SECTION III—EMERGENCY PROCEDURES

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INTRODUCTION.

A complete knowledge of the procedures in this section will enable the flight crew to cope with emergencies during takeoff, flight, and landing. Crewmembers must have a thorough knowledge of all emergency procedures. Each emergency procedure presents a different problem which can be solved only through specific remedial action. Good judgment, precision, and teamwork are essential. These can only be developed through frequent simulated emergencies and emergency drills. After it has been determined that an emergency exists, communications should be established immediately with surface craft or stations. These stations should be advised, in as much detail as possible, the aircraft position, nature of emergency, the aircraft commander's intentions and any other pertinent information.

Upon detecting a malfunction, the flight engineer will notify the pilot of the type of malfunction and the location. The pilot, when detecting a malfunction, will call for an engineer's report, advising the flight engineer of the location of the suspected malfunction. The flight engineer replies that the malfunction is (Loss of Power No. _____ Engine, Fire Warning Light No. _____, Left Cabin Heater Fire, etc.). The pilot commands, "Pilot's power, execute Emergency Procedure." The flight engineer acknowledges, "Pilot's power, executing Emergency Procedure." The flight engineer sets mixtures to auto rich, manual spark, master switch to retard, and proceeds with required procedure. The copilot sets rpm as required by pilot. Before increasing rpm over 2400 the copilot will assure that the manual spark is in retard and the mixtures are in auto rich. Coordination between the pilot and flight engineer is required for rpm change when the synchronizer is inoperative.

All odors not identifiable by the flight crew shall be considered toxic. Immediately go on 100 percent oxygen, properly ventilate the aircraft and land as soon as practicable. Do not take off when unidentified odors are detected.

NOTE

- When the pilot commands, "Execute emergency procedure," the copilot and flight engineer initiate whatever immediate action is required of each, followed by accomplishment of the appropriate checklist as soon as feasible. A separate command for the checklist will not be necessary unless the pilot notices the checklist has not been accomplished. Steps appearing in **BOLDFACE** type on the checklist are mandatory memory and immediate action items which must be accomplished before reading the checklist. For those instances not requiring rapid and immediate action (such as unfeathering, preplanned engine shutdown, and preplanned fuel dumping), procedures will be accomplished by reference to the checklist.

- When the flight engineer's checklist is complete, he will report to the copilot, "Engineer's emergency checklist complete." When checklists are complete and the flight engineer is ready to assume power he will advise the pilot, "Engineer ready to assume power." If pilot is ready to relinguish power, he will acknowledge and reply, "Engineer's power."

During transition flying, when emergencies are being practiced and an actual emergency has not occurred, the commands of execution will be preceded by the word, "Simulate." Simulated engine failure and engine fire procedure will be used when aircraft altitude is less than 3000 feet above terrain. When altitude is 3000 feet or above, the actual emergency procedures for engine failure may be accomplished. Simulated feather (zero thrust) power setting at 4000 feet and 140 knots is 20 in. MAP and 2000 rpm.

GROUND EMERGENCIES.

ENGINE FIRE.

Judgment and precision are more important than speed when putting out an engine fire. Closing a wrong valve could cause more trouble than a few seconds delay in controlling the fire. The procedures vary for fires which occur during and after starting, and in flight.

ENGINE FIRE DURING START OR GROUND OPERATION CHECKLIST

If an engine fire occurs before the engine has started, discontinue priming and continue cranking to draw fire through engine and proceed as follows:

BOLDFACE items will be accomplished before reading the checklist.

Pilots		Flight Engineer
1. **BRAKE SELECTOR – EMER**	P,CP	NOTE
2. **NOTIFY TOWER AND CREW**	P	Steps 1, 2, and 4 are required only when the fire occurs while starting engines
		1. **PRIMER/MIXTURE – OFF**
		2. **STARTER – ENGAGED**

NOTE

If the engine fire occurs after completion of BEFORE TAXI CHECKLIST, **do not** shut down unaffected engines. The pilot will attempt to position the aircraft down wind and then direct the flight engineer to shut down remaining engines.

CAUTION

Do not attempt to restart engine until cause of fire has been corrected.

ENGINE FIRE DURING START OR GROUND OPERATION CHECKLIST – Continued

Pilots		Flight Engineer
		If fire continues
		3. STARTER – DISENGAGED
		4. EMERGENCY SHUTOFF – FULL OFF
		5. FIRE SELECTOR – SET
		6. FIRE EXTINGUISHER – DISCHARGED
(3.) All mixture levers – OFF	P	(7.) All Mixtures – OFF, at pilot's command
		WARNING Do not cut mixtures until tower has been notified. notified.
		8. Fuel tank selectors – OFF
4. All ignition switches – OFF	P,CP	9. Fuel pumps – OFF
(5.) Battery – OFF		(10.) Battery – OFF, at pilot's command
6. Evacuate aircraft	P	
NOTE One long ring of the alarm bell on the ground signifies crew emergency evacuation.		**CAUTION** Do not attempt to restart engine until cause of the fire has been determined and corrected.

EMERGENCY BRAKE OPERATION.

NOTE

- When the brake accumulators are charged normally, approximately ten applications are available. Brake selector lever must be in EMER before the accumulator can be charged.
- If, after touchdown, a brake emergency occurs in which little or no braking action can be developed by any of the following emergency procedures, propeller reversing is available for aerodynamic braking. However, reversing should be used judiciously if the secondary hydraulic system is inoperative because nosewheel steering will not be available. If the accumulator pressure has been depleted, hold brake pedals down and use emergency hand pump.
- If braking action is lost while operating on emergency and secondary pressure is normal, it may be regained by selecting normal.

BRAKE FAILURE CHECKLIST

BOLDFACE items will be accomplished before reading the checklist.

Pilots		Flight Engineer

NOTE

- This checklist will be used when a sudden loss of pressure occurs.

- Any time a ground emergency is experienced brake selector lever should be shifted to the EMER position.

NOTE

If there is no braking action with the brake selector lever in NORM position, do the following:

1.	Brake selector – EMER	CP	**1. MIXTURES – RICH**
2.	Emergency handpump – As required	CP	
3.	Propeller reversing – As required	P	
(4.)	Hydraulic crossover – As required	P	(2.) Hydraulic crossover – As required

BRAKE FIRE CHECKLIST

BOLDFACE items will be accomplished before reading the checklist.

Pilots		Flight Engineer

When frequent landings are made or when excessive brake usage is required, it is possible to overheat the brake system and cause a fire. To avoid the possibility of retracting the gear with hot brakes, it is desirable to obtain a visual brake check before takeoff. At the first indication or report of a brake fire, the pilot states, "Brake fire, executing emergency procedure."

1.	**BRAKE SELECTOR LEVER – EMER**	P	**1. MIXTURES – RICH**
2.	Stop aircraft	P	
3.	Wing flaps (to facilitate evacuation) – 100 PERCENT	CP	
4.	Ground firefighting equipment – Requested	CP	
5.	Nosewheel – Turned full throw toward burning or smoking wheel	P	
6.	Brake on burning wheel – Released, opposite brake ON, parking brake set	P	
7.	RPM on engine over burning wheel – 2600 rpm	P	
	Increase rpm to 2600 or as required to attempt to extinguish fire.		
(8.)	All engines (except engine overburning wheel) – Shut down	P	(2.) All engines (except over burning wheel) – Shut down.
	If ground fire equipment is available, shut down engine over burning wheel and evacuate crewmembers.		

FUEL PRESSURE DROP – ENGINE OPERATING NORMALLY.

DURING GROUND OPERATION.

If the fuel pressure drops below the operating limits, but the engine continues to operate normally, stop the aircraft and stand by to release fire extinguishing agent to the affected engine, and shut down immediately. Investigate and correct the cause before takeoff.

HEATER FIRE CHECKLIST

Pilots **Flight Engineer**

If a fire occurs in the cabin heaters or cabin heater compartments, the fire detectors will energize the warning lights and the fire can be extinguished with the integral fire extinguishing system.

BOLDFACE items will be accomplished before reading the checklist.

1. **HEATERS – OFF**
2. **RECIRCULATING AND FLIGHT STATION FANS – OFF**
3. **FLIGHT STATION MIXING VALVE – COOL**
4. **HEATER FIRE SELECTOR – SET**
5. **FIRE EXTINGUISHER – DISCHARGE**

WARNING

Do not release the second charge until it is certain that the first charge did not smother the fire and the first five checklist items have been accomplished.

After the Fire is Out

6. Heater fire selector – OFF

(1.) Engineer's Heater Fire checklist – Completed CP

(7.) Engineer's Heater Fire checklist – Completed

GTPU FIRE CHECKLIST (C-121G)

When BOLDFACE items have been completed, the checklist will be called for and accomplished in its entirety.

Pilots **Flight Engineer**

At first indication or report, state, "GTPU FIRE."

1. **GTPU STOP SWITCH – STOP.**
2. **GTPU FIRE SELECTOR – SET.**
3. **HRD/CO_2 DISCHARGED.**
4. GTPU fire selector (when fire is out) – OFF.

(1.) Engineer's GTPU Fire checklist – COMPLETED. P

(5.) Engineer's GTPU Fire checklist – COMPLETED.

WARNING

If fire persists, depressurize and use hand fire extinguisher through access hole in the pressure bulkhead.

TAKEOFF EMERGENCIES.

ABORT TAKEOFF PROCEDURE.

CAUTION

The primary problem faced in an emergency occurring prior to refusal speed is to stop the aircraft within the confines of the available runway. Hence, all operating engines should be utilized as necessary during the reversing procedures. An engine which is on fire can be effectively utilized for this purpose. Once the aircraft is stopped the engine fire procedure can be implemented.

If the automatic feathering system is turned on, the propeller should feather automatically when the BMEP falls to within the auto feathering range. The following procedure should be accomplished if engine failure or fire is encountered before readhing refusal speed:

NOTE

Any crew member will advise the pilot of any serious malfunction immediately during takeoff run using the term "Abort."

a. Throttles – Close

b. Reverse throttles – Reverse range

c. Stop aircraft with brakes

d. Execute appropriate emergency checklist

ENGINE FAILURE OR FIRE DURING TAKEOFF.

If an engine fails, or a fire is detected after passing V_1 speed, and there is insufficient runway to stop the aircraft, the takeoff should be continued. If maximum performance climb is required, climb at V_2 speed until starting wing flaps up. If the automatic feathering system has been turned on, the propeller should feather automatically when the BMEP falls to the auto feathering range. Engine failures or power losses occurring during critical gross weight takeoffs may result in insufficient power available to keep aircraft airborne if the engine is feathered prematurely. It is therefore recommended that under these circumstances the engine continue to be operated until the BMEP falls to the auto feathering range, or until sufficient atltitude and airspeeds are obtained for safe operation with the remaining engine power available. Engine Failure or Fire procedure will be initiated upon pilot's command. After the gear is up, the pilot will call for METO power if a power reduction is feasible. Climb will be continued until desired altitude is reached. If an engine fails or an engine fire is detected, shut down the inoperative engine as described in the following procedure. If the flight can be continued, refer to the Appendix for cruise control with one or more engines inoperative. The minimum control speed is that speed required to provide sufficient control to enable the airplane to fly a straight path over the ground when an outboard engine has failed. This minimum control speed is based on takeoff configuration, propeller on dead engine windmilling in low pitch, maximum power on remaining three engines, wing flaps 60 percent position, landing gear either retracted or extended, and no more than 5 degrees of bank angle away from the failed engine.

The minimum control speed is 91 knots IAS using the No. 2 static system.

SAFE ENGINE-OUT SPEED.

The safe one-engine-out speed is defined as that speed which permits an aircraft at the maximum recommended gross weight to climb a minimum of 100 fpm on a sea-level standard day in the clean configuration, propeller feathered on the inoperative engine, and maximum power on the remaining engines.

130,000 Lb Gross Weight

Power and Configuration	Three Engine Climb Speed (No. 2 Static)	Takeoff Rate of Climb Available
Max Power Gear Down Flaps Takeoff	118 knots IAS	530 ft/min
Max Power Gear Up Flaps Takeoff	118 knots IAS	800 ft/min
METO Power Gear Up Flaps Takeoff	118 knots IAS	415 ft/min
METO Power Gear Up Flaps Up	160 knots IAS	640 ft/min

The preceding tabulation presents the normal one-engine inoperative climbout speeds and sequence. Performance is based on standard day, sea-level conditions with the propeller feathered on the inoperative engine. Power schedules are for the inboard engine(s) and is 277 and 254 BMEP for Maximum and METO power, respectively.

When operating at heavy gross weights, it may be necessary to alter this sequence. For maximum climb performance, reduce drag (gear and flaps up) before reducing power. Do not reduce power, unless terrain permits during the acceleration to the three-engine climb speed (155 knots IAS), unless terrain permits. Refer to Appendix I, Part 4, Climb,

for specific effects of weight, configuration, speed, altitude and power.

WARNING

Unless operational conditions require, do not take off if V_1 is less than V_{meg}.

ENGINE FAILURE UNDER SPECIFIC CONDITIONS.

ENGINE FAILURE AND/OR FIRE DURING TAKEOFF.

If an engine failure or fire occurs during takeoff before the airplane has accelerated beyond refusal speed, the takeoff must be aborted. Refer to Abort Takeoff Procedure under Takeoff Emergencies in this section.

RUNAWAY PROPELLER DURING TAKEOFF.

An overspeeding propeller is a condition during which rpm goes beyond maximum normal range but is controllable by governor action. A runaway propeller is a condition during which rpm goes beyond maximum normal range and is not controllable by governor action. Overspeeds are most likely to occur during operations that require the master propeller pitch lever to be in the calibrate position. In this position, the propeller governors call for full increase rpm, as is indicated by the limit lights. However, if a propeller should start to exceed 2900 rpm while the governor is not calling for full increase rpm, and the limit light is not on (that is, while METO power is set during the takeoff precedure), a runaway condition is indicated.

a. In the event of an overspeed during takeoff, toggle back and throttle back as necessary. If the rpm cannot be reduced with the toggle switch, reduce power and maintain a minimum safe airspeed. If overspeeding persists with toggling and reduction of power, feather the propeller and shut down the affected engine after reaching a safe altitude.

b. In the event of a runaway propeller during takeoff, use the following procedure:

(1) If airborne when advised of a runaway propeller, climb the aircraft at takeoff speed.

NOTE

- During critical stages of flight such as takeoff, feathering the runaway propeller must be weighed against the loss of power of that engine which could adversely affect the performance of the aircraft. Circumstances may warrant consideration of continued operation of the affected engine at reduced power, which may be possible if the propeller has pitch-locked at a sufficiently high blade angle. (Refer to Hydraulic Overspeed Pitch-lock, Section I.)
- Engine rpm has to be allowed to increase to the range 3110 to 3220 in order to ensure a locked-out condition. If the throttle is reduced to prevent a propeller from pitch-locking, the blades will rotate to a full low-pitch position and very little forward thrust can be obtained.

(2) When clear of obstructions with the aircraft well under control, the pilot directs the flight engineer to feather the malfunctioning propeller. (Feather the propeller before allowing the aircraft to accelerate beyond takeoff speed.)

NOTE

Most runaway propellers experienced have occurred as the result of loss of governing action which, in turn, allows the propellers to go toward a low blade angle. There has been no reported instance of a propeller running away in flat pitch. As a matter of fact, it is practically impossible for the propeller on this airplane to go into flat pitch as a result of loss of governing control. Therefore, some positive thrust can still be obtained from a runaway propeller during takeoff. Furthermore, if the BMEP is reduced sufficiently, engine limits will not be exceeded. If a propeller sticks in full low pitch during takeoff at sea level, a MAP of about 25.5 inches will not produce more than about 2900 rpm if the airspeed is not allowed to exceed 122 knots. (If the runaway occurs after METO power is set, the airspeed will be 140 knots or more.) In this case the flight engineer should immediately retard the throttle to about 20 in. MAP and recommend feathering. In addition, the pilot should immediately pull the nose up and slow the aircraft to takeoff speed. The zero-thrust point with the propeller in full low pitch is approximately 20 in. MAP. Therefore, if a runaway occurs before an excessive amount of forward speed is gained, retarding the throttle to between 25.5 and 20 in. MAP will allow some positive thrust to be retained without exceeding engine limits.

(3) Complete the Engine Failure Or Fire checklist if practicable, and land as soon as possible.

LANDING GEAR TIRE FAILURE.

If a tire is blown during takeoff, and the remaining runway is sufficient to stop the aircraft, close the throttles and maintain directional control by using brakes and nosewheel steering. Use reverse thrust as necessary. If the remaining runway is not sufficient to accomplish a safe stop, continue the takeoff, but do not retract the landing gear, since the blown tire may jam the gear in the wheel well.

RUNAWAY PROPELLER DURING TAKEOFF CHECKLIST

Pilots	Flight Engineer
BOLDFACE items will be accomplished before reading the checklist.	
1. AIRSPEED – MAINTAIN MINIMUM SAFE VALUE P	**(1.) PROPELLER – FEATHERED (if pitchlock does not engage)**
(2.) Engine Failure and or Fire during Flight checklist – Completed	(2.) Engine Failure and or Fire during Flight checklist – Completed

NOTE

Refer to One-Engine-Out procedure.

INFLIGHT EMERGENCIES.

ENGINE FAILURE OR FIRE DURING FLIGHT.

NOTE

When a serious engine malfunction or fire is detected, a scanner must be posted immediately in an area where he can observe the affected engine. He will report all significant indications (figure 3-1) noted during the emergency to the pilots and flight engineer.

ENGINE FAILURE.

The corrective action required after an engine failure consists of feathering the propeller, shutting down the failed engine, and retrimming the aircraft to continue flight. The longer the delay between the detection of a malfunction and the actual feathering, the more severe the damage to the engine will be.

Feather the propeller for:

a. Extreme or abnormal engine vibration

b. Excessive or uncontrollable power loss

c. Sudden or uncontrollable rise in oil temperature

d. Sudden or uncontrollable drop in oil pressure

e. Sudden and uncontrollable rise of cylinder head temperature

f. Heavy discharge of oil from the engine breather or exhaust system

g. Turbine malfunctions (usually evidenced by discharge of smoke, heavy orange flame and sparks from or around the exhaust flight hood)

h. Loss of BMEP (refer to Section VII)

i. Two or more cylinders inoperative or when symptoms of impending mechanical failure exist in any one cylinder (two shorted secondary patterns or two low resistance patterns in one cylinder)

j. Any other condition that indicates feathering is advisable.

WARNING

- If the No. 2 or No. 5 cylinders become inoperative for any reason or if they indicate a malfunction when the analyzer is being scanned for engine roughness or power loss, feather the propeller immediately. The propeller feathering lines are attached to these cylinders.

- When continued operation of an engine is considered imperative in the interest of safety of the aircraft and crew, operation shall be performed at the discretion of the pilot. If these conditions exist, it is recommended that operation of the engine be conducted with caution and at the minimum power required.

FLIGHT CHARACTERISTICS UNDER PARTIAL POWER CONDITIONS.

Flight characteristics of this aircraft with either inboard engine inoperative remain unchanged, and rapid trim changes are not required. With either outboard engine inoperative, a slight yawing of the aircraft may be noticeable and rudder trim may be required. The BMEP indicators should quickly indicate to the flight engineer which engine has failed. The aircraft is fully controllable with the loss of any one engine, but as a precaution, the wing flaps should not be fully extended during final approach until the landing is assured.

ENGINE FAILURE OR FIRE DURING FLIGHT CHECKLIST

Pilots		Flight Engineer
BOLDFACE items will accomplished before reading the checklist.		
1. POWER – AS REQUIRED	P,CP	1. PROPELLER – FEATHERED
2. GEAR AND FLAPS – AS REQUIRED	P,CP	2. MIXTURE – OFF
		3. EMERGENCY SHUTOFF (After rpm is zero) – FUEL OFF
If the emergency occurs while in cruise with the mixtures in MANUAL LEAN it will be necessary to ensure that the engineer has moved the mixtures to AUTO RICH and the manual spark to RETARD prior to increasing rpm above 2400. An inoperative master lever will require change by the flight engineer.		NOTE Hydraulic fluid, fuel, blast air, and engine oil OFF. Return to third detent (hydraulic fluid, fuel, blast air OFF) when it has been determined there is no fire.
		4. FIRE SELECTOR – SET
		5. FIRE EXTINGUISHER – AS REQUIRED
		WARNING Do not release second charge until it is definitely determined that first charge did not smother the fire and that the first five steps have been accomplished.
		6. Cowl flaps – 10 percent
		7. Feathering button – Neutral
		CAUTION Continuous operation of feathering pump is limited to one minute.
		NOTE Visually check propeller after feathering operation and at frequent intervals thereafter to see that propeller remains feathered.
		8. Manual spark control – RETARD

ENGINE FIRE AND SMOKE CHART

CAUSE	ACTION	
SMOKE: POWER RECOVERY TURBINE BEARING FAILURE. EXHAUST VALVE OPEN. HOLE IN PISTON.	SHUT DOWN ENGINE.	 BLUE-GREY SMOKE FROM ONE EXHAUST ONLY
SMOKE: OIL LEAKING ONTO EXHAUST STACKS AND VAPORIZING. NOT A DANGEROUS CONDITION PROVIDING OIL LEAK IS NOT EXCESSIVE. NO INSTRUMENT INDICATIONS EXCEPT FOR POSSIBLE DROP IN OIL QUANTITY.	NORMALLY, NO ACTION IS NECESSARY UNLESS FIRE DEVELOPS. IF FIRE OCCURS, FOLLOW EMERGENCY ENGINE FIRE PROCEDURE.	 THIN WISPS OF BLUISH-GREY SMOKE FROM EXHAUST AND COWL FLAP AREA
SMOKE: DAMAGED OR WORN-OUT PISTON RINGS PERMITTING CYLINDER TO PUMP OIL. AT NIGHT, THIS CONDITION APPEARS AS FIRE, HOWEVER, IT IS ONLY HOT OIL BURNING IN EXHAUST STACK AND EXHAUST STREAM. NO INSTRUMENT INDICATIONS ON THE GROUND. IN FLIGHT, MONITOR OIL CONSUMPTION	ON GROUND, MANUALLY LEAN. IN FLIGHT, LEAN MIXTURE ACCORDING TO THE APPROVED MANUAL LEANING PROCEDURE.	 GREY-BLACK SMOKE COMING FROM EXHAUST
SMOKE: ON GROUND AT IDLING SPEEDS, INDICATES MIXTURE TOO RICH. IN FLIGHT, USUALLY AT HIGH POWER SETTINGS, THIS CAN OCCUR AND INDICATES TOO RICH MIXTURE. ENGINE WILL TEND TO DIE ON GROUND. IN FLIGHT, CHECK FUEL FLOW.	MONITOR CONDITION AND RECORD IN FORM 781.	 BLACK SMOKE COMING FROM EXHAUST
SMOKE AND FIRE: FIRE CAUSED BY OIL LEAK IN ACCESSORY SECTION. FIRE DETECTOR LIGHTS FOR ZONE 2 AND 3 WILL COME ON IF FIRE OCCURS.	FOLLOW EMERGENCY ENGINE FIRE PROCEDURE.	 BLACK SMOKE COMING FROM ACCESSORY SECTION
SMOKE AND FIRE: FUEL FIRE IN ACCESSORY SECTION GENERALLY CAUSED BY BROKEN FUEL LINE. LOW FUEL PRESSURE MAY BE INDICATED. FIRE WARNING LIGHTS, ZONE 2 AND 3, WILL COME ON.	FOLLOW EMERGENCY ENGINE SHUTDOWN PROCEDURE. PREPARE TO ABANDON AIRCRAFT IF FIRE DOES NOT GO OUT.	 BLACK SMOKE WITH ORANGE-YELLOW COMING FROM ACCESSORY SECTION
SMOKE AND FIRE: DETONATION FOULED SPARK PLUGS, OR FOULED FUEL INJECTION NOZZLE. IF DETONATION CONTINUES, ENGINE FAILURE MAY BE IMMINENT.	ENRICH MIXTURE. INCREASE COWL FLAP SETTING IF CHT IS HIGH; IF ENGINE CONTINUES TO BE ROUGH AND LOW ON POWER, SHUT DOWN ACCORDING TO APPROVED SHUTDOWN PROCEDURE.	 BLUE-BLACK SMOKE WITH FLASHES OF ORANGE COMING FROM EXHAUST

F66-0-3-1

Figure 3-1

ENGINE FAILURE OR FIRE DURING FLIGHT CHECKLIST – Continued

Pilots		Flight Engineer
		9. Fuel tank selectors (operating engines – Tank to engine
		10. Fuel tank selectors (inoperative engine) – OFF
		11. Fuel pump – OFF
		12. Tank 5 and fuel crossfeed – CLOSED
		13. Propeller deicers – OFF
		14. Generator – OFF
		15. Propeller – Full DECREASE RPM
		16. Master engine selector switch – As required
		After the fire is out accomplish the following:
		17. Oil cooler flap – 22 percent set
		18. Cowl flaps – 10 percent set
		19. Engine fire extinguisher selector – OFF
		20. Tank 5 and fuel crossfeed levers – As required
		21. Emergency shutoff – 3rd detent (oil on)
(3.) Ignition – OFF	P	(22.) Ignition – OFF
(4.) Engineer's Engine Failure or Engine Fire checklist – Completed	CP	(23.) Engineer's Engine Failure or Engine Fire checklist – Completed

FAILURE OF TWO ENGINES.

Because of the manner in which associated systems are integrated between the engines, the effect of losing various combinations of engines must be understood and anticipated. In all combinations of two-engine failures, cabin superchargers must be disconnected. Descent to a safe altitude is necessary because pressurization is not available. Generator loading must be kept to a minimum. All non-essential electrical units must be shut off as directed by the pilot to keep loading within the range of available generator output and to obtain maximum available BHP from the operating engines.

ENGINES NO. 1 AND NO. 4 INOPERATIVE

Pilots	Flight Engineer
NOTE To operate deicer boots the deicer air pump selector valve switches must be placed in the DEICER PRESS position.	a. Paddle switches – WARMER b. Auxiliary vent – As required

NOTE

The hydraulic pump driven by No. 3 engine will supply hydraulic pressure for those units normally operated by the secondary system. The restriction control valve may slow the operation of the wing flaps and the landing gear while giving priority to the other systems. The hydraulic pump driven by No. 2 engine will supply hydraulic pressure for the operation of the flight control boosters. DC generators No. 1 and 4 and the two ac generators will be inoperative. NESA power will not be available.

ENGINES NO. 2 AND NO. 3 INOPERATIVE

Pilots

Flight Engineer

a. Cabin superchargers – Disconnected
b. Paddle switches – WARMER
c. Electrical load – Monitor
d. Auxiliary vent – As required

NOTE

With engines No. 2 and 3 inoperative, the vacuum system will not operate and suction for the deicer boots wil will not be available. The hydraulic pump driven by engine No. 4 will supply hydraulic pressure for those units normally operated by the secondary system. The restriction control valve may slow operation of the wing flaps and landing gear while giving priority to the other systems. The hydraulic pump driven by engine No. 1 will supply hydraulic pressure for the operation of the flight control boosters. DC generators No. 2, 2A, 3, and 3A and 100 va alternators will be inoperative.

ENGINES NO. 3 AND NO. 4 INOPERATIVE

Pilots

a. Hydraulic system crossover – As required

Flight Engineer

(a.) Hydraulic system crossover – As required
b. Engine No. 1 cabin supercharger – Disconnected
c. Paddle switches – WARMER
d. Electrical load – Monitor

NOTE

With engines No. 3 and 4 inoperative, secondary hydraulic pressure will not be available. However, the units normally operated by the secondary system will be operated by hydraulic pressure supplied by the primary system through the crossover valve. The ac generator and dc generators No. 3, 3A and 4 and the 100 va alternator for No. 3 engine will be inoperative.

ENGINES NO. 1 AND NO. 2 INOPERATIVE

Pilots

(a.) Hydraulic system crossover – EMERGENCY

Flight Engineer

(a.) Hydraulic system crossover – EMERGENCY
b. Engine No. 4 cabin supercharger – Disconnected
c. Paddle switches – WARMER
d. Electrical load – Monitor

NOTE

With engines 1 and 2 inoperative, primary hydraulic system pressure will not be available. However, the flight control boosters will be operated by hydraulic pressure supplied by the secondary hydraulic system through the crossover valve. The ac generator and dc generators No. 1, 2, and 2A and the 100 va alternator for No. 2 engine will be inoperative.

Pilots

Flight Engineer

a. Cabin supercharger (operating engine) – Disconnected

b. Paddle switches – WARMER

c. Electrical load – Monitor

NOTE

With either of these two combinations of inoperative engines, hydraulic power will be available but flow will be reduced. One air pressure pump and one suction pump in the surface deicing system will be inoperative. One ac generator, three dc generators and one 100 va alternator will be inoperative.

RUNAWAY PROPELLER IN FLIGHT.

Runaway propellers result from the following causes:

a. Centrifugal twisting moments on the blades of a revolving propeller continually attempts to drive the blades toward the low pitch stops. Governing action counteracts these forces. When a failure causes the loss of this governing counter action, the blades move from a governed pitch to a low pitch, resulting in an increased rpm.

b. Lack of propeller oil or mechanical failure of the propeller pumping system will cause failure of governing action and a resulting runaway.

c. High internal leakage within the high pitch line may cause a runaway propeller; it may also hamper feathering action.

The symptoms of an impending or actual runaway propeller and actions to be taken are as follows:

a. The audible sound increases rapidly as the rpm goes beyond the usual governing range. This occurs because, as the rpm increases, more and more of the propeller blades, from the tips inward, enter the speed-of-sound range.

WARNING

Continued operation of the affected engine must not be attempted unless the pitchlock occurs at a high enough blade angle to produce some power and unless that power is required to sustain flight.

b. When the decision is made to secure and shutdown the affected engine, throttle back immediately, pull nose up, and slow down to the minimum safe airspeed for the gross weight. Use flaps up to 60 percent if necessary.

c. On pilot's command, engineer will feather immediately.

NOTE

With each decrease of 10 knots IAS, altitude remaining constant, the windmilling rpm will be decreased by approximately 200 rpm.

(1) Feathering must be attempted immediately. At high runaway rpm, the centrifugal twisting force may be so great that feathering oil pressure is insufficient to increase the blade pitch toward the feather position.

d. Mixture – OFF.

NOTE

Actions in steps b, c, and d, should be accomplished almost simultaneously.

e. Open the throttle. This will decrease windmill speed if the propeller fails to feather. High blower will increase this braking effect. An open throttle in low blower may only decrease the rpm by 50, but under the circumstances any decrease will help.

CAUTION

Do not try to shift blowers to HIGH at runaway rpm.

f. If the propeller feathers, complete the Engine Failure or Fire checklist.

g. If the propeller will not feather or pitchlock, do the following:

(1) Order passengers removed from danger area and reduce the cabin differential pressure.

(2) Continue to maintain the minimum safe airspeed for the gross weight. Flaps may be used to 60 percent maximum.

(3) Complete the Engine Failure or Fire check list except that the emergency shutoff lever must be left in the third detent.

(4) Descend to a lower altitude.

NOTE

The higher the altitude, the higher the windmil rpm. With a constant IAS the windmilling rpm will be decreased by approximately 50 for each 1000-foot decrease in altitude. Therefore it is desirable to start a descent as soon as possible if the propeller will not feather.

(5) As the windmill rpm is decreased by reducing airspeed, opening throttle, and decreasing altitude, again attempt to feather.

WARNING

Freezing an engine to stop an uncontrollable propeller is extremely dangerous and must be avoided if possible. If it should become necessary, to remain airborne, or if there is an engine fire, freezing the engine should be accomplished in the following manner.

a. Feather the adjacent propeller.

b. Put the aircraft in a gentle turn away from the affected engine.

c. Slow the rpm of the affected engine as much as possible using the above procedure.

d. Freeze the engine gradually by placing the shutoff lever to the OIL OFF position intermittently.

e. Inspect the propeller of the adjacent engine before restarting if the uncontrollable propeller separates when the engine freezes.

h. Occasionally a propeller fails to feather because of an electrical fault. Therefore, when attempting to feather, check the following:

(1) Check for a light in the feathering button. If the light is on while the button is depressed, it is a positive indication of current being delivered to the feathering pump motor.

(2) If a light does not show and the feathering switch holding coil is not energized, check the circuit breakers on the upper 212 panel.

NOTE

If the feathering circuit breaker will not reset, it may be possible to feather the propeller by holding the feathering button in the feather position and operating the cowl flap on the same engine.

(3) If the cowl flaps also fail to operate, the sectionalizing relay current limiter may have failed. This could be caused by a welded starter relay or a faulty limiter. (Operation of the cowl flaps cannot cause this current limiter to fail because the cowl flap circuit has a separate protection which is set at a lower value.)

i. If rpm cannot be controlled, reduce airspeed to within limits.

j. After all emergency procedures have been completed, select a cruising altitude that will allow the optimum three-engine range.

WARNING

In flight, do not unfeather a propeller which has been feathered because of a runaway.

FAILURE OF AUTOMATIC PROPELLER SYNCHRONIZATION.

If the propeller fails to respond to operation of the master propeller pitch lever, check propeller synchronization circuit breaker on the flight engineer's upper 212 circuit breaker panel; if off, reset one time. If the synchronization circuit cannot be restored, proceed as follows:

a. Report – "LOSS OF AUTOMATIC PROP. CONTROL GOING TO MANUAL"(E).

b. Propeller synchronization circuit breaker – OPEN.

c. Propeller governor control switches – RPM, as required.

NOTE

RPM should be set to 2600 or above rpm during the BEFORE LANDING CHECKLIST.

PROPELLER GOVERNOR SELECTOR SWITCH MALFUNCTION.

If propeller operation is erratic, a control malfunction is indicated. Do not actuate propeller control again.

Proceed as follows:

a. Trip the propeller synchronization circuit breaker on the flight engineer's upper 212 circuit breaker panel.

b. If rpm is within acceptable engine range, leave rpm at last setting, and complete mission.

c. If rpm cannot be maintained within acceptable engine range, retard throttle and feather propeller on command of pilot.

d. Complete the ENGINE FAILURE CHECKLIST.

FAILURE OF TACHOMETER GENERATOR.

In the event of tachometer failure, the master engine selector switch should be turned to the OFF position.

NOTE

If the tachometer fails on a slaved engine and the master engine selector switch is not turned OFF and propeller synchronization button is intermittently activated, rpm will increase to 2900 rpm on the slaved engine. If it fails on the master engine and propeller synchronization button is intermittently activated, the rpm will follow to full decrease.

RUNAWAY PROPELLER IN FLIGHT CHECKLIST

BOLDFACE items will be accomplished before reading the checklist.

Pilots

1. AIRSPEED – MAINTAIN MINIMUM SAFE VALUE P

a. At the first indication of a runaway propeller immediately throttle back, pull up nose, and slow down to the minimum safe airspeed for the gross weight. Use flaps up to 60 percent if necessary.

NOTE

- With each decrease of ten knots IAS, altitude remaining constant, the windmilling rpm will be decreased by approximately 200 rpm.
- With propeller synchronizer circuit breaker off, pilots propeller control lever will be inoperative and flight engineer must set rpm manually.

(2.) Engine Failure or Fire during Flight checklist – Completed P

Flight Engineer

1. THROTTLE – RETARD

2. PROPELLER – DEC RPM

WARNING

Do not actuate the switch again. If the rpm is within an acceptable range, continue flight operation (1600 to 2600). If rpm is not within an acceptable range, attempt to toggle into this range. If propeller operation is erratic when the toggle switch is actuated, a control circuit malfunction is indicated.

3. PROPELLER – FEATHERED

4. Synchronizer circuit breakers – OFF

(5.) Engine Failure or Fire during Flight checklist – Completed.

WARNING

If overspeeding cannot be controlled, move personnel away from the area of propeller plane rotation and descend to a safe altitude.

INADVERTENT REVERSING IN FLIGHT CHECKLIST

BOLDFACE items will be accomplished before reading the checklist.

Pilots

(1.) Engine Failure or Fire during Flight checklist – Completed P

Flight Engineer

1. THROTTLE – CLOSED

2. PROPELLER REVERSE CIRCUIT BREAKER – PULL OUT

3. PROPELLER – FEATHERED

(4.) Engine Failure or Fire during Flight checklist – Completed.

UNFEATHERING AND RESTART DURING FLIGHT CHECKLIST

CAUTION

The propeller should be under observation by a crewmember while being unfeathered. Move personnel from forward crew area.

Pilots		Flight Engineer
		1. Ignition – OFF
		2. Emergency shutoff –ALL ON position
(1.) Airspeed – 140-155 knots	P	(3.) Airspeed – 140-155 knots
		4. Throttle – CLOSED
		5. Fire extinguisher selector – Set
		6. Engine supercharger – LOW
		7. Mixture – OFF
		8. Manual spark – RETARD
		9. Propeller – FULL DECREASE RPM
		10. Starter – Engage
		NOTE The observer will notify the flight engineer when the propeller has turned six blades. If a liquid lock is evident, make no further attempt to start.
		11. Fuel tank selector – ON
		12. Fuel pump – LOW
(2.) Ignition – BOTH	P	(13.) Ignition – BOTH
		14. Feathering button – Unfeather intermittently
		15. Mixture (At 500-600 rpm) – AUTO RICH
		NOTE • Check engine and supercharger oil pressure. • After the propeller is governing, advance the throttle gradually until power is indicated on the BMEP gage and fuel flow is indicated. When engine oil-in temperature has risen and oil pressure has stabilized, gradually increase rpm and power to correspond with the other engines.
		16. Generator – ON
		17. Cowl and oil cooler flaps – As required
		18. Fire extinguisher selector – OFF
(3.) Engineer's Unfeathering and Restart checklist – Completed	CP	(19.) Engineer's Unfeathering and Restart checklist – Completed

FUSELAGE FIRE.

CABIN FIRE.

Due to the amount of electric and electronic equipment installed in these aircraft, fires that are minor in nature with negligible smoke accumulations occur quite frequently. Shutting off the recirculating fans and switching the flight station mixing valve to cool, while the affected unit is isolated and allowed to cool, usually suffices for corrective action. If the fire and smoke are intense enough to require depressurization and subsequent use of Position B of the aux vent knob for ventilation, the flight crew and the fire fighters must breathe 100 percent oxygen. When hand fire extinguishers are required to combat flames, maximum ventilation (aux vent knob full open) will be used as soon as the fire is out in order to dissipate fumes from the extinguishing agent and the fire as quickly as possible. Follow the smoke removal procedure in this section if the smoke becomes dense enough to affect the pilot's vision. Attempt to isolate the cause and shut off any fluids that may be feeding a fire originating underneath the floor. Then proceed as follows:

CAUTION

Because the under-floor areas are not equipped with fire detectors nor fixed fire extinguishers, the hand extinguishers must be used. Use extreme caution when opening floor hatches.

ELECTRICAL FIRE.

ELECTRICAL FIRE DETECTION AND EXTINGUISHING.

It is recommended that when smoke or the odor of burning insulation is detected in the aircraft, the following detection procedure be used to locate the defective equipment. Instruct crewmember to open the shrouds enclosing respective electronic equipment racks and inspect. Instruct that underfloor area be inspected through the viewing windows and, if necessary, remove floor hatches and inspect. Flight engineer will be responsible for extinguishing fires forward of the 545 bulkhead. Designated crewmembers will be responsible for detecting and extinguishing fires.

NOTE

When smoke or fumes first become apparent, engineer should turn off recirculating and flight station fan switches.

WARNING

Search for the affected or faulty equipment should be confined to a visual inspection since fumes may be toxic.

SHORT CIRCUIT FIRE.

Fires resulting from an active short circuit cannot be extinguished until the circuit involved is dead. It is essential, therefore, to locate the fire and interrupt any circuit whidh may be involved as quickly as possible.

CAUTION

The generator switches must be OFF and the field circuit breakers opened to prevent the generators from developing any electrical potential.

CABIN OR ELECTRICAL FIRE CHECKLIST

BOLDFACE items will be accomplished before reading the checklist

Pilots

1. **AUTOPILOT – OFF**
2. **BLOWER FANS – OFF (Notify technician)** CP
3. AC Generators – As required (Notify electronic technician) CP
4. Radio call – Crew and ground station notified CP
5. Aux control booster switches and aileron shut-off lever – As required P,CP

Flight Engineer

1. **RECIRCULATING AND FLIGHT STATION FAN SWITCHES – OFF**

CABIN OR ELECTRICAL FIRE CHECKLIST – Continued

Pilots

Flight Engineer

NOTE

Auxiliary boost will still be available for rudder and elevators and should be turned ON if the hydraulic system has been turned OFF. Aileron boost should be bypassed to reduce forces. The auxiliary boost motors will deplete the batteries very rapidly, and, since the batteries may be the only power available for operation of the propellers, radio, instruments, etc., auxiliary boost should be turned OFF as soon as safety permits. To reduce control forces, the rudder should be bypassed and the elevator BOOST SHIFT control pulled out and locked.

WARNING

If the fire or source of smoke is located in the underfloor area, use extreme care when opening floor hatches and use 100 percent oxygen for protection against smoke and fumes. The cabin recirculating fans may draw some of the smoke into the cabin. It is very important, therefore, to shut off the recirculating fans immediately to minimize smoke accumulation in the cabin and to reduce the possibility of fanning the fire.

2. FLIGHT STATION MIXING VALVE – COOL

NOTE

If fire is minor in nature and there is a negligible accumulation of fumes, complete steps 12, 13, and 14.

3. Aux vent–POSITION B

NOTE

Position B on the aux vent knob dumps the cabin superchargers and puts them in minimum flow, opens the cabin safety relief and dump valve, partially opens the aux vent inlet and exit valves, and closes the recirculation dampers. Although this configuration reduces the ventilation, some ventilation nevertheless is supplied that will aid in keeping the cabin and flight station clear.

4. Fuel tank selectors – Tank-to-engine

5. Tank 5 and crossfeed – CLOSED

(6.) Emergency Shutoff Levers – HYD OIL OFF

(6.) All emergency shutoff levers (inform pilot prior to bypassing pumps) – HYD OIL OFF

NOTE

- If it is definitely known that the hydraulic systems are not involved in fire, step 6 may be omitted.

7. Copilot's flight instrument power – EMERGENCY

CP

- Monitor ac generator over-voltage and over temperature warning lights. If either light is on or if the

CABIN OR ELECTRICAL FIRE CHECKLIST – Continued

Pilots		Flight Engineer
		master ac generator warning light is on, disconnect the affected generator by means of the driveshaft disconnect switch. If neither of these lights gives indication of malfunction, then proceed as follows:
		7. Mixtures – RICH
(8.) RPM – As required	P	(8.) RPM – Increase as required
		9. Battery – OFF
(9.) All dc generators – OFF	P	(10.) All dc generators – OFF
		11. All generator circuit breakers – OFF

CAUTION

If generators are turned off, the auxiliary boost motor, if used, will rapidly deplete the batteries. The pilot should consider intermittent use of the auxiliary boost system until power is restored.

CAUTION

When the battery switch and all dc generator switches are OFF, propeller feathering systems will be inoperative. The ac generator driveshaft disconnect also will be inoperative.

10. Descend – As required	P	
		12. Affected equipment – Disconnect
		13. Combat fire – As required

WARNING

Prolonged exposure (5 minutes or more) to high concentrations (pronounced irritation of eye and nose) of Bromochloromethane (CB) or its decomposition products should be avoided. CB is an anesthetic agent of moderate intensity. It is safer to use then previous fire extinguishing agents (carbon tetrachloride, methylbromide). However, especially in confined spaces, adequate respiratory and eye protection from excessive exposure, including the use of oxygen when available, should be sought as soon as the primary fire emergency will permit. Maximum ventilation (aux vent knob full open) must be used after the fire is extinguished.

(11.) Engineers Cabin or Electrical Fire checklist – Completed	P	(14.) Engineers Cabin and/or Electrical Fire checklist – Completed

CAUTION

Conservation of battery power for necessary flight instruments, radio communication, and auxiliary booster operation for landing is of vital importance.

The following procedure will be accomplished by the crew member indicated and as directed by the pilot. During cabin or electrical fire, additional crew duties are as follows:

Navigator

1. Electrical equipment – As required.
2. Stand by to assist.

CABIN OR ELECTRICAL FIRE CHECKLIST – Continued

CICO

1. Portable fire extinguishers – Supervise as required.

CIM

1. Portable fire extinguishers – Assist as required.

Radio operator

1. Electrical equipment – OFF.
2. Stand by to assist.

Electronic's technician

1. Blower fans – OFF
2. Electronic equipment – OFF, or stand by, as required.

NOTE

On ECM equipped aircraft use the Radar Vent DC circuit breaker on the Radar.

Operator's circuit breaker panel. On non-ECM aircraft, use the blower switch.

3. Trip ac generators – As directed by the pilot.
4. Portable fire extinguishers and oxygen bottles – As necessary.

NOTE

Under no condition other than the safety of the flight or repair of required mission equipment will any terminal strip cover panel be removed. Prior to removing any terminal strip cover panels, all applicable circuit breakers supplying power to that panel will be pulled.

EWO

1. Electrical equipment – OFF
2. Standby to assist.

NOTE

Pilot will direct each crewmember to turn on equipment.

SMOKE/FUME REMOVAL CHECKLIST

VENTILATION

If it becomes necessary to clear the cabin of fumes or gases of any kind, depressurize the cabin by setting rate of change to maximum and raising cabin altitude with the altitude selector until the cabin differential drops to 1 in. Hg. If immediate removal is necessary, proceed as follows:

WARNING

- Sound judgment is required to measure the relative danger involved in fanning the fire with fresh air and subjecting the passengers and crew to high altitude as against the alternate danger of asphyxiation.
- Never open an exterior vent in the flight station before there is an opening in the cabin over the wing. Never open an emergency exit in front of the propeller plane. The pressure outside of the cockpit is low and a vent in this area will suck air forward into the flight station. By first opening a vent over the wing, where the pressure is even lower, air will be sucked aft from the flight station and out over the wing.

Pilots

1. Notify flight crew – 100 PERCENT OXYGEN P
2. Airspeed – Reduced to 175 knots or below P
3. Rapid descent – As required P

Flight Engineer

1. Recirculation and flight station fans – OFF
2. Flight station mixing valve – COOL
3. Aux vent – FULL OPEN, then to POSITION A
   a. Blower fans – OFF

NOTE

Position A of the aux vent knob supplies no ventilating air to the flight station and cabin through the normal ventilating system; therefore, position A should be used only when windows may be opened for ventilation.

4. Cabin supercharger – DISCONNECTED (if required)

Cabin superchargers have been known to discharge fumes into the cabin.

(4.) Engineer's Smoke Removal Checklist – Completed CP

(5.) Engineer's Smoke Removal checklist – Completed

5. Emergency exits – OPEN CP

NOTE

If, after cabin has been depressurized, it is not possible to open an emergency exit, break window by using an axe or heavy object. Personnel should stay clear of the opening.

6. Pilots' windows – As required P,CP

WARNING

Never open a vent or window in the flight station before there is an opening in the cabin over the wing. Pressure outside of the flight station is low; an open vent in this area will suck air forward into the flight station. By first opening a vent over the wing where the pressure is even lower, air from the flight station will be sucked aft and out over the wing.

During Smoke or fume removal, additional crew duties are as follows:

CICO

1. Emergency exits – Open.

CIM

1. Stand by to assist.

Electronic technician

1. Blower fans – OFF
2. Emergency exits open as directed by CICO.

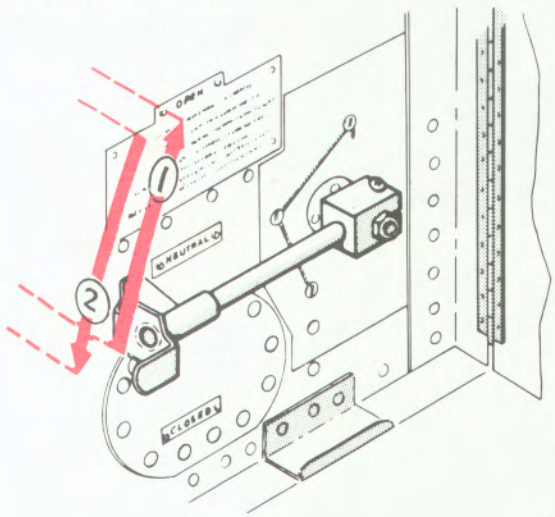
FUEL DUMPING CHECKLIST

(See figures 3-2 through 3-5)

Dumping fuel when a fire is involved should only be accomplished as a last resort at the pilot's discretion.

FUEL DUMPING PROCEDURE

FUEL DUMP CONTROL LEVER – **OPEN** UNTIL FUEL STARTS TO DUMP; THEN **NEUTRAL**



FUEL DUMP CONTROL LEVER – **CLOSED** UNTIL VALVES HAVE CLOSED; THEN **NEUTRAL**

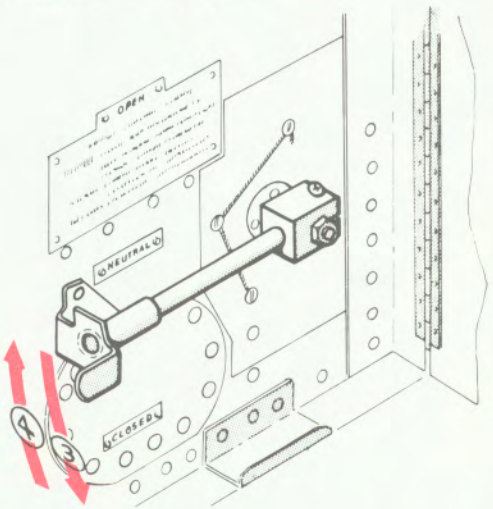


Figure 3-2

F66-0-3-2

Pilots

1. Alert entire crew – Accomplished — P
2. Electronic equipment – ON STANDBY or OFF. Notify equipment technician — CP
3. HF radios – OFF
4. Wing flaps – UP — CP
5. Landing gear – UP — CP
6. Airspeed (140 min – 190 max) – 155-165 knots desired — P
7. Exterior lights – STEADY — CP
8. Start dumping – Dump valve open — P

NOTE

The maximum permissible airspeed during fuel dumping is 190 knots, the minimum 140 knots. However, since airspeed will build up as fuel is dumped, it is desirable to start dumping at a speed of 155 knots. The aircraft should be flown straight with wings level to avoid the possibility of flight through fuel vapors. Engine powers should be kept constant. Shallow turns, climb and descent are permissible.

Flight Engineer

1. Cabin heaters – OFF
2. Tank 5 and fuel crossfeeds – CLOSED

3. Start dumping – Dump valve open

When fuel starts to dump, move fuel dump lever to NEUTRAL.

4. Fuel pumps 6L and 6R switches – As required.

CAUTION

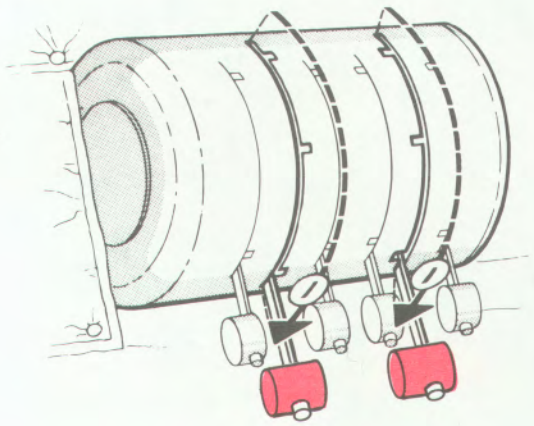
Auxiliary booster pumps 6L and 6R should never be in the HIGH position except during fuel dumping operations. Refer to Fuel Dump rates, figure 3-5.

FUEL DUMP VALVE LEVER OPERATION C-121G

LEVER ON 260 STEP (LOWER RIGHT)

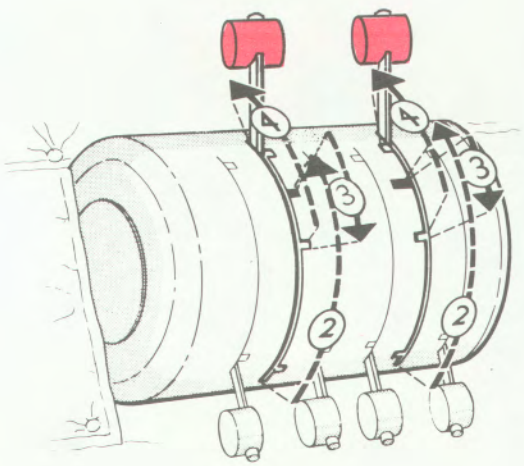
TANKS NO. 1, 2, 3 AND 4

1 FUEL DUMP LEVERS FOR TANKS NOS. 1, 2, 3 AND 4 - FULL FORWARD



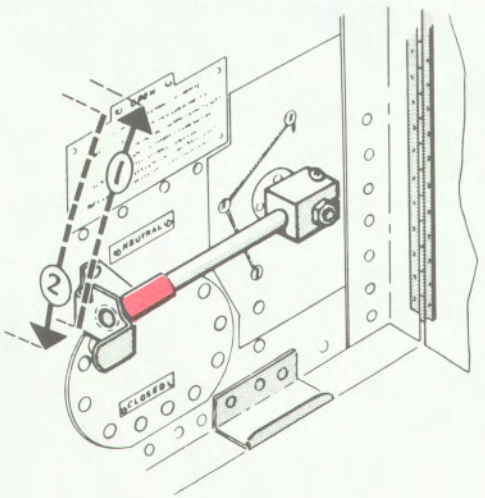
AFTER THE DESIRED QUANTITY OF FUEL HAS BEEN DUMPED:

2 MOVE CONTROL HANDLES TO RED LINES ON QUADRANT
3 MOVE BACK TO INTERMEDIATE FOR 15 TO 30 SECONDS
4 MOVE TO AFT POSITION



TANKS NO. 2A AND 3A

1 FUEL DUMP LEVER FOR TANKS NOS. 2A AND 3A - OPEN
2 AFTER FUEL STARTS TO DUMP - NEUTRAL



3 FUEL DUMP LEVERS FOR TANKS NOS. 2A AND 3A - CLOSED
4 AFTER FUEL STOPS DUMPING (VALVES CLOSED) - NEUTRAL

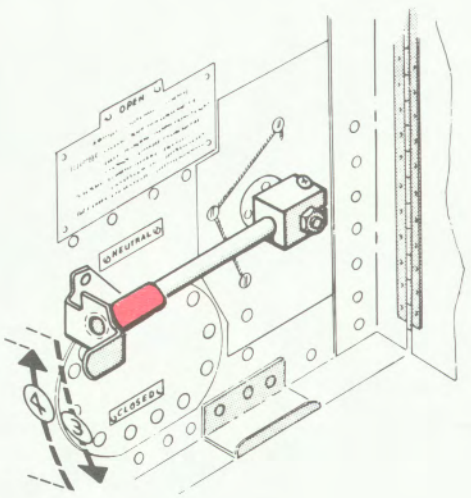


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Figure 3-3

FUEL DUMPING FOR WEIGHT REDUCTION (C-121G)

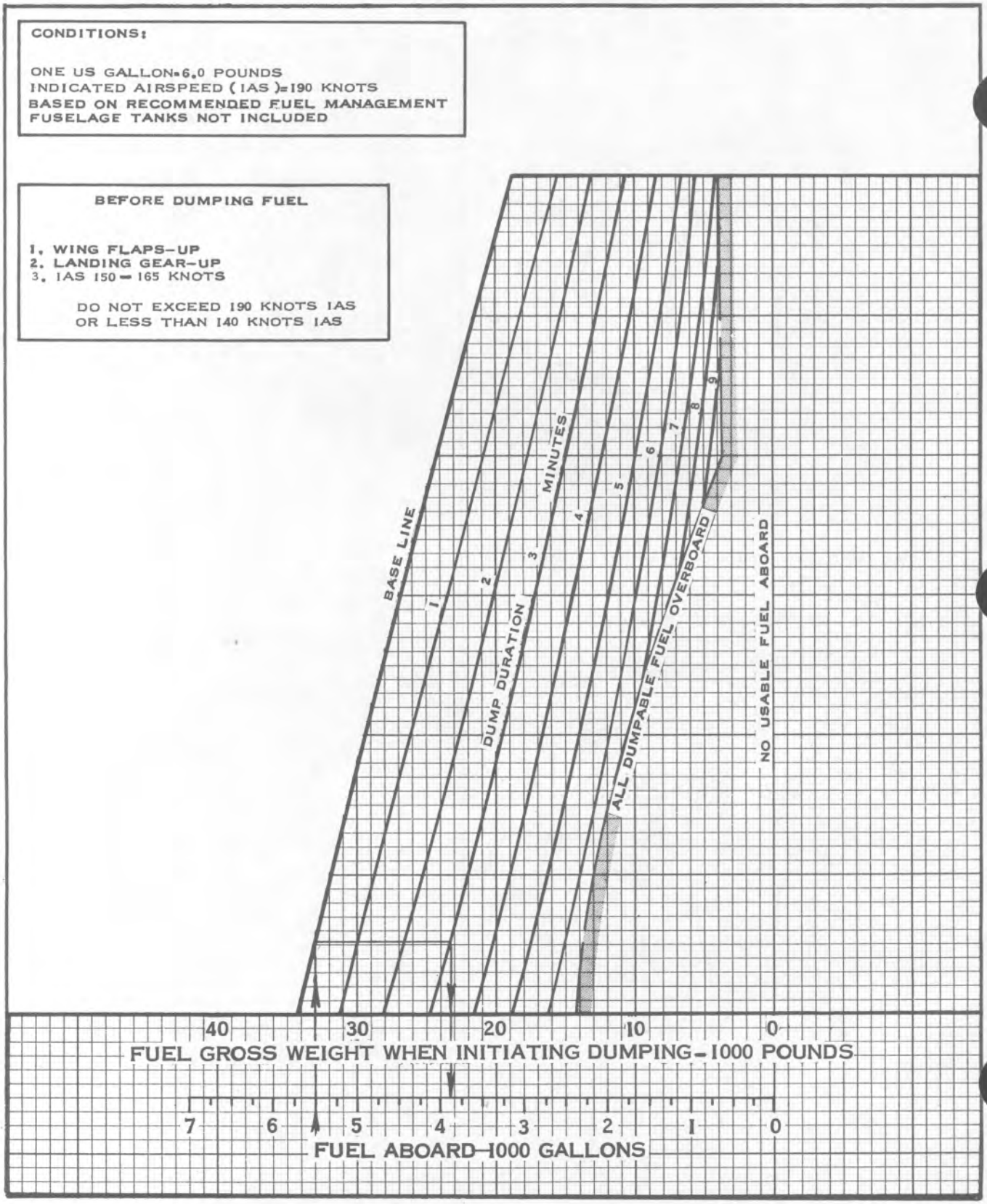


Figure 3-4

BEFORE DUMPING FUEL

1. ALL ELECTRONIC EQUIPMENT IN STANDBY
2. WING FLAPS UP
3. LANDING GEAR RETRACTED
4. INDICATED AIRSPEED (IAS) OF 155 – 165 KNOTS
   DO NOT EXCEED 190 KNOTS IAS
   OR LESS THAN 140 KNOTS IAS

LANDING GR WT LB	MAX ALLOWABLE IN TIP TANKS GAL/TANK	DUMPING DURATION MINUTES
122,000	300	3.9 *
110,000	200	5.4 *

* 601 GAL/TANK (FULL) INITIALLY

CONDITIONS:

ONE US GALLON = 6.0 POUNDS
INDICATED AIRSPEED (IAS) 190 KNOTS
FUSELAGE TANK FUEL NOT DUMPABLE
BASED ON RECOMMENDED FUEL MANAGEMENT

EXAMPLE:

GROSS WEIGHT – 142,500 LB
FUEL WEIGHT – 45,000 LB (INCLUDING FUSELAGE TANK FUEL)
DUMPING DURATION – 9 MINUTES
FUEL ABOARD AFTER DUMPING – 12,500 LB
GROSS WEIGHT AFTER DUMPING – 110,000 LB

NOTE

AVERAGE RATE IS 4000/LBS/MINUTE

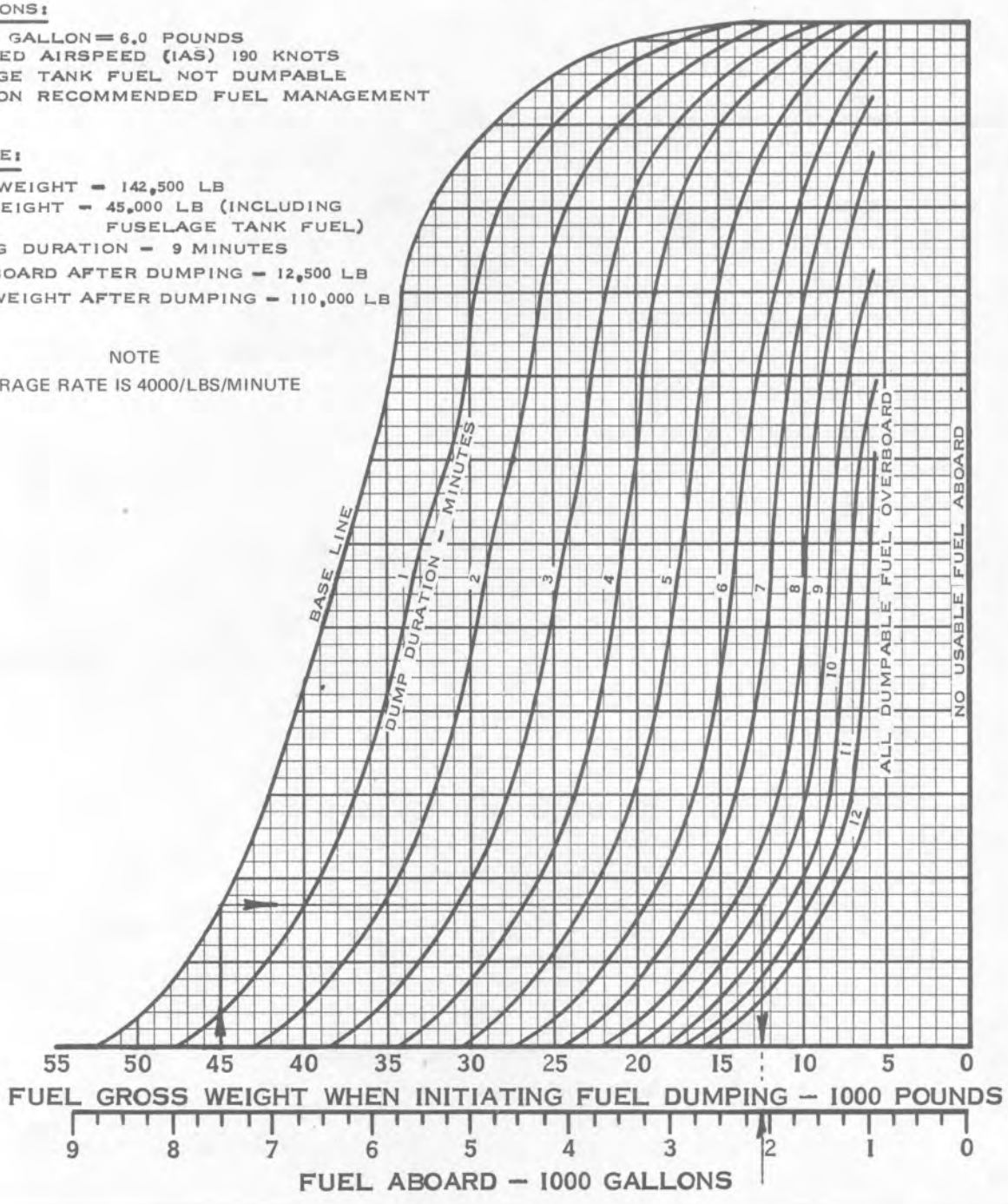


Figure 3-5

FUEL DUMPING CHECKLIST – Continued

Pilots		Flight Engineer
(9.) Stop dumping – Dump valve closed	P	(5.) Stop dumping – Dump valve closed When valves are closed, move fuel dump lever to NEUTRAL. 6. Fuel pumps 6L and 6R – OFF
(10.) Engineer's Fuel Dumping checklist – Completed	CP	(7.) Engineer's Fuel Dumping checklist – Completed

NOTE

If a fuel dump system malfunction is encountered, attempt to use the Emergency Fuel Dumping system.

During fuel dumping, additional crew duties are as follows:

Navigator

Before dumping

1. Radios and electrical equipment – OFF.

After dumping

1. Radios and electrical equipment – As required.

Radio operator

Before dumping

1. Radio and electrical equipment – OFF

After dumping

1. Radio and electrical equipment – As required.

CICO

Before dumping

1. CIC equipment – OFF
2. Scanners – Posted

After dumping

1. CIC equipment – As required

CIM

Before dumping

1. Radio equipment – OFF

After dumping

1. Radio equipment – As required

Electronic technician's

Before dumping

1. Electronic equipment – OFF.

After dumping

1. Electronic equipment – As required.

EWO

Before dumping

1. Electronic equipment – OFF (as directed).

After dumping

1. Electronic equipment – As required.

FUEL DUMPING (EMERGENCY SYSTEM) CHECKLIST

(See figure 3-4)

Pilots		Flight Engineer
WARNING Dumping fuel when a fire is involved should only be accomplished as a last resort at the pilots discretion.		
1. Accomplish steps No. 1 through No. 8 of Fuel Dumping checklist.	P	1. Accomplish steps No. 1 through No. 4 of Fuel Dumping checklist.

FUEL DUMPING (EMERGENCY SYSTEM) CHECKLIST – Continued

Pilots		Flight Engineer
2. Emergency fuel dump lever (figure 3-6) – FUEL DUMP	CP	
3. Handpump selector lever – EMER GEAR	CP	
4. Handpump – Operate	CP	
After fuel dumping:		
(5.) Stop dumping procedure – Dump valve CLOSED	P,CP	(2.) Stop dumping procedure – Dump valve CLOSED
6. Handpump – Operate	CP	3. Fuel pumps 6L and 6R – OFF
7. Emergency fuel dump lever – L G EMER EXT	CP	
8. Handpump selector – EMER BRAKES	CP	
9. Emergency extension tank – Reserviced as required	P	
(10.) Engineer's Emergency Fuel Dumping checklist – Completed	CP	(4.) Engineer's Emergency Fuel Dumping checklist – Completed.

LOSS OF ALL GENERATORS CHECKLIST

Pilots	Flight Engineer
	BOLDFACE items will be accomplished prior to reading the checklist.
	1. SHIP BATTERY SWITCH – OFF
	2. FLIGHT INSTRUMENT SWITCH – OFF
	3. Generators – OFF
	4. All non-essential dc currents – OFF
	NOTE
	Before battery power is depleted, engine rpm should be increased to a value at which ample power for a go-around can be obtained – unless fuel requirements are critical. The battery switch may be turned on momentarily to make rpm changes.

FUEL PRESSURE DROP – ENGINE OPERATING NORMALLY.

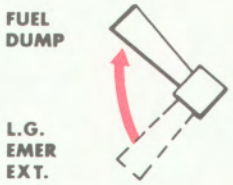
The primary fuel pressure indicator is a 26-volt ac instrument. A secondary indication is provided by a 28-volt dc warning light which comes on at approximately 19 psi. It is unlikely that a fuel leak exists without affecting both indicators. Loss of fuel pressure indication while climbing to altitude with a warning light indication can be attributed to a clogged balance line. A sudden fuel pressure drop without a light usually indicates instrument malfunction.

A fuel leak after the master control will not necessarily be reflected in a fuel pressure drop. It will, however, be reflected by a high fuel flow accompanied by secondary effects on engine operation. The engine will not develop power equal to its asymmetrical engine. There will be difficulty when trying to manually lean, and, depending

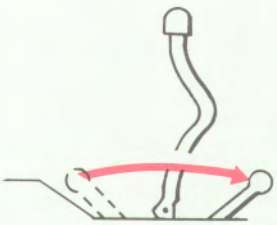
FUEL DUMPING EMERGENCY HANDPUMP OPERATION

TO DUMP

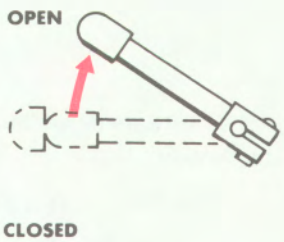
1. Emergency fuel dump lever—**FUEL DUMP** position.



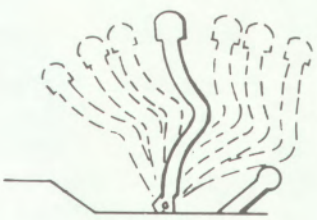
2. Emergency hand pump selector lever—**EMER. GEAR** (aft position).



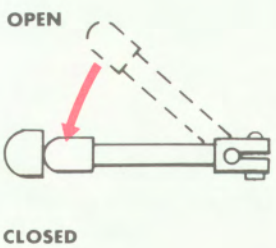
3. Fuel dump control valve lever (sta. 260)— **OPEN.**



4. Emergency hand pump—Operate until fuel starts to dump.

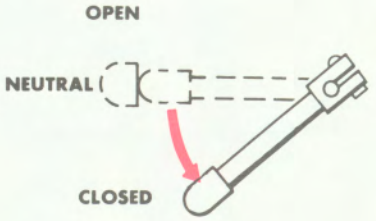


5. Fuel dump control valve lever (sta. 260)— **NEUTRAL.**

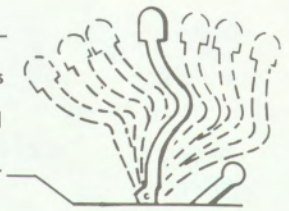


AFTER DUMPING

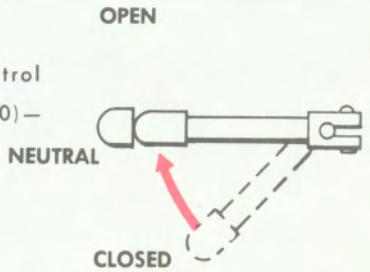
6. Fuel dump control valve lever —**CLOSED.**



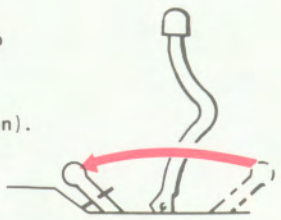
7. Emergency hand pump—Operate until dump valves are closed and the inboard dump chutes are retracted.



8. Fuel dump control valve lever (sta. 260)— **NEUTRAL.**



9. Emergency hand pump selector lever—**EMER. BRAKES** (forward position).



10. Emergency fuel dump lever—**L. G. EMER. EXT.** position.

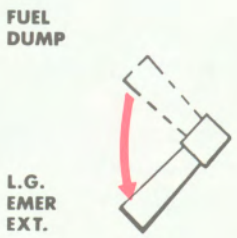


Figure 3-6

on the severity of the leak, there may be an abnormal spread between A and B row cylinder head temperatures.

If fuel pressure drops below normal operating limits but the engine continues to operate normally, the cause may be fuel line leakage, primer solenoid leakage, oil dilution leakage, engine-driven fuel pump bypass valve leakage, clogged pressure line, or instrument failure. The action to be taken depends upon the circumstances existing at the time. Such factors as known aircraft condition, power requirements, and flight conditions must be considered. All factors being equal, any one of the following procedures are recommended:

a. Shut down engine immediately, using the following procedure if power from affected engine is not necessary to sustain flight or to reach a safe destination.

(1) Place mixture control of the engine with the suspected fuel leak OFF.

(2) Allow the engine to cool two minutes.

(3) Complete the Engine Failure or Fire During Flight checklist.

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

c. Keep the affected engine in operation at or above normal cruising speed while maintaining a constant watch for fire. This can be done if it cannot be determined that a leak exists and the engine power 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, shut down the affected engine completely by means of the mixture control (not by retarding the throttle) and accomplish a three-engine landing unless the added power is absolutely essential to effect a safe landing. Do not reduce airspeed until the affected engine is shut down. This procedure is based on the fact that the cooling effect of the airflow over the engine and nacelle will frequently keep a fire from starting (even though a fuel leak exists) until aircraft speed is reduced sufficiently as during landing.

AIRCRAFT SYSTEMS FAILURE.

Refer to Section IV for Inverter Failure Procedures.

ELECTRICAL FAILURE.

DC ELECTRICAL POWER SYSTEM FAILURES.

It is extremely difficult to anticipate all of the possible dc electrical failures and plan corrective action for each individual failure. A broad analysis of the situation indicates that they fall into three possible categories; (1) loss of primary power source, (2) generator malfunction or failure, and (3) equipment and distribution system faults.

Loss of Primary Power Source.

If a field relay trips, as indicated by the illumination of an amber field relay tripped warning light, reset and check the generator output. Inability to put out the light by resetting indicates a feeder fault and no further corrective action to that generator is permissible. If the light goes out momentarily when the switch is in the reset position, an over voltage condition exists. An under-voltage condition exists when there is no amperage output from a particular generator that indicates slightly less voltage than the others. If this condition is not extreme, shutting off the generator with the highest amperage will bring the low one on the line. A complete loss of both voltage and amperage without illuminating the field relay tripped warning light is an indication of a sheared generator shaft or possibility the accessory drive if an inboard engine is involved. The inboard propeller need not be feathered unless the loss of the generator is accompanied by indication of an internal engine failure. No corrective action is required on an outboard engine if the gear box oil temperature is normal.

CAUTION

- Adjustment of voltage regulators in flight without the use of a precision voltmeter is permissible only when the alternative is a complete loss of dc power.
- Do not pull the trip warning and reset for generator field relays circuit breaker above MJB No. 1 in order to extinguish the field relay tripped warning light. The generator overheat warning light receives power through the same circuit breaker.

Generator Malfunction or Failure.

If the ammeter starts to fluctuate and generator voltage is erratic, or a generator overheat light comes on indicating

a possible generator failure, take immediate corrective action as set forth in the following steps:

1. Check operating generators to determine that amperage limitations will not be exceeded. Reduce loads if necessary.

2. If the amperage and the voltage of a particular generator are erratic and the generator overheat light comes on and remains on, feather the propeller if no more serious emergency exists. If the affected generator is on an outboard engine, disconnect the driveshaft.

3. If a generator overheat light comes on and remains on yet all other indications for that generator are normal, the cause may be a blocked blast air duct or a shorted warning light. Switch the generator OFF. Check blast tube shutoff circuit breaker on remote circuit breaker panel. Lack of cooling air is the cause if the light goes out after the load is removed from the generator. Conditions permitting, experimental feathering may be used to determine whether a shorted warning light is the answer if the light remains on after the switch has been OFF for five minutes.

4. If the generator overheat and field relay trip lights are both on, feather the propeller unless a more serious situation exists. If this situation occurs on an outboard engine generator, disconnect the driveshaft.

Equipment and Distribution System Faults.

If one or more items of electric or electronic equipment should fail, isolate the faulty item by removing the fuse or pulling the circuit breaker in the affected circuit. Faults on the distribution system should clear up through the remedial action supplied by circuit breakers, fuses, current limiters and generator protection systems. Such failures or faults may be accompanied by smoke and require some emergency corrective action. Refer to the Electrical Fire paragraph. The possibility of a fault on either the main dc bus or the electronic dc bus causing a complete failure of the dc system is remote. However, failures of components in the isolation contactor system that interconnects the two busses may occur, resulting in the loss of the electronic bus. Resetting the contactor control circuit breakers on the remote circuit breaker panel (figure 1-25) or replacing the 35 amp current limiter on the main dc bus should restore power to the electronic bus.

WARNING

If the replacement of a current limiter is required, the dc electrical system must be deenergized.

AC Generator Drive-Shaft Disconnect.

When the over-voltage warning light glows, the flight engineer should have the equipment technician monitor the electrical load and reduce it as necessary to relieve the situation. Reset the tripped generator. If the generator trips again do not reset until the fault has been corrected. If the over-temperature warning light glows, have the technician select the other ac generator. If the temperature cannot be lowered sufficiently, trip the generator from the bus. If this action does not lower the temperatures to within tolerance, disconnect the drive shaft to the associated generator.

WARNING

The fault lockout relay must not be reset in flight.

NOTE

- If the ac generator drive shaft is disconnected, it cannot be reconnected in flight.
- Since each gear box drives one ac generator and dc generator, both will be disconnected and monitoring of the dc loads will be required.
- If generator fails to disconnect, check dc circuit breaker on lower MJB 212 panel.

AUTOMATIC PILOT EMERGENCY OPERATING PROCEDURES.

When using the automatic pilot, the pilot or copilot must be in his seat, with his safety belt fastened so that if any malfunction occurs, he can recover immediately.

Automatic Pilot Failures.

Automatic pilot failures generally will be indicated by continuous hard-over signals or oscillating signals. The continuous hard-over type of malfunction can result from shorting or grounding of certain circuits, and/or the failure of certain tubes. The result will be that the automatic pilot servo will develop full torque on one of the surfaces (not necessarily full deflection) and the maneuver that results will depend upon the speed, cg position, gross weight, and to a certain extent upon the type of failure that has occurred, as it is possible to get erroneous signals that do not develop full torque from the servo unit.

Elevator Hard Nose Down.

If automatic pilot malfunction gives an elevator hard nose-down signal, the aircraft will pitch over quite rapidly to almost zero G, which is the critical condition. In combination with turbulence, this hard nose-down signal may produce an acceleration below zero G's which could unseat the pilot. Therefore, the pilot must have his safety belt fastened at all times.

Aileron Hard-Over.

Another type of failure is an aileron hard-over signal which produces a smooth movement at the ailerons and the aircraft will roll at a maximum rate of about six degrees per second. This is so smooth that it is quite possible that the pilot will not detect the motion at night or when on instruments, unless he is actually observing the gyro horizon or the control wheel at the time. It is possible that the aircraft can reach a very steep angle of bank before the pilot detects the motion, particularly if the air is slightly turbulent, making the pilot relatively insensitive to the small acceleration produced by the aileron roll.

Oscillating Signals.

Oscillating signals can occur due to a failure in the automatic pilot follow-up circuit and will be evident by the oscillating movement of the controls. If the automatic pilot malfunctions, it should be disengaged immediately by one of the following methods:

a. Operate either the pilot's or copilot's clutch disconnect switch.

b. Pull out the clutch switch.

c. Move the servo disconnect levers to OFF (up) position.

d. Move the flux gate caging switch to the ON (up) position and then release.

If a malfunction occurs, the pilot must restrain the controls while disconnecting the automatic pilot to prevent a sudden jerk when it disengages. The automatic pilot will be automatically disengaged by any momentary interruption of either ac or dc current.

NOTE

The automatic pilot may be overpowered; however, the control forces required will be higher than when the automatic pilot is disengaged.

HYDRAULIC SYSTEM FAILURE.

HYDRAULIC PUMP FAILURE.

Continuous or repeated flashing of a pump low pressure warning light, which is not caused by operating a system component at low engine rpm, and where there is no loss of fluid, indicates cavitation of the pump or internal pump failure. Place a load on the defective pump by operation of the brakes or flight controls to restore normal operation. If the defective pump does not return to normal operation turn off the good pump in the affected system and place a load on the defective pump again. If the pump will not prime and resume normal operating pressure it is defective. Turn the good pump back on. Leave the defective pump off and continue normal operation. Under most circumstances it is not advisable to open the emergency crossover valve after suspected pump failure. Contamination of the entire system may result. One pump inoperative in the primary system will not affect normal control booster operation of the flight controls. Loss of one pump in the secondary system will only restrict the flow and slow the operation of the landing gear, nose wheel steering, wing flaps and oil transfer. However, if the pilot faces severe weather conditions he may decide to use the crossover valve to provide better response to flight controls under heavy air load conditions or to provide positive steering and brakes during the landing roll.

CAUTION

Do not move the hydraulic system crossover switch to the EMERGENCY position until it has been determined by visual inspection that a complete loss of the remaining hydraulic system pressure will not occur.

HYDRAULIC SYSTEM CONTAMINATION.

The major cause of hydraulic system contamination is internal hydraulic pump failure. By not bypassing the affected pump soon enough after failure, fine and large metal particles from the defective pump may clog or crush the pump filter. When the pump filter is clogged or crushed the filter bypass will open at 50 psi, allowing contaminated fluid to enter either the primary or secondary system if the overhead emergency shutoff of the affected pump is still in the FULL ON position. **BY OPENING THE EMERGENCY CROSSOVER THE ENTIRE HYDRAULIC SYSTEM WILL BE CONTAMINATED.**

The possibility of contamination can be minimized by expedient troubleshooting to determine if the pump is defective before metal particles crush or clog the pump filter. When a pump is found to be defective, move the emergency overhead shutoff lever to the HYD OIL OFF position. The overhead shutoff lever actuates the pump control shutoff valve which bypasses and restricts fluid from entering the pressure system.

TROUBLESHOOTING THE HYDRAULIC SYSTEM.

Each hydraulic pump has a capacity of 22 gallons per minute at 1650 psi. Since the entire hydraulic system holds only 54 gallons of fluid it can be readily seen that prompt corrective action is essential when a loss of fluid quantity is observed in the primary or secondary system. If too much fluid has been lost, the system cannot be restored. Therefore, if a loss of quantity is observed with or without a serious loss of pressure or pump low pressure warning light indication, both hydraulic pumps on the

affected system should be shut down immediately. Move the emergency shutoff levers to the HYD OIL OFF position and then troubleshoot the affected system.

WARNING

In the event of a hydraulic pressure and/or fluid loss in flight, all nonessential equipment in the wing root and radome area will be turned off until the source of leak or pressure loss is determined. Once the problem has been identified and located, that equipment which will not be affected by hydraulic fluid leak may be turned back on. All precausions possible should be taken to prevent leaking hydraulic fluid from contacting a source of ignition. The following equipment, if installed, is considered nonessential for flight:

Cabin heaters

Recirculating fans

Electronic inverters

All nonessential radio equipment

Any other equipment may be turned off in the interest of safety.

FAILURE OF PRIMARY HYDRAULIC SYSTEM.

If there is a loss of primary system fluid quantity or pressure:

a. The pilot must shut off the automatic pilot and tell the engineer to place the No. 1 and No. 2 shutoff levers in the HYD OIL OFF position. The pilot must have the copilot turn the auxiliary boost on and then the pilot must pull the aileron boost lever off.

WARNING

Do not move the emergency shutoff levers beyond the first detent. Engine failure may result.

b. If the elevator or rudder auxiliary boost system has a leak the affected control will stiffen up as the hydraulic system loses pressure. Shut off the defective control boost, reservice the hydraulic system and return to normal operation.

c. If the elevator and rudder auxiliary boost system holds pressure and operates normally, check the lower compartments and tail section for leaks. If a leak is located in the hydraulic plumbing or components refer to the hydraulic system diagram to see if the leak can be isolated. If no leak is found, continue troubleshooting as indicated below.

d. Reservice the main hydraulic reservoir to three-fourths full.

e. Turn on No. 2 hydraulic pump. The inboard pump is the lower pump in the system and less likely to cavitate due to air in the lines. Due to air in the system it is not unusual for the quantity to drop rapidly to approximately one-half full before stabilizing. If the quantity drops below one-half, shut off the No. 2 pump and reservice the reservoir to three-fourths full.

NOTE

If considerable fluid has been lost it is extremely difficult to determine if the drop in quantity is due to a hydraulic leak or due to air in the lines returning to the reservoir. Under these conditions it is advisable to check the No. 2 pump again. If the quantity drops below one-half a second time, reservice the reservoir to three-fourths full and check the No. 1 pump for leaks.

If the No. 1 pump holds pressure and quantity it has been established that the leak is in the No. 2 pump. Reservice and resume normal operation.

CAUTION

Do not allow hydraulic reservoir quantity to drop below one-fourth full. Loss of system may result.

f. If the No. 2 pump holds pressure and quantity the leak is either in the No. 1 pump or the aileron boost system. Since pump failures are more common, check the aileron boost first.

CAUTION

Slow aircraft to 155 knots or below prior to turning on the aileron boost lever.

g. If the aileron boost system leaks, shut it off. Turn the No. 1 pump back on and continue operation with the aileron boost off.

If the pressure and quantity holds with the aileron boost on it may be assumed that the No. 1 hydraulic pump is inoperative. Leave the No. 1 pump off and resume normal operation. Do not use crossover unless weather or runway conditions require aileron boost.

h. If both No. 1 and No. 2 pumps fail to hold pressure, either both pumps are defective or there is a leak in a line common to both pumps. The aircraft may be flown with the auxiliary boost system on and the aileron boost shut off, or if conditions warrant, use of the emergency crossover may be attempted.

WARNING

If the emergency crossover valve is opened and the primary hydraulic system is contaminated with metal particles from a pump failure, the secondary hydraulic system will become contaminated. Loss of the secondary system may result.

i. If the emergency crossover must be used for landing, the landing gear should be lowered and the wing flaps lowered to 60 percent prior to opening the crossover. Shut off the No. 3 and No. 4 hydraulic pumps. Turn on the No. 3 hydraulic pump. Observe secondary system quantity and pressure. (The primary system pressure will continue to read zero.) If the secondary quantity and pressure holds, turn the No. 4 hydraulic pump back on. All primary system units can now be operated by the secondary system.

If the leak in the primary system is below the primary isolation check valve, the secondary system will not hold pressure and secondary hydraulic fluid will be lost through the leak. Return the crossover valve to NORMAL.

FAILURE OF SECONDARY HYDRAULIC SYSTEM.

In the event of loss of secondary system fluid quantity or pressure proceed as follows:

a. During Ground Operation: Tell the engineer to place the No. 3 and No. 4 emergency shutoff levers in the HYD OIL OFF position. Tell the copilot to place the emergency brake selector lever in the EMER position. Stop the aircraft. Insert landing gear pins. Do not taxi the aircraft.

b. During Flight: Place No. 3 and No. 4 emergency shutoff levers in the HYD OIL OFF position.

WARNING

Do not move the emergency shutoff levers beyond the first detent. Engine failure may result.

CAUTION

Hydraulic reservoir filler selector should be in MAIN position unless hydraulic fluid is expressly required in emergency tank.

c. Reservice the main hydraulic reservoir to three-fourths full. Check the emergency extension reservoir. Set aside three gallons of fluid in the event the emergency extension reservoir requires reservicing if the emergency system must be used.

d. All operating units should be shut off. If the hydraulic failure occurred during the operation of one of these units the leak is probably in the unit. For example: If a failure occurs during landing gear retraction the landing gear up line is probably leaking. Place landing gear selector lever in the neutral position.

e. Check each lower compartment for leaks. Considerable plumbing and several of the selector valves are located in these areas. Refer to hydraulic system diagram to see if the leak can be isolated. If the wing flap motor or associated plumbing below the wing flap shutoff valve is leaking the leak can be isolated. Hold the wing flap shutoff valve test switch in the TEST position and pull out the wing flap shutoff circuit breaker (MJB-3 panel). Then release the test switch.

NOTE

Wing flaps must be extended manually if the wing flap shutoff valve is closed. Refer to Emergency Wing Flap Extension checklist.

f. Turn on No. 3 hydraulic pump since it is the lower pump in the system. If the hydraulic quantity drops below one-half full, shut off the No. 3 pump and reservice the reservoir to three-fourths full.

NOTE

If considerable fluid has been lost it is extremely difficult to determine if the drop in quantity is due to a hydraulic leak or due to air in the lines returning to the reservoir. Under either condition it is advisable to check the No. 3 pump again. If the quantity drops below one-half the second time, reservice the reservoir to three-fourths full and check the No. 4 pump for leaks.

If the No. 4 pump holds pressure and quantity then it has been established that the leak is in the No. 3 pump. Reservice and resume normal operation.

CAUTION

Do not allow hydraulic reservoir quantity to drop below one-fourth full. Loss of the system may result.

g. If the No. 3 pump holds pressure and quantity the leak is either in the No. 4 pump or the secondary

plumbing or operating units. Since all secondary units will operate on one pump it is not advisable to risk the loss of more fluid by checking No. 4 pump.

h. If there is no leakage of fluid with pressure on the system and all operating units are shut off, the leak may be further isolated by operating units one at a time. Frequently, if the location of the leak can be determined and isolated, the remainder of the hydraulic system may continue to be operated normally.

i. If both No. 3 and No. 4 pumps fail to hold pressure either both pumps are defective or there is a leak in a line common to both pumps. The use of emergency crossover is not recommended unless nosewheel steering is essential because of weather or runway conditions.

WARNING

If the emergency crossover valve is opened and the secondary hydraulic system is contaminated with metal particles from a pump failure the primary hydraulic system will become contaminated. Loss of the primary system may result.

j. If the emergency crossover must be used for landing, shut off one of the primary hydraulic pumps prior to placing the emergency crossover valve switch in the EMERGENCY position. Observe primary system quantity and pressure (The secondary system pressure will continue to read zero.) If the primary quantity and pressure hold, return both primary pumps to normal operation. All secondary units can now be operated by the primary system.

If the leak in the secondary system is below the secondary isolation check valve the primary system will not hold pressure and primary hydraulid fluid will be lost through the leak. Return the crossover valve to NORMAL.

k. If pressure cannot be restored to the secondary system by the engine driven pumps the emergency hand pump must be used to dump fuel, extend the landing gear, and to provide pressure for brakes. The emergency extension reservoir, located forward of the pilot's rudder pedals, should be full prior to operation of the hand pump and will require reservicing after the landing gear is extended. The wing flaps may be extended by means of the hand crank. The nose gear steering will be inoperative. The right secondary heat exchanger fan motor will not operate. The reserve oil transfer system can be operated by placing the oil pump switch in the AUX (ELEC) position.

NOTE

Brakes will be available only if the brake accumulators are charged and the brake selector is in the EMER position. If the accumulators are discharged the brakes must be powered by the hand pump with the hand pump selector lever in the EMER BRAKES position and the brake selector lever in the EMER position.

FAILURE OF BOTH HYDRAULIC SYSTEMS.

If a hydraulic system failure disables both the primary and secondary hydraulic systems, the automatic pilot (operated with boost off) may be used in preference to the auxiliary electrically driven booster system while cruising, particularly during a long flight. Under these conditions, the use of the automatic pilot would save the auxiliary booster motors for landing at the end of the flight. Using the automatic pilot in preference to manually flying the aircraft with boost off also presents an obvious advantage to the pilot. The automatic pilot should never be used under conditions wherein the boosters are being shifted off and on. It is very important to be certain that the automatic pilot is disconnected before shifting the boosters either from OFF to ON, or ON to OFF. In rough air, if the automatic pilot is used with the surface control boosters off, it is important to realize that the automatic pilot cannot control the aircraft properly; hence, a gust can cause the aircraft to be put in an unusual attitude if too much reliance is placed on the automatic pilot. Therefore, the human pilot should monitor the controls very closely under these conditions. No automatic pilot malfunction tests have been conducted with the surface control boosters OFF. In the event of an automatic pilot malfunction, the forces applied to the surface controls by the automatic pilot are not great enough to cause a quick change in the aircraft attitude. However, it is possible that an automatic pilot malfunction could cause a very slow and gradual maneuver, such as a diving spiral. Boost-off recovery from such a maneuver, if it becomes well developed before corrective action is initiated, could be very difficult. Therefore, the pilot should be prepared at all times to take corrective action immediately if a malfunction occurs. Use of the automatic pilot with the surface control boosters off is approved; however, it is not necessarily recommended for all conditions. When using the automatic pilot with boosters off, the various limitations described in these paragraphs should be clearly understood.

FAILURE OF PRIMARY HYDRAULIC SYSTEM INFLIGHT CHECKLIST

BOLDFACE items will be accomplished before reading the checklist.

NOTE

The following procedures are to be used whenever hydraulid system fails. They are especially important during critical phases of flight (i.e., takeoff, landing, and turbulence, etc.).

Pilots		Flight Engineer
1. AUTOPILOT DISCONNECTS – OFF	**P**	
(2.) NO. 1 AND NO. 2 EMERGENCY SHUTOFFS – HYD OIL OFF	**P**	(1.) No. 1 and No. 2 emergency shutoffs – HYD OIL OFF
3. AUXILIARY BOOSTERS – ON	**CP**	2. Troubleshoot
4. AILERON SHUTOFF – OFF	**P**	

NOTE

If both auxiliary control boosters operate normally, continue to operate on auxiliary boost while troubleshooting the primary system. Loss of one auxiliary control booster indicates leak area.

CAUTION

If troubleshooting is delayed or prolonged flight without the primary system pressure is anticipated. It is recommended that auxiliary boost be turned off to avoid pump failure. This will save the auxiliary motors to use for landing. If troubleshooting determines that the leak is common to the normal and emergency boost systems, follow Boost Off Landing procedures.

(5.) Hydraulic Crossover valve – OPEN (if location of leak permits)	P	(3.) Hydraulic Crossover valve – OPEN (If location of leak permits)

WARNING

Do not move the hydraulic system crossover switch to the EMERGENCY position until it has been determined by visual inspection that complete loss of the remaining fluid will not occur.

BOOST-OFF LANDING.

In the event of complete control booster failure use extreme caution. Flight can be maintained safely but banks in excess of 15 degrees should not be attempted. An instrument approach should never be attempted under these conditions except as a last resort. Three miles or more will be required to line up with the runway. To reduce pilot effort a runway should be chosen very nearly aligned with the wind.

When a boost-off landing is necessary, aircraft loading should be arranged to give a gear-down cg of 23 to 30 percent MAC. The forward cg position is limited by inability to flare for landing because of reduced elevator travel (elevator shift lever pulled out to EMER position). The aft cg position is limited by the possibility of experiencing insufficient down elevator in case it is necessary to use full power at low airspeeds in rough air. Approach at 140 to 145 knots IAS for normal landing weights. The aircraft should be maintained in trim during the approach to eliminate excessive elevator control forces. A longer final approach with power for a low rate of descent is recommended to reduce the amount of attitude change during the landing flare. A small amount of power should be maintained until the aircraft touches down. Reverse thrust rather than brakes should be used for deceleration during the initial portion of the landing rollout. The copilot should stand by to hold the controls during reversing to prevent excessive buffeting.

Rudder and/or differential power may be used for directional control. Turns may be made with the rudder, ailerons, or differential power. Ailerons and/or differential power may be used to raise the wings.

CAUTION

Although the above procedure is recommended, boost-off landings may be made using 60 percent wing flaps, if desired. When using wing flaps the above technique is recommended except that the approach speed should be 135 knots EAS instead of 140 to 145 knots EAS. The use of 60 percent wing flaps, which permits lower approach and touchdown speeds, is important only if reverse thrust is not available.

NOTE

If troubleshooting discloses that actuating the hydraulic system crossover switch would result in complete loss of the secondary hydraulic system, the aircraft must be operated, at the pilot's discretion, with either the rudder and elevator auxiliary booster switches ON and the aileron booster lever OFF, or all boosters OFF.

WARNING

The removal of equipment prior to the completion of programmed installed equipment will require close monitoring of the cg for boost off landings (refer to paragraph entitled, Weights and Loads, page 5-11).

To keep the forward cg limit above 18 percent MAC for landing, it is permissible to move personnel or equipment to the aft compartments, not to exceed the limits listed in the Compartment Data Chart of the Chart "E." Personnel will be secured in seats with safety belts and loose equipment stored behind bulkheads and tied down securely.

NOTE

The effect obtained by shifting weight will be dependent on the original compartment location. A relocation of 400 pounds from "D" to "N" compartment will increase the cg by 1.3 percent. A transfer of 400 pounds from "J" to "N" will result in only an 0.5 percent cg increase.

TURNING BOOSTERS ON IN FLIGHT.

CAUTION

Once the boosters have been turned off, they should not be turned on again unless it is definitely known that the cause of the malfunction no longer exists.

If the decision is made to turn the boosters on, use the following procedure:

a. Airspeed – 130 to 155 knots.

NOTE

With the airspeed in this range, an abrupt control surface deflection is not likely to cause a serious change in attitude, and consequently will not subject the aircraft structure to as large loads as would be the case at higher speeds.

b. Altitude – As required.

NOTE

Maintain sufficient altitude to permit recovery from any inadvertent attitude change.

c. Automatic pilot – OFF.

NOTE

Trim the aircraft longitudinally, laterally, and directionally for hands-off, straight and level flight. Even though the aircraft is trimmed for hands-off flight with boost off, it is possible that a boost control valve may be slightly open, and when the boost is turned on, may cause an abrupt change in control surface position. For this reason, airspeed should be held within the range noted in step a.

CAUTION

Do not apply any force to the rudders, elevators, or ailerons, but merely hold the controls lightly. This is important because the application of pressure to any of the controls will open the booster control valve which, when boost is turned on, will result in large deflection of the control surface.

d. Boost control levers – ON (move slowly).

NOTE

Positioning the control levers slowly has the effect of turning on hydraulic pressure slowly, which if a booster control valve is slightly open, will preclude the possibility of an abrupt surface control deflection. If there is some misrigging between the aileron booster units, turning the aileron booster on may cause the aircraft to rock laterally.

SHIFTING FLIGHT CONTROL SYSTEMS FROM BOOST-ON TO BOOST-OFF.

The need to shift a boosted surface control system from boost-on to boost-off could be created by a loss of hydraulic pressure or by a discrepancy in the mechanical portion n of the affected booster system.

Most control system difficulties should be recognizable by one or more of the following conditions:

a. Aircraft does not respond to pilot force on flight controls.

b. Flight controls seem to be immovable or require abnormally high force.

c. Aircraft starts nosing up or down, rolling or yawing and application of pilot force on the flight controls to correct or stop the condition is ineffective. (If the changing attitude is being caused by an automatic pilot malfunction, corrective action on the flight control will be effective since malfunctions of the automatic pilot can be overpowered.)

d. Application of trim tab has no effect on aircraft trim. In the case of a tab system problem the airplane will respond to pilot force on the primary control.

An important consideration in shifting a boosted control system to boost-off is the position of the trim tabs which should be at or near normal trim position prior to shifting. If the trim tabs are displaced several degrees out-of-trim (by pilot or the automatic pilot), the airplane may be expected to lurch when the transition to boost-off operation is made. If time does not permit retrimming prior to shifting to boost-off, the next best thing to do is to retrim as soon as possible after achieving boost-off operation.

Although the procedure of shifting to boost-off usually will not help if the control system is rigidly jammed by a foreign object or other serious interference, it is recommended that the shift to boost-off be made regardless because it is possible that the problem will be overcome by doing so.

EMERGENCY CONTROL BOOST SHUTOFF CHECKLIST

BOLDFACE items will be accomplished prior to reading the checklist.

Pilots	Flight Engineer
1. AUTOPILOT DISCONNECTS LEVERS – OFF	**P**
2. TRIM TAB – NEUTRAL IF TIME PERMITS	**P**

If time does not permit, retrim airplane after booster shift is accomplished.

WARNING

A sudden and pronounced lurch of the airplane should be anticipated as the shift is made if the tab setting is more than 2 or 3 degrees from the normal trim position.

EMERGENCY CONTROL BOOST SHUTOFF CHECKLIST – Continued

Pilots	Flight Engineer
3. AFFECTED CONTROL BOOST – PULL OFF P	

WARNING

When shifting the elevator system to boost-off, a force on the control column will increase the force required to pull the shift handle. A heavy force could make it difficult to pull the shift handle. Do not apply force on the elevator control column during operation of the elevator shift handle.

If unable to shift affected system for any reason (such as malfunction of shift mechanism):

4. UNAFFECTED CONTROL BOOST SYSTEMS – PULL OFF P	
(5.) NO. 1 AND NO. 2 EMERGENCY SHUTOFFS – HYD OIL OFF P	(1.) NO. 2 AND NO. 2 EMERGENCY SHUTOFFS – HYD OIL OFF
6. AUX BOOST – OFF CP	
7. AFFECTED CONTROL BOOST – PULL OFF P	

WARNING

If the shift cannot be completed, leave primary hydraulic pressure off for the remainder of the flight.

8. Auxiliary boost or primary hydraulic pressure – As required. CP

NOTE

- Auxiliary boost or primary pressure can be reestablished provided it does not supply pressure to the malfunctioning control system.
- If the shift is completed on the malfunctioning system, re-established airplane hydraulic pressure and return the other two control systems to boost-on operation.

9. Operative boost systems – ON. P

EMERGENCY CONTROL BOOST SHUTOFF CHECKLIST – Continued

Pilots	Flight Engineer

SPECIAL CASE FOR NOT SHIFTING TO BOOST-OFF.

If any primary control (elevator, rudder, or aileron) should become free, that is, flight control moves freely with no effect on aircraft attitude, the following is recommended:

a. Leave automatic pilot ON if already on.

b. Turn automatic pilot ON if not on.

c. Do not shift to boost-off.

d. Land airplane with automatic pilot by using automatic pilot controller and/or tabs. (Refer to Boost-Off Landing Procedures, this section.)

EMERGENCY DESCENT PROCEDURES.

Emergency rapid descents from high altitudes may be made in either the clean configuration or with landing gear down and wing flaps extended. Descent in the clean configuration can be made at speeds up to placarded limits. Refer to Section V for operating limitations.

EMERGENCY DESCENT WITH GEAR AND FLAPS EXTENDED.

Descent with gear DOWN and flaps in 60 percent position may be made at speeds up to the landing gear extended placarded limits; similarly, descent with landing gear DOWN and the flaps in LANDING position may be made at speeds up to the wing flap extended placarded limits. With landing gear and flaps extended the angle of descent will be greater than when descending in a clean configuration, but the rate of descent is lower because of the lower airspeed necessitated by the landing gear extended or the wing flaps extended limits.

EMERGENCY DESCENT PROCEDURE

Pilots		Flight Engineer

NOTE

If proximity of the landing area, rough air, or the possibility of structural damage indicates the advisability of descending at low airspeed, rapid loss of altitude can be achieved at relatively low airspeeds with the landing gear down and the wing flaps extended. This configuration will also permit smoke removal during descent, if necessary.

a. Automatic pilot – OFF	P	a. Engine superchargers – LOW
b. Throttles – RETARD	P,CP	b. Mixtures – RICH
c. Wing flaps – As required	P,CP	c. Master spark control – RETARD
d. Landing gear – As required	P,CP	d. Propellers – RPM 2600 Set

EMERGENCY DESCENT PROCEDURE – Continued

Pilots		Flight Engineer
e. Aux control boosters SWS – ON	CP	e. Cowl and oil cooler flaps – 100 percent open during descent with flaps and gear down), and As required during clean descent. f. Aux vent (if necessary) – Full open, then position A

LANDING EMERGENCIES.

LANDING GEAR TIRE FAILURE.

a. If the nosewheel tires are flat at time of landing, keep those wheels off the ground as long as possible, with aft cg at 30 percent. (Moving 400 pounds from the center cabin area to the rear cabin area will shift the cg approximately one percent.) Use a minimum of braking.

b. If one or both tires are flat on one main gear, drop the nose gear as quickly as possible. There is very little actual danger in landing with one flat tire on one main gear. The landing should be made smoothly and taxiing should be done slowly.

c. If both tires are flat on one main gear as a result of striking some object on the runway, damage in addition to the flat tires, may have occurred. For example, a hydraulic hose may have been torn loose, a wheel may have been broken, or the landing gear itself may have been damaged.

A forward cg will place more weight on the nose wheel and provide positive steering after touchdown. Make a normal approach and landing. After touchdown, the aircraft will tend to swerve in the direction of the blown tires; therefore, land the aircraft on the side of the runway away from the blown tires to allow space for possible swerve during deceleration. Use aileron to ease weight on the blown tires. When the aircraft has slowed, reverse thrust may be used on the outboard engine opposite the side of the blown tires to aid in maintaining the directional control. Do not apply brakes to the wheels with the blown tires during the landing roll nor attempt to taxi after the aircraft has stopped.

LANDING ON SOFT GROUND OR UNPREPARED RUNWAYS.

If it is necessary to land on soft ground or on unprepared runway, the landing should be made with the landing gear retracted.

LANDING WITHOUT LANDING GEAR FULLY EXTENDED.

LANDING WITH PARTIALLY EXTENDED LANDING GEAR.

In the event that a landing gear malfunction cannot be corrected and neither the main or nose landing gear will fully extend nor retract and a landing is to be attempted, proceed with the following gear-up landing procedures:

a. Notify crew of intention to make an emergency landing.

b. Request assistance required (crash equipment, foam, etc.).

c. Reduce gross weight of aircraft by dumping fuel.

d. If possible, move center of gravity to approximately 25 to 30 percent MAC.

e. Secure or stow loose equipment.

f. Open all doors; remove and stow securely all emergency exit covers.

NOTE

Leave cabin heaters off.

g. Order all seat belts fastened.

h. Flight control auxiliary boosters – ON.

i. Shut down engines No. 2 and No. 3 by placing mixture off (do not feather) when advised by the pilot.

j. Ignition of shutdown engines No. 2 and No. 3 – OFF.

k. All auxiliary fuel boost pumps – OFF.

l. Wing flaps – Extend to LAND (100 percent) position as soon as it is certain landing area can be reached.

m. Give order to brace, 30 seconds before contact.

n. Mixture controls – Engines No. 1 and No. 4 – OFF.

o. Fuel tank selector – OFF.

p. Ignition – OFF.

q. All electrical power (batteries, generators, and generator field circuit breakers) – OFF as soon as possible after ground contact.

r. Hold nose fairly high for landing.

s. Emergency shutoff levers, all engines – Full OFF position.

t. Evacuate aircraft promptly.

NOTE

Steps n, o, p, and q should be accomplished simultaneously just prior to contact with the ground so that engines No. 1 and No. 4 can be kept running up to the last possible moment to provide hydraulic power for flight control boosters.

LANDING WITH MAIN LANDING GEAR ONLY – NOSE GEAR RETRACTED.

Nose gear component failure can cause a condition where the main gear comes down and locks, but the nose gear remains in an unsafe condition. The following procedure will allow the aircraft to be landed in this configuration with minimum damage.

a. Reduce landing weight by burning or dumping excess fuel.

WARNING

If the nose gear is to be inspected through the nosewheel well access door, turn off all electrical equipment in the compartment. With the access door open, leaking hydraulic fluid can spray back into the lower compartment.

b. Make a flat approach using 60 percent flaps.

c. Place brake selector in EMER.

d. After touchdown, shut down engines No. 2 and No. 3

CAUTION

Minimum damage should occur by shutting down the engines with the mixture controls. Feathering may result in the engines being torn loose from the mounts when the stopped propellers strike the runway.

e. As the speed decreases, lower the nose to the runway as gently as possible before elevator control is lost.

NOTE

When the nose is lowered through a level attitude increased control force can be expected due to a negative angle of attack.

f. After stopping the aircraft using brakes, shut down engines No. 1 and No. 4

g. Secure all switches and controls, and evacuate promptly.

LANDING WITH MAIN LANDING GEAR RETRACTED – NOSE GEAR EXTENDED.

a. Retract nose gear and follow Landing Without Landing Gear Fully Extended procedures.

LANDING WITH ONE MAIN LANDING GEAR NOT EXTENDED.

a. Retract all landing gear and follow Landing Without Landing Gear Fully Extended procedures.

LANDING GEAR SYSTEM MALFUNCTION PROCEDURES.

FAILURE TO EXTEND.

If any of the landing gear warning devices indicate an unsafe condition after the gear is extended, it should be assumed that the gear is unsafe, not that there is a malfunction in the warning system. The gear unsafe indications are: glowing of the gear unlocked warning light, unlocked indication of any of the gear down and locked lights or indicators, and the sounding of the landing gear warning horn. The following procedures are based on the assumption that normal hydraulic system pressure is available; however, certain portions will still apply if only the emergency extension system is operating. The procedures apply to either a malfunctioning nose or main gear unless specified otherwise.

a. Determine whether the affected gear is still on the uplock, or is down but not locked.

NOTE

The down and locked indicators will identify the malfunctioning landing gear. The approximate position of the gear can then be determined by crew inspection. This can be done with the driftmeter for any gear, or from the cabin for main gear and from the lower forward baggage compartment door or by making a pass by the control tower and asking the operators to check gear position.

b. If affected gear is up and locked:

(1) Operate the landing gear lever UP and DOWN several times. Wait for the gear to complete each cycle.

(2) Malfunctioning main gear only – With the landing gear lever down, fully extend and retract the wing flaps several times. Wait for the flaps to complete each cycle. Operation of the flaps causes relative span-wise motion between the uplock sleeve and the uplock jaws and may be effective in releasing the uplock. Airspeed limitations with flaps extended must be observed.

(3) Retract gear and try extending it by means of the emergency extension system, using recommended procedures (No. 3 and 4 pumps OFF). Pump maximum pressure with the handpump.

(4) Malfunctioning main gear only – Turn No. 3 and 4 pumps back on and operate the wing flaps through several full cycles while holding maximum hand pump pressure.

(5) Make alternate push-overs and pullups while holding maximum hydraulic pressure and hand pump and normal system. Use caution to avoid exceeding aircraft structural limitations.

(6) Repeat the preceding steps as necessary. Past experience with cases of this type has shown that repeated cycling of the gear will usually result in a successful gear extension.

c. If affected gear is down but not locked:

(1) Operate landing gear lever up and down several times. Wait for the gear to complete each cycle.

(2) Make alternate puch-overs and pullups while using normal system pressure to hold gear down. Use maximum handpump pressure if normal system pressure is not available.

(3) Extend gear with emergency extension system using recommended procedures, and pump maximum pressure with the handpump.

(4) Repeat the preceding steps as necessary.

FAILURE TO RETRACT.

If the landing gear lever will not go past the neutral position, insert a finger in the hole on the right side of the control pedestal and push the solenoid pin out of the way.

CAUTION

- If handle movement is satisfactory and secondary system pressure is up but gear does not retract, check the handpump selector valve at the base of the handpump. If this valve is in the emergency (aft) position, the gear return fluid may be trapped, hydraulically locking the gear in the extended position. If this condition exists, the following procedure must rigidly be adhered to: Move the gear handle full down, move the handpump selector lever to the brake (forward) position, and then move the gear handle back up to the UP position. Failure to follow this sequence may rupture the emergency extension tank.
- If any of the gear do not retract, and lock, lower gear to locked position. Do not make any further attempt to retract the gear.
- If the nose gear does not retract or gives an unsafe indication when the gear handle is placed in the UP position, inspect the gear and the wheel-well doors through the forward baggage compartment door.
- If the nose gear is in the uplock and there is no apparent damage to either the gear or the wheel-well doors, place the gear handle to neutral. If the gear stays in the uplock, the flight may be continued. Extend the gear only when necessary for landing.

NOTE

Fuel can be dumped safely with the gear extended if required. Cross reference all landing gear malfunctions with the indicator, warning lights, and horn.

EMERGENCY NOSE GEAR EXTENSION.

In cases of emergency, such as failure in the emergency hydraulic line to the main gear, accompanied by some other malfunction which prevents the extension of the nose gear with the normal hydraulic system pressure, emergency pressure can be concentrated in the nose gear line by capping off the emergency line to the main gears. If the main gear can be extended and locked successfully by free fall, the main gear can be isolated from the emergency gear extension system, and emergency pressure directed

to the nose gear with the emergency extension procedure.

a. The emergency main gear extension line may be reached through the forward cargo compartment by removing the forward section of the compartment lining on the left side to expose the hydraulic plumbing. The emergency line to the main gears is marked L.G. EMERG EXT.

LANDING WITH A GEAR FULLY EXTENDED BUT NOT LOCKED.

If the procedures above fail to lock the gear down and a landing must be made, it is still possible to land safely while holding the gear in the extended position by hydraulic pressure. To maintain sufficient pressure, it is essential to keep engines operating at an adequate rpm and to refrain from actuating other hydraulically operated units that might cause pressure to drop in the landing gear hydraulic lines. Specifically, the following procedure is recommended:

a. Place brake selector lever in EMER.

b. Turn refrigerator cooling fan switches OFF; paddle switches to WARMER until secondary scoop lights are out.

c. If certain that both hydraulic systems are operating normally, place hydraulic crossover shutoff switch in EMER (open).

d. Make a normal landing, or slightly flatter than normal, if runway length is adequate; however, it must be remembered that use of propeller reverse should be avoided, and that the aircraft will require more landing distance than normal. Do not make an extremely slow, nose-high landing as the impact forces, if the plane should drop in a stalled condition, could tend to collapse the gear.

e. Do not use propeller reversing.

NOTE

Because of the geometry of the main gear, the forward motion of the aircraft being opposed by the wheel brakes will tend to hold the gear extended. This may not be true if propeller reversing is used for braking.

f. Do not use nosewheel steering unless unable to steer the aircraft by differential wheel braking. Do not turn off the runway.

g. Do not raise the flaps. Operation of the flaps will reduce hydraulic pressure which may allow the gear to collapse.

h. Maintain 1000 to 1200 rpm on all four engines and gradually apply the brakes. Just before the aircraft comes to a complete stop, release the brakes momentarily to allow the lower drag strut to retract and then bring the aircraft to a smooth stop. Hold position with the brakes.

NOTE

An rpm of 1000 to 1200 will give full hydraulic pressure as long as no hydraulic system units are operated. This is considerably more pressure than is required to keep the gear extended. Also, at this rpm the lower drag shock strut normally will remain retracted as the aircraft stops. It is recognized that at times the airplane will rock backward as it stops in spite of the pilot's best efforts to stop with the lower drag shock struts retracted; however, this condition is not critical as long as full hydraulic pressure is maintained and rpm is in the recommended range. Stopping with the drag shock struts retracted is recommended since it facilitates ground action in making the gear safe as explained below.

(1) The hydraulic force imposed by the landing gear hydraulic cylinder acts to pull the downlock hook onto the shaft. If the lower drag shock strut is extended the tension in the drag shock strut opposes the force exerted by the landing gear hydraulic cylinder and tends to raise the downlock hook off the shaft. This may make it difficult or impossible to move the latch to the locked position in order to insert the ground safety pin.

(2) If the shock strut is broken, the landing gear hydraulic cylinder will extend until it bottoms, which will put the upper and lower drag struts in an over-center (stable) condition. If the lower drag shock strut is extended, the tension produced opposes the force exerted by the landing gear hydraulic cylinder. This tends to pull the upper and lower drag struts back into a straight line, or on-center position, and makes it more difficult to insert bracing to hold the gear extended.

i. Establish interphone communications with ground personnel.

j. Have the landing gear safety pins inserted. It may be necessary to move the downlock latch to the locked position manually. If a main gear downlock or downlock latching mechanism is damaged, thus preventing the insertion of the safety pin or rendering its insertion ineffective, insert "stiff knee" adapter if available, if not block the nosewheels and jack the aircraft with a wing jack. Blocking the nosewheels will prevent the airplane from rocking off the jack when engine power is reduced should the lower drag shock struts retract at that time.

WARNING

Ground personnel should be altered to the possibility of the landing gear collapsing while the ground safety pins are being inserted or while the aircraft is being jacked. It may be considered desirable to back a heavy truck under the wing box beam; however, to be of any help, the truck must have sufficient bearing area and strength to support the aircraft. Use of small equipment is not recommended since it will not protect personnel and will increase the damage to the aircraft if the gear does collapse.

k. Do not reduce engine rpm until either the landing gear is safely locked down or the aircraft is on jackes. When safe to do so, reduce rpm gradually to idle prior to cutting engines. Do not move the aircraft until the landing gear is safely locked.

LANDING AFTER FUEL DUMPING.

The following will be accomplished during and after landing when fuel has been dumped in flight.

a. Request fire trucks to stand by the runway during the landing.

NOTE

The use of idle reverse and light braking (consistent with runway length and condition) is recommended.

b. Stop the aircraft after leaving the runway and request the firemen to check the main tank dump chutes for leakage. If leaks are noted, reactivate the dump valve to the CLOSE position. If the leak persists, shut down the engines and evacuate the aircraft using the emergency ladder.

If no leaks are detected, request fire trucks to follow the aircraft to the parking area and stand by until the engines are shut down.

EMERGENCY LANDING GEAR EXTENSION CHECKLIST

(See figure 3-7)

Pilots

1. No. 3 and No. 4 emergency shutoffs –HYD OIL OFF — CP
2. Landing gear – DOWN — CP
3. Emergency fuel dump lever – L G EMER EXT — CP
4. Emergency handpump selector – EMER GEAR (aft) — CP
5. Emergency handpump – Operate (Requires 245 strokes, 3 to 5 minutes). — CP
6. Landing gear position indicator – GEAR DOWN AND LOCKED — P,CP
7. Emergency handpump selector – EMER BRAKES (forward) — CP

WARNING

Do not reactivate the secondary hydraulic system after the gear is down and locked if the landing gear selector valve is malfunctioning or if it cannot be determined that the landing gear selector valve is in the DOWN position.

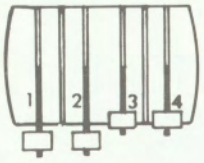
Check fluid level and have replenished.

Flight Engineer

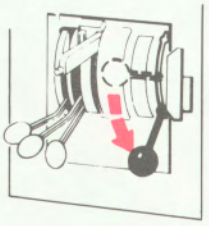
1. No. 3 and No. 4 emergency shutoffs – HYD OIL OFF
2. Hydraulic crossover system switch – NORMAL
3. Emergency extension tank quantity – CHECKED

EMERGENCY GEAR EXTENSION

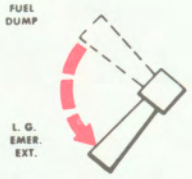
1. NO. 3 AND NO. 4 EMERGENCY SHUTOFF LEVERS – **HYD OIL OFF**



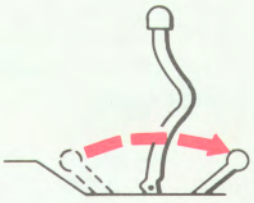
2. LANDING GEAR CONTROL LEVER – **DOWN.**



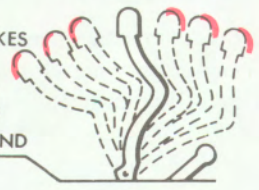
3. EMERGENCY FUEL DUMP LEVER – **L.G. EMER. EXT.**



4. EMERGENCY HAND PUMP SELECTOR LEVER – **EMER. GEAR** (AFT).

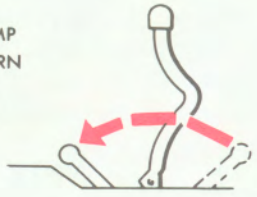


5. USE FULL STROKES OF THE HAND PUMP. ABOUT 245 FULL STROKES OF THE HAND PUMP ARE REQUIRED OVER A PERIOD OF 2 1/2 TO 3 MINUTES TO EXTEND AND LOCK ALL GEARS.



6. LANDING GEAR POSITION INDICATOR – CHECK FOR GEAR DOWN AND LOCKED.

7. EMERGENCY HAND PUMP SELECTOR LEVER – RETURN TO **EMER. BRAKES** (FORWARD) POSITION.



F66-0-3-4

Figure 3-7

EMERGENCY BRAKE OPERATION BEFORE LANDING CHECKLIST

Pilots

Flight Engineer

NOTE

Accomplish the following after the gear has been extended and locked by means of the emergency system.

1. Emergency handpump selector – EMER BRAKES — CP
2. Grake selector – EMER — CP
3. Emergency brake pressure (minimum 1250 psi) – Checked — CP

1. Emergency extension reservoir fluid – Checked

EMERGENCY BRAKE OPERATION BEFORE LANDING CHECKLIST – Continued

Pilots	Flight Engineer

NOTE

If pressure is down, use handpump until positive pressure rise is obtained and maintain pressure until landing is completed.

4. Handpump – Stand by (maintain 1250 psi) CP

NOTE

- Avoid pumping the toe pedals because this will reduce the number of useful brake applications.
- Use propeller reversing with caution. Nosewheel steering will be inoperative.

WING FLAP MALFUNCTION.

The aircraft is equipped with an asymmetric flap shutoff system which normally prevents wing flap malfunctioning by stopping all flap movement any time the flaps split approximately 1-3/4 inches. However, a malfunction within the asymmetric shutoff itself or an electrical power failure will render the asymmetric shutoff inoperative and split flaps could result. Furthermore, the automatic shutoff will operate only if the torque tube breaks or otherwise becomes separated. Therefore, if the drive chains or cables to individual flap sections should fail, these sections would become fixed whereas the other flap panels with drive mechanisms intact would continue to operate.

NOTE

If drive chains break while the flaps are above 60 percent, aerodynamic forces may cause the failed section to further extend to some fixed position between 60 percent and 80 percent. It is possible to have a partial asymmetric flap condition with no indication in the flight station except a rolling tendency. For this reason, the flaps should not normally be raised after takeoff until an altitude of 500 feet is attained, and the copilot should keep his hand on the flap control lever whenever the flaps are operated until the flaps stop at the selected position. The procedure is as follows:

Asymmetric wing flaps will be indicated by a rolling motion of the aircraft (not created by the ailerons as evidenced by displacement of the yoke) following any movement of the wing flap selector handle. The roll will be away from the extended flap. The time required for the wing flaps to extend to 60 percent position is approximately fifteen seconds. This allows a reasonable reaction time for detection of the malfunction, and initiation of corrective action before loss of control of the aircraft occurs.

Wind tunnel analysis indicates that it is possible to control the aircraft at speeds below 165 knots with an asymmetric wing flap deflection of 60 percent. With the wing flap on one side extended to the 100 percent position and the other retracted, it will be impossible to control the aircraft laterally at any speed.

In the event of a wing flap malfunction, immediate action must be taken to stop the flaps as quickly as possible after the roll is noticed.

Procedure: At the first indication of a wing flap malfunction pilot commands "Stop Flaps." Copilot acknowledges, "Stopping the Flaps," and positions the flap handle to the position shown on the wing flap position indicator. Pilot reduces airspeed to 165 knots and, if possible, maintains a level flight attitude. Copilot advises pilot when flap travel has been stopped. If the electrical system is operative, flap travel may also be stopped by actuating the asymmetry test switch. The flap selector handle may then be placed in the position shown on the wing flap position indicator. After being advised that flap travel has been stopped, the pilot will prepare to land the aircraft as soon as possible.

WARNING

After the flaps have been stopped by means of movement of the flap handle, further movement of the flap handle in the wrong direction will cause additional asymmetric flap travel which may result in total loss of control of the aircraft.

Successful landings have been made with all wing flaps on one side at 60 percent and all the wing flaps on the opposite side retracted. Asymmetrical travel in excess of 60 percent will permit only partial control of the aircraft.

If the asymmetric condition is critical, it is recommended that the secondary hydraulic system be shut off and the flaps hand cranked to symmetrical condition.

WARNING

Reposition the flap control lever to hydraulic neutral prior to repressurizing the secondary system.

Emergency Wing Flap Operation.

If the hydraulic system fails, the wing flaps can be operated manually with the handcrank, although movement is very slow. Because 360 turns (counterclockwise) are required to extend the flaps to 60 percent, they should not be lowered beyond this point.

WARNING

Do not move flap lever or otherwise use secondary hydraulic system during manual operation of flaps.

EMERGENCY WING FLAP EXTENSION CHECKLIST

Pilots

Flight Engineer

1. Emergency shutoff levers (No. 3 and No. 4) – HYD OIL OFF

LANDING WITH ONE OR MORE ENGINES INOPERATIVE.

The following notes and procedures are in addition to the normal landing procedures. It is assumed that the landing area is within landing range and that feathering procedure checklists have been completed. Landing with only one engine inoperative will not seriously affect the normal flight characteristics of the aircraft. When landing with one engine out, the hydraulic crossover valve should be opened to provide immediate hydraulic pressure if another engine on the same side fails during the approach. However, with engine No. 3 or No. 4 inoperative, the reduction in output to the secondary hydraulic system may cause the landing gear and wing flap operation to be slower than normal. After landing, the wing flaps should not be raised until after full use of nosewheel steering and full use of the brakes is not critical. When landing with any two engines shut down, the wind milling drag is reduced by one half and deceleration with closed throttles is less than normal. Hence, excessive speed on approach should be anticipated and avoided. However, a slightly high final approach with low power is considered good practice. With two engines operating at METO power, the propellers feathered on the inoperative engines, and the aircraft not exceeding recommended landing weights, the wing flaps may be lowered to 60 percent without loss of altitude up to approximately 2500 feet. The airspeed during final approach should be 140 knots at maximum landing weight, and until the landing is assured, no more than 60 percent flaps should be used.

GO-AROUND WITH ONE OR MORE ENGINES INOPERATIVE.

NOTE

The following is based on EC-121R performance. C-121G performance is somewhat better.

Go-Around, Three Engines Operating, Flight Control Boosters On.

A go-around at not more than the recommended landing weight of 110,000 lbs, with landing gear down and 100 percent flaps, can be accomplished if altitude is more than 100 feet and the indicated airspeed is more than 113 knots. If engines No. 3 or 4 are inoperative, operation of the gear and flaps will be slower. Procedure will be the same as four-engine procedure.

Go-Around, Two Engines Operating, Flight Control Boosters On.

In general, a two-engine go-around is not recommended. It can be accomplished, however, if gross weight is not above design landing weight of 110,000 lb, with landing gear down and 100 percent flaps, if altitude is not less than 400 feet and airspeed is not less than 130 knots. If engines No. 1 and 2 are inoperative, the hydraulic system crossover valve must be open for boost-on operation.

If engines No. 3 and 4 are inoperative, the hydraulic system crossover valve must be open to extend and retract the landing gear and wing flaps.

If fuel pressure drops below normal operating limits but the engine continues to operate normally, the cause may be fuel line leakage, primer solenoid leakage, oil dilution leakage, engine-driven fuel pump bypass valve leakage, clogged pressure line, or instrument failure. The action to be taken depends upon the circumstances existing at the time. Such factors as known aircraft condition, power requirements, and flight conditions must be considered. All factors being equal, any one of the following procedures are recommended:

a. Shut down engine immediately, using the following procedure if power from affected engine is not necessary to sustain flight or to reach a safe destination.

(1) Place mixture control of the engine with the suspected fuel leak OFF.

(2) Allow the engine to cool two minutes.

(3) Complete the Engine Failure and/or Fire During Flight checklist.

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

c. Keep the affected engine in operation at or above normal cruising speed while maintaining a constant watch for fire. This can be done if it cannot be determined that a leak exists and the engine power 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, shut down the affected engine completely by means of the mixture control (not by retarding the throttle) and accomplish a three-engine landing unless the added power is absolutely essential to effect a safe landing. Do not reduce airspeed until the affected engine is shut down. This procedure is based on the fact that the cooling effect of the airflow over the engine and nacelle will frequently keep a fire from starting (even though a fuel leak exists) until aircraft speed is reduced sufficiently as during landing.

GO-AROUND – TWO ENGINES OPERATING

Pilots		Flight Engineer
(a.) Power – As required.	P	(a.) Power – As required.
b. Airspeed (minimum) – 130 knots.	P	
c. Wings flaps – Raise to 60 percent.	CP	
d. Landing gear – Up (After flaps are at 60 percent).	CP	
e. Wing flaps – UP (raise flaps slowly).	CP	
f. Airspeed – Accelerate to 152 knots.	P	

CAUTION

At 152 knots the sea level rate of climb is approximately 400 ft/min at design landing weight (110,000 lb), wing flaps up, and landing gear retracted. Below 152 knots the rate of climb drops off rapidly and at 130 knots the rate of climb is essentially zero. It takes several minutes (depending on whether altitude loss if permissible, turbulence, etc.) to accelerate from 130 to 150 knots. Therefore, terrain clearance must be considered. (Refer to Appendix, Part IV, for emergency climb data.)

BOOST OUT LANDINGS.

If an actual emergency go-around is required during practice with boost out, do not shift the elevator boost level to ON position. The aileron and rudder boost levers, however, should be moved to ON. Ample elevator control is available for go-around provided excessive elevator trim has not been used during approach and the cg is within the recommended boost-out range of 23 to 30 percent of MAC.

PRACTICE MANEUVERS WITH ONE OR MORE ENGINES INOPERATIVE.

NOTE

It should be understood that during practice maneuvers the simulation of engine failures and various systems failures requires thorough knowledge of resulting conditions. Therefore, cognizance of military regulations and other sections of this manual is essential. Practice maneuvers involving more than one engine inoperative should be accomplished by feathering only one engine and simulating zero thrust with the second engine (set 20 inches Hg and 2000 rpm). Practice maneuvers involving the actual feathering of one engine and the throttling (zero thrust) of an additional engine should be confined to altitudes which comply with military regulations. The following information is based on a gross weight of 110,000 pounds.

PRACTICE MANEUVERS WITH ONE OR MORE ENGINES INOPERATIVE

Pilots		Flight Engineer
CAUTION Turns should not exceed 30 degrees of bank during simulated two-engine failure because of undue control forces. During training, when emergencies are being practiced and an actual emergency has not occured, the commands of execution will be preceded by the word, "Simulate." It is much easier for the instructor pilot to countermand this order in case of an actual emergency than it is to correct actual commands of execution which have already been given.		
(a.) First engine – Shut down and feather.		a. First engine – Shut down and feather after reaching safe altitude.
(b.) Second engine – Simulate engine failure by producing zero thrust (2000 rpm and 20 in. Hg MAP.).	P	b. Second engine – Simulate engine failure by producing zero thrust (2000 rpm and 20 in. Hg MAP.).
c. Power – As required	P	

WARNING

During practice maneuvers, the simulated failure of more than two engines is prohibited. There are no restrictions on combinations of two engine failures.

FLIGHT CREW GENERAL EMERGENCY PROCEDURES AND EQUIPMENT.

All flight crews will familiarize themselves with the emergency procedures as outlined for each crew position in the different types of emergency situations. Individual crewmember Emergency Procedures checklist will be prepared and posted at or near the appropriate crew position or duty station. Upon entering the aircraft, each crewmember and passenger will locate his ditching and crash landing position and inspect it for proper installation. He will also inspect the safety belt, head rest and/or applicable support surfaces. He will inspect, fit, and adjust emergency equipment over all outer garments during preflight inspection and then stow it at his ditching and crash landing position or duty station.

EMERGENCY ENTRANCE.

If it is necessary to enter the aircraft to rescue trapped personnel, open the emergency exits or the aft cabin door, all of which are operable from the inside and outside. Otherwise it is necessary to chop through the fuselage at the marked cut-in areas.

DITCHING. (See figure 3-8.)

Ditching is a term used to describe an emergency landing of an aircraft on water. A successful aircraft ditching is dependent on sea conditions and wind, aircraft type, and skill and technique of the pilot. It is essential that pilots know how to evaluate sea conditions in order to execute a pattern and touchdown suited for the existing weather and sea conditions. The aircraft may be damaged by impact and all efforts must be directed toward a prompt and orderly abandonment. Each crewmember should be thoroughly familiar with his duties as well as the duties of all crewmembers, so that in event of injury to one, another crewmember may assume his duties. Responsibility for each piece of equipment to be removed from the aircraft should be assigned to various regular crewmembers. Periodic drills will ensure orderly operation when an emergency occurs and will familiarize flight personnel with the location of all emergency equipment. A description of each crewmember's duties and other helpful information are outlined in the Ditching, Crash Landing, Bailout Chart in this section. Ditching information contained in this section has been condensed from AFM 64-6, Aircraft Emergency Procedures Over Water, and each aircrewmember should review this manual for further amplification of ditching procedures.

NOTE

The Radio Operator's Emergency ICS cutout switch has two positions, operative and inoperative. With the switch in the operative position, the radio operator will be connected to the EMERG. ICS system. With the switch in the inoperative position, the radio operator is disconnected from the EMERG. ICS system and can transmit regardless of the position of the pilot's EMERG. ICS CREW-CALL SWITCH.

PREPARATION. (See figures 3-7 through 3-12.)

If the following techniques are used in the preparation for ditching, the possibility of a successful ditching will be greatly increased. When ditching is probable, the pilot will notify the crew by six short rings of the alarm bell followed by an announcement over the PA system. The announcement will include the pilot's intentions and the estimated time of ditching. The pilot will at this time set course for the nearest land or surface vessel.

All crewmembers will accomplish duties as outlined on the chart in this section. The additional crewmembers and/or passengers will perform such duties as directed. If time permits the anti-exposure suit should be donned.

NOTE

Do not attempt to open emergency exits until the cabin is depressurized, except under extreme circumstances. If it is necessary to dump pressure in a hurry and in order to get emergency exits opened, break window and stay clear of opening. The overwing emergency exits should be opened prior to touchdown.

When ditching is imminent (at least 3 minutes prior to touchdown if possible) the pilot will notify the crew by an announcement over the PA system. All crewmembers will assume ditching positions.

WARNING

Do not inflate life vests inside the aircraft. Be certain that all crewmembers are so instructed. In the event of rapid submersion, an inflated life vest will make it impossible for the wearer to dive to the exit level or to pass through the emergency escape hatch and escape from the sinking aircraft.

At least 30 seconds prior to impact, the pilot will notify the crew with one long ring of the alarm bell. All crewmembers and passengers will brace for impact and remain in position until the aircraft comes to a stop.

SPECIAL PROCEDURES.

Selection of Ditching Heading.

The greatest danger to an aircraft during ditching is that rapid deceleration, extensive damage, and injury to

DITCHING

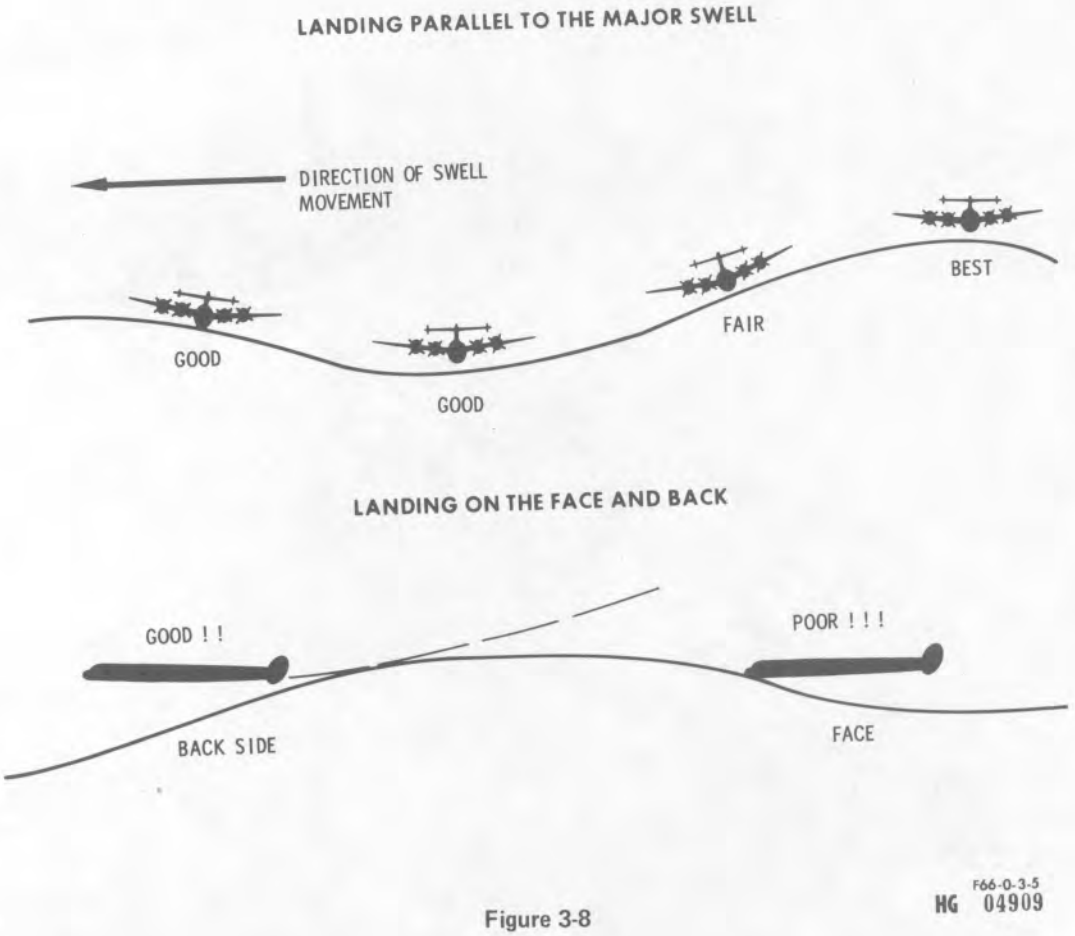


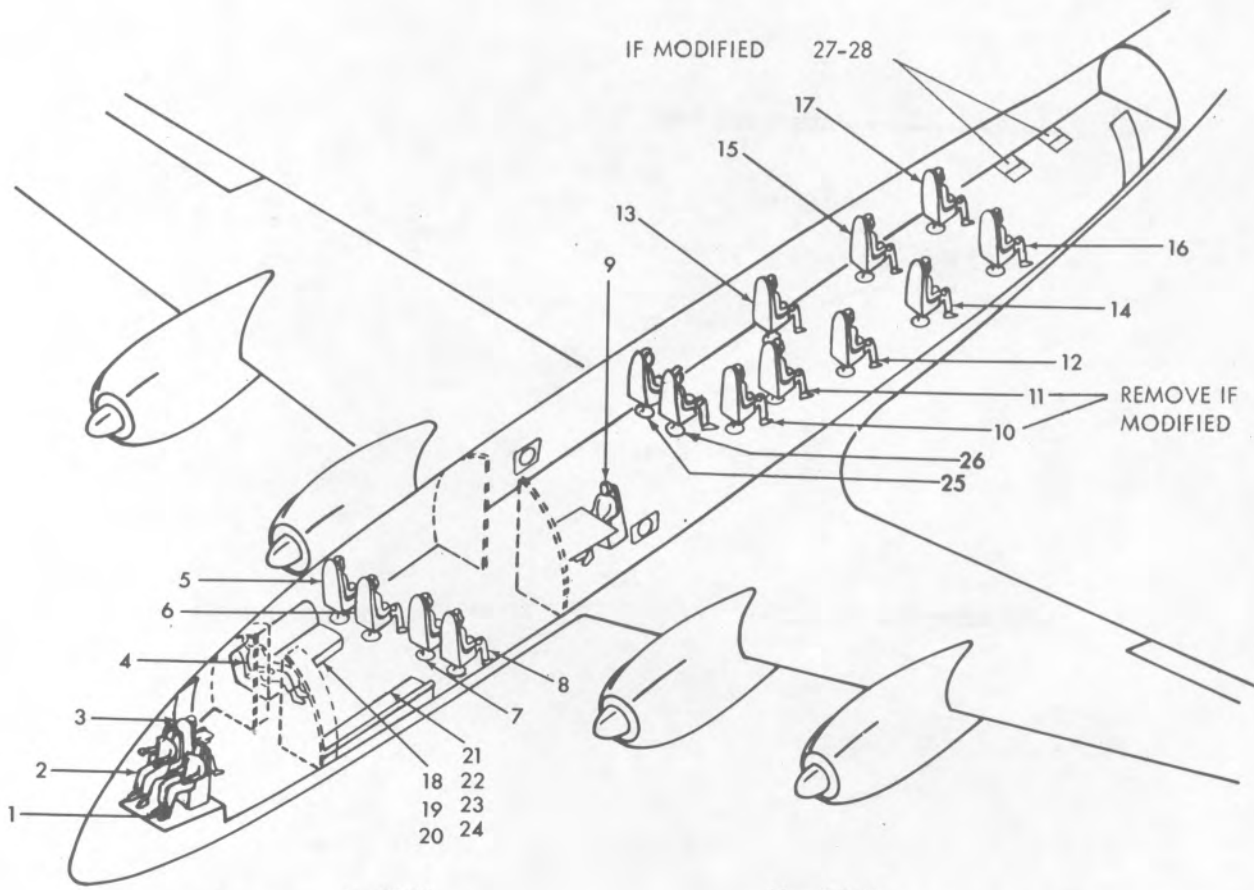
Figure 3-8

personnel may be experienced upon contact with the water. These dangers can be minimized by selecting the optimum ditching heading. Selection of the ditching heading may well determine the difference between survival and disaster, Factors to consider in heading selection are as follows:

1. EFFECT OF SWELLS. A swell is a condition of the surface which has been caused by a distant disturbance. The individual swell appears to be regular and smooth with considerable distance between the rounded crests. The primary swell is the swell system having the greatest height from trough to crest. Secondary swells are those systems having less height than the primary swell system. Swell direction is the direction from which a swell is moving. This direction is not necessarily the result of the wind present at the scene. Wave or chop is the condition of the surface caused by local winds. It is characterized by its irregularity, short distance between crests, whitecaps and breaking motion. It is not sufficient to land into the wind without regard for sea conditions. This procedure has proved disastrous in the past. Many ditchings plus hundreds of open sea seaplane landings have proved that the swell systems must be taken into consideration. The best touchdown conditions are obtained with a minimum relative speed existing between the aircraft and the swells. If the aircraft is landed into the swell, it has a good chance of being swamped or thrown into the air out of control by the oncoming swell. If the aircraft is landed down swell with touchdown just beyond the crest, the aircraft may come to rest short of the next crest; but shorter swell lengths ordinarily prevent this heading, except when conditions warrant landing down a secondary swell system. The best ditching heading is parallel to the primary swell system. It makes little difference whether touchdown is on top of the crest or in the trough, although it is preferable, if possible, to land on the top or backface of the system (see figure 3-6). Most sea conditions involve two or more swell systems running in different directions. A difficult situation occurs when two swell systems are at right angles. If a pilot parallels one

DITCHING AND CRASH LANDING POSITIONS

(TYPICAL)



1. PILOT
2. COPILOT
3. FLIGHT ENGINEER (DUTY)
4. A.C.M.
5. A.C.M.
6. A.C.M.
7. A.C.M.
8. A.C.M.
9. A.C.M.
10. A.C.M.
11. A.C.M.
12. A.C.M.
13. A.C.M.
14. A.C.M.
15. A.C.M.
16. A.C.M.
17. A.C.M.
18. A.C.M.
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20. A.C.M.
21. A.C.M.
22. A.C.M.
23. A.C.M.
24. A.C.M.
25. A.C.M.
26. A.C.M.
27. A.C.M.
28. A.C.M.

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ADDITIONAL CREW MEMBER (A.C.M.)
(AS DESIGNATED BY THE USING COMMAND)

Figure 3-9

EMERGENCY ESCAPE ROUTES—WATER

(TYPICAL)

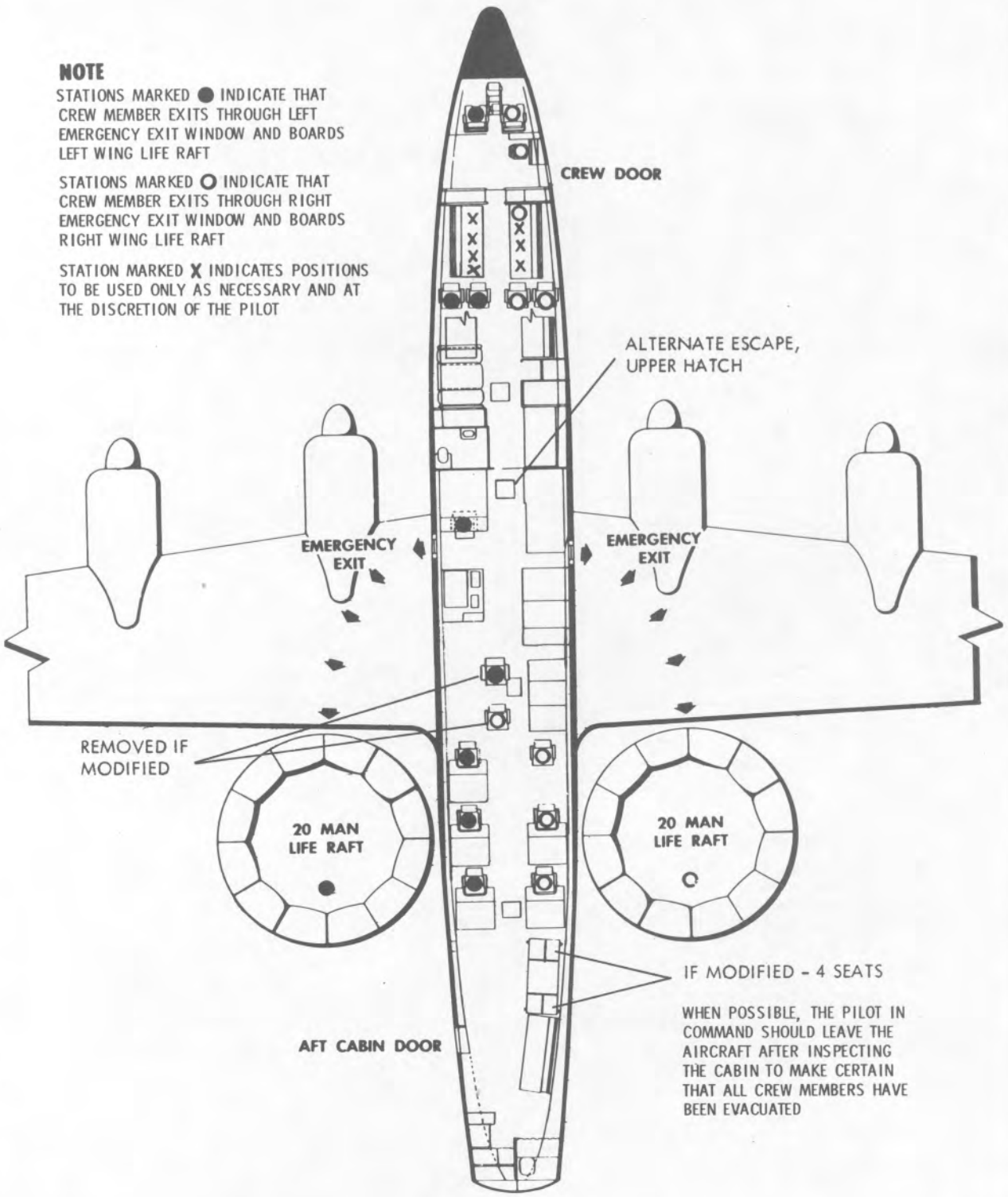


Figure 3-10

EMERGENCY ESCAPE ROUTES—LAND

(TYPICAL)

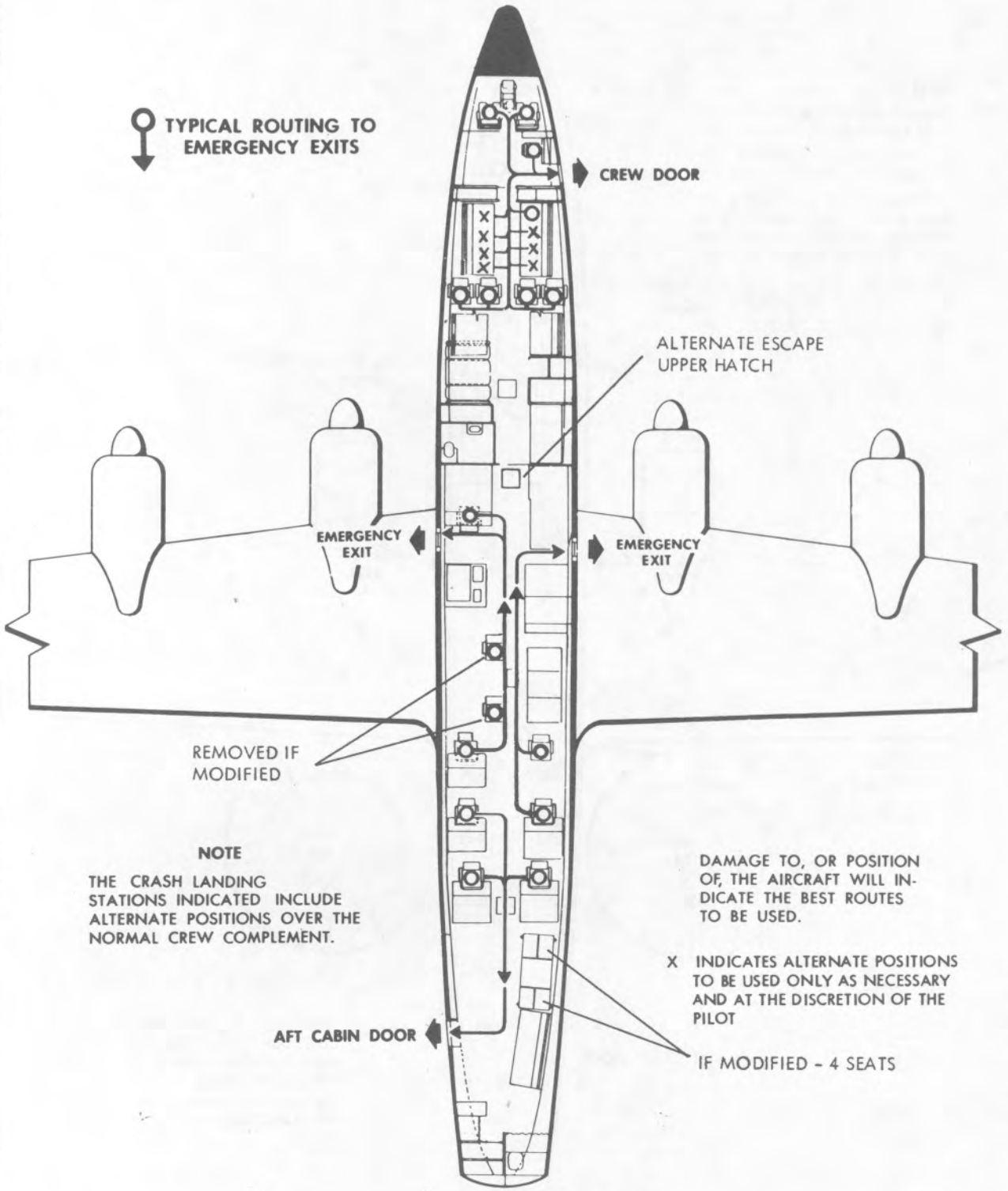


Figure 3-11

EMERGENCY EXIT OPERATION

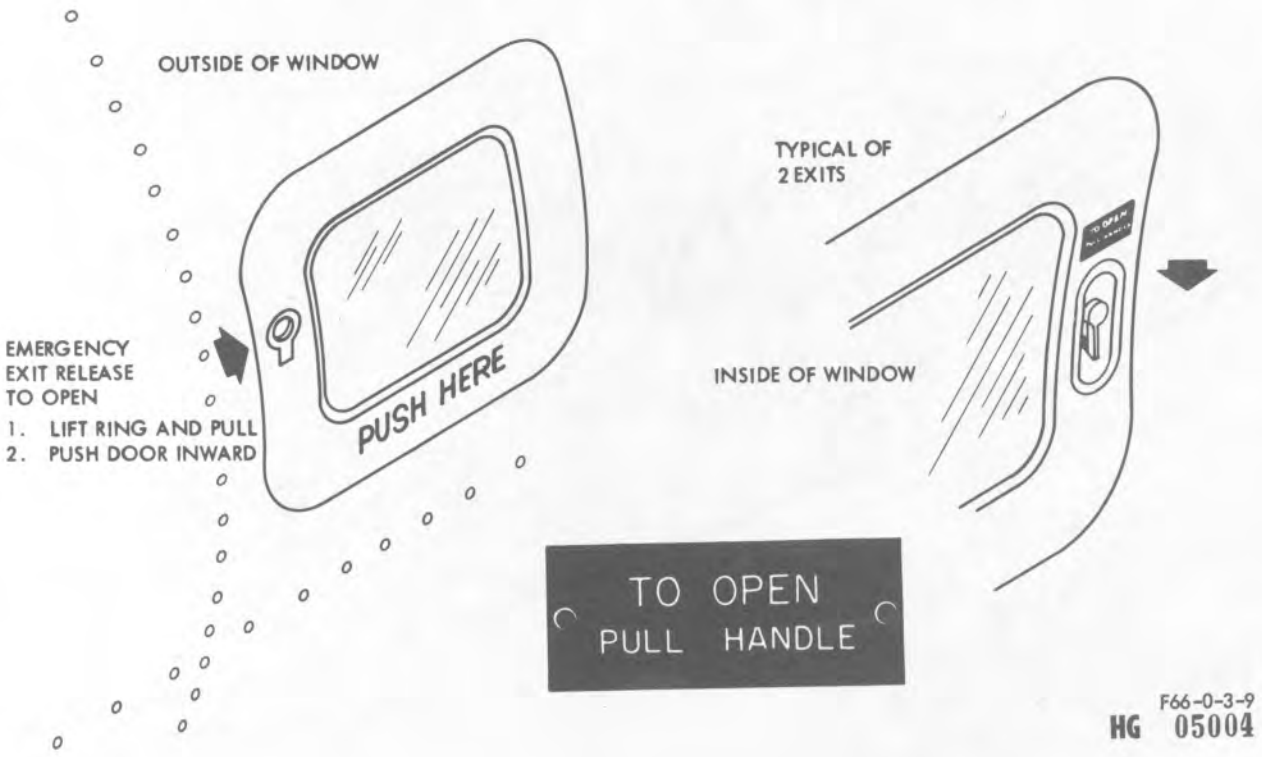


Figure 3-12

swell system, he must land into or down the other system. In this case, down swell to both systems may be advisable. When landing down a secondary swell and parallel to the primary, attempt to touch down on the backside, not on the face of the swell.

2. EFFECT OF WAVES OR CHOP. Local winds create waves that ride on top of the underlying swell systems. Moderate waves alone caused by wind can be discounted as a danger to ditching.

3. EFFECT OF WIND. The best condition for ditching is one which permits landing parallel to a single swell system and into the wind. This situation seldom exists. Some crosswind is usually present and must be accepted in order to land parallel to the major swell. There is ample reason, based on theoretical considerations and on a limited number of actual ditchings in high winds, to believe that low wing landplanes can accept a higher crosswind component than seaplanes. If the swell system is formidable, it is considered advisable in landplanes to accept more crosswind to avoid landing directly into the swell. The following rules apply to seaplane operations in the open sea and can be used as an aid in selecting a ditching heading:

a. WINDS FROM 0-25 KNOTS. Ignore the crosswind component and land parallel to the primary swell. If a pronounced secondary swell exists, it may be desirable to land down the secondary system and accept some tailwind component.

b. WINDS BETWEEN 25-35 KNOTS. It may be necessary to select an intermediate heading, neither parallel to the swell (since the crosswind may prove too much to handle) nor into the wind (because the ground speed reduction, due to headwind, will not compensate for the disadvantage of landing into the swell). A heading at an angle into the greater crosswind component should be accepted in order to more closely parallel the swell.

c. WINDS OVER 35 KNOTS. Generally, with winds of this force, the landing will be made into the wind regardless of the swell. Ground speed will be materially reduced. However, if the swell is so formidable as to make a

DITCHING AND CRASH LANDING POSITIONS (C-121G)

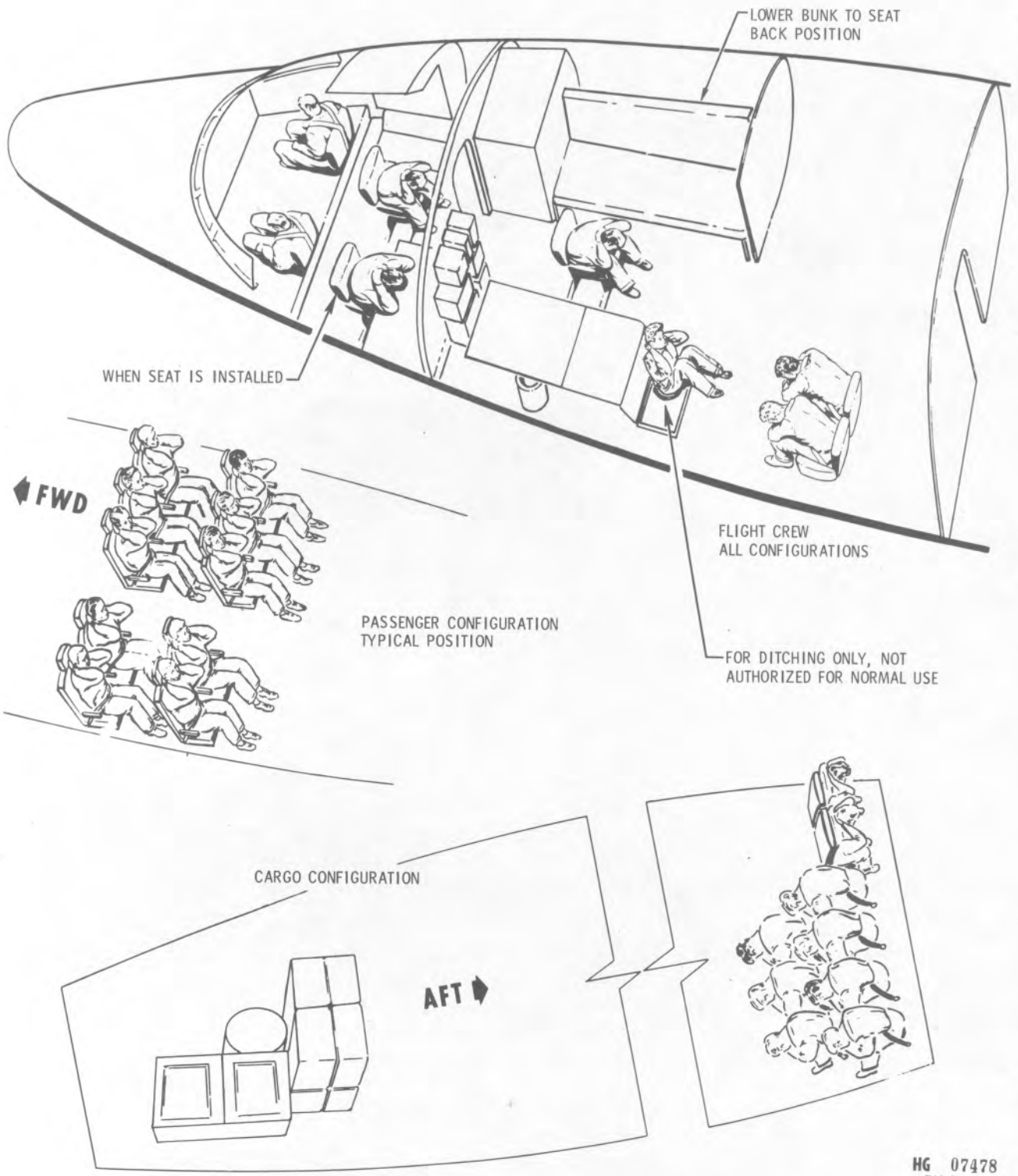
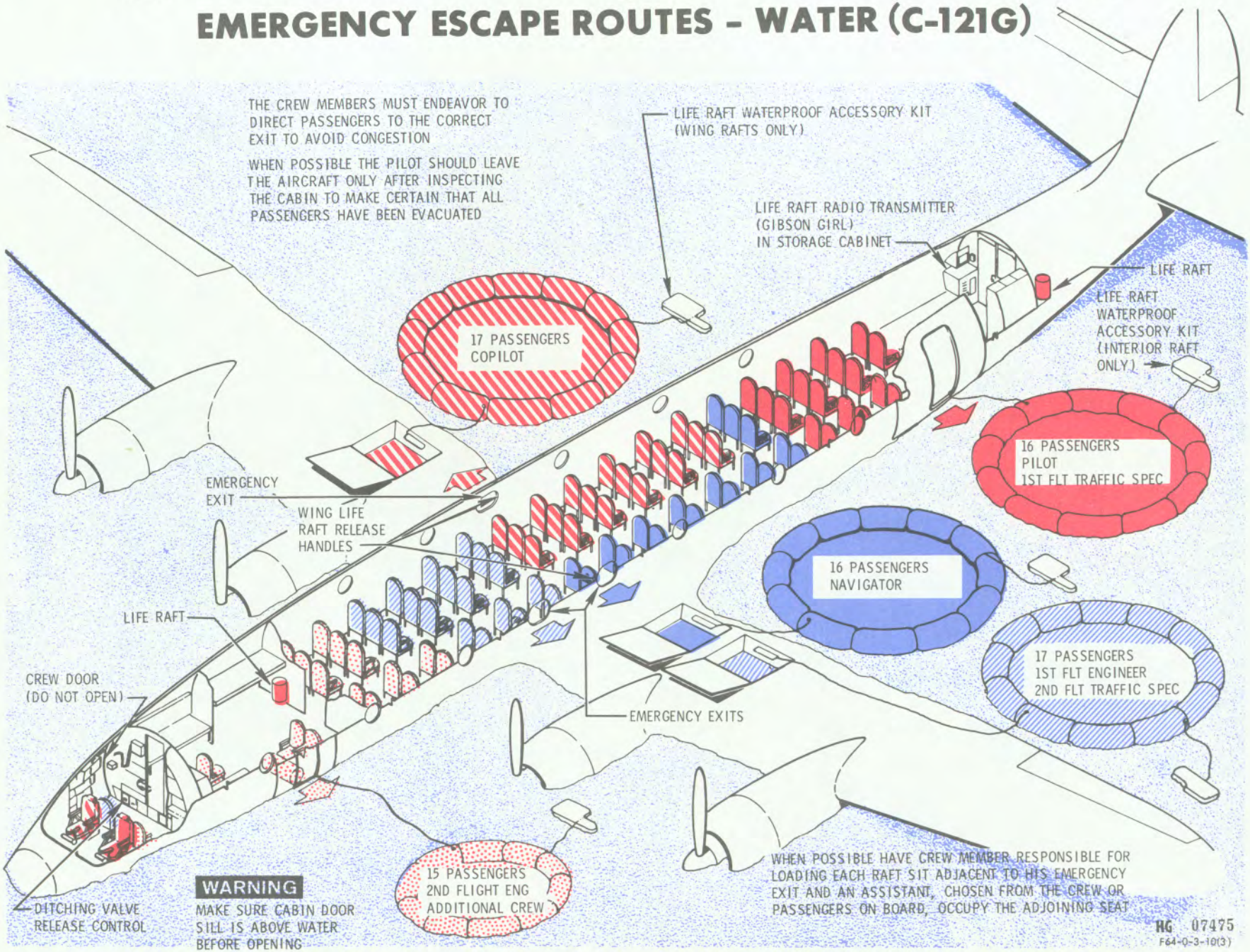


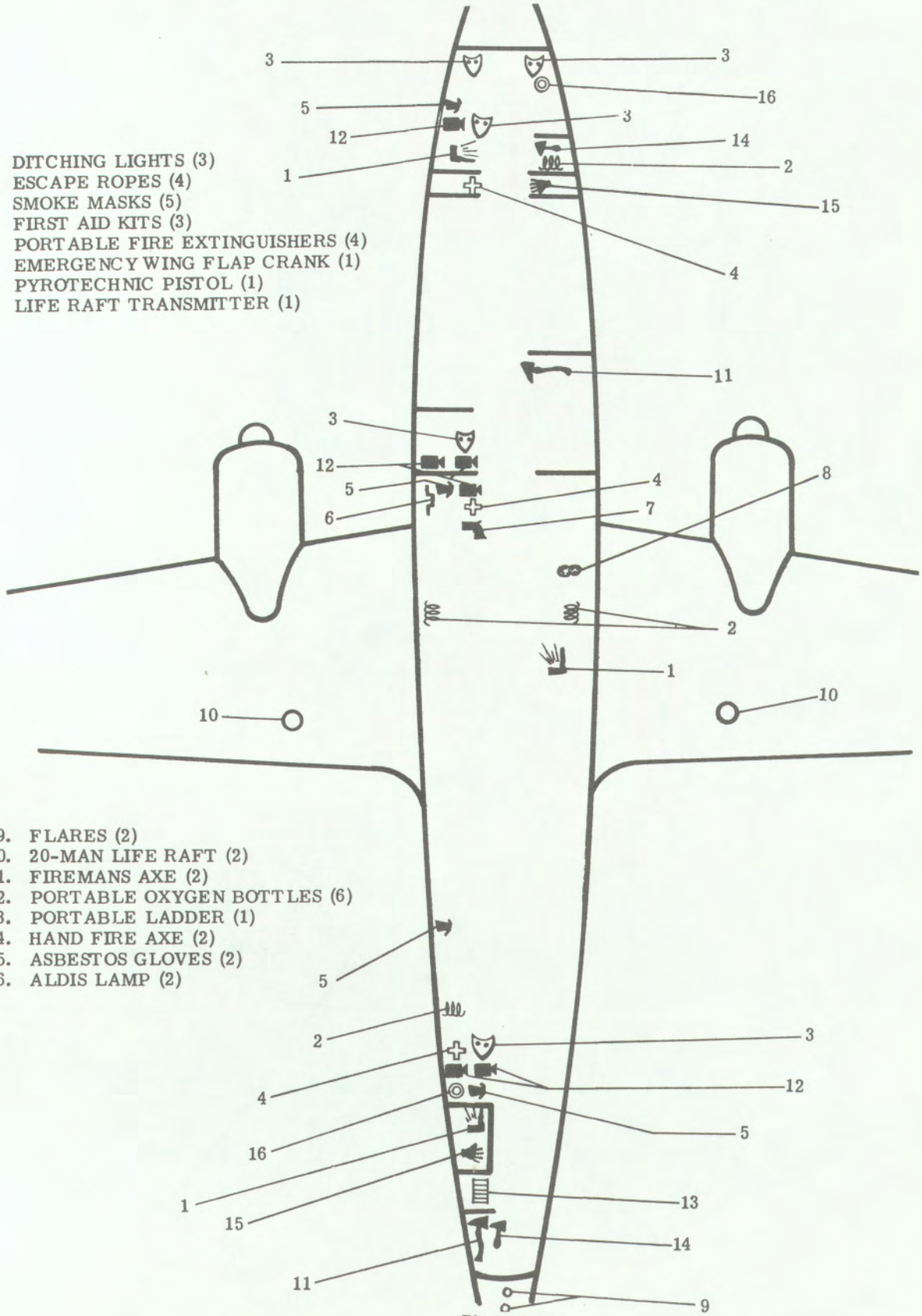
Figure 3-13

EMERGENCY ESCAPE ROUTES - WATER (C-121G)



EMERGENCY EQUIPMENT LOCATIONS (EC121R)

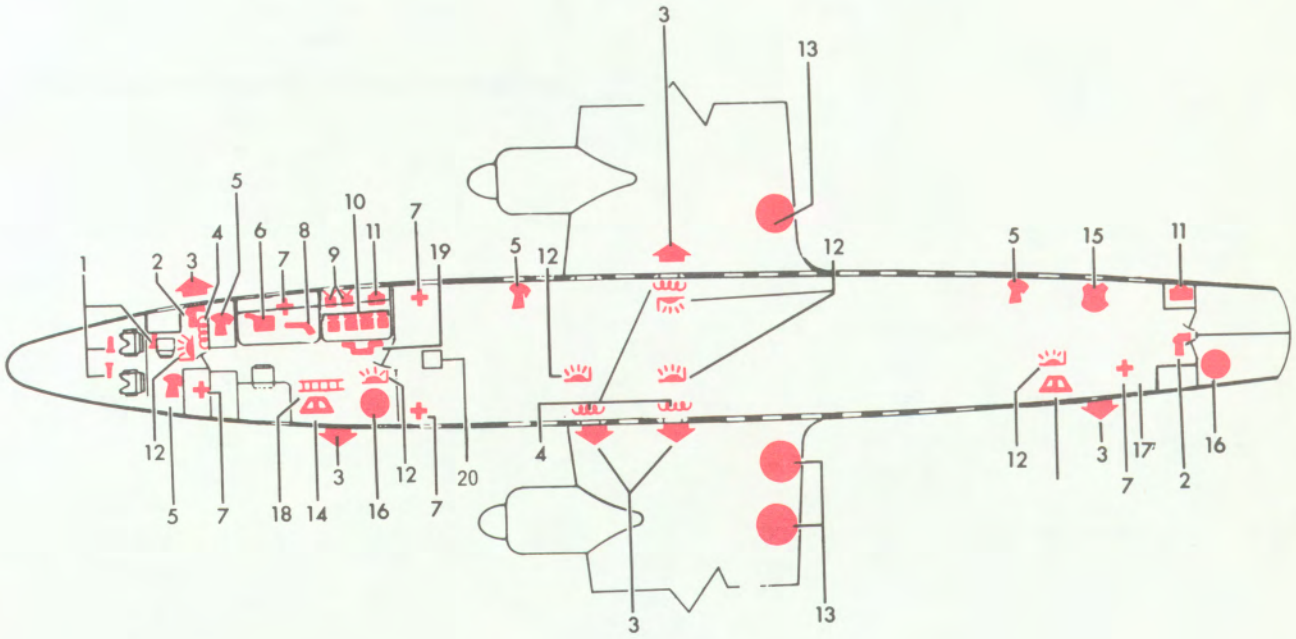
1. DITCHING LIGHTS (3)
2. ESCAPE ROPES (4)
3. SMOKE MASKS (5)
4. FIRST AID KITS (3)
5. PORTABLE FIRE EXTINGUISHERS (4)
6. EMERGENCY WING FLAP CRANK (1)
7. PYROTECHNIC PISTOL (1)
8. LIFE RAFT TRANSMITTER (1)



9. FLARES (2)
10. 20-MAN LIFE RAFT (2)
11. FIREMANS AXE (2)
12. PORTABLE OXYGEN BOTTLES (6)
13. PORTABLE LADDER (1)
14. HAND FIRE AXE (2)
15. ASBESTOS GLOVES (2)
16. ALDIS LAMP (2)

Figure 3-15

EMERGENCY EQUIPMENT LOCATIONS (C-121G)



PROVISIONS:

1 TO STOW A LIFE VEST IN EACH PASSENGER SEAT

2 TO CARRY A MINIMUM OF 10 PARACHUTES FOR TRAINING AND MAINTENANCE FLIGHTS
NO PARACHUTES CARRIED ON SCHEDULED TRANSPORT FLIGHTS

3 SAFETY BELTS, ONE PER PERSON AS PRESCRIBED IN TECHNICAL ORDERS

4 OXYGEN MASKS AND SMOKE MASKS AS PRESCRIBED IN TECHNICAL ORDERS

1 FLASHLIGHTS
2 CRASH AXES
3 EMERGENCY EXITS
4 EMERGENCY EXIT ROPES
5 PORTABLE CO_2 FIRE EXTINGUISHERS
6 SPARE HYDRAULIC FLUID
7 FIRST-AID KITS
8 PYROTECHNIC EQUIPMENT
9 EMERGENCY RADIO VHF/UHF TRANSCEIVER (TWO)
10 OXYGEN WALKAROUND BOTTLES
11 LIFE RAFT EMERGENCY RADIO TRANSMITTER AN/CRT-3 (TWO)
12 EMERGENCY LIGHTS
13 TWENTY-MAN LIFE RAFT (WING)
14 EVACUATION CHUTES
15 CHILD'S LIFE VESTS
16 TWENTY-MAN LIFE RAFT (PORTABLE, CARRIED INTERNALLY)
17 WATER-TYPE HAND FIRE EXTINGUISHER
18 EMERGENCY EVACUATION LADDERS
19 EMERGENCY WING FLAP CRANK
20 ACCESS TO EMERGENCY WING FLAP ACTUATOR

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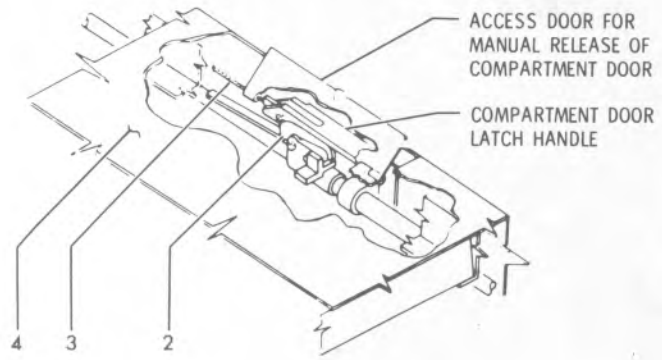
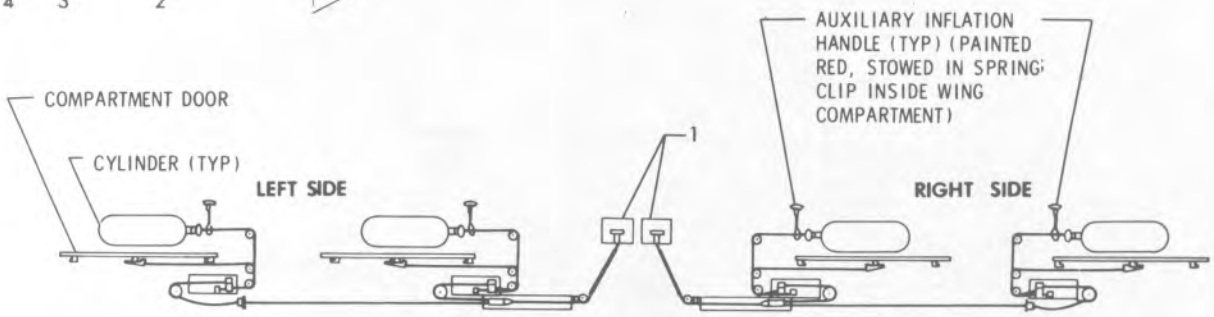
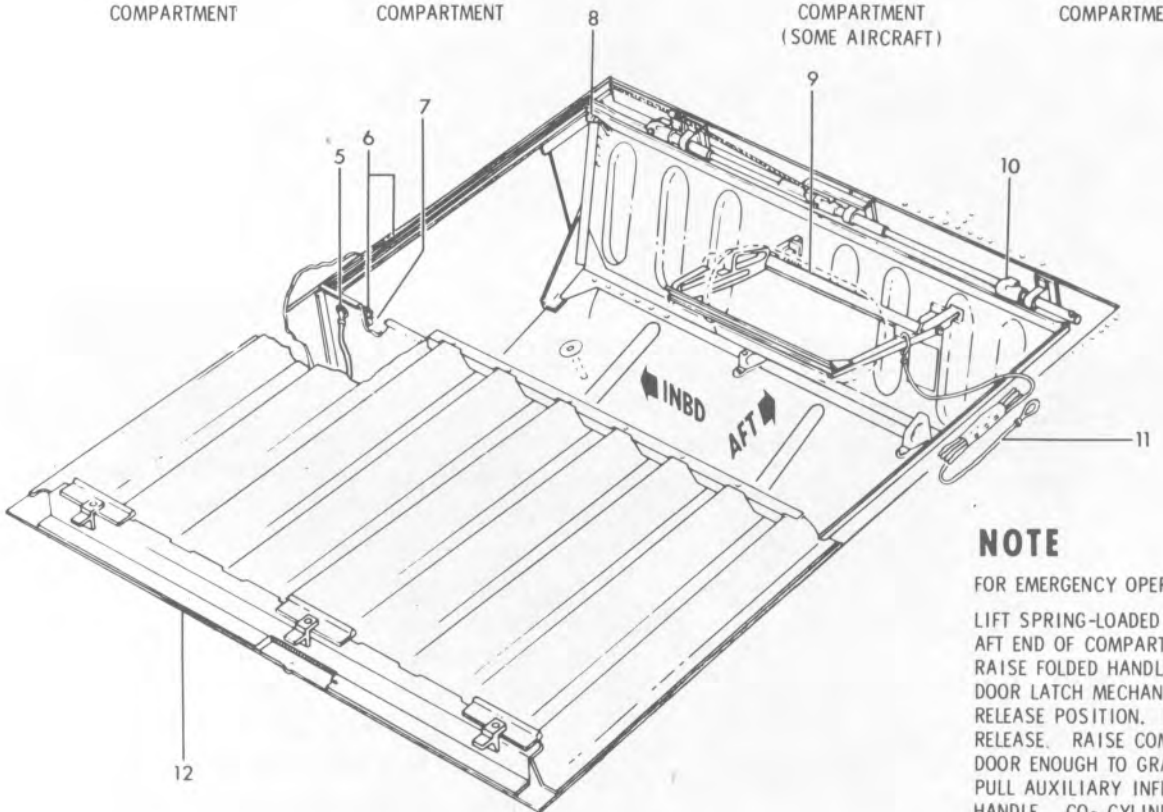
Figure 3-16

LIFE RAFT RELEASE (EC-121R)



1. EMER EXIT WINDOW RELEASE HANDLES
2. SAFETY LATCH
3. DOOR RELEASE CABLE
4. TRAILING EDGE (WING)
5. COMPARTMENT DRAIN TUBE
6. COMPARTMENT SEAL
7. DRAIN TROUGH
8. CYLINDER CABLE CONDUIT
9. CYLINDER SUPPORT
10. DOOR LATCH
11. LANYARD
12. COMPARTMENT DOOR





NOTE

FOR EMERGENCY OPERATION:

LIFT SPRING-LOADED COVER AT AFT END OF COMPARTMENT DOOR, RAISE FOLDED HANDLE AND SLIDE DOOR LATCH MECHANISM TO RELEASE POSITION. DOOR MUST RELEASE. RAISE COMPARTMENT DOOR ENOUGH TO GRASP AND PULL AUXILIARY INFLATION HANDLE. CO_2 CYLINDER MUST DISCHARGE AND RELEASE LIFE RAFT.

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Figure 3-17

EXTERIOR LIFE RAFT RELEASE (EC-121R)

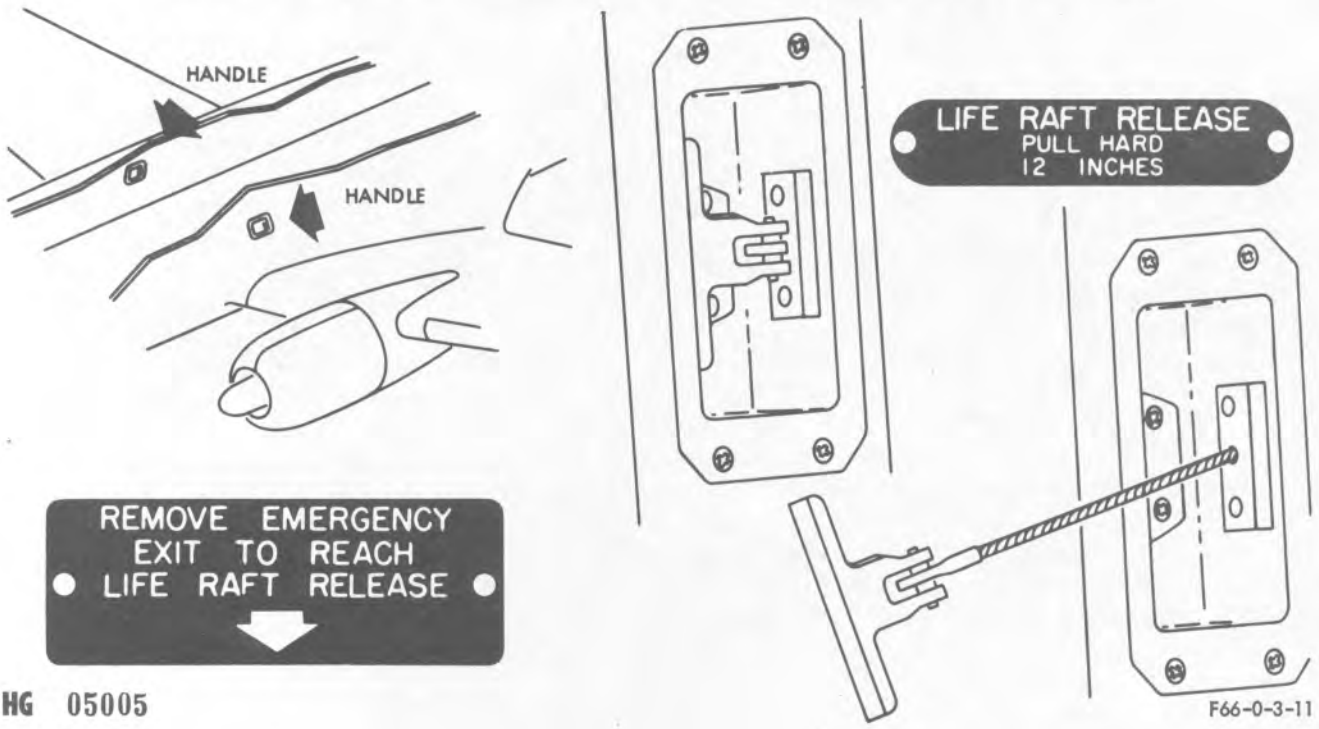

Figure 3-18

successful ditching into it doubtful, it may be advisable to land at an angle, or parallel, to the swell – accepting cross-winds of great force.

The simplest method of estimating the wind direction and velocity is to examine the wind streaks on the water. These appear as long streaks up and down wind. Some persons may have difficulty determining wind direction after seeing the streaks on the water. Whitecaps fall forward with the wind, but are overrun by the waves, thus producing the illusion that the foam is sliding backward. Knowing this and by observing the wind streaks, the wind direction is easily determined. Wind velocity can be estimated by noting the appearance of the whitecaps, foam and wind streaks.

SURFACE CONDITION	APPROX WIND VELOCITY KNOTS
Few white crests	8-17
Many white crests	17-26
Steaks of foam from crests	26-35
Spray blown from tops of waves	35-43

Selection of Touchdown Point.

On final approach, look ahead and observe the surface of the sea. There may be shadows and whitecaps – signs of high seas. Touchdown in these areas is to be avoided. Look for a relatively smooth area where the shadows and whitecaps are not so numerous and try to touch down on the near edge.

Sea Evaluation.

The pilot should begin analyzing the surface from as high an altitude as the surface can be seen, 2000 feet or more if possible. The primary swell will be recognized first. Determine its direction and then look for secondary systems. As altitude is decreased and the aircraft turned through 360 degrees, surface appearance will change and the direction and size of the different swell systems should be remembered. Once primary and secondary systems are recognized, the analysis may be checked by flying on various headings just above the water. When flying into any system, the sea appears to be steep, fast, and rough. When flying down or parallel to the system, the sea seems much more calm. Estimate the direction and velocity of the wind. Using these factors, select the best ditching heading.

Sea Evaluation Minimum Time.

1. Determine direction of primary swell.
2. Determine direction of secondary swell if time permits.
3. Estimate direction and velocity of wind.
4. Using these factors, select ditching heading.

DITCHING TECHNIQUE.

The pilot's task is essentially to set the aircraft down on a proper heading in the right spot at the best combination of attitude and speed. The desired aircraft configuration is flaps 100 percent with landing gear retracted and fuel dump completed. Touchdown should be at the lowest speed and rate of descent which permit safe control and optimum nose up attitude on impact. When preditching preparations are complete, the pilot should turn to the ditching heading and commence letdown. The aircraft should be dragged low over the water and slowed down until 10 knots above a stall. At this point, power should be added to overcome the additional drag caused by the nose up attitude. When a smooth stretch of water appears ahead, cut power, and touch down as close to a stalling speed as possible. Care must be taken not to drop the aircraft from too high an altitude or to balloon due to excessive speed. At night or over smooth, glassy water, it is easy to misjudge altitude. Under these conditions, carry enough power to maintain 9-12 degrees nose up attitude and 7-10 knots above stall speed until contact is made with the water. If power is available on one side only, a little power should be used to flatten the approach; however, the engine should not be used to such an extent that the aircraft cannot be turned against the good engines right down to the stall with a margin or rudder movement available. If power is available on one side only, a slightly higher than normal glide approach should be used. This will ensure good control and some margin of speed after leveling off without the use of excess power. If no power is available, a greater than normal approach speed should be used down to flare out. This speed margin will allow the glide to be broken early and more gradually, whereby giving the pilot time and distance to feel for the surface. In most cases, drift caused by crosswind can be ignored; the forces acting on the aircraft after touchdown are of such magnitude that drift will only be a secondary consideration. If the aircraft is under good control, the "crab" may be kicked out with rudder just prior to impact. Flaps may be expected to carry away on initial impact. If the flaps do withstand impact, some diving tendencies may result. The importance of flaps in slowing down the aircraft on approach make their use mandatory. If the aircraft is landed wing low, a waterloop may result, thus increasing the possibility of structural failure to the after fuselage. Prior to ditching, the aircraft should be made as light as possible by dumping fuel. The possibility of successful ditching is greatly increased with lower gross weights.

WARNING

- Initiate the recovery from an emergency rapid descent, if applicable, at 3000 feet and level off at 2000 feet to establish the proper ditching pattern configuration. The decision to bail out rather than ditch will be influenced by many varying factors. Normally the decision should be made prior to reaching level-off altitude.
- Keep flight station windows closed because the aircraft has a tendency to nose under as it loses forward speed on water. All openings, with the exception of the overwing emergency escape hatches, will be kept closed.

Ditching Procedure By Self Illumination. (See figure 3-19.)

If an aircraft is forced to ditch at night, the pilot must be prepared to select a suitable ditching heading based on surface conditions received during the mission weather briefing or information obtained from other sources. Many ships at sea, including Ocean Station Vessels, send frequent weather reports. This information may sometimes be obtained through the air-ground station, which requests it from the Rescue Coordination Center. A pilot will often have an estimate of the best ditching heading from observation made during daylight. Additional aid in ditching may be obtained from the use of parachute flares. It is advisable to utilize both flares simultaneously for ditching. After selecting a ditching heading, the following procedures are recommended for a single aircraft ditching by self illumination.

a. Make all preparations for ditching. Use ditching checklist.

b. Fly the reciprocal of the selected ditching heading. Descend, rate as required, to 2000 feet.

c. Flaps 60 percent and establish desired pattern approach speed (140 to 150 knots). (Make all turns standard rate 3 degrees per second.)

d. Turn 40 degrees right (descent to 2000 feet may be accomplished on 40 degree teardrop leg).

e. Drop both flares from 2000 feet and begin descent of 1000 feet per minute. MAP approximately 22 in. Hg or as required. (Power settings based on aircraft gross weight of 110,000 lbs, four engines operating.)

f. Maintain 40 degree teardrop leg for 45 seconds.

DITCHING PATTERN WITH SELF ILLUMINATION

1. Prepare for ditching.

2. Fly the reciprocal of ditching heading Descend, rate as required, to 2000 feet.

3. FLAPS 60%, airspeed (140-150kts). RPM 2600. (Make all turns standard rate 3° per second.

4. Turn 40° right (Descent to 2000 feet may be accomplished on 40 teardrop leg.)

5. Drop both flares. Begin 1000 ft/min rate of descent. MAP approximately 22" Hg or as required. (Power setting based on acft gross weight of 110,000 lbs, 4 engines operating.)

6. Maintain 40° teardrop leg for 45 seconds.

7. Turn 220° left or until flare is dead ahead. Water and flare should be clearly visible throughout the last 180° of turn, weather permitting.

8. Do not descend below 500 feet indicated until established inbound. Adjust rate of descent and/or power, as required. (Last 90° of turn will probably require additional power for a level turn.)

9. When established inbound, lower 100% flaps. Descend and flare prior to touchdown. The illumination flare will be approximately 1 minute ahead.

10. Slow acft to 7-10 kts above stall - engage water prior to passing flare.

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HG 04904

Figure 3-19

g. Turn 220 degrees left or until the flare is dead ahead. Water and flare should be clearly visible throughout the last 180 degrees of turn, weather permitting.

h. Do not descend below 500 feet indicated altitude until established inbound. Adjust rate of descent and/or power as required. (Last 90 degrees of turn will require additional power for a level turn.)

i. When established inbound, lower flaps to 100 percent; descend and flare prior to touchdown. The illumination flare will be approximately one minute ahead.

WARNING

If the flares are not visible at the point where the aircraft reaches 500 feet on the ditching heading, convert to a power-attitude approach. Begin descent of 200 feet per minute and an airspeed of 7-10 knots above stall with flaps 100 percent. This approach should be maintained until the aircraft makes contact with the water or visual contact is established for ditching.

j. Ditch straight ahead using the light of the flare and set power, as required, to reduce airspeed to 7-10 knots above stall. Do not overshoot. The best touchdown point is several hundred yards short of the flare. Avoid flying into the water at a high rate of descent due to faulty depth perception or altimeter setting.

Ditching with Very Low Ceiling and Visibility.

The effectiveness of parachute flares with low ceilings and reduced visibility is only fair, but still better than no illumination at all. If the flares are dropped from an altitude of 2000 feet, they will ignite at 1700 feet and 3 minutes later go out at 100 feet. Even with a low ceiling, the flares would be visible during the final portion of the approach.

IF FLARES ARE NOT AVAILABLE FOR DITCHING OR LOW VISIBILITY PROHIBITS THEIR USE, A POWER APPROACH SHOULD BE MADE. When using the self illumination pattern and the flares are not visible at the point where the aircraft reaches 500 feet on the ditching heading, convert to the power approach and continue straight ahead. Set up a power altitude combination for a rate of descent of 200 feet per minute and an airspeed 7-10 knots above stall with flaps down. This approach should be maintained until the aircraft makes contact with the water or visual contact is established for ditching.

Altitude Determination.

The pressure altimeter may be several hundred feet in error. The radio and radar altimeter should be used throughout the descent as a check against the pressure altimeter. Near the water, or with a high rate of descent, the radio altimeter is generally more reliable. The APN-22 altimeter should have the altitude limit switch set to 50 feet. When the red light comes on, the pilot can expect contact momentarily.

ABANDONMENT.

Unless the bottom has been seriously damaged, leakage should be slow, and the aircraft should float long enough to evacuate all flight personnel safely. Evacuation must be conducted in an orderly manner as shown in Figure 3-9. After the life rafts have been loaded, and if it appears safe to do so, salvage any additional equipment and valuables which can be transported without jeopardizing the comfort and safety of the crew members and passengers aboard life rafts. Any coats and blankets which can be carried into the life rafts will provide welcomed protection. Space limitations will indicate how much extra equipment can be taken.

AFTER DITCHING.

The forward crew door and the aft cabin door provide the easiest means of exit; however, the window exits must be used to board the wing life rafts. These exits are convenient for evacuation, because the wings provide a pier from which the rafts may be boarded. Emergency supplies should be distributed among the rafts and tied down in the center of the rafts to prevent them from being lost in case the raft should capsize. After all crewmembers and passengers have been evacuated, move the rafts out from under any part of the aircraft which might strike them as it sinks. Rope the rafts together so that they will not drift apart or become separated and complicate rescue. Remain in the vicinity of the aircraft as long as it remains afloat.

WARNING

Do not open any doors if their sills are below water. Use emergency exits.

CRASH LANDING.

The techniques and procedures relative to crash landing must be formulated with periodic drills to ensure orderly operation and to increase the chance for survival after a crash landing. A well disciplined and informed crew will greatly aid in the proper preparation and final result of a successful crash landing with minimum personal injury and

loss of life. In an emergency it is possible to land this aircraft with gear retracted without serious damage. With the exception of those procedures which are obviously peculiar to ditching, the procedures for a crash landing are very similar to those recommended for ditching. A crash landing immediately after takeoff, however, would reduce the preparatory time considerably.

PREPARATION.

The following procedures should be utilized for adequate crash landing preparation. When a crash landing is probable, the pilot will notify the crew and passengers by six (6) short rings of the alarm bell followed by an announcement over the PA system. The announcement will include the pilot's intentions and time remaining.

NOTE

The Radio Operator's emergency ICS cutout switch has two positions, operative and inoperative. With the switch in the operative position, the radio operator will be connected to the EMERG. ICS system. With the switch in the inoperative position, the radio operator is disconnected from the EMERG. ICS system and can transmit regardless of the position of the pilot's EMERG. ICS CREW-CALL SWITCH.

In the case of crash landing on takeoff, the pilot will notify the crew and passengers by one long, sustained ring on the alarm bell followed by an announcement over the PA system, if time permits. At this time, all crewmembers and passengers will remain in position and brace for impact. In preparation for crash landings other than on takeoff, all crewmembers will accomplish duties as outlined in the Ditching/Crash Landing/Bailout chart. The additional crewmembers and passengers will perform such duties as directed. When crash landing is imminent (at least 3 minutes prior to touchdown, if possible) the pilot will notify the crew and passengers by an announcement over the PA system. At this time, all crewmembers and passengers will assume crash landing positions. At least 30 seconds prior to impact, the pilot will notify the crew and passengers with one long ring of alarm bell. All crewmembers and passengers will brace for impact and remain in position until the aircraft comes to a stop.

NOTE

Do not attempt to open emergency exits until the cabin is depressurized except under extreme circumstances. If it is necessary to dump pressure in a hurry and in order to get emergency overwing exits open, break window and stay clear of opening. The emergency exits should be opened prior to touchdown.

ABANDONMENT.

Since the aircraft may be damaged by impact, all efforts must be directed toward a prompt and orderly abandonment of the aircraft. Escape routes are shown on figure 3-14. It is essential that each crewmember be thoroughly familiar with crash landing procedures and duties of all other crewmembers; in the event of injury to one, his duties may be assumed by another crewmember. Responsibility for each piece of equipment to be removed from the aircraft is as outlined in Ditching/Crash Landing/Failout chart and as otherwise directed.

AFTER CRASH LANDING.

After all crewmembers and passengers have vacated the aircraft, a check for extent of injuries, etc., should be made. Also, if it is determined feasible, all equipment that is considered of any use in rescue and/or survivival should be removed from the aircraft. Remain in the vicinity of the aircraft, if possible, in order to aid being located by rescue facilities.

BAILOUT.

The decision to bail out rather than ditch or crash land will be determined by many varying factors. Primarily in the interest of survival over water, ditching should be considered over bailout. However, to avoid possible serious injury whenever the terrain is unknown or unsuited for a crash landing, more consideration should be given to bailout. A high degree of crew discipline must be maintained at all times during bailout preparation and execution.

Bailout can be made from the aft cabin door at airspeeds up to 295 knots IAS and still clear the horizontal stabilizer in smooth air. However, decreased airspeed preferably below 180 knots IAS, is desirable, since clearance of the horizontal stabilizer increases with decreased airspeed. Lower speeds are especially important in rough air because erratic motions of the aircraft could result in the crewmember striking the horizontal stabilizer.

PREPARATION.

When the decision is made to abandon the aircraft while in flight, the pilot will notify the crew by 3 short rings of the alarm bell followed by an announcement over the PA system which will include whether the aircraft is over land or over water and the time remaining, if possible. The information regarding overland or overwater bailout will be the deciding factor in what emergency and survival equipment the crew will be required to don at this time. If an overwater bailout is anticipated, crewmembers must also don the life preserver and dinghy in addition to normal overland bailout equipment.

If it becomes necessary to assist an injured or unconscious crewmember to abandon the aircraft, proceed as follows:

a. Detach ditching rope at aft crew door and attach to injured crewmember's parachute D-ring.

NOTE

Parachute is to be secured and properly fitted.

b. Two crewmembers will hold the ditching rope ten to fifteen feet from the clipped end.

c. Position the injured or unconscious crewmember in a crouched position at the aft exit door and ease him into the slipstream.

WARNING

All crewmembers assisting the injured crewmember will have parachutes on and fastened.

EQUIPMENT DONNING SEQUENCE. (COMMAND – 3 SHORT RINGS ON ALARM BELL.)

Over Water.

1. Anti-exposure suit – Don over all outer garments.

2. LPU-2P/LPU-3P life preserver.

3. Parachute harness – Ensure that both life preserver bladder packets fit approximately four inches under the arm pit, outside the harness. Packets must be outside the harness in order to ensure proper inflation.

4. MB-1 Survival kit – Attach to "D" type rings located on the rear of the harness adjacent to the sling. Ensure inflation activation lanyard is on the top right hand side.

5. Chest chute – Attach to right and left snaps below chest adjustment strap. Insure "D" ring is facing to the right.

Over Land.

1. Parachute harness – Don over all outer garments.

2. Chest chute – Attach to parachute harness.

All crewmembers will accomplish duties as outlined in the Ditching/Crash Landing/Bailout chart. The additional crewmembers and/or passengers will perform such duties as directed. The pilot will designate a jumpmaster on all missions. The jumpmaster duties are as outlined in Sections III and VIII.

All equipment that may be used after bailout and will not render any additional hardship or possible injury during the process of bailout, i.e., flare pistols and flares, first aid kits, etc., should be evacuated by designated crewmembers or as directed. After crewmembers complete preparation duties they will remain at takeoff/landing stations until the signal to bail out is given.

ABANDONMENT.

The pilot will notify the crew to bail out by one long ring of the alarm bell. Crewmembers will proceed to the aft cabin door in an orderly manner and bail out. Proper position for bailing out is as follows.

Stand at the trailing end of the door, feet together slightly over the edge of the door sill, knees slightly bent, head up and looking straight out, arms extended out with hand palms against the outside edge of door. At the command to jump, crewmember will push himself with hands and arms jumping straight out from aircraft, bringing hands and arms back close to body, head forward on chest, at the same time starting the descent count, one thousand, two thousand, etc., depending on the altitude which determines the amount of counts required. Then pull rip cord. If too many crewmembers congregate in the rear of the aircraft, the flight characteristics will be adversely affected. The jumpmaster will ensure that all crewmembers have evacuated the aircraft. The pilot will reduce airspeed if possible. If over land, the pilot will turn the aircraft and head for uninhabited area in a slightly nose-down attitude. If over water, the pilot will place the aircraft in a slightly nose-down attitude and execute a 360-degree turn to the left until all crewmembers have abandoned the aircraft.

DESCENT OVER WATER.

After Parachute Blossoms.

1. Check canopy for malfunction. See-saw or shake risers to release shroud lines that may extend over canopy to slow rate of descent.

2. Inflate life raft.

3. Inflate life preserver.

4. Release J-1 safety clips before entering the water. (200-500 feet above water.)

5. Upon entry into water pull both J-1 releases to discard canopy.

6. Board raft and await rescue.

DESCENT OVER LAND.

After Parachute Blossoms.

1. Check canopy for malfunction.
2. Release J-1 safety clips (200-500 feet above ground).
3. Prepare for ground landing (relax with feet together).
4. After completing landing roll, pull both J-1 releases to discard canopy.

DITCHING/CRASH LANDING/BAILOUT

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Pilot	**DITCHING**		
STATION 1	1. Give alarm bell warning (6 short rings) followed by an announcement on PA system of emergency condition and intentions. 2. Set course for nearest land or surface vessel (information furnished by navigator). 3. Order fuel to be dumped (if applicable). 4. Order engineer to depressurize cabin. 5. Order copilot to don necessary survival equipment, adjust and fasten shoulder harness. 6. Don necessary survival equipment. 7. Adjust and lock shoulder harness. 8. Order electronic equipment not needed – OFF. WHEN DITCHING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT). 1. Jettison flares. **WARNING** Do not jettison flares while dumping fuel. 2. Order copilot to give warning on PA and interphone. 3. Order flap lever 100 percent landing position. 4. Order copilot to turn on alarm bell 30 seconds prior to impact. 5. Power (if available) as desired to point of contact.	1. Check aircraft for evacuation of personnel. 2. Take flashlight, dinghy and evacuate aircraft. 3. Assume command of left life raft.	1. Left Emergency Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Pilot	**CRASH LANDING**		
STATION 1	1. Give alarm bell warning (6 short rings) followed by announcement on PA system of emergency condition and intentions. 2. Order fuel to be dumped (if applicable). 3. Order engineer to depressurize cabin. 4. Adjust and lock shoulder harness. 5. Order electronic equipment not needed – OFF. WHEN CRASH LANDING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT): 1. Order copilot to give warning on PA and interphone. 2. Order flap lever 100 percent landing position. 3. Order copilot to turn on alarm bell 30 seconds prior to impact. 4. Power (if available) as desired to point of contact.	1. Check aircraft for evacuation of personnel. 2. Egress aircraft with necessary survival equipment.	1. Nearest Available Exit.
Pilot	**BAILOUT**		
STATION 1	1. Give alarm bell warning (3 short rings) followed by announcement on PA system of emergency condition and intentions. 2. Don necessary survival equipment while copilot manages aircraft. 3. Order engineer to depressurize cabin. 4. Reduce airspeed if possible. 5. Aircraft, slightly nose down trim. 6. Give bailout signal (one long ring on alarm bell). 7. Automatic pilot may be engaged to maintain course and stability for crew abandonment. 8. When jumpmaster advises that all personnel have abandoned the aircraft put aircraft on autopilot and don parachute. Evacuate aircraft.		1. Rear Entrance Door

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Copilot	**DITCHING**		
STATION 2	1. Execute specific orders from pilot.	1. Confirm that the life rafts have been released.	1. Right Emergency Exit.
	2. Send emergency message with UHF on guard channel.	1. Take flashlight, dinghy, and evacuate aircraft.	
	3. Turn IFF/SIF to EMERGENCY.	3. Assume command of right life raft.	
	4. Secure all loose equipment in flight station.		
	5. Don necessary survival equipment and place pilot's survival equipment advantageous to his station.		
	6. Adjust and lock shoulder harness.		
	WHEN DITCHING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT):		
	1. Give PA and interphone warning on order from pilot.		
	2. Assist pilot as required.		
	3. Flap lever – 100 percent landing position (on order from pilot).		
	4. Landing gear lever – Up.		
	5. Turn on alarm bell (on order from pilot).		
Copilot	**CRASH LANDING**		
STATION 2	1. Execute specific orders from pilot.	1. Egress aircraft with necessary survival equipment.	1. Nearest Available Exit.
	2. Send emergency message with UHF on guard channel.		
	3. Turn IFF/SIF to EMERGENCY.		
	4. Secure all loose equipment in flight station.		
	5. Adjust and lock shoulder harness		

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Copilot	**CRASH LANDING – Continued**		
STATION 2	WHEN CRASH LANDING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT): 1. Give PA and interphone warning on order from pilot. 2. Assist pilot as required. 3. Flap lever – 100 percent landing position (on order from pilot). 4. Landing gear lever – Up. 5. Turn on alarm bell (on order from pilot).		
Copilot	**BAILOUT**		
STATION 2	1. Executes specific orders from pilot. 2. Send emergency message with UHF on guard channel. 3. Turn IFF/SIF to EMERGENCY. 4. Don necessary survival equipment and parachute. 5. Evacuate aircraft upon bailout signal.		1. Rear Entrance Door
Duty Flight Engineer	**DITCHING**		
STATION 3	1. Heaters and recirculating fan switches – OFF. 2. Dump fuel on pilot's order. 3. Depressurize cabin on pilot's order. **NOTE** Reduce fuel load to the lowest practical minimum before ditching. Empty, or nearly empty, fuel tanks will provide extra buoyancy.	1. Take flashlight, dinghy, first aid kit and evacuate aircraft. (Before leaving flight station assure the seat is far enough forward on the track to enable pilot and copilot to pass).	1. Right Emergency Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty Flight Engineer	**DITCHING – Continued**		
STATION 3	**WARNING** Make certain that fuel dump valves are closed before making contact with the water, and close all openings below waterline. This includes cabin door, flight station door, and auxiliary ventilation intakes and exits. 4. Pull ditching valve release handle and close auxiliary ventilation valves (Position A). 5. Turn paddle switches to WARMER (lights out). 6. Don necessary survival equipment. 7. Pass loose gear aft for jettisoning. 8. All unnecessary switches OFF. 9. Turn emergency ditching and night lights ON. WHEN DITCHING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT): 1. Battery switch – OFF. 2. Turn seat aft, install headrest (if applicable) and fasten safety belt. 3. Brace for impact.		
Duty Flight Engineer	**CRASH LANDING**		
STATION 3	1. Heater and recirculation fan switches – OFF. 2. Dump fuel (on pilot's order). 3. Depressurize cabin (on pilot's order).	1. Mixture levers all engines – OFF. 2. Fuel tank selectors – OFF. 3. All electrical power (gen erators) – OFF (as soon as possible after contact with ground).	1. Nearest Exit

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty Flight Engineer	**CRASH LANDING – Continued**		
STATION 3	4. Auxiliary fuel pump switches – OFF.	4. Discharge engine fire extinguisher bottles.	
	5. Open forward crew entrance door and lock in position	5. Take flashlight, fire axe, first aid kit and necessary survival equipment and evacuate aircraft. (Before leaving flight station assure the seat is far enough forward on the track to enable pilot and copilot to pass.)	
	6. Turn emergency and night lights – ON.		
	WHEN CRASH LANDING IS IMMINENT (AT LEAST THREE MINUTES PRIOR TO IMPACT):		
	1. Open all engine selector valves for HRD fire extinguisher system.		
	2. Battery switch – OFF.		
	3. Turn seat aft, install headrest (if applicable) and fasten safety belt.		
	4. Brace for impact.		
Duty Flight Engineer	**BAILOUT**		
STATION 3	1. Execute specific orders from pilot.		1. Rear Entrance Door.
	2. Depressurize cabin (on pilot's order).		
	3. Push seat forward.		
	4. Don necessary survival equipment and parachute.		
	5. Remain at station.		
	6. Evacuate aircraft upon bailout signal.		

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Off-Duty Flight Engineer	**DITCHING**		
	1. Assist duty engineer as necessary. 2. Don necessary survival equipment. 3. Check immediate area for loose equipment; stow all loose equipment. WHEN DITCHING IS IMMINENT: 1. Assume assigned ditching position. 2. Brace for impact.	1. Take flashlight, dinghy, additional equipment as directed and evacuate aircraft.	1. Left Emergency Exit.
Off-Duty Flight Engineer	**CRASH LANDING**		
	1. Assist duty engineer as necessary. 2. Don necessary survival equipment. 3. Check immediate area for loose equipment, stow all loose equipment. WHEN CRASH LANDING IS IMMINENT: 1. Assume assigned crash landing position. 2. Brace for impact.	1. Take flashlight, additional equipment as directed and evacuate aircraft.	1. Nearest Emergency Exit.
Off-Duty Flight Engineer	**BAILOUT**		
	1. Assist in preparing aircraft for bailout as directed. 2. Don necessary survival equipment and parachute. 3. Remain at assigned position. 4. Upon bailout signal proceed to rear exit and bail out.		1. Rear Entrance Door.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty Navigator	**DITCHING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Give pilot heading and distance to nearest land or surface vessel. 3. Pass position to pilot and radio operator. Include position, time, course, speed, altitude and additional information as time permits. 4. Stow periscopic sextant forward of radio rack. 5. Don necessary survival equipment. 6. Remove right emergency escape hatch and stow in forward lavatory. WHEN DITCHING IS IMMINENT: 1. Assume ditching position. 2. Brace for impact.	1. Pull right life raft release handle. 2. Throw free end of ditching rope onto right wing. 3. Take flashlight, dinghy, and evacuate aircraft.	1. Applicable Emergency Exit.
Duty Navigator	**CRASH LANDING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Pass position to pilot, radio operator. Include position, time, course, speed, altitude and additional information as time permits. 3. Stow periscopic sextant forward of radio rack. 4. Don necessary survival equipment. 5. Remove right emergency escape hatch and stow in forward lavatory. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position. 2. Brace for impact.	1. Take flashlight, and evacuate aircraft.	1. Nearest Available Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty Navigator	**BAILOUT**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Pass position to pilot, radio operator. Include position, time, course, speed, altitude, and additional information as time permits. 3. Don necessary survival equipment and parachute. 4. Remain at station. 5. Upon bailout signal proceed to rear exit, and bail out.		1. Rear Entrance Door.
Off-Duty Navigator	**DITCHING**		
	1. Stow all loose equipment at navigator station, including seat in forward lavatory. 2. Don necessary survival equipment. 3. Direct preparation of galley and forward crew compartment for ditching. WHEN DITCHING IS IMMINENT: 1. Assume ditching position. 2. Brace for impact.	1. Direct removal of food, water, and first aid kits using personnel ditching in galley positions. 2. Distribute supplies to crew members departing both exits. 3. Take flashlight, very pistol and flares, dinghy and evacuate aircraft.	1. Applicable Emergency exit.
Off Duty Navigator	**CRASH LANDING**		
	1. Stow all loose equipment at navigator station, including seat, in forward lavatory. 2. Don necessary survival equipment 3. Direct preparation of galley and forward crew compartment for crash landing. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position. 2. Brace for impact.	1. Take flashlight, very pistol and flares and evacuate aircraft.	1. Nearest Available exit

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Off-Duty Navigator	**BAILOUT**		
	1. Don necessary survival equipment and parachute. 2. Stow nav seat and sextant stand in forward lavatory. 3. Remain at takeoff station. 4. Upon bailout signal proceed to rear exit and bail out.		1. Rear Entrance Door.
Radio Operator	**DITCHING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Send emergency message to appropriate ground station (information supplied by navigator). 3. Don necessary survival equipment. 4. Stow all loose equipment. Remove left emergency escape hatch and stow it in forward lavatory and pick up first aid kit. 5. Continue sending emergency message. 6. Turn on emergency light WHEN DITCHING IS IMMINENT: 1. Radio operator's table top secured up. 2. Turn seat facing aft, slide seat forward and fasten seat belt. 3. Brace for impact.	1. Slide radio seat forward and clear of hatch opening. 2. Pull left life raft release handle. 3. Throw free end of ditching rope out on left wing. 4. Take flashlight, first aid kit, dinghy and evacuate aircraft. 5. Receive CRT-3 from technician. 6. Stow equipment in raft and position it for boarding, holding it free of any torn metal to avoid puncture.	1. Left Emergency Exit.
Radio Operator	**CRASH LANDING**		
	1. Acknowledge warning announcement and pilot's intentions 2. Send emergency message to appropriate ground station (information supplied by navigator).	1. Slide radio seat forward and clear of hatch opening. 2. Pull left life raft release handle.	1. Nearest Available Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Radio Operator	**CRASH LANDING – Continued**		
	3. Don necessary survival equipment 4. Stow all loose equipment. Remove left emergency escape hatch and stow it in forward lavatory and pick up first aid kit. 5. Continue sending emergency message. 6. Turn on emergency light. WHEN CRASH LANDING IS IMMINENT: 1. Radio operators table top secure up. 2. Turn seat facing aft, slide seat forward and fasten seat belt. 3. Brace for impact.	3. Throw free end of ditching rope out onto left wing. 4. Take flashlight and evacuate aircraft. 5. Receive CRT-3 from Technician.	
Radio Operator	**BAILOUT**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Send emergency message to appropriate ground station. 3. Don necessary survival equipment and parachute. 4. Procure CRT-3 (Gibson Girl). (Over water only.) 5. Remain at station. 6. Upon bailout signal proceed to rear exit. 7. Fasten CRT-3 parachute lanyard to escape rope lanyard bracket and throw out CRT-3. (Over water only.) 8. Bail out.		1. Rear Entrance Door.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
CICO	**DITCHING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Send emergency message on tactical frequency in use. 3. Don necessary survival equipment and directly supervise CIC preparation. 4. Supervise the following: a. Cabin and emergency lights to BRIGHT. b. Electronic equipment not needed turned off when ordered by pilot. c. Stow all of loose equipment in latrines and bunks. d. Curtain removal and distribution for use as blankets. WHEN DITCHING IS IMMINENT: 1. Ensure that CIC crew members are in ditching positions. 2. Notify pilot that CIC compartment is ready. 3. Assume ditching position. 4. Cabin lights to DIM (night operations only). 5. Brace for impact.	1. Supervise evacuation of personnel from CIC section. 2. Take flashlight, survival equipment and evacuate aircraft.	1. Left Emergency Exit.
CICO	**CRASH LANDING**		
	1. Acknowledge warning announcement and pilot's intentions 2. Send emergency message on tactical frequency in use. 3. Don necessary survival equipment and directly supervise CIC preparation.	1. Supervise evacuation of personnel from CIC section. 2. Take flashlight, survival equipment and evacuate aircraft.	1. Nearest Available Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
CICO	**CRASH LANDING – Continued**		
	4. Supervise the following: a. Cabin and emergency lights to BRIGHT. b. Electronic equipment not needed turned off when ordered by pilot. c. Stow all of loose equipment. d. Curtain removal and distribution for use as blankets. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position. 2. Notify pilot that CIC compartment is ready. 3. Cabin lights on DIM (night operations only). 4. Brace for impact.		
CICO	**BAILOUT**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Send emergency message on tactical frequency in use. 3. Don necessary survival equipment and parachute. Directly supervise CIC preparation. 4. Check jumpmaster in position. 5. Remain at station. 6. Upon bailout signal proceed to rear exit and bailout.		1. Rear Entrance Door
Jumpmaster	**DITCHING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment	1. In conjunction with CICO, supervise evacuation of personnel from aircraft. 2. Take flashlight, survival equipment and evacuate aircraft.	1. Applicable Emergency Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Jumpmaster	**DITCHING – Continued**		
	3. Stow and secure all loose equipment in aft section. 4. Remove aft curtains and distribute for use as blankets. 5. Ensure aft door – closed. 6. Brace for impact.		
Jumpmaster	**CRASH LANDING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment. 3. Stow all loose equipment. 4. Remove curtains and distribute for use as blankets. 5. Rear exit door locked open. 6. Brace for impact.	1. In conjunction with CICO, supervise evacuation of personnel from aircraft. 2. Take flashlight, survival equipment and evacuate aircraft. 3. Assemble crew members upwind of the aircraft and take a head count to be sure all crew members have safely evacuated the aircraft.	1. Nearest Available Exit
Jumpmaster	**BAILOUT**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment and parachute. Supervise crew emergency preparations. 3. Open and secure rear entrance door after depressurization. 4. Upon bailout signal have the crew form in the aisle in single file to the rear entrance door and evacuate aircraft. When all crew members have evacuated the aircraft notify the aircraft commander.		

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
CIM and Additional Crewmembers	**DITCHING**		
	1. Assist in preparing aircraft for ditching as required. 2. Don necessary survival equipment. 3. Check immediate area for loose equipment; stow in latrine and bunks. WHEN DITCHING IS IMMINENT: 1. Assume assigned ditching position. 2. Brace for impact.	1. Take flashlight, survival equipment and additional equipment as directed and evacuate aircraft.	1. Emergency exit on same side of aircraft as ditching position.
CIM and Additional Crewmembers	**CRASH LANDING**		
	1. Assist in preparing aircraft for crash landing as directed. 2. Don necessary survival equipment. 3. Check immediate area for loose equipment; stow in latrine and bunks. WHEN CRASH LANDING IS IMMINENT. 1. Assume assigned crash landing position. 2. Brace for impact.	1. Take flashlight, survival equipment and additional equipment as directed and evacuate aircraft.	1. Nearest Available Exit.
CIM and Additional Crewmembers	**BAILOUT**		
	1. Assist in preparing aircraft for bailout as directed. 2. Don parachute and necessary survival equipment. 3. Remain at assigned position. 4. Upon bailout signal proceed to rear exit and bail out.		1. Rear Entrance Door.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Electronics Technician	**DITCHING**		
	1. Stow all loose equipment 2. Turn off all electronic equipment as directed by CICO 3. Zeroize equipment when directed. 4. Don necessary survival equipment. WHEN DITCHING IS IMMINENT: 1. Assume ditching position with seat facing aft. 2. Brace for impact.	1. When aircraft comes to complete stop, take CRT-3 and pass to radio operator on left wing 2. Take flashlight and dinghy, evacuate aircraft. 3. Assist radio operator with left life raft.	1. Left Emergency Exit.
Electronics Technician	**CRASH LANDING**		
	1. Stow all loose equipment. 2. Turn off all electronic equipment as directed by CICO. 3. Zeroize equipment when directed. 4. Don necessary survival equipment. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position with seat facing aft. 2. Brace for impact.	1. After aircraft comes to complete stop, take flashlight and evacuate aircraft.	1. Nearest Available Exit.
Electronics Technician	**BAILOUT**		
	1. Don survival equipment and parachute. 2. Shut off all equipment as directed by CICO if time permits. 3. Zeroize equipment when directed. 4. Remain at duty station. 5. Bail out rear exit when signal is given.		1. Rear Entrance Door.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty EWO	**CRASH LANDING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment. 3. Turn off all unnecessary electronic equipment. 4. Stow all loose equipment. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position. 2. Brace for impact.	1. Take flashlight, survival equipment and evacuate aircraft.	1. Nearest Available Exit.
Duty EWO	**BAILOUT**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment and parachute. 3. Turn off all unnecessary electronic equipment when ordered by pilot. 4. Remain at duty station. 5. Upon bailout signal, proceed to rear exit and bail out.		1. Rear Entrance Door.
Duty EWO	**DITCHING**		
	1. Acknowledge warning announcement and pilot's intentions. 2. Don necessary survival equipment. 3. Turn off all unnecessary electronic equipment. 4. Stow all loose equipment. WHEN DITCHING IS IMMINENT: 1. Assume ditching position. 2. Brace for impact.	1. Take flashlight, dinghy and evacuate aircraft.	1. Applicable Emergency Exit.

Crewmember Position	Duties Before Impact	Duties After Impact	Exit
Duty EWO	**FUEL DUMP AND/OR FIRE**		
	BEFORE DUMPING: 1. Electronic equipment – OFF. AFTER DUMPING: 1. Electronic equipment – ON as required.		
Off-Duty EWO	**CRASH LANDING**		
	1. Don survival equipment. 2. Assist Duty EWO. WHEN CRASH LANDING IS IMMINENT: 1. Assume crash landing position. 2. Brace for impact.	1. Take flashlight, survival equipment and evacuate aircraft.	1. Nearest Available Exit.
Off Duty EWO	**BAILOUT**		
	1. Don necessary survival equipment and parachute. 2. Assume crash landing position. 3. Upon bailout signal, proceed to rear exit and bail out.		1. Rear Entrance Door
Off-Duty EWO	**DITCHING**		
	1. Don survival gear. 2. Assist Duty EWO. WHEN DITCHING IS IMMINENT: 1. Assume ditching station. 2. Brace for impact.	1. Take flashlight, dinghy and evacuate aircraft.	1. Applicable Emergency Exit.

MISCELLANEOUS EMERGENCIES.

EXPLOSIVE DECOMPRESSION.

When an explosive decompression occurs, the cabin pressure is reduced to the outside pressure in less than a second. The fog caused by explosive decompression should not be confused with smoke. Any explosive decompression affects all crewmembers and can be extremely dangerous if occurring at high altitude. Rush of air from lungs, a momentary dazed sensation that passes immediately, possible gas pains, and hypoxia if oxygen equipment is not immediately available are some of the effects accompanying explosive decompression. Maintaining a safe pressure differential, and having oxygen equipment immediately available are precausions that should be observed in pressurized compartments. If an explosive decompression occurs, the pilot should try to determine the cause of the trouble. If repairs cannot be made in flight he should decide whether to continue the mission or to descend to a safe altitude immediately.

EMERGENCY JETTISONING.

Jettisoning of Baggage and/or Cargo.

If it becomes necessary to reduce weight in flight, consideration should be given to the peculiarities of the cargo load and to time available for load reduction.

Careful consideration should be given to the following:

a. Jettisoning the heaviest cargo that can be pushed out of the aft cabin door which would reduce weight in less time as opposed to jettisoning lighter items because of better accessibility and ease of handling.

b. Maintaining the airplane center of gravity within limits to preclude inadvertent loss of altitude.

c. If carrying passengers, all unneded baggage, seats, gear and radio equipment may be jettisoned, but if possibility of ditching exists, seats should be retained. An object pushed from the aft cabin door, when operating under conditions set forth in the following table, will clear the horizontal tail by:

5 LB PER CUBIC FOOT CARGO DENSITY

Operating Speed Flaps Up	Airplane Operating Weight	Clear Horizontal Tail
180 knots IAS	120,000 lb	*6.0 ft
180 knots IAS	130,000 lb	*5.75 ft
180 knots IAS	140,000 lb	*5.50 ft

*At a given airplane weight a reduction in speed, increase in object weight density, or operating with extended wing flaps will increase this clearance.

Proceed as follows:

a. Depressurize, and at 1 in. Hg turn auxiliary ventilation control knob to position A.

b. Airspeed – 150 to 160 knots.

c. Wing flaps – may be used to change the longitudinal axis of the aircraft to facilitate movement of the cargo fore or aft for jettisoning.

d. Aft personnel entrance door – OPEN.

WARNING

- Crewmember who is jettisoning cargo must be safety-strapped to aircraft structure so that maximum length of strap will prevent his falling through the opening.
- The cargo doors must never be opened in flight.

HYDRAULIC ACCESS DOOR UNLATCHED.

If the hydraulic oil access door opens after takeoff, severe buffeting will result. The aft portion of the door is in a region of pressure which causes the door to lift under certain flight conditions. This lifting creates a turbulence over the upper wing surface in the wing-to-fuselage fillet area. This condition is a function of the wing angle of attack and is, therefore, related to airspeed and aircraft weight. If buffeting occurs and the cause is related to the hydraulic oil tank access door, the following procedures are recommended:

a. a. If buffeting occurs when wing flaps are retracted after takeoff, it is possible that the door has come open. Re-extend the wing flaps to 60 percent.

b. If buffeting occurs during flight, increase airspeed, if possible, to a point at which buffeting stops. According to flight tests with gear and flaps retracted, buffeting will decrease or stop if airspeed is increased to within the following ranges for given gross weights.

80,000 pounds – 150-160 knots
110,000 pounds – 165-180 knots
120,000 pounds – 180-200 knots
145,000 pounds – 200-220 knots

The variation in airspeed at which buffeting stops depends upon characteristics of individual aircraft.

c. If necessary to maintain a lower speed, extend flaps until the buffeting is stopped at the speed you wish to maintain.

d. Land as soon as practicable at nearest suitable airport.

e. If buffeting is experienced during landing, keep the airspeed above the buffeting range with wing flaps extended.