

PART 3
CHAPTER 5—APPROACH AND LANDING

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VISUAL CIRCUITS

Visual Approach and Landing

1. An overshoot followed by a circuit and landing uses up to 250 lb of fuel per side (F Mk 3, 200 lb/side). An overshoot followed by an instrument circuit and landing uses 500 lb/side. When calculating the fuel required for landing, bear in mind that up to 400 lb/side gauged fuel may be unusable. Approach, threshold and touchdown speeds are listed in the FRC.
2. In the T Mk 5 only, the wheelbrakes are not to be applied during the five minutes immediately before landing.
3. After joining the circuit, carry out the **Checks Before Landing** listed in the FRC. Ensure that the brakes are off: in the F Mk 6, post-mod 4212, check that the left and right pointers indicate zero on the triple pointer gauge; in the T Mk 5 check that the left stick parking catch is not engaged and both stick brake levers are fully off.

4. Make the initial turn on to final approach at the approach speed plus 15 knots in the F Mk 6 or at 190 knots in the F Mk 3 and T Mk 5. When converging with the runway centreline, reduce the bank angle and airspeed progressively to line up at 300 feet at the approach speed. Airbrakes are normally extended half-way round the finals turn.
5. A shallow approach is recommended, maintaining at least 60% RPM to ensure rapid engine acceleration if this becomes necessary. Avoid steep approaches owing to the danger of striking the rear fuselage on the runway at round-out.
6. Reduce speed slowly on the approach to cross the threshold at the recommended speed. Round out smoothly, with power on, to prevent the rear fuselage striking the ground. When the main wheels are on the ground, close the throttles to idle/fast idle, lower the nosewheel and pull the brake parachute handle to its full extent. To prevent damage to the parachute during streaming, hold the control column fully forward;

when the parachute has deployed, move the No 2 throttle to idle. If the brake parachute is streamed below 100 knots, there may be insufficient airflow to assist the pilot chute to deploy the main canopy.

7. The braking effect of the parachute is high and it is always to be used. The parachute normally reduces the aircraft speed to 20 knots in approximately 6000 feet without the use of wheelbrakes, irrespective of runway surface conditions. Use the wheelbrakes as necessary to supplement the effect of the parachute and to keep straight. If wheelbrakes only are used, the landing ground roll is increased by approximately 40 to 50% on a dry runway and up to 90% on a wet runway. Landing data is given in the ODM.

Roller Landing

8. Roller landings are not normally permitted owing to the possibility of overheating the tyres.

Precautionary Landing

9. When an approach is made in circumstances that preclude any further approach being made, the precautionary landing technique is to be adopted as follows. At touchdown, move the throttles to idle/idle, lower the nosewheel to the ground promptly, and employ the maximum braking technique (para 19), simultaneously pulling the brake parachute handle to its full extent.

10. If the brake parachute deploys, release the wheelbrakes and complete a normal landing run. If the brake parachute fails to deploy (or it is not available), continue with the maximum braking technique; do not taxi because damage to the brakes and tyres may have occurred.

Crosswind Landing

11. The crab landing technique is recommended for approaches in crosswind conditions. When rudder is used to eliminate drift, anticipate a rolling moment due to yaw.

12. Immediately after touchdown, lower the nosewheel and stream the brake parachute anticipating weathercocking and correcting by the use of rudder. Apply into-wind aileron to keep the wings level and equalise weight distribution on the wheels as far as possible. Use differential wheel braking only when the rudder begins to lose effectiveness, thereby minimising the chance of drift caused by loss of runway adhesion.

13. The most critical part of the landing run is between 125 and 100 knots. Below 100 knots, normal wheel braking up to maximum may be used as

required without significant adverse effects on directional control. Landing distances are longer than normal.

14. If an uncontrollable drift to the downwind side of the runway occurs, the following actions are recommended:

- a. Release the brakes, thereby allowing maximum use of the restoring force provided by tyre/runway friction to oppose drift.
- b. Allow the weathercocking effect to yaw the aircraft nose into wind and restore tracking towards or parallel to the upwind side of the runway.
- c. Delay the use of wheelbrakes until rudder control becomes insufficient or until directional control ceases to be critical.
- d. Do not jettison the brake parachute to counter drift unless retaining it is likely to cause the aircraft to leave the side of the runway.

Turbulence

15. When landing in turbulent conditions, add five to 10 knots to the threshold and touchdown speeds.

Braking Technique

16. *Dry Surfaces.* On dry surfaces, the maxaret units normally prevent the wheels from locking when excessive brake pressure is applied but, unless the shortest possible run is required, more gentle use of the brakes is recommended. The aircraft is to be firmly on the ground before the brakes are applied as the maxaret units do not operate unless the wheels are rotating. As a safeguard against the wheels locking during a bounce, the maxaret units remain operative for several seconds, ie the wheels continue to rotate even though the brake lever is applied. If a slip or skid is felt, or difficulty is experienced in keeping straight, release the brakes momentarily to allow the wheels to spin up. Use brakes judiciously to minimise wheel-brake heating.

17. *Wet Surfaces.* Braking effect may be greatly reduced on wet runways, depending on runway surface and the amount of water. Generally, in wet conditions, light, continuous braking should be started after the wheels have had time to spin up. Thereafter brake application may be progressively increased as the speed falls.

18. *Flooded or Icy Runways.* Whenever possible avoid flooded or ice-covered runway conditions because of the reduced wheelbrake effectiveness. If a landing is to be made in such circumstances, employ the wet surfaces technique, using extreme caution.

19. *Maximum Braking Technique.* If maximum braking is necessary, lower the nosewheel on to the runway as soon as possible after touchdown. With the stick held fully forward, apply firm brake pressure and simultaneously stream the brake parachute. Progressively move the stick rearward and increase the brake pressure as the aircraft slows, avoiding maxaretting.

Overshoot Procedure

20. Normally 90% RPM is sufficient for an overshoot before touchdown. Open the throttles together smoothly and retract the airbrakes; when climbing away, raise the undercarriage. If required, the undercarriage may be left down; it is to be left down for a short time if the wheels have touched the runway in order to assist cooling. Delay the selection of flaps UP until a speed of 180 knots is attained.

Failure of the Brake Parachute

21. Failure of the brake parachute to stream considerably increases the landing run and places a heavy demand on the wheelbrakes. The action to be taken depends on the prevailing conditions and is to be decided on before starting the final approach.

22. If conditions permit a further approach, apply full cold power to become airborne again, raising the flaps at 180 knots. Leave the undercarriage down to cool the wheels. Make the subsequent landing using the precautionary landing technique.

23. If the parachute streams but subsequently collapses, the decision whether to become airborne again depends upon the initial deceleration obtained, the remaining length of runway available and the prevailing conditions. When it is decided to roll and make a further approach, roll as described in para 22, being sure to jettison the brake parachute. Initially the pilot will have no indication whether the parachute has jettisoned or not.

Heavy Weight Landing

24. Landing at AUW in excess of 34,500 lb should be avoided whenever possible. Before making the approach, consider the actions to be taken in the event of a brake parachute failure. If a landing at high AUW is inevitable:

- a. Make a flatter than normal approach and, to avoid damaging the undercarriage, land as gently as possible.
- b. As soon as the nosewheel is on the ground, employ maximum braking technique (para 19).

c. Do not stream the brake parachute until the speed has reduced to 150 knots (170 knots, F Mk 6).

d. After a successful stream, moderate wheel braking should suffice. The landing run may be reduced by closing one HP cock.

Flapless Landing

25. All stages of a flapless circuit and landing should be flown at 10 knots faster than for a normal landing. Whenever practicable, reduce AUW in order to keep the touchdown speed as low as possible. The absence of flap results in a marked nose-up attitude throughout the circuit and, unless the seat position is raised, difficulty may be experienced in retaining an unobstructed view of the runway on the final approach.

26. Make a flatter than normal approach; the high angle of attack reduces tail bumper clearance when rounding out and extra care is necessary at this stage of landing. The higher touchdown speed may cause the aircraft to bounce unless prevented by moving the control column forward as the main wheels touch the ground. The minimum landing run is approximately 600 feet longer than for a normal landing.

Checks After Flight

27. Carry out the **Checks After Landing** listed in the FRC.

28. If heavy braking has been used during the landing, the minimum braking necessary is to be used during taxiing to avoid wheel overheating.

29. In dispersal carry out the **Shutdown Checks** listed in the FRC.

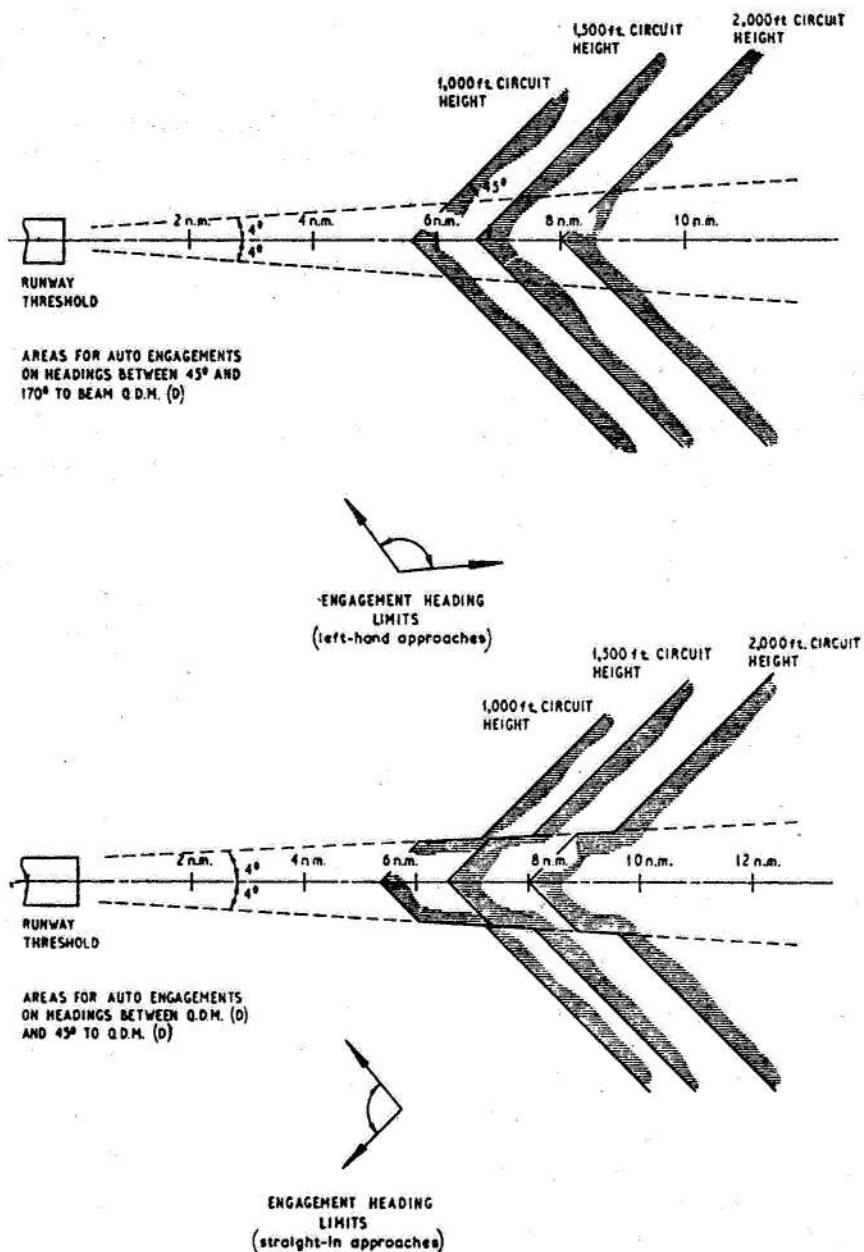
INSTRUMENT APPROACHES

PAR and ILS

30. It is recommended that ILS approaches be monitored by PAR.

31. Instrument approach power settings, speeds to fly and aircraft approach limitations are set out in the FRC.

32. In the event of a missed approach, carry out the overshoot procedure (para 20). If the fuel state is marginal for dealing with any subsequent undercarriage malfunction that might arise, leave the undercarriage down during and after the overshoot.



3-5 Fig 1 Engagement Areas for Auto-ILS Approaches

Auto-ILS

33. Plan the let-down into the ILS pattern so that on reaching check height the aircraft is suitably positioned within the ILS engagement area (Fig 1). Do not descend to less than 1000 feet AGL until the ILS glidepath is intercepted. The Checks Before Landing are normally completed by 12 miles from touchdown.

34. During the let-down, set or confirm:
- a. Autostabilisers ON and functioning satisfactorily.
 - b. ILS MASTER switch ON, channel selected and beacon identified.

- c. VP/ILS to ILS.
- d. ILS selected on the navigation display, heading selector on QDM(D), localiser index set on beam QDM.
- e. BEAM and GLIDEPATH amber lights not showing.
- f. Autopilot engage switch OFF.
- g. TRACK selected on the FCS control unit.

35. Below 250 knots with both engines set at 75% RPM, select throttle servo to ENGAGED. It may be

necessary to make small adjustments to the power setting to maintain the correct speed; these small movements to the throttle can be made without servo disengagement. When high AUW requires an approach speed above 180 knots, disengage the servo and control the speed manually.

36. With the aircraft trimmed out, the autopilot trim indicator should fluctuate about the central position.

37. When positioned within the ILS engagement area and on the correct heading (ie within 170° of QDM(D)), check that the ILS indications are logical and the autopilot trim indicator central. Select the stick switch to AP: the FD bead moves from its parked position.

38. The autopilot immediately applies up to 30° of bank to turn the aircraft towards the localiser beam and fly an interception heading of up to 45° to the QDM(D). During this turn the aircraft may descend by as much as 400 feet. This can be corrected by overriding the autopilot; using the trimmer to correct the error as an alternative, necessitates re-trimming when the turn is complete.

39. After passing through the localiser beam once, the autopilot aligns the aircraft on the localiser centreline. At short ranges, this overshoot through the beam may cause a full-scale deflection on the ILS indication.

40. When the glide bar begins to move down, extend the airbrakes and press the GLIDE key. The aircraft pitches down and follows the glidepath.

41. Throughout the approach, carefully monitor autopilot trim and approach speed and keep them correct by trimming and overriding the throttle servo clutch as appropriate. The small corrections that may be necessary should be followed by a delay of about 30 seconds, where practicable, to allow the system to stabilise.

42. At decision height, disengage the throttle servo, select the stick switch to OFF and land or overshoot as appropriate.

Note 1: QDM(D) is the heading required, allowing for drift, to track the beam centreline (QDM). The accuracy of the final approach depends on the accuracy of the drift allowance set.

Note 2: If the autopilot trim indicator does not indicate zero in steady flight, do not engage the autopilot.

Note 3: Do not select GLIDE with a heading error greater than 10° from QDM(D) or with a localiser error at full deflection. If necessary, selection may be delayed until half-scale 'fly-down' is indicated.

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