PART 3

CHAPTER 4 — FLYING IN MANUAL

Contents

1 Selecting Manual

(*a*) It is structurally safe to fly in Manual within the speed limitations and, in emergency, Manual can be selected at any altitude and airspeed. However, until experience is gained, it is recommended that selection of Manual and subsequent practice flying in Manual should be carried out above 10,000 feet AGL. This is because of the out-of-trim forces which may be present when Manual is selected, the heaviness of the controls and the reduction of manoeuvrability when in Manual. When flying in Manual control at speeds above 250 knots, a two-handed pull is required to counteract the nose-down trim change if flaps are lowered without simultaneously trimming nose-up on the main or standby trimmer.

(*b*) Provided that the aircraft is in trim in Power, the trim changes on selection to Manual are normally slight. If the tailplane and elevator are incorrectly rigged, however, these changes may be large. Because of this possibility, when practice flying in Manual is to be carried out after adjustments or replacement of flying control surfaces, the first selection should be made above 10,000 feet AGL and at a low airspeed.

(*c*) Before selecting Manual, ensure that the weather conditions at base are suitable for a possible Manual landing, then check:

Height	Sufficient, see (*a*) and (*b*) above
Airspeed	Within Manual limitations
Trim:	
Tailplane	In trim
Aileron and rudder trim indicators ...	Neutral
Aileron trim lock ...	Disengaged
Fuel and stores ...	Correctly balanced

2 Flying in Manual

(*a*) The elevator forces are high but tolerable and no difficulty should be experienced with longitudinal control but care should be exercised when entering a turn with a nose-down out-of-trim condition as a significant loss of height may result. The ailerons are heavy and require considerable effort to produce only small deflections; allowance must be made for the considerably reduced manoeuvrability. The rudder can be used to assist control in the rolling plane but it should not be used at low airspeeds as it may induce or aggravate Dutch rolling.

(*b*) *When Carrying Stores*

Because of the increased inertia, lateral control is less effective; this is particularly noticeable on the approach when lateral rocking, due to either turbulence or overcontrolling, is difficult to damp out. In gusty or severe crosswind conditions consideration should be given to jettisoning the stores before attempting to land. Should the rocking be marked, aileron buffet is slightly reduced and better control is achieved by selecting 60° flap, instead of 80°, on the final approach. The remaining flap can be lowered after touchdown to provide maximum drag on the landing run.

Note: Following hydraulic failure, use of the emergency lowering system gives full flap only.

(*c*) *Trim Changes*

Trim changes in Manual are similar to those in Power (see Part 3, Chapter 2, para 3 (*g*)), but are more noticeable due to the greater stick forces involved. When the landing gear is lowered, the aircraft may roll either way depending upon which leg lowers first.

3 Landing in Manual

(*a*) Until pilots have considerable experience of flying in Manual control, practice landings should be made only in ideal conditions, ie a steady wind down the runway. Because any asymmetric lowering of the landing gear is liable to cause lateral control difficulties, the landing gear should be lowered at a safe height. A wider than normal circuit should be made, followed by a long straight powered approach. Lateral rocking may be encountered, in which case 60° instead of full flap is recommended. It must be remembered, however, that following hydraulic failure, use of the emergency lowering system gives full flap only.

(*b*) When the airspeed is below 170 knots with landing gear and full flap down, aileron buffet can be felt on the control column. The stick force required to flare the aircraft varies considerably and in cases of forward CG may be high. If an overshoot has to be made, the landing gear should not be raised until a safe height is reached, because of control difficulties near the ground. Retrim the aircraft during flap retraction to counter the nose-up change of trim; the trim change is most marked during the final stages of retraction. If remaining in the circuit, four notches of flap can be left down.

(*c*) *With External Stores*

(i) *Drop Tanks*

Manual landings should not be attempted with fuel in the drop tanks when flying in turbulent conditions and when a crosswind will be encountered.

(ii) *Rocket Launchers*

◀ Before attempting to land in Manual in turbulent conditions consideration should be given to firing the RP or jettisoning the launchers. If RP are carried great care must be taken as lateral control on the approach is inferior to that of the clean aircraft. ▶

(*d*) *With Asymmetric Loads*

Before attempting a Manual landing with any asymmetric load other than an empty inboard drop tank, a low speed handling check must be made at a safe height to determine that lateral control is adequate at a threshold speed

that will ensure a safe landing. If this check is not satisfactory and the asymmetric store cannot be jettisoned, the aircraft should be abandoned. Trials have shown that with a nominal 1000 lb weight on an inboard pylon, the wings cannot be held laterally level below 180 knots.

(*e*) *With Asymmetric Drag* (eg one landing gear leg locked up)

(i) There are three dangers which must be avoided:

1. High airspeeds and resultant high control forces.
2. Improper trimming.
3. Attempting to control the aircraft laterally with ailerons only, resulting in unbalanced flight.

(ii) Alone or in combination these dangers could result in disastrous loss of control, but approaches can be flown safely in this emergency condition using the following technique:

1. Counteract sideslip (as indicated by the slip ball) with rudder.

2. The use of rudder to pick up the 'heavy' wing should be kept to an absolute minimum.

3. Trim out the resulting control forces. Above 150 knots the rudder force can be trimmed out completely; below 150 knots an additional light foot force is required. At 150 knots with one landing gear leg locked up, about 10% aileron trim is required in addition to full rudder trim.

4. Manoeuvres should be gentle and all turns should be accomplished with co-ordinated aileron and rudder, with the emphasis on rudder.

5. If possible carry out a low speed handling check and in order to keep control forces to a minimum, avoid speeds above 170 knots.

6. Flap can be used on the approach and, subject to a satisfactory low speed handling check, an approach speed of 160 knots and a threshold speed of 150 knots should be used.

4 Reselecting Power

After reselection, check that the appropriate magnetic indicators are black. Re-engage the aileron trim locking guard.