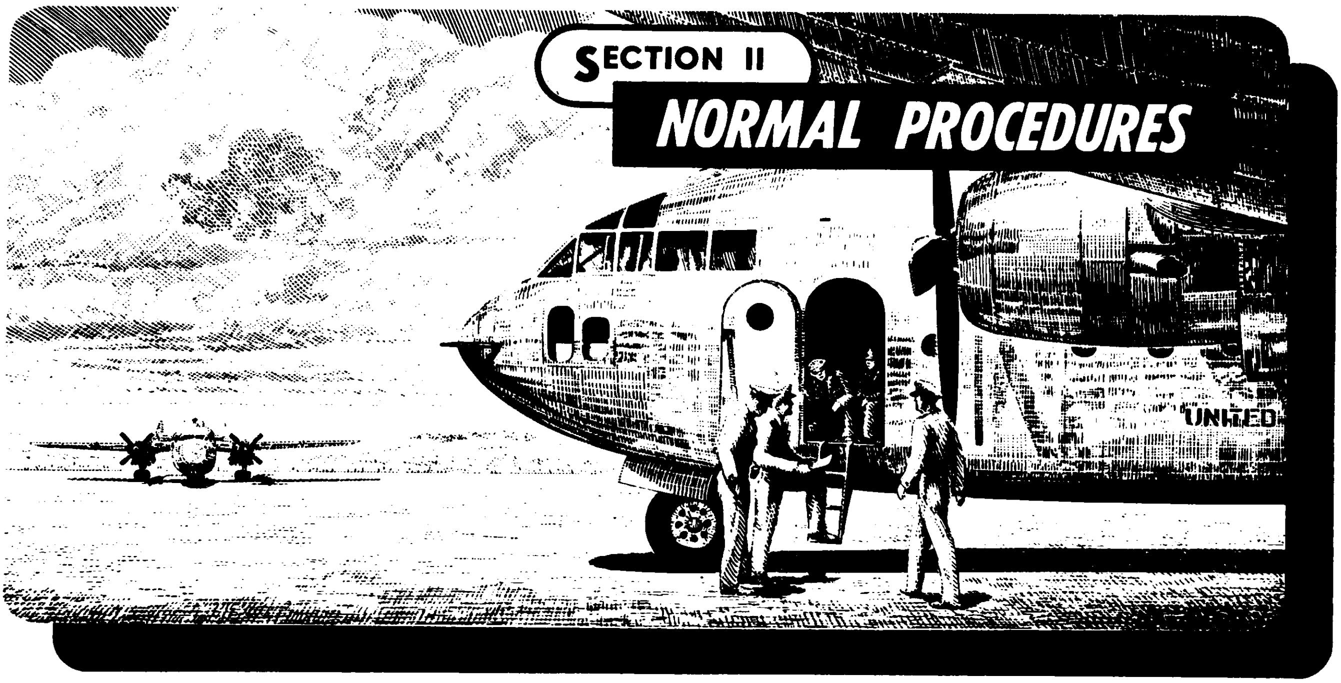


TABLE OF CONTENTS

Note

This section contains the steps of procedure to be accomplished from the time the airplane is approached by the flight crew until it is left parked on the ramp after completing one non-tactical flight under normal conditions. Sequence of phases and actions are arranged in the normal chronological manner so that crew members need not return to any portion of the airplane a second time for additional checks. All checks are made from left to right except where chronology must take precedence.

STATUS OF THE AIRPLANE.

FLIGHT RESTRICTIONS.

For flight restrictions and limitations imposed on the airplane, refer to Section V of this handbook.

FLIGHT PLANNING.

Determine the supply of fuel, airspeed, power settings, etc., necessary for the successful completion of the proposed mission by using the operating data contained in the Appendix of this handbook.

WEIGHT AND BALANCE.

Obtain take-off gross weight and loading data. From this and flight information, calculate anticipated landing gross weight and balance. Weight limitations are covered in Section V of this handbook. Refer to Handbook of Weight and Balance, T. O. No. 1-1B-40, for detailed loading information. A load adjuster slide rule (balance computer), provided with the airplane, supplements the data which may be obtained from the above-mentioned sources. It is the responsibility of the pilot to ascertain that the required payload has been properly loaded.

ENTRANCE.

Enter the airplane through the front entrance door in the forward left side of the fuselage by means of the metal hook ladder normally stowed above the front entrance door. Entrance may also be gained through the rear cargo doors which form the aft section of the

EXTERIOR INSPECTION *Diagram*

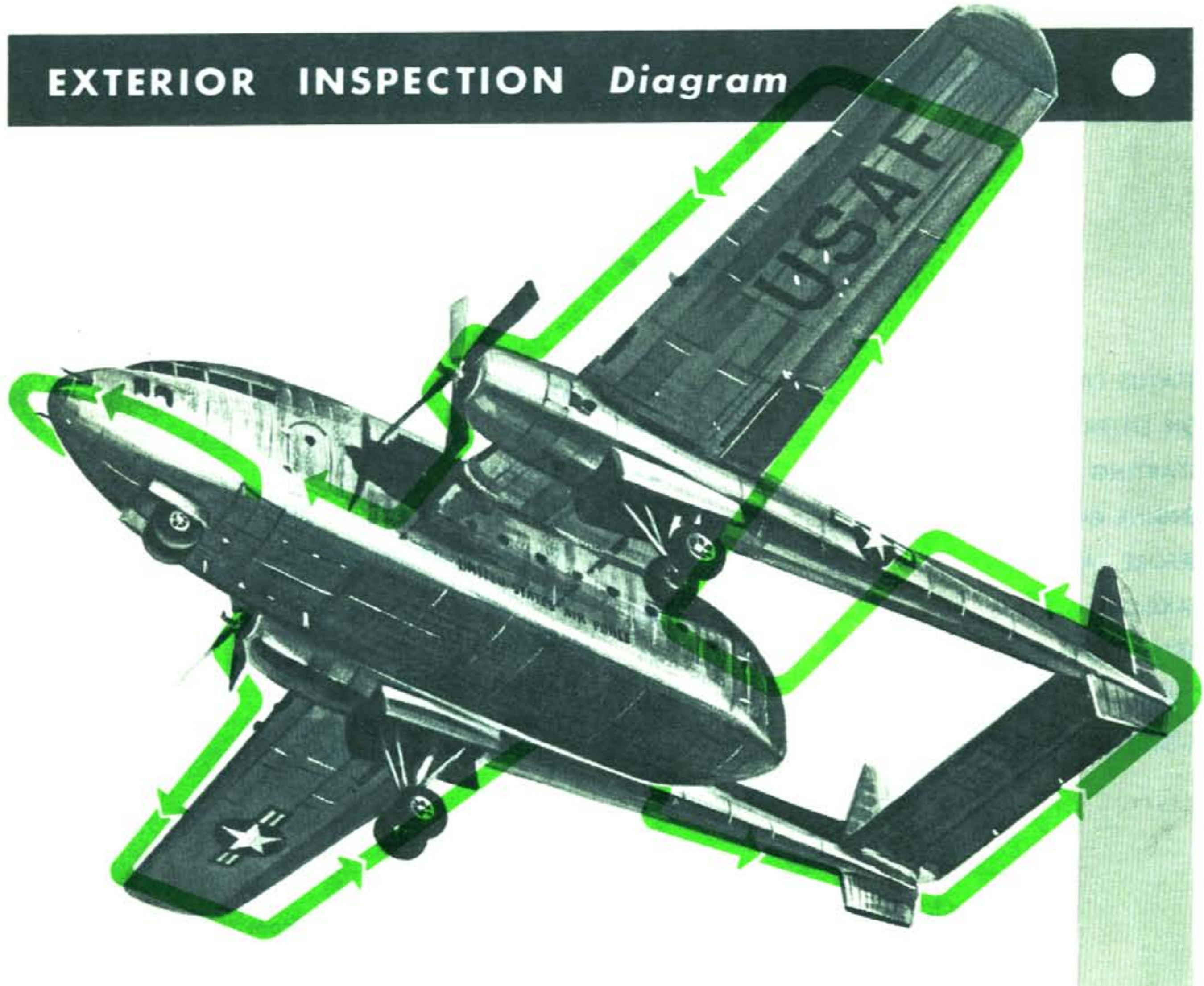


Figure 2-1

fuselage. Enter the crew compartment through the entrance way located on the left side of the cargo compartment forward bulkhead.

BEFORE EXTERIOR INSPECTION.

Prior to the exterior inspection, the following pre-exterior inspection safety check should be made:

1. Check DD Form 781, Form F, and publications.
2. Check hydraulic pressure.
3. Landing gear switch—DOWN.

CAUTION

The landing gear switch should be kept in the DOWN position during all ground operation.

4. Emergency landing gear switch—OFF.
5. Ignition switches—OFF.
6. Battery switch—ON.
7. Trim tabs—NEUTRAL.
8. Check oil quantity.
9. Cowl flaps—OPEN.
10. Battery switch—OFF.

EXTERIOR INSPECTION.

Visually examine exterior of airplane in accordance with Figure 2-1, Exterior Inspection Diagram.

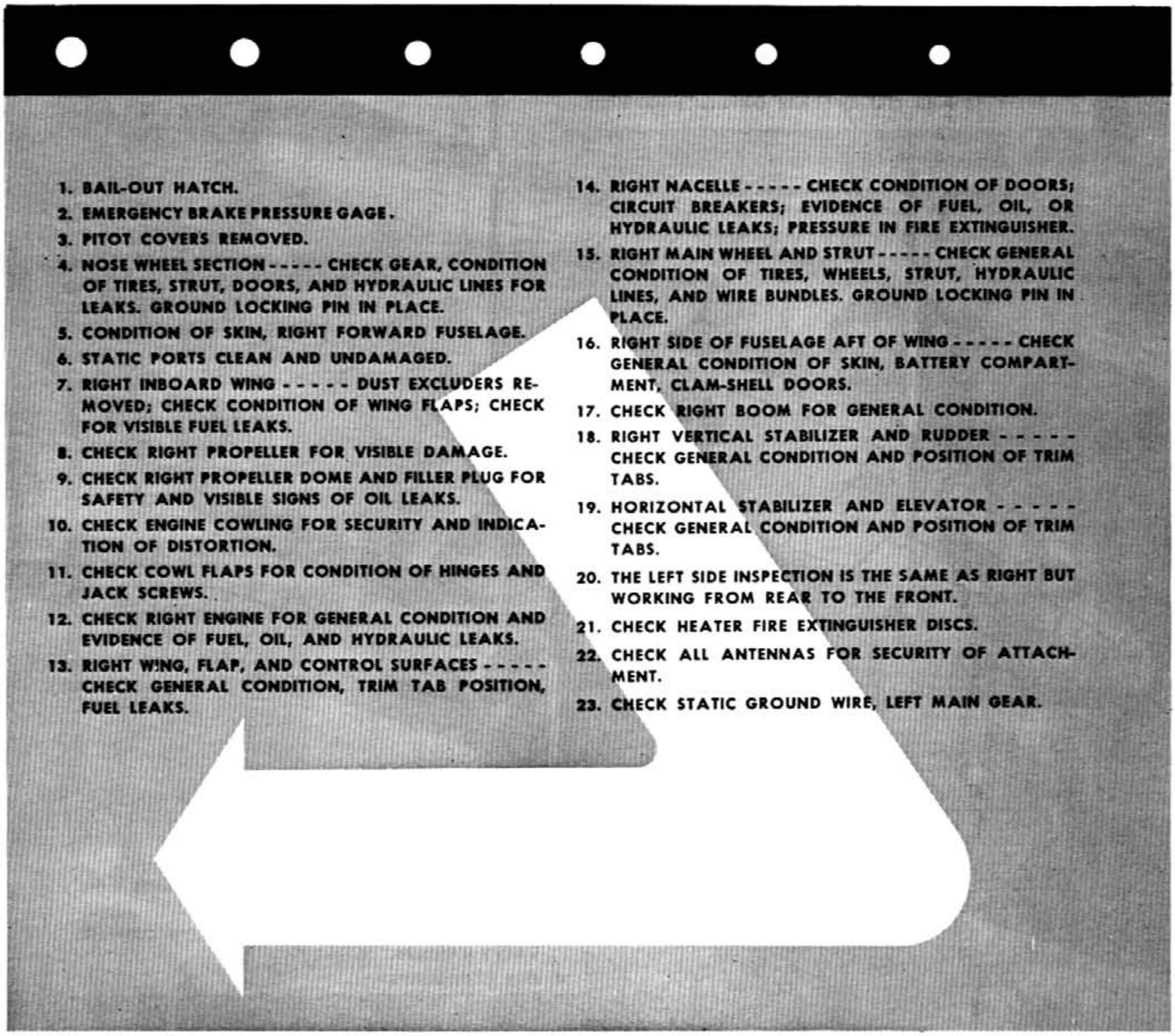
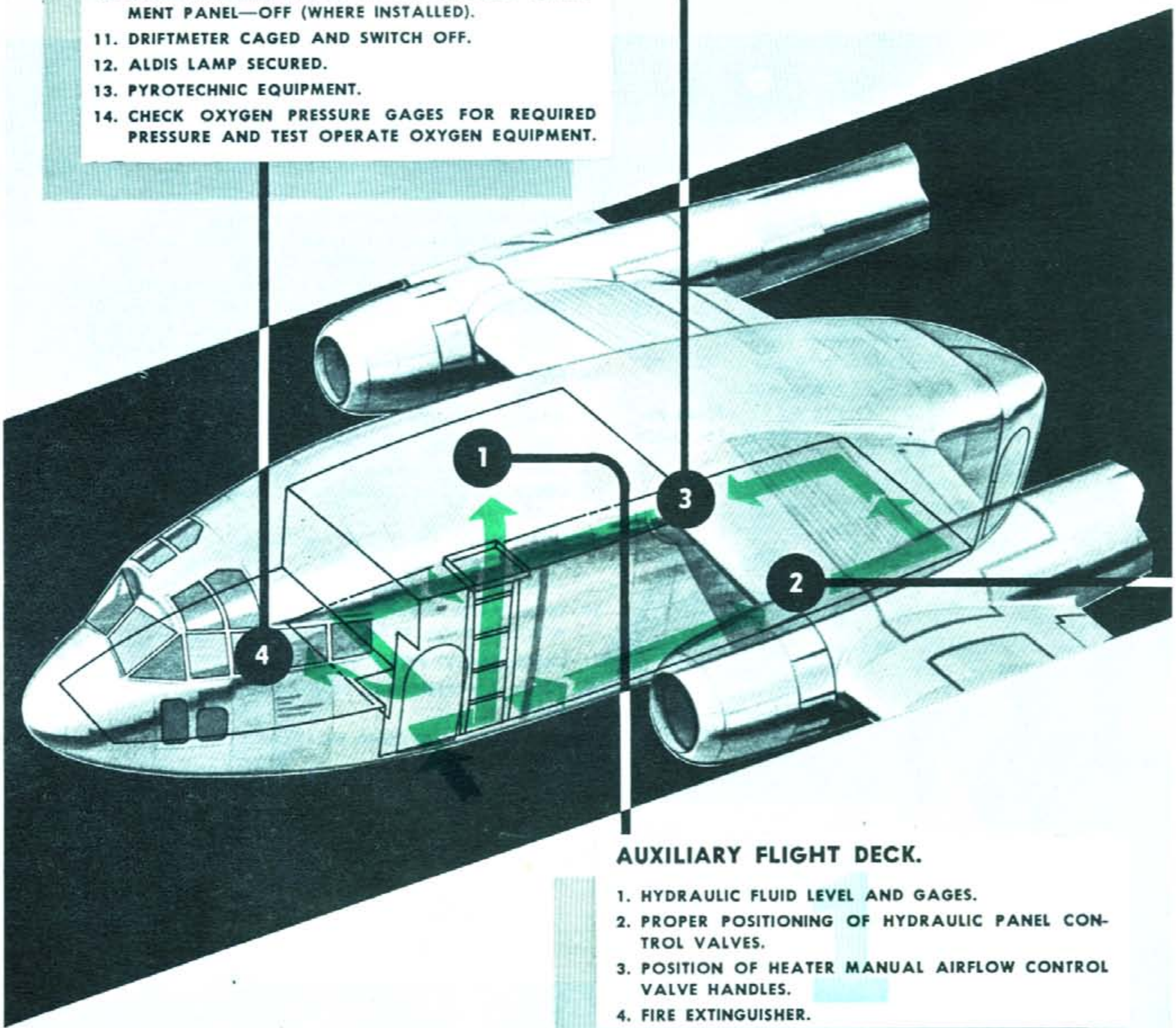


Figure 2-1

INTERIOR INSPECTION *Diagram*

CREW COMPARTMENT.

1. CHECK CIRCUIT BREAKERS ON EMERGENCY BUS (WHERE INSTALLED).
2. CIRCUIT BREAKER PANEL IN RADIO JUNCTION BOX.
3. BAIL-OUT HATCH SECURED AND SAFETIED.
4. EMERGENCY HAND AXE.
5. FIRST AID KITS.
6. SAFETY OF LIFE RAFT RELEASE HANDLE.
7. OVERHEAD HATCH SECURED AND SAFETIED.
8. MONITOR BUS SWITCH—NORMAL (WHERE INSTALLED).
9. POSITIONING OF CIRCUIT BREAKERS ON MONITOR BUS JUNCTION BOX (WHERE INSTALLED).
10. SPARE INVERTER SWITCH ON NAVIGATOR'S INSTRUMENT PANEL—OFF (WHERE INSTALLED).
11. DRIFTMETER CAGED AND SWITCH OFF.
12. ALDIS LAMP SECURED.
13. PYROTECHNIC EQUIPMENT.
14. CHECK OXYGEN PRESSURE GAGES FOR REQUIRED PRESSURE AND TEST OPERATE OXYGEN EQUIPMENT.



AUXILIARY FLIGHT DECK.

1. HYDRAULIC FLUID LEVEL AND GAGES.
2. PROPER POSITIONING OF HYDRAULIC PANEL CONTROL VALVES.
3. POSITION OF HEATER MANUAL AIRFLOW CONTROL VALVE HANDLES.
4. FIRE EXTINGUISHER.

Figure 2-2 (Sheet 1 of 2 sheets)

CARGO COMPARTMENT—RIGHT SIDE.

1. CLAM SHELL DOOR.
2. PARATROOP DOOR - - - - - CHECK FOR PROPER POSITIONING, SAFETYING AND LUBRICATION OF THE PARATROOP DOOR RELEASE HINGES AND PIN ASSEMBLIES.
3. LOADING JACK.
4. PUSH TEST JUMP LIGHTS.
5. AERIAL DELIVERY CLUTCH RELEASE HANDLE IN ENGAGED POSITION.
6. RIGHT OVERHEAD DITCHING HATCH FOR SAFETYING AND SECURITY OF ATTACHMENT.
7. CHECK CARGO FOR PROPER TIEDOWN, AVAILABILITY OF SPECIAL EQUIPMENT AND PROPER STOWAGE OF LOOSE EQUIPMENT.
8. FIRST AID KITS.
9. PROPER POSITIONING OF CIRCUIT BREAKERS ON MAIN JUNCTION BOX.
10. GUST LOCK EMERGENCY RELEASE VALVE IN NORMAL POSITION (where installed).
11. AUXILIARY FUEL SELECTOR VALVES IN PROPER POSITION.
12. RED ARM MONORAIL STOP SWITCH IN THREE O'CLOCK POSITION (Unless monorail is to be used).
13. CHECK BRAKE SYSTEM GAGE FOR HYDRAULIC PRESSURE.
14. CHECK CIRCUIT BREAKERS ON NOSE JUNCTION BOX.
15. CHECK BRAKE CONTROL VALVE FOR LEAKS.

CARGO COMPARTMENT—LEFT SIDE.

1. FORWARD ENTRANCE DOOR EMERGENCY LATCH PIN - - - - - IN PLACE.
2. CHECK CARGO FOR PROPER TIEDOWN, AVAILABILITY OF SPECIAL EQUIPMENT AND PROPER STOWAGE OF LOOSE EQUIPMENT.
3. LIFE RAFT RELEASE HANDLE FOR SAFETYING.
4. FIRST AID KITS.
5. FIRE EXTINGUISHERS.
6. LEFT OVERHEAD DITCHING HATCH FOR SAFETYING AND SECURITY OF ATTACHMENT.
7. LOADING JACK.
8. PUSH TEST JUMP LIGHTS.
9. POSITION OF CIRCUIT BREAKERS ON OVERHEAD AND SIDE JUNCTION BOXES.
10. PARATROOP DOOR - - - - - CHECK FOR PROPER POSITIONING, SAFETYING, AND LUBRICATION OF THE PARATROOP DOOR RELEASE HINGES AND PIN ASSEMBLIES.
11. CLAM SHELL DOOR.

Figure 2-2 (Sheet 2 of 2 sheets)

ON ENTERING THE AIRPLANE.

On entering the airplane, accomplish all checks prior to STARTING ENGINES.

INTERIOR CHECKS.

Accomplish interior checks in accordance with figure 2-2.

BEFORE STARTING ENGINES.

The following checks will be accomplished to ascertain that systems either are or have been checked by the air crew.

1. Exterior and interior check complete.
2. DD Form 781, Form F and publications . . . checked.

Note

Make certain that the airplane has been serviced with proper quantities of fuel, engine and APP oil, hydraulic oil, and water injection supply. (Refer to Servicing Diagram, Figure 1–25.)

CAUTION

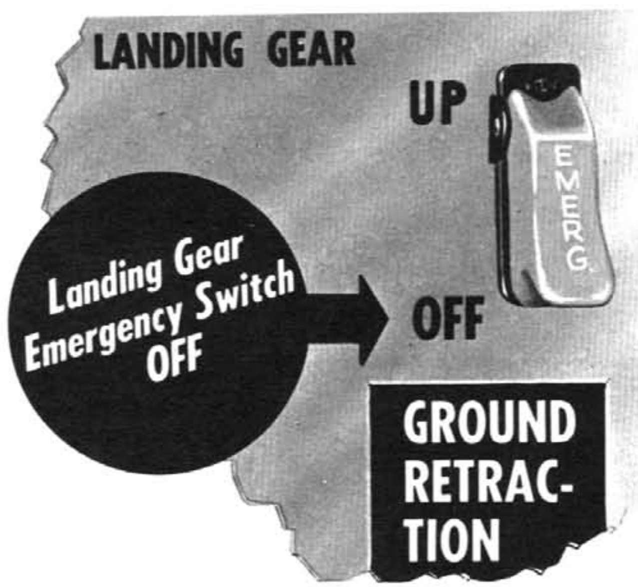
The alternate fuel permitted is 100/130. Refer to Section V for Operating Limitations.

3. Landing gear ground locking pins in place.
4. Dust and pitot tube covers removed.
5. Hydraulic fluid level—checked.
6. Driftmeter—caged and switch OFF.
7. Spare inverter switch (navigator's instrument panel)—OFF.
8. Seats, rudder pedals, safety belts, shoulder harnesses—Adjusted.
9. Auxiliary power plant IDLE, if external power is not available. (On some airplanes battery switch must be ON to start APP. Make certain engine ignition switches are OFF, emergency landing gear switch is OFF, and landing gear switch is DOWN.

Note

If external power is not available, the auxiliary power plant should be used. Refer to Section IV for starting procedure of this unit. Use of APP is to be considered a secondary source of power.

10. APP generator—RESET, then OFF. (Battery switch OFF, if used.)
11. Flight controls—unlocked. Check visually for free and correct movement.
12. Communications equipment switches—OFF.
13. Automatic pilot power switch—OFF.
14. Landing lights—OFF.
15. Fuel booster pump switches—OFF.
16. Carburetor air control switches—COLD.
17. Superchargers switches—LOW.
18. Cowl flaps open—check visually.
19. Wing flaps—UP.
20. Mixture controls—IDLE CUT-OFF.
21. Propeller controls—INCREASE RPM.
22. Water injection switches—OFF.
23. Throttles—3/4" to 1-3/4" open.
24. Alarm bell—check operation.
25. Air brake pressure—checked.
26. Parking brake—set.
27. Radio altimeter—OFF. (Where installed).
28. Windshield wipers—PARK and OFF.
29. Hydraulic pressure—Check.
30. Landing gear control switch—DOWN.
31. Emergency landing gear switch—OFF.



32. Copilot's vertical gyro—uncaged.
33. Emergency power switch—Check operation, then turn to OFF.
34. Brake pressure reservoir oil level indicating rod—maximum extension 3/4".
35. Overhead hatch and bail-out chute—Secured and safetied.
36. Circuit breakers—Checked at all locations.
37. All heater switches—OFF.

38. All anti-icing and de-icing switches—OFF.

39. All light switches—OFF.

40. Battery and ignition switches—OFF.

41. Generator switches—ON.

42. Oil cooler exit flap switches—AUTO.

43. Inverter switches—OFF.

44. Fuel selector switches.

a. OUTBOARD on airplanes having vapor return lines to outboard tanks.

b. INBOARD on airplanes having vapor return lines to inboard tanks.

45. Fuel, oil, and hydraulic shut-off switches—NORM.

46. Fire extinguisher switches—OFF and safetied.

INTERIOR CHECKS (MONORAIL MISSIONS).

For detailed check refer to Section VII.

INTERIOR CHECKS (HEAVY DROP MISSIONS).

For detailed check refer to Section VII.

STARTING ENGINES.

The following procedure should be employed when starting engines:

1. Note field barometric pressure on manifold pressure gages before starting as reference for power and ignition system checks.

2. Battery switch—OFF (ON, if external power is not used. If external power is available, connect at this time).

3. Auxiliary power plant—RUN. Auxiliary power plant generator switch—ON. (APP OFF—if external power is used.)

4. Check lights for night flight.

5. Fire guard—posted.

Note

Make certain ground personnel are provided with fire-fighting equipment. For fire-fighting procedures refer to Section III.

6. Wheel chocks in place.

7. Perform propeller static feathering check as follows:

a. Move the propeller control lever to the FEATHER position and visually note that the blades move approximately 10° toward the feather position.

b. Immediately return the propeller control lever to the full INCREASE RPM position and note that the propeller blades return to the low pitch (high rpm) position. This check should be accomplished as rapidly as possible since propeller motion is very fast.

Note

This check can be made only if the accumulator is at least partially charged. If the blades do not change angle, it will be necessary to hydraulically charge the accumulator before the feathering mechanisms can be fully checked. Refer to HYDRAULICALLY CHARGING THE ACCUMULATOR, Section VII.

c. In the event the blades fail to return to the low pitch (high rpm) angle setting when the propeller control lever is moved to the INCREASE RPM position, it will be necessary to hydraulically charge the accumulator. Refer to HYDRAULICALLY CHARGING THE ACCUMULATOR, Section VII.

8. Starter switch—ON, right or left as required. (Normally the right engine will be started first.)

9. Clear the engine, pulling the propeller through eight blades with continuous starter operation.

CAUTION

Energize the starter continuously until two complete revolutions of the propeller are made. Maintain contact with the observer for reports of propeller movement. If any indication of hydraulic lock is noted, discontinue starting procedure. Do not crank engine continuously over any period greater than 1 minute to prevent overheating of starter. Allow starter to cool for at least 1 minute after 1 minute of continuous cranking.

10. Ignition switch—BOTH.

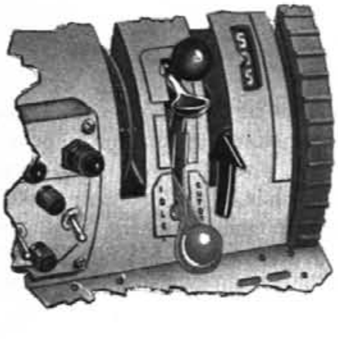
11. Fuel booster pump switch—NORMAL ON.

12. Prime continuously until engine speed stabilizes at 1200 rpm.

Note

Do not use mixture control to prime engine. These engines can be operated up to approximately 1700 rpm on prime alone.

13. Mixture control—RICH, after engine is running smoothly on prime.



CAUTION

The mixture control should be moved smoothly at all times. An engine tending to become "overloaded" may often be saved by placing the mixture control back in IDLE CUT-OFF and, without hesitation, returning the mixture control to RICH.

14. Primer switch—OFF.

Note

Transition from prime to carburetor operation should be made before disengaging prime to prevent backfire.

15. Spare inverters—ON.

Note

The main and spare inverter switch and main and spare instrument inverter switch will be turned to SPARE immediately after the engine is running.

16. Adjust throttle to 1000 rpm, watching oil pressure for indication of rise.

Note

If oil pressure does not register within 10 seconds, or reach 40 psi within 20 seconds, stop engine and investigate.

17. Fuel booster pump switch—OFF.

18. Fuel pressure—Check.

19. Hydraulic pressure—Check.

Note

Wing flaps are extended and raised to check operation of hydraulic pump. Properly functioning hydraulic pump will immediately restore the pressure to normal operating range. Flaps will be permitted to travel through complete cycle prior to reversing direction of the flap mechanism. This procedure must be observed to prevent damage to the flap linkage.

20. Start remaining engine as above.

21. Spare inverters—OFF, main inverters—ON.

22. Auto pilot inverter—ON.

Note

Check that inverter failure lights remain off.

23. Instruments—check for desired range.

24. Landing gear ground locking pins and wheel chocks removed.

CAUTION

If external power has been used for starting engines, disconnect and remove same at this time. Then turn on battery switch. Start APP and place APP generator switch in ON position if take-off is to be accomplished under instrument flight and/or night conditions. If APP has been used for starting and is not to be used for takeoff (day VFR conditions), idle for five minutes; then turn OFF.

25. Communications equipment switches—ON.

ENGINE GROUND OPERATION.

The airplane engine should always be warmed up on the ground until proper lubrication for engine operation is assured. As soon as the engine is started, oil pressure permitting, and hydraulic pump having been checked, the throttle should be adjusted to smoothest speed, approximately 1200 rpm. Warm-up at this speed will assure best possible operation, since adverse conditions will have least effect at this speed.

CAUTION

Do not attempt to warm-up engines more quickly by closing cowl flaps, as damage to ignition wiring or excessive cylinder head temperatures may result.

The ground operation of each engine must be held to a minimum. Engines should be run only when it is necessary to perform the required checks, and should be shut down if running unnecessarily during a prolonged check of another engine. Head the airplane into the wind when ground operation for an extended period of time is anticipated.

DURING WARM-UP.

1. Fuel and oil quantity—checked.
2. Carburetor air control switches—COLD, or as required.
3. Throttles—1200 rpm.
4. Fuel tank selector switches—Check operation.

Note

This is performed by observing increase in fuel pressure on both engines with both booster pumps on EMERGENCY ON. Turn left fuel tank selector switch to CROSSFLOW and observe momentary decrease in left fuel pressure reading. Turn left fuel tank selector switch to remaining tank and observe momentary fluctuation in fuel pressure reading. Return fuel selector switch to OUTBOARD for take-off. Check right tank selector switch as above. Return booster pumps switches to OFF position.

5. Electrical system—Check voltage.

Note

By using the dc voltmeter and voltage selector switch, the voltage output of each engine generator will appear on the dc voltmeter; the output of the engine generators should be 28 volts (if engine speed is over 1000 rpm). If the APP is being utilized, APP generator should indicate a reading of 27 volts. The ac voltmeter and associated voltmeter selector switch on the instrument panel provide a similar check on the voltage output of the inverters.

CAUTION

Do not attempt to adjust voltage by use of copilot's voltage regulator rheostats. This is to be accomplished only by qualified personnel except as stated in Section III.

6. Wing flaps and cowl flaps—Check operation.
7. Check elevator, aileron and rudder trim tab actuating mechanisms for normal unrestricted operation and set for take-off.
8. Fire detector system and warning lights—Test operate all.
9. Check propeller de-icing - - - - - Required whenever icing conditions are anticipated.

   a. Propeller control levers—INCREASE RPM.

   b. Throttles—1600 RPM.

   c. Turn on propeller de-icing switch, observing propeller de-icing ammeters on the instrument panel to see that the system is functioning correctly as outlined in Section IV.

CAUTION

A 2-minute operation period is required to permit the 15-second on-off cycling of the system. Refer to propeller de-icing, Section IV, for operational period on the ground.

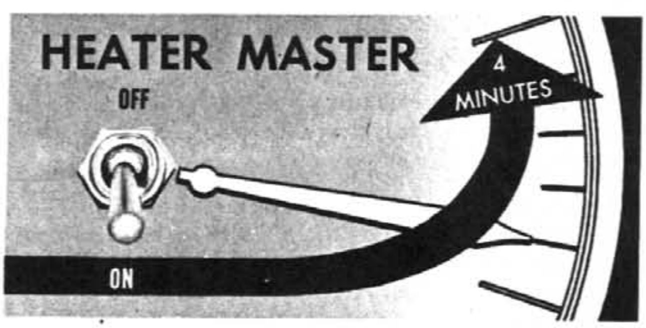
10. Check heating and anti-icing system (when required).

   a. Throttles—1200 RPM.

   b. Start all heaters.

   c. Check all heating and anti-icing systems except engine accessory heat. Observe wing and tail anti-icing indicators for temperature rise. (For detailed operation of heating system, refer to Section IV.)

   d. Turn heaters OFF and leave master heater switch ON for four minutes to allow heaters to cool.



11. Check operation of communication equipment by communicating with control tower, and operation of interphone equipment by calling each station. Consult radio operator and navigator concerning operation of all radio and radar equipment. (For operation of communication equipment, refer to Section IV.)

12. Check automatic pilot system. The following procedure is recommended for a pre-flight check of the automatic pilot:

CAUTION

Assure that flight controls locks and gust locks are disengaged prior to checking operation of the automatic pilot system.

a. Turn automatic pilot power switch ON and allow at least two minutes to warm up.

b. Cage attitude gyro and check for proper response of attitude and flux gate gyro during caging cycle.

Note

It is impossible to engage automatic pilot until the caging cycle has been completed and gyros are erected.

c. Center the turn-control knob in its detent position. Also center pitch-trim control and bank-trim adjustment.

d. Neutralize flight controls.

e. Depress clutch engage switch.

f. Place turn control knob in left turn position and check that controls move in proper direction. Repeat in right turn position.

g. Check automatic pilot trimming controls.

h. Disengage automatic pilot by employing servo clutch switch and check copilot's disengage button.

i. Re-engage automatic pilot by pushing servo clutch switch; then check copilot's disengage button.

j. Re-engage automatic pilot and pull out servo clutch switch, checking that auto pilot becomes disengaged.

13. Ignition switch safety check—Throttles—700 rpm. (Perform this check as rapidly as possible to prevent backfire when the ignition is turned on again.) Ignition switches from BOTH to LEFT to RIGHT to OFF momentarily, then back to BOTH. A slight drop in rpm when operating on each set of spark plugs and complete cutting out of the engine in the OFF position indicates proper functioning of the ignition switches.

Note

If the engine does not cease firing during this check, it is an indication that the magneto ground wire is open at some point and any subsequent ignition check will be unreliable. Caution personnel to keep clear of the propeller after engine has been shut down until the difficulty has been corrected.

14. Manifold pressure purge valve check.

a. Throttles—700 RPM.

b. Depress purge valves noting that manifold pressure increases to approximately field barometric pressure.

c. Release purge valves and note that manifold pressure returns to previous setting.

Note

Do not operate purge valves except when engines are idling. Only when the manifold pressure is less than atmospheric pressure, will the moisture or foreign matter in the lines be drawn into the engine.

15. Propeller reversing check.

CAUTION

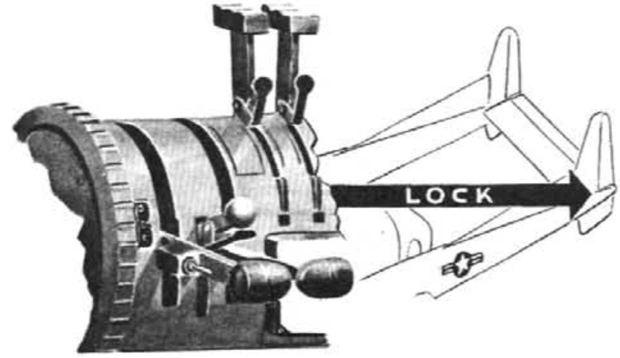
Do not run propellers in reverse pitch for an extended period since the engine cylinder head temperature indicators will not give a true indication and extreme temperatures may result.

a. Propeller control levers—INCREASE RPM.

b. Throttles—CLOSED.

Note

When throttles are moved into the reverse pitch range, the elevator lock will engage and remain engaged until the propellers are unreversed and throttles are advanced to approximately 38 in. Hg. manifold pressure. Ailerons and rudders are still free and should be restrained.



c. Raise throttles over the reversing cams and apply power with a steady movement until the desired reverse thrust power is attained.

d. Check throttle synchronization in reverse range.

CAUTION

Make certain automatic pilot is disengaged when propellers are reversed, since it imposes unnecessary loads on the flight control system.

e. To unreverse, advance throttles forward into the normal operating range.

TAXIING.

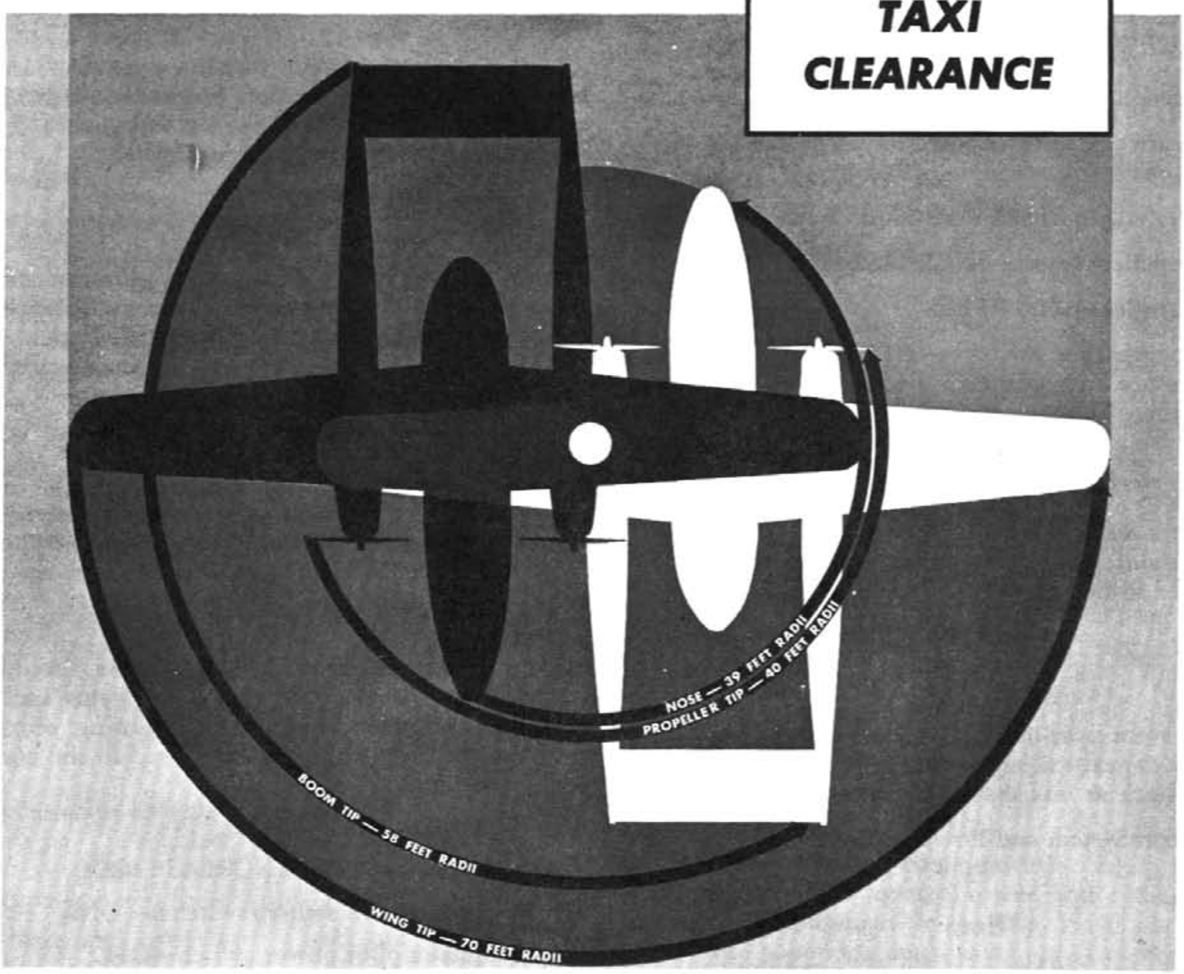
1. Parking brake—OFF.

2. Prior to movement of the airplane, taxi clearance should be checked. For turning clearance dimensions refer to figure 2-3. Control of the airplane during taxiing is accomplished by a steerable nose gear in conjunction with brakes and differential power. The steering mechanism is operated by turning the pistol grip-type handle installed at the pilot's station. The nose gear, due to its castering effects while in motion, returns to neutral when the steering load is released and becomes inoperative when there is no weight on the nose gear. An indicator above the steering control handle shows the degree of nose gear swivel and should be checked for operation while taxiing. When movement of the airplane is started, check brake pedals and parking brake. Apply gently to avoid violent braking action.

CAUTION

On slippery surfaces, ice or snow, taxi with brakes and engines only since a more positive control is provided by the increased tire contact area of the main wheels. Do not use nose wheel steering. However, observe nose gear position before take-off run is started to make certain it is centered.

TAXI CLEARANCE



Refer to TURNING LIMITATIONS, Section V.

Figure 2-3

3. Hydraulic pressure—Check frequently during taxiing.

4. Controls—Hold firmly to prevent surfaces from striking limit stops. Elevator gust locks may be engaged if necessary.

5. Gyro flight instruments—observe operation.

ENGINE RUN-UP.

1. Propeller Functional Check

a. Propellers—INCREASE RPM.

b. Throttles—1600 RPM.

c. Move propeller control levers to full DECREASE RPM and note mimimum rpm to be within 1200-1400 rpm.

Note

Some propellers will oscillate when the control is placed in the extreme low rpm range. Engine speed variations up to 150 rpm are acceptable below 1600 rpm. From 1600 to 2000 rpm, speed variations of 30 rpm or less are acceptable.

d. Return propeller control levers to INCREASE RPM and check for a reading of 1600 rpm.

2. Supercharger Clutch Operation Check.

a. Propellers levers—INCREASE RPM.

b. Throttles—1600 RPM.

c. Supercharger switches—HIGH. A fluctuation in oil pressure and an increase in manifold pressure indicates that the blowers have shifted to high ratio.

d. Advance throttles to obtain 30 in. Hg. manifold pressure.

e. Move supercharger switches to LOW. A decrease in manifold pressure indicates that the blowers have shifted to LOW ratio.

Note

To prevent over-heating of the clutch plates, do not repeat the supercharger clutch operation check at less than five-minute intervals.

3. Ignition System and Power Check.

Note

During this check the engine should accelerate smoothly with no tendency to backfire with normal throttle movement.

a. Propeller levers—INCREASE RPM.

b. Throttles—Set to obtain field barometric pressure as noted before starting engines.

c. Check that rpm reads approximately 2150-2275 rpm, and all instruments are within desired range.

d. Place ignition switch in L position and observe rpm.

Note

It is essential that all readings be allowed to stabilize between ignition switch changes. This must not be construed to mean, however, that the engines will be allowed to operate on single ignition at this speed for an extended period of time as pre-ignition and/or detonation may occur. A period as long as 30 seconds is not considered excessive, but should not be exceeded.

e. Return ignition switch to BOTH position in order to stabilize speed.

f. Repeat this procedure with ignition switch in R position.

g. A drop of 30 rpm (4 psi torque pressure) or less when operating on one magneto is considered satisfactory provided no engine roughness is encountered.

Note

An increase in rpm on single ignition can and sometimes does occur on engines equipped with automatic spark advance mechanism. However, any increase over 10 rpm warrants investigation.

h. If unacceptable magneto check occurs, reduce rpm to 1200 and attempt to clear spark plug fouling as described in Section VII.

4. Carburetor heat control—check operation.

BEFORE TAKE-OFF.

Prior to take-off the following checks should be accomplished to ascertain that the systems immediately pertinent to take-off are functioning normally and that the flight controls are placed in the correct take-off settings.

1. Mixture controls—RICH.
2. Propeller controls—INCREASE RPM.
3. Water injection switch/switches—ON.
4. Automatic pilot power switch—OFF.
5. Trim tabs—Set for take-off.
6. Fuel booster pump switches—EMERG. ON.

7. Carburetor air control switches—COLD.
8. Supercharger switches—LOW.
9. Wing flaps—as desired.

Note

Use of wing flaps for take-off is not recommended for normal operation. The use of wing flaps will shorten the take-off run and improve climb over 50-foot obstacles, but will decrease the margin of safety for single-engine operation, due to the increase in drag.

10. Engine accessory heat switch—OFF.
11. Pitot heat switch—ON (if required).
12. Fuel selector switches:
    a. OUTBOARD on airplanes having vapor return lines to outboard tanks.
    b. INBOARD on airplanes having vapor return lines to inboard tanks.
13. Gyros—Reset and uncaged.
14. Instruments—Check for desired range.
15. Flight controls—Check for free and correct movement.

Note

Advance left throttle to 38-40 in. Hg. to release elevator gust lock.

16. Check that all crew members are at their stations, briefed and prepared for take-off.
17. Windows, doors and hatches—closed and secured.
18. Seats—secured.
19. Cowl flaps—TRAIL.

TAKE-OFF.

The following take-off technique, when employed, will produce the results stated in Appendix I. Refer to the Take-Off Distances Charts for take-off distance required by gross weight, wind velocity, density altitude and the percentage of deviation in engine power from sea level standard BHP. Also, refer to the appropriate Limit Take-Off Gross Weight Chart, Appendix I, for limiting take-off gross weight. Reference to the applicable Climb Chart will give best climbing speed with rate and time required for a specific climb as well as fuel consumption.

NORMAL TAKE-OFF.

Refer to Figure 2-4 for normal take-off procedure.

NORMAL TAKE-OFF.

1. Throttles as required to obtain full take-off power,

CAUTION

Manifold pressure and torque pressure should not be permitted to exceed take-off limits when using wet or dry take-off power. Application of power should be halted when either limit is obtained. Full forward throttle may result in power setting above the take-off limits.

2. Check engine instrument indications in desired range for expected power output.

4. To obtain take-off distances listed in Appendix I, allow nose gear to remain on runway until take-off speed is obtained.

3. During take-off roll, maintain directional control by use of nose gear steering for the initial part of the roll until rudder control is obtained.

5. Retract landing gear after safe altitude and airspeed has been attained, consistent with gross weight .

Figure 2-4

GROSS WEIGHT (pounds)	WING FLAPS UP		WING FLAPS TAKE-OFF	
	TAKE-OFF SPEED (CAS knots)	TO CLEAR 50 FT. (CAS knots)	TAKE-OFF SPEED (CAS knots)	TO CLEAR 50 FT. (CAS knots)
44,000	88	96	84	92
48,000	91	100	88	96
52,000	96	104	91	100
56,000	99	108	95	103
60,000	102	112	98	107
64,000	106	116	101	111
68,000	109	119	105	114
72,000	112	122	108	118
76,000	116	126	110	120
77,000	116	127	111	121

STANDARD TAKE-OFF SPEEDS—CARGO DOORS ON & OFF

Figure 2-5

MINIMUM RUN TAKE-OFF.

1. Set wing flaps lever to TAKE-OFF position.

2. Holding brakes, move throttles as required to obtain full take-off power.

CAUTION

Manifold pressure and torque pressure should not be permitted to exceed take-off limits when using wet or dry take-off power. Application of power should be halted when either limit is obtained. Full forward throttle may result in power setting above the take-off limits.

3. Perform high power take-off check, observing that engine instrument indication is in the desired range.

4. Release brakes, maintaining directional control by use of nose wheel steering until rudder control is obtained.

5. Allow nose gear to remain on runway until take-off speed is obtained as indicated in Take-off Speed Chart, figure 2-5.

6. With smooth action, raise nose gear off ground to obtain maximum take-off attitude.

7. Retract landing gear after becoming safely airborne and increase airspeed to "speed for best rate of climb."

8. When at safe airspeed and altitude, retract flaps.

OBSTACLE CLEARANCE TAKE-OFF.

1. Set wing flaps to TAKE-OFF position.

2. Holding brakes, move throttles as required to obtain full take-off power.

CAUTION

Manifold pressure and torque pressure should not be permitted to exceed take-off limits when using wet or dry take-off power. Application of power should be halted when either limit is obtained. Full forward throttle may result in power setting above the take-off limits.

3. Perform high power take-off check, observing that engine instrument indication is in desired range.

4. Release brakes, maintaining directional control by nose wheel steering until rudder control is obtained.

5. Allow nose gear to remain on runway until take-off speed to clear a 50-foot obstacle is obtained, as indicated in the Take-Off Speed Chart, Figure 2-5.

6. With smooth action, raise nose gear off ground to obtain maximum take-off attitude.

7. Retract landing gear after becoming safely airborne and maintain take-off speed until clear of all obstacles.

8. Upon clearing obstacles, increase air speed to "speed for best rate of climb" and retract flaps.

NIGHT TAKE-OFF.

Proceed with a normal take-off using landing lights if desired. On becoming airborne, assume a maximum safe angle of climb to avoid obstacles.

MAXIMUM PERFORMANCE TAKE-OFF SPEEDS

GROSS WEIGHT (pounds)	TAKE-OFF SPEED AND TO CLEAR 50 FT. CAS (Knots)	POWER-ON STALL SPEEDS * CAS (Knots)
44,000	71	69
48,000	74	72
52,000	77	75
56,000	80	78
60,000	83	81
64,000	86	84
68,000	88	86
72,000	91	89
76,000	93	91
77,000	94	92

Cargo Doors On or Off

WING FLAPS AT TAKE-OFF

Warning

Take-Off Speeds above are for MAXIMUM PERFORMANCE of the airplane and should be used only where absolute minimum take-off distances are required.

Accelerate on ground to take-off speeds as given above, using maximum Wet Power (3500 BHP at standard sea level conditions). Lift off and hold same speed over 50 foot obstacle.

** Power-on stall speeds above are based on 3200 BHP.*

Figure 2-6

CROSSWIND TAKE-OFF.

WIND

Normal procedure is to be followed for a crosswind take-off. However, upon becoming airborne, a crab should be initiated to maintain a straight ground path.

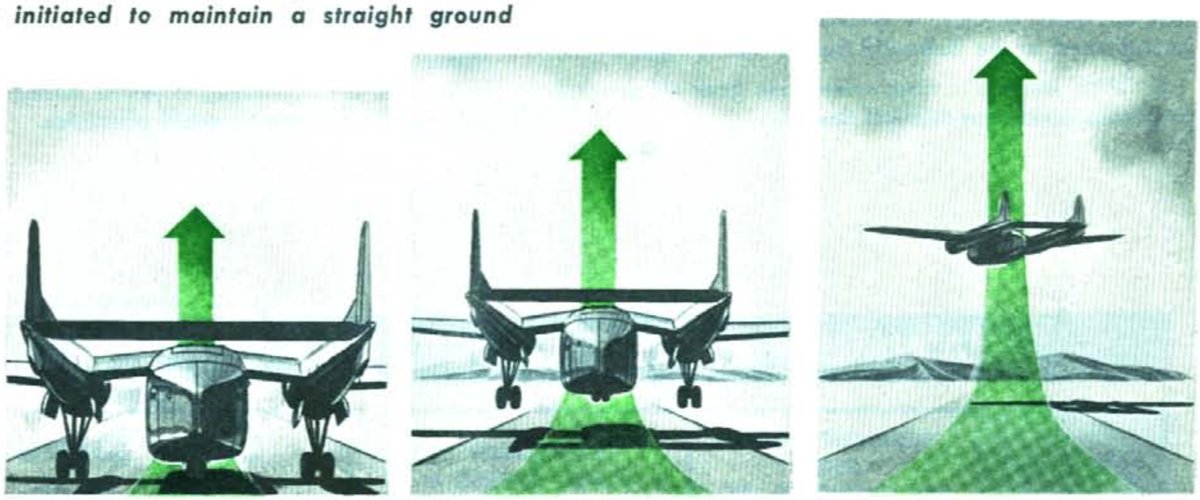


Figure 2-7

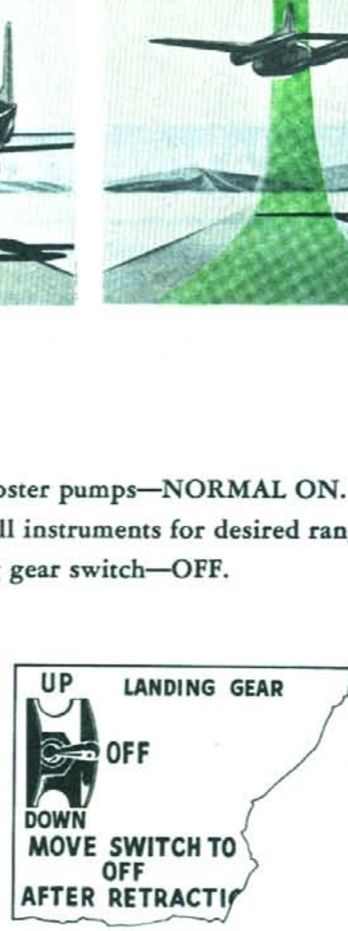
UNPREPARED RUNWAY TAKE-OFF.

It is recommended that the minimum run technique be employed for take-off from unprepared runways, thereby reducing the length and rate of travel over rough terrain to the minimum possible for take-off. To jump airplane into the air from a rough or muddy runway, full flaps may be extended during the take-off run. Flaps should be retracted from full down to take-off position as soon as obstacles are cleared. As soon as safe air speed is obtained, flaps may be fully retracted.

AFTER TAKE-OFF.

After take-off, the following procedure will be employed:

1. Landing gear switch—UP. (Approximate landing gear retraction time is 11 seconds).
2. Wing flaps lever—UP after reaching best climb speed.
3. Reduce power to maximum continuous (normal rated power).
4. Water injection—OFF.
5. Mixture controls—NORMAL (After the first power reduction).
6. Fuel booster pumps—NORMAL ON.
7. Check all instruments for desired range.
8. Landing gear switch—OFF.



Note

Only after the landing gear switch is in OFF do the gears drop into the uplock since hydraulic pressure holds the gear slightly above the uplock position.

9. Cowl flap switches—As required to maintain cylinder head temperatures within limits.
10. Auxiliary power plant—OFF after idling for five minutes (if used).
11. Adjust trim tabs as required.

CLIMB.

Refer to Climb Charts in Appendix I, this handbook, for information concerning climbing speeds, etc. Set cowl flap switches to TRAIL position as long as temperature remains within limits.

FLIGHT CHARACTERISTICS.

For information regarding flight characteristics, refer to Section VI.

SYSTEMS OPERATIONS.

Additional information on systems operation supplementing those described in Sections I and IV is available in Section VII.

CRUISE.

1. Fuel booster pump switches—OFF, or as required.
2. Cowl flaps—As required.
3. Mixture controls—NORMAL.
4. Instruments—Check for desired range.
5. Fuel management (Refer to Section VII).
6. Cruising mixture check (Refer to Section VII).

DESCENT.

Desired rate of descent can be obtained by the combination of airspeed and engine power setting; however, sufficient power to assure proper engine operation during an extended descent must be maintained. A minimum torque pressure of 75 psi will be maintained during extended descent. This is accomplished by using low rpm.

An increased rate of descent, if desired, may be obtained by lowering the landing gear and wing flaps to increase drag. However, descent with gear and flaps extended should not be made at an airspeed in excess of that indicated in Instrument Range Markings, Figure 5–1. Maximum airspeed permitted during descents with gear and flaps retracted, likewise, is indicated in the Instrument Range Markings by the limiting maximum dive speed. For power-off descents, refer to MAXIMUM GLIDE, Section III.

PRE-TRAFFIC PATTERN CHECK.

Refer to figure 2-8.

TRAFFIC PATTERN CHECK.

Upon entering the traffic pattern, the following action should be taken:

1. Notify crew and passengers to prepare for landing.
2. Driftmeter—OFF and caged.

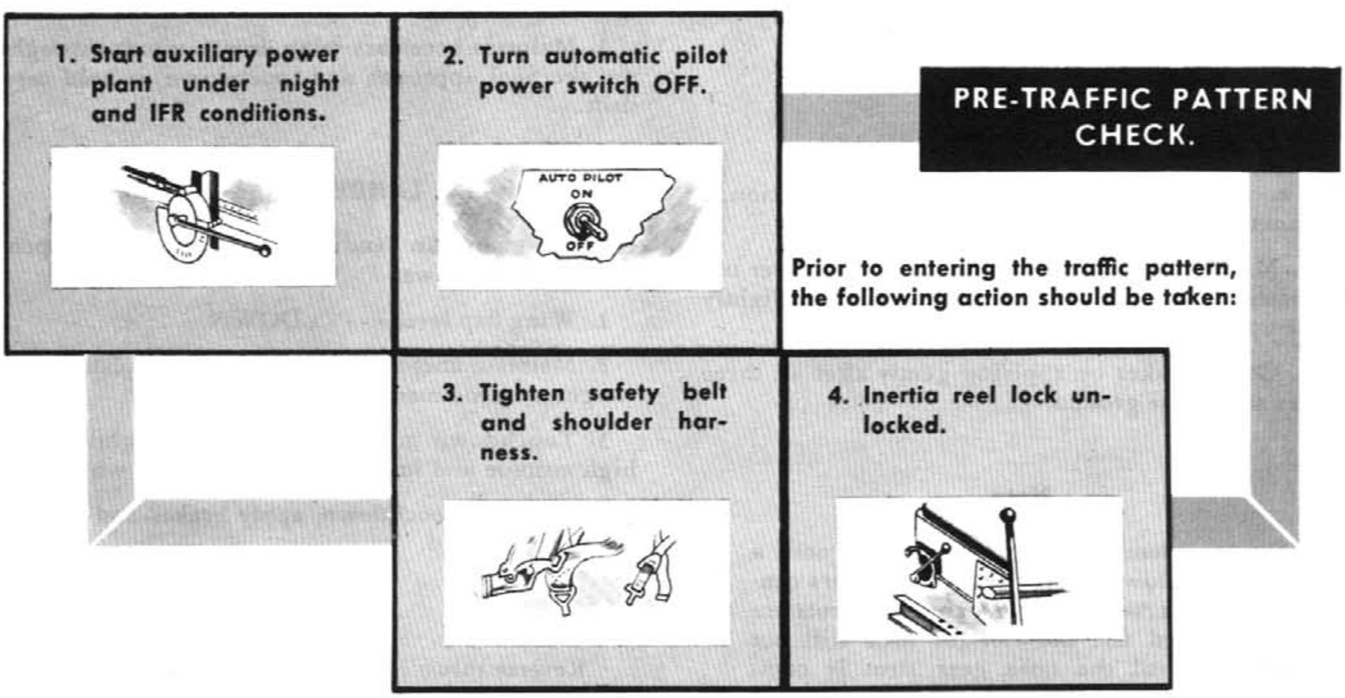


Figure 2-8

3. Fuel selector switches—OUTBOARD.
4. Fuel booster pumps—EMERGENCY ON.
5. Carburetor air switches—COLD or as required.
6. Supercharger switches—LOW.
7. Cowl flap switches—as required.
8. Propellers—2600 rpm.
9. Landing gear switch—DOWN.

Note

Check that green indicator lights come on. Also make a visual check that all gears are down and steering accumulator pin, where applicable, is properly extended.

10. Check high and low hydraulic pressure (depress brake pedals) and note fluctuation of low pressure hydraulic indicator.
11. Check instruments for desired range.
12. Turn all excess radio equipment off.
13. Wing flaps as required.
14. Mixture controls RICH on final approach.
15. Adjust power and attitude to assume recommended approach speed for the airplane gross weight (See Appendix I).

LANDING.

NORMAL LANDING. (SEE FIGURE 2-9).

On normal landing, the following course of action is recommended.

1. Make a gradual flare out and ease the power off. Contact the ground with main gear first in slightly nose-up attitude.
2. Check brakes by applying gently after all three gears are on the ground.

Note

Do not attempt to use reverse thrust until a full touchdown is made. The propellers cannot be reversed until the main gear struts are compressed and the elevator lock will not engage until the nose gear strut is compressed and throttles are moved to the reverse position.

3. Use reverse thrust as required (have copilot hold control wheel if reverse thrust is used).

Note

Reverse immediately upon nose wheel touchdown as reverse thrust is most effective during initial part of the landing roll. To minimize stress on the elevator and its control system when reverse thrust is used at the lower airspeeds, restrict reverse thrust operation to the initial part of the landing roll. When it is certain that brakes are adequate to stop the airplane within available runway length, return the throttles to the CLOSED position (forward thrust) and apply brakes.

CROSSWIND LANDING.

Crabbing method is not recommended for crosswind landing because of the high landing loads encountered on the main gears when contact is made. In general, it is extremely difficult because of inertia effect in this size aircraft, to time the corrective yaw action with the sinking and touchdown speed. The wing down method facilitates a very simple technique since angle of bank can be set up on final approach for zero drift and held through flare and touchdown transition. The following procedure is recommended as the most effective and safest method for making a crosswind landing with this airplane:

1. Use aileron and rudder to drop the up-wind wing.
2. Hold the nose of the airplane in line with the runway.
3. Maintain necessary wing down attitude throughout the final approach and touchdown to hold zero drift.

MINIMUM RUN LANDING.

For minimum run landing the recommended procedure is as follows:

1. Wing flap lever - - - - - DOWN.
2. Maintain final approach speed for airplane gross weight as recommended. See Appendix I.
3. Touchdown main gear first in a slightly nose-high attitude and immediately lower nose wheel.
4. After full touchdown, apply brakes and reverse thrust as required.

Note

Reverse thrust is most effective during initial part of landing roll. Reverse early and apply power as necessary during landing roll.

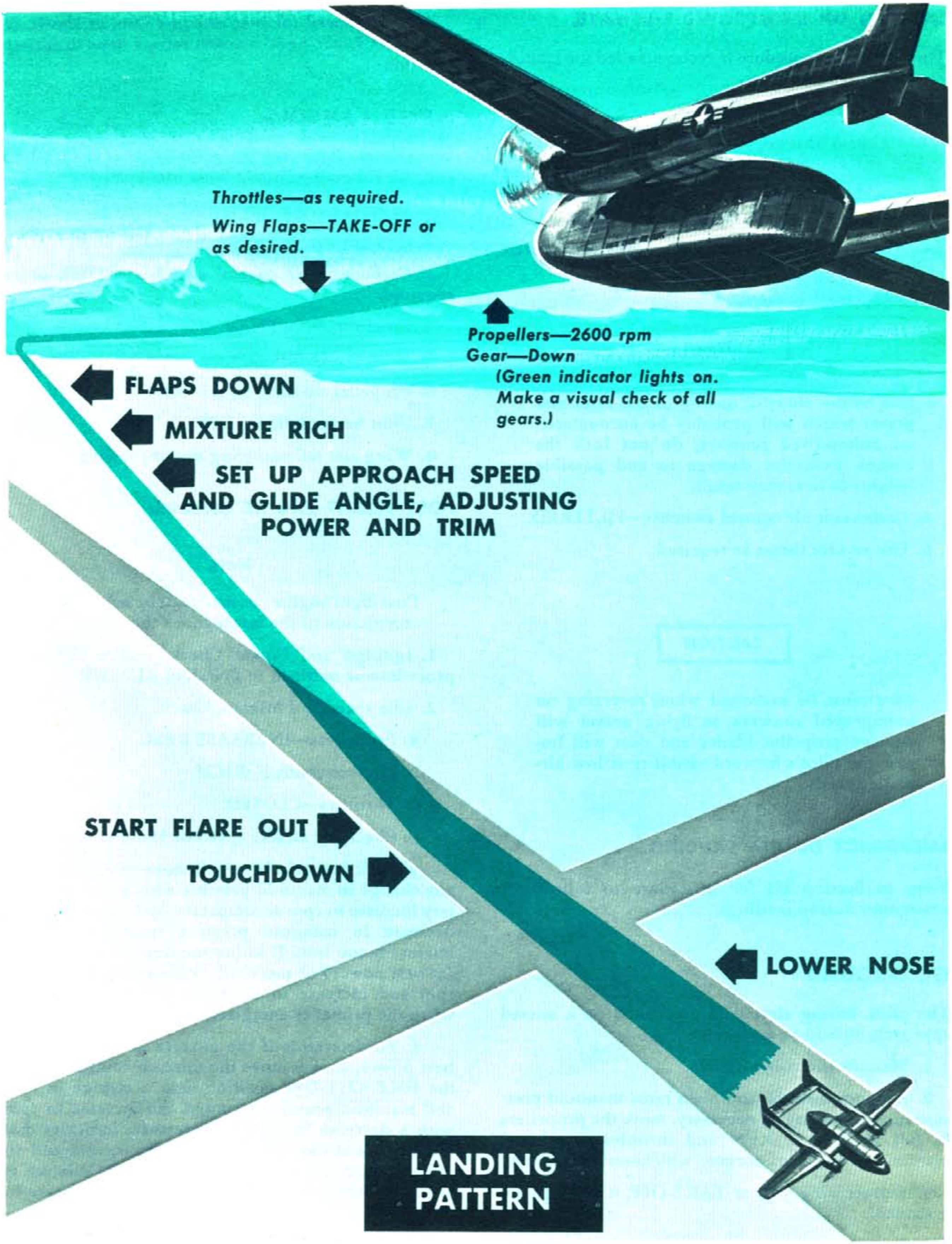

Throttles—as required.
Wing Flaps—TAKE-OFF or as desired.
Propellers—2600 rpm
Gear—Down
(Green indicator lights on. Make a visual check of all gears.)
FLAPS DOWN
MIXTURE RICH
SET UP APPROACH SPEED AND GLIDE ANGLE, ADJUSTING POWER AND TRIM
START FLARE OUT
TOUCHDOWN
LOWER NOSE
LANDING PATTERN

Figure 2-9

LANDING ON UNIMPROVED RUNWAYS.

The following procedure is recommended for landing on unimproved runways.

1. Wing flaps lever—DOWN.
2. Maintain final approach speed for airplane gross weight as recommended. See Appendix I.
3. Touch down main gear first in a slightly nose high attitude and immediately lower nose wheel.
4. After full touchdown, apply brakes as required.

CAUTION

Due to the abrasive quality of the sand and gravel which will probably be encountered on unimproved runways, do not lock the brakes. Excessive damage to and possible failures of tires may result.

5. Carburetor air control switches—FILTERED.
6. Use reverse thrust as required.

CAUTION

Care must be exercised when reversing on unimproved runways as flying gravel will damage propeller blades and dust will impair the pilot's forward visibility at low airplane speeds.

EMERGENCY DURING LANDING.

Refer to Section III for procedure to follow for emergency during landings.

GO-AROUND.

The pilot, having elected to go-around on a missed approach, should immediately:

1. Mixture controls—RICH.
2. Advance throttles to obtain rated manifold pressure for rpm setting. If necessary, move the propellers to full INCREASE RPM and throttles to take-off manifold pressure or torque, whichever comes first.
3. Retract wing flaps to TAKE-OFF, if full flaps are extended.
4. Retract landing gear. (Increased power and retracted gear will require nose-down trim).
5. When speed for best rate of climb, as shown in Appendix I, has been reached retract flaps to full up position.

AFTER LANDING.

Immediately following the completion of the landing roll, the following should be accomplished:

1. Propeller controls—INCREASE RPM.
2. Fuel booster pump switches—OFF.
3. Carburetor air control switches—COLD, or as required.
4. Cowl flaps—OPEN.
5. Wing flaps—UP.
6. Propeller de-icing switch—OFF.
7. Pitot heater switch—OFF.
8. Wing and tail anti-icing switches—OFF.

POST FLIGHT ENGINE CHECKS.

Note

Post flight engine checks are to be made upon completion of the last flight of the day.

1. Ignition and Power Check. Follow the same procedure as outlined in ENGINE RUN-UP.
2. Idle speed and Mixture Check.
    a. Propellers—INCREASE RPM.
    b. Mixture control—RICH.
    c. Throttles—CLOSED.
    d. Check for an idle speed of 550-650 rpm.
    e. Flick fuel primer switch momentarily and note any change in manifold pressure and rpm. A momentary increase in rpm accompanied by a corresponding decrease in manifold pressure indicates that the mixture is too lean. If idling mixture is either correct (at best power) or too rich, a momentary decrease in rpm and increase in manifold pressure will occur when the primer is energized.
    f. To determine if the mixture is too rich or at best power, slowly move the mixture control toward the IDLE CUT-OFF position until a change in rpm and manifold pressure is noted. An increase in rpm with a decrease in manifold pressure, indicates that the mixture is too rich. If a decrease in rpm and an increase in manifold pressure occurs, the mixture is at the desired best power setting. Return mixture to RICH.
3. Ignition switch safety check. Follow the same procedure as outlined in DURING WARM-UP.

STOPPING ENGINES AND SECURING AIRPLANE.

In shutting down the engines, employ the following procedure:

1. Parking brake—set.
2. Instrument and auto-pilot inverters—OFF.
3. Heaters—OFF. Ground blowers OFF after four minutes.
4. Idle engines at 550 to 650 rpm until cylinder head temperature drops to a maximum of 150°C or to a value consistent with existing atmospheric temperatures.
5. When a cold weather start is anticipated, dilute in accordance with the time-dilution percentage data given in Section IX of this handbook.
6. Idle two minutes below 700 rpm for engine oil scavenging before shutdown.
7. Mixture controls—IDLE CUT-OFF. (Right engine first)

Note

Do not move throttles when stopping engines since backfiring may occur.

8. Check left engine hydraulic pump.

Note

Wing flaps are extended and raised to check operation of hydraulic pump. Properly functioning pump will immediately restore the pressure to normal operating range. Flaps will be permitted to travel through complete cycle prior to reversing direction of the flap mechanism. This procedure must be observed to prevent damage to the flap linkage.

9. Ignition switches—OFF. (Only after engines are completely stopped).
10. All electrical switches—OFF. (Except generator; fuel, oil and hydraulic fluid shutoff switches; and battery switch).
11. Landing gear switch—DOWN.
12. Landing gear ground locking pins—in place.
13. Battery switch—OFF.
14. Generator switches—OFF.

Note

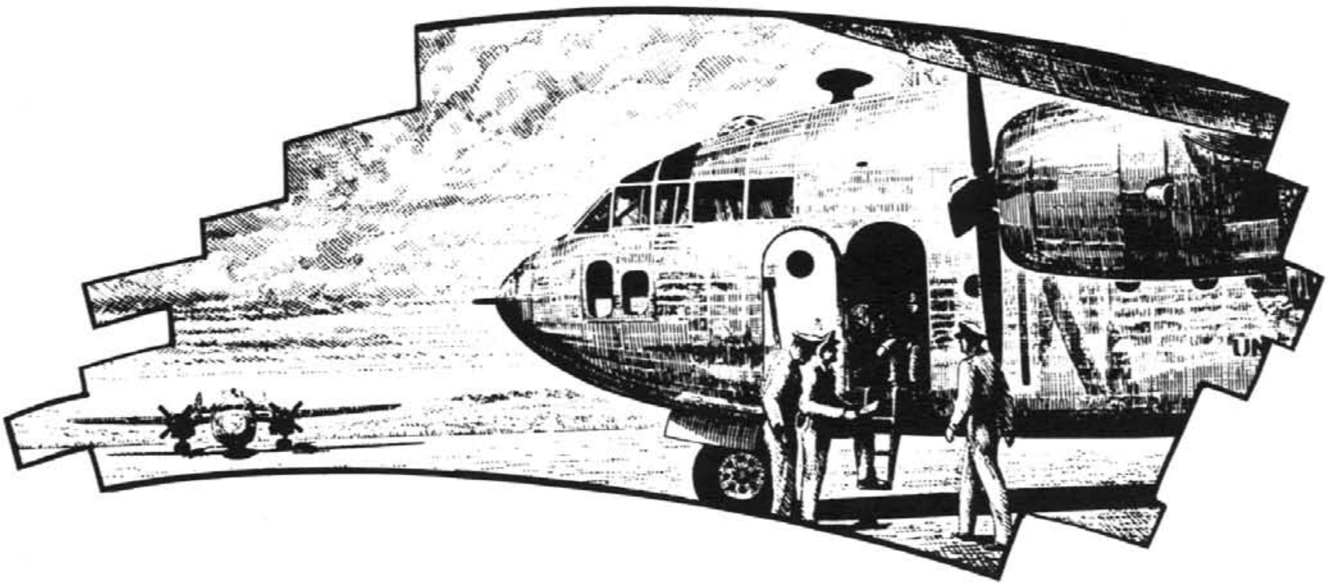
On emergency bus airplanes, the generator indicator lights will glow at any time the generator is not operating and the generator control switch is in the ON position. Placing the generator switches in OFF will turn off the lights and prevent a drain of battery power.

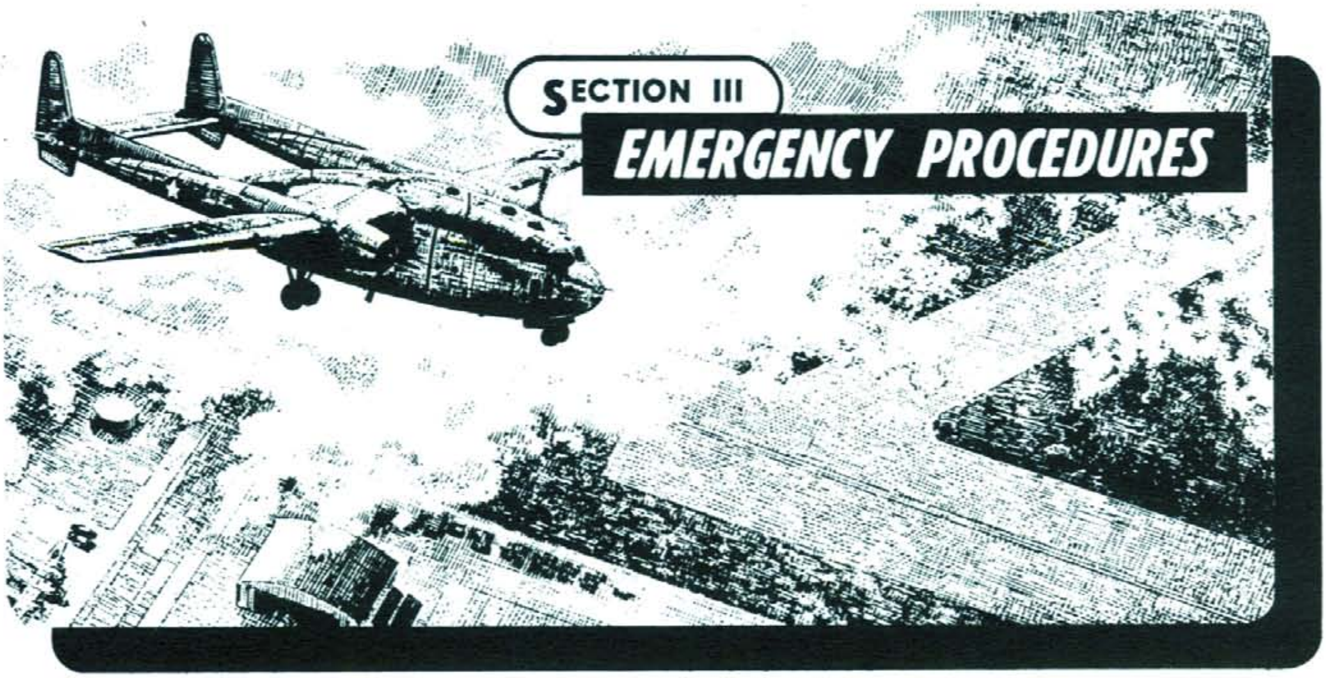
15. Flight controls—locked.

Note

Make certain that hydraulic gust lock has been released before engaging flight control lock.

16. Parking brake—OFF (After wheels are chocked).
17. Auxiliary power plant—OFF (After idling five minutes, if used).
18. Complete DD Form 781.
19. Install pitot covers and cover all openings if the airplane is to be idle for an extended period of time or if dusty conditions exist.





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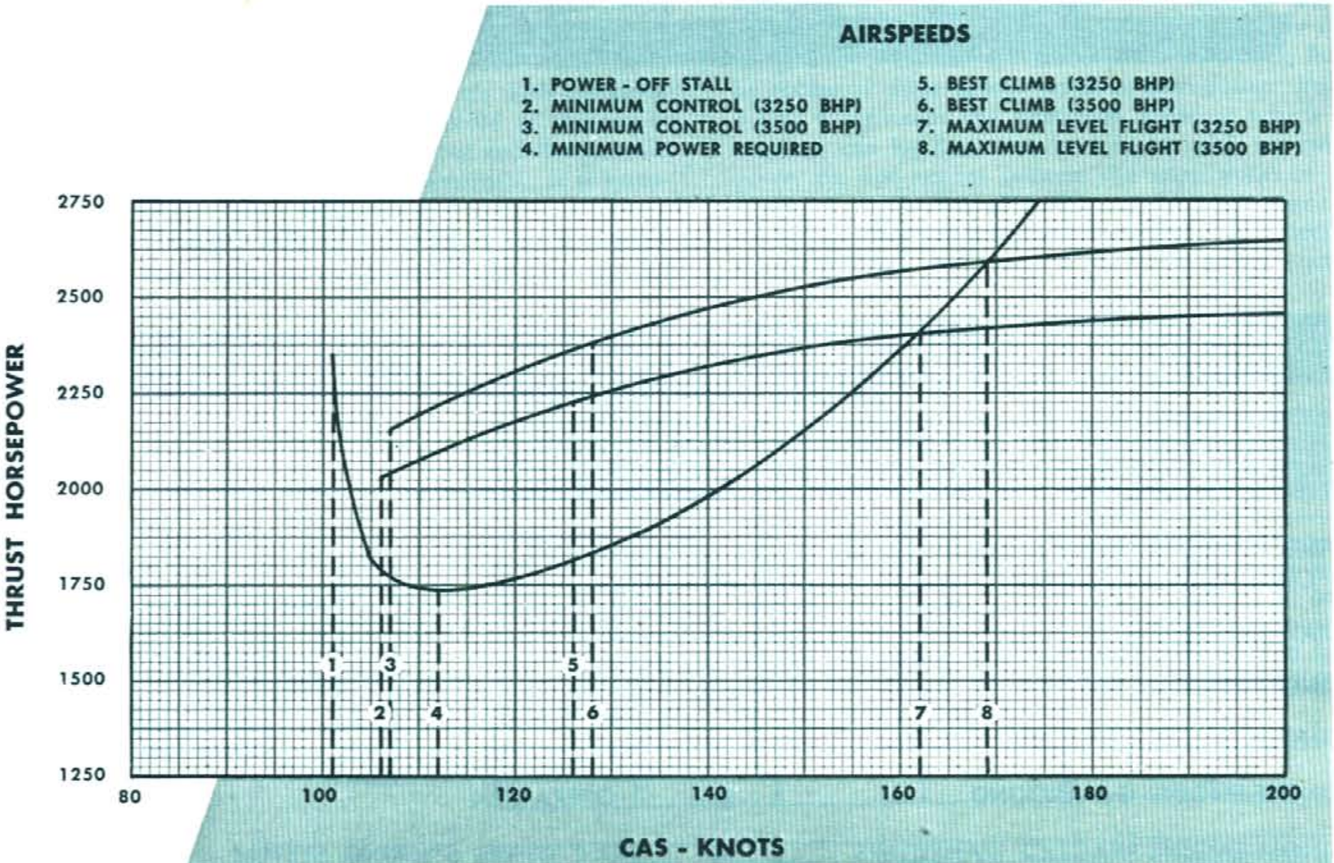
ENGINE FAILURE.

SINGLE-ENGINE FLIGHT CHARACTERISTICS.

No abnormal flight characteristics are encountered with one engine inoperative. As long as the recommended airspeeds are maintained, all normal flight maneuvers may be performed. With the rear cargo doors removed it will be more difficult to maintain the recommended airspeeds because of the increase in drag. Likewise, with the cargo doors on but with the paratroop doors open, an increase in drag will be particularly noticeable under single-engine conditions.

FACTORS AFFECTING SINGLE-ENGINE PERFORMANCE.

For any given aircraft gross weight, there are definite limits for both ceiling and rate-of-climb under partial power conditions. The pilot should compute these limits before take-off and adjust the airplane's gross weight to insure adequate single-engine performance in the event of a power plant failure. Numerous factors come into play to influence an airplane's performance under single-engine conditions. These include poor technique in reducing drag (such as failing to retract the landing gear and flaps, feather the propeller, or close the cowl flaps on the dead engine) as well as permitting the airspeeds to decrease too far by delaying the application of power on the good engine. Also of major importance are such mechanical items as proper fit of wheel nacelle doors, flaps, and all external inspection doors, as well as the general cleanliness of the aircraft's exterior surfaces. More important, however, is the requirement for reducing the drag of the windmilling propeller by feathering, a move which improves both performance and controllability. The application of full power on the good engine should not be delayed since adequate rudder power is available to offset this unsymmetrical thrust at airspeeds above 107 knots with a windmilling propeller and wings level. By executing a slight bank (5°) toward the good engine, directional control can be maintained above 102 knots with the propeller windmilling and above 99 knots with the propeller feathered.



SINGLE - ENGINE POWER REQUIRED AND AVAILABLE FOR CLIMB

STANDARD SEA LEVEL CONDITIONS 70,000 LB.

PROP FEATHERED **GEAR AND FLAPS UP**

DATA BASIS: FLIGHT TEST **DATA AS OF: MARCH 1955**

Figure 3–1

SINGLE ENGINE BEST CLIMB SPEEDS

CARGO DOORS ON

	GROSS WEIGHT (pounds)	SEA LEVEL CAS (Knots)	SEA LEVEL TAS (Knots)	5,000 FT. CAS (Knots)	5,000 FT. TAS (Knots)	10,000 FT. CAS (Knots)	10,000 FT. TAS (Knots)	15,000 FT. CAS (Knots)	15,000 FT. TAS (Knots)	20,000 FT. CAS (Knots)	20,000 FT. TAS (Knots)
MAX WET POWER	44,000	115	115	114	123	107	124	104	131	106	145
	55,000	120	120	120	129	113	132	110	138		
	66,000	126	126	127	136	121	141				
	77,000	132	132	134	144						
MAX DRY POWER	44,000	114	114	110	120	106	123	104	131	106	145
	55,000	119	119	117	126	112	131	110	138		
	66,000	124	124	123	132						
	75,900	128	128								

CARGO DOORS OFF

	GROSS WEIGHT (pounds)	SEA LEVEL CAS (Knots)	SEA LEVEL TAS (Knots)	5,000 FT. CAS (Knots)	5,000 FT. TAS (Knots)	10,000 FT. CAS (Knots)	10,000 FT. TAS (Knots)	15,000 FT. CAS (Knots)	15,000 FT. TAS (Knots)	20,000 FT. CAS (Knots)	20,000 FT. TAS (Knots)
MAX WET POWER	44,000	125	125	121	130	111	129	102	129	106	145
	54,000	125	125	121	130	111	129				
	64,000	125	125	122	131						
	73,000	128	128								
MAX DRY POWER	44,000	122	122	117	126	108	125	102	129	106	145
	54,000	122	122	117	126	109	127				
	64,000	122	122	119	128						
	69,700	123	123								

Figure 3–2

Gross Weight	Config-uration	Left Propeller	Right Bank	CAS Knots
54,000 lb.	Take-off	Windmilling	0°	107
54,000 lb.	Take-off	Windmilling	5°	102
54,000 lb.	Clean	Feathered	5°	99
180 LB. RUDDER PEDAL FORCE ASSUMED				
Data Basis: Flight Test Data As Of: December 1954				

Directional control is not adequate in the single-engine configuration below 107 knots CAS at sea level with one propeller feathered and maximum wet power on the remaining engine. All doors-on single-engine speeds quoted in the handbook are based on the yawing moment coefficient equivalent to the above condition. In order to provide adequate rudder trim for single-engine climb with maximum wet power at sea level, a low speed limit of approximately 125 knots CAS is recommended during cargo-doors-off operation. Accordingly, all doors-off single-engine cimb speeds quoted in the handbook are based on the yawing moment cofficient equivalent to this condition.

Probably the most important factor to be considered in single-engine operation is airspeed for this is not only the key to adequate control of the unsymmetrical power condition but the secret of maintaining the required altitude and/or establishing a positive rate-of-climb.

POWER REQUIRED AND POWER AVAILABLE.

To visualize the significance of airspeed, the pilot must understand some basic aerodynamics with respect to Power Required and Power Available curves. The curve shown in Figure 3-1 is for one condition only—the airplane being operated at a gross weight of 70,000 pounds, propeller of dead engine feathered, gear and flaps up, and maximum power developed under standard sea level conditions on the good engine. This curve shows thrust horsepower plotted against velocity in knots, with the curve labeled THP_R representing the thrust horsepower required and the curves marked THP_A denoting thrust horsepower available with the engine developing 3250 BHP (dry) or 3500 BHP (wet).

DERIVATION OF THE THRUST HORSEPOWER REQUIRED CURVE. The THP_R curve is a combination of the induced drag curve and the parasite drag curve. At low speeds where the wing angle of attack is high, the induced drag also is high. Thus the power required for flight is high, decreasing at higher speeds and lower angles of attack to a minimum at maximum velocity. The parasite drag (that which is caused by such items as fuselage, tail, and antennas) starts out at zero drag at zero velocity and increases with increased speed, with maximum power required at maximum velocity. By adding the induced drag and the parasite drag factors, the THP_R curve is obtained. It is essential the pilot understand that the minimum power required for flight under the conditions stated is at the speed corresponding to that shown at the lowest point of the THP_R curve, with increased power again being required at both the higher and lower velocities.

THRUST HORSEPOWER AVAILABLE CURVES.

Two THP_A curves appear in Figure 3-1. The upper curve shows maximum power available when the water injection system is used. The lower curve indicates maximum power available when water injection is not employed. These curves slope upward with increased velocity, indicating that the usable thrust horsepower increases with speed while a constant brake horsepower is maintained but never attains the equivalent of the brake horsepower. This increase may be attributed primarily to variations in propeller efficiency.

OPERATING TECHNIQUES DERIVED FROM SINGLE-ENGINE POWER REQUIRED AND AVAILABLE CURVES.

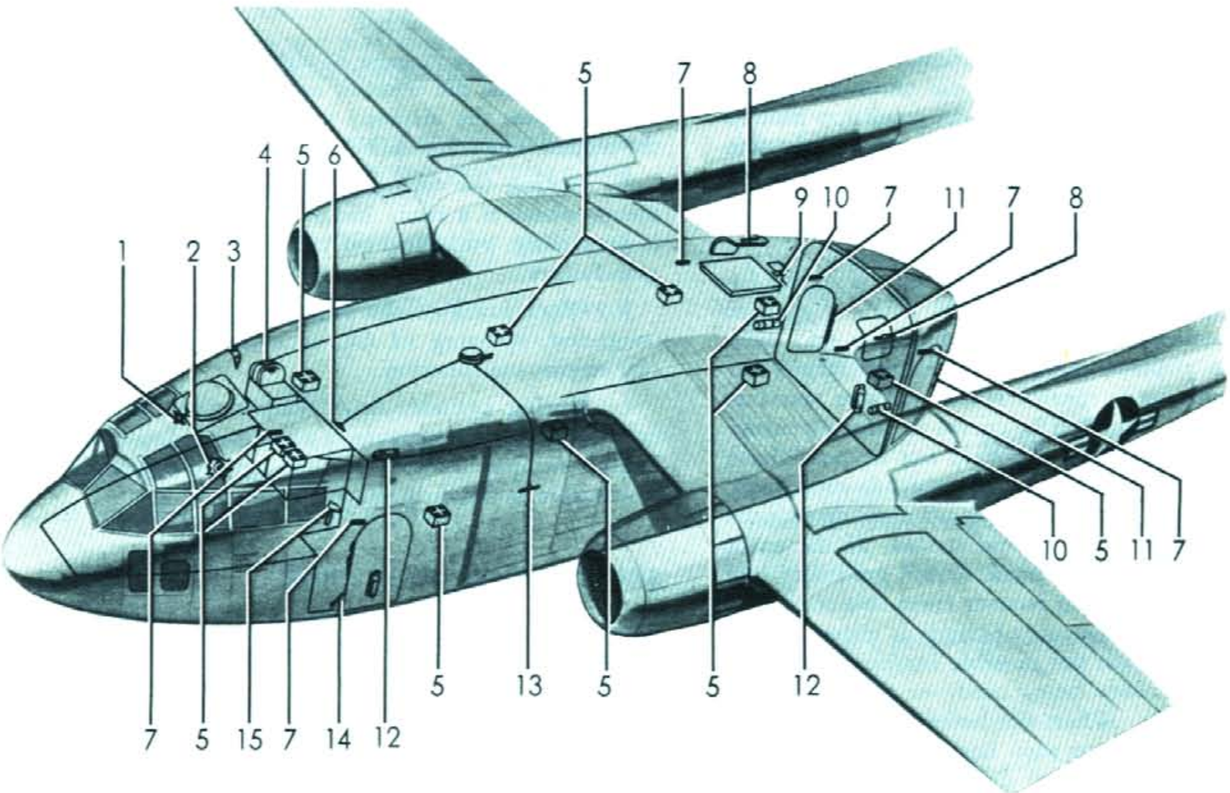
In Figure 3-1 points 7 and 8 at which the THP_R and THP_A curves intersect represent the maximum velocity which can be obtained in level flight with one engine operating at full power (3250 BHP or 3500 BHP). Above these speeds the power required is greater than the power available and the airplane cannot be flown in excess of these speeds without descending. Points 3 and 4 represent the minimum speed at which the airplane can be flown in level flight with maximum power on one engine because the application of full rudder is required to offset the single-engine yaw condition and maintain direction control. At velocities shown between the minimum shown at points 3 and 4

SINGLE ENGINE BEST CRUISE SPEEDS

		SEA LEVEL		5,000 FT.		10,000 FT.	
		CAS—Knots	TAS—Knots	CAS—Knots	TAS—Knots	CAS—Knots	TAS—Knots
Cargo Doors On	44000	121	121	119	128	113	132
	48000	124	124	120	130	112	131
	52000	125	125	122	132	114	133
	56000	123	123	124	134	119	139
	60000	123	123	128	138	127	148
	64000	128	128	132	142	140	163
	68000	137	137	137	148		
	72000	146	146	147	158		
	74000	149	149				
Cargo Doors Off	44000	113	113	111	120	112	130
	48000	115	115	110	119	113	132
	52000	116	116	116	125	116	135
	56000	122	122	125	135	119	139
	60000	131	131	134	144	122	142
	64000	139	139	141	152		
	68000	145	145				

Figure 3–3

EMERGENCY EQUIPMENT DIAGRAM



1. ASTRODOME RELEASE HANDLE
2. FLARE CHUTE
3. PYROTECHNIC PISTOL MOUNT
4. PYROTECHNIC STOWAGE
5. FIRST AID KITS
6. LIFE RAFT RELEASE HANDLE (CREW COMPARTMENT)
7. FLASHLIGHTS
8. ESCAPE HATCH RELEASE HANDLES
9. LIFE RAFT EXTERNAL RELEASE HANDLE
10. EMERGENCY STATIC LINE
11. PARATROOP DOOR EMERGENCY RELEASE
12. HAND FIRE EXTINGUISHER
13. LIFE RAFT RELEASE HANDLE (CARGO COMPARTMENT)
14. MAIN ENTRANCE DOOR EMERGENCY RELEASE
15. EMERGENCY AXE

Figure 3–4

and the maximum at points 7 and 8, excess power is available which can be converted into a positive rate-of-climb which varies with the speed. For the gross weight and atmospheric conditions plotted, the speed at which the least power on the operative engine is required (the lowest point on the THP_R curve) is 118 knots. This is approximately the speed to maintain under these conditions for endurance or maximum time aloft. The point on the curves where the greatest differential in thrust horsepower exists is at approximately 128 knots. For the best single-engine rate-of-climb, the airplane should be flown at this speed. Reference to Figure 3-2, Best Single-Engine Climb Speeds, will indicate the speed for optimum climb at various gross weights other than the weight condition plotted in Figure 3-2. These speeds may be considered the safe single-engine speeds of the airplane inasmuch as the excess power available is at a maximum value and the potential for optimum climb exists.

In Figure 3-1, it will also be noted that, with the increase of THP_R and the reduction of THP_A at altitude because of atmospheric effects, a condition may exist whereby the airplane could be flown at speeds between the minimum control speed and the speed at which the THP_R and THP_A curves at altitude intersect. In this speed range it would not be possible to climb or maintain altitude. If the altitude were held, the airspeed would gradually drop off until directional control was lost or the airplane stalled. If the exact airspeed were held, the airplane would gradually lose altitude. The only way to recover from this condition and reurn to a positive rate-of-climb is either to add more power—which is not possible inasmuch as maximum power is already being used—or to increase the airspeed by diving. When the latter has been accomplished, the airplane can then begin to climb because a positive thrust horsepower differential exists. However, conditions could exist in which the airplane would be too low to permit diving for extra speed, and a forced landing straight ahead would be necessary.

It is essential the pilot realize during single-engine operation at the higher gross weights that it may be possible to have a negative rate-of-climb at speeds somewhat above the minimum speed for directional control. This indicates that at take-off it is most important to accelerate to the recommended take-off speed prior to leaving the ground and, as soon as possible after take-off, to accelerate to the best single-engine climb speed for the gross weight of the airplane. Assuming engine operation at this point is satisfactory, the pilot can concentrate on obtaining his normal two-engine climb speed.

SINGLE-ENGINE BEST CLIMB AND CRUISE SPEEDS.

The Single-Engine Best Climb Speeds Chart, Figure 3-2, presents best single-engine climb speeds for maximum wet and dry powers. The Single-Engine Best Cruise Speeds Chart, Figure 3-3, gives speeds which, if maintained, will result in 99% best economy. Both charts are based on the clean configuration of the airplane with the propeller of the inoperative engine feathered.

DETECTION OF INOPERATIVE ENGINE.

If engine failure should occur, the inoperative engine can best be determined by:

1. Noting the change in directional trim. When an engine fails, the effect of asymmetric power is such that it causes the airplane to yaw in the direction of the engine which has failed.

2. Noting the torquemeter readings. The torquemeter, which is a ready index of the power an engine is producing, will drop off rapidly at the time of engine failure.

3. Observation of the engine in question. Engine roughness, spewing of oil, or evidence of fire indicate engine malfunction.

4. Noting cylinder head temperature. A drop in cylinder head temperature is an accurate indication of engine failure; however, it is not as immediately discernible as the drop in torque pressure.

SINGLE-ENGINE PROCEDURE.

Although slight modifications are required for specific types of engine failure, basic single-engine procedure is as follows:

1. Gear—UP.
2. Flaps—UP.
3. Mixture controls—NORMAL, unless RICH is required.
4. Booster pump switches—EMERG. ON, or as required.
5. Propellers—2600 rpm, or as required.
6. Throttles—Maximum continuous operation, or as required to maintain safe airspeed.
7. Close throttle of dead engine.
8. Feather propeller of dead engine.
9. Mixture control of dead engine—IDLE CUT OFF.
10. Fuel, oil, and hydraulic shut off switch of dead engine—SHUT.
11. Fuel selector switch of dead engine—OFF.
12. Ignition switch of dead engine—OFF.
13. Generator switch of dead engine—OFF.
14. Cowl flaps.
    a. Cowl flaps of dead engine—CLOSED (TRAIL, if engine is on fire).
    b. Cowl flaps of good engine—as required.

15. Engine fire extinguisher switch (if fire exists)—ON.

16. Trim airplane for level flight.

17. Turn off all unnecessary electrical equipment.

18. Start APP to augment output of remaining generator.

19. If necessary, jettison cargo and equipment to reduce weight.

Note

If difficulty is encountered in maintaining directional control, safe altitude and airspeed, alert passengers and crew for bail-out with three short rings of the alarm bell. If unable to maintain directional control, safe altitude and airspeed, sound bail-out warning by continuous ringing of the alarm bell.

20. After all danger of fire is past, close cowl flaps and oil cooler exit flaps on dead engine to reduce drag.

21. Land airplane at first suitable landing field.

Note

If engine has been shut down due to fire, do not attempt to restart engine. If the cause of engine failure has been other than fire and it is deemed reasonably safe to do so, the engine may be restarted in flight.

RESTARTING IN FLIGHT.

To restart the engine in flight, the following procedure should be employed:

1. Throttle of dead engine—CLOSED.
2. Fuel, oil, and hydraulic shut off switch—NORM.
3. Fuel selector switch—as required.
4. Ignition switch—BOTH.
5. Move propeller control lever to full INCREASE RPM position. As soon as engine speed reaches 800-1000 rpm, immediately move propeller control lever to permit governing at 1200-1400 rpm.
6. Mixture control—NORMAL.
7. Cowl flap switch—as required.

Note

Allow engine to warm up at low power settings until cylinder head temperature reaches 100°C and oil temperature reaches 40°C.

ENGINE FAILURE DURING TAKE-OFF.

DURING TAKE-OFF ROLL.

If engine failure should occur during take-off run before the airplane becomes airborne, the pilot, at his discretion, should immediately reduce power, and use all available equipment to brake the forward roll. If braking and propeller reversing are insufficient to prevent crashing into buildings, hangars, planes, personnel, etc., the emergency landing gear switch should be used to retract the gear and restrict further travel of the airplane.

BEFORE OBTAINING SAFE SINGLE-ENGINE AIRSPEED.

If, during take-off, engine failure is encountered when airborne and before safe single-engine airspeed has been obtained:

1. Hold directional control, maintaining as straight a flight as possible. If directional control cannot be maintained, reduce power on good engine proportionately.
2. Feather propeller of malfunctioning engine.
3. Prepare for crash landing.
4. Land straight ahead with gear and flaps down, if possible.

AFTER OBTAINING SAFE SINGLE-ENGINE AIRSPEED.

If engine failure occurs during take-off after safe single-engine airspeed is obtained, accomplish SINGLE ENGINE PROCEDURE and attempt to attain best single-engine climb speed. Refer to single-engine climb chart in Appendix I or Best Single-Engine Climb Speed Chart, Figure 3-2.

WARNING

It is necessary to maintain both straight flight and the recommended airspeed for several minutes in order to gain altitude before attempting to circle back for landing. Any maneuvering of the aircraft during this critical period may further reduce the rate-of-climb (possibly from a positive rate to negative) and continued flight may become impossible. Keep in mind that the rate-of-climb may be as low as 100 fpm if the take-off was accomplished at a maximum gross weight adjusted for existing atmospheric conditions. At least several hundred feet of altitude should be gained by straight flight before any turning is attempted, and the recommended speed should be held throughout the turning, even at a sacrifice in altitude.

ENGINE FAILURE DURING FLIGHT.

Should engine failure occur in flight, the procedure outlined in SINGLE-ENGINE PROCEDURE should be accomplished.

FUEL PRESSURE DROP— ENGINE OPERATING NORMALLY.

DURING GROUND OPERATION.

If the fuel pressure drops below the operating limits during ground operation, but the engine continues to operate normally, stop the airplane, and shut down immediately. *Do not take-off.* Investigate the cause and correct.

DURING FLIGHT.

If the fuel pressure drops below the operating limits during flight, but the engine continues to operate normally, the cause may be one or more of the following: primer solenoid leakage, oil dilution solenoid leakage, engine-driven fuel pump by-pass valve leakage, clogged pressure line, instrument failure, or line leakage. Possible courses of action depending on the causes of the pressure drop are listed below:

1. *Cut the engine immediately.* Do this if the power is not necessary to sustain flight or to reach a safe destination.

2. *Continue operating the engine normally.* This may be done if it can be unquestionably determined that the indicated fuel pressure drop has not resulted from a fuel leak.

3. *Keep the affected engine in operation at or above cruising speed while maintaining a watch for fire.* This can be done if it cannot be determined whether or not an actual fuel leak exists and the engine is required either to sustain flight or to maintain the required altitude for arrival at a safe destination. However, prior to power reduction for entrance to the landing pattern, cut the affected engine completely (by means of the mixture control—not by retarding the throttle) and accomplish a partial power landing. Unless the added power is absolutely essential to effect a safe landing, do not reduce airspeed until the affected engine is shut down. Too many lives and aircraft have already been lost when the pilot gained a false sense of security as a result of several hours of flight under these circumstances without any indication of fire only to discover that, upon reducing power for a landing, an engine fire developed and it became too late to take any corrective action. This required procedure is based on the fact that air flow over the engine and nacelle, due to its cooling and dispersing effect, will frequently serve to keep a fire from breaking out, even though an actual fuel leak exists—that is until the speed of the airplane is reduced sufficiently as during landing.

Note

All other factors being equal, course "1" above is generally the best. However, action to be taken depends entirely upon the circumstance existing at the time. Such factors as the known condition of the airplane and the remaining engine, stage and requirements of the mission, and power requirements of the airplane should all be considered.

WARNING

Shut down the engine by means of the mixture control and not by retarding the throttle. The mixture control is the most effective means of shutting off fuel to the engine.

MAXIMUM GLIDE.

REAR CARGO DOORS ON.

The minimum glide angle for the airplane with cargo doors on, power off and both propellers feathered is computed to be 3.86° and will result in the maximum glide range possible with no power available. This angle may be obtained regardless of gross weight of the airplane, by maintaining the airspeeds listed on the DOORS ON chart for the given gross weights. Also on this chart are listed the glide ranges resulting from the various altitudes. When the glide speeds are maintained, the rate of sink at 44,000 pounds gross weight is approximately 730 feet per minute (12.2 feet per second); at a gross weight of 77,000 pounds the rate of sink is approximately 966 feet per minute (16.1 feet per second).

REAR CARGO DOORS OFF.

With the rear cargo doors removed, the minimum glide angle for the airplane with power off and both propellers feathered is computed to be 4.37°, and will likewise result in maximum glide. A chart for DOORS OFF is provided for this condition. The rate of sink for a doors off configuration is approximately 823 feet per minute (13.7 feet per second) at 44,000 pounds; at 73,000 pounds the rate of sink is approximately 1061 feet per minute (17.7 feet per second). Refer to Figure 3-5.

SINGLE-ENGINE LANDING.

There are several significant factors which should be considered in executing a single-engine landing. One of these is the drag produced by extending the landing gear. At high gross weights it is very difficult to maintain altitude under single engine conditions with the

MAXIMUM GLIDE

Cargo Doors On

The minimum glide angle for the airplane with cargo doors on, power off and both propellers feathered is computed to be 3.86° and will result in the maximum glide range possible with no power available. This angle may be obtained regardless of the gross weight of the airplane, by maintaining the airspeeds listed for the given gross weights. Glide ranges resulting are given for the various true heights.

GROSS WEIGHT	GLIDE SPEED CAS—KNOTS	RATE OF SINK AT S.L. FPM	RATE OF SINK AT S.L. FPS
44,000 LB.	107	730	12.2
55,000 LB.	120	817	13.6
66,000 LB.	132	895	14.9
77,000 LB.	142	966	16.1

FROM TRUE ALTITUDE OF	GLIDE RANGE RESULTING IS
5,000 FT.	12 N. MI.
10,000 FT.	24 N. MI.
15,000 FT.	37 N. MI.
20,000 FT.	49 N. MI.

Cargo Doors Off

With the rear cargo doors removed, the minimum glide angle for the airplane with power off and both propellers feathered is computed to be 4.37°, and will likewise result in maximum glide range with no power available. This angle may be obtained regardless of the gross weight of the airplane, by maintaining the airspeeds listed for given gross weights. Glide ranges resulting are given for the various true heights.

GROSS WEIGHT	GLIDE SPEED CAS—KNOTS	RATE OF SINK AT S.L. FPM	RATE OF SINK AT S.L. FPS
44,000 LB.	107	823	13.7
54,000 LB.	119	913	15.2
64,000 LB.	129	995	16.6
73,000 LB.	138	1061	17.7

FROM TRUE ALTITUDE OF	GLIDE RANGE RESULTING IS
5,000 FT.	11 N. MI.
10,000 FT.	22 N. MI.
15,000 FT.	32 N. MI.
20,000 FT.	43 N. MI.

Figure 3–5

gear down. Plan the approach with a higher-than-usual downwind leg, and extend the landing gear on this leg of the approach. This will allow time for emergency extension if the gear should fail to operate normally. In addition, the increased drag will become noticeable, and the pilot can better plan the rest of the approach because he will have more time to judge the aircraft's rate of descent. Turn on the base leg with more-than-normal traffic altitude, close-in to the runway. This will permit the final approach to be made at low power on the good engine and at a steep glide angle, which will make the airplane easier to control directionally. Flaps may be extended at any time at the pilot's discretion, but they should not be extended until the landing is assured. Altitude cannot be maintained on single engine when landing gear and flaps are extended. If necessary, cowl flaps also can be opened to increase drag and rate of descent if the approach is too high.

SINGLE-ENGINE LANDING PROCEDURE.

Should it be necessary to execute a single-engine landing, refer to the Landing Charts, Appendix I, and employ the following procedure:

1. Establish flight pattern with high, close-in base leg.
2. Extend landing gear on base leg.
3. Keep airspeed at prescribed approach speed for applicable gross weight.
4. Turn water injection switch ON, if desired.

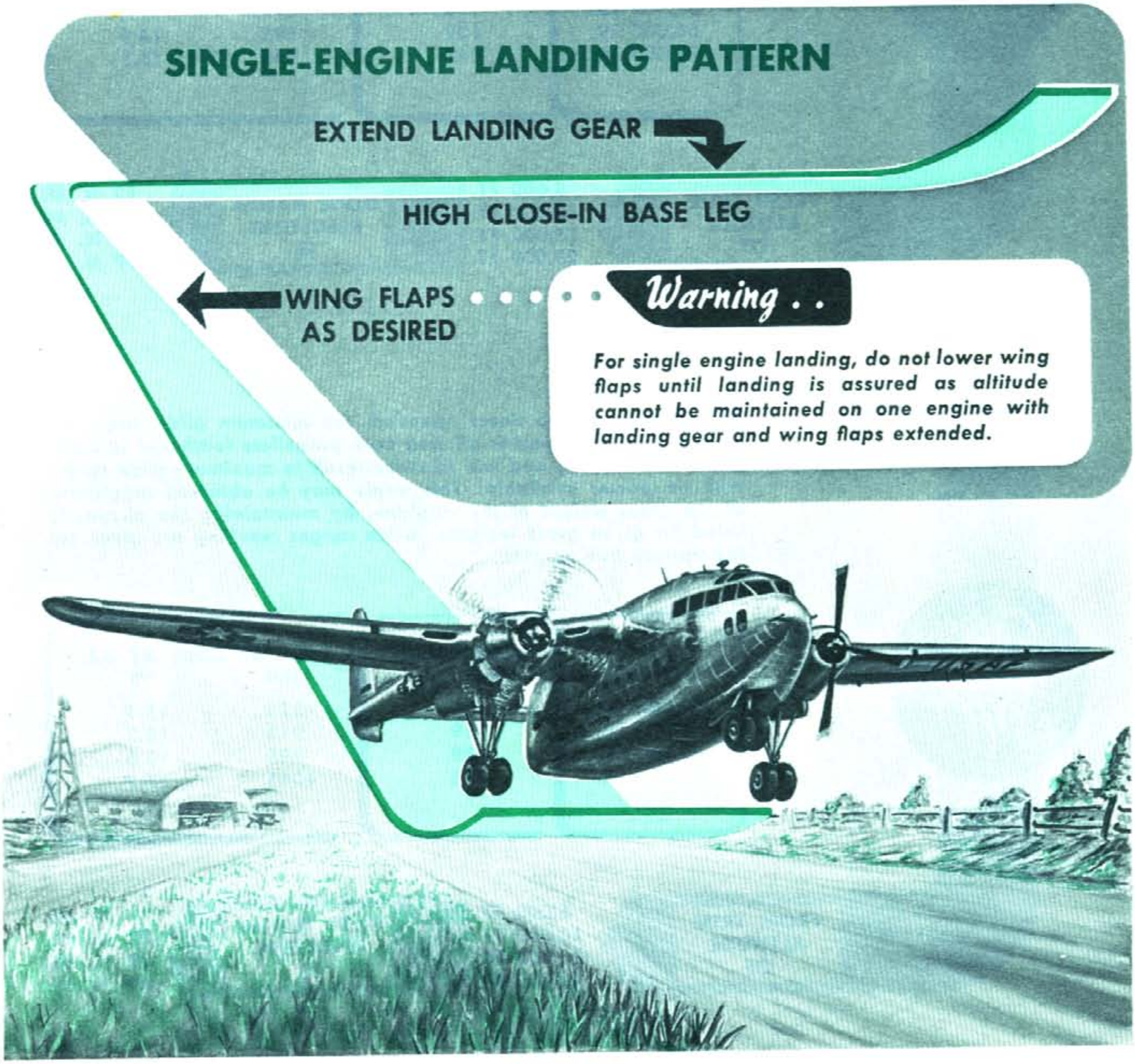


Figure 3–6

5. Adjust trim tabs as needed (preferably neutral).

6. When landing is assured, use wing flaps as desired, close throttles, and proceed with normal landing procedure.

WARNING

For single-engine landings, do not lower wing flaps until landing is assured, as altitude cannot be maintained on one engine with landing gear and wing flaps extended. If it is deemed necessary to go-around, apply power smoothly to live engine and immediately retract landing gear.

SINGLE-ENGINE REVERSING.

The use of single-engine reverse thrust is a positive aid in landing an airplane with one engine inoperative, provided the necessary techniques are employed and their limitations thoroughly understood. Under any of the conditions listed below, it should be noted that reverse thrust is most effective during the initial phase of the landing roll and that rudder control is sufficient to maintain heading at this time. Likewise, it should be understood that a short field landing approach on the longest available runway, with consideration of wind velocity and direction, gross weight, width and surface of runway, is recommended. If landing in a crosswind is unavoidable, land so that the crosswind is from the direction of the dead engine. In addition, when the use of single-engne reversing is anticipated, land well to the dead engine side of the runway as the reverse thrust of one propeller will tend to cause the airplane to turn into the direction of the propeller reversed.

SINGLE-ENGINE REVERSING WITH BRAKES AND STEERING AVAILABLE.

With both brakes and nosewheel steering available, the use of reverse thrust on one propeller is definitely controllable and may be used to shorten the landing roll. Employ the following procedure:

1. Reverse immediately upon initial contact of all three gears.

2. Maintain directional control by use of the brakes and nosewheel steering.

3. When a full stop can be safely accomplished with brakes only, return throttle to forward thrust range.

SINGLE-ENGINE REVERSING WITH STEERING BUT WITHOUT BRAKES.

If nosewheel steering is available but brakes are not, there is a reduction in controllability, so that the amount of reverse thrust applied should be governed by the ability to control the airplane directionally. The following procedure is recommended:

1. Reverse immediately upon contact of all three gears.

2. Maintain directional control by use of rudder and nosewheel steering. With the loss of rudder control, the amount of reverse thrust which may be applied is governed by the ability to maintain directional control with nosewheel steering.

3. If a full stop cannot be safely accomplished within the remaining runway length, the airplane may be partially ground-looped.

SINGLE-ENGINE REVERSING WITH NEITHER BRAKES NOR STEERING AVAILABLE.

If neither brakes nor nosewheel steering is available, extreme caution should be exercised when using reverse thrust on one propeller. The following procedure is recommended:

1. Reverse immediately upon initial contact of all three gears.

2. Use maximum reverse thrust during that portion of the landing roll that rudder control is available. As airspeed is reduced and rudder control becomes ineffective, reverse thrust, likewise, will have to be reduced.

3. If a full stop cannot be made safely within the remaining runway length, reverse thrust may be used to ground loop the airplane.

CAUTION

If it is anticipated that a ground loop may be necessary, select that section of the runway which affords the widest paved area and maximum clearance of obstacles. Attention should also be given to the suitability of the field immediately off the sides of the runway as the ground loop may cause the airplane to veer off the paved area.

4. Should a collision with buildings, hangars, personnel, or parked aircraft be unavoidable, retract the landing gear by use of the landing gear emergency switch to restrict further travel of the airplane.

SINGLE-ENGINE GO-AROUND.

Generally it is not considered feasible to attempt a single engine go-around when the flaps are full down and the gross weight is 64,000 pounds or more. Five hundred feet of altitude can easily be lost during the period after the go-around decision has been made and the airplane is being changed from approach to climb-out configuration and attitude. The decision to go around should be made before descending to 500 feet if possible, as the altitude lost may cause the airplane to settle in. When weighing the possibilities for go-around in terms of altitude, airspeed, grossweight aircraft configuration, wind conditions, runway facilities and visibility, the pilot should always consider the advantages of a controlled crash landing versus an unsuccessful go-around especially if aircraft performance is critical or altitude is marginal (about 500 feet or less above the ground).

SINGLE-ENGINE GO-AROUND PROCEDURE.

If a go-around is deemed necessary during single-engine operation, use the following procedure:

1. Increase power on good engine, or use as much power as can be controlled.
2. Wing flaps lever to TAKE OFF if full flaps have been utilized. Retract flaps fully as airspeed permits.
3. Landing gear switch—UP.
4. Retract flaps fully as airspeed permits.
5. Attempt to attain recommended single-engine climb speed.
6. Use take-off power, water injection, on good engine, if necessary.
7. Trim airplane to the desired degree.
8. If airplane will not remain airborne, maintain straight flight and land, gear and flaps down.

SINGLE-ENGINE PRACTICE MANEUVERS.

To familiarize yourself completely with the single-engine characteristics of the airplane, practice the following single-engine procedures.

SINGLE-ENGINE TAKE-OFF.

Refer to Figures 3-8 and 3-9.

SINGLE-ENGINE FLYING.

Note

In the following practice maneuvers a single-engine condition with feathered propeller may be simulated by setting "dead" engine propeller control lever at DECREASE RPM and good engine propeller control lever at 2600 rpm. Retard "dead" engine throttle to 18 in. Hg. This simulates a feathered condition and allows use of the "dead" engine if necessary.

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 airplane at a constant airspeed and power setting. With feet off the rudder pedals, ease back on the control column. As the airspeed decreases, the trim becomes less effective because of decreased flow of air over control surfaces, and the airplane will turn into the dead engine. Push the control column forward until the original airspeed is exceeded, and as the trim becomes more effective with the increased airflow over the control surfaces, the airplane will turn into the good engine.

EFFECT OF POWER REDUCTION ON TRIM.

Practice directional control on single engine by using

SINGLE-ENGINE TURNS.

After you become proficient in single-engine procedure, practice single-engine turns. You can turn safely in either direction if you maintain safe single-engine airspeed.

1. Roll into the turn smoothly and slowly.

2. Maintain a constant airspeed throughout the turn, holding the speed for which you were trimmed when you rolled into the turn.

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

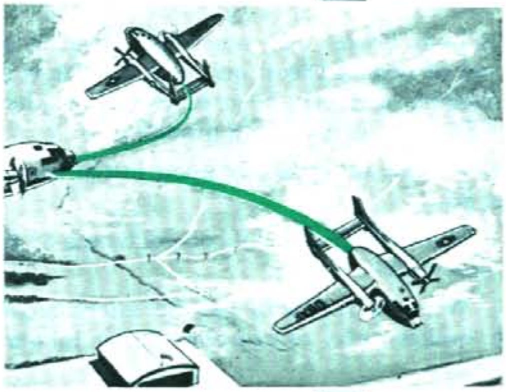


Figure 3–7

NOTE *Practicing these two procedures will give you some criteria for the decision you must make if an engine fails on take-off.*

SIMULATED SINGLE-ENGINE TAKE-OFF BEFORE GAINING SAFE SINGLE-ENGINE SPEED.

Simulate take-off conditions at altitude using normal power, flaps up (or take-off), gear down, at an airspeed of 90 knots. (Under these conditions, on a normal take-off the airplane will have 50 to 100 feet altitude.) Cut one thottle back completely and note that to maintain directional control it is necessary to reduce power on the good engine with a consequent loss of altitude which would necessitate making a crash landing straight ahead. Accomplish as much of the single-engine procedure as possible before simulated ground level altitude is reached.

Figure 3–8

SIMULATED SINGLE-ENGINE TAKE-OFF AFTER OBTAINING SAFE SINGLE-ENGINE SPEED.

Simulate take-off condition at altitude using normal power, flaps and gear up, at a safe single-engine airspeed corresponding to gross weight. Refer to Single-Engine Best Climb Speeds Chart, figure 3-1.

Cut one throttle, perform normal single-engine procedure, and continue the simulated take-off. With a little practice you can accomplish this procedure with little or no loss of altitude. This clearly demonstrates the advisability of gaining safe single-engine airspeed immediately after take-off and illustrates that the take-off can be subsequently continued.

Figure 3–9

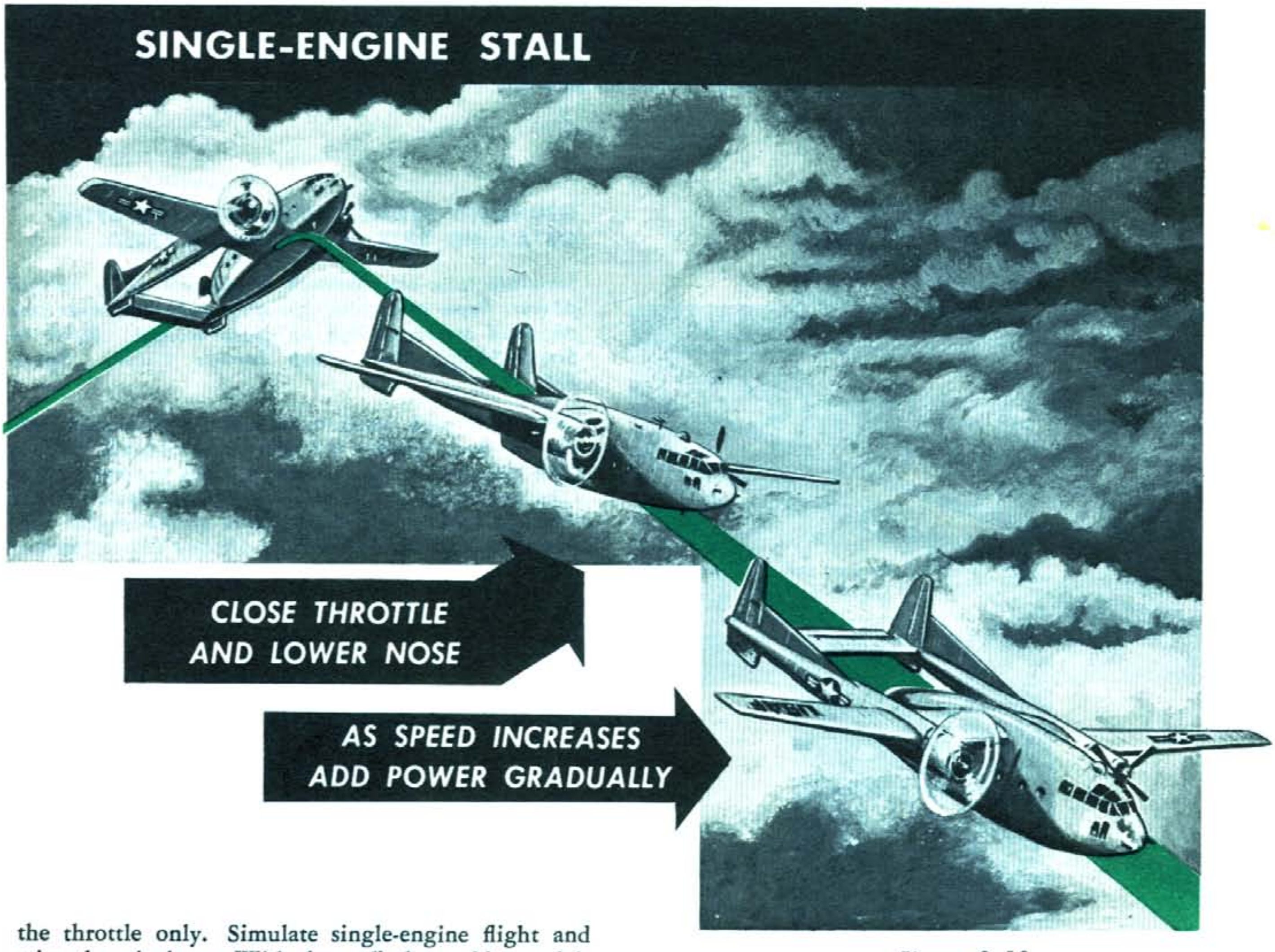


Figure 3–10

the throttle only. Simulate single-engine flight and trim the airplane. With feet off the rudder pedals pull control column back slowly. As speed decreases, gradually reduce power on the good engine to prevent airplane 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 RECOVERY FROM SLOW FLYING.

An engine failure while flying at a very low air-speed can be disastrous, especially at low altitude, unless you take immediate corrective action. To demonstrate this, put the airplane in a slow-flying attitude, gear and flaps down, at a safe altitude, and then retard one throttle completely. The first step of your single-engine procedure, obtaining airspeed and directional control, is vital when the engine fails at this time. Reduce power, lower the nose, and raise your gear and flaps. As the airspeed increases and you regain directional control, start adding power to the good engine and then complete the normal single-engine procedure.

SINGLE-ENGINE STALLS.

You can safely stall the airplane when only one engine is operating, provided you observe the principle of reducing power to maintain directional control. The following practice stall will teach you the limits of operation on one engine, and will also show the difficulties encountered in counteracting the thrust of the good engine when below safe single-engine speed.

1. At safe altitude set the engine at 2000 rpm and a torque pressure of 95 psi. Feather the other engine or simulate feathering.

2. Pull the nose up slowly and smoothly, using coordinated control movements.

3. Your first indication of the stall is an even downward trend of the rate-of-climb indicator.

4. Continue the slow even back pressure on the control column until the airplane stalls completely.

5. At this point, close the throttle and lower the nose.

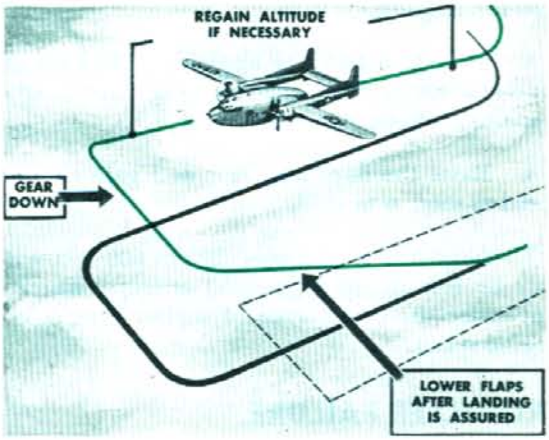
SIMULATED SINGLE-ENGINE LANDING. *(AT SAFE ALTITUDE)*

Practice single-engine landing, applying the principles discussed in previous paragraphs, and single-engine landing procedure.

1. Cut one throttle in the simulated traffic pattern and perform normal single-engine procedure, merely simulating the cutting of mixture and fuel switches, and feathering propeller.

2. If any altitude is lost during the procedure gain it back on the downwind leg if possible, but never during the turn to base leg or final approach. Altitude can be held by keeping airspeed at prescribed limits for gross weight. Conserve your altitude but not at the expense of safe single-engine airspeed. On single engine you are safer at 100 feet altitude and at 120 knots than at 1000 feet trying to hold 100 knots.

3. Complete your single-engine landing procedure.



NOTE ***Set the "dead" engine controls at DECREASE RPM and 18 in. Hg. and the good engine controls at 2600 rpm using manifold pressure required but not to exceed 142 psi torque pressure. Advance rpm on "dead" engine to 2600 rpm on final approach in the event a go-around is necessary.***

Figure 3–11

6. As you pick up speed, gradually add power and resume level flight. Remember, a power-off nose down recovery is the only safe recovery from a full stall on single engine; failure to decrease power the necessary amount to hold straight path may cause the airplane to roll into a dangerous attitude. If you approach the stall too fast and too steeply, the first indication of stall on the rate of climb indicator will be missed, and the resulting stall may be abrupt. Abrupt and uncoordinated control movements in entry and recovery will increase the stalling speed and exaggerate the rolling tendency.

SIMULATED SINGLE-ENGINE GO-AROUND AT SAFE ALTITUDE.

To prepare yourself for a safe approach to a single-engine landing, practice simulated approaches and go-around. During these maneuvers, notice carefully the altitude lost, and the amount of power you can use on the good engine and still maintain directional control.

1. Set up standard single-engine landing approach.

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

3. Raise the flaps and gear and retrim the airplane.

4. Never allow airspeed to drop below safe single-engine speed.

5. Note that when proper technique is used, only 200 to 300 feet of altitude is lost.

To show what happens if you attempt to go-around below 300 feet at 100 knots:

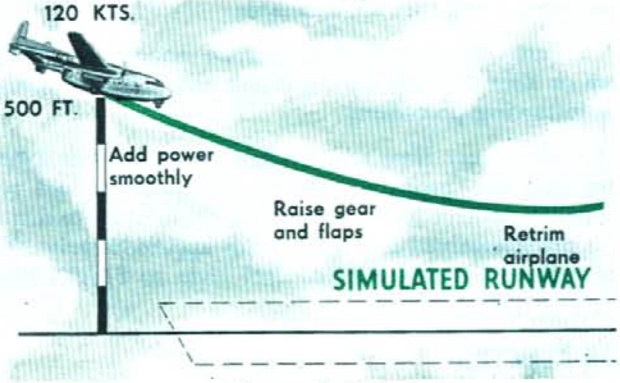


Figure 3–12

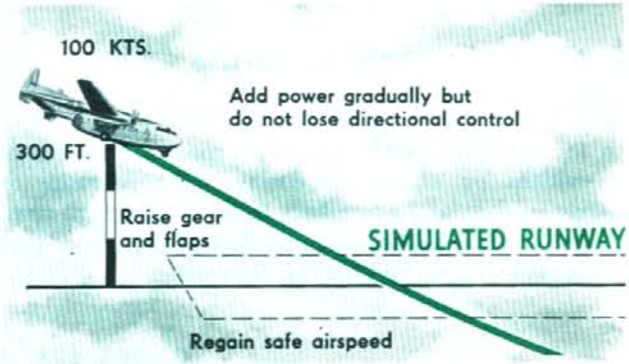


Figure 3–13

1. Set up standard single-engine landing approach.

2. At 300 feet above simulated field elevation, reduce power and slow airplane to 100 knots in preparation for landing.

3. Start go-around by applying power on good engine but not so much that you lose directional control —maintain your heading.

4. Raise the flaps and gear and gain single-engine speed as soon as possible.

5. Note loss of altitude—500 to 600 feet will probably be lost in the go-around attempt, which should emphasize the importance of maintaining safe single-engine speed.

PROPELLER FAILURE.

If failure of propeller is encountered in flight, the corrective action which the pilot may take is necessarily limited. However, below is a listing of propeller failures and procedures to be followed in minimizing the adverse effects on continued operation produced by each.

EXTERNAL PROPELLER OIL LEAKAGE.

Starvation of the propeller pump due to low oil or an external loss of oil will be evident initially by a relatively slow increase in rpm. If setting the propeller control lever one knob-width toward the DECREASE RPM position does not control the increase in rpm, the propeller control lever should immediately be moved to the FEATHER position.

Note

The charge of oil contained in the accumulator will be sufficient to feather the propeller but will not be sufficient to maintain an operating rpm by intermittent movement of the control lever to the feather position. Once the accumulator is depleted, it is impossible to feather the propeller.

INTERNAL OIL LEAKAGE IN THE CONTROL SYSTEM.

An internal leak in the propeller control system will be evident by erratic governing, poor response to change in rpm, and a tendency to go toward high rpm. If this condition becomes uncontrollable, move propeller control lever to FEATHER position.

Note

Do not attempt to maintain an operating rpm by "milking" the control lever in an out of the FEATHER position. Doing so will deplete propeller accumulator hydraulic fluid pressure. Feathering will then be impossible and a runaway propeller will result.

UNWANTED OR SELF-FEATHERING OF PROPELLER.

Although it is highly unlikely that this condition will be experienced, employ the following procedure should this condition occur:

1. Move the propeller control lever to full INCREASE RPM.

2. If rpm reduces to a point where no power can be obtained from the engine, move the propeller control lever to FEATHER position and continue single-engine operation.

RUNAWAY PROPELLER.

Note

Do not confuse the momentary surge in rpm which occurs when the throttles are advanced to take-off position with propeller runaway. As the propeller governor assumes control, this rpm will decrease to desired range.

If a runaway propeller overspeed condition (3100 rpm or above) arises during take-off and initial climb proceed with the following course of action:

1. Reduce throttle on overspeeding engine.

2. If airspeed for best rate-of-climb with the existing gross weight is 130 knots or above, feathering the propeller is advisable.

3. If propeller fails to feather, reduce airspeed to approximately 125-130 knots and adjust throttle to obtain 2950 rpm. At this airspeed and power setting, some propelling thrust is available.

If a runaway propeller overspeed condition (2900 rpm or above) arises during climb and cruise, employ the following procedure:

1. If, at any time, the engine speed exceeds 2900 rpm and the propeller either does not respond to propeller control lever movement or does not remain at a predetermined setting (within approximately 200 rpm) move the propeller control lever to FEATHER.

PAGES 90A AND 90B DELETED

2. If unable to feather the propeller, reduce airspeed to approximately 125-130 knots and adjust throttles to obtain 2950 rpm. At this airspeed and power setting, some propelling thrust is available.

FAILURE TO FEATHER.

If propeller has been operating erratically and fails to feather, refer to the procedure for RUNAWAY PROPELLER. If propeller has been functioning properly and fails to feather with normal movement of the propeller control lever to the FEATHER position, the propeller will feather, in most cases, if the lever is momentarily returned to cruise and immediately placed back in FEATHER with severe action (hard against the feather stops with one fast motion.)

Note

If this last action is still unsuccessful, leave the propeller control lever in the FEATHER position. The propeller will crank itself to within 1° to 1.5° of full feather in 4 to 5 minutes. The drag will be negligible.

Complete shut down of the engine as outlined in SINGLE-ENGINE PROCEDURE and continue single-engine operation.

Note

If there is no evidence of fire, the fuel, oil and hydraulic shut off switch should be left in NORM.

FAILURE TO UNFEATHER.

Should a propeller, having been intentionally or unintentionally feathered, fail to unfeather when the propeller control lever is placed in the full INCREASE RPM position, repeat procedure several times. If unfeathering is then impossible, place propeller control lever in FEATHER, complete engine shut down as outlined in SINGLE-ENGINE PROCEDURE and continue single-engine operation.

FAILURE TO REVERSE.

CAUTION

If either propeller or both should fail to reverse when the pilot's throttles are moved into the REVERSE THRUST range, do not make a second attempt to reverse the propeller or propellers which failed to reverse. Damage to the propeller low pitch stop operating mechanism may result. After landing, make certain ground maintenance personnel are informed of this condition.

If one or both propellers fail to reverse during landing, advance both throttles to forward thrust range and use brakes to stop forward landing roll. Turn off runway to avoid obstructions. If only one propeller fails to reverse and brakes are not adequate to stop forward roll of the airplane:

1. Attempt to hold the airplane straight with nose wheel steering and use SINGLE ENGINE REVERSING procedure.

2. As last resort retract landing gear, by use of the landing gear emergency switch.

FAILURE TO UNREVERSE.

If either or both propellers should fail to unreverse after being used to brake the landing roll and it is necessary to obtain forward thrust for continued operation, place the throttle controls in the forward thrust range and move the propeller control levers to the FEATHER position for a sufficient length of time to bring the propellers into the forward thrust range. If continued operation of the engines is not required, shut down with the propellers in reverse; this will aid the ground crews in determining the cause of the failure.

FAILURE OF PROPELLER DE-ICING.

In the event de-icing failure on one propeller should occur, continue until excessive roughness is detected. Attempt to locate altitude where icing conditions are less prevalent. If excessive roughness does develop, feather and shut down engine.

Should the propeller de-icing system on both propellers fail or should a complete failure of the electrical system occur, avoid icing conditions if possible. If icing conditions cannot be avoided and if propeller roughness has not become excessive, increase engine rpm as much as necessary for a period of 10 to 20 seconds to dislodge the ice from the blades.

PROPELLER BLADE FAILURE.

PROPELLER VIBRATION AND ITS DETECTION.

The in-flight warning of the start of a propeller blade failure may be a high frequency-low amplitude vibration of the entire aircraft structure which can be detected by a blurring of the instruments and an awareness of vibration. The time interval between the initial vibratory condition and the separation of an engine from the nacelle may vary from a few seconds to as much as 40 minutes. In view of the limited warning interval and the difficulty of isolating the defective propeller assembly by instrumentation or observation, it is recommended that the following procedure be employed:

1. Automatic pilot power switch—OFF.

2. Immediately reduce power and rpm on both engines to the minimum possible. If altitude permits, close the throttles and reduce rpm to a minimum.

3. If vibration ceases, increase rpm and then power, individually on each engine, to the original settings.

4. Immediately feather the propeller of the engine that causes a recurrence of the sensed vibration.

5. If vibration does not cease during the power and rpm reduction outlined above, individually feather and unfeather each propeller to determine the source of vibration.

6. If feathering either propeller eliminates the vibration, leave that propeller feathered, shut down the engine as outlined under SINGLE-ENGINE PROCEDURE, Section III, and continue with single-engine operation.

ENGINE SEPARATION.

A propeller blade failure can cause separation of the engine from the airplane. In the event a separation occurs, the pilot must immediately determine whether the airplane is safe to land or must be abandoned. Because separation of an engine from the airplane results in varying extents of damage to the affected wing, it is impossible to predict the effect of such an eventuality on the flight characteristics of the airplane. Drag effects may be particularly critical during landing when speeds may be so low as to make directional control impossible even with full rudder deflection. Also contributing to the complication of a landing under these conditions is the fact that stalling speeds may be adversely affected, especially if the airplane is in a yawing attitude or if extensive damage is done to the wing. Therefore, the pilot must carefully weigh the advantages of landing versus abandoning, depending on individual circumstances. When any doubt exists regarding the possibility of accomplishing a safe landing, the airplane should be abandoned.

If, in the event of an engine separation, it is determined that flight may be safely continued and a successful landing accomplished, employ the following procedure:

1. Automatic pilot power switch—OFF.

2. Use aileron and rudder as needed to maintain control.

3. Increase rpm and power on remaining engine.

Note

Do not hesitate to exceed normal power as needed for either control or performance.

4. If additional drag on the clean side is required for directional control, slowly open the cowl flaps on that side.

5. Depending on the extent of the damage, accomplish those steps of SINGLE-ENGINE PROCEDURE, Section III, as are applicable.

6. Refer to SINGLE-ENGINE LANDING, Section III.

FIRE.

ENGINE FIRE DURING GROUND OPERATION.

If fire is located in the air induction system, open the throttle of the affected engine. Fire is often sucked through the engine and extinguished. If fire continues, use the following procedure:

1. Mixture controls—IDLE CUT OFF.

2. Fuel selector switch—OFF.

3. Fuel, oil and hydraulic shut-off switch—SHUT.

4. Engine fire extinguisher switch—ON as soon as engine stops.

5. Ignition switches—OFF.

6. Shut down both engines completely.

7. As soon as engine stops, ground personnel should place hand fire extinguisher nozzle through the access door in the bottom of the nacelle, and release extinguishing agent.

ENGINE SMOKE AND FLAME IDENTIFICATION.

For the identification of various types of engine fires and the remedial action to be undertaken, refer to Figure 3-14.

ENGINE FIRE DURING FLIGHT.

1. Feather propeller on affected engine.

2. Mixture control—IDLE CUT OFF.

3. Fuel selector switch—OFF.

4. Fuel, oil and hydraulic shut off switch—SHUT.

5. Engine fire extinguisher switch—ON as soon as engine stops.

6. Cowl flap switches—TRAIL.

7. Ignition switch—OFF.

8. Advance power on good engine as necessary to hold airspeed.

9. Complete normal shut down of dead engine turning generator switch to OFF.

10. After all danger of fire is past, close cowl flaps to reduce drag.

Note

Do not restart the dead engine as the fire indicates a positive malfunction in the engine or its accessories.

HEATER COMPARTMENT FIRE.

If a fire is detected in the heater compartment, employ the following procedure:

1. Master heater switch—OFF.

2. Heating system control switches—OFF.

Note

When operating the heater fire extinguisher system, the cockpit air, windshield anti-icing and cargo heat switches should be turned OFF to prevent fumes from entering the crew and cargo compartments.

3. Heater fire extinguisher switch—ON.

CAUTION

Do not restart the heaters as a fire indicates a positive malfunction in the heating system.

FUSELAGE FIRE.

If fire occurs in the fuselage, follow the procedure outlined below:

1. Close all windows and ventilators, and keep all doors and emergency exits closed.

2. Crew members should don oxygen masks, and set the diluter lever of the oxygen regulator to 100% OXYGEN.

3. Use all available hand fire extinguishers.

4. If the auxiliary fuel system is being used, switch to main fuel system and close auxiliary fuel manual shut-off valves.

5. If electrical fire, turn battery switch OFF, generator switches OFF, and APP ignition switch OFF. Turn the emergency power switch ON.

WING FIRE.

If fire occurs in the wings, follow the procedure outlined below:

1. All wing lights—OFF.

2. Follow progress of fire closely and land airplane as quickly as possible, or bail out, whichever the situation demands.

ELECTRICAL FIRE.

When a short circuit in the electrical system is detected by fire, smoke, or overheating of the electrical wiring or equipment, the following course of action should be followed:

1. Turn OFF all sources of electrical power (generators, battery, APP is running); turn emergency power switch ON.

2. Use hand fire extinguishers to put out the fire. If no fire exists, check for smoke or overheating. Should the malfunctioning wiring or equipment be located, turn off the switches and pull out the circuit breakers in that particular system.

3. If the short circuit cannot be located by inspection, turn off all electrical equipment switches.

4. When smoke or odor has cleared enough to permit resensing the effects of electrical malfunction, turn on power source equipment individually and at intervals sufficient to observe the equipment, instruments and wiring and to determine if these units are malfunctioning.

5. In the same manner turn on switches controlling the operation of essential flight equipment.

6. Continue to turn on equipment as before until the defective circuit is detected. When located, the malfunctioning circuit should be de-energized by turning off the switches controlling its source of power and releasing the associated circuit breakers.

7. If cause of fire or overheating cannot be isolated, land as soon as possible.

AUXILIARY POWER PLANT FIRE.

If a fire should occur in or around the auxiliary power plant, turn the APP ignition switch to the OFF posi-

Engine Smoke and Flame Identification

Various engine malfunctions are often indicated by characteristic smoke and flame patterns. This chart is provided so that the flight crew may more accurately identify different engine smoke and flame conditions and know at once the cause and the remedial action to be undertaken.

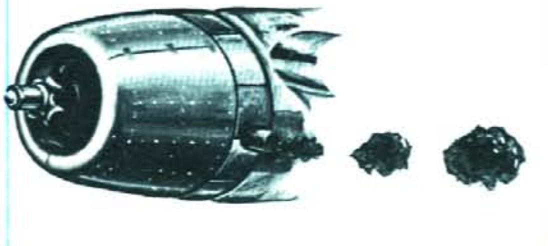
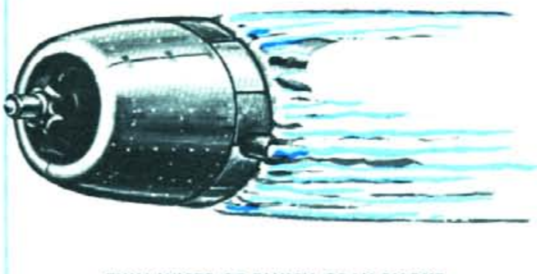
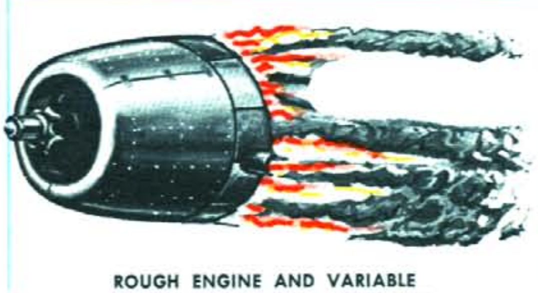
	CAUSE	ACTION
 ROUGH ENGINE AND PUFFS OF BLACK SMOKE FROM EXHAUST	Detonation, afterfire or backfire from lean mixture and/or carburetor failure which may be indicated by high CHT and CAT, fluctuating MP, RPM and fuel flow. If this condition is allowed to continue, loss of power and engine failure are imminent.	Enrich mixture, reduce power, and temperature, monitor engine instruments.
 THIN WISPS OF BLUISH-GRAY SMOKE FROM COWL FLAPS AND EXHAUST AREA	Slight oil leak which may possibly be indicated by a drop in oil quantity. Slight possibility of fire exists but nc action necessary unless fire develops.	Watch closely and feather if volume of smoke indicates the necessity.
 ROUGH ENGINE AND VARIABLE QUANTITY OF GRAY SMOKE AND POSSIBLY LIGHT FLAME FROM COWL FLAPS AND EXHAUST AREA	Cylinder head or exhaust stack failure indicated by high CHT, fluctuating MP and RPM, low oil pressure. If this condition is allowed to continue, engine failure and fire may result.	Fire and feather procedure and alert crew.

Figure 3-14

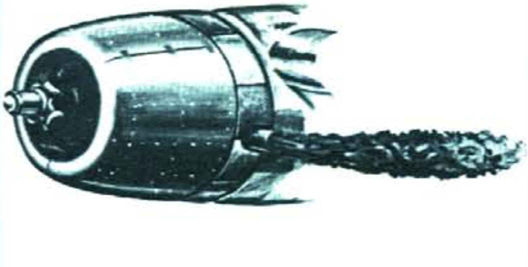
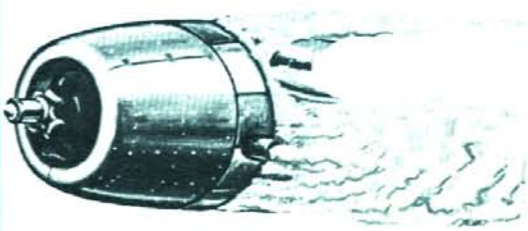
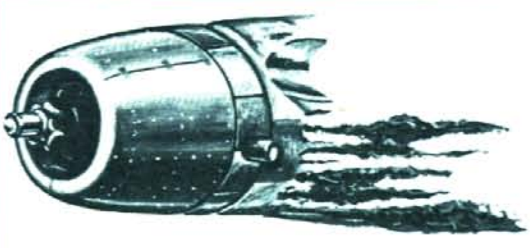
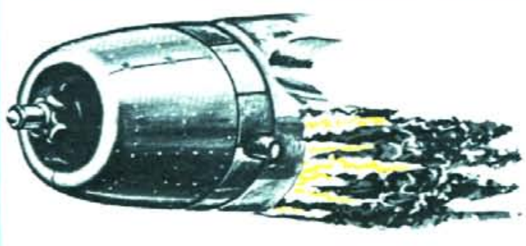
	CAUSE	ACTION
 HEAVY BLACK SMOKE FROM EXHAUST	Induction casting burning and/or burned through possibly indicated by very high CHT and CAT and fluctuating engine instruments. An uncontrolled fire may develop.	Fire and feather procedure and alert crew.
 DENSE WHITE SMOKE FROM EXHAUST AND/OR COWL FLAPS AREA	Initial induction fire from burning fuel possibly indicated by high CHT and a sudden drop in MP and RPM. An uncontrolled fire may develop.	Fire and feather procedure and alert crew.
 BLACK SMOKE FROM ACCESSORY SECTION	Oil leak and oil fire possibly indicated by variable oil pressure, high CHT and illumination of fire detector lights. An uncontrolled fire may develop.	Fire and feather procedure and alert crew.
 BLACK SMOKE AND ORANGE FLAME FROM ACCESSORY SECTION	Gasoline leak and fire possibly indicated by variable fuel pressure, high CHT, and illumination of fire detector lights. An uncontrolled fire may develop.	Fire and feather procedure and alert crew.

Figure 3-14

tion and employ hand fire extinguishers to combat the fire.

WARNING

Repeated or prolonged exposure to high concentrations of bromochloromethane or decomposition products should be avoided. CB is a narcotic agent of moderate intensity but prolonged duration. It is considered to be less toxic than carbon tetrachloride, methyl bromide, or the 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.

SMOKE ELIMINATION.

Note

Use oxygen masks if the concentration of smoke and fumes require it.

The most rapid means of dissipating smoke and toxic fumes may be obtained by:

1. Opening side windows of crew compartment.

CAUTION

Do not attempt to ventilate until it is certain that the fire has been extinguished as the draft may tend to spread the fire.

2. Opening the air ducts on the pedestal immediately below the instrument panel.
3. Opening the paratroop doors which will cause contaminated air to move from crew compartment to cargo compartment and out.

JETTISONING CARGO.

In the event that it is necessary to jettison the cargo and equipment of the airplane in order to maintain altitude during emergency single-engine operation, the paratroop door on the side of the dead engine and the aerial delivery doors should be used.

Note

Always jettison cargo from the paratroop door on the side of the dead engine to prevent the cargo being caught in the prop wash and carried into the tail assembly of the airplane.

It is recommended that the cargo loading ramps be retained in the airplane until an attempt has been made to lighten the load by first jettisoning other less cumbersome items. If, after ejecting the other items of cargo and equipment, it is found essential to lighten the airplane still more, the cargo loading ramps may be released through the paratroop door on the side of the dead engine. This operation should be carried out as rapidly as possible to avoid unnecessary drag on the airplane.

FRONT ENTRANCE DOOR—OPENS IN FLIGHT.

Should the front entrance door open during flight, it is very probable the door was not securely latched prior to take-off. Closing and latching the door during flight is usually possible if engine power and airspeed are reduced to cruise values. If the door cannot be fully closed and latched, secure the door (as near the faired-in position as possible) with troop safety belts, ropes, cable or by any available means to prevent the door from flying off and striking the propeller.

LANDING EMERGENCIES.

Landing emergencies develop basically from equipment failure or flight conditions which were not foreseen and taken into account at the onset of the mission. By accurately checking the airplane before takeoff and by anticipating emergency conditions which may develop in flight, the hazards involved in landing emergencies, which suddenly become very real as the landing pattern is approached, may be effectively reduced. Techniques and procedures are of primary importance in successfully accomplishing an emergency landing. Below are the recommended procedures to be employed should any of the following landing emergencies develop: forced landing, landing without brakes, landing with a flat tire, and landing with various gear emergencies. Refer to SINGLE-ENGINE LANDING, Section III, for the recommended landing procedure should engine failure occur during flight.

FORCED LANDING PROCEDURE.

Refer to figure 3-15.

LANDING WITHOUT BRAKES.

If the source of supply of hydraulic pressure is inoperative but the brake system accumulator is charged, the pilot will have one to three applications of brakes upon landing. If the hydraulic brake system is completely discharged, reverse thrust and the emergency air brakes are available to brake the forward speed of the airplane. Should the loss of both hydraulic and emergency air brake systems occur, employ the following procedure:

1. Turn off all non-essential equipment switches.
2. Tighten safety belts and shoulder harness, lock inertia reel lock control.
3. Wing flap lever—DOWN.
4. Land with as slow a forward speed as possible.
5. Land as short as possible on runway thus allowing greater distance in which to stop airplane.
6. Make contact with main landing gear, easing nose gear down.
7. Lift throttles over stop and use reverse thrust at moment nose gear contact is made.
8. If forward roll cannot be stopped, retract landing gear with landing gear emergency switch.

LANDING WITH FLAT TIRE.

If landing with flat tire, make a normal approach planned so the touchdown will be as short on the runway as possible, and on the edge of the runway on the side of the good main gear. By doing so, the drag caused by the flat tire will not cause the airplane to veer off runway as soon. Upon landing, hold the damaged gear off as long as possible. After touchdown is complete, maintain directional control by use of nose wheel steering, brakes, and engines.

LANDING—NOSE GEAR FAILS TO EXTEND.

Should the nose gear fail to extend when both the normal and emergency extension procedures are employed, it is possible to enter the nose wheel compartment, disconnect the nose gear actuator, and push the gear down. If this last action is unsuccessful, the following procedure is recommended for landing on prepared runways:

1. Give warning over the interphone and by six short rings of the alarm bell.
2. Turn off all non-essential equipment.
3. Tighten safety belts and shoulder harnesses; lock inertia reel lock control.

CAUTION

When the inertia reel lock control is locked, it is impossible to bend forward; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

4. Keep the main gears extended and plan a normal approach for a nose high landing at minimum speed consistent with the gross weight of the airplane.
5. Wing flaps lever—DOWN.
6. Immediately prior to contact give warning with one long ring of the alarm bell.
7. Cut power upon contact with the ground.
8. Hold nose off the ground as long as possible to reduce fuselage damage.
9. Use brakes with extreme caution.

WARNING

Indiscriminate braking may cause the nose to strike the ground with an impact strong enough to endanger personnel in the crew compartment.

10. Mixture controls—IDLE CUT-OFF.
11. Ignition switches—OFF.
12. Immediately after airplane stops, open crew compartment escape hatch.
13. Battery switch—OFF when it is certain the fire extinguishing system is no longer needed.

LANDING—MAIN GEAR FAILS TO EXTEND.

If only one main gear will extend, land with all gears retracted in accordance with the procedure outlined in LANDING—WHEELS UP.

If the nose gear and only one main gear will extend, the following procedure is recommended for landing on prepared runways:

1. If the cargo compartment contains passengers, retract all gears and land on the fuselage to minimize injury to passengers. Refer to the procedures outlined under LANDING—WHEELS UP.
2. If no personnel are being carried in the cargo compartment, accomplish the following procedure to minimize damage to the aircraft:

   a. Remove the nose wheel well access panel and insert the nose gear ground lock pin.

   b. Retract the one main gear which is extended.

FORCED

PILOT AND COPILOT	RADIO OPERATOR
1. Give warning over interphone and six short rings of alarm bell. If at all possible, order all personnel in the cargo compartment to bail out.	*1. Transmit course, speed, altitude, position and distress signals. Turn on emergency keyer.*
2. Order crew to jettison all cargo and loose gear if time permits.	
3. Shoulder harness and safety belt tightened and inerita reel lock control locked. **CAUTION** *The pilot is prevented from bending forward when the control is in the locked position; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.*	*2. Assume seat on flight deck, fasten safety belt, and turn seat to face forward. Fold arms and lean forward, using padding to protect head and shoulders.*
4. Check that the landing gear is extended and locked.	
5. All non-essential electrical switches OFF.	
6. Land with as slow a forward speed as possible, wing flaps DOWN; make normal approach.	
7. One long sustained ring of the alarm bell.	*3. Brace for impact.*
8. Immediately prior to impact, close throttles, turn fuel, oil and hydraulic shut-off switch SHUT, fuel selector switches OFF, and ignition switches OFF.	

Figure 3–15

LANDING

NAVIGATOR	FLIGHT MECHANIC	PASSENGERS
1. Give radio operator emergency information to be transmitted.		*1. All personnel in cargo compartment will bail out if at all possible. (If bail-out is impossible, proceed as follows):*
	1. Take charge of jettisoning cargo.	*2. Assist flight mechanic in jettisoning cargo.*
2. Assume seat on flight deck, fasten safety belt, and turn seat to face forward. Fold arms and lean forward, using padding to protect head and shoulders.	*2. Shut down APP.*	*3. Assume forced landing positions in troop seats, snug lap belts, and lean toward the nose of the airplane as far as possible.*
	3. Assume seat on flight deck, fasten safety belt, fold arms and lean forward.	
3. Brace for impact.	*4. Brace for impact.*	*4. Brace for impact.*
4. As soon as movement of the airplane is halted, open crew compartment escape hatch.		

Figure 3–15

c. Give warning over the interphone and by six short rings of the alarm bell.

d. Turn off all unnecessary equipment.

e. Tighten safety belts and shoulder harnesses; lock inertia reel lock control.

CAUTION

When the inertia reel lock control is locked, it is impossible to bend forward; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

f. Make a normal approach at a minimum speed consistent with the gross weight of the airplane.

g. Wing flaps lever—DOWN.

h. Land in a near level attitude so that the touchdown of the nose gear and the aft end of the fuselage is approximately simultaneous.

i. Immediately prior to contact give warning by one long ring of the alarm bell and close throttles.

j. Mixture controls—IDLE PUT-OFF.

k. Ignition switches—OFF.

l. Use nosewheel steering to hold the airplane on the runway.

m. Immediately after airplane stops, open crew compartment escape hatch.

n. Battery switch—OFF when it is certain the fire extinguishing system is no long needed.

LANDING—WHEELS UP.

The following procedure is recommended when the landing must be accomplished on prepared runways with all gears retracted:

1. Give warning over the interphone and by six short rings of the alarm bell.
2. Turn off all non-essential equipment.
3. Tighten safety belts and shoulder harnesses; lock inertia reel lock control.

CAUTION

When the inertia reel lock control is locked, it is impossible to bend forward; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

DITCHING AND CRASH LANDING STATIONS

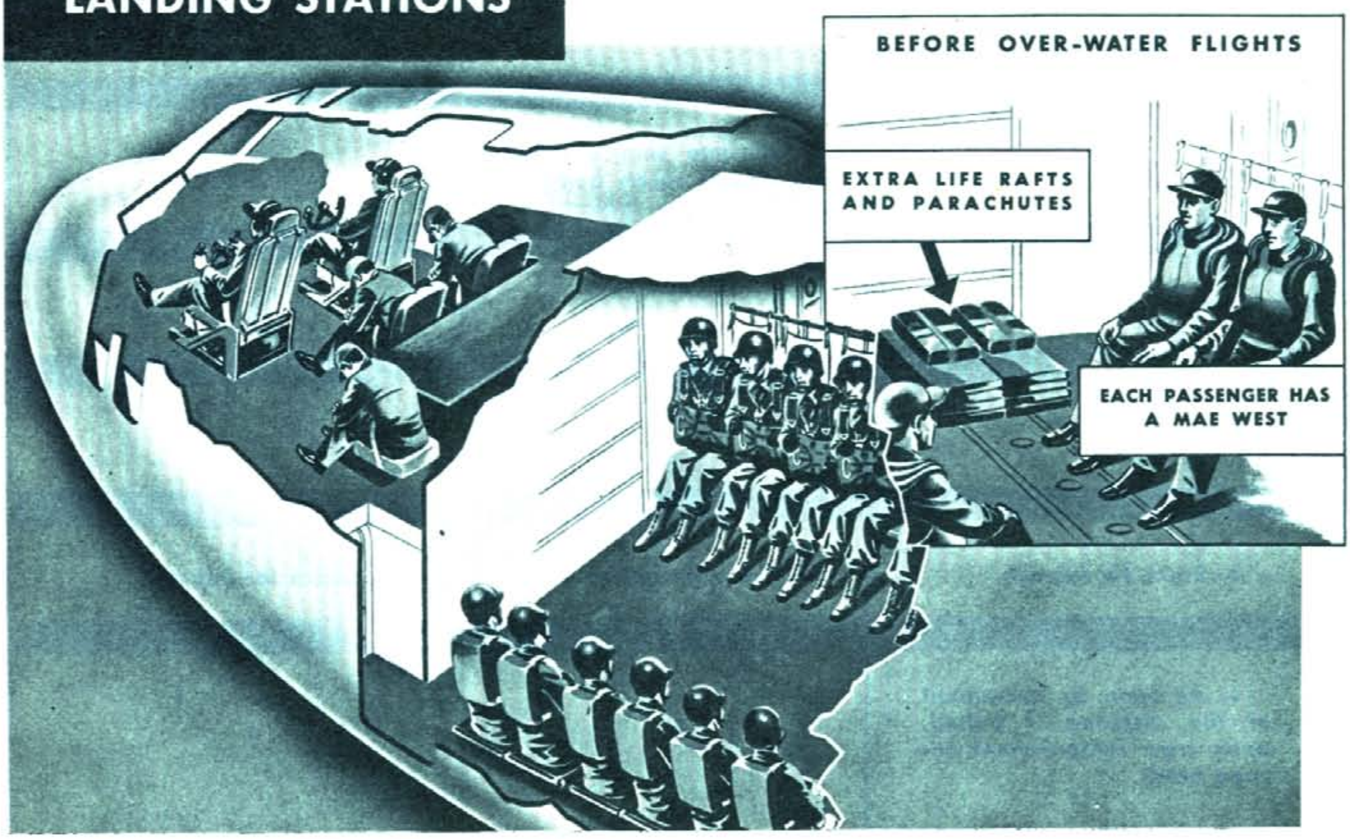


Figure 3–16

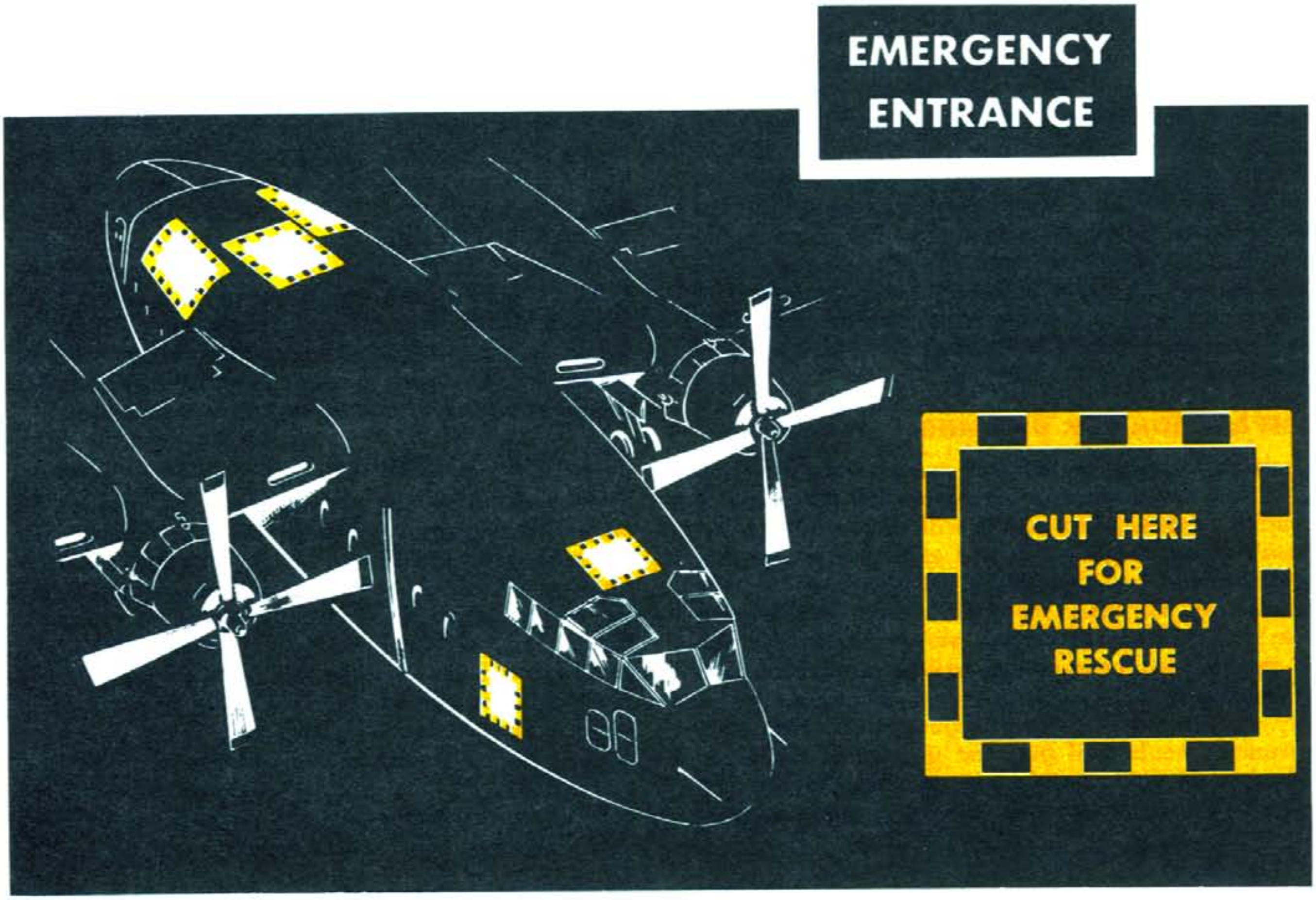


Figure 3–17

4. Make a normal approach at a minimum speed consistent with the gross weight of the airplane. Note that a decrease in the rate-of-descent results from the decrease in drag with all gears fully retracted.

5. Wing flaps lever—DOWN.

6. Land in a comparatively level attitude so that the initial contact will be made on as many fuselage cross frames as possible.

7. Immediately prior to contact give warning by one long ring of the alarm bell and close throttles.

8. Mixture controls—IDLE CUT-OFF.

9. Ignition switches—OFF.

10. Immediately after airplane stops, open crew compartment escape hatch.

11. Battery switch—OFF when it is certain the fire extinguishing system will not be needed.

EMERGENCY ENTRANCE.

In the event of a crash landing which damages all doors so that entrance into the airplane is impossible, the emergency entrance areas as marked in yellow on the airplane should be used. (See figure 3-12.) These areas are located on all the hatches on the top of the fuselage. If it is impossible to open the hatches by means of the external release handles, cutting through the fuselage skin at these areas will afford the least resistance. An additional emergency rescue area is provided on the right side of the fuselage just below the navigator's side window. By cutting through this area, entry into the lavatory compartment is possible.

DITCHING.

Note

> The decision to ditch the airplane should be made before fuel supply is depleted so that personnel in the cargo compartment may bail out; cargo may be jettisoned; flares, if necessary, be dropped; most favorable spot may be selected; and proper approach based on sea conditions may be made.

The cargo compartment may flood very rapidly when the airplane is ditched. For this reason any personnel carried in the cargo compartment should bail out rather than ditch. If bail-out is impossible, occupants of the cargo compartment should follow the ditching procedure. With reasonable precautions the occupants of the crew compartment should be able to ditch successfully in this airplane. This procedure is recommended if circumstances permit since the large life raft carried on the airplane is equipped with extensive signalling and survival gear. Ditching drill should be carried out periodically so that if the emergency arises all crew members will be familiar with the tasks expected of them. Refer to Ditching Chart (figure 3-14) for duties and responsibilities of each crew member. Before each over-water flight, a visual inspection should be made of all emergency equipment. Particular attention should be paid to location of extra life rafts and individual mae wests for the passengers. Be sure to have an extra parachute for each large life raft carried loose in the cargo compartment. The crew and passengers should be briefed on ditching procedure to be followed.

PREPARATION FOR DITCHING.

Decision to ditch or bail out must be made by the pilot in view of existing circumstances. Fire, loss of control, or damage in the air will make ditching impossible; very high winds and extremely rough and irregular seas, poor knowledge of procedure, and lack of training will make the ditching extremely hazardous; the presence of surface vessels or land in the immediate vicinity may make bail-out preferable; lack of immediate surface help may make ditching a necessity. In this airplane any personnel in the cargo compartment should bail out, and if possible the flight crew should ditch the airplane near the downed personnel. This will avoid the danger of entrapment of occupants of the cargo compartment in a ditching and will still make available the large raft with signalling and survival equipment. If ditching with passengers in the cargo compartment is unavoidable, the passengers should jettison all loose equipment not required in the ditching operation and then assume positions in the forward troop seats, fasten and draw lap belts snug, and lean toward the nose of the airplane as far as possible. The radio operator, navigator, and flight mechanic should position themselves in their respective seats in the crew compartment with safety belts fastened. Turn seats to face forward and move seat as far forward as possible. The arms should be folded in the lap while leaning forward. Any padding available should be placed to protect the head and shoulders.

DITCHING PROCEDURE.

Pilot warns crew and passengers of the decision to ditch the airplane as soon as possible. Warning is given over the interphone and by sounding six short rings on the alarm bell. If conditions permit, when the cargo compartment is occupied, these personnel should bail out and make use of individual dinghy packs if available. Two bail-out runs should be made if possible and passengers should leave the airplane in rapid succession, using the paratroop doors and aerial delivery doors. On the second run the large life rafts carried loose in the cargo compartment should be dropped with extra parachutes by one of the crew

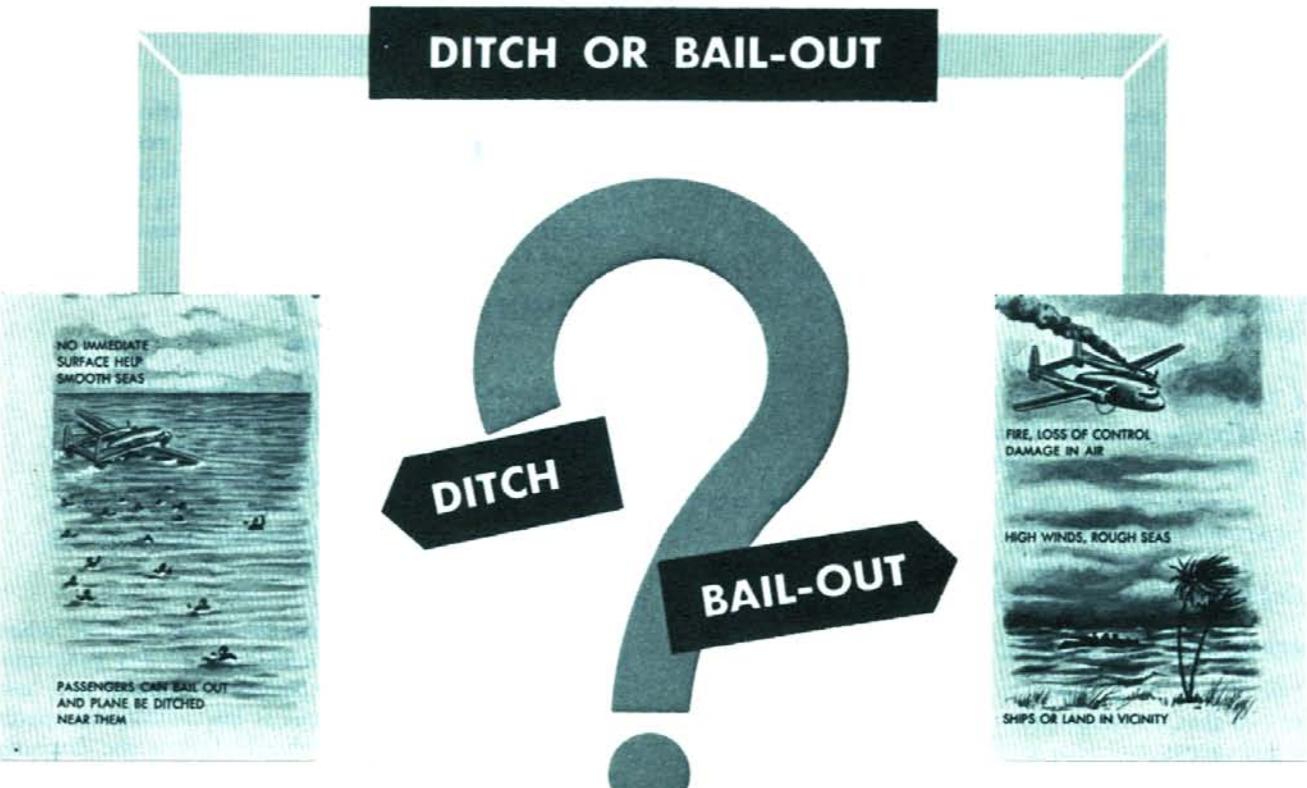


Figure 3-18

DITCHING PATTERN

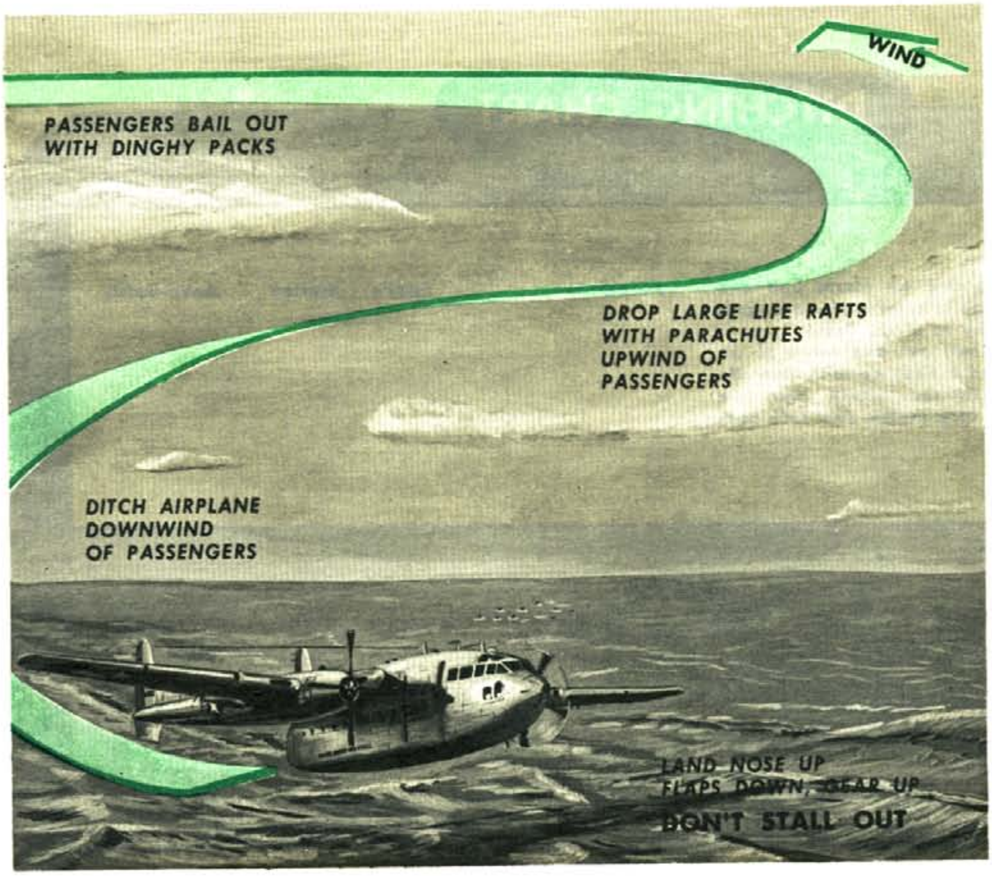


Figure 3–19

members. After dropping all necessary equipment, the paratroop doors and aerial delivery doors should be closed securely. These runs should be made so that equipment is dropped up wind of personnel in the water. If the airplane is then ditched, this should be down wind from personnel in the single dinghys.

If ditching is unavoidable with passengers in the cargo compartment, they should prepare for ditching.

1. On pilot's order ditching escape hatches should be opened prior to landing. The hatches used in ditching are the crew compartment hatch and the two rear escape hatches on the top of the fuselage.

2. On pilot's order "stations for ditching" all personnel must proceed immediately to their assigned ditching stations.

3. Approximately five seconds before striking the water the pilot should warn all occupants to brace by sounding one long sustained ring on the alarm bell. Occupants should not relax until airplane has stopped moving since more than one shock may be felt.

4. When the airplane has stopped, all personnel should leave the airplane as rapidly as possible while not neglecting to recover all necessary emergency equipment. The life raft release should be pulled as soon as the airplane stops. The copilot should check for life raft release and proper inflation and the pilot should attempt to locate all personnel.

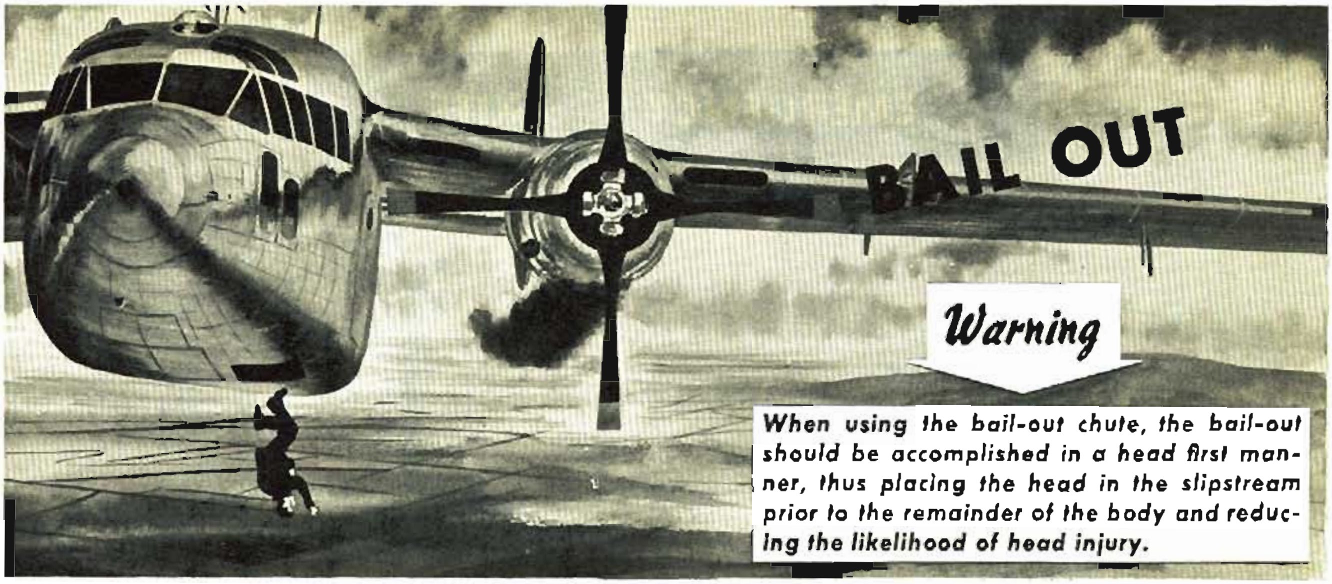
DITCHING TECHNIQUE.

The ditching should be made, if possible, before fuel is exhausted entirely, so as to have engine power available. The sea surface should be examined to determine the size and direction of waves or swell formation. It must be remembered that the sea usually is much rougher than it appears from the air. If regular waves or swells are running, the ditching should be parallel to the wave pattern with touchdown aimed at the crest or on the falling side of the wave or swell. The heading should place the wind in as favorable direction as possible. If the sea surface is irregular and confused with interfering wave patterns the best heading is into the wind. The sea surface should be watched for areas which are smoother than average. The ditching should be attempted on such areas where interfering waves tend to cancel each other. If the ditching is made at night it may be possible to drop a string of flares and land parallel to them. Landing lights should be used if the light does not cause glare under the existing sea conditions. The approach should be made in a normal glide with sufficent speed for adequate lateral control. The landing gear should be up and locked and flaps take-off or full down. The pilot should attempt to strike the water at as low an airspeed as possible, making a nose-up landing. The airplane should not be stalled at impact. If the ditching is made with one engine out, use only small amounts of power from the remaining engine.

DITCHING CHART

PERSONNEL	DUTY	PROVIDE	POSITION	EXIT
PILOT	Give warning by alarm bell and interphone to crew and passengers to standby to ditch. Order passengers to bail out and cargo to be jettisoned if time permits. Don life jacket, tighten safety belt and harness, lock inertia reel lock control.	Parachute	Pilot's Station	Astro-hatch
COPILOT	Take over control of plane while pilot adjusts his equipment. Turn all non-essential electrical equipment OFF. Don life jacket, tighten safety belt and harness, lock inertia reel lock control. Ring alarm bell as signal to brace for impact.	Confidential folder, brief-case, flashlight.	Copilot's station	Astro-hatch
RADIO OPERATOR	Turn on emergency keyer. Don life jacket. Turn IFF to EMERGENCY. Send emergency SOS signal, position, speed, and intention to ditch. Screw down radio key. IFF destructor switch ON. Release raft from inside after plane is is stopped on water.	Drinking water container, first aid kit, crash axe, battery lantern.. . . .	Radio Operator's station	Astro-hatch
NAVIGATOR	Check position and give to radio operator. Don life jacket. Open astro-hatch. Oversee jettisoning of cargo; instruct and supervise passengers in ditching procedures. Tighten safety belt.	Flashlight octant, and drinking water container.	Navigator's station.	Astro-hatch or cargo escape hatch.
FLIGHT MECHANIC	Don life jacket. Oversee collection of all emergency gear in place of readiness. Assist navigator. Tighten safety belt.	Flashlight, Very pistol, ammunition, drinking water container.	Flight mechanic's station.	Astro-hatch or cargo escape hatch.
JUMPMASTER AND TROOPS	Assist navigator in jettisoning the cargo.		Forward cargo compartment seats.	Cargo escape hatch.

Figure 3–20



BAIL-OUT.

The following procedure is recommended for a bail-out over land:

1. Give spoken warning over interphone and three short rings of alarm bell.

2. Turn emergency keyer ON.

3. Reduce airspeed as much as possible.

4. Check parachutes and parachute harnesses.

5. Trim airplane to approximately level flight.

6. Open bail-out chute, paratroop and aerial delivery doors, as these are the only safe in-flight exits.

NOTE

Should a bail-out by personnel in the cargo compartment be necessary when the rear cargo door area is blocked by equipment and tie-down devices, the aerial delivery doors should be used. On later airplanes, the aerial delivery doors may be opened by use of the aerial delivery door switch on the forward jumpmaster's panel. If the pilot's aerial delivery salvo switch is used to open the aerial delivery doors, the red arm monorail stop switch must first be placed in the six o'clock position.

7. Give bail-out order over interphone accompanied by one long ring of alarm bell.

8. Set automatic pilot to fly airplane away from inhabited area.

Consideration of various unfavorable factors involved in an over-water bail-out of the crew limits the decision recommending over-water bail-out to several specific instances; namely, when visual contact is made with land or adequate surface help; when wind and sea conditions are such as to preclude ditching; and when fire or loss of control makes ditching impossible.

Should a bail-out over water be required or decided upon, employ the following procedure:

1. Give spoken warning over the interphone and three short rings of alarm bell.

2. If time permits (approximately one extra minute is required) put on exposure suits over flying clothing. (Exposure suits are only carried on special missions.)

3. Don life jackets and parachutes, making certain the individual life raft pack is secured to parachute harness. Crew members should check the equipment of each other for completeness and proper adjustment.

4. Reduce air speed as much as possible, yet maintaining control.

5. Trim airplane to approximately level flight.

6. Open bail-out chute, paratroop and aerial delivery doors as these are the only safe in-flight exits.

NOTE

Should a bail-out by personnel in the cargo compartment be necessary when the rear cargo door area is blocked by equipment and tie-down devices, the aerial delivery doors should be used. On later airplanes, the aerial delivery doors may be opened by use of the aerial delivery door switch on the forward jumpmaster's panel. If the pilot's aerial delivery salvo switch is used to open the aerial delivery doors, the red arm monorail stop switch must first be placed in the six o'clock position.

7. If ship is in the vicinity, make a run so that the crew, on bailing out, will drift onto the course and just ahead of the ship.

8. Give bail-out order over interphone and one long ring of alarm bell.

9. Set automatic pilot to fly airplane away from immediate area.

Figure 3–21

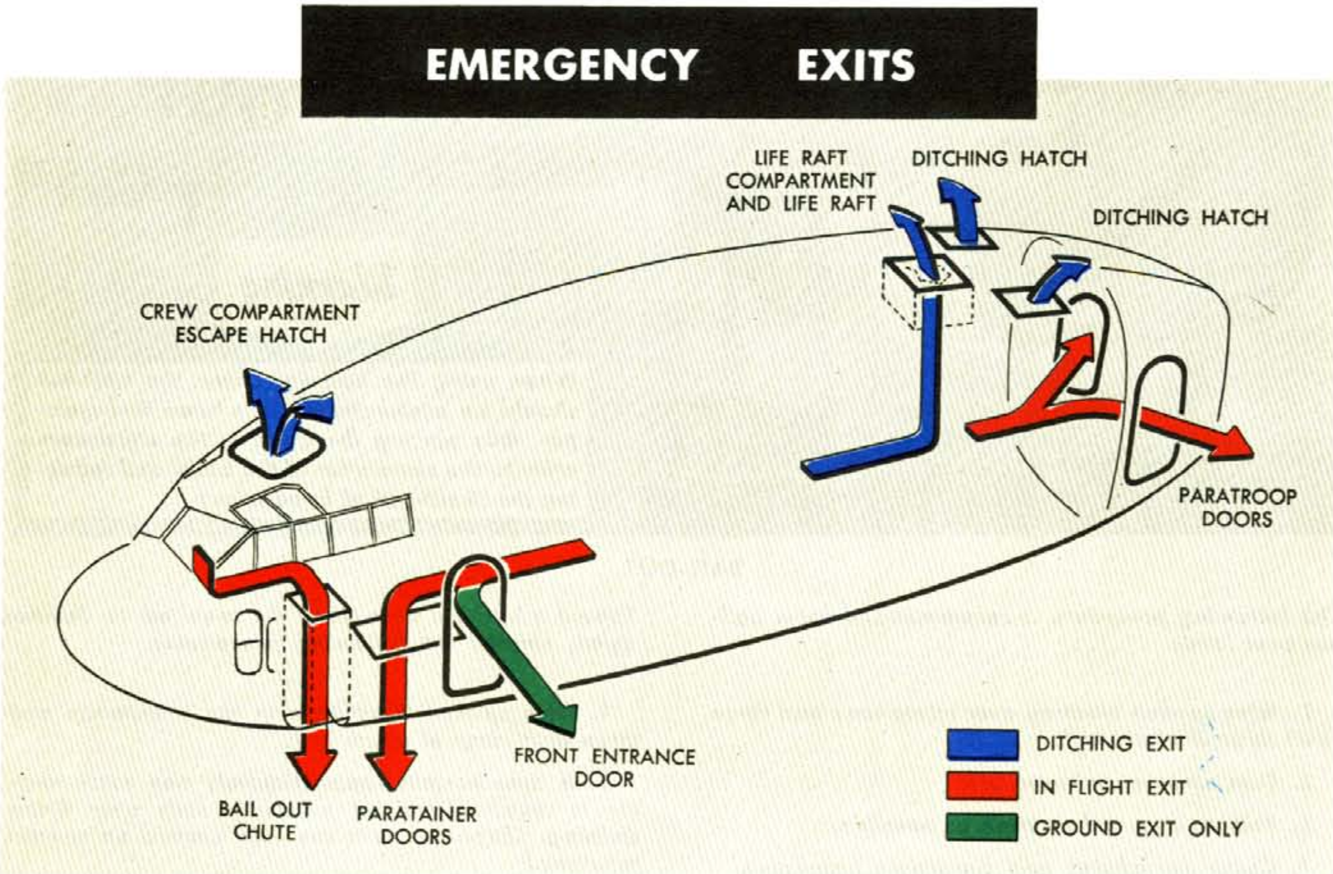


Figure 3–22

ELECTRICAL POWER SYSTEM EMERGENCY OPERATION.

Because of the major differences in the electrical systems of emergency bus airplanes and those on which this feature has not been incorporated, a division of the procedures for electrical system emergency operation has been made on this basis. The procedures outlined below, then, are given for (1) emergency bus airplanes and (2) airplanes without the emergency bus.

PARTIAL POWER FAILURES.

Partial electrical power failures are emergency conditions in that they restrict the airplane in some specific phases of its operation. Such failures seldom jeopardize safety of flight and, in most cases, prompt corrective action in utilizing the equipment provided to cope with a partial power failure will offset the effectiveness of the power loss. The dc and ac voltmeters, as well as the generator loadmeters, will immediately confirm a suspected power failure. Likewise, the generator and inverter warning lights will indicate a malfunction in the electrical system. Discussed below are some specific partial electrical power failures and the remedial action to be undertaken should they occur.

Note

> Airplanes IK 441 and 442 are not equipped with an emergency bus. Wherever emergency procedures differ for these airplanes, separate treatment is presented.

GENERATOR FAILURE (On Airplanes IK 441 and IK 442).

When an engine generator overvoltage warning light illuminates, indicating that its respective field control relay has tripped because of an excessive voltage condition, employ the following procedure:

1. Turn off all electrical equipment not needed for existing flight conditions.

2. Direct flight mechanic to start APP. Allow APP to idle so as to be immediately available if needed to offset the loss of electrical power.

3. Place the generator control switch in the RESET position to reset the field control relay and allow the switch to return to OFF.

Note

If the generator overvoltage warning light remains on, the field control relay has not reset and should be reset manually.

4. Check the voltage output of the generator by use of the dc voltmeter on the instrument panel. If the voltage is 28 volts—which indicates the field control relay has reset—manually place the generator switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remains off and that the corresponding generator loadmeter indicates that the generator output is reaching the bus.

5. If, on checking the voltage of the generator after the control switch has been turned to RESET, an output of more than 28 volts is obtained—which indicates that the relay has been reset—lower the voltage by means of the copilot's voltage regulator rheostat or the adjusting knob at the voltage regulator. Then manually place the generator switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remains off and the corresponding generator loadmeter indicates that the generator output is reaching the bus.

6. If, on checking the voltage of the generator after the control switch has been turned to RESET, an output of approximately 3-5 volts is obtained—which indicates that the relay has not been reset—depress the manual reset button on the field control relay and check that the voltage output is 28 volts. Then manually place the generator control switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remains off and that the generator loadmeter indicates the generator output is reaching the bus.

7. If it is impossible in all the above conditions to get the output of the generator on the bus, turn the generator switch to the OFF position and use the APP generator output to offset the power loss.

GENERATOR FAILURE.

(On All Airplanes Except IK 441 and IK 442).

When an engine generator power failure warning light glows, indicating a malfunction in its respective generator system, employ the following procedure:

1. Turn off all electrical equipment not needed for existing flight conditions.

Note

On airplanes with the monitor bus installation, certain electronic equipment is automatically disconnected from the main bus when an engine generator failure occurs. This equipment includes Loran, Radar Beacon (APN-12), Navigation and Search Radar (APS-42), the Liaison Radio, and on airplanes AF 53-7880 through 53-7884, propeller deicing. Should use of any of these units be necessary following failure of one generator, movement of the monitor bus switch (located at the navigator's station) to the OVERRIDE position provides an alternate path for power to reach the equipment. However, when the OVERRIDE position is used, carefully observe the loadmeter of the remaining generator to prevent overloading.

2. Direct flight mechanic to start the APP. Allow APP to idle so as to be immediately available if needed to offset the loss of electrical power.

3. Place the control switch of the affected engine generator to the RESET position to reset the field control relay; then allow the switch to return to OFF.

Note

When the generator switch, is turned to RESET, the warning light will go out. This does not indicate that the field control relay has been reset.

4. Check the voltage output of the generator by use of the dc voltmeter on the instrument panel. If the voltage is 28 volts—which indicates that the field control relay has been reset—manually place the generator switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remain off and that the corresponding generator loadmeter indicates the generator output is reaching the bus.

5. If, on checking the voltage of the generator after the generator control switch has been turned to RESET, an output of more than 28 volts is obtained—which indicates that the relay has been reset—lower the voltage by use of the adjusting knob at the voltage regulator in the cargo compartment. Then manually place the generator switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remains off and that the corresponding generator loadmeter indicates the generator output is reaching the bus.

6. If, on checking the voltage of the generator after the generator control switch has been turned to RESET, an output of approximately 3-5 volts is ob-

tained—which indicates that the relay has not been reset—depress the manual reset button on the field control relay in the cargo compartment and check that the voltage output is 28 volts. Then manually place the generator switch lever to the ON position (closing the switch guard will not necessarily turn the switch from OFF to ON). Immediately check that the warning light remains off and that the generator loadmeter indicates the generator output is reaching the bus.

7. If, on checking the output of the generator after the generator switch has been turned to RESET, a zero voltage reading is obtained, a mechanical failure of the generator is indicated. However, to preclude the possibility of field control malfunction, it is always advisable to depress the manual reset button on the field control relay and, again check the voltage output of the generator.

8. If it is impossible in all the above conditions to get the generator output on the bus, turn the generator switch to the OFF position and use the APP generator output to offset the power loss.

GENERATOR FAILURE—ZERO INDICATION ON PERCENT LOADMETER (On Airplanes IK 441 and IK 442).

Should all generator warning lights be off and one engine generator loadmeter indicate a no-load condition while the other indicates a normal reading, employ the following procedure:

1. Turn off all electrical equipment not needed for existing flight conditions.

2. Direct flight mechanic to start APP. Allow APP to idle so as to be immediately available if needed to offset the loss of electrical power.

3. Check the voltage output of the generator suspected of malfunctioning by use of the dc voltmeter on the instrument panel.

4. If the voltage output is normal, turn the corresponding generator control switch to OFF and note if the reading on the other loadmeter increases. An increase on the other generator loadmeter indicates that the generator voltage is reaching the bus and that the loadmeter has failed.

Note

Manually place the generator switch lever to the ON position. Closing the switch guard will not necessarily turn the switch from OFF to ON.

5. If the voltage output of the generator is found to be zero, a mechanical failure of the generator is indicated. Place the corresponding generator switch in the OFF position. Use the APP output to offset the power loss.

FAILURE OF BOTH ENGINE GENERATORS (On Airplanes IK 441 and IK 442).

A failure of both engine generators, admittedly, is an emergency condition when encountered in flight, but the prompt accomplishment of proper corrective action will greatly lessen the adverse effects of the power loss. Naturally, the sooner the failure is detected, the less critical the emergency is likely to become. Indication of a complete generator failure will be apparent immediately by all of the following conditions: any lights that are on will dim; the voltmeter with the selector switch in MAIN BUS will indicate the battery voltage of 24 volts or less; and the generator loadmeters will register a no-load condition. Moreover, as the battery voltage drops off, radio reception will fade and both the dc and ac instruments will become sluggish. Immediate action should be taken to conserve battery power. If the electrical equipment utilized during normal flight procedure is energized solely by battery power, the battery will be depleted in a matter of minutes. However, if battery power is conserved and used only for absolutely essential equipment, it may last several hours. The following procedure is recommended should both engine generators fail:

Note

Make certain that location of flashlights is known to all crew members. Should both generators fail during a night mission, several flashlights will be required in accomplishing the emergency procedures.

1. Battery switch—OFF.

Note

Attempt to stay clear of IFR conditions and land at the first suitable landing field.

2. Emergency power switch—ON. This will provide ac power for the pilot's attitude and directional gyros.

3. Start APP immediately using manual starting procedure. Refer to Section IV for starting procedures.

4. Turn off all electrical equipment not needed for existing flight conditions, so that the load which the APP must assume is reduced to minimum.

5. If the engine was being operated in high blower at the time of generator failure, turn the supercharger switches to LOW prior to turning the battery switch ON.

Note

If high blower operation is desired after the output of the APP has been connected to the bus, shift the high blower operation in accordance with the limitations outlined under SUPERCHARGER, Section V.

6. When the APP is operating normally and all non-essential equipment has been turned off, return the battery switch to the ON position.

CAUTION

When operating solely on the APP, propeller de-icing may be used in an extreme emergency provided all electrical systems except emergency instrument inverters and heaters, if required, are turned off.

7. Attempt to determine the cause of the malfunction and correct it. Get the engine-driven generators back on the bus. Refer to the procedures outlined under GENERATOR FAILURE, Section III.

FAILURE OF BOTH ENGINE GENERATORS

(On All Airplanes Except IK 441 and IK 442).

Should both engine-driven generators fail (assuming the APP is not operating), the battery is automatically disconnected from the main dc bus. Failure of both generators is immediately signalled by the loss of all electrical equipment except certain emergency equipment including the instrument power failure light and the generator failure lights which will illuminate to indicate the power loss. The pilot's C-4 spotlight also remains energized so that illumination of the immediate cockpit area is available for the accomplishment of the emergency procedures under night conditions.

The alarm bell and IFF destruct, while not on the emergency bus, are operable on battery power. Should failure of both generators occur, the procedure to be employed on emergency bus airplanes is as follows:

1. Turn the emergency power switch ON. This provides battery power for the pilot's turn-and-bank indicator, generator reset, spare instrument inverter and pitot heat (by selection).

2. Turn the ac voltmeter selector switch to SPARE INST. and check the output of the spare instrument inverter. The output of this inverter is required for the energization of the pilot's attitude and directional gyros.

Note

Attempt to stay clear of IFR conditions and land at the nearest suitable landing field.

3. Direct the flight mechanic to commence manual starting of the APP. The manual starting procedure is outlined in Section IV.

4. Turn off the auto pilot and single-phase inverters, propeller de-icing and all unnecessary equipment. Check that the supercharger switches are in LOW.

Note

If the engines were being operated in high blower at the time of the power loss, the superchargers will shift to low blower. If high blower operation is desired after generator power is restored to the main dc bus, shift to high blower in accordance with the limitations outlined in SUPERCHARGER, Section V.

CAUTION

If emergency use of any equipment on the main dc bus becomes imperative, the battery switch may be held in the OVERRIDE position and the specific equipment turned on. Use of the OVERRIDE position must be restricted to limited operation of communications equipment essential to safety of flight; otherwise, an excessive drain on the battery will result.

5. Turn engine generator switches to RESET, then OFF. When the engine generator switches are placed in RESET, the generator failure lights will go off. This does not mean that the field control relays have been reset.

6. Check the voltage of each generator by means of the dc voltmeter and voltage selector switch. A voltage of approximately 28 volts indicates that the field control relay has been reset; a voltage of approximately 5 volts indicates that the relay is still tripped and should be manually reset. If zero voltage is obtained, a mechanical failure of the generator is indicated; however, a further attempt to reset the relay manually should be made.

Note

The generator reset circuit is protected by the pitot heat circuit breaker on the emergency bus. Electrical resetting of the field control relays requires that this circuit breaker be closed.

7. If either engine generator output is 28 volts, turn that generator switch ON and check its respective loadmeter to assure that the output is reaching the bus.

Note

With the output of one generator on the bus, electrical starting of the APP should be accomplished if manual starting has not been completed. Operate the APP in IDLE.

8. If it is not possible to get an engine generator on the bus immediately, place the APP generator switch ON after manual starting and warm-up has been accomplished.

CAUTION

When operating solely on the APP, propeller de-icing, may be used in an extreme emergency provided all electrical systems except the instrument inverter and the heaters (if required) are turned off.

9. Attempt to get the engine generators back on the bus, employing the procedures outlined under GENERATOR FAILURE, Section III.

INVERTER FAILURE.

FAILURE OF BOTH SINGLE-PHASE INVERTERS.

Should failure of both single-phase inverters occur, the following equipment is inoperative; fuel flowmeters, fuel quantity, fuel pressure, water pressure, oil pressure, torque pressure, compass light, B-3 driftmeter, nose wheel position, IFF, loran, radar beacon, radio magnetic indicators (ID-250), bearing converter (ID-251) wind drift needle and localizer (vertical) needle of the course indicator (ID-249), and the remote indicating compasses (slaved gyro magnetic compasses). The AN/APS-42 equipment becomes inoperative should either or both single-phase inverters fail.

FAILURE OF AUTOMATIC PILOT INVERTER.

Failure of the automatic pilot inverter will result in the loss of the automatic pilot system as well as the cards of the radio magnetic indicators (ID-250), bearing converter (ID-251), master direction indicator, vertical gyro control, rate gyro, and the remote indicating compasses (slaved gyro magnetic compasses).

FAILURE OF BOTH THREE-PHASE INSTRUMENT INVERTERS.

Should both three-phase instrument inverters fail, the pilot's attitude and directional gyros become inoperative. The B-6 driftmeter is lost if either or both three-phase inverters fail.

LOSS OF ALL ELECTRICAL POWER.

In the event a loss of all electrical power should occur, the major factor influencing the pilot's course of action is the atmospheric conditions prevailing at the time. If the failure should occur during VFR conditions, continued operation is practical; however, every effort should be made to stay clear of instrument flight conditions and to land at the first suitable airport. If such a failure should occur during IFR conditions continued operation would be made at the discretion of the plane commander. Under the above conditions, control of the airplane is limited to the following:

1. Flight controls less aileron and rudder trim tabs.

2. Control of engines with throttles, propellers and mixture controls only. Supercharger operation is restricted to low blower.

3. Engine instruments—MAP and RPM.

4. Flight instruments—magnetic compass, altimeter, and rate-of-climb, also airspeed depending upon atmospheric conditions.

5. Landing gear and wing flaps emergency extension only.

6. Brake systems operate normally.

HYDRAULIC SYSTEM EMERGENCY OPERATION.

EXCESSIVE HYDRAULIC PRESSURE.

Relief valves in the main hydraulic system are set to relieve at 3500 psi. Should failure of these devices result in the build-up of excessive pressure, the emergency pressure release valve on the emergency hydraulic control panel should be placed in the EMERGENCY position in order to prevent possible damage to seals, lines, and actuators. Placing this valve in the EMERGENCY position diverts main system pressure to the reservoir; back pressure of the circulating fluid will be approximately 250 psi.

LANDING GEAR EMERGENCY OPERATION.

ELECTRICAL SYSTEM FAILURE.

In the event there is a complete electrical failure the landing gear switches will be inoperative and the landing gear retraction and extension should be accomplished as follows:

1. Place the landing gear normal operation switch in OFF position.

2. Open cover plate in hydraulic emergency control panel located on the auxiliary floor.

3. Hold in proper (UP or DOWN) selector valve manual control button until all landing gears are either full up and locked or full down and locked. The landing gear indicating system will be inoperative so a visual check should be made to assure that the gears are locked.

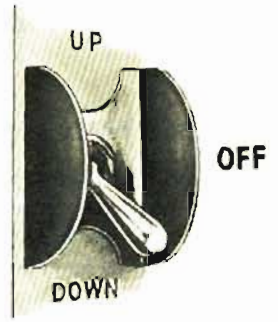
Landing Gear EMERGENCY EXTENSION

(Hydraulic System Failure)

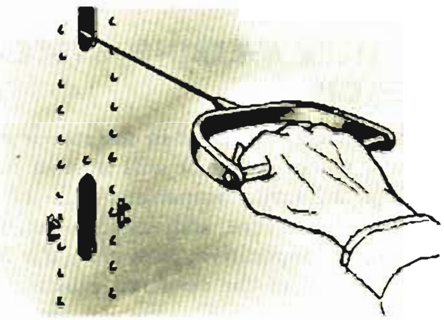
In the event the hydraulic normal power system should fail, the landing gear may be extended through the use of the following procedure:

NOTE

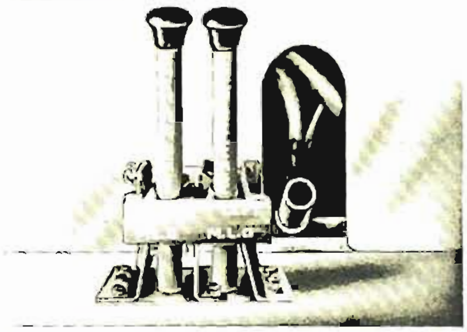
On flight operable door airplanes, make certain the flight operable door auxiliary pressure valve is in NORMAL.



1. Place the landing gear normal operation switch in the DOWN position.

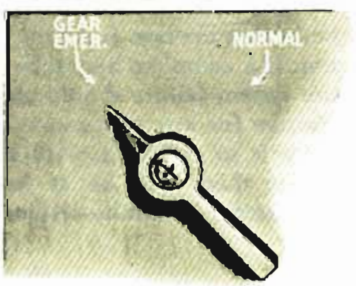


2. Pull the nose landing gear emergency up-lock release handle located on the cargo compartment forward bulkhead.



3. Remove the safety pin and push the two main landing gear emergency uplock release handles.

CHECK THAT ALL GEARS HAVE FREE FALLEN.



4. Open the cover plate on the hydraulic emergency control panel and turn the hydraulic emergency selector valve to EMERGENCY.

5. Operate the hydraulic emergency hand pump until indicator lights show all gears to be down and locked.

Figure 3-23

HYDRAULIC SYSTEM FAILURE.

For emergency operation of the landing gear should a failure of the hydraulic system occur, refer to Figure 3-23.

NOSE WHEEL STEERING SYSTEM EMERGENCIES.

Should all hydraulic pressure in the steering system be lost, the nose wheel (wheels) will trail in the centered position but shimmy dampening will be lost. An electrical system failure will render control of the steering system inoperative; however, the nose wheel (wheels) will trail in the centered position and shimmy dampening will remain effective. Steering of the aircraft will be accomplished by use of throttles and brakes.

ELEVATOR GUST LOCK EMERGENCY RELEASE OPERATION.

On later airplanes emergency release of all hydraulic gust lock pressure may be accomplished by pulling the automatic pilot emergency disconnect or manually operating the selector valve in the cargo compartment should there be any indication of pressure restricting control column movement of the elevator surface except during intentional locking. By positioning the elevator gust lock emergency release valve to EMERGENCY, this pressure release is assured.

CAUTION

When elevator gust lock release valve is turned to EMERGENCY, the hydraulic elevator gust lock is inoperative until valve is repositioned to NORMAL. If landing with valve in EMERGENCY position, the pilot should exercise caution, when reverse thrust is used, and the copilot should attempt to restrain the movement of the control column.

WING FLAP EMERGENCY OPERATION.

Note

Landings may be accomplished without the use of wing flaps. Consideration must be given to the fact that wing flaps should be retracted in the event of go-around; consequently, emergency operation of the wing flaps should be governed accordingly.

ELECTRICAL SYSTEM FAILURE.

In the event there is a complete electrical failure the wing flap lever will be inoperative and the wing flaps operation should be accomplished as follows:

1. Place the wing flap lever in the desired position. (This is a safety precaution in case electrical power should become available.)

2. Hold in the proper (UP or DOWN) wing flap selector valve manual control button located on the hydraulic emergency control panel, until the flaps are in desired position.

HYDRAULIC SYSTEM FAILURE.

In the event the hydraulic normal power system should fail, the wing flaps may be operated by placing the hydraulic emergency selector valve to the EMERGENCY position and wing flaps lever to desired setting.

1. Operate the hydraulic emergency hand-pump until flaps are in position desired.

Note

On airplanes with flight operable door, check that the auxiliary pressure valve is in the NORMAL position.

2. In the event of a hydraulic system failure and an electrical system failure, the wing flap selector valve manual control button must be held in during the hand pumping operation.

HYDRAULIC BRAKE SYSTEM EMERGENCIES.

BRAKE PEDAL SYSTEM FAILURE.

A failure of the brake pedal system is indicated by no fluctuation of the hydraulic system low pressure indicator when the brake pedals are depressed. Should the brake pedal system fail, brakes may still be applied by use of the parking brake or the emergency air brakes.

HYDRAULIC SYSTEM FAILURE.

The hydraulic brakes operate from the hydraulic low pressure system. If a complete hydraulic system failure or low pressure system failure should occur, the brakes will be inoperative for any continuous use. However, the brake system is so arranged, with a special brake accumulator, that there will be at least one brake application left after a hydraulic system pressure supply failure.

Note

If the hydraulic pressure indicators on the instrument panel should indicate low pressure, a check should be made of the brake system accumulator air gage, located in the lavatory compartment to determine the amount of pressure available in the brake system.