

PART VI

EMERGENCY HANDLING

85. Engine failure and flame-out

(a) *Mechanical defect*

If the engine fails because of an obvious mechanical defect set:—

Throttle	SHUT.
H.P. and L.P. cocks	Closed.
Booster pump	Off.
Non-essential electrical services	Off.

Do not attempt to relight.

(b) *Sudden drop in engine speed*

- (i) If an inexplicable drop in r.p.m. occurs in flight, close the throttle and switch ON the isolating valve. Since, in these circumstances, the rate of flow of fuel may not be under the control of the B.P.C. or A.C.U., the throttle should be opened again with care, to avoid overfuelling and a consequently high j.p.t. Large changes in r.p.m. may be experienced for relatively small movements of the throttle and, during a descent, the throttle may have to be opened progressively to maintain a constant r.p.m. The switch should be left on until after the landing, which should be made as soon as practicable. Because the idling r.p.m. may be high with the switch on, the landing should be made with caution and, if necessary, the H.P. cock should be shut after touchdown to ensure the shortest possible landing run.
- (ii) If combustion has ceased, relight, leaving the H.P. pump isolating switch on.

(c) *Flame-out*

- (i) If flame-out occurs, a relight may be attempted immediately, while r.p.m. are decreasing, by closing the throttle and pressing the relight button with the H.P. cock open. Successful relight will be indicated by the r.p.m. stabilising and then starting to rise.
- (ii) If no relight occurs within 10 seconds, release the relight button and proceed as follows:—

Throttle	$\frac{1}{4}$ open (shut if isolating switch ON).
H.P. cock	Closed.
All non-essential electrics	Off (to conserve electric power).
Booster pump	ON if an immediate relight is to be made, otherwise OFF.

86. **Relighting**

- (a) Relighting may be accomplished at altitudes up to 40,000 feet but is more certain at 30,000 feet and below. If the H.P. pump isolating switch is ON, no attempt must be made to relight above 30,000 feet.
- (b) Check and/or set:—
- | | |
|-----------------------------|---|
| Maximum altitude | See (a) above. |
| Airspeed | 180–250 knots. |
| Windmilling speed | Not more than 1,800 r.p.m. |
| All non-essential electrics | Off (to conserve electric power) |
| Throttle | $\frac{1}{4}$ open (shut if isolating switch ON). |
| Ground/flight switch | FLIGHT. |
| H.P. pump isolating switch | As required (see para. 47). |
| Booster pump | On. |
- (c) Press the relight button and, at the same time, move the H.P. cock *quickly* to the fully open position, keeping the relight button pressed for 15–20 seconds. Immediately a rise in r.p.m. or j.p.t. is observed, or after 5–6 seconds (see NOTE), close the throttle if it is open. The engine should then accelerate to the normal idling speed for the altitude.

NOTE.—It is possible that the two igniter combustion chambers may relight satisfactorily but combustion may not spread to the other chambers if the throttle is open. If, therefore, the engine has not relit normally within 5–6 seconds of reopening the H.P. cock, the throttle should be closed to encourage combustion to spread.

- (d) When r.p.m. increase to idling speed, open the throttle *carefully* to the desired power setting. This is essential if the H.P. pump isolating switch is ON.
- (e) If the engine has not relit within 30 seconds of opening the H.P. cock, close the cock again and wait about one minute before repeating the cycle of operations.

87. **Action in the event of engine fire**

- (a) If the engine fire-warning light comes on, close the throttle immediately. If the light remains on, close the H.P. and L.P. cocks and switch off the booster pump.
- (b) Reduce the airspeed to as low as practicable and turn off the cockpit pressure before operating the fire extinguisher. To obtain maximum benefit from the fire-extinguishing equipment, the aircraft should be in level flight when the button is pressed.
- (c) These operations should be carried out as quickly as possible.
- (d) If the fire has been extinguished, the fire-warning light will go out.
- (e) Any attempt to relight the engine may result in a further outbreak of fire, which will be uncontrollable since the extinguisher cannot be used again.

WARNING.—Fire in the engine bay may render the flying controls and pressure instruments useless, necessitating immediate abandoning of the aircraft.

88. **Hydraulic system failure**(a) *Hydraulic pump failure*

If the hydraulic pump fails, indicated by the audio warning and subsequently by the warning light, set the flaps selector

lever to neutral. Pressure is available in two accumulators for emergency use.

- (i) *No. 1 accumulator.* The main accumulator is connected to all the services but its capacity provides for only one one-way operation of the undercarriage together with flaps or airbrakes, provided that manual control has been selected as soon as the failure has occurred. If Manual control has not been selected immediately the failure has occurred, the accumulator may have been partially exhausted with use of the ailerons.
 - (ii) *No. 2 accumulator.* This accumulator provides a reserve for the powered ailerons. Three full aileron reversals will normally exhaust the accumulator.
 - (iii) When the accumulators are exhausted, the handpump can be used to pump down the undercarriage and flaps. It will not operate the ailerons or airbrakes. When operating the handpump for lowering the undercarriage, ensure that the flap selector lever is in the neutral position.
- (b) To conserve pressure in No. 1 accumulator for lowering undercarriage and flaps, Manual aileron control should be selected. If a descent or deceleration is required, the airbrakes must not be used. This is because the airbrakes cannot be operated by the handpump in flight and the capacity of No. 1 accumulator is insufficient to effect full retraction following extension.
- (c) If a descent from high altitude is required, the following procedure is recommended:
- Reduce speed to below 220 knots.
 - Lower the undercarriage. This will have to be pumped down if the main accumulator is exhausted.
 - Descend at not more than 220 knots.
- (d) If a G.C.A. is being made, aim to have full flap lowered before the glide path is reached.
- (e) *Emergency operation of the undercarriage*
- (i) If the hydraulic pump has failed and no pressure is available in No. 1 accumulator, the undercarriage may be lowered by means of the handpump, after normal selection. Up to 115 strokes of the handpump will be required to lock the undercarriage down.

- (ii) The undercarriage can be retracted, in an emergency, by first operating the override switch and then raising the normal selector lever. This will not be possible if complete electrical failure has occurred.

(f) *Emergency operation of the flaps*

If the hydraulic pump has failed and accumulator pressure is not available, the flaps may be lowered by the handpump, after normal selection. Do not attempt to lower the flaps by the handpump until the undercarriage is down and locked.

89. **Electrical failure**

- (a) If one generator fails, the other should be sufficient to supply normal loads.
- (b) If both generators fail, the main battery will last for only a short time. Switch the V.H.F. (and turn and slip) to STANDBY. Switch off all non-essential electrics and land without delay. With the booster pump inoperative, maximum r.p.m. will not be obtainable above 20,000 feet and engine surging and rough running may occur.

WARNING.—The Mk. 4F compass will cease to be reliable and reference should be made to the E.2A compass.

90. **Loss of cockpit pressure at high altitudes**

- (a) Cockpit pressure failure will be indicated by the red warning light (40) and the cockpit altimeter (38).

NOTE.—Should cracks, or other signs of failure, appear in the perspex of the hood or windscreen, reduce cockpit pressure and speed to a safe minimum.

- (b) If a type J mask is fitted, proceed as follows:—
 - (i) Set the emergency lever on the oxygen regulator to ON.
 - (ii) Turn the valve on the type J mask to the position marked H, to inflate the pressure breathing waistcoat.
 - (iii) Descend as rapidly as possible to 30,000 feet or below, when the emergency lever may be switched OFF, the valve on the type J mask turned back to the normal position and high flow selected.

- (c) If a type H mask is fitted, proceed as follows:—
- Set the emergency lever on the oxygen regulator to ON.
 - Descend as rapidly as possible to 30,000 feet or below.
 - Set emergency lever to OFF and check supply on HIGH flow.

91. Hood jettisoning

- (a) If Mods. 1042 and 1043 are not incorporated, the following jettisoning drill must be carried out because of the overlapping de-misting pipes (see para. 28). A lanyard must be fitted.
- Ensure that the lanyard is attached to the winding handle.
 - Open the hood to the limit imposed by the lanyard (one inch).
 - Pull inwards the hood jettison handle on the cockpit starboard wall.
- (b) If a lanyard is not fitted and Mods. 1042 and 1043 are not embodied, the pilot should eject through the hood rather than attempting to jettison it first. ~~The gunsight must be lowered before ejection.~~
- (c) If Mods. 1042 and 1043 are embodied, the hood may be safely jettisoned at speeds between 110 and 170 knots and there is no need to deflate the hood seal first.
- (d) The pilot's head should be lowered below the level of the cockpit coaming before operating the lever.

92. Drop tank and bomb jettisoning

(a) *Wing-tip tanks*

The tanks can be jettisoned in straight and level flight within the following speed ranges:—

Tanks empty	180–260 knots
Tanks full	130–260 knots

To jettison the wing-tip tanks, press the rear button on the inboard face of the throttle box. If the electrical jettison system fails, jettison the tanks mechanically by pulling up the lever on the right-hand side of the seat.

(b) *Pylon tanks*

To jettison the pylon tanks, press the forward button on the inboard face of the throttle box. If the electrical system fails, jettison the tanks mechanically by pulling up the lever on the left-hand side of the seat. Before jettisoning, reduce speed to between 180 and 260 knots and check the airbrakes are in. Because of the possibility of damage to the airbrakes when the tanks are jettisoned at high mach numbers, reduce height to below 35,000 ft.

(c) *Bomb jettisoning*

Bombs may be jettisoned through the normal release circuit, or by the mechanical jettison lever. If fitted direct to the pylons, when provision has been made for pylon tanks, they can be jettisoned by the pylon tank release button (see para. 43).

93. Forced landing

NOTE.—When making a forced landing on an aerodrome or in open country, experience suggests that it is preferable to lower the undercarriage. In the down position, it absorbs most if not all of the initial impact, assists in retarding the aircraft and, provided that electrical power is available, it may be retracted after touchdown if necessary. With the undercarriage up, the aircraft must be lowered gently on to the ground *at the normal speed*; if the speed is too low, a wing drop is likely to occur and if the speed is too high, the aircraft is prone to bounce, the initial impact having a damaging effect on the cockpit.

- (a) In all cases of engine failure, when a relight is not possible, carry out the following actions immediately:—
- | | |
|-----------------------------|---------|
| L.P. and H.P. cocks | Closed. |
| Booster pump | Off. |
| All non-essential electrics | Off. |
| Glide at 160 knots. | |
- (b) Even if the engine is windmilling, it is unlikely that sufficient hydraulic pressure will be generated to keep the accumulators charged and the ailerons in Power, so the following procedure is recommended:—

- (i) Select Manual control (see para. 88 (b)).
- (ii) If circumstances permit, jettison all stores and external tanks.
- (iii) Jettison the hood (lower the head below the level of the cockpit coaming before doing so). If it is decided not to jettison the hood, the hood seal cock should be off and the lanyard disconnected from the winding handle. (See para. 91.)
- (iv) Release the emergency oxygen supply tube, the parachute harness and the dinghy pack lanyard attachment to the life-jacket.
- (v) When manœuvring to land, maintain 140 knots until the selected landing area is within reach.
- (vi) Lower the flaps, aiming to cross the threshold of the landing area at 110 knots.

NOTE.—1. Do not use the airbrakes (see para. 88 (b)).
 2. The ejection seat is a source of danger to unskilled persons. After a crash landing the pilot should, if possible, make the seat safe by inserting the safety pin in the firing handle. An appropriate warning should be given to the authority on the spot.
 3. If the battery isolating switch is put OFF before landing, it must be put ON again after landing if it is required to operate the fire-extinguisher, unless Mod. 921 is embodied.

94. Abandoning the aircraft

- (a)
 - (i) Reduce speed as far as practicable.
 - (ii) Lower the head below the level of the cockpit coaming and jettison the hood. (See para. 91.)
 - (iii) Pull the firing blind sharply over the face, being careful to keep the elbows out of the slipstream.
- (b) *Action should the Mk. 2F seat fail to eject*
 - (i) Pull the first D-ring on the parachute harness.
 - (ii) Trim nose-heavy, invert the aircraft, release the safety harness and fall out.
 - (iii) In these circumstances the parachute will not be opened automatically so, when clear of the aircraft, pull the second D-ring to develop the parachute canopy.

- (c) *Action should the automatic mechanism of the Mk. 2F seat fail*

If, after ejection, the pilot for any reason doubts the serviceability of the automatic parachute releasing mechanism, he should operate the parachute manually as follows:—

- (i) Pull the first D-ring on the parachute harness.
- (ii) Release the restraining straps from the seat.
- (iii) Release the safety harness.
- (iv) After falling clear of the seat, pull the second D-ring to develop the parachute canopy.

95. Ditching

- (a) Ditching characteristics are believed to be poor, because of the probability of the tail booms hitting the water and causing a nose-down pitch and subsequent dive in. The tail booms may in some cases break off. It is therefore recommended that the aircraft be abandoned rather than ditched.
- (b) Successful ditching in ideal conditions may be possible using the following technique:—
 - (i) The water must appear calm (but not glassy) and free from swell.
 - (ii) Jettison the hood, tip-tank fuel and all external stores. (See para. 85.)
 - (iii) Make a normal approach, using 10° of flap *only*, using engine assistance where possible.
 - (iv) The speed at touchdown must be 10 knots above the *normal* speed and any nose-up attitude likely to cause the tail booms to hit the water first must be avoided.
 - (v) Provided that the tail booms do not hit the water first at touchdown and if the sea is calm, the aircraft should plane well on its fuselage with the nose clear. To reduce any tendency to porpoise, the rate of descent at touchdown must be at a minimum.



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