PART 4

Chapter 1 — ENGINE EMERGENCY PROCEDURES

Contents

1 Loss of oil pressure

Should oil pressure failure occur, the aircraft should be landed as soon as practicable, restricting RPM to the minimum required to reach a suitable airfield. Throttle handling should be smooth and progressive to avoid high transient bearing loads and where engine acceleration is unavoidable, the extent of RPM increase and the duration at the higher power setting should be limited. If severe vibration occurs, a bearing failure is indicated which may lead to engine seizure.

2 Engine seizure

(*a*) Engine seizure involves both hydraulic and electric supply failure. If the engine has failed due to obvious mechanical causes do not attempt to relight.

(*b*) Proceed as follows:

(i) Close the HP and LP cocks and switch off booster pumps.

(ii) Carry out a forced landing or eject.

3 Sudden drop in engine speed

If a sudden inexplicable drop in engine speed occurs, possibly accompanied by indications of an AC malfunction, which cannot be identified as engine surge, switch off the top temperature control and maintain the JPT within limitations manually by throttle movement. If the RPM are not restored proceed as follows:

Above 20000 *feet.* Close the throttle fully and descend; check engine response to throttle movement during the descent.

Below 20000 *feet.* If the engine fails to respond to normal throttle movements close the throttle fully and set the HP pump isolating switch to ISOLATE. If the engine still fails to respond to throttle movement, leave the switch at ISOLATE and carry out relight action. Once the switch has been set to ISOLATE it must be left there for the remainder of the flight; with it thus set the BPC and ACU are ineffective and all throttle movements must be made with care. Exercise caution when landing because of high idling RPM.

4 Engine flame-out

(*a*) *Immediate actions*

(i) If a flame-out occurs, a relight may be attempted *immediately*, while RPM are decreasing, by pressing and holding the relight button with the throttle at its set position. A successful relight is indicated by the RPM stabilising and then starting to rise; the likelihood of a successful relight is increased if the height and airspeed are below the recommended maxima for relighting.

(ii) If no relight occurs within 10 seconds, release the relight button and proceed as follows

HP cock	OFF
Throttle	Closed
LP cock	Leave on
All non-essential services	Off
If below 35000 feet ...	Carry out the relight drill
If above 35000 feet ...	Switch off the booster pumps, descend to 35000 feet and carry out the relight drill

(*b*) *Considerations*

If above 35000 feet the decision either to descend quickly or to glide at 210 knots depends on the prevailing circumstances, eg weather conditions, distance to travel, etc. The following should be borne in mind.

(i) The likelihood of obtaining a relight increases with decrease in altitude.

(ii) At best gliding speed the aircraft covers approximately 2 nm per 1000 feet.

(iii) With normal services running, the batteries cannot be relied on for more than approximately 10 minutes. All non-essential services including booster pumps should therefore be switched off to conserve battery power.

(iv) Manual should be selected before attempting to relight in case relighting is unsuccessful and the batteries are weakened to the extent that it is not possible to select Manual. For the same reason, consideration should be given to jettisoning the drop tanks and wing stores at this time.

(v) Descending rapidly at a speed above 210 knots increases the windmilling RPM. Consequently hydraulic pressure is higher and the generators may supply power.

(vi) Switch the tailplane interconnection off and trim load-free.

(vii) If it is necessary to descend more rapidly than at normal gliding speed, 15° flap may be used to increase the rate of descent, but the speed must not exceed 0·90M. Intermediate degrees of flap can only be selected while electric and hydraulic power is available. The pull force needed to reduce speed to 210 knots is considerable if in Manual.

5 Relighting

NOTE 1: Every precaution should be taken to ensure success at the first attempt to relight due to the drain on the batteries. If the engine and its fuel system are serviceable and the drill is followed correctly a relight should occur at the first attempt.

NOTE 2: If below 20000 feet set the HP pump isolation switch to ISOLATE and leave it at ISOLATE after relighting has been accomplished. Allow for possible high idling RPM when landing; close the HP cock after touchdown, if necessary.

(*a*) (i) Check and/or set:

Maximum altitude	...	...	35000 feet
Maximum airspeed	...	...	0·80M below 25000 feet 200 knots above 25000 feet

HP pump isolating switch ...	ISOLATE (if below 20000 feet)
Throttle	Closed
LP cock	ON
Battery master switch	ON
Engine master switch	ON
Ignition switch	ON
Booster pumps	ON

(ii) Press the relight button and at the same time open the HP cock keeping the relight button pressed until the engine lights up and RPM rise by about 200. When the RPM rise to idling, increase power carefully.

(iii) If no relight occurs within 30 seconds, release the relight button, close the HP cock and switch off the booster pumps. Allow, if possible, 30 seconds for the engine to dry out before the next attempt.

(*b*) *Failure to relight*

(i) If the engine fails to relight close the HP and LP cocks and switch off all non-essential electrical services (including the booster pumps).

(ii) Carry out a forced landing or eject.

6 Emergency relighting

(*a*) In circumstances where the engine cannot be relit by use of the above drill, provided that the pilot is reasonably certain that the fault lies in the relight button circuit, it may be possible to obtain a light-up using the starter button in the following way:

(*b*) To ensure that a live cartridge is not fired, the spent cartridge with which the engine was ground-started should first be mechanically re-indexed. To do this set the engine master switch OFF and then press the starter button fully in twice, pausing for an instant between each operation to allow the button to spring fully out.

(*c*) Check and/or set:

Maximum altitude	15000 feet
Maximum airspeed	0·80M
Non-essential electrics	Off
Throttle	Closed
HP cock	OFF
LP cock	ON
Battery master switch	ON
Engine master switch	ON
Ignition switch	ON
Booster pumps	ON

(*d*) Press the starter button again and then open the HP cock. The igniters then function but if the re-indexing drill has been correctly carried out a cartridge is not fired. If no relight occurs within 30 seconds, set the HP cock to OFF when the starter button comes out. The spent cartridge must be re-indexed as in (*b*) above before any further attempt is made.

WARNING: If for any reason the re-indexing drill has not been correctly carried out and a live cartridge is indexed when the starter button is finally pressed, it is probable that damage will be caused to the starter and to the aircraft. This probability may be lessened to some extent if the engine windmilling speed is low and positive G is not applied at the time of operating the starter button.

7 Action in the event of fire

WARNING: In some flight conditions, eg take-off and instrument approach, fire warning requires an immediate decision whether or not to eject because a reduction in power may cause the aircraft to stall or assume a flight path outside the minimum safe limits of the ejection seat.

(*a*) *Immediate actions*

Close the throttle. If this is impracticable eject within the seat limitations. Reduce speed to the minimum practicable. Check for confirmatory signs of fire, such as smoking jet wake, heat, fumes, system malfunctions. Have an external inspection made, if possible.

(*b*) *Subsequent actions*

(i) *If the warning light goes out within 5 seconds and there are no other signs of fire (hot gas leak symptoms)*: Prepare to land as soon as possible at the nearest suitable airfield, using minimum necessary power. If the warning light comes on again, throttle back at frequent intervals to check that the light goes out at lower power.

(ii) *If there are definite signs of fire (smoke, smell or system malfunction)*:

HP cock	OFF
LP cock	OFF
Booster pumps	OFF
Extinguisher	Operate
IFF/SSR	EMGY
If FWL goes out within 30 seconds	Carry out fumes drill and forced landing or eject
If FWL persists	Eject

(iii) *If the warning light remains on but there are no other signs of fire*:

Use minimum power to position for a possible forced landing. Land as soon as possible at the nearest suitable airfield. Continue to search for confirmation of fire and be prepared to resume the fire drill at (ii) above.