Part III—Engine and Aircraft Handling

Chapter 4—Asymmetric Flying

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1 Shutting down an engine in flight

If an engine fails in flight or when deliberately stopping an engine in flight, close the throttle and bring it back through the gate to close the HP cock. The booster-pump switches for the tank group feeding the failed engine should be switched off and, in the case of engine failure, the LP cock of the failed engine set to off, if the occasion demands. The generator switch for the shut down or failed engine must be set to OFF & TRIM. Whenever possible this should be done before engine speed has fallen to generator cut-out RPM.

2 Relighting in flight

(*a*) Relighting is progressively more certain with decrease in altitude and the chances of successful relight are greater if the engine is warm.

(*b*) After an abortive relight attempt, the engine and jet-pipe must be drained of unburned fuel over a period of three minutes before a further relight is attempted. During this period the aircraft should, if possible, be flown in a nose-up attitude to assist drainage. Not more than three unsuccessful attempts to relight should be made on any one engine in one sortie.

(*c*) If an engine flames out for reasons other than mechanical failure, a relight should be achieved, regardless of the altitude, if the following actions are carried out. Press the relight button immediately and close the throttle to the IDLING gate keeping the button pressed. If an immediate relight, as indicated by the RPM and JPT rising smoothly, does not occur, keep the button pressed and bring the throttle behind the IDLING gate trying different throttle positions until the engine relights. When the engine is fully relit, release the relight button and open the throttle gradually to IDLING. Check the engine fire warning light, JPT and oil pressure, and synchronise the RPM as required. Switch on the generator.

NOTE 1: If a partial relight occurs, indicated by the JPT rising without a corresponding rise in RPM, then the throttle must be closed gradually behind the IDLING gate, keeping the relight button pressed until a full relight is obtained, shown by the RPM rising and the JPT falling to normal. If the JPT rises rapidly above 600°C close the HP cock immediately.

NOTE 2: If the JPT does not rise within 30 seconds of the initial action, release the relight button and close the HP cock. Subsequently, the relighting drill as in (*d*) below should be carried out at an altitude below 36,000ft.

(*d*) For relighting a cold engine the following procedure should be used.

(i) Altitude below 36,000 feet.

(ii) Reduce speed until the failed engine windmilling speed is as far as is convenient below 15 per cent RPM.

(iii) Ensure that the LP cock and at least one booster-pump is on for the tank group feeding the failed engine. Check that the fuel pressure warning indicator is black.

(iv) With the HP cock shut, press and hold the relight button and after five seconds move the throttle *very slowly* towards the IDLING gate.

(v) Release the relight button after JPT has increased smoothly and engine speed has risen to 45 per cent RPM. Synchronise the engine and switch on the generator. Switch on the remaining booster-pumps as required.

NOTE 1: Engine relight will be indicated by JPT rising to about 250°C, but if 600°C jet pipe temperature is obtained and the temperature continues to rise, close the HP cock immediately.

NOTE 2: If after 30 seconds with the relight button pressed the engine has not lit up, release the button and close the HP cock. A further attempt can be made at a lower altitude after allowing the engine a reasonable time to drain out.

(*e*) When the engine has been relit, inform the AEO who will bring the generator on line as detailed in Part 1, Chap 7, Para 12.

(*f*) Whenever an engine is relit in flight, a JPT/RPM comparison check between the engines must be carried out as detailed in Part III, Chap 2, Para 3.

3 Asymmetric handling

(*a*) Due to the proximity of the engines to the fuselage, asymmetric thrust causes little difficulty in handling, even with two engines failed on the same side ; however, the loss of one or more generators may necessitate electrical load shedding, and/or paralleling action. (See Part V, Chap 2, Para 13.)

(*b*) At high weights, manoeuvre limits will be governed by the thrust available ; there is little restriction with only one engine failed but if two engines have failed the airspeed should not be reduced below 170 knots in turns and the angle of bank should not exceed 30 degrees.

4 Asymmetric landing and overshoot

(*a*) As long as the necessary total thrust can be obtained with three good engines, the technique for approaching, landing and overshooting should be as normal.

(*b*) During an approach on two engines, the minimum approach speed, down to the decision height of 200 feet above the airfield level, must not be below the calculated approach speed for the weight or 140 knots, whichever is the higher.

(*c*) If the thrust available is marginal, it is recommended that a landing without airbrakes is carried out.

(*d*) When an overshoot is carried out on two engines, it must be begun at or above the decision height and the approach speed. Increase power as required and, as the speed increases, select up to maximum power and climb away to a safe height, at the threshold speed plus 30 knots. Rudder must be applied to counteract yaw and up to 5° of bank may be applied towards the live engines. Coarse use of aileron must be avoided.