
sinclair®
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ZX Spectrum®
Science Horizons
GLIDER
CASSETTE 48K RAM

SCIENCE HORIZONS GLIDER

GLIDER

Acknowledgements

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Educational aims

By taking on the role of a glider pilot, users of *Glider* quickly become familiar with the scientific principles of the sport.

A glider has no engine to propel it through the air, and so in still air it must constantly lose height as it flies. For this reason a pilot must search for rising currents of warm air (called *thermals)* which will increase the glider's height.

A winged craft needs to maintain flying speed to avoid 'stalling', and diving towards the ground. A good glider pilot can get out of a stall fairly easily, while a pilot in charge of fast jet aircraft with small wings would have more difficulty in avoiding a crash.

In the program the user can consider how the rising air currents are influenced by what is on the ground - buildings, ploughed fields, expanses of water - as well as time of day and weather conditions. The number of thermals which arise, and the height to which they rise, depends on the heat from the sun. This obviously increases towards the afternoon, but can alter dramatically depending on the amount of cloud cover.

Users will be able to grasp the concept that the glider, which is non-powered, and is heavier than air, can be lifted by air-in the form of thermals. Similar action occurs when a hot air balloon rises, or small particles of dust are lifted as they pass over a radiator in the home. **(Safety note -** do not experiment using naked flames.)

Loading the program

Make sure your ZX Spectrum® is connected as explained in the Sinclair ZX Spectrum ® manual.

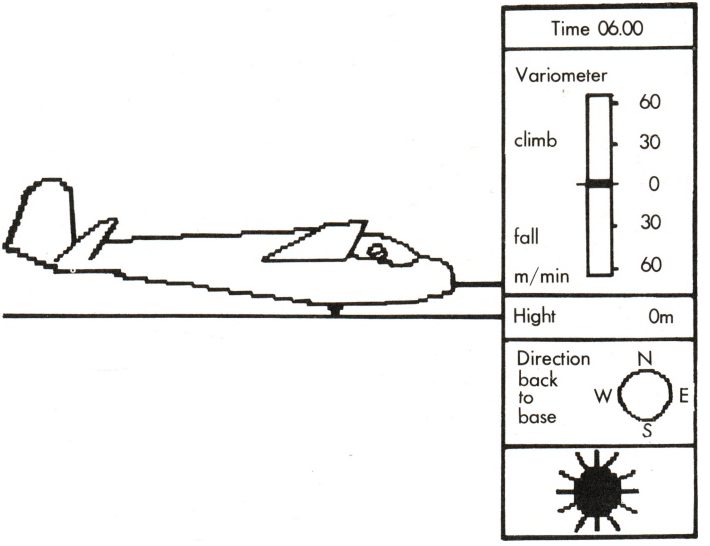
Check that the tape is at the beginning.

Type **LOAD "GLIDER"** then press **ENTER** or
type **LOAD** then press **ENTER**
Start the tape.

The message **Loading please wait** should appear on the screen. The program takes about 3 minutes to load.

Running the program

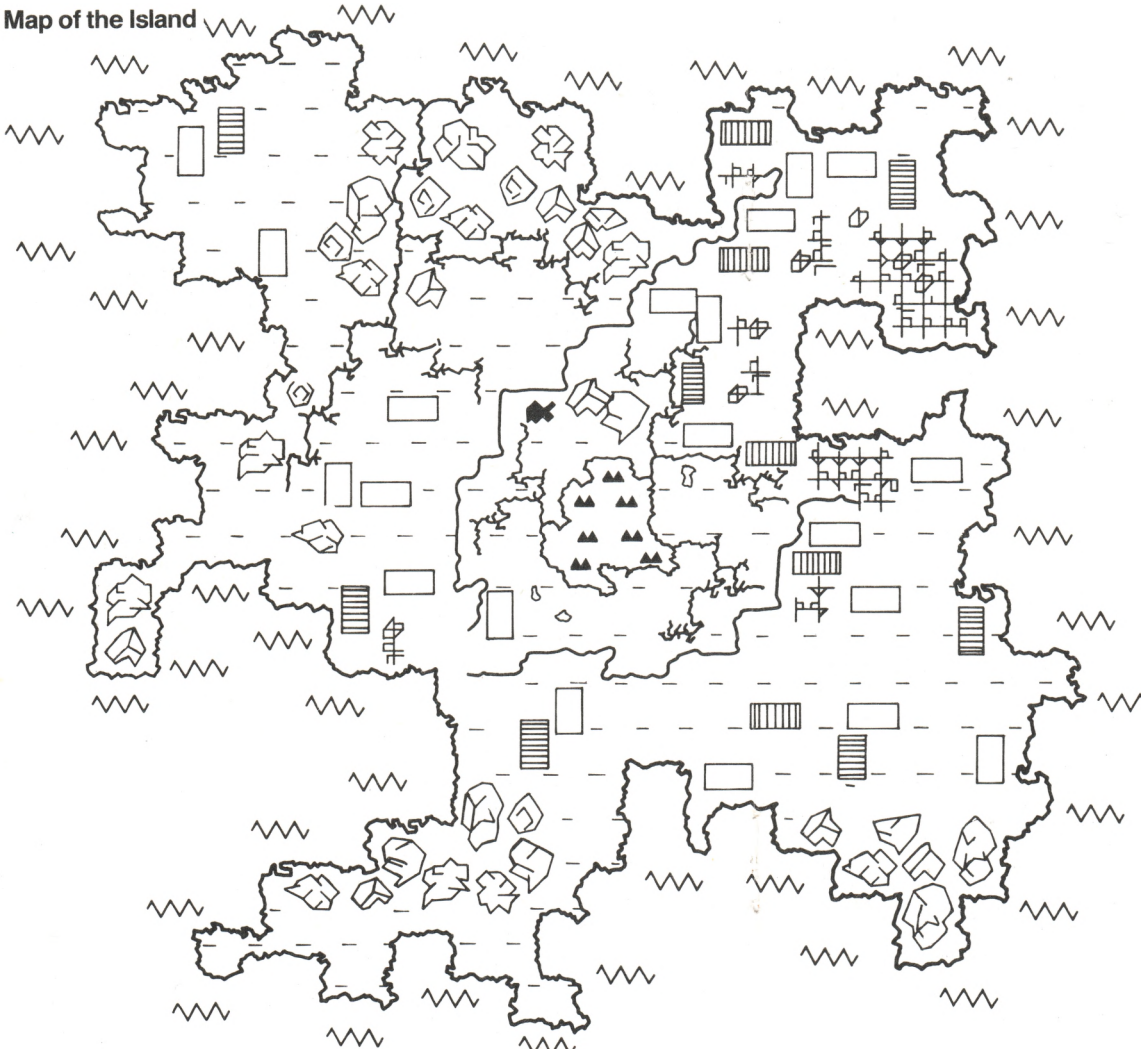
When the program has loaded, you will see your glider ready for launch. The time is set at 6 am and the weather conditions are shown (in this case it is sunny):



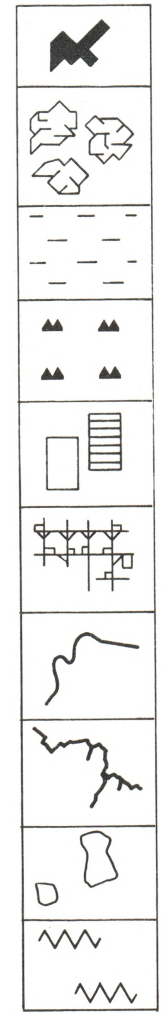
Decide what time of day and what weather conditions you would like for launch, then press **SPACE** to move the time, hour by hour. The time moves from 0600 to 1800 then on to the next day.

When you are ready to launch, press **ENTER.**

Map of the Island



Key to land use symbols



You will be towed, quickly rising to a height of 50 metres and then released at 300 metres, when the **ON TOW** notice at the bottom left of the screen will disappear and **RELEASE** will appear. Now it is up to you to direct the glider to continue your flight.

To change the direction of the glider, use the keys

T Y U
G J
B N M

(or use a joystick if you have one).

Note that the direction keys are not operational until the glider is released.

The glider will then continue to move in that direction until you press another key.

If you want to circle in the same place, press **H.** Remember that the glider will circle *after its next move* - so you will have to plan in advance, and be prepared to overshoot.

Press **P** to pause at any time (perhaps to consult the map).
Press **C** to continue.

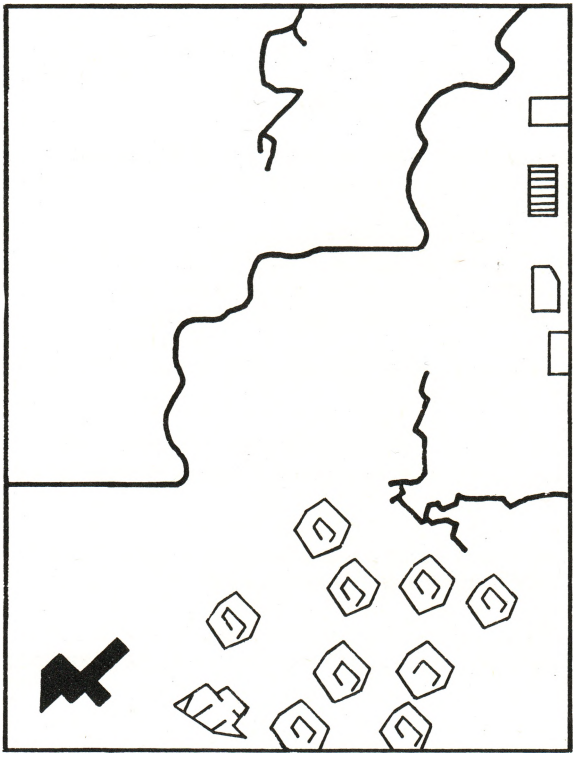
The **variometer** will show you your rate of climb or fall. When you reach a thermal the variometer will quickly rise, then drop as the thermal weakens. When you see that you are in a thermal, press **H** to circle and gain as much height from it as you can.

Below the variometer you can see your height above the ground. Beware of dropping below 50 metres as you will probably crash!

Your direction of flight is monitored on the screen - the dial shows your direction back to base, which will help you work out your position over the land.

At the bottom of the screen you can see changes in weather condition, which will help you decide where thermals are likely to occur.

Detailed map of area near base



You are flying above an island, a rough map of which is shown in the booklet. You are launched from the same base each time, somewhere near the middle of the island.

When you begin to use the program we suggest you aim for areas where thermalsarelikelytoarise-overfactories, houses, ploughed fields-soyou become practised enough atgaining heightto explore the whole island. We have printed a key in this booklet to help you recognise the features over which you are flying.

As you fly, you build up a score according to how far you fly from base, how long you stay in the air, and whether you land safely back at base (you get 2000 points for landing at base).

To make a successful landing at base you must gradually lose height, perhaps by circling over the area of the base, until you are less than 50 metres above it.

If you are unable to land at base then aim for flat areas such as grass where you can also land safely. If you go below 50 metres over buildings, trees, river or sea then you will crash.

You gain fewer points for landing on grass than for landing at base (but more than for crashing!).

When you come to the end of your flight - by either crashing or landing - press **SPACE,** to see the Air Traffic Controller's report and your final score.

At the end of a game, or at any time during a flight, press **CAPS SHIFT** and **A** together to play again.

The computer will record your highest score of the session. Press **SYMBOL SHIFT** and **A** together to break out of the program and load a new one.

If at any time you wish to have a print-out of the screen, make sure your ZX Printer ® is connected as explained in the manual, then press **CAPS SHIFT** and **Z** together.

Press **Q** to turn the sound effects off or on.

Background information

A glider needs an initial lift to launch it into the air. This can be done either by a plane towing it (as in the program) or by using a winch. Glider controls are similar to those of powered aircraft, but with simpler instrumentation - and no throttle control! The glider is controlled by a 'joystick' which, by moving flaps on the wings and tail, allows the pilot to climb or dive, and bank to the left or the right. A rudder control controls the tail fin to make the glider turn. This may be incorporated in the joystick, or operated by foot on the rudder bar.

A glider pilot must understand the origin of thermals in order to know where to find them. It has already been noted that the weather conditions, and especially the amount of sun, are critical for the occurrence of thermals. A still day is best for gliding, and high winds make any kind of flying difficult. At the same time, the ability of the land surface to absorb and then release heat is an important factor. Dark colours absorb heat more easily than light colours. This heat then warms the neighbouring air and gives rise to the warm currents we call thermals. Woods tends to trap cold air beneath branches and leaves of the trees. This air is warmed during the day and may provide a small amount of lift towards evening as it escapes.

Thermals must not be confused with the updrafts of air which are forced up the side of cliffs and mountains and occur with or without sunshine.

When you are flying it is important to know where thermals are likely to arise; but remember that all the conditions must be right - if you find a thermal today, don't expect to find one in the same place tomorrow.

In the program, you will be able to rise to about 2000 metres which is an average gliding height. Thermals sometimes rise even higher than this-some thermals associated with thunder clouds can go as high as 7000-10000 metres, giving a tremendous lift.

The British Gliding Association offer a prize each year to the pilot who achieves the highest altitude in the British Isles. Normally this is won

with a height of 10 000-14 000 feet (approximately 3000-4300 metres). The British record stands at over 28000 feet (approximately 8500 metres). In 1962 the world record was set at over 42 000 feet (approximately 13 000 metres) over the Sierra Nevada desert, USA.

To achieve these great heights a special glider is needed, with a pressurised cabin, an oxygen supply, and a flying suit similar to that of an astronaut.

In Britain there are over 100 gliding clubs, with over 9700 glider pilots taking part in the sport.

Flying a glider is the closest that we can come to imitating bird flight. You may like to find out more about which birds use thermals to fly. Smaller birds flap their wings very fast while larger birds do not need to flap but can open their wings and'glide'more, for example vultures and condors.

Historical note

Two gliding pioneers were Otto Lillenthal, a German, and Sir George Cayley, who was British. Both lived in the nineteenth century.

Otto Lillenthal achieved a distance of 750 feet (approximately 230 metres) before he was killed in a gliding accident in 1896.

Sir George Cayley used his coachman to pilot his first machine across Brompton Dale in 1853. The coachman is said to have resigned after the flight! A few years ago a replica of Cayley's machine was made. A modern pilot followed the same route as the coachman and achieved a greater distance, proving that Sir George Cayley's ideas about flight were sound. Some people believe that if a lightweight internal combustion engine had been available, in addition to the heavy steam engines of the time, then powered flight might have come into being 50 years before the famous Wright brothers'flight in 1903.