EMERGENCY PROCEDURES

SECTION I. HELICOPTER SYSTEMS

9-1. HELICOPTER SYSTEMS.

This section describes the helicopter systems emergencies that may reasonably be expected to occur and presents the procedures to be followed. Emergency operation of mission equipment is contained in this chapter insofar as its use effects safety of flight. Emergency procedures are given in checklist form when applicable. A condensed version of these procedures is contained in the condensed checklist.

9-2. IMMEDIATE ACTION EMERGENCY STEPS.

NOTE

The urgency of certain emergencies requires immediate and instinctive action by the pilot. The most important single consideration is helicopter control. All procedures are subordinate to this requirement. The MASTER CAUTION should be reset after each malfunction to allow systems to respond to subsequent malfunctions. If time permits during a critical emergency, transmit MAYDAY call, set transponder to emergency, jettison external stores if appropriate, and lock shoulder harnesses.

Those steps that must be performed immediately in an emergency situation are underlined. These steps must be performed without reference to the checklist. When the situation permits, nonunderlined steps will be accomplished with use of the checklist.

9-3. DEFINITION OF EMERGENCY TERMS.

For the purpose of standardization, the following definitions shall apply:

a. The term LAND AS SOON AS POSSIBLE is defined as landing to the nearest suitable landing area (e.g., open field) without delay. (The primary consideration is to ensure the survival of occupants.)

b. The term "LAND AS SOON AS PRACTICABLE" is defined as landing at a suitable landing area. (The primary consideration is the urgency of the emergency.)

c. The term AUTOROTATE is defined as adjusting the flight controls as necessary to establish an autorotational descent and landing.

1. Collective - Adjust as required to maintain rotor RPM.

2. Pedals - Adjust, crab or slip as required.

3. Throttle - Adjust. Close as required.

4. Airspeed - Adjust as required.

d. The term EMER SHUTDOWN is defined as engine shutdown without delay.

1 .Throttle - Close.

2. Fuel Valve Handle - OFF.

3. BAT switch - OFF. Before turning the battery switch off during in-flight emergencies requiring EMER SHUTDOWN, the pilot should consider a "MAYDAY" call, transponder, emergency, and the possible adverse effects of total electrical failure.

NOTE

Total electrical failure in the OH-58C will result in loss of rotor RPM indications.

9-4. AFTER EMERGENCY ACTION.

After a malfunction of equipment has occurred, appropriate emergency actions have been taken and the helicopter is on the ground, an entry shall be made in the Remarks section of DA Form 2408-13 describing the malfunction. Ground and flight operations shall be discontinued until corrective action has been taken.

9-5. EMERGENCY EQUIPMENT.

A fire extinguisher and first aid kit (figure 9-1) are mounted on the right of the center post behind the pilot seat.

9-6. EMERGENCY EXITS/EMERGENCY ENTRANCE.

Emergency exits are shown in figure 9-1. Emergency jettison handles are yellow. To exit the aircraft in an emergency, first attempt to open doors. If doors will not open, use emergency jettison handles. The crew doors can be jettisoned by pulling the yellow handles to the aft position and the cabin doors by moving t yellow handles to the forward position. If doors WILL not jettison, break plexiglas to exit the aircraft.

9-7. ENGINE MALFUNCTION - PARTIAL OR COMPLETE POWER LOSS.

a. The indications of an engine malfunction either a partial or a complete power loss, are: left yaw, drop in engine RPM, drop in rotor RPM, low RPM audio alarm, illumination of the ROTOR RPM warning light, ENGINE OUT warning light, and change in engine noise.

WARNING

Do not respond to the RPM audio and/or warning light illumination without first confirming engine malfunction by one or more of the other indications. Normal indications signify that the engine is functioning properly and that there is a tachometer generator failure or an open circuit to the warning system, rather than an actual engine malfunction.

b. Flight Characteristics:

1. Control response with an engine inoperative is similar to a descent with power.

2. Airspeed above the minimum rate of descent from autorotational glide characteristics chart (figure 9-2) will result in greater rates of descent but may be used as necessary to extend glide distance.

3. Airspeeds below minimum rate of descent airspeeds will increase rate of descent and decrease glide distance.

4. Should the engine malfunction during a left bank maneuver, right cyclic input to level the aircraft must be made simultaneously with collective pitch adjustment. If the collective pitch is decreased without a corresponding right cyclic input, the helicopter will pitch down and the roll rate will increase rapidly, resulting in a significant loss of altitude.

c. Partial Power Condition. Under partial power conditions, the engine may operate smoothly at reduced power or it may operate erratically with intermittent surges of power. In instances where a power loss is experienced without accompanying power surging, the helicopter may be flown at reduced power to a suitable landing area. Under this condition, the pilot should always be prepared for a complete power loss. In the event a partial power condition is accompanied by erratic engine operation or power surging, and flight is to be continued, the throttle may be adjusted in an attempt to correct the surging condition. If flight is not possible, close the throttle completely and complete an autorotational landing.

d. Complete Power Loss. Under a complete power loss condition, delay in recognition of the malfunction, improper technique or excessive maneuvering to reach a suitable landing area reduces the probability of a safe autorotational landing. Flight conducted within the avoid area of the chart (figure 9-3) exposes the helicopter to a high probability of damage despite the best efforts of the pilot.

e. Low Airspeed and Low Altitude. Under low altitude low airspeed conditions, the deceleration capability is limited, and caution should be used to avoid striking the ground with the tail rotor. Initial collective reduction will vary after an engine malfunction, dependent upon the altitude and airspeed at the time of the occurrence. For example, collective should not be decreased when an engine failure occurs at a hover below 15 feet; whereas, during cruise flight conditions, altitude and airspeed are sufficient for a significant reduction in collective, thereby, allowing rotor RPM to be maintained in the safe operating range during autorotational descent. The rotor may overspeed and require collective pitch application to maintain the RPM below the upper limit. Collective should never be applied to reduceRPM below normal limits for extending glide distance because of the reduction in RPM available for use during autorotational landing.

9-8. MINIMUM RATE OF DESCENT- POWER OFF.

The power-off minimum rate of descent is attained at an indicated airspeed of 43 knots and 100% rotor RPM. Refer to figure 9-2, autorotational glide characteristics chart.

9-9. MAXIMUM GLIDE DISTANCE- POWER OFF.

The maximum glide distance is attained at an indicated airspeed of 71 knots and 100% rotor RPM. Refer to figure 9-2 for maximum glide distance.

9-10. ENGINE FAILURE - HOVER.

1. Autorotate.

9-11. ENGINE FAILURE- LOW ALTITUDE/LOW AIRSPEED OR CRUISE.

1. Autorotate.

2. EMER SHUTDOWN. Accomplish during descent if time permits.

9-12. ENGINE RESTART - DURING FLIGHT.

After an engine failure in flight, an engine start may be attempted. Because the exact cause of engine failure cannot be determined in flight, the decision to attempt the start will II depend on the altitude and time available, rate of descent, potential landing areas, and crew assistance available. Under ideal conditions, approximately one minute is required to regain powered flight from the time the attempted start is begun. If the decision is made to attempt an in-flight start a:

1. Throttle - Close.

2. Attempt start.

3. Land as soon as possible.

9-13. ENGINE COMPRESSOR STALL.

Engine compressor stall may be characterized by a sharp rumble or a series of loud sharp reports, severe engine vibration and a rapid rise in TOT depending on the severity of the surge. After engine compressor stall, maneuvers requiring rapid or maximum power applications should be avoided. Should engine compressor stall occur:

1. Collective - Reduce.

2. ENG DEICE and HTR switches - OFF.

3. Land as soon as possible.

9-14. ENGINE OVERSPEED.

Engine overspeed will be indicated by a right yaw, rapid increase in both rotor and engine RPM, and an increase in engine and rotor noise. If an engine overspeed is experienced:

1. Collective - Increase to load the rotor and sustain engine/rotor RPM below the maximum operating limit.

2. Throttle - Adjust until normal operating RPM is attained.

3. Land as soon as possible. Perform a power-on approach and landing by controlling the RPM manually with throttle.

If RPM cannot be controlled manually:

4. Autorotate when over a safe landing area.

5. EMER SHUTDOWN. Accomplish during descent if time permits.

9-15. ENGINE UNDERSPEED.

a. If an engine underspeed occurs, the collective must be adjusted downward to maintain rotor RPM within limits. If powered flight with rotor in the green can be accomplished, land as soon as possible in an area that will permit a run-on landing.

b. An engine underspeed below 94% N2 results in rotor RPM decay below minimum safe limits. Should this occur:

1. Autorotate.

2. EMER SHUTDOWN. Accomplish during descent, if time permits.

9-16. ENGINE SURGES.

If surges in engine RPM are experienced:

1. GOV INCR switch- INCR for maximum RPM.

2. Throttle-Adjust to 98%N2.

3. Land as soon as possible.

If engine surges are not controlled in steps 1 and 2 above, proceed as follows:

4. Autorotate - when over safe landing area.

5. EMER SHUTDOWN. Accomplish during descent if time permits.

9-17. ROTORS, TRANSMISSION, AND DRIVE SYSTEMS MALFUNCTIONS.

9-18. TAIL ROTOR FAILURE AND DIRECTIONAL CONTROL MALFUNCTIONS.

Because of the many different malfunctions that can occur, it is not possible to provide a solution for every emergency. The success in coping with the emergency depends on quick analysis of the condition and selection of the proper emergency procedure. The following is a discussion of some types of malfunctions, probable effects, and corrective actions.

9-19. COMPLETE LOSS OF TAIL ROTOR THRUST.

This situation involves a break in the drive system, such as a severed driveshaft, causing the tail rotor to lose power.

a. Powered flight.

(1) Indications:

(a) Pedal input has no effect on helicopter trim.

(b) Nose of the helicopter turns to the right (left sideslip).

(c) Left roll of fuselage along the longitudinal axis.

NOTE

Degree of roll and sideslip may be varied by varying throttle and/or collective. (At airspeeds below 40 knots, the sideslip may become uncontrollable, and the helicopter will begin to spin on the vertical axis.)

(2) Procedures:

(a) If safe landing area is not immediately available, continue powered flight to suitable landing area at or above minimum rate of descent autorotational airspeed.

(b) When landing area is reached, make an autorotative landing.

(c) Use airspeed above minimum rate of descent airspeed.

(d) If landing area is suitable for run-on landing, touch down above effective translational lift.

(e) If run-on landing is not possible, start to decelerate from about 75feet altitude, so that forward ground speed is at a minimum when the helicopter reaches 1 0 to 20 feet. Execute the touchdown with a rapid collective pull just prior to touchdown in a level attitude with minimum ground speed.

b. Power off. (Autorotation).

(1) Indication. Pedal input has no effect on trim.

(2) Procedures:

(a) Maintain airspeed above minimum rate of descent airspeed.

(b) If run-on landing is possible, complete autorotation with a touchdown airspeed above effective translational lift.

(c) If run-on landing is not possible, start to decelerate from about 75 feet altitude, so that forward ground speed is at a minimum when the helicopter reaches 1 0 to 20 feet; execute the touchdown with a rapid collective pull just prior to touchdown in a level attitude with minimum ground speed.

9-20. FIXED PITCH SETTINGS.

This is a malfunction involving a loss of control resulting in a fixed pitch setting. Whether the nose of the helicopter yaws left or right is dependent upon the amount of pedal applied at the time of the malfunction. Regardless of pedal setting at the time of malfunction, a varying amount of tail rotor thrust will be delivered at all times during flight.

a. Reduced power (low torque).

(1) Indications: The nose of the helicopter will turn right when power is applied.

(2) Procedure:

(a) If helicopter control can be maintained in powered flight, the best solution is to maintain control with power and accomplish a run-on landing as soon as practicable.

(b) If helicopter control cannot be maintained, close the throttle immediately and accomplish an autorotational landing.

b. Increased power (high torque).

(1) Indications: The nose of the helicopter will turn left when power is reduced.

(2) Procedure:

(a) Maintain control with power and airspeed. (Between 40 and 70 knots.)

(b) If needed, reduce engine RPM manually to 98%.

(c) Continue powered flight to a suitable landing area where a run-on landing can be accomplished.

(d) Execute a run-on landing with power and a touchdown speed which will minimize sideslip. Use throttle and collective, as necessary, to control sideslip and heading.

c. Hover.

(1) Indication: Helicopter heading cannot be controlled with pedals.

(2) Procedure:

(a) Fixed pedal - Land.

(b) Loss of tail rotor thrust - Perform hovering autorotation.

9-21. LOSS OF TAIL ROTOR COMPONENTS.

The severity of this situation is dependent upon the amount of weight lost. Any loss of this nature will result in a forward center of gravity shift, requiring aft cyclic.

a. Indications:

(1) Varying degrees of right yaw depending on power applied and airspeed at time of failure.

(2) Forward CG shift.

b. Procedure:

(1) Enter autorotative descent (power off).

(2) Maintain airspeed above minimum rate of descent airspeed.

(3) If run-on landing is possible, complete autorotation with a touchdown a/s above effective translational lift.

(4) If run-on landing is not possible, start to decelerate from about 75 feet altitude, so that forward ground speed is at a minimum when the helicopter reaches 10 to 20 feet; execute the touchdown with a rapid collective pull just prior to touchdown in a level attitude with minimum ground run.

9-22. LOSS OF TAIL ROTOR EFFECTIVENESS (LTE).

This is a situation involving a loss of effective tail rotor thrust without a break in the drive system which cannot be stopped with full left pedal application. If LTE is experienced, simultaneously:

1. Pedal - Full Left.

2. Cyclic - Forward.

3. As recovery is effected, adjust controls for normal flight.

WARNING

Collective reduction will aid in arresting the yaw rate; however, if a rate of descent has been established, collective reduction may increase the rate of descent to an excessive value. The resultant large and rapid increase in collective to prevent ground or obstacle contact may f further increase the yaw rate, decrease the rotor RPM and cause an overtorque and/or over-temperature condition. Therefore, the decision to reduce collective must be based on the pilot assessment of the altitude available for recovery.

If spin cannot be stopped and crash is imminent, an autorotation may be the best course of action. Maintain full left pedal until the spin stops, then adjust to maintain heading.

9-23. MAIN DRIVESHAFT FAILURE.

A failure of the main driveshaft will be indicated by a Sudden increase in engine RPM, decrease in rotor RPM, left yaw and activation of the low RPM audio, and illumination of the ROTOR RPM warning light. A transient overspeed of Nl and N2 may occur but will stabilize. In the event of main driveshaft failure:

1. Autorotate - Establish a power on autorotational glide.

2. EMER SHUTDOWN after landing.

9-24. CLUTCH FAILS TO DISENGAGE.

A clutch failing to disengage in flight will be indicated by the rotor RPM decaying with engine RPM as the throttle is reduced to the engine idle position when entering autorotational descent. This condition results in total lost of autorotational capability. If a failure occurs:

1. Throttle - Open.

2. Land as soon as possible.

9-25. MAST BUMPING.

Land as soon as possible.

9-26. FIRE.

The safety of helicopter occupants is the primary consideration when a fire occurs; therefore, it is imperative that every effort be made by the flight crew to put the fire out. On the ground, it is essential that the engine be shut down, crew and passengers evacuated and fire fighting begun immediately. If time permits, a "MAYDAY" radio call should be made before the electrical power is off to expedite assistance from fire fighting equipment and personnel. If the helicopter is airborne when a fire occurs, the most important single action that can be taken by the pilot is to land the helicopter.

WARNING

Toxic fumes of the extinguishing agent may cause injury, and liquid agent may cause frostbite or low temperature burns.

CAUTION

If aircraft fire occurs on ground while using Ground Power Unit (GPU); the GPU should be shutdown immediately.

9-27. HOT START.

CAUTION

During engine starts using a Ground Power Unit (GPU), failure of the GPU could possibly result in an engine hot start. After GPU failure during start, the pilot must turn the battery switch on before accomplishing the procedure described below.

During engine starting or shutdown, if TOT limits are exceeded, or it becomes apparent that TOT limits may be exceeded.

1. STARTER switch - Press until TOT is less than 200C.

2. Throttle - Close.

9-28. ENGINE/FUSELAGE/ELECTRICAL FIRE - GROUND.

EMER SHUTDOWN.

9-29. ENGINE/FUSELAGE FIRE IN FLIGHT.

If a fire is observed during flight, prevailing circumstances such as VMC, IMC, night, altitude, and landing areas available must be considered in order to determine whether to execute a power-on, or power-off landing.

If Power-On landing:

1 - Land as soon as possible.

2. EMER SHUTDOWN after landing.

If Power-Off landing:

1. Autorotate.

2. EMER SHUTDOWN. Accomplish during descent if time permits.

9-30. ELECTRICAL FIRE - FLIGHT.

Prior to shutting off all electrical power, the pilot must consider the equipment that is essential to a particular flight environment that will be encountered. In the event of electrical fire or suspected electrical fire in flight:

1. BAT and GEN switches - OFF.

2. Land as soon as possible.

3. EMER SHUTDOWN after landing.

9-30 1. ATAS MISSILE SYSTEM FIRE - FLIGHT

In the event of fire involving the ATAS missiles or launcher, proceed as follows:

JTSN switch - Activate.

9-31. SMOKE AND FUME ELIMINATION.

Smoke and/or toxic fumes entering the cockpit and cabin can be exhausted as follows:

CAUTION

Do not jettison doors in flight above effective translational lift.

1. Vents -Open.

2. DEFOG & VENT switch - ON.

9-32. ELECTRICAL SYSTEM MALFUNCTIONS.

9-33. GENERATOR FAILURE - NO OUTPUT.

A no-output malfunction of the generator will be indicated by a zero indication on the DC AMMETER and a DC GENERATOR caution light illumination. An attempt may be made to put the generator back on line by accomplishing the following:

1. GEN FIELD, GEN & BUS RESET circuit breaker - Check IN.

2. GEN switch - RESET then GEN - Do not hold the switch in the RESET position.

If the generator is not restored, or if it goes off the line again:

3. GEN switch -OFF.

4. Turn OFF all unnecessary electrical equipment.

5. Land as soon as practicable.

9-34. OVERHEATED BATTERY.

An abnormally high DC AMMETER indication is evidence of a high battery charging rate or a battery thermal runaway. High battery charging amperage is normal immediately after engine start and should dissipate within minutes. DC AMMETER indication of 30 AMPS or below is normal after 15 minutes of aircraft operation with all systems operating.

WARNING

Do not open battery compartment or attempt to disconnect or remove overheated battery. Battery fluid will cause burns and overheated battery will cause thermal burns and may explode.

If high DC amperage does not dissipate:

1. BAT Switch -OFF.

If high DC amperage indication disappears with BAT switch OFF, a high battery charging rate and possible battery thermal runaway is confirmed, in this event:

2. Land as soon as possible.

3. EMER SHUTDOWN after landing.

If high DC amperage indication does not dissipate, pilot should anticipate electrical fire in flight.

9-35. HYDRAULIC SYSTEM MALFUNCTION.

9-36. HYDRAULIC POWER FAILURE.

Hydraulic power failure will be evident when the force required for control movement increases; a moderate feedback in the cyclic and collective controls is felt and the HYD PRESS caution light illuminates. Control movements will result in normal aircraft response in every respect. In the event of hydraulic power failure:

1. Airspeed-Adjust as necessary to attain the most comfortable level of control movements.

2. HYD BOOST SOL circuit breaker - Out; check for restoration of hydraulic power.

If hydraulic power is not restored:

3. HYD BOOST SOL circuit breaker - In.

4. HYD BOOST switch - OFF.

WARNING

Do not return the HYD BOOST switch to the ON position for the remainder of the flight. This prevents any possibility of a surge in hydraulic pressure and the resulting loss of control.

5. Land as soon as practicable at an area that will permit a run-on landing.

9-37. LANDING AND DITCHING.

9-38. LANDING IN TREES.

A landing in trees should be made when no other landing area is available. In addition to accomplishing engine malfunction emergency procedures, select a landing area containing the least number of trees of minimum height. Decelerate to minimum forward speed at treetop level and descend into the trees vertically. Apply all of the remaining collective, prior to the main rotor blades entering the trees.

9-39. DITCHING - POWER ON.

If ditching becomes necessary, with power available accomplish an approach to a hover above the water and:

1. Doors - Jettison at a hover.

2. Crew (except pilot) and passengers - Exit.

3. Hover a safe distance away from personnel.

4. Autorotate. Apply all remaining collective as the helicopter enters the water. Maintain a level attitude as the helicopter sinks and until it begins to roll, then apply cyclic in direction of the roll.

5. Pilot - Exit when the main rotor stops.

9-40. DITCHING - POWER OFF.

If an engine failure occurs over water and ditching is imminent, accomplish engine failure emergency procedures and proceed as follows:

1. AUTOROTATE. Decelerate to minimum forward speed as the helicopter nears the water. Apply all remaining collective as the helicopter enters the water. Maintain a level attitude as the helicopter sinks and until it begins to roll, then apply cyclic in the direction of the roll.

2. Doors - Jettison.

3. Crew and passengers - Exit when the main rotor stops.

9-41. FLIGHT CONTROL MALFUNCTIONS.

Failure of components within the flight control system may be indicated through varying degrees of feedback, binding, resistance, or sloppiness. These conditions should not be mistaken for hydraulic power failure. In the event of a flight control malfunction:

1. Land as soon as possible.

2. EMER SHUTDOWN after landing.

9-42. LIGHTNING STRIKE.

Land as soon as possible.

9-43. IN-FLIGHT WIRE STRIKE.

Land as soon as possible.

SECTION II. MISSION EQUIPMENT

9-44. ARMAMENT.

9-45. NOT APPLICABLE.

9-46. NOT APPLICABLE.

9-47. MISSILE LAUNCHER EMERGENCY JETTISON.

JTSN switch - Activate.

9-48. MISSILE HANGFIRE/MISSILE MISFIRE.

Hangfire is a missile that has been fired but has not left the launcher.

Misfire is a missile that has been fired but missile launch motor has not ignited within one minute.

In the event of a hangfire/misfire, proceed as follows:

JTSN switch - Activate.

9-49. MISSILE DEFLAGRATION.

Missile deflagration is a breakup or explosion of the missile flight motor in proximity of the aircraft.

In event of missile deflagration, land as soon as possible.