CHAPTER 5

WINCH GLIDING

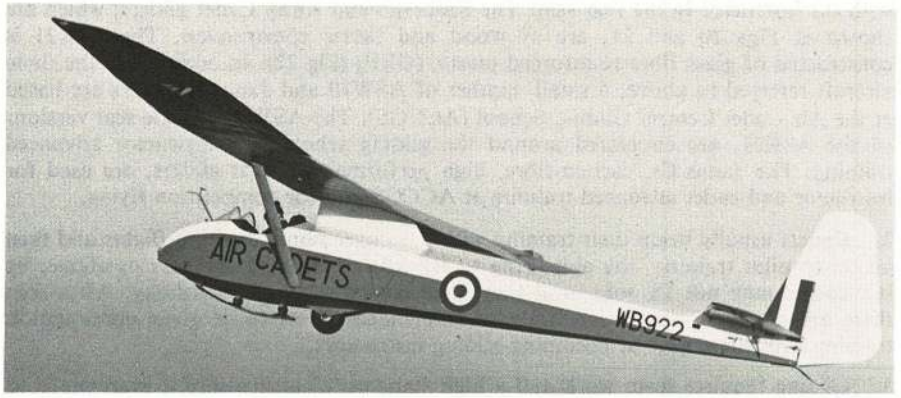

Fig 20 Sedbergh Mk 1

Fig 21 Kirby Cadet Mk 3

Fig 22 ASK 21

Introduction

1. Air Cadet gliding schools are located throughout the country, mainly at RAF stations, to provide gliding training for cadets. This chapter covers the operation of winch-launched gliders, namely the Sedbergh, the Kirby Cadet MK III and the ASK21. All three types of aircraft have dual controls. In the Sedbergh, the pilot and student sit side-by-side. In the other two the instructor and student sit in tandem, with the instructor in the rear seat. The Sedbergh and Kirby Cadet gliders, which are shown at Figs 20 and 21, are of wood and fabric construction. The ASK21 is constructed of glass fibre re-inforced plastic (GRP) (Fig 22). In addition to the three aircraft referred to above, a small number of ASW19 and Janus C gliders are based at the Air Cadet Central Gliding School (ACCGS). The ASW19s, single seat versions of the ASK21, are circulated around the gliding schools for instructor advanced training. The Janus Cs, carbon-fibre, high performance 2-seat gliders, are used for instructor and cadet advanced training at ACCGS and for competition flying.

2. Cadets usually begin their training with passenger familiarization flights and then go on to pilot training, the aim being to fly solo when aged 16 years or above; by law cadets may not fly solo until they have passed their 16th birthday. After solo there are opportunities for specially recommended cadets to be given continuation training with the object of becoming gliding instructors.

3. Gliding requires team work and a high standard of airmanship if everyone is to enjoy this activity to the full. Individuals are given clearly defined duties which they must carry out responsibly so that gliders can be launched safely and, after landing be brought back to the launch point; but working in the open air as part of a team and enjoying the pleasure of pure flying in an aircraft free from noise and vibration combine to make gliding a fine adventure.

The Glider

4. **Controls.** A glider has the same type of controls and control surfaces as a conventional aircraft, *ie* it is controlled in flight by the co-ordinated movement of the elevators, ailerons and rudder which the pilot achieves by operating *the stick* and *the rudder bar.* In addition there is:

a. A *yellow toggle* which the pilot pulls *to release the cable* when the glider has reached the top of the launch.

b. A *lever* to operate the *spoilers* (Sedburgh and Kirby Cadet) or *airbrakes* (ASK21). Spoilers are hinged panels which, when retracted, form part of the upper surface of the wings. When extended, they reduce the lift, allowing the glider to descend at a higher rate of descent without measurably increasing the speed, so enabling the pilot to land in a smaller space than would otherwise be possible. Airbrakes are similar to spoilers but as they increase drag as well as reducing lift, they provide even greater control when used for landing.

5. **Safety Harness.** An aircraft safety harness, one for each seat, is fitted so that the occupants can strap themselves securely to the seat.

6. **Instruments.** Although the glider is normally flown by visual reference to the horizon four flying instruments are fitted to allow the pilot to fly more accurately. Three of these, the Airspeed Indicator, the Altimeter and the Turn and Slip Indicator are the same type as fitted in any aircraft but the fourth, the Variometer is special to gliders. They work as follows:

a. *Airspeed Indicator (ASI).* This instrument records the speed in knots of the glider through the air. The single figure on the dial has to be multiplied by 10 to obtain the speed, *ie* the reading "4" indicates 40 knots.

b. *Altimeter (ALT).* This instrument indicates the aircraft's height above the pre-set datum—which in a glider is normally the height above the airfield from which the glider is operating.

c. *Turn and Slip Indicator.* The turn part of this instrument comprises a pointer and the slip indicator, a ball which is free to move in a curved glass tube. When bank is applied, the pointer will move away from the vertical to indicate the direction of the turn. The greater the amount of bank applied, the greater will be the displacement of the needle. The position of the ball in the slip indicator is controlled by the rudder. To keep the aircraft in balance, the ball must be kept in the centre of the tube. If, during a turn, the ball moves away from the centre of the tube towards the centre of the turn, the aircraft is said to be slipping. If it moves away from the centre of the turn, the aircraft is skidding. Opposite rudder is applied to return the ball to the centre of the tube.

d. *Variometer.* The variometer is special to gliders and is fitted to tell the pilot whether he is in *rising air* (and thus climbing) or whether he is in *still air* gliding normally downwards or even *descending air* and thus gliding downwards at a faster rate than normal. It is a simple instrument consisting of two vertical glass tubes, one containing a green ball and the other a red ball. When the glider is passing through rising air the green ball will rise but at all other times when the glider is descending the red ball will rise (the green ball being down). The height to which these balls rise indicates *the rate* of climb or descent. This instrument is important to the pilot who wants to stay airborne for as long as possible because he will be seeking rising air and when he finds it will endeavour to fly his glider in such a way as to stay in it as long as possible.

Launching

7. Since a glider has no engine it must be accelerated in some other way to its flying speed. There are four principal methods:

- Aero-towing
- Auto-towing
- Bungee
- Winch

8. **Aero-Towing.** In this method the glider is attached to a tug aircraft with a tow-rope about 60 yards long and when the aircraft takes-off it tows the glider behind it. When he has reached the pre-determined height and place the glider pilot releases the tow-rope and glides on by himself, the aircraft returning to the airfield to prepare for the next launch. The advantages are that the glider can be released at a much greater height than by any other method and can be towed to areas where the glider pilot wants to be.

9. **Auto-Towing.** The glider is attached to the motor vehicle by a tow-rope and the vehicle drives forward as near into wind as possible and at a speed sufficient for the glider to take-off and climb. The height that the glider can attain depends on the length of the tow rope, the length of ground run available and the windspeed.

10. **Bungee.** This is the method used for launching the primary gliders used in the Combined Cadet Force. The glider is attached to the centre of a strong elastic rope

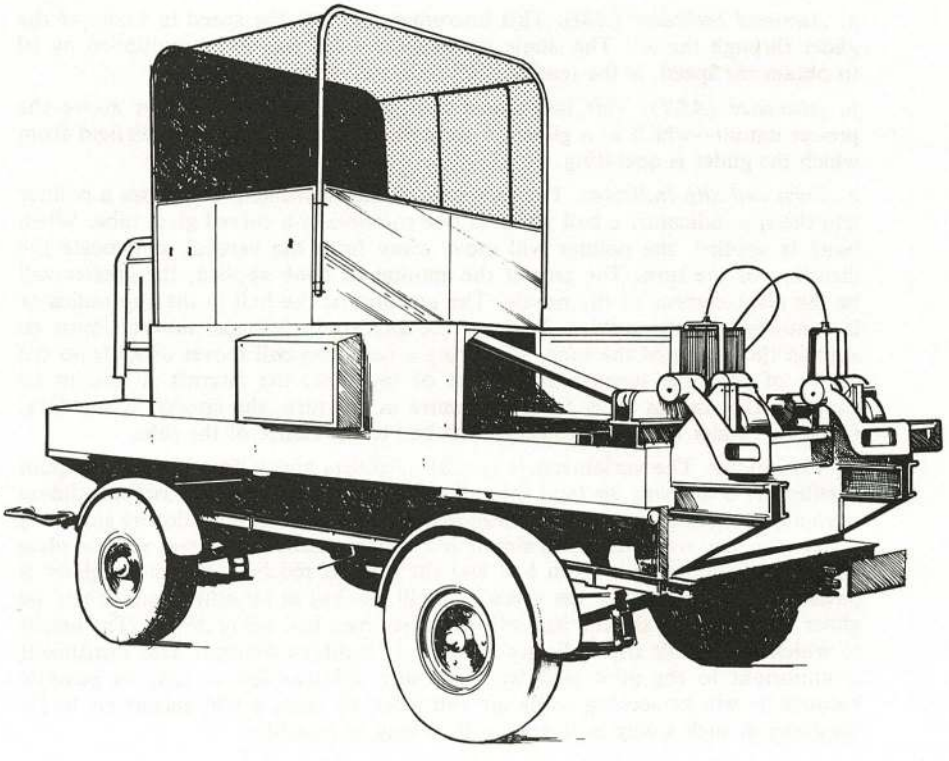

Fig 23 Glider Launching Winch

(called a bungee) and a number of people pull on each end of the rope stretching it out in a "V" shape in front of the glider. The glider is held back and released when the bungee has been stretched to a pre-determined tension. The height reached on this type of launch is relatively low.

11. **Winch.** This is the method used for all other cadet training. A winch (Fig 23) is a drum on which is wound rather more than 1,000 yards of strong, flexible steel cable. The drum is turned by a powerful engine which the winch driver controls through an automatic gearbox or through a clutch and throttle.

The winch is normally sited as near to the upwind boundary of the airfield as possible and the cable is then attached to the rear of a motor vehicle and drawn out to the launch point at the other end of the airfield, downwind of the winch. When the pilot is ready the cable is attached to the glider and the pilot calls "TAKE UP SLACK". This instruction is passed to the winch driver by a signaller using lamp signals or large bats and on receiving this signal the winch driver slowly reels in the cable until it is taut. When the pilot is satisfied that the slack has been taken up, he orders "ALL OUT". The winch driver is signalled to this effect. He immediately speeds up the drum, the cable pulls the glider forward and after a short distance it becomes airborne. Initially the glider climbs slowly but the attitude quickly steepens and height is gained rapidly. When the cable is about 70° to the horizontal, the pilot releases it and is then free to commence his gliding exercises (Fig 24).

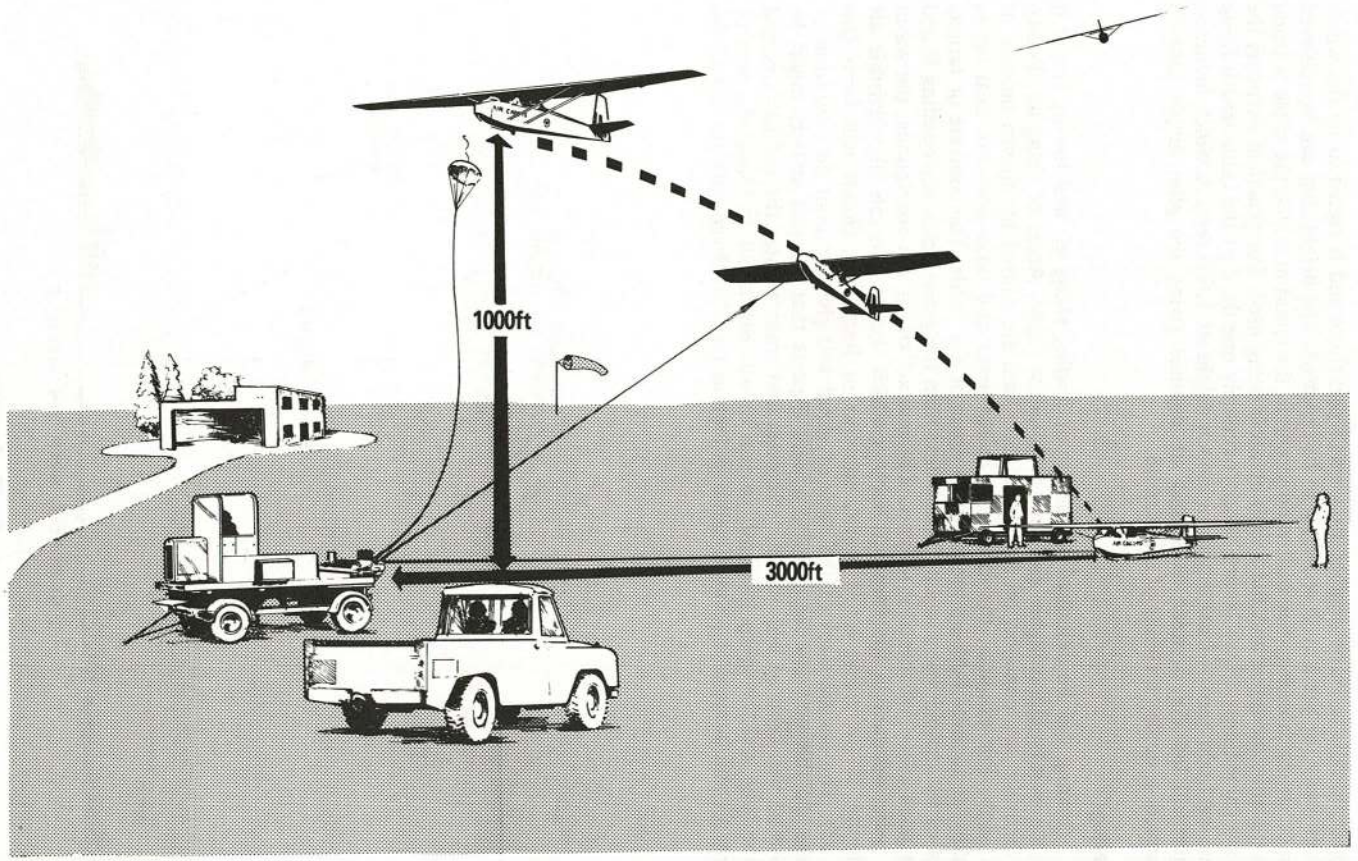

Fig 24 Glider Winch Launch

The cable falls to earth steadied by a small parachute and is reeled in by the winch driver ready for the launch sequence to be repeated. The height that can be achieved from a winch launch varies with wind strength, the speed at which the cable is being wound onto the drum and the length of cable being used. For practical purposes the height gained on a winch launch is approximately one third of the cable length being used, *eg* 1,000 yards of cable gives a launch height of 1,000 feet. A winch launched flight will last for between three and six minutes giving the pilot ample time to complete a standard circuit of the airfield.

Soaring

12. Soaring can be described as the art of finding rising air and having found it staying in it to climb higher and thus prolong the flight. Areas of rising air, known as thermals, are common on hot sunny days and are caused by uneven heating of the earth. For example, the air over wooded areas and lakes does not heat up as rapidly as air over built-up areas, sandy areas or dry fields. The concrete or tarmac area of an airfield also gives off more heat than the green fields surrounding it and is a good place for thermals to start. Thermal activity is not continuous, the warm air being released in the form of bubbles which rise at intervals like invisible air balloons. If the rising air is moist, cumulus or heap type clouds will form (*see* Fig 25). The development of this type of cloud will give the pilot an indication of where the thermals are forming. If a pilot expects that thermal activity might be about he will keep an eye on the variometer and when he sees the red ball descend in the tube and the green ball start to rise he will endeavour to locate the area of rising air and circle in it so as to climb as high as possible. Even with the aid of the

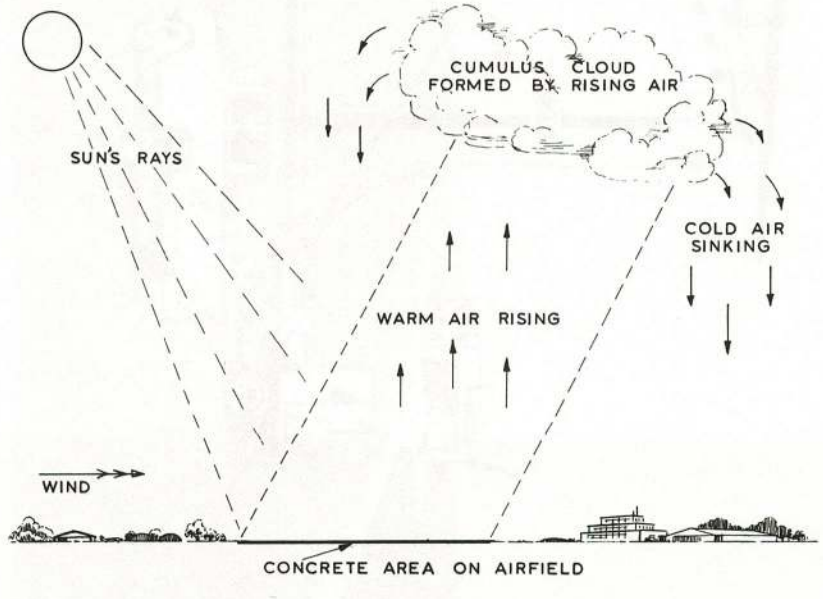

Fig 25 Thermal

variometer, it requires considerable skill and experience to use the thermal to the full. Cadets who are accepted for training as gliding instructors will be instructed in the art of thermal soaring but it is not uncommon for cadets undergoing basic gliding training to encounter thermal activity.

13. Rising air can also be found when gliding on the windward side of hills. When the prevailing wind strikes the face of a hill or ridge it will be deflected upwards so providing a constant up-current above the face of the ridge (Fig 26). By remaining in this area of rising air the pilot will be able to maintain height, remaining airborne if he wishes until the conditions change. If the up-current is strong enough it will enable him to gain height but he must take care however, not to fly the glider behind the ridge as down-currents there will result in the glider losing height rapidly.

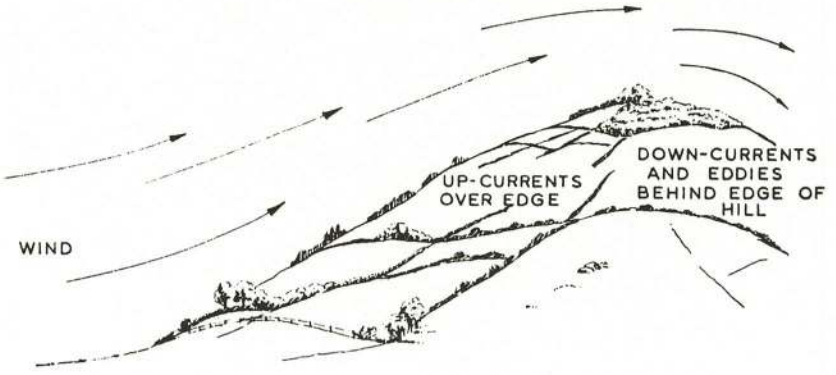

Fig 26 Wind Striking Ridge Causes Up-Current