONE
TURN GENERATOR SWITCH OFF. (SEE NOTE 3f.)	3. NONE
SEE NOTE 3g.	4. CHECK VOLTAGE REGULATOR FOR OPEN OR SHORTED CONTACTS ON REGULATOR BASE.
OPERATE GENERATOR SWITCHES INDIVIDUALLY TO OFF THEN ON. IF SYSTEM DOES NOT OPERATE CORRECTLY PROCEED PER NOTE 3g.	5. SAME AS 4.
ACT FAST. TURN OFF BATTERY SWITCH. TURN OFF GENERATOR SWITCHES. OPERATE ON EMERGENCY POWER IF AVAILABLE.	6. NONE
PLACE THE GENERATOR MAIN LINE SWITCH TO OFF. (SEE NOTE 3f.)	7. SAME AS 4.
SWITCH OFF AFFECTED GENERATOR; BE PREPARED FOR POSSIBLE GENERATOR FIRE. (SEE NOTE 3f.) REMOVE VOLTAGE REGULATOR IF POSSIBLE. (SEE NOTE 3a.)	8. SAME AS 4.
REPLACE BURNED OUT LIGHTS. (SEE NOTE 3g.)	9. PRESS FIXTURE TO TEST LAMP. OPERATE GENERATOR SWITCH OFF AND ON TO CLEAR POSSIBLE OPEN SWITCH CONTACT. REPLACE LAMP AND RECHECK BY PRESSING FIXTURE.
ACT FAST. TURN OFF BATTERY SWITCH. TURN OFF GENERATOR SWITCHES. OPERATE ON EMERGENCY POWER IF AVAILABLE.	10. NONE
ACT FAST. SWITCH OFF BATTERY. SWITCH OFF GENERATORS. SWITCH BATTERY ON. SWITCH LOW GENERATOR ON. MONITOR LOAD FOR NORMAL OPERATION. MOST LIGHTING AND RADIO CIRCUITS WILL PROBABLY BURN OUT. REPLACE BURNED-OUT LAMPS.	11. REMOVE REGULATOR. SAME AS 4. (SEE NOTE 3a.)
REMOVE VOLTAGE REGULATOR IF POSSIBLE. PLACE GENERATOR SWITCH TO OFF. (SEE NOTES 3f AND 3a.)	12. NONE

BATTERY SWITCH IMMEDIATELY. TURN ON EMERGENCY POWER SYSTEM IF AVAILABLE. DO NOT PLACE BATTERY ON LINE PRIOR TO CLEARING ELECTRICAL SYSTEM MALFUNCTION.

e. WITH BATTERY SWITCH OFF AND BATTERY RELAY OPEN, POWER IS SUPPLIED TO THREE ITEMS.
   1. BAIL-OUT BELL.
   2. MAIN JUNCTION BOX INTERNAL LIGHT.
   3. CB FIRE EXTINGUISHING SYSTEM.

f. IF GENERATOR FAILURE OCCURS, THE AMMETER OF THE REMAINING GENERATOR SHOULD BE IMMEDIATELY CHECKED FOR OVERLOAD AND NON-ESSENTIAL ELECTRICAL EQUIPMENT TURNED OFF. IF NECESSARY, MONITOR REMAINING GENERATOR AMMETER TO PREVENT OVERLOADS.

g. IF TWO-GENERATOR POWER CAPACITY IS REQUIRED, MONITOR BOTH AMMETERS FOR POSSIBLE OVERLOAD. TURN OFF ALL NON-ESSENTIAL ELECTRICAL EQUIPMENT. IT IS PREFERRED THAT THE DEFECTIVE GENERATOR BE TURNED OFF.

Figure 3-10 (Sheet 2 of 2)

ABANDONING THE AIRCRAFT.

Leave the aircraft as quickly as possible. Do not overlook necessary equipment or assigned duties. Hold ditching position until the aircraft comes to rest, then proceed as follows:

a. Crew members detailed to life raft removal will launch life rafts through the main cargo door and inflate.

b. Crew members and other personnel will leave through assigned escape exit and, upon emerging, inflate life jackets.

BAIL-OUT.

BAIL-OUT ALARM BELL

The following are the standard alarm signals for bail-out:

Three short rings ..... Prepare to bail out

One long ring ....Bail out

BAIL-OUT PROCEDURE.

When the decision has been made to abandon the aircraft in flight, the pilot will give a warning signal to "Prepare for bail-out." This signal will be three short rings on the alarm system, a verbal signal over the interphone/PA system. When all the crew members (and passengers, if carried) are ready, the pilot will be notified. When the pilot desires to have all on board abandon the aircraft, he will give a warning signal to "Bail out," which will be one long sustained ring, or a verbal signal over the interphone/PA system. In addition to the alarm signals, the pilot will give verbal warnings over the interphone. If passengers are carried, a crew member will brief them. Primary exit from the aircraft will be through the main cargo door, which can be jettisoned from the aircraft.

Pilot.

The pilot will:

a. Notify crew and receive acknowledgement. Ring alarm bell three short rings, or give verbal signal over interphone for crew members to perform all preparatory duties for bail-out. IFF/SIF - EMERGENCY.

b. Reduce the airspeed, if possible, to approximately 100 knots (115 mph) IAS.

c. Put aircraft on autopilot control.

d. Don an antiexposure suit and life vest if over water, adjust parachute.

e. Place alarm bell on continuous signal, give signal for "bail-out" over interphone/PA system.

f. After receipt of "All clear" signal from the co-pilot, the pilot will order him to bail out and will follow him out.

Co-Pilot.

The co-pilot will:

a. Acknowledge the pilot's bail-out instructions and adjust his parachute. Don an antiexposure suit and life vest if over water. Adjust parachute.

b. Transmit emergency voice signals.

c. Turn on landing lights (night only).

d. Assist pilot until bail-out signal is given.

e. Evacuate aircraft on the final bail-out signal.

Navigator (C-47 and R4D Series Aircraft).

The navigator will:

a. Acknowledge pilot's bail-out instructions, adjust his parachute, and don an antiexposure suit and life vest if over water.

b. Give final aircraft position report to the pilot, co-pilot, and radio operator.

c. Evacuate aircraft on final bail-out signal.

Radio Operator.

The radio operator will:

a. Acknowledge pilot's bail-out instructions.

b. Transmit distress signal and position report, and continue to do so until the final bail-out signal.

c. Don an antiexposure suit and life vest if over water, adjust parachute.

d. Screw down the transmitter key.

e. Evacuate the aircraft on final bail-out signal, taking code book and radio operator's flimsy (notebook).

light Mechanic or Steward.

The flight mechanic or the steward will:

a. Prepare passengers for bail-out.

b. Don an antiexposure suit and life vest if over water, adjust parachute.

c. Unlock door and kick down on the yellow emergency release latch at the main cargo door forward end and push the door from the aircraft.

WARNING

The person jettisoning cargo door will be secured to the interior of the aircraft fuselage.

NOTE

On some aircraft there is no provision for jettisoning the air stair door.

d. Control movement of passengers to main cargo door.

e. Bail out after all passengers have evacuated.

LOADMASTER.

The loadmaster will:

a. Monitor interphone.

b. Acknowledge pilot's order - verbal or 3 short rings on alarm bell.

c. Prepare passengers for bail-out.

d. Jump-door-pulled and secured on pilot's order.

e. Notify pilot - cabin prepared for bail-out.

f. Bail-out on signal after all passengers have evacuated.

OVERWATER RECOMMENDATIONS.

Bail-out is not recommended unless visual contact is made with adequate surface help. If no rescue vessels are in the vicinity, bail-out should be used only as a last resort because of the extreme difficulty of getting the crew together in the water. The life rafts offer survival and signaling equipment. In any but the warmest seas, a man will survive only a few hours if kept afloat by means of a life vest alone. Wearing an anti-expsoure suit will increase this time, but this still cannot compare with the length of time survival is possible in a life raft. If bail-out is required or decided upon, the following procedure is recommended:

a. If surface help is available, it is much easier for rescue crews to find and rescue 2 or 3 men at a time in a small area than to rescue 10 or more men strung out in a long line in the water. Always head the aircraft in a direction to allow the crew to drift into the course and just ahead of rescue vessel.

b. If surface help is not available, it is still important to keep the crew as close together as possible in the water. Individual members can aid each other, especially if some of them are injured. Most important of all, a group of life rafts is much easier to find than a single individual. This is true whether the search is from a surface vessel or from an aircraft. Therefore, inflated rafts should be jettisoned if possible. Then the aircraft should be flown in as tight a circle as conditions will permit, bailing out three or four men at a time, and then come around in relation to the other men or the surface vessel, before bailing out the other members. This will place the members as close as possible to the other men or the surface vessel.

c. As in ditching, try to plan the bail-out before the last minute. The pilot must warn the crew as soon as bail-out is decided upon. Give three short rings on the alarm bell, or warn the crew on the interphone and receive acknowledgements.

d. When the bail-out warning is given, crew members should check each other's equipment to insure that all straps and packs are properly secured and adjusted. Upon receiving the bail-out signal, crew and passengers will leave with the least possible delay, through the main cabin door, in accordance with the above procedure, or as prescribed by the pilot to cope with the particular emergency.

FUEL SYSTEM FAILURE.

VAPOR LOCK.

Vapor lock can cause malfunction of the fuel system when the fuel boils or when the fuel is supersaturated with air. The usual indications start with regular and rapid engine surging at high frequency, usually followed by an irregular surge of greater magnitude with extreme fuel pressure fluctuation. Vapor lock can be corrected by retarding the throttle and placing the fuel booster pump ON.

ELECTRICAL POWER SYSTEM FAILURE.

GENERATORS.

(See figure 3-10, Malfunctions of Multi-Generator D-C Electrical Systems.)

If there is no indication on one ammeter, but the other indicates a normal reading, make the following check.

If the switch for the malfunctioning generator is ON, turn it OFF and see whether the reading of the other ammeter increases. If it does, the trouble may be attributed to the instrument and the generator may be turned on again.

On aircraft with the priority bus system installed, if the bus priority relay disconnects the No. 2 bus system for any reason, the remaining generator will automatically supply power to the failed bus.

HYDRAULIC POWER SYSTEM FAILURE.

Failure of the normal hydraulic system will usually be indicated by the loss of both system pressure and of fluid in the sight gage on the hydraulic control panel.

NOTE

During flight when hydraulic units are being operated, the movement of fluid within the reservoir may draw the fluid from the level sight gage; however, when no hydraulic units are being operated, the fluid level in the sight gage will rise.

In the event of system failure place the controls of all hydraulically operated units in the OFF positions.

NOTE

The hydraulic fluid reserve of 3 quarts does not show on the sight gage.

WING FLAP EMERGENCY OPERATION.

If a loss of hydraulic pressure occurs and it is necessary to operate the wing flaps, move the wing flap lever to the desired position, actuate the hydraulic hand pump, then return flap lever to neutral.

LANDING GEAR SYSTEM FAILURE.

LANDING GEAR EMERGENCY EXTENSION.

1. Star valve - OFF - CP.
2. Landing gear lever - DOWN - CP.
3. Handpump - Operate the pump until the gear is down _ CP.
4. Landing gear lever - NEUTRAL - CP.
5. Warning lights - check green ON red OFF - CP.
6. Visual check - CHECKED - P, CP.
7. Landing gear latch lever - POSITIVE LOCK - CP.

CAUTION

Place latch lever in POSITIVE LOCK position only after the gear is down and normal pressure is indicated, since the spring lock action catch is locked closed in the POSITIVE LOCK position.

8. Warning horn - CHECKED (retard throttle) - P.

LANDING GEAR HYDRAULIC LINE FAILURE.

In the event of a complete line failure, the gear can be snapped down so that the latches will engage. Return the landing gear lever to NEUTRAL as soon as it is certain that the safety latches have engaged, so as to conserve all the fluid and pressure possible for wing flap and brake operation. If the above condition exists, the green landing gear warning light will go on when the lever is returned to NEUTRAL, but the pressure shown on the landing gear system pressure gage may fall rapidly to zero.

LANDING GEAR SAFETY LATCH FAILURE.

The aircraft may be safely landed whether or not the landing gear safety latches are engaged, providing the landing gear is fully down, the hydraulic system pressure is within limits and the landing gear lever is in the DOWN position. Pressure in the landing gear actuating struts is indicated on the landing gear pressure gage. The horn will continue to sound and the red light will stay on, since the switches are connected to the safety latch and landing gear lever. When landing under these conditions, the gear is held in the extended position by the pressure of the hydraulic fluid against the retracting strut pistons.

When the brakes are applied, the resulting rotative force will have a tendency to cause the gear to retract, moving the pistons up in the struts and resulting in an increased pressure in the landing gear downlines. To eliminate the possibility of a line failure due to the excessive rise in pressure caused by the piston moving up in the strut, the brakes should be used only if absolutely necessary. If the length of the runway necessitates the use of the brakes, apply them as lightly as possible and, in any event, limit the pressure applied to the brakes so that the pressure indicated on the landing gear pressure gage does not exceed 1500 psi.

LANDING WITHOUT HYDRAULIC SYSTEM PRESSURE.

A landing without fluid pressure would be necessary only in case of failure in the lines from the hand pump to the retracting struts. In this case, the landing gear down position latches will hold the gear in place, and a safe landing can be made. Move the landing gear lever to the DOWN position to allow as much fluid as possible to get into the actuating strut, and then zoom the aircraft as required to snap down the gear and engage the latches. Return the control handle to NEUTRAL. If the warning light is green, it indicates that the latches have engaged and a normal landing can be made.

BRAKE SYSTEM FAILURE.

If the pressure gage reads below 600 psi and the hydraulic system is connected to the operating engine, or if both engines are operating and the pressure gage reads below 600 psi, carry out the hydraulic braking operation with the aid of the hydraulic hand pump, leaving the star valve in the OFF position. The co-pilot should operate the hydraulic hand pump to supply pressure to the brakes. The pump handle will move each time the brakes are applied. About 50 pounds pull should be exerted on the pump handle continuously until the brakes are no longer required. When the brakes are hand-operated in this manner, no pressure will show on the gage. Apply the brakes with one steady application.

1. Star Valve - OFF.
2. Hydraulic Handpump - OPERATE.
3. Brake Pedals - STEADY APPLICATION.

LANDING GEAR FIRE.

Head aircraft into the wind and park. Maintain at least 2000 RPM on engine ahead of the affected landing gear. If fire causes the tire to explode, continue to maintain at least 2000 RPM. Explosion will not extinguish the fire. Shut down engines when fire equipment is in position to flight the fire. Evacuate the aircraft. First Officer: call tower for assistance. Wing flaps full down. On order from the Captain deplane with passengers on side of fuselage opposite from fire to a safe distance from the aircraft.