GLIDING

A Handbook on Soaring Flight

DEREK PIGGOTT

This book provides a comprehensive guide to gliding. It includes the latest ideas on this increasingly popular sport and should be of particular interest to the pupils and instructors at the many new clubs now forming all over the world.

The first section will help the beginner who so often finds that his gliding instructor has too little time to answer all his queries: it explains everything the pupil needs to know before flying solo. Section two will help the inexperienced pilot to use the glider more efficiently: it includes chapters on flying safely in high winds, aerotows and very full, practical explanations of stalling and spinning and on turning efficiently. The last section deals with cross-country flying, cloud flying and the various ways in which the glider pilot can make longer flights and qualify for the highest international awards. The author is the Chief Flying Instructor at the Lasham Gliding Centre.

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The author preparing for a flight with H.R.H. The Duke of Edinburgh in a T42b Eagle at Lasham, Hants

Photograph by Keystone Press Agency Ltd.

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by

DEREK PIGGOTT

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AND 75 FIGURES

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Section I

LEARNING TO GLIDE

This section gives you the information you will need before you make your first few solo flights and qualify for the "A" and "B" certificates. However, if you have not had the necessary flying experience, do not expect this, or any other book to teach you to fly. A book can only be a useful supplement to your gliding instructor and cannot replace him.

Solo flight is the first step towards becoming a soaring pilot.

CHAPTER I

FIRST FLIGHTS IN A GLIDER

The layout of hill and airfield gliding sites—Fastening the safety harness—The cockpit layout and flying controls—First flights—Suitable clothing—Log books

DURING your first visit to a gliding site you may get the opportunity to fly in a glider as a passenger.

If you have never flown in an aeroplane or a glider, it is always possible to do this without committing yourself to the expense of a yearly membership of the club.

There is no doubt that you will be thrilled by the experience of gliding, but, before you begin to learn to glide you should consider carefully whether you are prepared to put up with the hard physical work and perseverance required. There will be times, particularly during your training, when you will have to wait most of the day for your turn of instruction.

Unlike learning to fly a powered aircraft, it is usually impractical to book glider flights in advance and it is, therefore, often necessary to spend at least half a day at the site when you go to fly.

Ideally, club members should either help to get the gliders and equipment to the launch point when flying begins, or they should help to put them away at the end of the day.

They should also do their fair share of pushing the gliders and helping in the many other tasks which need to be done to keep the gliding club operating.

The layout of a gliding site depends upon whether it is a hill site or a flat airfield. Where the site is close to a hill, a large field, or group of fields is used for take off and landing and the gliders are able to soar along the hill side when the wind is blowing in the right direction. A hill site is illustrated in Fig. 1. Launching is almost invariably by winch or bungee.

Today many of the most active clubs operate on flat sites or aerodromes and rely entirely upon thermals for soaring flights.

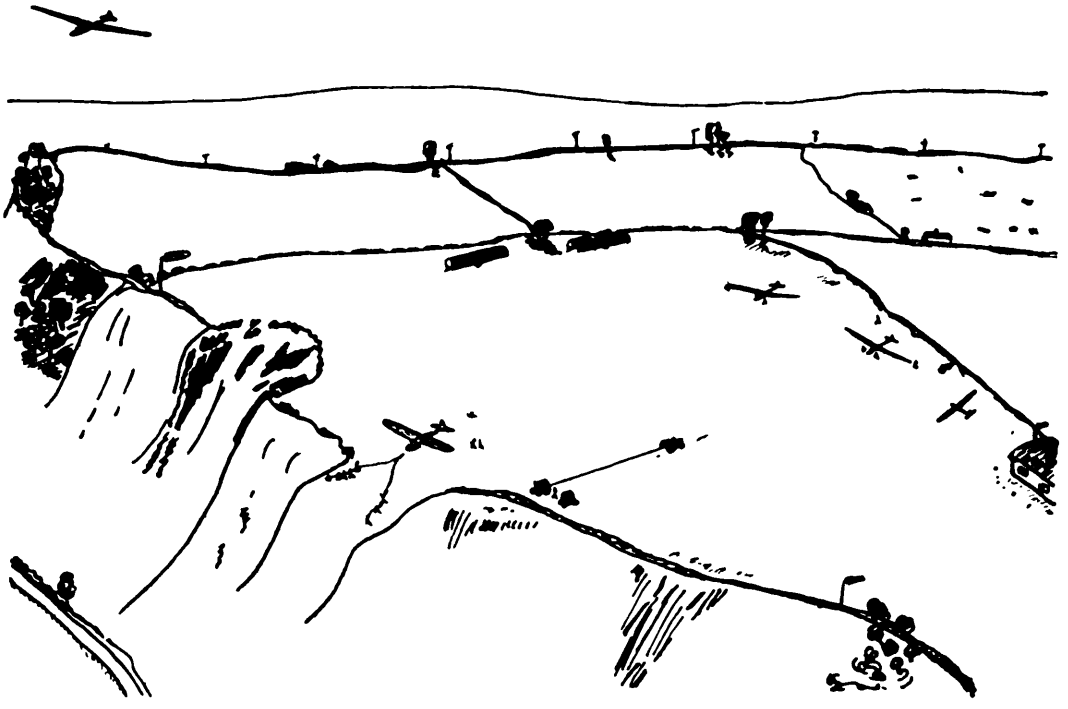

Fig. 1. A hill site using winch and bungee launching.

Fig. 2 shows a typical airfield gliding site with motor car towing in progress on the runway and with winch launching on the grass field on one side. Most clubs use one or other of these methods of launching their gliders.

The winches are positioned at the upwind end of the field in order to give the longest launching line more or less into wind.

In this case the winches have been sited slightly out of wind, and on the upwind side of the runway which is being used for motor car towing. This ensures that the tow car wire falls away from the winch cables so that the winch launching is not held up. The winch cable on the downwind side is used first to make sure that it falls well clear of the second cable. Both cables are wound up to the winch and clear of the runway after being used in order that they do not interfere with the motor car launching. The two winch cables are towed out to the launching point together by a tractor or a small truck.

The gliders normally aim to land about 150–200 yards from the boundary of the field. This allows them to approach at a safe height above any obstructions on the airfield boundary. The launches are, therefore, started from this position so that unnecessary effort is avoided in pushing the glider back for another launch. The field between the boundary and the landing area enables a safe landing to be made even if the pilot misjudges the approach and undershoots slightly.

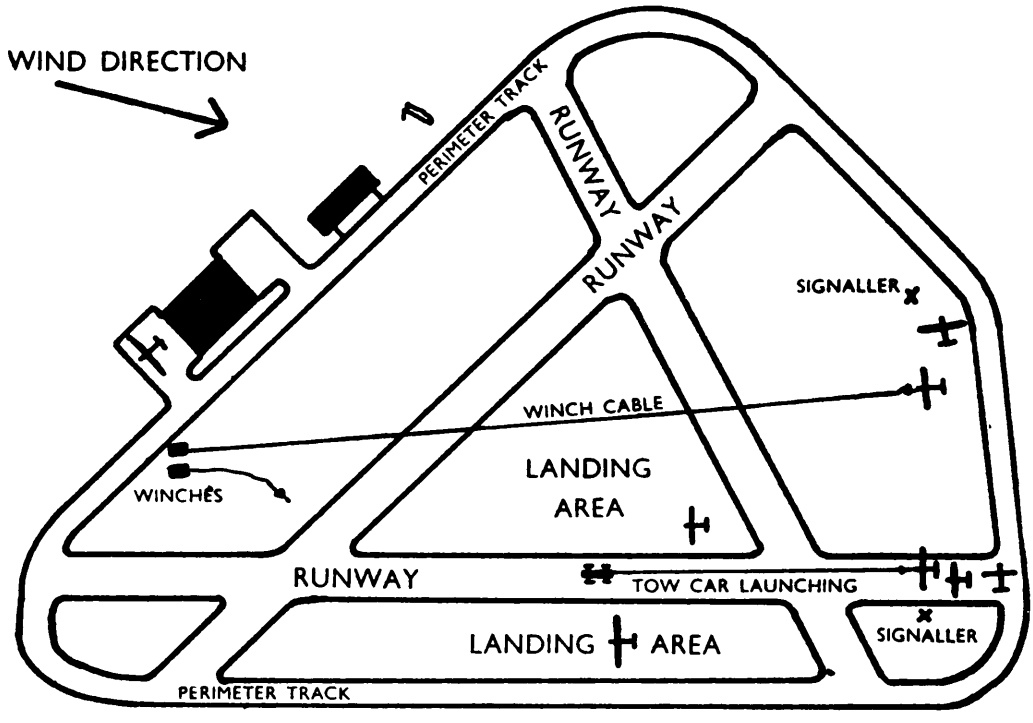

Fig. 2. The layout of an airfield gliding site.

The signallers are positioned to the side of the gliders being launched, where their signals can be clearly seen from the winch or tow car. The launching is usually supervised by an instructor assisted by club members.

Gliders which are not about to be launched are parked at right angles to the wind direction with tyres on the upwind wing tip.

A log of all flights is kept by one person at the take-off point in order to record details of each flight.

Even if you are visiting a gliding site for the first time you can help with the ground handling while you wait for a chance to fly.

You will be asked to sign an indemnity form before going up in a glider and, if you are under twenty-one the form must be countersigned by a parent or guardian. This indemnity absolves the club from liability for injury while you are on the ground or flying. Flying risks are almost insignificant for normal training and club flying.

There are greater risks on the ground from tow cars and winch cables and gliding is far less risky than playing football.

Your pilot will show you how to climb into the glider.

It is always quite safe to step onto the centre of the seat and then onto the floor or foot boards on either side of the control column. You may find that you need some padding behind you in order to

reach the controls and rudder pedals easily. In this case you should remember to bring suitable cushions every time you come to glide so that you will always be sitting at the same height and position on instructional flights.

Your instructor will help you to fasten the safety harness when you are sitting in the cockpit. The purpose of the harness is to prevent the pilot from moving in his seat in bumpy conditions in flight and to prevent injury which might occur in a bad landing through the pilot moving forward and striking the instrument panel. An efficient harness must, therefore, hold the pilot round the waist and shoulders.

With the old "Sutton" type of harness, after getting into the cockpit it is best to lay out all four straps in position before attempting to fasten them. The top left strap has a movable peg which should be adjusted to a position just below the solar plexis. The other straps can then be fastened over this peg and finally locked with the triangular clip. The correct order for fastening them is: top left, bottom right, bottom left, top right and then the fastening clip.

The "Q" type harness is an improved version of the Sutton harness and is fitted with adjustable straps and a quick release box in place of the locking pin, etc. First check that the quick release box is set to "Fasten" and then insert the lower strap into the appropriate slot. The lower straps should then be tightened so that the box is as low as possible. The shoulder straps are then inserted and tightened as necessary.

The harness can be quickly released by turning the lever on the release box in either direction.

It is very important to adjust the harness until it is tight so that you are held firmly in position and feel as though you are really a part of the aircraft.

There is nothing more uncomfortable than having the harness too loose so that you move in the seat. Even if your straps feel too tight when they are first adjusted, after a few moments they will ease off as you settle into the seat.

The next thing to do is to look round the cockpit at the controls and instruments. The cockpit layout for a typical glider is shown in Fig. 3.

The flying controls consist of the control column and the rudder pedals.

The instruments generally include an airspeed indicator, altimeter, variometer, turn and slip indicator and a compass. These are unimportant on the first few flights.

The release knob for the launching cable is painted yellow and is generally on the left of the instrument panel.

There is also a lever for operating the airbrakes or spoilers and probably a small lever for adjusting the elevator trim tab.

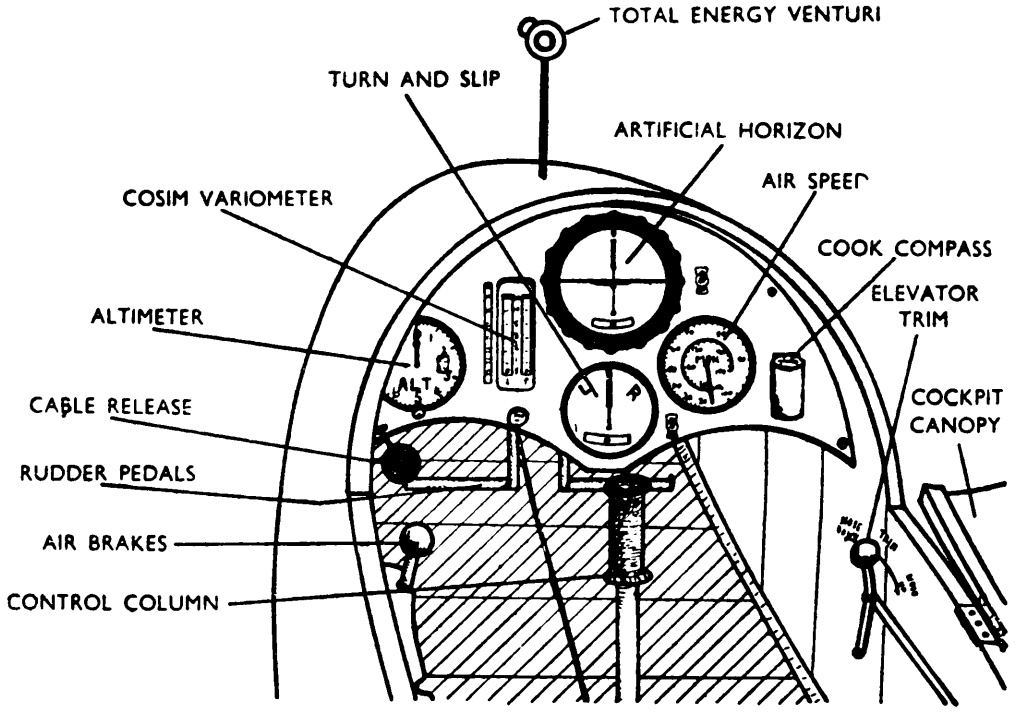

Fig. 3. The cockpit layout of a modern glider.

The most important lesson in the air experience flights is the art of relaxing in the air and becoming a part of the glider as it banks and turns. Banking in an aircraft is similar to leaning over on a bicycle. It is necessary to learn to lean over with the glider in a turn instead of trying to sit upright in relation to the ground.

It is also necessary to accustom yourself to looking at the ground. Strangely enough there is no real sensation of height such as you get from looking down from a tall building. You need not worry if you have a bad head for heights as flying will not affect you in the same way.

During these first flights, the instructor will not be making any violent manoeuvres or aerobatics. Most of the time will be spent getting to know the layout of the site and the local landmarks.

A Slingsby T21b trainer coming in to land

Photograph by Sidney-Barton Ltd.

A later design, the T42 Eagle two seater

Photograph by Charles E. Brown

You will notice that the climb is gradually steepened as the glider gains height so that a normal glide and landing can be made should the cable break at any stage of the launch. At first, the angle of the climb will seem rather steep. However, after a few flights you will quickly become accustomed to the sensation and think nothing of it.

If you have never flown before you will probably notice the change of pressure in your ears as the glider gains or looses height. If this becomes uncomfortable or makes you temporarily deaf, it can be cured by swallowing, or pinching your nose and blowing occasionally.

There is absolutely no need to worry about air sickness during your first few launches because circuit flights are too short to upset anyone. In any case, it is most unlikely that you will be one of the rare people who are affected in this way.

INSTRUCTION

If you are learning to glide at your own expense you will want to obtain the best value out of the flights you have. It is seldom possible to arrange for a perfect training programme which would take the form of a fortnight's continuous instruction making an average of three or four flights a day.

If the training is carried out over a long period of occasional days, the final sessions before solo should be as close together as possible.

It is tempting to try to save money by making occasional single flights instead of three or more at a time. In the long run this is wasteful and results in a much greater number of launches to first solo, besides a lower standard of flying in many cases. It is, therefore, wiser to be prepared for the expense of six or eight flights in a day towards the end of training.

Because there are usually other students learning to fly and always launches for advanced flights going on, it is not possible to guarantee continuous training excepting on a special training course. Most gliding clubs run such courses during the summer months and details can be obtained by writing to the club concerned or the British Gliding Association.

Bad weather will also hold up your training but you should take every opportunity to fly, even in windy conditions or when the cloud base is low. You will also learn by helping in the workshops

or hangar and by talking about flying when the weather is too bad to fly.

A small minority of people benefit from training over a long period since they take longer to acclimatize themselves to flying and to learn to relax.

CLOTHING

It is not necessary to buy expensive clothes specially for gliding. Any old clothes that you do not mind getting dirty would be suitable. However, most gliding sites are situated in exposed places and, even in the summer, warm clothing is needed for flying.

A hat or beret of a type which cannot be blown off by the airflow is advisable to prevent your hair getting into your eyes.

Some inexpensive sort of boiler suit or overall will help to keep the wind out and save your clothes from getting too dirty. The ideal flying suit for gliding is an ex-R.A.F. light-weight flying suit. This is shower proof and wind proof but is not too hot for strenuous work.

In winter, warm pullovers and gloves and waterproof boots or Wellingtons are necessary to keep reasonably warm and dry.

If all your flying is likely to be in open types of gliders, it is worthwhile buying a pair of goggles as a protection against rain or hail. The best type to buy are the ex-R.A.F. flying goggles which are obtainable at most Government surplus stores. They are splinter proof and have alternative tinted lenses for very bright days. Goggles for flying must allow a full range of vision sideways. Many types of motor cycle goggles act as blinkers and restrict the vision to a dangerous extent.

Since you are bound to get dirty sooner or later when you are gliding, do not make a habit of arriving in your best suit. This will infer that you are not willing to help with the work involved in keeping the aircraft flying.

LOG BOOKS

As soon as you start your glider flying you will need a log book in which to record your flights. An inexpensive glider pilot's log book can be obtained from the British Gliding Association or from your club.

An accurate record of all your gliding is essential so that, if you visit another club, you have documentary proof of your gliding experience and ability. Your log book should be signed by your chief flying instructor periodically, particularly if you are visiting a gliding club in another country and you hope to fly there.

As you gain experience your log book begins to have a considerable personal value when you look over the pages. Most pilots like to keep barograph charts, photographs and notes on flights of interest in their log books. It is well worthwhile spending an extra few minutes writing the entries in neatly rather than finishing up with a log book of which you are ashamed.

CHAPTER 2

LAUNCHING PROCEDURE

Attaching the cable—Launching procedure and signals

ATTACHING THE CABLE

MODERN British gliders are fitted with the Ottfur type of towing hook. The Ottfur release is normally operated by the pilot who pulls the yellow release knob in the cockpit to drop the cable. However, if the pilot fails to release the cable at the top of the launch, the cable will release itself automatically as soon as the pull of the cable becomes directly downwards or backwards. The automatic or override mechanism eliminates the risk of accident if the pilot cannot release the cable by the normal method.

It is important to test both methods before the first flight of the day in order to make quite sure that the release is functioning correctly.

The manual operation should be checked by releasing the cable while the cable is being pulled downwards and forwards by the person attaching it.

The automatic part of the release is tested by pulling the cable backwards towards the tail of the glider so that it releases itself.

After the first flight of the day the release need not be tested again between flights.

On some types of gliders two releases are provided. Motor car and winch launches are normally made with the cable attached to the rear release which is usually mounted somewhere below the pilot's seat. The front or nose hook should only be used for aerotow launches and towing on the ground. If the front hook is used for a winch or car launch, the climbing angle will be restricted and it will be difficult to reach a normal launching height. An aerotow launch may be more difficult to control if it is made on the rear hook because of the increased tendency for the glider to climb above the towing aircraft.

The cable should not be attached to the glider until the occupants are strapped in and are ready for the launch. Should the flight be postponed or delayed, the pilot should release the cable immediately so that at no time is the cable attached to the glider unless it is actually about to be launched.

The person attaching the cable is expected to carry out a quick check of the parachute, weak link, rope and rings to make sure that they are serviceable. Fig. 4 shows the arrangement of the parachute, etc, at the end of the cable.

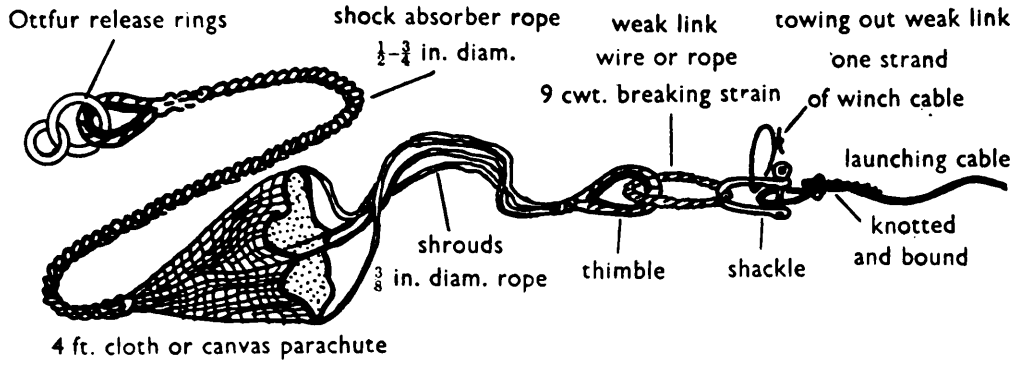

Fig. 4. The cable make-up.

The weak link is of vital importance for safe launching because the main cable will stand a much greater load than the wings of the glider. The weak link is normally designed to break with a load of nine hundredweight which is before there is any risk of overstressing the wings of the glider.

The release rings should be inspected before every flight to see that they are not elongated. The larger ring acts as a fatigue indicator and, being of greater diameter but made of the same material, it elongates first if the material fatigues. It is of vital importance to see that the smaller ring is round as otherwise it may jam in the release under load. The small ring should pass into the release easily and, after attaching the cable, the rings should be rattled to make sure that they are free to move. If the rings will not rattle, it is possible that they are either bent or oversized, and that they may prove difficult to release at the top of the launch.

An elongated or oversized ring is the *only* possible cause of the cable failing to release with the Ottfur type of release. On *no* account may home-made or non-standard rings such as links of chain be used for launching gliders.

After attaching the cable, it should be given a strong tug to make sure that it is secure.

LAUNCHING PROCEDURE AND SIGNALS

In the past there have been many dangerous incidents directly attributable to poor procedure leading up to the launch. Slack procedure may result in the glider being launched before the pilot is fully prepared or while onlookers are standing too near or even in front of the aircraft.

At one gliding site a pupil was actually launched off while waiting for the instructor to climb into the back seat of a two-seater. Fortunately he was almost ready for his first solo and had no difficulty in making a circuit and landing. This incident shows the need for the pilot to give clear orders for launching and for the signaller to insist on an order and to take no notice of vague hand signals from the pilot. Otherwise the pilot may find himself launched before he is ready if he happens to so much as scratch his face.

Whereas only the pilot should be able to initiate the launch, anyone can give the order to stop it. On hearing a shout of "Stop", the pilot must release the cable immediately. It is the duty of every person on a gliding site to stop the launch if there appears to them to be the slightest risk of an accident if the launch continues.

Launching signals and procedure are more or less standard so that wherever you glide in England similar signals are in use and there is no risk of confusion.

The launching signals are normally given by bats or flashing light signals. Obviously, for safe operation they must be clearly visible from the winch or tow car a mile or more across the airfield.

The signaller should repeat back the orders which he receives so that the pilot is certain that his orders have been correctly heard and that the signals are being given.

The signals used are, "Take up slack", "All out", and "Stop". (Fig. 5.)

The "Take up slack" signal gives the car or winch driver permission to select the gear for the launch and to take up the slack in the cable so that the glider will not receive a severe jerk when it is launched.

The "All out" signal gives the driver permission to go ahead with

the launch and the "Stop" signal orders the driver to stop the launch immediately.

If light signals are being used, the "Dashes" and "Dots" must be long enough to allow the bulb to light up clearly for the "Dots" and for there to be a distinctive difference between the two signals. A definite difference in rhythm will also help to make the signals easier to read at a glance. Whenever possible the lamp should be mounted on a stand so that it cannot be misdirected while the signals are being given.

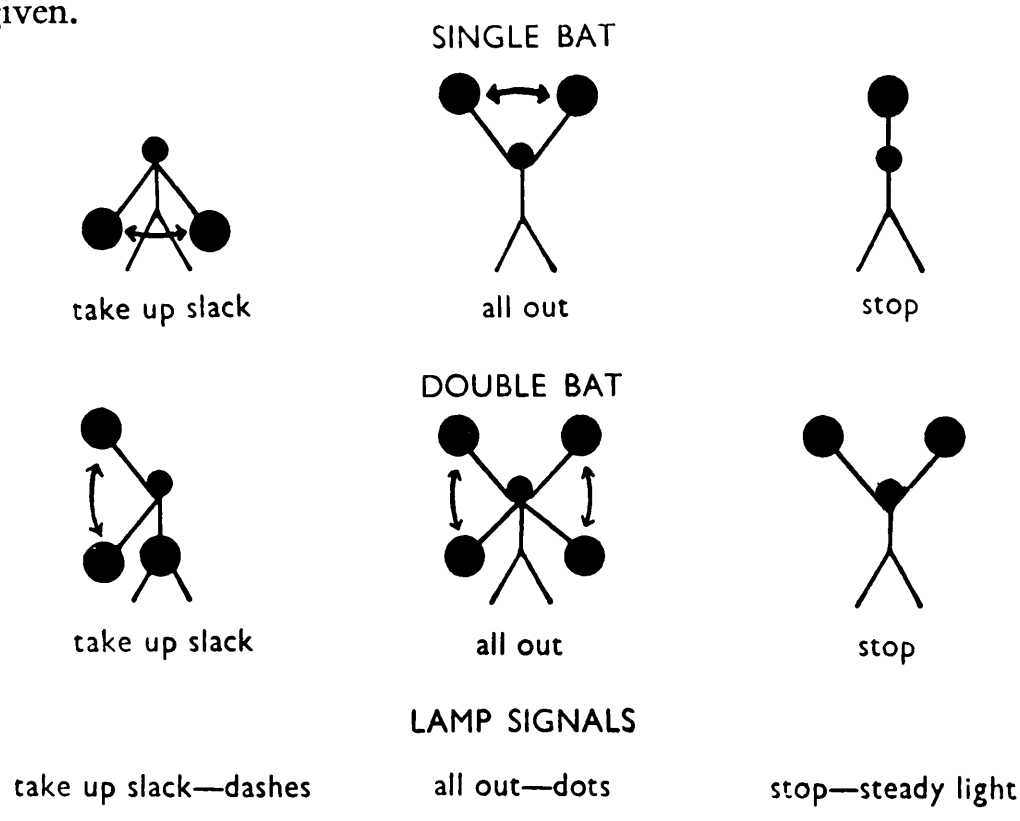

Fig. 5. Launching signals.

If it is necessary for the person holding the wing tip to give the launching signals at the same time, the single bat signals must be used. Signalling by rocking the wings is dangerous as there is no means of giving a "Stop" signal after the glider has begun the take off. A "Stop" signal would be vital if, for instance, the glider overran the cable so that the parachute became entangled with the skid.

The importance of an efficient method of signalling is shown by the example I have given of just one of the serious incidents which can easily occur through slipshod launching procedure. Obviously, whatever method of signals are used, it must be possible to give the "Stop" signal at any time during the launch.

Ideally, all launching signals should be acknowledged by another signaller at the winch so that the pilot and signaller can see that the winch is receiving the signals correctly. This can save the signaller calling for the launch and wondering whether his signals are being received. If the winch is temporarily out of action, the signaller there should give a "Stop" signal as this will save unnecessary signalling at the launch point. A "Ready" or "Take up slack" signal can then be given from the winch as soon as it is ready to launch again.

On some gliding sites, the winch may be out of sight of the launch point and an intermediate signaller is needed to relay the signals in the middle of the field. This signaller must always face the launch point with his back to the winch as he signals so that he will see a "Stop" signal immediately if one is given.

The use of a telephone and radio communication for signalling has been tried but it is neither cheap nor foolproof. With either of these methods, a failure of the system, or difficulty in hearing above the noise of the winch engine at full power, might result in the launch being continued despite a "Stop" signal. Radio communication between the pilot and the winch can help to obtain the ideal launching speeds, and this gives an improvement of up to 30 per cent in most conditions. However, it is expensive and too complicated for everyday use on the average gliding club site.

CHAPTER 3

THE EFFECTS OF THE CONTROLS

The primary and further effects of the controls—The correct flying attitude

IF you do not understand the use of the individual controls, you are bound to find it impossible to fly a glider. It is, therefore, the first and probably the most important lesson for the beginner to learn.

There are three flying controls in a glider, the elevators, the ailerons and the rudder.

The elevators and ailerons are both operated by the control column (or stick) and the rudder by the rudder pedals.

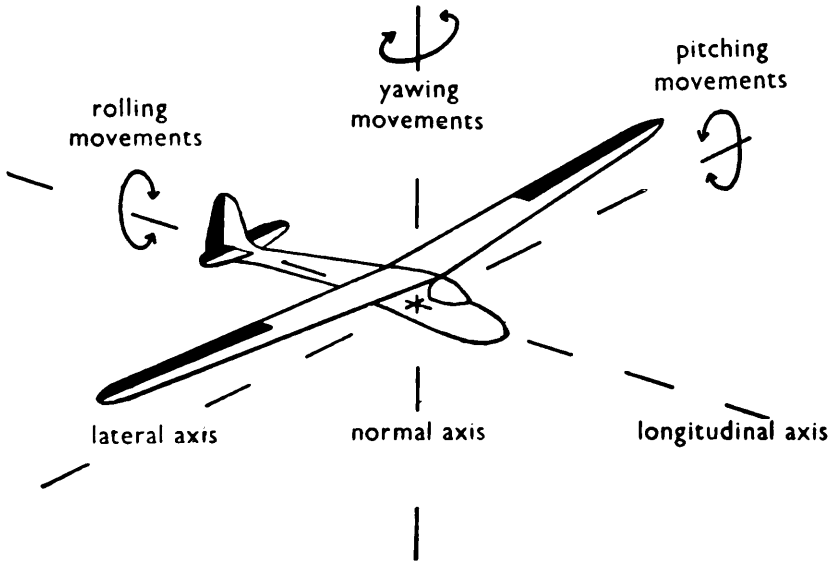

Fig. 6a. Axes of movement.

All of the controls are easy to move and require very little pressure to move them. The stick should be held with a light hold with the right hand and the feet should rest lightly on the rudder pedals.

The primary effect of each control is to move the aircraft about one particular axis. (See Fig. 6.)

The elevators control movement of pitch, nose up or down about the lateral axis.

The ailerons control rolling or banking movements about the longitudinal axis.

The rudder controls yawing movements about the normal axis.

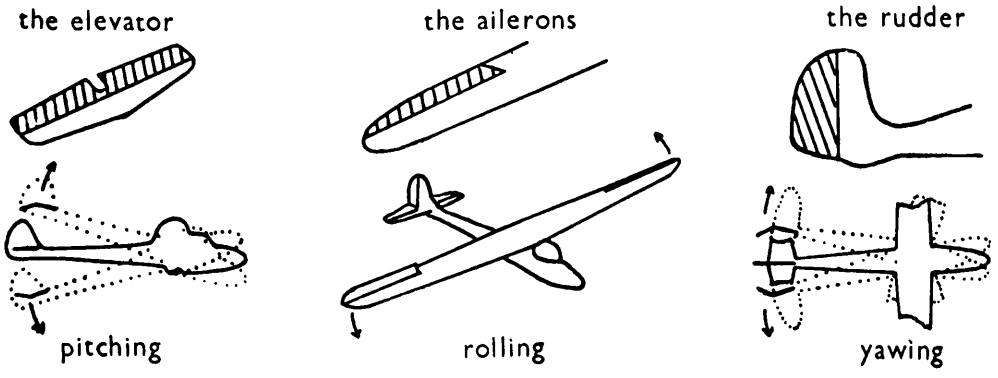

Fig. 6b. The effects of the controls.

It must be noted that the controls act about these same axes whatever attitude the aircraft may be in. For example, in normal flight a movement forward on the control column lowers the nose. The same movement in a turn produces a similar pitching movement about the same axis.

The easiest way to think of this is to do your safety harness up tightly so that you can really imagine yourself as a part of the glider or as having strapped your wings on. The controls will always react in the same way in relation to your position in the cockpit.

The elevators and ailerons are easy to master; to lean forward or put the nose down, move the stick forward, and to lean to the left or bank to the left, move the stick to the left.

The rudder movements are not instinctive but are quickly learnt by practice.

Applying left rudder by moving forward on the left foot swings or yaws the nose to the left; right rudder swings the nose to the right.

The effectiveness of these controls depends on the speed of the airflow over the controls and the amount they are moved. At low speeds larger movements are required to produce the same effects. At very low speeds (near stalling), the controls become very ineffective and do not always produce the normal effects.