SECTION III

EMERGENCY PROCEDURES

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GENERAL

Due to the varied types of equipment installed, pilots and aircrewmen must be thoroughly familiar with the emergency procedures in the succeeding paragraphs. The emergency situations and procedures outlined in this section cover the general types of emergencies encountered; however, the procedures in an actual emergency must result from consideration of the complete situation. The corrective actions for each emergency are divided into critical and noncritical items. The critical items are those actions which must be performed immediately to preclude aggravating the condition and/or avoiding further damage or injury. The critical items in this section are in capital letters. Compound emergencies may require departure from normal corrective procedures set forth below for any specific emergency. The term "land as soon as practicable" is used throughout this section for the purpose of standardizing phraseology. The absolute definition of this term has been intentionally omitted so as to allow the use of sound judgment on the part of the aircraft commander under any condition. An appropriate radio call and a switching of the transponder to an emergency code should be made in emergencies when deemed necessary by the aircraft commander.

ENGINE MALFUNCTIONS DURING START

COLD HANG UP

Either engine may be started with the emergency fuel control lever when it cannot be started normally due to engine fuel control unit malfunction.

Symptoms

1. Ng, T5 and fuel flow remain low after engine lite-off with speed selector in ground idle.

Corrective Action

If operational requirements do not dictate continuation:

1. Speed selector - shut off.
2. Secure engine and aircraft and investigate cause.

If operational requirements dictate continuation:

1. Emergency fuel control lever - advance slowly to approximately 56% Ng.
2. Engine instruments - check.
3. Emergency fuel control lever - close slowly.
4. a. If engine continues to run at idle Ng -

   (1) Continue with checklist procedures.

   b. If Ng decreases with emergency fuel control lever movement -

   (1) Perform engine shutdown.

CAUTION

All movements of the emergency fuel control lever should be made slowly and deliberately.

HOT START

Symptoms

1. Rapid increase in T5.
2. ENG ST button does not prevent T5 from rising to 840°C.

Corrective Action

1. **SPEED SELECTOR - SHUT OFF.**
2. Monitor T5 for post shutdown fire.

ENGINE SHUTDOWN PROCEDURES

1. Speed selector - shut off.
2. Ignition switch - off.
3. Fuel shutoff valve switch - off.
4. Boost pumps and crossfeed - as required.
5. Monitor T5 for post shutdown fire.

ENGINE MALFUNCTIONS

The material contained herein assumes a certain knowledge of basic engine operation. In regard to cockpit indications it is particularly important to consider the relationship of N_g and T_5. These two indications on a properly operating engine will always rise and fall together as a function of engine power.

When analyzing any engine malfunction it is imperative that corrective action be based on an intelligent analysis of all indications of both engines and not on any one source, particularly not on torque indication alone.

LUBE PUMP SHAFT FAILURE

Power for the engine lube pump is furnished from the engine accessory drive section by means of a splined shaft. This drives the engine lube pump which in turn drives the N_g-tachometer-generator.

Symptoms

1. Sudden decrease of N_g to zero.
2. Sudden oil pressure drop.

Corrective Action

1. **SPEED SELECTOR (MALFUNCTIONING ENGINE) - SHUT OFF.**
2. **Nr - MAINTAIN.**
3. **SPEED SELECTOR (GOOD ENGINE) - FULL FORWARD.**
4. **WHEELS - DOWN (UP OVER WATER).**
5. **COMPLETE ENGINE SHUTDOWN PROCEDURES.**
6. **LAND AS SOON AS PRACTICABLE.**

LOSS OF ENGINE OIL

Symptoms

1. ENG OIL QTY LOW caution light on.
2. Engine oil pressure may or may not decrease.
3. Engine oil temperature may or may not rise.

Corrective Action

1. **VISUALLY CHECK FOR ENGINE OIL LEAK.**
2. **ANALYZE ALL ENGINE INSTRUMENTS.**

NOTE

With a properly operating engine oil low level caution system, the ENG OIL QTY LOW caution light comes on when 1.5 gallons of oil remain.

3. **IF ENGINE OIL PRESSURE DECREASES BELOW 24 PSI:**
   a. **SPEED SELECTOR (MALFUNCTIONING ENGINE) - SHUT OFF.**
   b. **Nr - MAINTAIN.**
   c. **SPEED SELECTOR (GOOD ENGINE) - FULL FORWARD.**
   d. **WHEELS - DOWN (UP OVER WATER).**
   e. **COMPLETE ENGINE SHUTDOWN PROCEDURES.**
4. **LAND AS SOON AS PRACTICABLE.**

ENGINE OIL PRESSURE FAILURE

Symptoms

1. Engine oil pressure fluctuates or goes to zero.
2. Other gages normal.

Corrective Action

1. **VISUALLY CHECK FOR ENGINE OIL LEAK.**
2. **ANALYZE ALL ENGINE INSTRUMENTS - monitor for:**
   a. ENG OIL QTY LOW caution light on.
   b. Engine oil temperature rising.
   c. Unusual vibrations and/or noises.
   d. Confirmed oil leak.
3. If any of the above conditions occur:
   a. **SPEED SELECTOR (MALFUNCTIONING ENGINE) - SHUT OFF.**

b. Nr - MAINTAIN.

c. SPEED SELECTOR (GOOD ENGINE) - FULL FORWARD.

d. WHEELS - DOWN (UP OVER WATER).

e. COMPLETE ENGINE SHUTDOWN PROCEDURES.

4. LAND AS SOON AS PRACTICABLE.

T5 SYSTEM MALFUNCTION

Symptoms

1. T5 fluctuates, fails to rise and fall in harmony with Ng or falls to zero.
2. Other gages normal.

Corrective Action

1. If the mission dictates, continue flight using other engine instruments, and avoid high power settings.
2. Land as soon as practicable.

NOTE

Proper Ng topping adjustment will normally prevent overtemperature, however, prolonged operation at high power settings can result in exceeding temperature vs time limitations.

Ng TACHOMETER FAILURE

Symptoms

1. Sudden decrease of Ng to zero.
2. Other gages normal.

Corrective Action

1. Continue to operate engine and monitor instruments, particularly engine oil pressure.

ENGINE MALFUNCTIONS RESULTING IN APPARENT LOSS OF POWER

The following procedure shall be followed in all situations in which the pilot initially suspects a loss of power from either engine.

1. On the ground.
   a. Speed selectors - GRD IDLE.
   b. Analyze all engine instruments.
2. In flight.

a. Nr - MAINTAIN.

b. SPEED SELECTORS - FULL FORWARD.

c. WHEELS - DOWN (UP OVER WATER).

d. ANALYZE ALL ENGINE INSTRUMENTS.

e. Continue with procedures for specific situation.

ENGINE SPEED TRIM MALFUNCTION

Symptoms

1. Apparent power loss.
2. A movement of the speed selector either forward or back not induced by pilots.

Corrective Action

1. Nr - MAINTAIN.

2. SPEED SELECTORS - FULL FORWARD.

3. WHEELS - DOWN (UP OVER WATER).

4. ANALYZE ALL ENGINE INSTRUMENTS.

5. ENGINE SPEED TRIM circuit breaker - pull.

COMPRESSOR STALLS

Symptoms

1. Decreasing Ng and torque with an increasing T5 and a possible audible rumble.

Corrective Action

1. Nr MAINTAIN.

2. ANALYZE ALL ENGINE INSTRUMENTS.

3. SPEED SELECTOR (MALFUNCTIONING ENGINE) GRND IDLE.

a. If T5 stabilizes and engine limitations have not been exceeded:

(1) Slowly advance speed selector to regain engine operation.

(2) Land as soon as practicable.

b. If T5 does not decrease and stabilize:

(1) SPEED SELECTOR - SHUT OFF

4. SPEED SELECTOR (GOOD ENGINE) - FULL FORWARD.

5. WHEELS - DOWN (UP OVER WATER).

6. COMPLETE ENGINE SHUTDOWN PROCEDURES ON FAILED ENGINE.

7. LAND AS SOON AS PRACTICABLE.

HIGH SPEED (POWER TURBINE) SHAFT FAILURE.

Symptoms

1. Zero torque on malfunctioning engine accompanied by loud noises from MGB area.
2. Nf increases rapidly on malfunction engine.
   a. The fuel control may react to the Nf increase fast enough to prevent the engine from overspeeding. If this occurs, the engine may stabilize at minimum fuel flow with Nf above Nr.
   b. If Nf reaches 123%, the Nf overspeed protection will secure fuel at the fuel control. When Nf falls below 122% fuel will again begin to flow and the engine may or may not relight. If it does relight, it may stabilize at minimum fuel flow with Nf above Nr.
   c. If the Nf flex shaft is broken when the high speed shaft fails, the fuel control will sense zero Nf and the engine will go to topping. There will be no overspeed protection.

Corrective Action

1. Nr - MAINTAIN.

2. SPEED SELECTORS - FULL FORWARD.

3. WHEELS - DOWN (UP OVER WATER).

4. ANALYZE ALL ENGINE INSTRUMENTS.

5. MALFUNCTIONING ENGINE - PERFORM ENGINE SHUTDOWN PROCEDURES.

6. LAND AS SOON AS PRACTICABLE.

FUEL CONTROL SYSTEM MALFUNCTION

Symptoms

1. An apparent loss of power with one engine showing lower than selected Ng, T5, and torque while because of load sharing the other engine shows higher than desired Ng, T5, and torque.

Corrective Action

1. Nr - MAINTAIN.

2. SPEED SELECTORS - FULL FORWARD.

3. WHEELS - DOWN (UP OVER WATER).

4. ANALYZE ALL ENGINE INSTRUMENTS.

5. EMERGENCY FUEL CONTROL LEVER (LOW TORQUE ENGINE) - ADVANCE.

a. If the torque on the high engine decreases when the emergency fuel control lever is advanced on the low engine, the low engine is the malfunctioning engine.

b. If the torque on the high engine remains constant and Nf Nr increases, the high engine is the malfunctioning engine.

6. EMERGENCY FUEL CONTROL LEVER (MALFUNCTIONING ENGINE) ADVANCE.

7. Speed Selector (malfunctioning engine) - Ground idle.

8. Land as soon as practicable.

CAUTION

Considerable "dead band" travel will normally be encountered at high power settings before the emergency fuel control lever takes effect. From this point on, the control will be very sensitive, and care should be taken not to exceed T5 and Ng limits.

CAUTION

For complete control of the engine with the emergency fuel control lever, the speed selector must be retarded to the GRD IDLE detent. Further movement beyond the GRD IDLE detent will result in engine flameout, regardless of the position of the emergency fuel control lever.

NOTE

Close coordination between the pilot and copilot with regard to emergency fuel control lever and collective action is mandatory.

FLAMEOUT

Symptoms

1. Decreasing T5, Ng, torque, fuel flow and Nf on affected engine.

Corrective Action

1. **Nr - MAINTAIN.**
2. **SPEED SELECTORS - FULL FORWARD.**
3. **WHEELS - DOWN (UP OVER WATER).**
4. **ANALYZE ALL ENGINE INSTRUMENTS.**
5. **SPEED SELECTOR (MALFUNCTIONED ENGINE) - SHUTOFF.**
6. Perform engine restart procedures.
7. If unable to restart engine, perform engine shutdown procedures.
8. **LAND AS SOON AS PRACTICABLE.**

ENGINE RESTART DURING FLIGHT

A failed engine should not be restarted in flight unless it can be determined that it is reasonably safe to do so. If time allows, wait 30 seconds before attempting a restart, to purge the engine of fumes and fuel.

1. Ignition switch - normal.
2. T-handle - in.
3. Speed selector (inoperative engine) - shutoff.
4. Emergency fuel control lever - closed.
5. Fuel shutoff valve switch - open.
6. Crossfeed valve switch - as required.
7. Boost pump switch - on.
8. Starter button - depress. Motor the engine for approximately 10 seconds or until T5 is less than 100° and Ng has reached 19%.
9. Speed selector - grd idle.
10. Check for starter dropout and Nf indication.
11. Engine instruments - checked.
12. Speed selector - match torques.

NOTE

Above 10,000 feet altitude, emergency fuel control assist may be necessary during starts. If the engine does not accelerate smoothly after light-off with the speed selector in GRD IDLE, carefully advance the emergency fuel control lever to assist engine acceleration. Monitor T5 closely when using emergency fuel control lever. When engine speed reaches GRD IDLE, the emergency fuel control lever should be fully closed and all further engine operation controlled by the speed selector.

FAILURE OF THE Nf FLEX SHAFT

HIGH POWER DEMAND

Symptoms

1. Nf on affected engine decreases to zero while torque, Ng, T5 and fuel flow increase.
2. The non-affected engine's fuel flow, torque, T5, and Ng decrease to lesser values.
3. Nr essentially remains the same.

Corrective Action

1. **Nr - MAINTAIN.**
2. **SPEED SELECTORS - FULL FORWARD.**
3. **WHEELS - DOWN (UP OVER WATER).**

4. **ANALYZE ALL ENGINE INSTRUMENTS.**

5. **EMERGENCY FUEL CONTROL LEVER (MALFUNCTIONING ENGINE) — ADVANCE SLOWLY** until a slight restriction is felt, some indication of a rise in T5 or Ng is noted, or until it is full forward. Do not exceed 735°C T5, 106% Ng, or 150% torque.

6. **SPEED SELECTOR (MALFUNCTIONING ENGINE) - GRD IDLE.**

7. Slowly retard emergency fuel control lever on the malfunctioning engine until torques are matched.

CAUTION

Upon encountering Nf flex shaft failure in high speed cruising flight, reduction of collective and/or aft cyclic movement may result in rapid acceleration of the rotor system, leading to overspeed.

LOW POWER DEMAND

Symptoms

1. Nr increases - the rate depending upon the power demand.

2. Malfunctioning engine - Nf decreases to zero while torque, Ng, T5 and fuel flow increase.

3. Nonaffected engine - reduced fuel flow with corresponding decreases in Ng, T5, and torque.

Corrective Action

1. **Nr - MAINTAIN.**

2. **SPEED SELECTORS - FULL FORWARD.**

3. **WHEELS - DOWN (UP OVER WATER).**

4. **ANALYZE ALL ENGINE INSTRUMENTS.**

5. a. If situation and time permit:

   (1) EMERGENCY FUEL CONTROL LEVER (MALFUNCTIONING ENGINE) - ADVANCE SLOWLY until a slight restriction is felt, some indication of a rise in T5 or Ng is noted, or until it is full forward. Do not exceed 735°C T5, 106% Ng or 150% torque.

   (2) SPEED SELECTOR (MALFUNCTIONING ENGINE) - GRD IDLE.

   b. If situation and time do not permit:

   (1) SPEED SELECTOR (MALFUNCTIONING ENGINE) - GRD IDLE (This will result in single engine flight and the emergency fuel control lever should be used as soon as possible and as necessary.)

CAUTION

With the speed selector in ground idle, even slight movement of the emergency fuel control lever will result in engine response; therefore, engine instruments must be closely monitored to prevent an overtemperature condition.

NOTE

Close coordination between the pilot and copilot with regard to emergency fuel control lever and collective action is mandatory.

SPEED SELECTOR LINKAGE FAILURE

Symptoms

Any ONE of the following conditions:

1. Engine does not respond to movements of speed selector.

2. Speed selector will not move.

Corrective Action

1. On ground:

   a. Speed selector - shutoff. If this does not secure engine

   b. Fuel shutoff valve switch (fuel management panel) - off

2. In flight: If a higher engine setting is required

   a. Emergency fuel control lever - advance.

SINGLE-ENGINE FAILURES

The following aircraft situations represent areas where immediate action is required of the pilot due to either time or operating area limitations.

SINGLE-ENGINE FAILURE WHILE HOVERING AT LOW ALTITUDE

Corrective Action

1. **MAINTAIN A LEVEL ALTITUDE.**
2. **CUSHION LANDING WITH COLLECTIVE.**

CAUTION

To prevent excessive rotor droop at certain combinations of gross weight and hover altitudes, it will be necessary to initiate a descent by lowering the collective slightly.

SINGLE-ENGINE FAILURE DURING TAKEOFF

The pilot's decision to landback or to continue flight must be based on the existing flight conditions and terrain.

1. **LANDBACK.**
   - a. **AIRCRAFT ATTITUDE - POSITION NOSE TO OBTAIN GROUND SPEED DESIRED FOR TOUCHDOWN.**
   - b. **COLLECTIVE - ADJUST AS NECESSARY.**
   - c. **ASSUME LANDING ATTITUDE AT SUFFICIENT ALTITUDE TO PROVIDE ADEQUATE TAIL CLEARANCE.**
   - d. **COLLECTIVE - CUSHION LANDING AS NECESSARY.**
2. **CONTINUED FLIGHT.**
   - a. **COLLECTIVE - ADJUST FOR MAXIMUM POWER WHILE MAINTAINING Nr.**
   - b. **IF NECESSARY, SMOOTHLY LOWER THE NOSE TO EXCHANGE ALTITUDE FOR AIRSPEED.**
   - c. **SPEEDS SELECTORS - RECHECK FULL FORWARD.**
   - d. **ACCELERATE TO 70 KIAS AND TRANSITION TO 80 KIAS CLIMB ATTITUDE.**
   - e. **ANALYZE ALL ENGINE INSTRUMENTS.**
   - f. Continue with procedures for specific situation.

WARNING

Directional control becomes marginal if rotor RPM decays to 85% Nf/Nr.

SINGLE-ENGINE FAILURE WHILE HOVERING AT A HIGH ALTITUDE

1. **COLLECTIVE - ADJUST FOR MAXIMUM POWER WHILE MAINTAINING Nr.**
2. **ATTEMPT TO ACCELERATE.**
3. As conditions dictate, **PERFORM LANDBACK OR CONTINUED FLIGHT.**

SINGLE-ENGINE FLIGHT AND LANDINGS

The following situations exist after proper analyzation has taken place and the affected engine has proven unrecoverable. All engine shutdown procedures have been performed.

1. When altitude can be maintained.
   - a. Be sure aircraft is at a safe autorotational altitude.
   - b. **LAND AS SOON AS PRACTICABLE.**
2. When altitude cannot be maintained, an immediate decision, based on power requirements, gross weight, altitude, and nature of terrain or sea state, must be made as to what course of action should be followed.
   - a. **GROSS WEIGHT - DECREASE.**
   - b. If required, perform landing at best available area.

NOTE

Consideration should be given to starting the APU if the No. 1 Engine has failed. This affords a drive to the main transmission accessory section in case of a tail rotor drive takeoff free-wheeling unit failure.

SINGLE-ENGINE LANDING - LAND

1. **LANDING CHECKLIST - PERFORM.**
2. Approach airspeed - 80 KIAS.
3. At 300 feet AGL - **RECHECK SPEED SELECTOR ON OPERATING ENGINE FULL FORWARD AND WHEELS DOWN.**
4. At 200 feet AGL, reduce airspeed and rate of descent by executing a moderate transition.
5. Assume landing attitude at sufficient altitude to provide adequate tail clearance.
6. After touchdown - Slowly reduce collective.

NOTE

Do not use cyclic for aerodynamic braking.

SINGLE-ENGINE LANDING - WATER

The procedures described under SINGLE ENGINE LANDING - LAND should be utilized except:

1. **WHEELS - UP.**
2. **GROUND SPEED FOR TOUCHDOWN - BELOW 20 KTS.**
3. Perform emergency water landing procedures.

CAUTION

To avoid tail pylon contact, do not exceed a 7° nose up attitude on touchdown. If the helicopter enters the water with forward speed above 10 to 12 knots, more forward cyclic is normally required as the tail tends to tuck. If possible, maintain collective until the helicopter decelerates and levels. Then lower collective smoothly and position the cyclic as required. Lowering the collective rapidly will cause a nose up pitching motion which will reduce tail rotor clearance.

SINGLE-ENGINE WATER TAKEOFF

Normally all takeoffs should be executed into the wind. In high sea states it may be preferable to execute the takeoff slightly off the wind line in order to minimize wave impact. The most difficult takeoff conditions will result from calm wind, smooth sea states, and high gross weights. In addition to marginal lifting capability, power loss due to salt ingestion must be considered. If insufficient power is available to make a normal lift off but a lift off is necessary, the pilot should review and follow these procesures:

1. Off-load fuel, equipment and passengers - As required.
2. Fuel dump valves - Closed.
3. APU - On.
4. Engine speed selector, operable engine - Full forward.
5. Topping adjustment, operable engine - Full increase.
6. Collective - Raise until operable engine is at topping.
7. Emergency fuel control lever - Full open.
8. Collective - Lower to obtain 117% N_r.
9. Cyclic - Forward to attain maximum forward water taxi speed at 117% N_r.
10. Collective - Raise for takeoff to a water/wave clearance height of about 5 feet.

NOTE

1. Upon leaving the water, slight aft cyclic may be required to counteract a nosedown pitch rate resulting from hull-water interaction.

2. The initial rotor RPM decay will be quite rapid but the aircraft will leave the water with 100% N_r or higher.

11. Collective - Adjust (minimum allowable 89% N_r).
12. Transition to 45 KIAS at the initial altitude, then to 80 KIAS climb.
13. **ROTOR DECAY - IF IT APPEARS THAT THE ROTOR DECAY CANNOT BE STOPPED AT 89% - LAND SLIGHTLY NOSE HIGH, WITH A MINIMUM OF 89% N_r AND A MAXIMUM WATER SPEED OF 15 KNOTS.**

14. When well established in the climb or when reentering water, **EMERGENCY FUEL CONTROL LEVER - CLOSE.** In the event of an aborted takeoff, the safety pilot must retard the emergency fuel control lever to prevent a rotor overspeed as the collective is lowered. If at any time the helicopter has a speed above 10 to 12 knots and either the nose or tail tends to tuck, the collective position should be maintained until the helicopter decelerates and levels. Then lower the collective smoothly and position the cyclic as required.

DUAL-ENGINE FAILURE

Should both engines fail, a safe autorotative landing can be accomplished except when flying at airspeed and altitude combinations shown in the shaded areas of the Height Velocity Diagram - Dual-Engine Failure, in Appendix I. Continuous operation in these areas should be avoided. Autorotations conducted at either end of the speed range are extremely demanding due to high rates-of-descent (in excess of 3000 fpm can be expected), difficulty in maintaining desired RPM, and the margin of error which diminishes to zero. For these reasons it is recommended that an airspeed between minimum rate-of-descent (70 KIAS) and maximum autorotative gliding distance (110 KIAS) at 104% N_r be maintained. Immediately upon a two-engine failure, rotor rpm will decay and the helicopter will yaw and roll to the left. This is due to the loss in power and corresponding reduction in torque. Except in those instances when a dual-engine failure is encountered in close proximity to the surface, it is mandatory that autorotation be established by immediately lowering the collective to minimum.

WARNING

If collective pitch is not reduced sufficiently, control will be lost when rotor speed decreases to the point at which blade stall is encountered.

Autorotative RPM will vary with ambient temperature, pressure altitude, increases in "G" loading such as in turns, and gross weight conditions. High gross weights, increased "G" loads, and higher altitudes and temperatures will cause increased RPM which can be controlled by increasing collective pitch. If altitude permits, every effort should be made to restore engine operation.

WARNING

When entering autorotation, avoid abrupt control movements, as these movements may cause rotor blade to fuselage contact.

DUAL-ENGINE FAILURE WHILE HOVERING

Symptoms

1. N_r - rapid decrease.
2. Aircraft will yaw and roll to the left.
3. Rapid loss of altitude.

Corrective Action

1. **MAINTAIN HEADING AND LEVEL ATTITUDE.**
2. **COLLECTIVE - ADJUST AS NECESSARY TO CUSHION LANDING.**

AUTOROTATIVE LANDINGS - LAND

1. **N_r - MAINTAIN 104%.**
2. Airspeed - adjust to 70-110 KIAS.
   practice at 80 KIAS
3. **WHEELS - DOWN.**
4. **CREW - ALERTED.**
5. **PERFORM ENGINE SHUTDOWN PROCEDURES.**
6. **IFF - EMERGENCY.**
7. **DISTRESS CALL - TRANSMIT.**
8. Cockpit windows and cargo door - open.
9. At 200 feet AGL, initiate a flare to approximately 20° nose up to obtain an airspeed of 30 to 35 KIAS at an altitude of 100 to 110 feet AGL.
10. Commence an exit from the flare no later than 75 feet AGL.
11. The aircraft should be in a level attitude at 10-15 feet, eliminate all drift and increase collective to cushion landing.

NOTE

All autorotative landings should be made into the wind, if possible.

LANDING IN TREES

A power-off landing into a heavily wooded area should be accomplished by executing a normal autorotative approach and full flare. The flare and subsequent application of collective pitch should be executed so as to reach zero rate-of-descent and zero ground speed in a level attitude as close to the top of trees as possible. Increase collective to maximum and allow the helicopter to descend vertically through the trees.

MAXIMUM GLIDE

The maximum autorotative glide distance chart in Appendix I shows the maximum gliding distance attainable if power fails on both engines. Maximum autorotative gliding distance is obtained at 110 KIAS and approximately 104% Nr. Minimum rate-of-descent is obtained at 70 KIAS and 104% Nr. Increasing rotor speed above 104% will result in a greater rate-of-descent and reduced gliding distance.

AUTOROTATIVE LANDING - WATER

Autorotative landings on water differ from autorotative landings on land in that touchdown speed must be held to a minimum (less than 20 knots) and the descent from flare to water contact should be as vertical as possible.

1. **Nr - MAINTAIN 104%.**
2. Airspeed - Adjust to 70-110 KIAS.
3. **WHEELS - UP.**
4. **CREW - ALERTED FOR DITCHING.**
5. **PERFORM ENGINE SHUTDOWN PROCEDURES.**
6. **IFF - EMERGENCY.**
7. **DISTRESS CALL - TRANSMIT.**
8. Cockpit windows and cargo door - open.
9. At 200 feet AGL, initiate a flare to approximately 20° nose up to obtain an airspeed of 30 to 35 KIAS at an altitude of 100-110 feet AGL.
10. Commence an exit from flare no later than 75 feet AGL.
11. The aircraft should be in a level attitude at 10-15 feet, eliminate all drift, and increase collective to cushion landing.
12. **After landing - perform emergency water landing procedures.**

MAIN GEAR BOX MALFUNCTION

Symptoms

Any ONE of these conditions:

1. XMSN OIL PRESS caution light on.
2. XMSN OIL HOT caution light on.
3. XMSN CHIP MAIN caution light on.
4. Main gear box oil temperature or pressure indicator at red line.
5. XMSN OIL HOT caution light on and main gear box oil temperature indicator at or above red line.
6. XMSN OIL PRESS caution light on and pressure indicator zero.
7. Indications of low pressure plus indications of high temperature.
8. An indication of no XMSN oil pressure.
9. Abnormal transmission noises.

Corrective Action

1. **LAND AS SOON AS PRACTICABLE.**
2. Monitor engine and transmission instruments, caution panel and torque indications.
3. Fly at minimum safe altitude.
4. Maintain airspeed between 70 and 100 KIAS.
5. Avoid high power maneuvers.

CAUTION

Flight with no indication of transmission oil pressure can be sustained for approximately 45 minutes.

MAIN GEARBOX FAILURE IMMINENT

Symptoms

Any ONE of the following set of conditions:

1. An indication of no transmission oil pressure and the XMSN CHIP MAIN caution light illuminated.
2. An indication of no transmission oil pressure and yaw kicks.
3. An indication of no transmission oil pressure and abnormal transmission noises.
4. An indication of no transmission oil pressure and unusually high power requirements.
5. An indication of no transmission oil pressure and both torque needles at zero.
6. Illumination of XMSN CHIP MAIN caution light and yaw kicks.
7. Illumination of XMSN CHIP MAIN caution light and abnormal transmission noises.
8. Illumination of XMSN CHIP MAIN caution light and unusually high power requirements.

Corrective Action

1. **SPEED SELECTORS - FULL FORWARD.**
2. **WHEELS - DOWN (UP OVER WATER).**
3. **IMMEDIATELY REDUCE COLLECTIVE TO MINIMUM AND EFFECT A POWER-ON LANDING. DO NOT SPLIT N_f AND N_r DURING DESCENT OR FLARE.**

TORQUEMETER SYSTEM MALFUNCTIONS

OIL LEAKAGE FROM TORQUEMETER SYSTEM

Symptoms

1. One torque needle (pilot's and copilot's) goes to zero or gives erratic indications and all other engine indications are normal.

Corrective Action

1. **MONITOR TRANSMISSION OIL PRESSURE AND TEMPERATURE.**
2. **LAND AS SOON AS PRACTICABLE.**
3. If continued flight is necessary.
   a. Visually check for transmission oil leak.
   b. SPEED SELECTOR (engine with zero or erratic torque) - RETARD UNTIL N_f SPLITS FROM N_r.

OIL LEAKAGE FROM TORQUEMETER SYSTEM

Symptoms

1. Both torque needles go to zero and all other engine indications are normal.

Corrective Action

1. **MONITOR TRANSMISSION OIL PRESSURE AND TEMPERATURE.**
2. **LAND AS SOON AS PRACTICABLE.**
3. If continued flight is necessary:
   a. Match N_g's.
   b. Visually check for transmission oil leak.
   c. Fly at minimum safe altitude.
   d. Maintain airspeed between 70 and 100 KIAS.
   e. Avoid high power maneuvers.

WARNING

Transmission oil loss may be occurring, including loss of oil from the auxiliary sump. When the transmission oil pressure drops to zero transmission failure is imminent. A potential fire hazard exists because of oil leakage.

4. **If transmission oil pressure drops to zero:**
   a. SPEED SELECTORS - FULL FORWARD.
   b. WHEELS - DOWN (UP OVER WATER).

c. IMMEDIATELY REDUCE COLLECTIVE TO MINIMUM AND EFFECT A POWER ON LANDING. DO NOT SPLIT Nf AND Nr DURING DESCENT OR FLARE.

TORQUEMETER INSTRUMENT POWER SUPPLY FAILURE

Symptoms

1. The same torque needle on both the pilot's and copilot's instrument does not move with power changes.

Corrective Action

1. Circuit Breakers - Check.
2. Match Ng's, continue flight as necessary.

TAIL ROTOR TAKEOFF FREEWHEELING UNIT FAILURE

Symptoms

1. Illumination of the generator and converter caution lights with the No. 2 engine in the governing range, the APU off, and the No. 1 engine not in the governing range.

Corrective Action

1. No. 2 engine - Shut Off
2. Rotor brake - On (when droop stops are in and Nr has coasted down and stabilized)
3. No. 1 engine - Shut Off
4. Complete SECURE CHECKLIST

WARNING

Do not secure the No. 1 engine until the rotor has stopped in order to maintain hydraulic pressure for control servos.

ILLUMINATION OF INTERMEDIATE AND/OR TAIL GEAR BOX CAUTION LIGHTS

Corrective Action

1. LAND AS SOON AS PRACTICABLE.

2. If continued flight is necessary:

a. Establish safe altitude and airspeed for possible loss of tail rotor drive system.

WARNING

If accompanied by strong intermediate frequency vibrations, excessive noise, or hot metal/oil fumes coming from the tail section, land immediately. Descent and approach should be made with minimum power to facilitate entry into autorotation if tail rotor drive failure occurs.

TAIL ROTOR DRIVE SYSTEM FAILURE WHILE HOVERING

Symptoms

1. Excessive vibration or noise in tail section.
2. Possible illumination of the XMSN CHIP INTMED or XMSN CHIP TAIL caution lights.
3. Helicopter yaws sharply to right.
4. Tail rotor pedals movable but with no apparent effect.

Corrective Action

1. SPEED SELECTORS - SHUT OFF.

2. MAINTAIN A LEVEL ATTITUDE.

3. CUSHION LANDING WITH COLLECTIVE.

TAIL ROTOR DRIVE SYSTEM FAILURE IN FLIGHT

Symptoms

1. Excessive vibration or noise in tail section.
2. Possible illumination of XMSN CHIP INTMED or XMSN CHIP TAIL caution lights.
3. Helicopter rolls and yaws sharply to the right.
4. Nr increases rapidly.
5. Airspeed decreases rapidly.
6. Tail rotor pedals movable but with no apparent effect.

Corrective Action

1. **ENTER AUTOROTATION IMMEDIATELY.**
2. **SPEED SELECTORS - SHUTOFF.**
3. **Nr - MAINTAIN 104%.**
4. **WHEELS - DOWN (UP OVER WATER).**
5. **CREW - ALERTED.**
6. **IFF - EMERGENCY.**
7. **DISTRESS CALL - TRANSMIT.**
8. Complete engine shutdown procedures.
9. Cockpit windows and cargo door - Open.
10. At 200 feet AGL initiate and modify a flare as necessary to reduce rate of descent and groundspeed.
11. Commence an exit from the flare no later than 75 feet AGL.
12. At about 30 feet, level helicopter and use collective to cushion landing.

WARNING

Because of the hazardous nature of the landing, consideration should be given to abandoning the helicopter if parachutes are worn and time and altitude permit.

TAIL ROTOR CONTROL LINKAGE FAILURE

In most cases of control linkage malfunction, the tail rotor will continue to rotate in a thrust condition determined by the NFG spring. Power and airspeed should be adjusted to minimize yaw angle. After touchdown be prepared to use brakes to maintain directional control as the collective is lowered.

LOSS OF LEFT AND RIGHT PEDAL CONTROL

Symptoms

1. No response when either pedal is displaced.

Corrective Action

1. **MAINTAIN CONTROLLED FLIGHT BY ADJUSTING POWER, AIRSPEED AND ATTITUDE AS NECESSARY.**
2. Attempt to control helicopter heading by turning AFCS Yaw Trim knob.
3. If heading cannot be controlled with AFCS Yaw Trim knob:
   a. Direct crewman to inspect cables.
   b. Proceed to nearest suitable landing area and adjust power and airspeed to obtain a low rate of descent approach with nose aligned in direction of landing.

LOSS OF RIGHT PEDAL CONTROL

Symptoms

1. No response when right pedal is displaced.
2. Left yaw in low power conditions.

Corrective Action

1. **MAINTAIN CONTROLLED FLIGHT BY ADJUSTING POWER, AIRSPEED AND ATTITUDE AS NECESSARY.**
2. Direct crewman to inspect cables.
3. Proceed to nearest suitable landing area and initiate a high powered approach which does not require right pedal pressure.

LOSS OF LEFT PEDAL CONTROL

Symptoms

1. No response when left pedal is displaced.
2. Right yaw in high power conditions.

Corrective Action

1. **MAINTAIN CONTROLLED FLIGHT BY ADJUSTING POWER, AIRSPEED AND ATTITUDE AS NECESSARY.**
2. Direct crewman to inspect cables.

3. Proceed to nearest suitable landing area and adjust power and airspeed to obtain a low rate of descent approach with nose aligned to the left of the flight path.

4. Prior to making a running landing, elimate yaw with increased power or right pedal pressure.

MAIN ROTOR DAMPER MALFUNCTION

Symptoms

1. If malfunction occurs during ground operations, ground resonance may be encountered.

2. If malfunction occurs during flight, low frequency or medium frequency vibrations may or may not be experienced.

Corrective Action

1. **Nr - MAINTAIN 103%.**

2. **AIRSPEED - REDUCE TO MINIMIZE VIBRATION (60 KTS Minimum).**

3. **MAKE SMALL, SMOOTH CONTROL INPUTS AND SHALLOW TURNS.**

4. **LAND AS SOON AS PRACTICABLE.**

5. Perform a shallow approach to a running landing, but if conditions do not permit, then a normal approach to a touchdown should be made with a minimum of time spent in a hover.

WARNING

During shutdown, do not increase collective or use rotor brake as this will increase the possiblility of blade to blade contact.

WARNING

Check that all personnel are clear of rotor system prior to engine shutdown.

IBIS PRESSURE WARNING

Symptoms

1. BLADE PRESS caution light illuminated.

Corrective Action

1. IBIS AC circuit breaker - Check. Reset if out.

2. **AIRSPEED - REDUCE TO MAXIMUM OF 110 KNOTS.**

NOTE

The 110 knot speed restriction will ensure, for other than a catastrophic (i.e., blade strike) failure, that flight may be continued to a destination where a safe landing can be accomplished.

3. **Nr - MAINTAIN 104%.**

4. **LAND AS SOON AS PRACTICABLE.**

5. After landing and securing the helicopter, the IBIS indicators shall be visually inspected.

   a. If any IBIS indicators show red, maintenance action is required.

   b. If all IBIS indicators are yellow, the helicopter may be flown to a location where maintenance action can be performed. Helicopter speed and flight duration restricted to 110 knots IAS and 6 hours. Refer to AIRSPEED LIMITATIONS in Section V. IBIS circuit breakers should be pulled to eliminate the BLADE PRESS caution light.

WARNING

If red is visible in any indicator, the helicopter shall not be flown until corrective maintenance has been performed.

NOTE

The BLADE PRESS caution light may illuminate if hovering in close proximity to a vessel with an operating radar. If this should occur, the vessel's radar should be secured to confirm the validity of the caution light.

NEW NEW

NEW NEW

NOTE

A protective plastic cover, designed to eliminate radiation leakage, is carried on board each aircraft and shall be placed over any red IBIS indicator to preclude radiation leakage.

ROTOR BLADE DAMAGE

If the main/tail rotor blades have been damaged by a foreign object, the helicopter shall not be flown until a thorough inspection has been accomplished by qualified maintenance personnel. If the damage was incurred in flight, the helicopter should be landed as soon as practicable at the nearest safe landing site. Possible loss of the airframe after a safe landing has been made is not sufficient cause to continue flight with rotor blade damage.

ILLUMINATION OF ROTOR BRAKE CAUTION LIGHT

Corrective Action

1. Check rotor brake handle in detent. If light remains on:

2. LAND AS SOON AS PRACTICABLE.

3. If continued flight is necessary:

   a. Visually check for rotor brake fire. If rotor brake is on fire, perform Fuselage Fire corrective action.

FLIGHT CONTROL HYDRAULIC SERVO SYSTEM FAILURE

Control of the helicopter can be maintained through either the primary or the auxiliary flight control system if one or the other should fail. However, prolonged operation on one servo system is not recommended. Either system may turned off by actuating the servo switch, provided there is at least 1000 psi hydraulic pressure in the remaining system. When one servo system fails, it should be secured. If the failure is in the primary system, airspeed should be reduced to 80 knots IAS to minimize loads on the control system. Flight should be terminated as soon as it is practical, due to the possiblility of failure of the remaining servo system. With the auxiliary servo system inoperative, the AFCS and tail rotor pedal damper will be inoperative.

FLIGHT CONTROL SERVO UNIT MALFUNCTION

A primary servo unit malfunction may be identified by a vibratory force, with or without a coupled indication, felt at the pilot's control and throughout the helicopter. An auxiliary servo unit malfunction is identified by a single or uncoupled movement without vibratory forces.

Servo Unit Malfunction

Malfunctions of the rotor servo units during flight will result in erratic behavior of the helicopter, roughness, uncontrollable maneuvers, or locking of the cyclic stick and collective pitch lever. Sometimes, it is difficult to determine whether the auxiliary or primary servo system is causing the trouble. Whenever a servo unit malfunction is encountered, control difficulties may be eliminated by turning off the system containing the malfunctioning unit. Because of the difference in location of the two servo systems, a malfunctioning primary servo unit will give different indications in the flight control system than a malfunctioning auxiliary servo unit. The three servo units of the primary servo system are located at the stationary star. All three servo units respond simultaneously and move in the same direction in response to movements of the collective pitch lever. Two of the servo units (lateral servo units) respond simultaneously, but move in opposite directions in response to lateral movements of the cyclic stick. One of the servo units (fore-and-aft servo unit) responds to the fore-and-aft movements of the cyclic stick. Since all three movements can occur simultaneously through the action of the mixing unit, the position of any primary servo unit is the result of the combined input of the cyclic stick and collective pitch lever. This results in a primary servo system in which any one servo may have an effect on both collective pitch and cyclic (lateral or fore-and-aft) pitch. The four servo units of the auxiliary servo system are located between the mixing unit and the flight controls. Each control input acts independently on the corresponding auxiliary servo. The collective pitch lever positions the collective servo. The tail rotor pedals position the directional servo. The cyclic stick positions either, or both, the fore-and-aft servo and the lateral servo. This results in an auxiliary servo system in which only one servo has an effect on collective pitch, one on fore-and-aft cyclic pitch, one on tail rotor pitch, and one on lateral cyclic pitch.

SYMPTOMS OF PRIMARY HYDRAULIC SERVO SYSTEM MALFUNCTIONS

System Pressure Loss Or Blocked Pressure Line

Due to the spring-loaded bypass poppet valve, a loss of pressure causes an interconnection between both sides of the power piston. The servo then acts as a simple mechanical link between the auxiliary servo and the control rods to the rotor head. This type of malfunction can be recognized by a small amount of slop in the cyclic and collective pitch controls.

Hydraulic Hardover

This type of primary servo malfunction may be identified by a vibratory load which may be felt in the fuselage and at the pilot's controls (cyclic and collective or cyclic only). The severity of the malfunciton and the aerodynamic forces on the rotor blades will determine the amplitudes of the resulting vibratory load. This type of vibratory load differs from a similar vibration which may be caused by a malfunctioning AFCS. The hydraulic malfunction may cause vibratory loads on the controls, resulting in helicopter displacement. Whereas, an AFCS malfunction has no effect on the pilot's controls, but may cause helicopter vibrations and/or helicopter displacement. Any vibrations caused by a malfunctioning AFCS would be eliminated by depressing the AFCS REL button or turning off the appropriate channel disengage switch.

Blocked Return Line

A return line that is completely blocked will restrain only motion of the affected servo in one direction, because of the unbalanced piston in the primary servo. The result is a ratcheting motion of the cyclic stick (motion is possible in only one direction and irrecoverable in the other). The rate of control is dependent upon the amount of blockage. Anything other than a completely blocked return line will be controllable. In any event, placing the flight control servo switch in the PRI OFF position will alleviate the difficulty.

SYMPTOMS OF AUXILIARY HYDRAULIC SERVO SYSTEM MALFUNCTIONS

System Pressure Loss or Blocked Pressure Line

Due to the spring-loaded bypass actuator, a loss of pressure causes an interconnection between both sides of the power piston. This type of malfunction can be recognized by a heavier force required to move the cyclic stick, collective pitch lever, and the tail rotor pedals, plus a loss of AFCS effectiveness.

Hydraulic Hardover

An auxiliary servo hardover is identified by control movement in a single channel, (either pitch, roll, collective or yaw channel). This is distinguished from an AFCS hardover in that the AFCS has only ±10% control authority and can easily be overcome by the pilot. Whereas, an auxiliary servo hardover can only be eliminated by shutting off the auxiliary servo system.

Blocked Return Line

If closure of a return line from the auxiliary servo unit should occur, a hydraulic lock would form in all channels, preventing control motion other than that allowed within the sloppy link. Because of the high degree of filtration and redundant porting in the servo valves, a block, due to contamination, is only a remote possibility. However, if blockage should occur, the problem can be alleviated by turning off the auxiliary servo system.

CORRECTIVE ACTION FOR SERVO UNIT MALFUNCTIONS

The effects of any malfunctioning servo can be eliminated by use of the servo switch to shut off the malfunctioning system. Both the pilot's and copilot's switches should be secured to preclude the malfunctioning system from being inadvertently re-engaged. The following action should be taken:

a. If a single or uncoupled movement, either collective pitch lever or cyclic stick, is felt at the pilot's controls without vibrations, shut off the auxiliary servo system.

b. If vibration, with or without a coupled indication, is felt in flight controls, then turn off the primary servo system.

c. If unusual movement is observed in the pedals that cannot be overridden, turn off the auxiliary servo system.

d. Land as soon as practicable.

NOTE

One exception to the rule for coupled and uncoupled indications will be that a hardover in the fore-and-aft primary servo will overpower the auxiliary servo and drive the cyclic stick (longitudinal direction) to an extreme. At the same time, due to the action of the mixing unit, a force will be applied to the collective channel of the auxiliary servo. However, the force output of this channel is sufficient to withstand the applied force and the effect will not be felt at the collective stick. The end result is symptomatic of an auxiliary servo hardover but, in this case, is actually caused by a primary servo malfunction. If the pilot reacted to this situation by turning off the auxiliary servo, the collective stick would now be forceably moved along with the cyclic stick. The corrective action at this point would be to shut off the primary system.

SERVO HYDRAULIC PRESSURE FAILURE

Loss of pressure in either the primary or auxiliary servo systems will be indicated by either of the servo hydraulic low pressure caution lights and a lower than normal operating pressure on the corresponding servo hydraulic pressure gage.

1. **SERVO SWITCHES (PILOT AND COPILOT) - OFF (AFFECTED SYSTEM).**

NOTE

When AUX servo is OFF, the AFCS is inoperative.

2. If the primary servo is the affected system, reduce airspeed to 80 knots.

3. Land as soon as practicable.

CAUTION

Loss of pressure in any of the hydraulic systems creates a potential fire hazard in the vicinity of the accessory section.

CAUTION

Illumination of a servo system caution light should be considered a serious event even though the pressure for that servo system has not failed. Illumination of the light is provided by the 1000 psi switch which interconnects the two servo systems. Failure of one servo system's 1000 psi switch would preclude securing the second system in case of subsequent failure. Pilot should land as soon as practicable.

NOTE

Because of the pressure switch interlock, it is impossible to turn off one servo system when the pressure in the other servo system is below 1000 psi.

AFCS MALFUNCTIONS

AFCS PITCH OR ROLL HARDOVER

Symptoms

1. Displacement from selected pitch or roll attitude with no corresponding movement of cyclic.
2. Displacement can easily be overridden by pilot.
3. Vertical or horizontal bars on AFCS indicator are displaced to limits.

Corrective Action

1. **FLIGHT CONTROLS - OVERRIDE THE MALFUNCTION.**
2. AFCS Indicator - analyze.
3. Pass control of aircraft to copilot.
4. Channel Monitor Panel - Disengage defective channel.
5. a. If hardover still exists and situation permits-

   (1) AFCS - Disengage.

   b. If hardover still exists and situation permits-

   (1) Servo Switches (pilot and copilot) - AUX OFF.

AFCS COLLECTIVE OR YAW HARDOVER

Symptoms

1. Aircraft is displaced from desired heading with corresponding movement in tail rotor pedal or from desired altitude with corresponding movement of collective.
2. The displacement can easily be overridden by the pilot.
3. Vertical or horizontal pointers on AFCS indicator are displaced to limits.

Corrective Action

1. **FLIGHT CONTROLS - OVERRIDE THE MALFUNCTION.**
2. AFCS Indicator - analyze.
3. Pass control of aircraft to copilot.
4. Channel Monitor Panel - Disegage defective channel.
5. a. If hardover still exists and situation permits-
   (1) AFCS - Disengage.
   b. If hardover still exists and situation permits-
   (1) Servo Switches (pilot and copilot) - AUX OFF

AFCS FAILURE

Symptoms

1. Apparent loss of AFCS effectiveness.
2. AFCS indicator displays OFF flag with bars centered.
3. AFCS engage button light extinguished.

Corrective Action

1. **FLIGHT CONTROLS - STABILIZE THE AIRCRAFT.**
2. Circuit breakers - check.
3. AFCS - attempt re-engage.

CAUTION

The stick trim master switch shall not be secured following an AFCS failure.

AFCS PHASE B FAILURE

Symptoms

1. Apparent loss of AFCS effectiveness.
2. All AFCS indicators are centered. OFF flag is not displayed for approximately 120 seconds. NEW
3. AFCS engage button light remains illuminated for approximately 120 seconds. NEW
4. AFCS phase B circuit breaker popped.

Corrective Action

1. **FLIGHT CONTROLS - STABILIZE AIRCRAFT.**
2. Circuit breakers - check/reset.
3. a. If circuit breaker does not reset-
   (1) AFCS - Disengage.

NOTE

If the AFCS phase B circuit breaker pops while the vertical gyro switch is in the STBD position, power to the pilot's attitude indicator will be lost. If the circuit breaker cannot be reset, placing the vertical gyro switch in the PORT position will restore power to the pilot's attitude indicator.

STICK TRIM SYSTEM MALFUNCTION

RUNAWAY BEEPER TRIM

Symptoms

1. Cyclic stick begins a steady movement in any direction.

Corrective Action

1. **TRIM RELEASE BUTTON - DEPRESS AND REPOSITION CYCLIC.**
   If movement continues -
2. Stick trim master switch - off.
3. Pull BEEPER TRIM circuit breaker.

LOSS OF ELECTRICAL POWER

Symptoms

1. Cyclic stick cannot be trimmed to new position.

Corrective Action

1. **CIRCUIT BREAKER - CHECK/RESET**
   a. If circuit breaker does not reset, helicopter can be flown by overriding stick trim forces.

GYRO SYSTEM MALFUNCTIONS

PORT GYRO SYSTEM (ASN-50) FAILURE

Symptoms

1. Erratic helicopter movement, sometimes violent.
2. Copilot's attitude indicator erratic.
3. HDG CARD flags may be displayed and heading cards unreliable.
4. Copilot's GYRO flag displayed.

Corrective Action

1. **FLIGHT CONTROLS - STABILIZE AIRCRAFT.**
2. **AFCS - OFF.**
3. Pass control of aircraft to copilot. (May have to use pilot's attitude indicator for reference.)
4. VERTICAL GYRO switch - STBD.
5. Yaw channel disengage switch - OFF.
6. Compass control panel - COMP mode.
7. AFCS - engage.
8. VERT GYRO Switch - OFF.

WARNING

Failure of the ASN-50 gyro may induce vibrations which could be confused with impending failure of dynamic flight control components.

NOTE

While in the COMP mode the compass cards will display correct but unstable information. The HDG CARD flags will be displayed with the VERT GYRO switch off.

NOTE

If the AFCS phase B circuit breaker pops while the vertical gyro switch is in the STBD position, power to the pilot's attitude indicator will be lost. If the circuit breaker cannot be reset, placing the vertical gyro switch in the PORT position will restore power to the pilot's attitude indicator.

NOTE

Whenever the VERT GYRO switch is off, the radar (AN/APN-195) will give a reliable presentation in straight and level flight.

NOTE

In flight, whenever the VERT GYRO switch is OFF, the doppler should be placed in STBY to prevent damage to the antenna.

SEC 03-21

PORT GYRO (ASN-50) HEADING FAILURE

Symptoms

1. Erratic heading card movements.
2. Error between wet compass and heading cards.
3. Sync indicator needle on compass control panel off center.
4. Possible yaw kicks induced by the AFCS.

Corrective Action

1. **FLIGHT CONTROLS - STABILIZE THE AIRCRAFT.**
2. Pass control of aircraft to copilot.
3. Yaw channel disengage switch - off.
4. Compass control panel - comp mode.

See o 5 -21

STARBOARD GYRO (1080Y) GIMBAL FAILURE

Symptoms

1. Pilot's attitude indicator erratic (symptoms assume VERTICAL GYRO switch is in PORT position).

Corrective Action

1. Pass control of aircraft to copilot.
2. Starboard GYRO gang bar circuit breaker - pull.

STARBOARD GYRO (1080Y) PRECESSING

Symptoms

1. Pilot must make continuous trim adjustments to keep helicopter attitude aligned with starboard gyro.
2. Pilot's attitude indicator displays a different attitude than copilot's attitude indicator.

Corrective Action

1. Pass control of aircraft to copilot.
2. Starboard GYRO gang bar circuit breaker - pull.

PORT GYRO (ASN 50) PRECESSING

Symptoms

1. Aircraft follows precessing gyro movements.
2. Copilot's attitude indicator displays different attitude than pilot's attitude indicator.

Corrective Action

1. Pass control of aircraft to copilot. (May have to use pilot's attitude indicator for reference.)
2. VERTICAL GYRO switch - STBD.
3. Yaw channel disengage switch - OFF.
4. Compass control panel - COMP mode.
5. VERT GYRO switch - OFF.

NOTE

While in the COMP mode the heading cards will display correct but unstable information. The HDG CARD flags will be displayed with the VERT GYRO switch off.

NOTE

If the ASN-50 has precessed a large amount, the helicopter may jump when the gyros are switched.

NOTE

Whenever the VERT GYRO switch is off, the radar (AN/APN-195) will give a reliable presentation in straight and level flight.

See o 5 -21

GYRO COMPASS SYNCHRONIZATION MALFUNCTION

Symptoms

1. Significant difference between wet compass readings and gyro compass displays.
2. Sync needle deflected either right or left of center.

Corrective Action

1. Pass control of aircraft to copilot.
2. Yaw channel disengage switch - OFF.
3. Push to sync button - push. Should this fail to properly sync compass:
4. Compass mode switch - COMP. If this fails to align gyro compass with the wet compass:
5. Compass mode switch ~~FREE~~ D G

5A. See o 5 -21

6. YAW channel disengage switch - ON.

CAUTION

Landing sites with abnormally strong magnetic fields may affect helicopter compass synchronization. Extended time at these areas can cause the remote compass transmitter to slew off heading. The use of the free mode during operations in the vicinity of these magnetic fields will provide proper heading information after initial departure from the site.

NOTE

When operating in COMP mode, disengage the yaw channel of the AFCS.

NOTE

When operating in the FREE mode the gyro compass cards must be initially aligned and kept aligned with the wet compass by using the push to turn switch on the compass control panel.

SEC 03-21

FUEL SUPPLY SYSTEM MALFUNCTIONS

FUEL BOOST PUMP FAILURE

CAUTION

A probable cause of fuel boost pump failure is an electrical power supply malfunction. Although the fuel system provides maximum protection against electrical fire or explosive hazards in the fuel tanks, fuel pump circuit breakers shall not be reset after popping unless absolutely necessary.

Symptoms

1. Illumination of a fuel boost pump failure caution light.

Corrective Action

1. Turn on remaining fuel boost pump in affected tank.
2. Secure failed fuel boost pump.
3. Circuit breakers - check. If not already popped, pull failed FUEL PUMP circuit breaker.

DUAL FUEL BOOST PUMP FAILURE

CAUTION

At least one fuel boost pump per engine, if not crossfeeding, is required for operation of the helicopter during any of the following conditions:

1. Above 6000 feet pressure altitude.
2. Dumping fuel.
3. Above 43°C FAT.
4. Below 600 pounds of fuel per main tank.
5. Whenever a fuel filter bypass light is illuminated.
6. Whenever a fuel low pressure caution light is illuminated.

DUAL FUEL BOOST PUMP FAILURE IN ONE MAIN TANK

Symptoms

1. Illumination of the No. 1 and No. 2 fuel boost pump failure caution lights for either the forward main tank or the aft main tank.

Corrective Action

1. Secure failed fuel boost pumps.
2. Fuel low pressure caution light - monitor.
3. Fuel requirements - analyze.
   a. If enough fuel to reach a safe landing site is not available from the non-affected tanks, continue flight and monitor fuel low pressure caution light.
   b. If enough fuel is available from the non-affected tanks to reach a safe landing site, proceed to step 4.
4. Crossfeed switch - open.
5. Turn on remaining fuel boost pump in non-affected tank.
6. Circuit breakers - check. If not already popped, pull failed FUEL PUMP circuit breakers.

7. Transfer fuel from aux tank as necessary.

AIRFRAME FUEL FILTER CONTAMINATION

Symptoms

1. FWD FUEL BYPASS and/or AFT FUEL BYPASS caution light illuminated.

Corrective Action

1. LAND AS SOON AS PRACTICABLE.

NOTE

Consideration should be given to cross-feeding fuel from the non-affected tank if appropriate.

BROKEN FUEL PROBE - MAIN TANK

Symptoms

1. One engine apparently using less fuel than indicated on fuel flow gage.

Corrective Action

1. Compute actual fuel consumption.
2. Do not crossfeed from affected tank.
3. Do not rely on fuel quantity gage.

FUEL DUMP PROCEDURES

Fuel shall not be dumped except when required by an in-flight emergency or urgent rescue operations. Except for an in-flight emergency, dumping should be accomplished from one tank at a time as loss of a generator (and consequently two fuel boost pumps) will result in insufficient fuel pressure to sustain engine operation if two dump line valves are open.

1. CREW - ALERTED

2. COMMUNICATIONS - TRANSMIT INTENTIONS AND ADVISE OF RADIO SILENCE DURING DUMPING. UPON RECEIVING ACKNOWLEDGEMENT IT IS RECOMMENDED THAT ALL ICS ROTARY SELECTOR SWITCHES BE PLACED IN THE INT POSITION.

3. CABIN HEATER VENT SWITCH - NORM.

4. HEATER - OFF.

a. HEATER BLOWER GANG BAR CIRCUIT BREAKER - PULL

5. NO SMOKING.

6. AFT RAMP - CLOSED.

7. ALL FUEL BOOST PUMPS - ON.

8. CROSSFEED SWITCH - OPEN.

9. DIRECT CREW TO OPEN ONE OR BOTH MANUAL FUEL DUMP VALVES.

10. DIRECT CREW TO VISUALLY CHECK FUEL DUMPING.

11. MONITOR LOW FUEL PRESSURE CAUTION LIGHTS.

12. FUEL QUANTITY GAGES - MONITOR.

NOTE

Due to increased fuel flow, fuel boost pump failure caution lights and fuel bypass caution lights may illuminate.

NOTE

When securing fuel dumping visually check that fuel flow has stopped. Fuel will continue to flow for several minutes after manual dump valves are closed.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

For indications of malfunctions in the electrical system see Figure 3-1.

GENERATOR FAILURE

Symptoms

1. No. 1 or No. 2 generator caution light illuminated.
2. Selected No. 2 Fuel Boost Pump, Failure Caution Light illuminated.

Corrective Action

1. Generator switch - OFF/RESET, then ON. Should this fail to restore power:

COMPONENT FAILURE	FAILURE INDICATION	ACTION WITHIN SYSTEM	NO. 1 AND 2 PRIMARY AC BUS LOADS	NO. 1 AND 2 MONITOR AC BUS LOADS	PRIMARY DC BUS	MONITOR DC BUS	BATTERY BUS
No. 1 GENERATOR	No. 1 Generator Caution Light	Automatic Transfer of No. 1 Primary AC Bus Loads to No. 2 Generator	Retained	Dropped	Retained	Dropped	Retained
No. 2 GENERATOR	No. 2 Generator Caution Light	Automatic Transfer of No. 2 Primary AC Bus Loads to No. 1 Generator	Retained	Dropped	Retained	Dropped	Retained
No. 1 and 2 GENERATORS	All Generator and Converter Caution Lights (With Battery Switch On)	No. 1 and 2 Primary and Monitor AC Buses- *Primary and Monitor DC Buses Automatically Dropped	Dropped	Dropped	Retained (With Battery Switch On)	Dropped	Retained
No. 1 CONVERTER	No. 1 Converter Caution Light	No. 2 Converter Takes Over Entire Primary DC Bus Load	Retained	Retained	Retained	Dropped	Retained
No. 2 CONVERTER	No. 2 Converter Caution Light	No. 1 Converter Takes Over Entire Primary DC Bus Loads	Retained	Retained	Retained	Dropped	Retained
No. 1 and 2 CONVERTER	No. 1 and 2 Converter Caution Light (With Battery Switch On)	*Primary and Monitor DC Buses Automatically Dropped	Retained	Retained	Retained (With Battery Switch On)	Dropped	Retained

*With the battery switch ON, the battery will supply power to the primary dc bus, the battery need not be ON to supply power to the battery bus.

Figure 3-1. Electrical Power Supply System Malfunction Data

2. Both No. 1 fuel boost pump switches - ON.
3. Generator switch - OFF.
4. **LAND AS SOON AS PRACTICABLE.**

WARNING

Generator failure, if caused by a mechanical malfunction of the generator, can become a potential fire hazard.

WARNING

Impending mechanical failure of either generator may be accompanied by medium to high frequency vibrations without the associated generator caution light illuminated.

NOTE

If both generators fail the only remaining source of power will be the battery which will supply sufficient power to operate equipment required for VFR flight for approximately 15 minutes. Turn off all unnecessary electrical equipment.

NO. ONE SUPERVISORY PANEL MALFUNCTION

Symptoms (assume VERTICAL GYRO switch in PORT position)

1. No. 1 Converter caution light on.
2. Illumination of the selected No. 2 fuel boost pump failure caution light.
   a. If the No. 1 fuel boost pump is being used or is selected in the forward main tank, its failure caution light will also be on.
3. Loss of all equipment powered by the No. 1 AC primary bus as shown in Figure FO-6.
   a. Obvious cockpit indications of the equipment lost:
      (1) Loss of AFCS with no OFF flag displayed on the AFCS indicator for approximately 120 seconds.
      (2) HDG CARD flags displayed on both pilot's and copilot's course indicators.
      (3) GYRO flag displayed on copilot's attitude indicator.
      (4) No. 1 engine oil pressure and transmission oil pressure gauges at zero.
      (5) Both No. 1 torque needles "frozen."
      (6) Illumination of the RADIO XFMR caution light.
      (7) Illumination of the BLADE PRESS caution light.
      (8) See 03-21 Port Gyro Cage Light

NOTE

If the Vertical Gyro select switch is in the STBD position, power to the pilot's attitude indicator will be lost.

4. Loss of the equipment powered by all monitor buses.

Corrective Action

1. No. 1 generator switch - OFF.
2. Both No. 1 fuel boost pump switches - ON.
3. Land as soon as practicable.

WARNING

If either No. 1 or No. 2 supervisory panel malfunctions and the helicopter is operating in one of the conditions which requires one fuel boost pump per main tank as listed on page 1-0, an engine flameout may occur unless the proper corrective action is taken without delay.

CAUTION

If either ac primary bus is lost for any period of time, do not attempt to reset the affected generator as circuit protection is lost with failure of the supervisory panel. A potential fire hazard exists if the generator is reset.

NOTE

If either ac primary bus is lost for any period of time and then recovered, warning flags may appear for a short period on the associated gyro indicator.

NO. TWO SUPERVISORY PANEL MALFUNCTION

Symptoms

1. No. 2 converter caution light on.
2. Illumination of the selected No. 2 fuel boost pump failure caution light.
   a. If the No. 1 fuel boost pump is being used or is selected in the aft main tank, its failure caution light will also be on.
3. Loss of all equipment powered by the No. 2 AC primary bus as depicted in Figure FO-6.
   a. Obvious cockpit indications of the equipment lost:
      (1) GYRO flag displayed on pilot's attitude indicator.
      (2) No. 2 engine oil pressure gauge at zero.
      (3) Both No. 2 torque needles "frozen."
4. Loss of the equipment powered by all monitor buses.

Corrective Action

1. No. 2 generator switch - OFF.
2. Both No. 1 fuel boost pump switches - ON.
3. Land as soon as practicable.

CONVERTER FAILURE

Symptoms

1. No. 1 or No. 2 converter caution light illuminated.

Corrective Action

1. Circuit breaker - check. Reset if out.
2. Failed converter switch - OFF then ON. Should this fail to restore power:
3. Good converter switch - OFF the ON. Should this fail to restore power:
4. Failed converter switch - OFF
5. Circuit breaker - Pulled

CAUTION

If the battery has been secured, following this procedure may result in the momentary loss of the dc primary bus. If the failed converter will not reset, consideration should be given to increasing the dc load (i.e., turn on searchlight) rather than cycling the good converter to attempt to regain the failed converter.

NOTE

When both generators or converters fail, the battery is the only source of dc power available and all equipment not absolutely necessary should be turned off by pulling the applicable circuit breakers. Under normal conditions, the battery will provide sufficient power to operate equipment required for VFR flight for approximately 15 minutes.

RADIO AUTOTRANSFORMER FAILURE

Symptoms

1. RADIO XFMR caution light illuminated.
2. Failure of following equipment:
   a. Pilot's course indicator azimuth card, and RMI card frozen.
   b. Pilot's and copilot's #1 and #2 needles frozen.
   c. TACAN - azimuth and DME cockpit displays frozen or slowly oscillating.
   d. Doppler.
   e. Heading inputs to computer (AYN-1).
   f. VOR inputs to both pilot's and copilot's flight director (AYN-2).

Corrective Action

1. Radio XFMR switch - position to number 1.
2. Circuit breakers - check, reset if out.

AUTOTRANSFORMER FAILURE (NO. 1 AC PRI BUS)

Symptoms

1. Loss of the following INDICATORS:
   a. Copilot's course indicator azimuth card and RMI card frozen.
   b. No. 1 torque needles frozen.
   c. No. 1 engine oil pressure at zero.
   d. Transmission oil pressure at zero.
   e. Primary hydraulic pressure frozen.

Corrective Action

1. Circuit breakers - check - reset if out.
2. a. If unable to reset
   (1) Land as soon as practicable.

AUTOTRANSFORMER FAILURE (NO. 2 AC PRI BUS)

Symptoms

1. Loss of the following INDICATORS:
   a. No. 2 torque needles frozen.
   b. No. 2 engine oil pressure at zero.
   c. Utility hydraulic pressure frozen.
   d. Auxiliary hydraulic pressure frozen.

Corrective Action

1. Circuit breakers - check, reset if out.
2. a. If unable to reset
   (1) Land as soon as practicable.

BATTERY OVER-TEMPERATURE

Symptoms

1. BAT OVTEMP caution light on.

Corrective Action

1. **BATTERY SWITCH - OFF**

NOTE

If the BAT OVTEMP caution light goes off after a period of time, the battery should be left off unless absolutely needed and the following procedures shall be completed.

2. Land as soon as practical.
   a. Upon landing at a location where a replacement battery or dc external power is not available, start the APU, secure the engines and rotor, leave the generators and converters ON and complete the following procedures.
3. The battery compartment shall be opened by a properly outfitted (face, hand, and body protective clothing) crewmember or crashcrewman, when available, who will observe the battery for thermal runaway conditions.
   a. If these conditions do not exist and a replacement battery cannot be obtained, the helicopter may be flown to a location where the battery can be replaced. The battery switch should be left OFF unless the battery is absolutely needed.
   b. If thermal runaway conditions exist, secure the aircraft and follow procedures for BATTERY THERMAL RUNAWAY.

BATTERY THERMAL RUNAWAY

Symptoms

1. Smoke or fumes from battery compartment.
2. Sounds described as "bangs" or 'thuds" coming from the battery.
3. Leakage of electrolyte in battery compartment area.

Corrective Action (to be performed by a properly outfitted crewman or crashcrewman when available.)

1. Standby with fire fighting equipment.
2. Check for the following conditions and take the action indicated:
   a. If flame is present, use any available extinguishing agent.
   b. If no flame or fire, but smoke, fumes or electrolyte is being emitted from the battery or vent tubes, use water fog to lower the battery temperature.
   c. If no flame, smoke, hydrogen/oxygen gases or electrolyte is being emitted from the battery or vent tubes, ventilate.

WARNING

In no case should CO_2 be directed into a battery compartment to effect cooling or displace explosive gases. The static electricity generated by CO_2 could cause the hydrogen/oxygen gases trapped in the compartment to explode. CO_2 is an acceptable fire extinguishing agent once a fire has developed.

3. Remove the quick disconnect fitting.
4. Remove battery.
   a. Additional cooling may be accomplished with water fog.

UTILITY HYDRAULIC PRESSURE LOSS

Symptoms

1. A fluctuating or zero indication of utility system pressure.
2. Unable to operate:
   a. Wheels
   b. Hoist
   c. Ramps

Corrective Action

1. **VISUALLY CHECK AIRCRAFT FOR LEAKS.**
2. **LAND AS SOON AS PRACTICABLE.**
3. Wheels - may be lowered (once) by use of alternate gear handle.
4. Ramp operation - manual only.

WARNING

Utility hydraulic system pressure loss could result from a leak or a pump failure, either of which creates a potential fire hazard.

LANDING GEAR EMERGENCIES

NOSEWHEEL FAILS TO RETRACT

Symptoms

1. Red light in handle.
2. Green nose wheel position light on.

Corrective Action

1. Wheels - down.
2. Land as soon as practicable.
3. If urgency of mission dictates, continue with the flight and attempt to restore proper nosewheel operation by:
   a. Circuit breakers - check.
   b. Landing gear handle - recycle.
4. Nose gear kneel switch - cycle.
5. Direct crewman to tap kneeling valve.
6. If problem still exists, the pilot may decide to fly the helicopter with either the nosewheel down or with all wheels down.

NOSEWHEEL FAILS TO EXTEND

Symptoms

1. Red light in gear handle.

2. Nosewheel position light out.

Corrective Action

1. Landing gear handle - cycle.
2. Landing gear main circuit breaker - pull and reset.
3. Nose gear kneel switch - cycle.
4. Direct crewman to tap on kneeling valve.
5. If all the above fails

   a. Alternate gear handle - pull.

WARNING

The helicopter may be landed with the nose wheel retracted; however, no ground taxiing should be attempted. Blade to ground clearance in front of the helicopter is greatly reduced.

CAUTION

Do not cycle the landing gear handle after using the alternate gear extension system.

MAIN WHEELS FAIL TO LOWER

Symptoms

1. Red light in landing gear handle fails to extinguish.
2. Associated main landing position light not illuminated.
3. Main landing wheel visually checked not in down and locked position.

Corrective Action

1. Landing gear handle - recycle.
2. Circuit breakers - check.
3. Alternate gear handle - pull.

CAUTION

Do not cycle landing gear handle and/or do not reset circuit breakers after using alternate gear extension system.

NOSEWHEEL SHIMMY DAMPER FAILURE

Symptoms

1. Lateral vibration when performing run on/off maneuvers and in high speed taxiing. These vibrations may be quite violent.

Corrective Action

1. **LIFT AIRCRAFT OFF GROUND IMMEDIATELY/OR REDUCE TAXI SPEED.**
2. Make vertical landings or takeoffs as required.

VHF NAVIGATION RECEIVER FAILURE

Symptoms (VOR MASTER and VOR SLAVE selected.)

1. VOR-LOC flags displayed on pilot's flight director system.
2. No audio on VHF NAV.
3. Noticeable difference in VOR NAV displays from displays provided by backup navigation aids, i.e., TACAN, ADF.

Corrective Action

1. Attempt to retune desired nav aid.
2. Attempt to tune in another VOR station.
3. Circuit breakers - check.
4. If VHF navigation is imperative, secure both VHF NAV and VHF COMM and direct radioman to switch the receivers.

WARNING

There will be no VOR-LOC flags displayed on the copilot's flight director system. His flight director system will automatically display TACAN information if a TACAN station is tuned and being received.

FIRE

APU COMPARTMENT FIRE

Symptoms

1. APU fire warning light illuminated. On helicopters modified by 1H-3(H) F-563 an APU FIRE caution light will also be illuminated on the Caution-Advisory Panel along with the master caution lights.

2. Possible hand or voice signals from ground crew.

Corrective Action

1. **CONFIRM PRESENCE OF FIRE (GROUND CREW ALERTED).**

2. **APU EMERGENCY FUEL SHUTOFF SWITCH - SHUT OFF.**

3. **APU FIRE EXTINGUISHER SWITCH - FIRE EXTING.**

4. **APU MASTER SWITCH - OFF.**

ENGINE COMPARTMENT FIRE

Symptoms

1. Master fire warning light illuminated.

2. T-handle fire warning light illuminated.

3. Possible hand or voice signals from ground crew.

Corrective Action

In Flight

1. **CONFIRM PRESENCE OF FIRE (ALERT CREW).**

2. **SPEED SELECTOR (AFFECTED ENGINE) - SHUT OFF.**

3. **T-HANDLE (AFFECTED ENGINE) - PULL.**

4. **FIRE EXTINGUISHER - MAIN OR/AND RESERVE.**

5. **SPEED SELECTOR (GOOD ENGINE) - FULL FORWARD.**

6. **WHEELS - DOWN (UP OVER WATER).**

7. **(COMPLETE ENGINE SHUTDOWN PROCEDURES.)**

8. **LAND AS SOON AS PRACTICABLE.**

9. **IF FIRE BECOMES UNCONTROLLABLE - BAIL OUT.**

WARNING

At simultaneous or consecutive engine compartment fires, the last T-handle pulled selects the compartment into which the fire extinguishing agent will enter. After an engine fire, do not reset the pulled T-handle.

NOTE

Engine fire warning lights may illuminate due to hovering downwind or when hovering for extended periods of time on a hot day.

NOTE

The close proximity of both engine compartment fire detection elements make it possible for indications of a fire to be transmitted from one compartment to the other and thus, producing false dual-engine fire indications in the cockpit.

Corrective Action On Ground

1. **CONFIRM PRESENCE OF FIRE (GROUND CREW ALERTED).**

2. **SPEED SELECTORS - SHUT OFF.**

NOTE

If ac power is lost at this point the engine compartment fire detection system becomes inoperative.

3. **T-HANDLE (AFFECTED ENGINE) - PULL.**

4. **FIRE EXTINGUISHER - MAIN OR/AND RESERVE.**

5. Complete engine shutdown procedures.

6. Secure helicopter.

7. Exit helicopter.

ENGINE POST-SHUTDOWN FIRE

Symptoms

1. T_5 indicates above 300°.

Corrective Action

1. **IGNITION SWITCH (AFFECTED ENGINE) - OFF.**
2. **STARTER BUTTON - DEPRESS.**
3. Motor engine until T_5 below 200°.
4. Starter - disengage.

FUSELAGE FIRE

Corrective Action

1. **ALERT CREW AND DESIGNATE CREW MEMBER TO FIGHT FIRE.**
2. **WINDOWS - CLOSED.**
3. **CARGO DOOR AND RAMP - CLOSED.**
4. **CABIN HEATER VENT SWITCH - NORM.**
5. **HEATER - OFF.**
   a. **HEATER BLOWER GANG BAR CIRCUIT BREAKER - PULL.**
6. **LAND AS SOON AS PRACTICABLE.**
7. **IF FIRE BECOMES UNCONTROLLABLE - BAIL OUT.**

ELECTRICAL FIRE

Corrective Action

1. **ALERT CREW AND DESIGNATE CREW MEMBER TO FIGHT FIRE.**
2. **AFFECTED EQUIPMENT - OFF.**
3. **CIRCUIT BREAKERS (for affected circuits) - PULL. If fire persists -**
4. **GENERATOR SWITCHES - OFF.**
5. **BATTERY SWITCH - OFF.**
6. **LAND AS SOON AS PRACTICABLE.**

WARNING

The severity of the fire and actual flight conditions (night/instrument) will dictate the immediate procedures to be followed. It may not be advisable to secure all electrical power, thus losing AFCS and flight instruments, prior to achieving VFR conditions.

SMOKE AND FUME ELIMINATION

Corrective Action

1. **CARGO DOOR - OPEN.**
2. **COCKPIT WINDOWS - OPEN.**
3. Land as soon as practicable.

WARNING

If fuel fumes are present, communications should be limited, if possible, to transmission of intentions.

CAUTION

To prevent the venting of fumes through the cockpit, do not open the cockpit windows if cargo door is closed.

CAUTION

To avoid the possibility of any rotor blade damage, do not jettison any windows or the cargo door while the helicopter is in forward flight.

NOTE

Normally no toxic quantities of carbon monoxide gas or other gases are present from the engine exhaust. Objectionable odors of the engine exhaust gases, which are sometimes encountered in the helicopter during ground runup, taxiing, slow speed flight or single engine flight with one engine in ground idle, may be avoided by heading the helicopter into the wind and/or closing the pilot's compartment window, cargo door, and the ramp. Opening the cargo door and the pilot's compartment windows in flight will assist in removing objectionable fumes and odors.

BAILOUT

Bailout is recommended only if it is impossible to make a safe emergency landing. Bailout is possible either in level flight or autorotation.

WARNING

To avoid contacting sponsons during bailout, the following speeds should not be exceeded:

140 KIAS MAXIMUM POWERED FLIGHT

125 KIAS MAXIMUM AUTOROTATIVE.

1. **AIRSPEED - 70 KIAS.**
2. **ATTITUDE - LEVEL.**
3. **WHEELS - UP.**
4. **CARGO COMPARTMENT OCCUPANTS - ALERTED.**
5. **CARGO DOOR - OPEN (If cargo door will not open pull emergency handle and jettison door).**

NOTE

The pilot may, at his discretion, open the rear ramp in flight and have personnel bail out through the ramp exit. However, do not allow more than one person on the ramp at a time, to avoid a CG problem. Minimum bailout altitude should be 1000 feet AGL.

6. **CARGO COMPARTMENT OCCUPANTS - BAIL OUT.** Cargo compartment occupants dive down and out of the cargo door exit, arms close to body, and head down. Wait until clear of the helicopter before pulling the ripcord to avoid fouling the parachute.
7. **PILOT AND COPILOT - BAIL OUT** (The pilot should trim the helicopter for level flight).
   a. Copilot exit through cargo door.
   b. Pilot may exit either through the pilot's window or the cargo door, as circumstances dictate. If exit is through window, proceed as follows:
      (1) Pilots compartment sliding window - jettison.
      (2) Place both feet in seat, hands on either side of window frame.
      (3) Dive out and down.
8. **OPEN PARACHUTE WHEN CLEAR OF AIRCRAFT.**

EMERGENCY WATER LANDING PROCEDURES

BEFORE LANDING

1. **CREW - ALERTED.**
2. **DISTRESS CALL - TRANSMIT.**
3. **IFF - EMERGENCY.**

4. CARGO DOOR AND COCKPIT WINDOWS - OPEN.

a. If time permits, remove and stow sponson emergency exit windows.

5. LANDING CHECKLIST - PERFORM.

AFTER LANDING

1. AUX FLOTATION BAGS - DEPLOYED.
SEE MSG 191707 Z Aug 80

2. Wheels - down to lower center of gravity.

3. Anchor/sea anchor - deployed if required.

CAUTION

If an Emergency Water Landing was due to complete loss of oil from the main transmission, limit APU operation to emergency requirements only.

CAUTION

Without the stability and control afforded by the rotating blades, the helicopter may not right itself from a roll greater than approximately 25°.

4. Aux flotation collars - deployed if available and required.

NOTE

Since initial purchase of auxiliary flotation collars does not provide a set for each helicopter, it is possible that collars will have to be delivered to the downed helicopter. Detailed installation instructions are contained in the salvage section of TO 1H-3(H)F-2-2.

a. Remove and stow over sponson emergency exits.

b. Adjust gunner's belt to reach all portions of the sponson.

c. Secure power to HF and LORAN.

d. Crewmember with gunner's belt, move out onto sponson. Second crewmember pass appropriate collar out window.

e. If required, remove HF and LORAN antennas.

f. Connect flotation collars to sponson hardpoints in numerical sequence.

g. Inflate both collars simultaneously by use of the yellow lanyards.

CAUTION

If simultaneous inflation does not occur, the up-setting movement will increase and, dependent upon sea state, roll-over may result. If the primary and secondary systems fail to operate on one side, deflate the opposite side.

h. Rig secondary inflation system (lanyards for secondary system are green).

CAUTION

Do not inflate secondary unless primary compartment is completely deflated. If primary compartment deflation is imminent, carefully rupture outside skin and then inflate secondary compartment.

5. Bilge pump - rigged. Some water in the bilge is desirable as the added weight helps lower the center of gravity. The bilge pump should be used when severe flooding occurs.

CAUTION

If immediate evacuation is necessary upon water contact, secure engines and rotor system before personnel leave the helicopter. If immediate evacuation is not required, consideration should be given to taxiing the helicopter to shore or taxiing until surface assistance arrives. If eventual engine and rotor shutdown is required, the rotor should be allowed to coast down to a stop. If blade to surface contact is probable, apply the rotor brake at as low an RPM as conditions will permit.

SEE SS-24

TOWING OF HELICOPTER ON WATER

The recommended attachment point for a towline is the bow eye on the nose fitting. Use approximately 100 feet of towline to prevent surging up on the tow boat. Tow speeds up to 4 knots may be used depending on sea conditions. Since the helicopter will drift downwind more rapidly than a boat, the boat should stay to the windward. If a parachute type sea drogue (or Danforth anchor) is or can be streamed, one recommended procedure is to have the boat retrieve the anchor line and use it as a towline.

CAUTION

Avoid heading parallel to troughs of waves as this may cause excessive roll.

CAUTION

Use care to avoid damage to helicopter when tow boat comes alongside to pass a line, as boat handling personnel may not be experienced in tow operations.

CAUTION

During towing operations the sea drogue should be streamed out the aft ramp to assist in stabilizing the helicopter.

EMERGENCY ENTRANCES AND EXITS

(Refer to Figure FO 10)

COCKPIT SLIDING WINDOWS

Manual emergency release handles, marked EMERGENCY RELEASE PULL, are on the lower forward edge of each window inside the cockpit. The windows can be jettisoned by pulling the release handle up and pushing the window out.

The windows can also be released from the outside by levers, marked EMERGENCY RESCUE-PRESS BUTTON-TURN HANDLE PULL WINDOW OUT. The release lever is pushed in on one end, which causes the handle to extend outward. The handle is then pulled downward to release the window assembly. After release, the window will have to be pulled from the helicopter.

LEFT SEARCH STATION WINDOW

The window, on the left forward side of the cargo compartment, may be jettisoned to provide an emergency exit. The window is released by turning the release lever marked EMERGENCY EXIT-TURN PUSH, on the bottom of the window, and pushing out.

The window may be removed from the outside by pulling down on the release lever marked EXIT RELEASE PULL DOWN, and pulling the window out.

CARGO DOOR

An emergency release handle, marked EMERGENCY EXIT RELEASE TURN, is on the inside top center of the door. The door can be jettisoned by pulling down on the handle and pushing out on the door.

The door can be removed from the outside by turning the lever marked EMERGENCY RESCUE TURN HANDLE PULL OUT, at the top of the door, and pulling the door out.

CARGO COMPARTMENT WINDOWS

A jettisonable window is located over each sponson. To open, turn handle below window, marked EMER EXIT, TURN PUSH. The window must then be pushed out. The modified windows may be opened from the outside by pulling down on the handle below the window marked EXIT RELEASE PULL DOWN, and pulling the window out.

NOTE

The windows immediately forward and aft of the sponsons do not provide emergency entrances and exits, as they are permanently installed.

RAMP

Emergency exit can be accomplished through the aft ramp by pulling the handle marked EMERGENCY EXIT RELEASE HANDLE, on the starboard aft wall of the cargo compartment. The aft ramp can also be opened from the outside by pulling and holding down on the chain handle marked RAMP RELEASE, on the bottom of the tail pylon.

EMERGENCY EQUIPMENT

PORTABLE FIRE EXTINGUISHERS

One hand-operated (CO_2) fire extinguisher (6, Figure FO-10) is in the cockpit on the bulkhead behind the pilot's seat. A second (CO_2) fire extinguisher (13, Figure FO-10) is on the right side above the ramp. The extinguishers are held in place by a bracket with a tight fitting quick release spring.

FIRST AID KITS

One first aid kit (5, Figure FO-10) is mounted in the cockpit on the bulkhead behind the pilot's seat. Five additional kits are installed in the cabin, one on the left (3, Figure FO-10) and four on the right side (8, 9, 10, 11, Figure FO-10). Each kit is held in place by a metal frame and supporting clips.

CRASH AXE

One crash axe (4, Figure FO-10) is below the step at the cockpit entrance, secured by a bracket and strap.

LIFE RAFTS

There are provisions for stowage of two MK-7 life rafts on the aft cargo ramp (1 and 14, Figure FO-10).

PARACHUTE AND LIFE JACKET STOWAGE

There are provisions for the stowage of twelve QAC parachutes, six on each side of the cargo compartment. Hangers are provided below the aft radio rack for stowage of parachute harnesses and life jackets. The cockpit seats are designed to accommodate back pack parachutes.