# 06
# CLIMBING

## AIM

To teach the student how to climb the aeroplane at a given airspeed and power setting.

Note: For practical and economic reasons the brief on descending should follow this brief as the airborne exercises are usually combined.

## INSTRUCTIONAL GUIDE

Before taking the student into the air ensure that he or she has a basic understanding of the practical considerations of the various methods of climbing you intend to teach during the particular lesson.

The student must be aware of the effect of changing power, the power settings to be used for the various climbs, the recommended airspeeds for these climbs, the effects of flap and its use during the climb and engine limitations. Also explain the forces acting on an aeroplane during the climb–figure 6-1 refers.

During the flight emphasis the importance of the climb attitude. By making small adjustments to this attitude an accurate climb speed can be maintained.

Do not allow the student to climb in a straight line for too long if the particular aeroplane has a blind spot under the nose. Show the student how to change heading or lower the nose at intervals to ensure that this blind spot is clear then resume the original heading.

Often students encounter difficulty when leveling off after a climb. Do not expect the student to be very accurate at this manoeuvre during the early stages.

Ensure, however, that the student is anticipating the altitude required, as a guide by 10% of the rate of climb. Holding the aeroplane in constantly varying attitudes whilst the speed is building up is frequently a problem. This can be overcome by anticipating and making the approximate trim change that will be required when straight and level is achieved.

## PRE-FLIGHT BRIEFING CONSIDERATIONS

### FORCES ACTING UPON THE AEROPLANE

Brief the student on the distribution of the forces acting on an aeroplane during the climb.

**Figure 6-1:** Forces acting on an aeroplane during climb

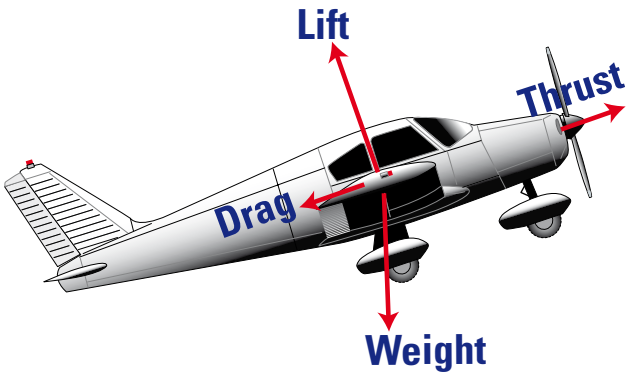
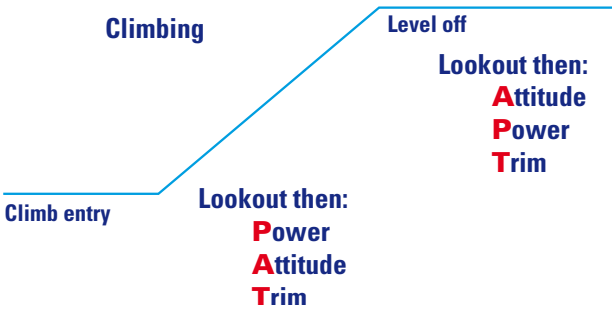



**Figure 6-2:** Sequence for entering a climb and levelling off



### BEST CLIMBING SPEED

Show that this depends on the power available and the power required to result in a certain airspeed. Explain that recommended climbing speed is often higher than the theoretically best speed, thereby giving better engine cooling and visibility.

### EFFECT OF FLAP

Show that the increase in lift at lower speed gives a greater climb angle. However, the increased drag gives a reduced rate of climb.

### PARTICULAR FEATURES OF THE AEROPLANE TYPE

Explain any particular features of the aeroplane type to assist the pilot during a climb like an offset fin or rudder bias. Tendency to yaw must be corrected with rudder.

### APPLICATION IN FLIGHT

Brief the student on the particular types of climb to be taught during the lesson i.e. normal climb, maximum rate climb and maximum angle climb. Explain the sequence of events for entering a climb, being Power - Attitude - Trim (see Figure 6-2). Ensure that the student is aware of the required power settings, approximate attitude, speed and if needed during the maximum angle climb, the flap setting to be used.

To return to straight and level flight the sequence is normally Attitude (constantly varying until the required speed is obtained) Power then Trim.

### AIRMANSHIP

As always, a good lookout is to be maintained.

Do not climb in a straight line for too long - clear the blind spot approximately every 500FT.

Engine handling—stress temperature control and the use of the mixture control and the carburettor heat control.

## AIR EXERCISE

(a) Normal climb - how attained

(b) Climbing at maximum rate

(c) Climbing at maximum angle

(d) Effect of flaps on the climb

### NORMAL CLIMB

Demonstrate the normal climb using the recommended climbing speed and power setting.

Firstly ensure that the area into which you are about to climb is clear. Apply climb power, preventing yaw with rudder and place the aeroplane into the estimated climbing attitude. Allow it to settle and check the speed. Adjust the attitude and trim as necessary. Impress upon the student that after each attitude adjustment the air speed is allowed to settle before any further adjustment.

Check that the wings are level and that the aeroplane is balanced. This is done by reference to the balance indicator. Check the trim and point out that if it is not fitted with a rudder trim it will be necessary to keep a pressure on one of the rudder pedals in order to keep straight and to balance the aeroplane.

During the climb, point out the indications of the various flight instruments. Relate these indications directly to the attitude of the aeroplane in relation to the natural horizon.

Point out that the view ahead is restricted and show how to periodically alter heading (or lower the nose)* to ensure the aeroplane is climbing into a clear area.

Note: *This method is least preferred as students often experience difficulty keeping the aeroplane balanced and resuming the desired climb speed.

Bring to the student's attention the engine instruments. Demonstrate the use of cowl flaps or other cooling devices if fitted. Advise that if overheating does occur it can normally be stopped by changing the attitude to climb at a slightly higher airspeed. If this remedy is not effective a reduction in power together with a higher airspeed or even a period of straight and level flight may be necessary until the temperatures are back within the limits.

Demonstrate level off from the climb. Anticipate the desired height by commencing the level off by about 10% of the climb rate. Keep the aeroplane balanced by use of rudder and progressively lower the nose by movement of the control column. Anticipate the amount of trim required and apply it. Reduce to cruise power as the desired IAS approaches and accurately re-trim the aeroplane. Then check the height to see that it is remaining constant. If it is not, adjust power, attitude and re-trim as necessary to maintain straight and level flight.

As the student becomes competent with entering the climb and leveling off, climbing rate one turns can be introduced as an extension of the lookout procedure.

## CLIMBING AT MAXIMUM RATE

Demonstrate this exercise using the same techniques as with the normal climb demonstration but with the power setting, normally full power, and airspeed recommended for the maximum rate climb. This demonstration should be carried out at an altitude low enough to make a convincing comparison with the normal climb. Point out to the student the higher nose position, the increased rate of climb and the indications of the flight instruments, these indications being related directly to the high nose position of the aeroplane. Make sure the student is aware of engine limitations. Point out that there may be a time limit for the use of this power setting.

On some light aeroplanes the demonstration of the difference between the maximum rate of climb and the normal recommended climb may not be very convincing.

If using one of these aeroplanes the instructor should use discretion as to whether the demonstration should be given.

## CLIMBING AT MAXIMUM ANGLE

This climb should be demonstrated at a reasonable altitude and then later on immediately after a short take-off when the student has progressed to that stage. Full power is normally used together with a lower airspeed than that used for the maximum rate climb. On many aeroplanes the use of flap, lowered to the optimum setting is recommended.

Point out to the student the high nose position in relation to the horizon. Relate the indications of the flight instruments directly to this steep attitude. Point out the engine limitations to the student and make him or her aware that this type of climb is rarely a prolonged one since it is used only long enough to clear any obstructions, a normal climb then being resumed.

## EFFECT OF FLAPS ON THE CLIMB

A prolonged climb with flaps extended should never be required. However, a student must be taught how to initiate a climb with flaps extended and be made aware of the effect of the drag of this component on the climb.

Demonstrate this exercise from a normal climb. At a suitable speed lower the flaps to the optimum setting. Point out the attitude and decreased rate of climb. Show too, that the airspeed to give the best rate of climb for this configuration is lower than normal. Point out the indications of the flight instruments, relating these directly to the attitude in relation to the horizon. Then lower full flap. Show the change of attitude and point out that the rate of climb is further decreased. Now show how to resume a normal climb. Raise the flaps to the optimum setting increasing speed towards normal climbing speed. At a safe height and speed raise the flaps completely and resume normal climbing.

## COMMON FAULTS

The student often fails to correct for yaw when changing power, therefore teach to anticipate this problem.

In concentrating on flying the aeroplane, students tend to forget to clear the blind spot created by the high nose position.

Students also tend to forget engine limitations. Accordingly, it is often taught to check the temperatures and pressures immediately before or after clearing the nose every 500FT in the climb.

If a student tends ‘to chase airspeed’ in the climb (or cannot climb at the nominated IAS) it may well be that the student is not trimming the aeroplane correctly or changing the attitude with trim.