About Gliding

Some questions and answers about gliding

ABOUT GLIDING

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During the course of a year many people visit gliding clubs to watch the flying. Most of them have questions which they would like to ask. This guide is intended to provide some of the answers.

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How are gliders launched?

A common method is by winch. If this method is being used, you will see the winch on the far side of the field. When the glider is ready to be launched one person holds a wing tip to keep the wings level, while another signals to the winch driver, using a lamp or signal "bats."

What are the signals used?

One bat moved up and down is a signal to the winch driver to wind in any slack in the cable. When the cable is tight the order "All out" is given and the signaller moves both bats up and down. The winch driver accelerates and the glider is pulled along the ground until it floats into the air in the same way that a kite rises into the air when someone runs along the ground pulling the kite at the end of a piece of string.

What happens then?

As the glider flies over the winch, the winch driver gradually slows down. When the pilot decides he has got as high as he can, he releases the cable by pulling a yellow knob inside the cockpit. The cable drops away and the glider is free.

What is the parachute at the end of the cable for?

To keep tension on the cable as the winch driver winds it in.

What happens if the pilot doesn't release the cable?

The cable will come off by itself after the glider has flown over the winch. There is a safety device which keeps the cable attached for as long as the cable is pulling the glider forward, but releases the cable if there is any backward pull on it.

What happens if the cable breaks?

The pilot releases the piece of cable attached to the glider, and then decides how to land. If he is still low there will be plenty of room for him to land straight ahead in the direction of the winch. If he is higher there will be time for him to do a circuit round the field and then land.

How does the pilot know when to release the cable?

Partly by knowing where the glider is in relation to the winch, but mainly by the feel of the glider. He can tell when the glider is no longer gaining height but is beginning to be pulled forwards and slightly downwards.

What other methods of launching a glider are there, apart from using a winch?

The most satisfactory way of launching a glider is by towing it behind a light aeroplane. This is called aerotowing. The method can only be used, of course, where the site is flat enough for the towing aeroplane to take off, for example on an aerodrome.

Aerotowing has the advantage that the glider can be taken to a greater height than can be reached by using a winch. This means that the pilot of the glider has longer to search for rising air currents than he does if the glider is launched by winch. Another advantage is that the pilot of the towing aircraft, who is usually also a glider pilot himself, will be able to tow the glider to a part of the sky where he considers that rising currents of air are most likely to be found on that particular day.

How high are gliders towed in this way before releasing?

Usually 2,000 feet.

And how high would they get by a winch launch?

Seldom much more than 1,000 feet, often less.

What does the pilot do after he has released the cable?

He will start looking for rising currents of air, because unless he finds rising air currents the glider will gradually float down to the ground again. If you see a glider being launched and then coming down to land after being up for only a few minutes, this means that there are no up-currents on that particular day — or, if there are, that the pilot hasn't succeeded in finding any.

Does there have to be wind for a glider to fly?

No.

But doesn't there have to be wind passing over the wings of the glider to support it in the air?

There has to be *air* flowing over the wing, yes. But this is the result of the glider flying forwards through the air and has nothing to do with wind. If you ride a bicycle on a completely calm day you feel air on your face; but this is not the same thing as wind.

What makes the glider travel forwards? There is no propeller to pull it along.

The same thing that makes a ball roll down a slope — the force of gravity. The path of a glider is in fact very much like that of a ball rolling down a gentle slope.

Would it be true to say that a glider flies on the same principle as a paper dart?

Yes, this is perfectly correct. If you make a paper dart and throw it so that it floats across a room, it will gradually sink to the floor. (There doesn't have to be any wind in the room for this to happen.)

So that as well as flying forwards, a glider is also sinking slowly downwards all the time?

Yes.

And it can only gain height, or even stay at the same height, if it finds an up-current which is going up faster than the glider is sinking down?

Exactly. Imagine someone throwing a paper dart, not in a room, but inside a lift. The dart will sink to the floor of the lift; but if the lift is going up, then by the time the dart has reached the floor, the lift itself may have reached the second storey of the building, with the result that the dart ends up higher than when it started (despite the fact that all the time it was sinking down through the air inside the lift).

So, for a glider to gain height after releasing the cable or even to maintain the same height, everything depends on the pilot finding an *up-current* before the glider floats back to the ground?

Precisely.

How are these up-currents formed?

There are broadly two things which cause air to rise. We can deal first with "thermal" lift, as this is most important. As the name thermal suggests, this kind of lift is caused by heat. What happens is this. The sun warms a piece of ground — a ploughed field, for example — with the result that it becomes warmer than the surrounding land. The ground warms the air lying above it. As the air becomes warmer it expands and becomes lighter and more buoyant. Eventually the warm air, being lighter, will break away and rise up like a bubble into the sky, forming a current of rising air. This up-current is termed a thermal.

So this kind of up-current is found more often in the summer and on warmer days?

Yes. Thermals which are strong enough to provide lift for gliding are found between about March and October. Spring and early summer are the best times.

What other types of ground are good for causing thermals?

The roofs of a village, a runway of an aerodrome, the side of a hill which is facing the sun and protected from the wind, a factory, a quarry, a railway siding. Things like these.

Would you say that a glider being carried up in a thermal is like a leaf being carried up in the hot air from a bonfire?

Yes, this is exactly what happens. And if the leaf leaves the rising air, it sinks to the ground, just as a glider will. Of course, in the case of the glider, the pilot will try to stay in the rising air, and he does this by circling where he finds the up-current is strongest.

Have thermals anything to do with clouds?

Yes. In the rising column of air there will be a certain amount of moisture vapour — as there is in all air. As the air rises it cools, and when it reaches a certain level it will condense into cloud. This is how the white puffy clouds on warm days are formed.

So that underneath each of these clouds there is a thermal of warm air leading up to it — like the stalk of a mushroom?

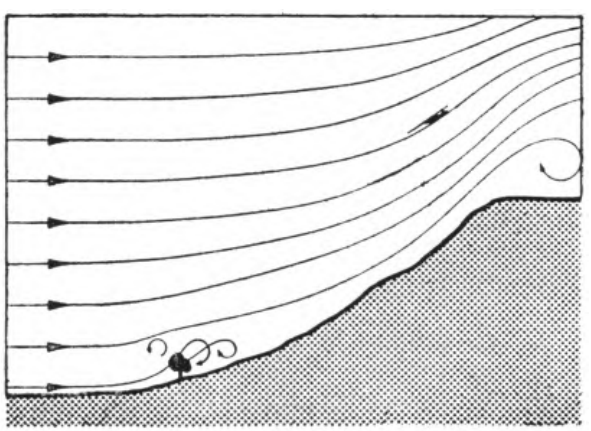
Broadly speaking, yes. But there is still much that is unknown about the shape and characteristics of thermals, and they vary according to the weather conditions and the nature of the countryside. On some days thermals may be small, but powerful and rough, throwing the glider about like a cork. On others they may cover a wide area, and be calm and smooth.

What is the other cause of rising air currents?

The other principal cause of rising air is the result of wind blowing against the side of a hill and being deflected upwards. If you have seen seagulls soaring over the cliffs without flapping their wings, they will have been using these rising currents caused by the wind blowing against, and up, and over the cliff.

Does this kind of lift extend above the height of the hill?

Yes, often up to as much as two or three times the height of the hill.

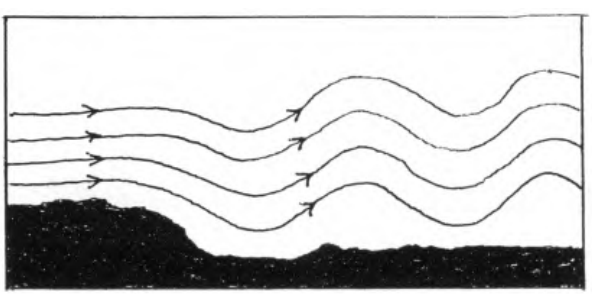


Is the lift only found along the edge of the hill which is facing into wind?

Yes. A glider can soar to and fro along the edge of the hill in rising air, but if it strays away from the edge of the hill it is liable to meet sinking air.

I have read of gliders reaching great heights over mountain ranges. Is this in hill lift?

No, but in another form of lift caused by hills which is termed "wave lift." In some weather conditions wind passing over mountains or high hills is formed into a series of waves or ripples. You will have seen how a stone in the bed of a stream can cause a ripple on the surface of the water — although the stone is only six inches in height and the surface of the water six feet or more above the top of the stone. The ripple passes up through the layers of water and shows on the surface. The same thing may happen when wind passes over a hill. Downwind of the hill, the wind forms into a series of undulations, like this:



If a glider flies into the up-going part of the system, it will rise. These waves sometimes go to great heights and gliders have reached over 40,000 feet in them.

So hill lift is found on the up-wind side of hills, wave lift on the down wind side?

Yes. Sometimes a glider pilot is able to use hill lift to reach the bottom of a wave which is formed by another, different, hill lying up-wind, and then gain height in the wave.

So wind does have something to do with gliding after all?

Yes, in this connection it has. But wind isn't necessary for a glider to *fly,* and, except when it is being deflected upwards by a hill, wind has nothing to do with keeping a glider up. Wind, by itself, blowing over flat country won't keep a glider up. If you throw a paper dart out of doors it will still float to the ground, whether there is a wind blowing or not.

But if I throw the paper dart downwind it will travel faster. Does the same thing apply to gliders?

Certainly. A glider flying downwind will travel faster over the ground than if it is flying into wind. But, of course, this has nothing to do with the glider staying up; and wind or no wind, it will sink to the ground unless it finds up-currents.

So a glider can fly into wind and not merely down wind?

Yes. Provided the glider's speed through the air is greater than the wind speed, then the glider will travel forward over the ground. For example, a glider travelling at 50 m.p.h. against a 10 m.p.h. wind will cover the ground at 40 m.p.h. But it can be hard work flying against the wind, because to gain height the glider will, from time to time, have to circle in thermals; and when circling, the wind will drift him back the way he has been struggling forward! If the wind is strong it could take several hours to cover only a few miles. If the glider had been travelling down wind, it might have travelled a hundred miles in the same time.

Can there be hill lift and thermal lift at the same time?

Yes, if the wind is in the right direction there will be hill lift; and if the weather is right — plenty of sun, but not too muggy — there will be thermals. And if conditions are right, there will be both kinds of lift. If a pilot is flying along the edge of the hill in hill lift, and he meets a thermal, he will start circling in the rising air.

Do thermals carry you higher than hill lift?

Yes, much higher. On an average day thermals may go up to about 3,000 feet; on a good day much higher.

What happens when the glider gets up to cloud level?

When the glider reaches the bottom of the cloud, it can continue to get lift inside the cloud, and this will take it higher still. If you fly into a giant thunderstorm cloud you may reach 20,000 — 30,000 feet. But flying in this kind of cloud requires much experience and skill.

How does a glider pilot know when he has flown into a thermal?

Partly by the feel of the aircraft (there is a bumpiness and a feeling of being lifted upwards) and partly by an instrument in the glider called a Variometer, which tells him when he is in rising air and when in sinking air. This is the most important instrument in the glider.

What does the pilot do when he knows he has flown into a thermal?

He will turn at once and start circling in the rising air. If you watch you may see gliders doing this. If the thermal is narrow he will circle tightly; if it covers a wider area, he needn't circle so steeply. If he is skilful — or lucky — he will stay in the thermal; if not, he may lose it and have to search for another one.

What happens if a glider hits an air pocket?

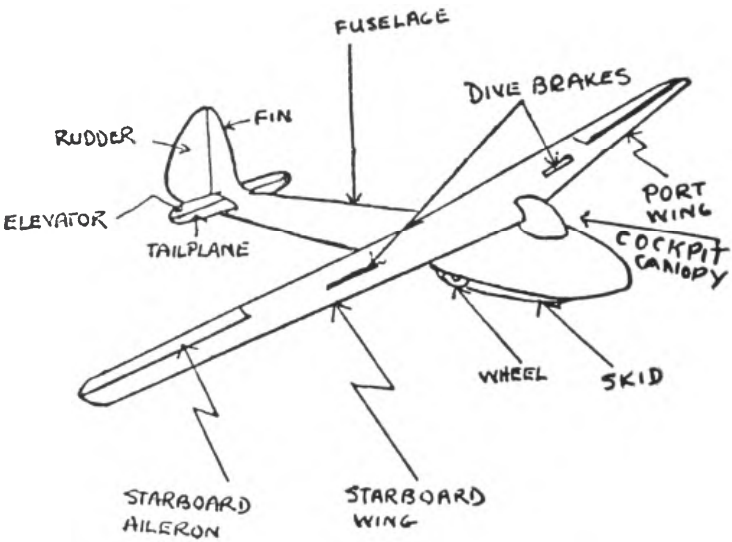
The term "air pocket" doesn't really mean anything. In the sky there are up-currents and down-currents (and horizontal currents, the wind). If a glider is in rising air, he tries to stay in it; if he is in sinking air (which is what people mean by an airpocket) he tries to get away from it.

How about learning to fly? Presumably someone starts in a two-seater glider?

Yes. Up to the stage when someone flies solo, training is carried out in a two-seater glider.

How is training carried out?

To begin with the pupil is shown the effect of the controls and how to fly the glider whilst in the air. At this stage the instructor will do the launch and landing. Later the pupil will do more of the flying, until he is handling the controls throughout the flight. Then he will have to learn how to plan his flight, so that he arrives back at the right place with the right amount of height, so as to come in and land where he wants to.



What are the controls of a glider?

They are the same as in a powered aeroplane, except that there are of course no engine controls.

The two principal controls are the stick and the rudder pedal. When the stick is pushed in a fore-and-aft direction, it moves the elevator (the flap on the tail plane) and when it is pushed from side to side it moves the ailerons (the flaps at the end of each wing).

The rudder pedal moves the rudder at the tail of the glider.

How do these various controls affect the way the glider is "steered?"

This brings us to the question of flying itself, which, although straightforward, is too big a subject to be tackled here. If you are interested, you can ask about it, or get a book on gliding. Derek Piggott's book "Gliding" is an excellent introduction.

What is the purpose of the flaps which come out of the middle of the wing?

These are termed air-brakes, and as the name suggests are for slowing down the speed. They are used when a glider is coming in to land. Another effect is to reduce the lift produced by the wings, with the result that the glider sinks more rapidly. This is useful if the pilot wants to reduce his height for any reason — for example, if he is too high when making his approach to land. The brakes are operated by a lever on the left-hand side of the cockpit.

How many training flights in the two-seater are needed before someone flies solo?

It varies. Roughly anything between 50 and 100.

How long would this take?

It depends on how often the person comes up to the club. If they came regularly, perhaps about six months.

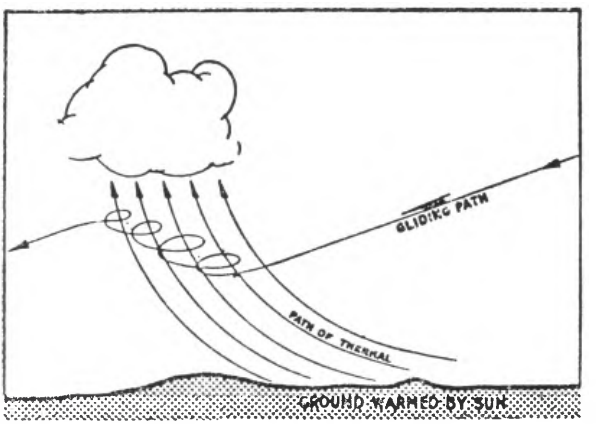
What happens after a person has been allowed to fly a solo glider?

His object then will be to stay up for longer periods and to reach greater heights. When he has obtained more experience he will be allowed to fly gliders of higher performance, and eventually to make his first cross-country flight.

How does a glider make a cross-country flight?

When the pilot has found his first thermal, he will circle up in it until he has reached a height which he considers sufficient to start his cross-country flight — perhaps about 3,000 feet. Then he will point the glider in the direction he wants to go, and fly in a straight line until he finds another thermal. Then

he starts circling again to work his way up as high as he can and then begins another straight glide in the direction of his destination. This goes on for the whole flight — circling up in the thermals, and then gliding on.



So between thermals he is losing height all the time?

Yes.

What happens if he doesn't find another thermal?

If he doesn't find another thermal, he will have to decide on a suitable field, and land in it. Or if he is within reach of an aerodrome he may decide to land there.

What kind of field will he choose?

He will pick a grass field so that there will be no damage to crops, and one with no cattle in it. He must make sure that there are no high trees or telephone wires on the side from which he approaches and that the ground is level; or, if there is a slight slope, that he lands uphill.

What happens after he has landed?

First, he finds the farmer who owns the field and explains what has happened. Then he telephones the Club to say where he has landed.

Do farmers mind?

The glider is unlikely to have done any damage and farmers are usually interested and helpful.

How is the glider taken back to the Club?

A trailer (you will see them parked by the hanger — they look like long horse boxes) will be towed by car from the Club to the place where the glider has landed. The glider is taken to pieces ("de-rigged"), put in the trailer, and brought back to the club.

Do cross-country flights always end away from the Club?

By no means. People often fly to one or more selected points, and then back to the Club again.

What kind of lift will be used on a cross-country flight?

Generally thermals the whole way. Hill lift is usually too local to be of much use, and after about 10-20 miles the hills may end and thermals will be the only kind of lift available.

Does this mean that cross-country flights take place mainly in the summer?

Yes.

What happens in the winter?

There is flying then too, but the only lift available is hill lift, or wave lift and so there are few cross-country flights.

Do weather conditions ever stop flying?

Yes. Flying stops if the visibility is bad (for example, when there is mist or fog), or when the wind is too strong.

Why should strong winds stop flying — wouldn't this make the hill lift better?

Gliders can fly safely in winds of up to gale force, and if the wind is in the right direction it will certainly improve the hill lift. But the danger is that in very strong winds a glider may be blown over while on the ground and damaged, even if there are several people hanging on to it. So after a certain point it is safer not to take the aircraft out of the hanger.

What about flying inside clouds?

There is often strong lift inside a cloud (the continuation of the thermal) and a glider will continue circling up into the cloud. When flying in cloud the pilot will have to rely on his blind flying instruments because in cloud there is no knowing which is up and which is down. Sometimes the air inside clouds is very turbulent.

Do glider pilots wear parachutes?

Generally, yes. But on short training flights they are not necessarily always worn. But it is a rule that no one must enter cloud unless he is wearing a parachute.

Is there any sensation of height or "falling" when flying a glider — how do people with a bad head for heights get on?

Strangely enough, there is virtually no sensation of height when gliding. You can tell that you are at a certin height, but there is none of the feeling you would get looking over a cliff. The reason for this is thought to be that as there is no physical link with the ground and the glider is completely detached from the ground, this sensation does not occur. People who may be unhappy using a step ladder find no trouble from this cause when flying.

What does it feel like in a glider when you are up in the air?

There is very little sound. In a glider with a covered cockpit there is only a whisper of air passing over the wings.

As for the view, you will have a bird's eye view of the towns, villages, fields and valleys of England. On a cross-country flight you will fly over mile after mile of open countryside, the shadows of the clouds moving across the fields.

When you are high up the ground becomes a blue haze, and you are more aware of the sky and the clouds around you than your position over the ground.

Is it very peaceful?

Yes and no. On some days it is certainly peaceful. But on other days conditions can make flying very rough, for example when flying in hill lift in strong winds. Thermals too can be bumpy and turbulent, and staying in a thermal often requires a great deal of concentration.

On a cross-country flight the pilot will not only have to think about staying up, but has also got to keep track of where he is, and what course he should set by his compass when flying between thermals. And when he is in sinking air, he will be trying to decide which cloud to head for in the hope that there will be lift under it. Many people have completed a cross-country flight and found that they have been so busy that they have forgotten to eat the chocolate they brought with them!

You mentioned a compass. What other instruments are there in a glider?

Nearly all gliders have the following :—

Air speed indicator — this is a "speedometer" which shows the speed of the glider through the air.

Altimeter — this shows how high the glider is above the ground.

Variometer — this shows whether the glider is rising or sinking.

On many gliders there will also be an instrument called an Artificial Horizon; this is worked by a gyroscope driven by batteries and is for flying in cloud.

Do gliders carry radio?

Most gliders which are used for cross-country flying are now equipped with radio. The main purpose is not so much to communicate with aerodromes as to tell the driver of the car which is towing the trailer where the glider has got to on a cross-country flight.

Do gliders carry oxygen equipment?

Yes, some have it. Above about 12,000 feet oxygen is needed to remain conscious. It isn't often that a pilot will reach this height, but if he has oxygen it will mean that he can continue to go higher.

What is the greatest height a glider reached?

The world record is 46,266 feet and the British record is 42,900 feet.

What is the greatest distance a glider has flown?

The world record is 907 miles. The British record is 461 miles.

How fast can a glider fly?

The maximum speed on a low performance glider is about 75 m.p.h., on a high performance one about 140 m.p.h. This is the speed through the air. With a tail wind the speed over the ground would be higher.

What do you mean by a high performance glider?

A high performance glider will glide further for each foot that it sinks than a low performance glider. If a high performance glider glides down from a height of 1,000 feet (without meeting up-currents or down-currents), it will travel about 8 miles before touching the ground. A low performance glider would travel only about half this distance.

Why is this important?

It is specially important when flying between thermals. If the thermals are wide apart, a low performance glider might sink too low and have to land before it came to the next thermal. But the high performance glider would have a better chance of reaching the next thermal and being able to continue the flight.

It also means that a high performance glider is better at flying into wind, and also that it can fly faster without losing so much height. This quality is known as the glider having better "penetration."

How does the pilot increase the speed?

By pointing the nose of the glider further and further down towards the ground; the "slope" down which the glider is flying thus becomes steeper and so the speed increases. But there is nothing special about speed as such. (You can make a brick go fast by dropping it!) What matters is how much height is lost in the process. As we mentioned above, this is where a high performance glider has the advantage, as it will travel further for each foot of height lost.

Are any gliders privately owned?

Yes. Many people, when they have had a certain amount of experience, prefer to have their own glider. But one glider is seldom owned by one person. What happens is that a group of people, usually about four, join together to buy a glider and share the running expenses and take it in turns to fly. But there is no need for anyone to buy their own glider, or a share in one, and many people fly aircraft owned by their Club.

What are gliders made of?

In the main, wood (spruce and ply) and fibre glass or other synthetic materials. The covering on the wings is usually plywood, or fabric painted with dope. Some gliders have tubular steel frame with fabric or sheet alloy covering.

Are gliders strong?

In the air they are very strong. But on the ground they can easily be damaged by accident, for example by someone putting their foot through a wing.

Can gliders do aerobatics?

Yes. They can do loops, spins, stall turns and "chandelles." Because greater stresses are imposed, only the more high performance gliders, which are stronger, are permitted to do aerobatics.

You use the term "glider." There is also the word "sail-plane." What is the difference?

Sailplane is a word sometimes used for high performance gliders. But whether they are high or low performance machines, they are all gliders.

Are there gliding competitions?

Yes. There are international, national and local competitions.

How long do these competitions last?

The larger competitions last about ten days. The smaller, local competitions, last about four days, for example over an Easter week-end.

What form do the competitions take?

Each day the competitors are set a different task, and marks are awarded according to each person's performance.

What kind of tasks are set?

One task is a race to a given goal — perhaps an aerodrome a hundred miles or so away. The pilot with the fastest time gains the most points.

Another task may be a race round a triangular course landing back at the Club. (There would be observers at each turning point).

How do the organisers decide what task to set?

The task is set in the light of each day's weather. The aim is to make the task difficult but just possible, so that only the best pilots will be able to achieve it.

Presumably each competitor has a crew to come out and fetch him back if he has landed away?

Yes; and in a week of competition flying the crew may drive many hundreds of miles towing the trailer. A competitor relies a lot on having a good crew to get him back to the Club without delay.

Is gliding controlled in any way?

Each Club is an individual unit with its own committee, but all gliding clubs are bound by the rules and regulations relating to airworthiness of aircraft, safety, training and operational regulations laid down by the British Gliding Association, which is in close touch with the appropriate government departments over these matters.

When flying cross-country, gliders are subject to the same rules of the air as powered aircraft.

Do you need any kind of licence?

For flying locally, no. But before anyone makes a cross-country flight he will have obtained his "Bronze C" Certificate. To obtain this, it is necessary to have a certain amount of solo flying experience, and to pass a written test which includes questions on air law.

Do women learn to glide?

Yes, some of the best pilots in the country are women.

Are there gliding "courses"?

Yes, in the summer a number of one-week courses are held for people who want to learn to glide. These courses combine an enjoyable holiday with learning to fly. The cost usually includes accommodation at the Club, meals, flying and instruction. The courses normally last from Sunday evening until after breakfast the following Saturday. Some people begin their gliding on one of these courses; others just come for the week without intending to take up gliding permanently.

Are there social members?

At most clubs people who do not want to fly themselves, for example the wives of flying members, are able to join the Club as social members.

Is gliding safe?

No one would claim that gliding is completely safe. As you can see for yourself, if a pilot misjudged his approach and landing, an accident could occur. But the accident rate is low, and the gliding movement is working constantly to reduce accidents still further. The importance of safety is something which is stressed throughout a pilot's training.

It is probably true to say that although gliding isn't completely safe, it is a great deal safer than driving on the road.

One thing, of course, which can't happen is engine failure !

Are visitors welcome at the Club?

Yes, visitors are usually very welcome. But it is important that people should not cross the field when flying is in progress, as they may get caught by the cable. So visitors are asked to keep to the sides of the field, never to cross between the winch and the take-off point, and to obey all notices.

Who should I ask if I have any other questions?

Members will usually be glad to answer questions, and please don't hesitate to ask. You will find that people who take part in gliding are nearly always glad to talk about it.

We hope you have had an enjoyable visit and that you have learnt something about gliding.