PART 4 : SECTION 2

CHAPTER 2

TWIN-ENGINE AIRCRAFT—APPROACH AND LANDING

Introduction

1. If unable to maintain height on asymmetric power with the undercarriage and flaps up, there is only a limited choice of action which is normally confined to using the available power for :—

(*a*) Keeping the rate of descent to a minimum.

(*b*) Reaching the best available landing area.

If an airfield cannot be reached, a wheels-up landing, using flaps as required, must be made. If possible the landing area should be chosen while there is at least 1,000 feet of height in hand. If an airfield can be reached, the best course of action will be governed largely by the amount of height in hand ; if this is less than 1,000 feet it will normally be advisable to make a wheels-up landing, unless the aircraft is fitted with a rapid-acting and low-drag undercarriage ; if more than 1,000 feet is available a wheels-down landing may be justifiable. In the latter case the undercarriage should be lowered in the usual position on the downwind leg, and the flaps selected as required when it is certain that the landing area can be reached. If unable to maintain height on asymmetric power with the undercarriage and flaps up, the pilot alone can best decide his course of action, depending on the circumstances prevailing, the height, rate of descent, and the drag of the lowered undercarriage.

Turn-and-Slip Indicator

2. Full use should be made of the turn-and-slip indicator during the circuit and approach. Particularly when increasing power, the slip indicator should be kept central, *i.e.* wings level, so that any uncontrollable deviation gives an immediate warning of the imminence of control difficulties. If the slip indicator moves from its correct central position and cannot be re-centralized by rudder movement, power must be reduced on the live engine or the nose lowered to increase speed, or a combination of both. The turn-and-slip indicator is of paramount importance when going round again on asymmetric power, for it is at low speeds and high powers that the greatest care is required.

3. The remainder of this chapter deals with aircraft on which it is possible to maintain height on asymmetric power with the undercarriage and flaps up.

Approach and Landing

4. Before returning to an airfield, check by radio the weather conditions prevailing for landing. If these prevent an approach from normal circuit height, or if visibility is seriously restricted, an early diversion should be made while ample height remains.

5. After joining the circuit, the undercarriage should be lowered in the normal position on the downwind leg and at the same time power should be increased to compensate for the increased drag. It must, however, be borne in mind that if only partial hydraulic power is available, or if the hand pump has to be used, it will take longer than usual to lower the undercarriage. Normally the aim should be to have the undercarriage locked down before beginning the base leg, so that this action does not interfere later with judging the approach. The airspeed must not be allowed to fall below the critical speed for the amount of power required for going round again (go-around power).

6. The flaps should be partially lowered to the maximum lift position. If setting the flaps to the maximum lift position gives better handling characteristics this can be done earlier in the circuit, before lowering the undercarriage. The best point at which to lower flap is not the same for all aircraft and the pilot must judge this from his experience of the type. Full flap should be lowered only when certain of reaching the required runway and when definitely committed to the landing.

7. **Decision Height.** On the base leg all the pre-landing checks, with the exception of full flap, should be completed before turning onto the final approach. After turning in, height should be reduced steadily down to the *decision height*. This height, which varies between different types of aircraft and on some types has no practical significance, is the minimum safe height from which a go-around could be made with the flaps at not more than the maximum-lift setting and the speed at or above the critical speed for go-around power. On some aircraft the handling characteristics are such that a

go-around can be done from any height ; but on others considerable height may be needed to ensure a safe margin above the ground during the time that height is being unavoidably lost while the requisite drill is carried out. Pilot's Notes state the required drill and advise on the decision height. The Flying Order Book, also, often states limitations on the decision height to be applied when *practising* landings on asymmetric power.

8. On reaching the decision height the pilot must decide finally whether or not to continue with the approach and landing. Until this decision is made the speed must be held above the critical speed for go-around power.

9. After deciding to land, the flaps can be used as required, the airspeed progressively reduced and the live engine used as necessary, within the limits of rudder control, to adjust the approach path as for a normal approach. The aim should be to cross the runway threshold at the height and speed for a normal approach for the particular A.U.W.

10. Rudder trim should not be taken off, because it will assist when using the live engine on the approach.

Undershooting

11. If, after deciding to land and having dropped the speed to below the critical speed for go-around power, it is found that the airfield cannot be reached, on no account should the nose be raised and an attempt made to stretch the approach to the airfield, because the speed will fall below the critical speed for the power used. *Power must never be increased beyond the limits of rudder control.* The undercarriage should be raised, or at least unlocked, and the live engine used, within the limits of rudder control, to regulate the rate of descent, to avoid obstacles, and to reach the best available landing area. Flaps should be lowered, fully if possible, and a crash landing made.

Going Round Again

12. The latest stage at which to decide to go round again is after the final turn towards the landing area and before more than maximum-lift flap is lowered. The height must be equal to or greater than the decision height.

13. Regardless of height, however, the airspeed must be at or above the critical speed for go-around power, and if necessary a shallow dive should be made to maintain the speed.

14. If it is decided to go round again, the throttle should be opened smoothly to the power required (the turn-and-slip indicator is a very important instrument at this stage) and then, in quick succession, undercarriage and flaps should be raised (in the sequence given in Pilot's Notes) to reduce the drag most rapidly. As soon as possible, check the rate of descent and climb away.

15. If ample height is in hand when it is decided to go round again, it is usually best to lower the nose and dive slightly to accelerate more quickly and gain the biggest possible margin over the critical speed ; rudder drag is thus reduced and the subsequent rate of climb improved.

16. On aircraft with good handling characteristics on asymmetric power there is often no critica need, *i.e.* the aircraft can be controlled at fulll power at any speed and could even be taken off under these conditions. The initial part of the take-off run might have to be done at a slow rate of power increase so that the rudder and assistance given by a steerable nose wheel, if fitted, could effectively balance the rate of increase of power. Alternatively, on aircraft having more than two engines, symmetric power could first be applied normally on opposite engines and then the power of the odd engine fed in progressively as the speed increased ; the take-off run will be considerably longer and when, through operational necessity, such a technique is specifically authorized, the A.U.W. must be the minimum possible under the circumstances.

Mislanding

17. Mislanding is defined as going round again because of a heavy bounce on touch-down, or some other behaviour on the part of the aircraft which would cause difficulty in completing the landing. On aircraft having no critical speed at go-around power or a critical speed lower than the touch-down speed, mislanding is possible. Power should be increased smoothly, *i.e.* slam accelerations avoided, and the rudder used to keep straight.

18. On aircraft having a critical speed at go-around power higher than the touch-down speed, any attempt to misland and use go-around power will result in an immediate uncontrollable yaw and roll. On such aircraft the most that can be done is to cushion any bounce or high hold-off by using as much power as can be held on the rudder, and no attempt should be made to go round again.