PART 3

HANDLING

LIST OF CHAPTERS

HANDLING

PART 3

CHAPTER 1 — PREPARATION FOR FLIGHT

Contents

1 Preliminary Checks

(*a*) Carry out the **Safe for Parking** checks on arrival at the aircraft and then continue with the **Initial Checks** and **External Checks** given in the FRC. Systematically check the outside of the aircraft for signs of damage and security of panels, filler caps, doors and hatches. The engine intakes must be free from obstruction, the starter fairings secure and the jet pipes free from distortion.

(*b*) In winds above 25 knots, leave the external rudder lock in for taxying; in winds above 35 knots, the aileron and elevator locks must also be fitted. If aileron locks are left in for taxying, the flaps must be fully up before the locks are fitted and the instructor's flap selector must be locked in the UP position by its locking pin until the **Pre-Take-Off Checks.**

WARNING: The flaps will be damaged if the flap selector is operated whilst the aileron locks are in. The rudder trimmer must not be operated while the rudder lock is in.

2 Internal Checks

Carry out the **Ejection Seat Checks** and the **Internal Checks** given in the FRC. If the aircraft is to be flown with the instructor's seat unoccupied, before strapping-in adjust the throttle and HP cock friction dampers, which are on the instructor's throttle quadrant. Ensure that the instructor's seat is positively locked in the mid (flying) position.

3 Starting the Engines

Carry out the **Starting Checks** given in the FRC.

4 Failure to Start

(a) If an engine fails to accelerate to idling RPM or a cartridge fails to fire, the HP cock must be closed immediately and the master starting and ignition switches set to OFF before any further action is taken.

(b) If, after a cartridge has fired, the pressure relief valve blows (indicated by clouds of black smoke in the engine air inlet) or the starter fails to accelerate the engine to more than 1000 RPM, no further attempt may be made with that starter, which is to be removed as suspect.

(c) If a cartridge fails to fire, at least 1 minute must elapse before the starter breech cap is removed. If a second cartridge fails to fire have the electrical system checked.

(d) If the engine fails to light up when the first cartridge is fired, a second may be loaded when the compressor has stopped rotating. If two cartridges have been fired the starter must be allowed to cool for a period of 10 minutes before loading a third cartridge. If the engine still fails to light up, not less than 45 minutes must elapse before loading each subsequent cartridge.

(e) After a failure to start, if the HP cock is closed without delay there should be no necessity to 'Blow Through' the engine. If in doubt and provided that the engine has accelerated to more than 1000 RPM during the previous attempt, any excess fuel may be removed by firing a further cartridge as follows:

MASTER STARTING switch ...	ON
IGNITION switch	OFF
HP cock	OFF
LP pumps	OFF
Starter button	Press

5 Checks Before Taxying

(a) Carry out the **After Start Checks** and **Taxy Checks** given in the FRC; if control locks are to be left in for taxying, delay the checks of the flaps and trims until the locks have been removed at the take-off point.

(b) Where the controls are duplicated, the checks are to be made on both sets of controls; the operation of the instructor's override should also be checked.

(c) When checking the aileron, rudder and tailplane trims, ensure that no overrun occurs when the trims are stopped at the neutral position from each direction. The aircraft must not be flown if a live circuit exists or if the trim operation is faulty. Check the trim as follows:

(i) *Aileron Trim*

Operate the trim over the full range and return to neutral.

(ii) *Rudder Trim*

Test for a live circuit by ensuring that no movement occurs when either switch is operated independently. Operate the trim over the full range and return to neutral.

(iii) *Tailplane Actuator*

Test for a live circuit by ensuring that the tailplane does not move when either the cut-in switch or trim switch is operated independently. Operate the tailplane over the full range and return to neutral.

6 Taxying

(a) Check the operation of the brakes, which are powerful, as soon as possible. Reduce speed when turning or manoeuvring and do not turn with one wheel locked.

◀ **WARNING:** Heavy braking will markedly reduce brake effectiveness as the heat absorption limit of the brakes is approached; even moderate braking at low AUW and slow speed can have the same effect if prolonged, eg lengthy taxying using brakes against power. After any such cases of heavy or prolonged braking, allow sufficient time for the brakes to cool before continuing with taxying or taking-off. ▶

(b) Check the serviceability of flight instruments during turns.

(c) Rudder pedal and control column loads can be high when taxying in strong winds. If the rudder lock has been

left in for taxying, apply only sufficient pressure to the rudder pedals to obtain differential braking.

(d) Avoid high speed taxying at aft CG, because of a tendency for the nose to lift.

◀ *(e)* In strong crosswind conditions the engines may stall during acceleration if the throttles are opened too quickly. ▶

(f) If it is necessary at any time to stand tail-into-wind run the engines at sufficient RPM to maintain JPT within the limit.

(g) Fuel consumption while taxying is about 32 lb per minute.

7 Checks Before Take-Off

Carry out the **Pre-Take-Off Checks** given in the FRC.

PART 3

CHAPTER 2 — HANDLING IN FLIGHT

Contents

1 Take-Off

(a) Extract the take-off information from the ODM. Provided that runway and temperature conditions are suitable, the time gap between achieving unstick speed and safety speed is reduced by keeping the aircraft on the ground until a speed of 125 knots is reached. If a short ground run is necessary, use the appropriate unstick speed given in the ODM.

(b) Align the aircraft on the runway and apply the brakes. Increase RPM to 7000 and check the alignment of the throttles and compare the JPT. Poor throttle alignment and a difference in JPT are an indication of inlet guide vanes malfunction. If an engine is suspect, increase power; the difference in JPT and throttle alignment will increase and the suspect engine will show a tendency to overspeed. If these symptoms are present, do not take-off: have the fault investigated. If the above check is satisfactory, release the brakes and open the throttles fully.

(c) During the take-off run, check the tendency for the nose to rise early. At 10 knots below unstick speed, move the control column steadily backwards and fly the aircraft

off the ground at the correct speed. If the nose is raised too early, the take-off run will be prolonged. When taking off from high-elevation airfields, where acceleration will be poor, the nose of the aircraft should be raised approximately 5 knots below unstick speed.

(d) When safely airborne, apply the wheelbrakes and retract the undercarriage. There is little change of trim, but take care not to exceed 170 knots before the wheels are locked up (all undercarriage lights out), particularly at low weights when acceleration is rapid. If 190 knots is reached before the doors are closed, it is possible that they may not close at all. There is no visual indication that the main doors are open but buffeting may be felt. Should this happen, reduce speed to about 170 knots to allow the doors to close.

(e) The aircraft accelerates rapidly with an increasing nose-up change of trim.

(f) If a sustained climb is intended, set the engines at 7600 RPM and climb at 330 knots. For circuit practice it is recommended that speed be kept below 180 knots. For the climb to circuit height 7000 RPM is ample.

(g) Crosswind Take-Off

(i) The maximum recommended crosswind component for take-off is 25 knots.

(ii) If a normal take-off is attempted in a strong crosswind, there is a risk that the downwind engine may surge as the RPM are increased against the brakes. If a surge occurs, close both throttles. Provided that the JPT limit has not been exceeded a further attempt to take-off may be made using the following technique. Line up on the downwind side of the runway angled off approximately 30° into wind and increase RPM to 7000 against the brakes. If the engine checks are normal, release the brakes, align the aircraft with the runway centre line by careful use of differential brake, and then increase RPM as the aircraft gains speed. If a surge is experienced using this technique, the engine must be considered to be unserviceable.

(iii) When a take-off is attempted with the crosswind component close to the recommended maximum, the crosswind take-off technique should be used without a prior attempt at a normal take-off.

2 Aborted Take-Off

(a) Below Stop Speed

If a take-off is aborted below the stop speed, the aircraft can be stopped in the remaining distance available using the following technique:

Close both throttles
Select flaps DOWN
Apply maximum continuous wheel braking
Close HP cock of malfunctioning engine (if applicable)
When flaps have travelled close HP cock of remaining engine(s)

Do not apply the brakes above EMBS since this is the maximum speed at which continuous braking may be initiated without risk of the brakes overheating and failing before the aircraft is brought to rest. Apply the brakes carefully at EMBS to avoid locking the wheels.

(b) Above Stop Speed

If a take-off is aborted above the stop speed, the abort technique will be influenced by such factors as the speed and weight of the aircraft, weather conditions, runway length and availability of an arresting barrier. The following considerations are relevant:

(i) Whenever possible, plan for a barrier engagement (see FRC). Keep the nosewheel on the ground and delay wheel braking until EMBS, to guard against brake failure. It is preferable to engage the barrier centrally with the brakes intact than to engage it off centre or to run off the side of the runway, albeit at a lower speed, because the brakes have failed. Ensure that the nosewheel is firmly on the ground before engaging the barrier.

(ii) In certain circumstances, particularly on a short runway, an abort at high speed and high AUW could result in either the barrier maximum entry speed being exceeded or, in the absence of a barrier, the aircraft leaving the end of the runway before the speed has reduced to EMBS. In these circumstances use wheel braking above EMBS.

(iii) In the last resort, the undercarriage may be raised when operating from an airfield with a hazardous overshoot area and no arresting barrier. It may be advisable to eject from the aircraft, but this should be done as early as possible and at a speed above 90 knots; adequate time must be allowed for the seat firing delays.

3 Engine Failure after Take-Off

(a) The safety speed with or without wing-tip tanks (full or empty) is 140 knots.

(b) If an engine fails during take-off, priority must be given to controlling the aircraft before dealing with the engine emergency. The aircraft responds to an engine failure by yawing and rolling towards the dead engine. The rates of yaw and roll increase rapidly if recovery action is delayed.

(c) The factors affecting recovery are:

(i) *Aircraft Speed*

Aircraft response to engine failure is more marked at low speeds, particularly below safety speed. The rudder is less effective at low speeds and recovery technique becomes more critical.

(ii) *Wing Stores*

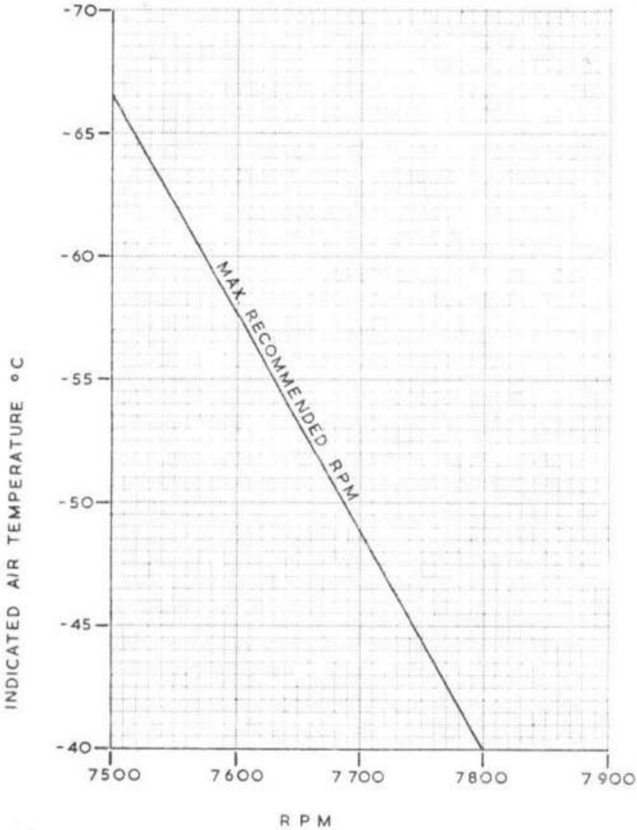
Increased yawing and rolling inertia due to wing stores (wing-tip tanks) help to slow down the initial aircraft response to engine failure. However, the increased inertia will also make it more difficult to stop the yaw and roll if it is allowed to develop. The extra thrust required to accelerate the aircraft because of the drag of the wing stores increases the critical speed. Therefore, the minimum speed from which a recovery can be made is also increased.

(iii) *AUW and CG Position*

AUW affects the speed from which recovery is possible by its effect on aircraft acceleration; at low AUW the improved acceleration assists recovery. At aft CG positions the rudder is less effective because of its reduced moment arm.

(iv) *Altitude and Temperature*

Increases in altitude and/or temperature cause reduced engine thrust and, therefore, lower critical speeds. This alleviates asymmetric handling difficulties but reduces aircraft acceleration and climb performance.



3—2 Fig 1 Low Temperature Engine Surge

(d) Recovery Actions

(i) *Undercarriage Down*

If practicable, control the yaw with rudder, close both throttles and land back on the runway. Aim for a barrier engagement. If a landing is not practicable take recovery action as for undercarriage up or eject.

(ii) *Undercarriage Selected UP*:

1 Apply full rudder to oppose the yaw. Up to 10° of bank may then be applied towards the live engine; this not only reduces the minimum control speed but

may also improve aircraft performance by reducing drag. If the yaw still continues, then *power on the live engine must be reduced until the yaw is stopped.*

2 Lower the nose to improve acceleration and confirm that the undercarriage and flaps are retracted.

3 Below safety speed, recovery is assisted considerably by jettisoning wing stores and this should be carried out as soon as possible after the initial rudder, aileron and throttle actions.

4 Climb away when the speed has increased to 160 knots. If power has been reduced, restore slowly as speed increases further, trim as necessary and then carry out the appropriate engine failure drill. If a safe climb cannot be achieved, the decision to eject or crash land must be made.

Note 1: Application of aileron before rudder adversely affects recovery.

Note 2: Before releasing the controls to operate the ejection seat, consider throttling back the live engine to prevent further roll developing before the seats have left the aircraft. ▶

(iii) At and above safety speed, it should be possible to regain and maintain control without reducing power on the live engine, provided that recovery action is taken immediately an engine failure is recognised. Below safety speed, it will always be necessary to reduce power on the live engine.If corrective action is taken quickly, it is possible to recover and climb away from an engine failure at 125 knots.

4 Climbing

(a) The optimum climbing speed is 330 knots until 0·72M is reached at about 20,000 feet. Thereafter, maintain 0·72M until reaching the desired altitude.

(b) RPM tend to increase with altitude and must be restrained by careful throttling. At high altitudes the precise setting of desired RPM is not easy. JPT remain approximately constant up to about 30,000 feet, above which they may increase slightly at constant RPM.

(c) The canopy internal demister must not be on during a climb.

(d) In heavy rain, particularly if the aircraft has been standing on the ground tail-into-wind, water may collect in the region of the aileron beaks and icing could restrict

aileron movement during any subsequent rapid climb in temperatures below 0°C. In these circumstances, avoid prolonged periods with the controls static and exercise the ailerons gently during the climb.

(*e*) *Climbing Checks*

Carry out the **Climbing Checks** given in the FRC.

5 Engine Handling in Flight

(*a*) *Low Level*

(i) Operate the throttles smoothly at all times and avoid slam accelerations and rapid decelerations.

(ii) At sea level, acceleration to full power from 4500 RPM can be obtained within 5 seconds; accelerations from lower RPM take considerably longer and care must be taken when opening the throttles, otherwise it is possible to stall the compressor, particularly when the speed is low and the aircraft is sinking. On the approach maintain a minimum of 4500 RPM until committed to a landing.

(*b*) *High Level*

(i) The ACU is not altitude compensated. Its action, and therefore engine acceleration, deteriorates progressively as altitude is increased above 5000 feet. Greater care in engine handling is necessary at high altitudes, especially during the early stages of throttle opening at low IAS. Rapid throttle movement, either opening or closing, may cause compressor stall and engine surge which may lead to severe overheating or flameout, particularly at altitudes above 40,000 feet at speeds below 200 knots IAS.

(ii) In extremely cold temperature conditions, generally associated with high altitude flight in tropical areas, there is a risk of surge followed by flameout when using high RPM at low IAS. This risk can be obviated by restricting maximum RPM according to variations in indicated air temperature as shown in Fig 1.

(iii) Any factor which disturbs the airflow through the engine, such as turbulence, turns at high angles of attack or changes of power setting can also induce a surge. When operating close to the surge line, more delicate engine handling is essential and if steep turns are necessary or if turbulence is encountered, RPM should be limited to a maximum of 200 below that recommended in the graph, to reduce the risk of surge.

(iv) If an engine surge occurs, the throttle must be closed immediately and the RPM and JPT allowed to stabilise before any attempt is made to increase RPM again. An increase in speed or a slower throttle movement may be required to obtain a satisfactory engine acceleration. If an engine compressor is stalled at very high altitude and low IAS, it may remain stalled when the throttle is closed, and a considerable increase in speed may be necessary to enable the engine to recover to a normal flight idling condition. If unable to obtain flight idling indications or if a flameout occurs following a surge, shut down the engine and attempt a **Normal Relight** at or below the recommended altitude.

(*c*) *Use of the HP Fuel Pumps Isolating Valves*

(i) Failure of either HP pump or a fault in the servo control system causes a sudden drop in engine RPM. If a sudden drop occurs in flight, first establish that this is not due to LP pump failure or icing. If neither of these is the cause, close the throttle and select ISOL (up) on the appropriate isolating switch. If the engine then idles normally, an attempt may be made to accelerate it. If it fails to idle normally, close the HP cock and relight the engine using the **Flame-Out** and **Normal Relight** drills given in the FRC; leave the isolating switch set to ISOL. Having relit, if both HP pumps are serviceable, maximum RPM should be obtainable, but if one HP pump has failed, only 60% engine thrust will be available at sea level, rising progressively with altitude; 100% thrust will be available at about 12,000 feet.

(ii) With the HP pump isolating switch set to ISOL considerable care must be exercised when the engine is opened up from idling RPM. If the throttle is handled coarsely at engine speeds below 5000 RPM, the engine is prone to over-fuelling and excessively high JPT, resulting in a possible engine fire. While opening the throttle keep a check on the RPM and JPT. If the JPT rises rapidly and reaches the maximum, the RPM meanwhile remaining constant, close the throttle immediately and then open it again using a slower movement. In the event of having to go round again, it should be remembered that only 60% of take-off thrust will be obtainable at low altitude if one pump has failed.

6 General Flying

(a) Controls

The controls are well harmonised and smooth in operation at all altitudes.

(i) *Rudder*

The rudder is light and effective at small deflections; it should be used with care at high IAS. Forces increase rapidly as deflection is increased and at all speeds a marked roll occurs when rudder is applied.

(ii) *Ailerons*

The ailerons are light and effective at low speed and high altitude but become heavier as speed is increased; they still give good response up to 0·83M, but above this mach number effectiveness decreases. However, at speeds below about 200 knots it is important to use co-ordinating rudder to minimise any difficulty in removing bank arising from rolling moment induced by high yaw forces in the direction of turn.

(iii) *Elevator*

The elevator is powerful and forces are light, becoming heavier at high speed. Effectiveness is reduced above 0·84M. (See Part 2, Chapter 2, para 2.)

(b) Trims

Tailplane incidence control is powerful at all speeds and becomes very sensitive at high speed. The rudder trim is powerful and quick in operation; it requires care in use. The aileron trim is the least powerful of the trims.

(c) Tailplane Operation

(i) *Operation in Flight*

Tailplane runaway can only occur if there is a double failure. If the cut-in switch is held on, in anticipation of trimming, the safety factor provided by the double circuit is removed. If the tailplane moves when the trim switch alone is operated, the flight may be completed and the trimmer still used but it should be remembered that the safety of the double circuit will no longer exist and the possibility of a runaway is increased. For this reason speed must be restricted to a maximum of 250 knots. If the tailplane moves when the cut-in switch alone is operated, the switch must be released immediately; on no account may any further attempt be made to trim in either direction; the aircraft must be restricted to a maximum of 250 knots and landed as soon as possible. If any other malfunction of the tailplane trim is experienced, the aircraft should again be landed as soon as possible. With the tailplane stuck at or near the limit of travel in either direction, attempts may be made to return it towards the neutral position. If the trim fails with the tailplane at or near the neutral position, no further attempts to trim should be made.

(ii) *Limited Tailplane Travel*

The tailplane travel is limited and the aircraft trim adjusted to ensure that longitudinal control can be maintained under any flight conditions within the normal limitations should the tailplane actuator have 'runaway' to the maximum nose-down position, ie the actuator on its mechanical stop. With the tailplane trimmed to the full nose-down position, the aircraft is in trim longitudinally at about 450 knots with flaps up and 125 knots with flaps down. When landing at high AUW in the latter condition, the elevator authority is reduced and care must be taken to make an approach which allows a gentle roundout.

(d) Airbrakes

At high IAS the airbrakes are effective, but below about 300 knots their effectiveness decreases until at approach speeds their effect is negligible. Above about 0·6M the use of airbrakes causes noticeable buffeting and a nose-down trim change; the buffeting increases at high mach numbers.

(e) Change of Trim

Undercarriage down	Slight nose-up
Undercarriage up	Little change
Flaps down	Strong nose-up
Flaps up	Strong nose-down

Airbrakes OUT	Little change except for nose-down at high mach numbers
Airbrakes IN	Little change
Bomb doors open or closed	Little change

(f) Buffeting

(i) When lowering flaps slight buffeting occurs which decreases as speed is reduced.

(ii) When bomb doors are opened at high airspeeds or mach numbers, marked buffeting occurs. Buffeting is correspondingly less at lower airspeeds and mach numbers.

7 Handling at Aft CG

With correct loading and standard fuel management, the CG remains within limits throughout flight. If, however, the CG moves outside the aft limit due to fuel mismanagement/failure, the elevator control forces are reduced and pitch control becomes more sensitive, leading to a possibility of inadvertently exceeding the aircraft's normal acceleration limits. ▶◀ If mismanagement of the fuel or fuel pump failure causes an aft movement of the CG, restrict handling, above 25,000 feet for aircraft without wing-tip tanks or above 37,000 feet with wing-tip tanks, to gentle manoeuvres only until the fuel balance has been restored.

8 Flying at Reduced Airspeed

Reduce speed to about 170 knots and keep the flaps up.

9 Flight in Turbulence

(a) High Altitude

There is a risk of flameout at high altitude due to turbulence. The risk is greatest when the variable inlet guide vanes are at the minimum swirl position and forward speed is low. The best protection is obtained by setting the engines at 6900 (6700)* RPM and maintaining 270 knots/0·72M. At low weights, surplus speed may be used for a gentle climb out of the turbulent area, but under no circumstances should normal climbing RPM be set. At high weights, if the recommended speed cannot be maintained at 6900 (6700)* RPM, a gradual reduction of height should, if practicable, be accepted.

*Pre-Avon mod 5278 engines.

(b) Low Altitude

Below 25,000 feet there is little danger of engine surge and flameout due to turbulence. The speed range 250 to 300 knots should be adhered to in moderate to severe turbulence.

10 Operating in Icing Conditions

(a) General

(i) No airframe or engine anti-icing equipment is provided; therefore, flight in icing conditions must be avoided whenever possible. If icing is experienced in flight, an immediate climb or descent until clear of icing conditions should be made.

(ii) The build up of airframe ice increases rapidly above 250 knots TAS. Ice is particularly likely to form on open bomb doors and may prevent them from being closed. Therefore, the bomb doors should be opened only for short periods if required to increase the rate of descent through icing conditions or to assist with speed control on an approach in icing conditions.

(iii) Engine icing in flight may occur in the presence or absence of airframe icing. The engines are most prone to icing at low airspeeds with high RPM settings when icing may occur in cloud or precipitation at true outside air temperatures as high as plus 5°C. At normal cruising speeds and RPM settings engine icing is unlikely to occur above 0°C.

(b) Engine Icing on the Ground

(i) The engines must not be started when the air temperature is between plus 1°C and minus 5°C with the relative humidity greater than 95 per cent and the visibility reduced to 600 metres or less by the visible moisture content of the air.

(ii) When the temperature is between plus 5°C and minus 5°C with the relative humidity greater than 90 per cent and the visibility reduced to less than 1000 metres by the visible moisture content of the air, avoid prolonged engine running at high RPM settings. The inlet guide vanes should be inspected frequently for ice after engine start with a final check at 7000 RPM immediately before take-off. If ice is present the engines must be shutdown.

(c) Engine Handling in Flight

Note: The RPM figures in brackets apply to engines pre-Avon mod 5278.

(i) The engine is more prone to surge in the inlet guide vanes operating range with the bleed valves closed and

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also during acceleration from below 6000 (5800) RPM. Throttle handling should receive the utmost care, RPM between 6250 and 7250 (6000 and 7000) should be avoided and on the final approach RPM should not be reduced below 6000 (5800) RPM until it is certain that the runway can be reached. Post-Avon mod 5278, 5800 RPM may be used on the final approach if bomb doors cannot be used for speed control.

(ii) To climb through or out of icing conditions, set 7600 RPM and climb at 250 knots. Do not move the throttles unless it is essential and then only very smoothly. If it is necessary to accelerate the engines from low RPM, move the throttles smoothly and without hesitation through the range 6250 to 7250 (6000 to 7000) RPM.

Note: Climbing at 250 knots with 7600 RPM results in a steep nose-up attitude, particularly at low AUW.

(iii) Avoid cruising in cloud or precipitation at levels where the true outside air temperature is between plus 1°C and minus 5°C.

(iv) To descend through or out of icing conditions, set 6000 (5800) RPM and descend at 250 knots using airbrakes and bomb doors as required, subject to sub-para (*a*) (ii) above. Maintain descent until either clear of cloud or the OAT is above plus 1°C, then maintain 6000 (5800) RPM for 5 minutes before exercising each engine in turn to check surge free operation. If unable to descend clear of icing conditions, maintain 6000 (5800) RPM until finally committed to landing or climb using the technique described in sub-para (*c*) (ii) above.

(v) If an engine surges in icing conditions, close the throttle and, if height permits, make a rapid descent until clear of icing conditions. The engine may then be slowly accelerated to 6000 (5800) RPM and left for 5 minutes, after which an attempt may be made to accelerate it further. If the JPT rises rapidly, throttle the engine back again to 6000 (5800) RPM immediately and allow a further 5 minutes for de-icing.

(vi) If, following a surge, flameout occurs, the throttle and HP cock should be closed and a **Normal Relight** attempted. If the relight is successful and height permits, descend until clear of icing conditions before accelerating the engine from idling to 6000 (5800) RPM. Great care must be taken when opening the throttle and when clear of icing conditions, RPM must be maintained at 6000 (5800) for 5 minutes before attempting to accelerate the engine further.

(vii) If a flameout occurs in icing conditions with no symptoms of surge or mechanical failure, an **Immediate Relight** may be attempted; if this fails, carry out the **Normal Relight** drill.

11 Stalling

(*a*) The approximate stalling speeds in knots are:

Weights (lb)	*Flaps and UC Up*	*Flaps and UC Down*
25,000	70 to 75	60 to 65
30,000	80 to 85	70 to 75
35,000	90 to 95	80 to 85

(*b*) Warning of the approach to the stall is given by slight buffeting which starts some 10 to 15 knots above the stall and becomes moderate as the stall is reached. Just before the stall either wing may drop gently and aileron is effective in raising the wing, but finally, as the stall occurs, the nose and either wing drop gently together. Use of aileron as the stall occurs aggravates the wing drop. Recovery from the stall is straightforward on releasing backward pressure on the control column with ailerons neutral, although in the initial stage of the ensuing dive slight buffeting may again be encountered and care is required to avoid inducing a further stall through too harsh a recovery to normal flight. If corrective action is taken at any time up to the stall, little or no height is lost; if it is taken after the stall has occurred, recovery can be effected in about 1000 feet.

(*c*) When wing-tip tanks are fitted the stall warning characteristics are generally similar but occur about 5 knots earlier. In addition the buffeting is more marked and is accompanied by slight aileron snatch; the snatching becomes marked if aileron is used to raise a dropping wing. With vortex generators fitted the aileron snatching is considerably reduced; no benefit will be obtained, however, unless both the wing-tip tanks and the wing tips are modified.

(*d*) At any time when g loading is applied, ample warning of the approach to a stall is given by buffeting which increases down to the stall proper, at which there is a tendency for either wing to drop. Recovery is immediate upon releasing the pull force on the control column.

(*e*) Because of the great care necessary in engine handling at high altitude, practice stalling at altitudes above 25,000 feet is not recommended.

12 High Speed Flight

Note 1: The limitations are laid down for structural reasons and must not be exceeded.

Note 2: The high mach number characteristics may vary slightly from aircraft to aircraft; they also depend, particularly at high altitude, on the angle of dive (rate of increase of airspeed), on g loading and on the condition of the aircraft.

Note 3: With wing tip tanks fitted the compressibility effects described below will occur at slightly lower mach numbers and even lower if they are badly fitted. If complete loss of control occurs recovery may be more difficult.

(*a*) *Below* 15,000 *Feet*

The speed limitation clean is 450 *knots or* 0·75*M whichever is the lower. The speed limitation with tip-tanks is* 365 *knots.* The aircraft is easily capable of exceeding its airspeed limitation even in level flight. As speed increases there will be a slight change of longitudinal trim and, at the maximum speed or mach number, slight intermittent buffeting may occur. If a rapid longitudinal oscillation develops at or near the IAS or mach number limitation, reduce speed as soon as possible until the oscillation ceases. If speed is inadvertently increased above 450 knots, a marked vibration may develop. If this occurs, speed must be reduced immediately. The airbrakes are effective at high IAS, but their use is accompanied by noticeable buffeting.

(*b*) *Between* 15,000 *and* 25,000 *Feet*

The speed limitation clean is 0·79*M. The speed limitation with wing-tip tanks is* 365 *knots or* 0·79*M.* As speed is increased buffeting commences at about 0·77M and increases in severity as speed rises. If the limitation of

0·79M is exceeded, there is a tendency for lateral unsteadiness to develop.

(*c*) *Above* 25,000 *Feet*

The speed limitation clean is the speed at which a strong nose-up change of trim occurs, ie about 0·84*M. The speed limitation with wing-tip tanks is* 0·80*M.*

(i) Up to about 35,000 feet, warning of the approach of severe compressibility effects is given by a strong nose-up change of trim which occurs at about 0·84M. Below this speed the first symptoms are given by slight buffeting which commences at about 0·78M to 0·80M. At about 0·81M the buffeting increases in intensity and at 0·83M a slight nose-down change of trim occurs followed by a strong nose-up change at about 0·84M. The lateral trim becomes sensitive at these speeds and lateral unsteadiness may be encountered.

(ii) Above 35,000 feet, warning of the approach of severe compressibility effects is given by lateral unsteadiness and the tendency for one wing, generally the port, to drop slowly at about 0·84M. This tendency occurs at slightly lower speeds, between 0·82M and 0·83M, at about 45,000 feet. Below these speeds the symptoms are much the same as in sub-para (i).

(iii) Above 35,000 feet, if the aircraft is accelerated past the speed at which there is a wing drop, aileron snatching and a loss of aileron effectiveness usually occurs, making it difficult to restore lateral level. At the same time elevator effectiveness falls off markedly and severe buffeting sets in. Should control be lost, great care must be taken to avoid over-stressing the aircraft during subsequent recovery at the lower altitudes when the airspeed may be high. Avoid the use of the tail trimmer during recovery, if possible, but if it has to be used, extreme care must be taken.

(iv) The behaviour under compressibility will vary between aircraft and is also likely to vary on individual aircraft depending on the CG position and the external condition of the aircraft. Although the wing drop case above is given as being the most critical from the point of view of possible temporary loss of control, other effects such as strong nose-up or nose-down changes of trim, severe buffeting, lateral rocking and directional instability, may be apparent and are equally critical.

As soon as compressibility effects become marked, particularly at the highest altitudes, speed must be reduced as the consequences of increasing the speed still further are unpredictable and may be serious. The remarks in this paragraph refer to the clean aircraft and when wing-tip tanks are fitted.

(v) Recovery from mild compressibility conditions is best made by throttling back and easing the aircraft out of the dive. Care must be taken to avoid high g-loading, which will aggravate matters.

(vi) If loss of control is experienced, the engines must be throttled right back and the airbrakes extended. About 10,000 feet may be lost before the mach number falls to a figure at which control can be regained. During recovery, g loading must be kept low. Avoid the use of the tail trimmer during recovery if possible, and if it has to be used extreme care must be taken.

(vii) At all altitudes if the engine power is high only a shallow dive is needed to reach limiting speeds.

13 Descent

(*a*) *Emergency Descent*

The recommended technique for making an emergency descent following cabin pressurisation failure at high altitude is to close the throttles, extend the airbrakes, open the bomb doors and descend at 0·79M above 40,000 feet and 0·75M/350 knots below; descend to below 25,000 feet.

(*b*) *Rapid Descent*

To make a rapid descent, close the throttles, extend the airbrakes and descend at 0·79M above 40,000 feet and 0·75M below, until a coincident speed of 350 knots is reached. This gives a rate of descent of approximately 5000 feet/minute down to 30,000 feet, increasing to 10,000 feet/minute or more at lower altitudes.

(*c*) *Normal Descent*

To make a normal descent, close the throttles, put the airbrakes OUT and descend at 0·75M until a coincident speed of 250 knots is reached, maintaining that speed thereafter.

(*d*) *Descent in Icing Conditions*

See para 10 (*c*) (iv).

(*e*) *Use of Canopy Internal Demister*

To obtain maximum efficiency from the internal demisting system, start demisting 10 minutes before the descent. The internal demister should not be on at any other time than that required for the descent, otherwise damage may be caused to the canopy.

PART 3

CHAPTER 3 — CIRCUIT AND LANDING PROCEDURES

Contents

1 Approach and Landing

(*a*) Carry out the **Pre-Descent/Recovery Checks** and **Pre-Landing Checks** given in the FRC. Threshold speeds are shown in Fig 1. These speeds may be increased by 5 to 10 knots when there is a strong surface wind or in gusty or turbulent approach conditions.

(*b*) *Normal Landing*

(i) Ascertain the threshold speed corresponding to the aircraft weight. The initial approach should be made at a minimum of threshold speed plus 30 knots. This speed should be attained by the time the aircraft is lined up with the runway, flaps being lowered as required at any time after the start of the final turn. At speeds above approximately 125 knots full nose-down trim is required when flaps are fully down.

(ii) When the aircraft is lined up with the runway with flaps down, reduce speed gradually, aiming to cross the runway threshold at threshold speed with power on. Do not allow the speed to fall below the minimum approach speed, ie threshold speed plus 10 knots, or reduce power below 4500 RPM until the decision to land has been made. Close the throttles just before touchdown.

(iii) When the mainwheels are firmly on the runway, lower the nosewheel and when appropriate apply the brakes (see para 5). Aerodynamic braking is not recommended for a normal landing.

(iv) When landing at high AUW, it is important to trim out the nose-down change of trim which occurs as speed is reduced in the final stages of the approach; this is to ensure that adequate elevator control is available for the round-out.

(*c*) *Short Runway Landing*

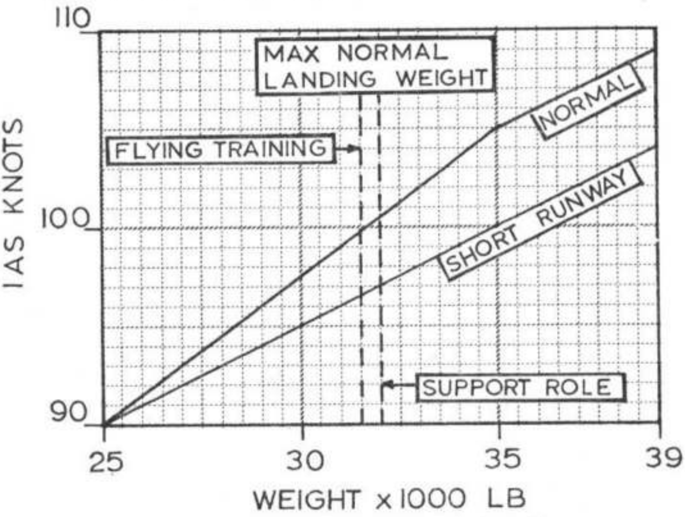
When the landing run available is limited, or the runway is wet or icy, use the following technique. Make the approach using the normal approach speeds. When the decision to land has been made reduce speed gradually to cross the threshold at the short runway threshold speed, power being maintained until just before touchdown. There is a marked tendency to sink if the throttles are closed prematurely or too quickly.

(*d*) *Landing With a Forward CG*

If landing with a forward CG, the threshold speed must be increased by 5 knots above the normal threshold speed for the weight. A forward CG should only occur if the fuel drill is not followed or if the fuel system has not functioned correctly. In cases of doubt, ascertain the extent of control in the landing configuration at a safe height and adjust the approach and threshold speeds accordingly.

(*e*) *Approximate All-Up Weight*

Crew only	23,000 lb
Full fuselage tanks	34,000 lb
Full fuel including wing-tip tanks ...	38,000 lb



3 — 3 Fig 1 Threshold Speeds

2 Flapless Landing

(*a*) Before making a flapless landing, reduce the AUW as much as practicable, using the normal fuel drill.

(*b*) The initial approach should be made at the normal threshold speed plus 30 knots. When lined up with the runway, reduce speed further to not less than 20 knots above the normal threshold speed. The approach should be longer and slightly flatter than normal.

(*c*) Throttle back early, aiming to cross the threshold 10 knots faster than the normal threshold speed for the same AUW.

(*d*) After touchdown, lower the nosewheel onto the runway and when below maximum braking speed apply the brakes, taking care not to lock the wheels (see para 5). Aerodynamic braking has less effect in the flapless configuration and it is not recommended unless a brake pressure failure has occurred prior to landing. If aerodynamic braking is used, careful elevator control is necessary to avoid striking the tail-skid on the runway during the landing run.

(*e*) A flapless landing may be carried out safely on a 6000 feet runway at maximum normal landing AUW (32,000 lb) and up to 39,000 lb in emergency. At AUW above 35,000 lb, if the runway is wet, a 9000 feet runway should be used if available.

3 Crosswind Landing

A crosswind landing presents no special difficulty; the 'crab' technique is recommended. The maximum permitted crosswind component for landing is 25 knots.

4 Landing With One Wing-Tip Tank Full

Determine at a safe height, the lowest speed for *adequate* control, ie the speed at which rolling manoeuvres up to a maximum of 30° angle of bank can be executed safely in both directions with the undercarriage and flaps down. The threshold speed should be the speed for *adequate* control plus 5 knots.

5 Braking

(*a*) *General*

Braking efficiency is improved, especially on wet runways and/or at low AUW, if the control column is moved rearwards as braking commences, thus transferring weight onto the mainwheels. When the nosewheel has lowered onto the runway the brakes can be used, dependent upon runway conditions, as follows:

(i) *Normal*

After the aircraft has touched down and the nosewheel has been lowered onto the runway, hold the control column slightly forward of centre and allow 1 to 2 seconds for the wheels to spin up. Apply sufficient braking to slow the aircraft down using the full length of runway available. This ensures minimum wear and tear of the brakes and tyres. In normal circumstances it should not be necessary to apply the brakes at speeds above 90 knots. Above 90 knots, particularly at low AUW, it is easy to lock the wheels.

(ii) *Maximum*

After the wheels have been allowed to spin up, apply as much brake as possible *without skidding*. Move the control column progressively rearward to increase the effective weight on the mainwheels, simultaneously increasing the application of brakes to ensure the nosewheel remains in firm contact with the runway. This technique should be continued throughout the landing run. If deceleration appears to decrease, then the wheels will probably have locked and the brakes should be released immediately and the control column moved forward to hold the nosewheel on the runway. The wheels must be allowed time to spin up again before restarting braking using the 'stick back' technique.

(iii) *Wet Runway*

A longer time is needed for the wheels to spin up when the runway is slippery; 2 to 4 seconds should be allowed before commencing gentle intermittent braking with the control column held slightly forward of central. When positive deceleration is achieved, begin continuous braking using the 'stick back' technique. It is important to remember that the purpose of gentle intermittent braking is solely to determine whether the wheels have spun up sufficiently to allow brake function without excessive spin down and wheel locking. If the wheels are felt to skid, or if a large expanse of water is about to be entered, release the brakes and move the control column forward. Allow a further period for the wheels to spin up before starting again with intermittent braking using the 'stick back' technique.

(iv) *Flooded Surfaces*

With an appreciable depth of water on the runway (ie 0·2 inch or more) friction between the tyres and the surface is drastically reduced and aquaplaning may occur. In these circumstances braking action is virtually nil and, even though the brakes are not applied, the wheels may spin down to a stop. The speed at which total aquaplaning occurs is dependent upon the type of runway surface and the tyre tread pattern but given the right conditions the tyres may aquaplane at ground speeds above 80 knots. At lower speeds partial aquaplaning may still be present but braking action will improve as speed is reduced further. Because of this drastic loss of braking effect, flooded runways should be avoided whenever possible; if, however, a landing must be made, the recommendations in (iii) above still apply. When pools of water exist, if the brakes have been applied they should be released before the aircraft enters a pool and if the control column is being held back to transfer weight onto the mainwheels, it must be moved forward to prevent the nose from rising.

(v) *Icy Runways*

Whenever possible these conditions should be avoided because of the certainty of the drastic reduction in braking effectiveness on icy surfaces. However, if a landing has to be made, extreme caution is required. The brakes must be used most carefully, as continuous application of excessive pressure can lead to wheel locking and subsequent tyre damage. Aerodynamic braking may be used for as long as possible, depending on runway length.

(*b*) *Normal Maximum Braking Speed (NMBS)*

NMBS is the highest speed, for given conditions, at which maximum continuous braking may be applied and the aircraft brought to rest without loss of braking efficiency and without damage to the brakes. NMBS is obtained from the ODM. The brakes should not be applied at speeds above NMBS except in emergency.

(*c*) *Emergency Maximum Braking Speed (EMBS)*
EMBS is the highest speed, for given conditions, at which maximum continuous braking may be applied and the aircraft brought to rest but with liability of damage to the brakes. If maximum continuous braking is applied at higher speeds, the brakes will overheat and fail before the aircraft is brought to rest. The brakes should never be applied at speeds above EMBS except in the circumstances given in Chapter 2, sub-para 2 (*b*) (ii). EMBS is obtained from the ODM and applies in emergency only.

(*d*) *Brakes Overheating*
Avoid overheating the brakes, by using them judiciously according to the length of runway. Do not make landings involving heavy braking at less than 10-minute intervals. If heavy braking is used, subsequent taxying should be reduced to a minimum. If possible, the aircraft should be parked for 30 minutes, with the wheels chocked and the parking brake off, to allow the wheels to cool before taxying. Alternatively, it may be advisable to shutdown the engines and be towed from the end of the runway.

(*e*) *Brake Fire*
If, after landing, the brakes are observed to be smoking or on fire, the HP cocks should not be closed until fire appliances are available, because dumped fuel may ignite beneath the aircraft. If fire appliances are not readily available, the engines should be stopped by switching off the LP cocks and pumps, leaving the HP cocks open; stopping the engines by this method must be reported, so that the fuel system can be primed before the next start.

6 Instrument Approach

(*a*) *Two Engines*

(i) Reduce speed to below 190 knots and carry out the **Pre-Landing Checks.** Calculate the threshold speed from the graph in the FRC. (See also Fig 1.)

(ii) When the undercarriage is down, set the required RPM (about 6200 RPM at 30,000 lb) to maintain threshold speed plus 40 knots. Only small power adjustments should be necessary until the threshold is reached.

(iii) Lower the flaps when the glidepath is intercepted and reduce the speed to threshold speed plus 30 knots. To achieve the desired rate of descent and at the same time counteract the nose-up change of trim as the flaps travel down, a steady push forward on the control column is required until the flaps are fully down and the aircraft is trimmed into the descent. With full nose-down trim applied, a residual push force will remain until the speed is below about 125 knots.

(iv) Maintain threshold speed plus 30 knots until about 500 feet AGL, then reduce speed gradually, aiming to cross the runway threshold at threshold speed. Do not allow the speed to fall below threshold speed plus 10 knots or reduce power below 4500 RPM until committed to a landing.

(*b*) *Asymmetric Approach and Engine Failure on the Approach*

See Chapter 4.

(*c*) *Instrument Approach in Icing Conditions*

◀ Instrument approaches should be avoided when widespread cloud together with temperatures below plus 1°C exist at or below pattern height. Divert to an airfield clear of icing conditions if possible, otherwise adopt the following recommended technique: ▶

(i) Set and maintain 6000* (5800 pre-Avon mod 5278 engines) RPM throughout the approach until certain of reaching the runway. Leave the undercarriage and flaps up in the pattern keeping the speed down to approximately 170 knots by use of the airbrakes and, if necessary, bomb doors. The bomb doors are prone to icing and should only be opened for short periods in icing conditions.

*5800 RPM may be used for short periods of time on post-mod 5278 engines if, for any reason, the bomb doors may not be used on the approach to assist with control of the speed.

(ii) Lower the undercarriage when the glidepath is intercepted but do not select flaps down until certain of reaching the runway without increasing power. If the aircraft is below 500 feet when the flaps are lowered, a higher than normal speed at the threshold may be unavoidable.

(iii) If it is necessary to overshoot, move the throttles smoothly and without hesitation through the range 6250 to 7250 RPM (6000 to 7000 pre-mod 5278 engines) and climb away at 7600 RPM.

7 Overshooting

(*a*) An overshoot followed by an instrument approach and landing requires about 1250 lb of fuel.

(*b*) Open the throttles smoothly to 7400 RPM, checking that symmetrical power is being obtained before selecting undercarriage and flaps up (both systems travel together taking a total time of about 16 seconds to retract, the undercarriage retracts in about 10 seconds). At high AUW a higher power setting may be necessary to accelerate to the recommended climbing speed of 160 knots. There is a strong nose-down change of trim during the last half of flaps travel; anticipate this by progressive application of nose-up trim as the flaps retract. The aircraft accelerates rapidly and any tendency to sink is easily checked.

(*c*) If an engine malfunction occurs when power is being applied for an overshoot, raise the flaps immediately (above 200 feet AGL) and increase power on the serviceable engine only within the limit of directional control. If the malfunction occurs below 600 feet AGL the aircraft must be landed, if possible on the runway and preferably with the undercarriage down. The overshoot may only be continued if by 600 feet AGL the flaps are fully retracted and the speed is above the asymmetrical initial approach speed.

(*d*) Overshooting below 200 feet AGL is not recommended because of the possibility of an engine malfunction occurring during acceleration from low RPM, causing high asymmetric thrust and consequent directional control problems at low level with low airspeed.

8 Roller Landing

Extreme care is necessary when carrying out a roller landing because of the danger of compressor stall and engine surge occurring while the engines are being accelerated from idling, especially in crosswind conditions. If it becomes necessary to go round again from the runway or if a roller landing is carried out for instructional purposes, careful throttling handling and engine monitoring is essential, and the following precautions must be observed:

(*a*) After touchdown lower the nosewheel onto the runway.

(*b*) Keeping the throttles together increase power, slowly initially to allow the engines to accelerate at the same rate. This is particularly critical up to 6000 RPM.

(*c*) At 7000 RPM, with the throttles aligned, compare JPT and check that symmetrical thrust is being obtained before opening the throttles further.

(*d*) Keep the nosewheel on the runway until the engines are at the required take-off RPM (minimum 7400) and unstick at not below the threshold speed for the AUW and flaps position.

(*e*) If at any time prior to unstick an engine malfunction is suspected or there is any indication of asymmetric thrust, the throttles must be closed immediately and the take-off aborted.

9 Checks After Landing

(*a*) Carry out the **After Landing Checks** given in the FRC.

(*b*) If the surface wind is above 25 knots, the rudder lock should be fitted for taxying, if practicable before the aircraft is turned out of wind. In wind speeds above 35 knots, the aileron and elevator locks should also be fitted.

(*c*) After parking for an 'engines running crew change', the aircraft must be made **Safe for Parking** before crew changeover. The relieving crew must carry out the **Crew Changeover Checks** given in the FRC before taxying.

10 Shutdown Procedure

(*a*) Before stopping the engines, trim the tailplane fully nose-down and then give one 'blip' up on the tail-trim switch to ease tension on the tailplane microswitch spring. This will also prevent ingress of moisture to the actuator jack.

(*b*) Carry out the **Shutdown Checks** given in the FRC.

PART 3

CHAPTER 4 — ASYMMETRIC FLYING

Contents

1 Stopping an Engine In Flight

If an emergency or malfunction necessitates shutting down an engine in flight or when practising emergency procedures, carry out the appropriate engine fire or failure drill given in the FRC. When shutting down an engine for other reasons, use the following sequence:

(a) Carry out electrical load shedding.

(b) Switch off the generator.

(c) Check DC voltage and confirm that the other generator warning light is out.

(d) Close the throttle and shut the HP cock.

(e) Switch off the appropriate LP pumps and engine air switch.

2 Flying on One Engine

(a) The aircraft has a good single-engine performance and the rudder trim is powerful enough to trim out all foot loads at normal cruising speeds.

(b) When flying on one engine, the tailplane trim should be used as little as possible, as the initial power load is high.

3 Relighting an Engine in Flight

(a) Immediate Relight

If an engine flames out and there are no indications of mechanical failure, an immediate relight may be attempted by pressing the relight button for 5 seconds and then releasing it, leaving the throttle and HP cock in their set positions. A successful relight will be indicated when the RPM stabilises and then begins to rise. At the higher altitudes particularly, it will probably be necessary to close the throttle after the RPM has stabilised, in order to stop the JPT rising beyond the limits. If JPT increases without a corresponding increase in RPM, close the throttle and then open it again slowly.

(b) Flame-Out

If an immediate relight fails or is impracticable, carry out the **Flame Out** drill given in the FRC and then try a **Normal Relight.**

(c) Normal Relighting — Recommended Conditions

For normal relighting, the following altitude and windmilling RPM are the recommended maxima, depending on the modification state of the engines.

(i) Pre-Avon mod 857 — 20,000 feet; 1200 RPM.

(ii) Post-Avon mod 857 — 25,000 feet; no RPM restriction.

Relighting is practicable up to approximately 5000 feet above the recommended altitude, but a reduction in altitude and windmilling RPM make relighting progressively more certain. If relighting is attempted above 25,000 feet (Avon mod 857), reduce the windmilling RPM to 1200 or less. The Normal Relight drill given in the FRC applies to both the pre- and post-mod 857 engines.

4 Relighting in Icing Conditions

See Chapter 2, para 10.

5 Asymmetric Approach, Landing and Overshoot

(a) Approach and Landing

(i) Carry out the **Pre-Landing Checks** (but see sub para (iii)) but instead of calculating the threshold speed, use the asymmetric initial and final approach speeds for the AUW as follows:

Minimum Asymmetric Approach Speeds

	Below 36,000 lb	Above 36,000 lb
Initial approach speed to 600 feet AGL (VCH)	140	150
Final approach speed from 600 feet AGL until certain of landing	125	135

◀ (ii) A straight-in instrument approach is recommended. If a visual circuit is flown, extend the downwind leg to give a longer approach path. Start the final turn so as to roll out between 650 and 750 feet on the extended centreline and on the normal glidepath to allow sufficient time to stabilise the approach before reaching VCH. ▶

(iii) To avoid using high asymmetric power on an instrument approach, the undercarriage should not be lowered until the start of the glidepath descent. About 6300 RPM will be required at an AUW of 30,000 lb. When carrying out a visual circuit at high AUW, lowering of the undercarriage may be delayed until near the end of the downwind leg. Whenever limited **Pre-Landing Checks,** excluding undercarriage lowering, have been carried out, they must be completed when the undercarriage is selected down by confirming 'three greens' and checking the brakes.

(iv) For asymmetric approaches, it is recommended ◀ that the rudder trim be set to the neutral position immediately before commencing final descent. ▶

(v) The approach should be made using a 3° glidepath. Do not reduce speed below the recommended initial approach speed, nor height below 600 feet AGL (VCH) until the final decision to land is made. When committed to a landing, reduce speed progressively by use of the throttle (minimum 4500 RPM) to not below the recommended final approach speed. Maintain this speed until absolutely certain of crossing the threshold, then close the throttle. Flaps may then be lowered to reduce the landing run but must never be selected down above 100 feet AGL. At speeds below 125 knots the nose-up change of trim as the flaps move fully down is negligible. However the change of trim becomes progressively more marked at the increased speeds associated with higher AUW.

(vi) The calculation of threshold speed for asymmetric landing is considered unnecessary, since if the technique is correctly used the speed over the threshold will always be above the flapless threshold speed.

(b) Overshooting

(i) An overshoot can be made safely provided the wings are level, the flaps are up, the speed is at least 140* knots and that the height is 600 feet AGL (VCH) at the start of the overshoot.

*150 knots at 36,000 lb and above.

(ii) As soon as the decision to overshoot is made, maintain the speed at not less than the initial approach speed (sub-para *(a)* (i)), by diving if necessary, ensure that the wings are level and then increase power on the live engine within the limits of directional control to about 7400 RPM, maintain the slip ball central by progressive application of rudder. Retract the undercarriage and check that the flaps are up. Climb away at 160 knots. If necessary, power may be further increased after the speed has increased from the initial approach speed, provided directional control can be maintained (slip ball held central) by use of rudder.

(iii) The initial overshoot power setting of about 7400 RPM is normally sufficient for a climb back to circuit height. Should 7400 RPM not produce a satisfactory climb performance for any reason, speed should be allowed to increase so that additional power can be used safely or, if height is critical, up to 10° of bank should be applied towards the live engine.

(c) Approach and Landing in Icing Conditions

Whenever possible divert to an airfield that is clear of icing conditions. If compelled to carry out an asymmetric approach in icing conditions, use the normal asymmetric approach and landing technique.

6 Engine Failure on Approach

If an engine failure occurs during a normal two-engine approach, proceed as follows:

(a) If Above 600 Feet AGL

Decide whether to continue the approach or to overshoot. If possible, continue the approach; however, an overshoot may be made, provided that the flaps can be fully retracted and the initial asymmetric approach speed can be achieved with wings level by 600 feet AGL. To overshoot, use the procedure recommended in para 5 *(b)*, selecting undercarriage and flaps up together. To continue the approach to land, increase power on the live engine within the limits of directional control, raise the flaps immediately and recover to the normal glidepath at the appropriate asymmetric approach speed. Adjust power thereafter as required.

(b) If Below 600 *Feet AGL*

The aircraft must be landed, if possible on the runway and preferably with the undercarriage down. Increase power on the live engine within the limits of directional control to counteract any increase in the rate of descent, then:

(i) *If Above* 200 *Feet AGL*

Raise the flaps immediately. As the flaps retract and the speed increases, adjust power to achieve and maintain the asymmetric final approach speed.

(ii) *If Below* 200 *Feet AGL*

At this height little advantage is gained by raising the flaps. However, at the normal minimum approach speed with flaps down it should be possible to apply sufficient power within the limits of directional control to make a safe landing.

7 Double Flameout

(a) If a double flameout occurs, a relight on one engine may be attempted immediately, while the RPM are decreasing, by pressing the relight button for 5 seconds and then releasing it, leaving the throttle at its set position. A successful relight will be indicated by the RPM stabilising and then starting to rise. Ensure, by throttling back if necessary, that the maximum JPT (600°C) is not exceeded.

Note: If double flameout occurs below the recommended maximum altitude for relighting, first switch ON the LP pump of another tank before attempting an immediate relight.

(b) If an attempt to relight an engine as above is unsuccessful, carry out on each engine in turn the **Flameout** drill given in the FRC and reduce electrical loads to an absolute minimum. If above the recommended maximum relight altitude, descend to it as rapidly as possible, commensurate with the need to avoid trimming and carry out on one engine only the **Normal Relight** drill given in the FRC. When that engine has relit, switch its generator on and relight the other engine.