PART 3

CHAPTER 2—TAKE-OFF

Contents

Performance Considerations

1. Vstop and Vgo speeds are given in Part 2 of the ODM.

2. If speed is at or below Vstop, the take-off may be aborted and the aircraft brought to rest by the use of the maximum braking technique in the remaining length of the runway. Therefore, when an engine failure occurs at or below Vstop, the take-off is to be aborted.

3. If speed is at or above Vgo, take-off may be continued after failure of an engine; the aircraft will become airborne within the remaining distance.

4. Provided Vstop is greater than Vgo, only Vstop need be considered. If Vgo is greater than Vstop however, a speed band occurs between the two speeds in which engine failure results in the aircraft running into the overshoot area irrespective of whether the take-off is continued or not.

Reheat

5. *F Mk* 3 *and T Mk* 5. Normally, if Vstop exceeds Vgo, use maximum cold power for take-off but, if reheat is used and one reheat fails during take-off, cancel the failed reheat and continue the take-off. However, when Vgo is greater than Vstop in cold power, use reheat from the start of the take-off run and, if either reheat fails to light, abort the take-off.

6. *F Mk* 6. In the F Mk 6, all take-offs are to be carried out using maximum reheat. If full overwing tanks are carried and either reheat fails to light, abort the take-off. In other configurations, if either reheat fails to light at the first attempt, a second selection is permissible provided the speed is below 90 knots. If this procedure is unsuccessful, abort the take-off.

Note: F Mk 6 aircraft fitted with overwing tanks containing fuel are only permitted to take-off when the runway in use has a serviceable and rigged upwind arresting gear. If no upwind arresting gear is available, the overwing tanks are to be empty.

Flap

7. *F Mk* 3 *and T Mk* 5. Although in the F Mk 3 and T Mk 5 the use of flap improves the unstick characteristics of the aircraft, flap should not be used for take-off because:

a. In cold power, single-engine climb-out performance is marginal with flaps down.

b. The nose-down pitching forces caused by the failure of No 1 engine with No 2 in reheat in the flap-down configuration may prejudice a safe take-off.

8. *F Mk* 6. In the F Mk 6, normal take-off is with full reheat and flaps down.

Engine Failure

9. If a cold power take-off is continued after an engine failure, reheat is not to be selected because a successful engagement of reheat is of little benefit in shortening the take-off run. Furthermore, if the nozzle opens but the reheat fails to light, the resultant thrust reduction aggravates the emergency.

10. Following an engine failure on a take-off that is not aborted, leave both throttles at the position selected for take-off because there is no yaw to assist the pilot in determining which engine has failed. When the aircraft is safely airborne, raise the undercarriage, identify the failed engine and then shut it down.

11. Details of climb-out performance with one engine windmilling are given in the ODM.

Icing Conditions

12. The use of anti-icing adversely affects the take-off performance by approximately 5%.

13. In icing conditions, anti-icing is to be used for take-off unless runway length is limiting, in which case run the engines at 85% RPM for not less than 30 seconds with the anti-icing on and then make an immediate take-off with the anti-icing switched off. This procedure removes any ice already formed but affords no subsequent protection; therefore, switch on the anti-icing again as soon as practicable after take-off.

14. If an engine fails when anti-icing is in operation, the net thrust on the remaining engine is reduced by 8·5%; this reduces Vstop by 5 knots and increases Vgo by 25 knots. Adjust take-off calculations accordingly.

Take-Off

15. Carry out the **Checks Before Take-Off** listed in the FRC.

16. Align the aircraft on the runway with the nosewheel straight and apply the brakes. Parallel No 1 throttle with No 2 and then open both throttles to 92% (85% in F Mk 3 or T Mk 5 pre-mod 4682) and check that the brakes hold at this setting. Release the brakes and increase both throttles to maximum cold thrust checking:

a. The nozzles have moved to the closed position.

b. Both JPT have increased to at least 650°C.

If either of these conditions is not satisfied, abort the take-off.

17. If reheat is to be used, rock the throttles through the gate and move them smoothly and quickly to maximum reheat. The TTC lights come on momentarily. Check that the nozzles are fully open, that the JPT is above 700°C but below 795°C, and that the TTC lights are out.

18. Take-off RPM may stabilise at any figure between 97% and 102·5%, depending on the ambient temperature, use of reheat, use of anti-icing, JPT controller operation and intake effects.

19. Speed increases quickly during the take-off run and there is no difficulty in keeping straight even in strong crosswinds. At 90 knots cross-check the IAS shown on the strip speed display with that of the standby ASI. Differential braking may be necessary until the rudder becomes effective at 100 knots.

20. In the F Mk 3 or T Mk 5 at 145 knots (135 knots without missiles), progressively move the control column rearwards to raise the nosewheel, avoiding an excessive attitude. In the F Mk 3 the nosewheel comes off cleanly at the recommended speed and care is to be taken not to attain a high nose attitude. In the T Mk 5, during a clean take-off, the nosewheel is reluctant to come off at the recommended speed. In both marks, once the nosewheel is raised, care is to be taken not to over-rotate otherwise there is a danger of the tail bumper striking the ground. At 150 knots, move the control column smoothly back, aiming to unstick at 175 knots.

21. In the F Mk 6 with flaps down, raise the nosewheel at 150 knots (165 knots with full overwing tanks). The nosewheel is reluctant to come off; a moderate pull force and nearly full rearward movement of the control column is required. Maintain this control position and the aircraft leaves the ground cleanly at the recommended speed of 170 to 180 knots (185 to 190 knots with full overwing tanks).

WARNING: In all marks, the undercarriage oleos extend appreciably before the aircraft finally unsticks; undercarriage retraction at this stage, when there is still some weight on the wheels, causes the aircraft to sink back on to the ground. To prevent this, establish a positive rate of climb before retracting the wheels.

22. During a take-off using full reheat and flaps down when carrying Red Top missiles without wings, the nosewheel raising speed and unstick speed are increased by up to 10 knots with an associated increase in ground roll of up to 600 feet. Be prepared to use more aft stick to lift the nosewheel.

23. In a strong crosswind, the up-wind wing may rise slightly and, when the aircraft unsticks, the down-wind wing may drop. The wing-drop is easily corrected by use of aileron.

24. As soon as the aircraft is safely airborne, apply the brakes and retract the undercarriage, keeping the speed below 250 knots and the brakes applied until the wheels are locked up. The nosewheel locks up with a distinct thud. Raise the flaps (if used) at not less than 190 knots (200 knots with full overwing tanks) and cancel reheat (if used) when no longer required (but not below 250 knots with fuel in the overwing tanks).

25. Carry out the **Checks After Take-Off.**

26. If a 'rotation' is to be performed after a reheat take-off, it is to be started at a minimum speed of 260 knots and acceleration is not to exceed +3g.

Aborting Take-Off

27. If an emergency occurs during the take-off run that makes it unwise to become airborne, abort the take-off even if Vstop has been exceeded. If there are no arresting facilities available, the decision whether or not to eject from the aircraft will depend upon the circumstances.

28. To abort the take-off:

a. Move the throttles to idle/idle.

b. Stream the brake parachute (which may not deploy if the speed is below 100 knots).

c. Employ the maximum wheel braking technique (Part 3, Chapter 5, para 16).

d. In the F Mk 6, if an arresting cable is available, lower the arrester hook and aim to engage the centre of the arresting cable at 90° (avoid hook bounce on centreline runway lighting, if installed, by aiming slightly left or right of centre). Release the brakes before entry. Any pull-back as the aircraft stops should be checked by the application of engine power, not the use of wheelbrakes.

e. All marks of aircraft are cleared to engage Mk 6, 12 and 12A, and Types A and B arresting barriers. F Mk 6 aircraft with overwing tanks fitted may only engage Mk 12A and Type A and B barriers; the overwing tanks must be empty.

29. Failure of the Services hydraulic system pumps is not indicated to the pilot during an abort since AC is off line. If a double pump failure has occurred, the wheelbrakes accumulator meets the normal braking requirements, but frequent maxaretting or differential braking could exhaust the system.

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