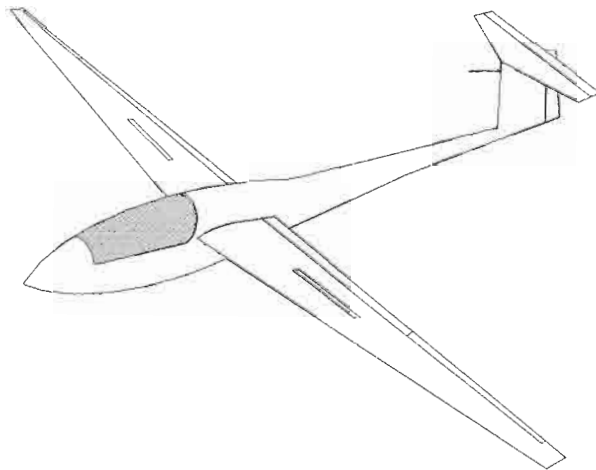


Scottish Gliding Union

Wave Soaring



8.0. Wave Soaring.

8.1 Technique

8.1.1 Working wave is much the same technique as working hill lift. It can be present at low, medium and high levels or all three at the same time. Cloud may or may not be present. This section is not meant to be a treatise on wave soaring but a few general hints which may assist people who have not much experience of this type of lift.

8.2 Location of Lift

8.2.1 The lift itself is generally silky smooth, varying from zero sink to 15 - 20 knots (up and down!) and it may be that no control movements are necessary for minutes at a time. Before the lift is contacted however very turbulent air can be encountered in passing through areas of rotor. The lift is usually found up wind of this rough air and the technique thereafter is to use the band of lift in a very similar way to working hill lift. It is essential to make sure that you are not drifted downwind into any cloud there may be, remembering that although the wind may be in excess of 40 knots the associated cloud is stationary relative to the ground.

8.3 When to use oxygen

8.3.1 When using lift above 12,000 feet pilots must start using oxygen, the use of oxygen is recommended above 10,000 feet. Bear in mind that there are considerable variations in tolerance to lack of oxygen, if you have any doubts, go on oxygen sooner. Due to the rapid rate at which you may climb in wave have your oxygen mask within easy reach so that it can be donned quickly.

8.4 Instrument error

8.4.1 When flying above 10,000 feet the pressure instruments begin to display large errors, typically **17% per 10,000 feet**. If you are flying fast in wave, e.g. "jumping bars" make adequate allowance for this error. Your ASI will **under-read** by the margins indicated above thus your true airspeed will be higher than that indicated and you may be a lot closer to the VNE than you think.

8.5 Actions required in event of being caught above total cloud cover

8.5.1. Watch for signs of the wave gaps filling in and creating a solid layer of cloud beneath you which you may have to make a long descent on instruments. This itself causes no real problems provided you know what height cloud base is and what your position is. We have some fairly high mountains just to the north of us and they can easily become cloud covered! When the wave system collapses the general environmental change could lead to a significant lowering of the cloudbase. If you have radio call other gliders, or base, and ask what the cloudbase is. Navigation above cloud has been greatly simplified with the introduction of GPS and pilots wishing to make regular wave flights are recommended to buy one. Remember though, GPS is an aid, and

should never be fully relied on to get you home. You should back it up with basic navigation skills at all times. If you have lost contact with the ground, be unsure of your position and are forced to descend through cloud you have two options:-

- A. Descend on a compass heading into the last known wind and once below 3000 feet reduce speed to the minimum consistent with adequate control. Should you arrive over high you should have a fair chance of it being a survivable arrival. It cannot be put any higher than that.
- B. Adopt the Benign Spiral Mode of descent. This is considered the safest method of escape when caught above cloud. The Benign Spiral Mode is a technique where, once properly trimmed, the glider is allowed to enter a spiral of its own volition and left there without the pilot touching the controls until clear of clouds, (if he clears clouds!) and recovery can be initiated. To enter the benign spiral mode, do the following:
 1. Establish a heading into the last known wind.
 2. While in level flight, trim the glider to as close to 1.5 times the stall speed as possible.
 3. Open the airbrakes to the full position. If necessary, hold them there. If the glider is equipped with flaps, lower them to the normal position for thermalling.
 4. Take your hands and feet off the controls and allow the glider to enter a spiral on its own. Once established in the spiral the airspeed and attitude will become constant.
 5. Once you have cleared clouds, recover as you would from a normal spiral.

It is recommended that this method of descent is practised a few times in clear air before needing to use it in cloud.

- 8.5.2 Portmoak is not very far from the North Sea and the Forth Estuary. Pilots should remain aware of their position as long as there is visibility.
- 8.5.3 While at height watch out for the onset of night. The evening is frequently a time of good wave conditions when it is easy to gain considerable height in a short space of time. It can however take a long time to get down from 20,000 feet and it could be dark on the ground by the time you get down. We try to keep a last landing time chart current on the notice board and you are advised to check this before you fly.

8.6. Oxygen Systems

- 8.6.1. The oxygen system is your life support system. It not only must function correctly throughout the flight, but you as the pilot must know its operation and its limitations. There are three kinds of oxygen systems in use in the gliding world:

8.6.2 **Constant Flow.**

In this system there is a continuous flow of oxygen from the bottle to the mask. A rebreather bag enables the pilot to use some of the oxygen that would otherwise be wasted. This type of system uses up oxygen at a high rate and with a good fitting mask can be used up to 25,000 feet.

8.6.3 **Diluter Demand**

This system uses a regulator to mix bottled oxygen with outside air. The regulator mixes the two automatically, increasing the amount of pure oxygen as you go higher. This type of system will deliver 100% oxygen at about 35,000 feet and its use above this height is not recommended.

8.6.4 **Pressure Demand**

Above 35,000 feet the air pressure is reduced to a level where positive pressure is required to deliver the necessary partial pressure of oxygen to your lungs. This type of system forces oxygen into you and your breathing cycle is reversed. Relax to inhale and work to exhale. The pressure demand system is good to about 45,000 feet.

8.6.5 **Emergency Bottle.** It is recommended to have a backup oxygen system for flights above 25,000 feet. In most cases an emergency, or bail out bottle will be sufficient. This emergency supply is usually a small bottle which can connect directly to your mask and will give about 15 minutes supply. If you need to use this supply you should start your descent immediately.

8.6.6 **The PRICE Checklist**

The oxygen system requires a pre-flight check just the same as the glider does. The purpose of the check is to ensure the entire system is functioning perfectly. The mnemonic PRICE is recommended and stands for **P**ressure, **R**egulator, **I**ndicator, **C**onnections and **E**mergency. They are checked as follows:

- A. **Pressure.** The absolute minimum amount you should carry is 1200 pounds. Ideally you should carry as much as possible.
- B. **Regulator.** Cycle through the regulator functions. Be sure to test both the normal and 100% settings. Blow into the oxygen tube to be sure that the diaphragm is tight. If you can blow through, something is wrong.
- C. **Indicator.** Check to be sure the indicator blinks on both the 100% and normal settings. The indicator should remain open while the regulator has a pressure setting on 100% and while you are holding your breath.
- D. **Connections.** Check for tight seals and look for any leaks, tears or breaks in the lines.

- E. **Emergency.** Check the emergency bottle has a full charge and is connected.

If any problems are found the system must be deemed unusable and the flight restricted accordingly. The oxygen system is your life support system. If it is not working perfectly, it could cost you your life.

8.7. Hypoxia

8.7.1. Hypoxia is a general term that simply means that oxygen is not being supplied to the body's tissues and to the brain. This oxygen deficiency is such that it can result in poor judgement, euphoria, confusion and loss of consciousness. The symptoms of hypoxia are very subtle, and the pilot who is suffering from it is usually the worst judge of its effects.

8.7.2. Symptoms of Hypoxia.

These can be very subtle and may vary from person to person. They may all appear, or only one may be detected.

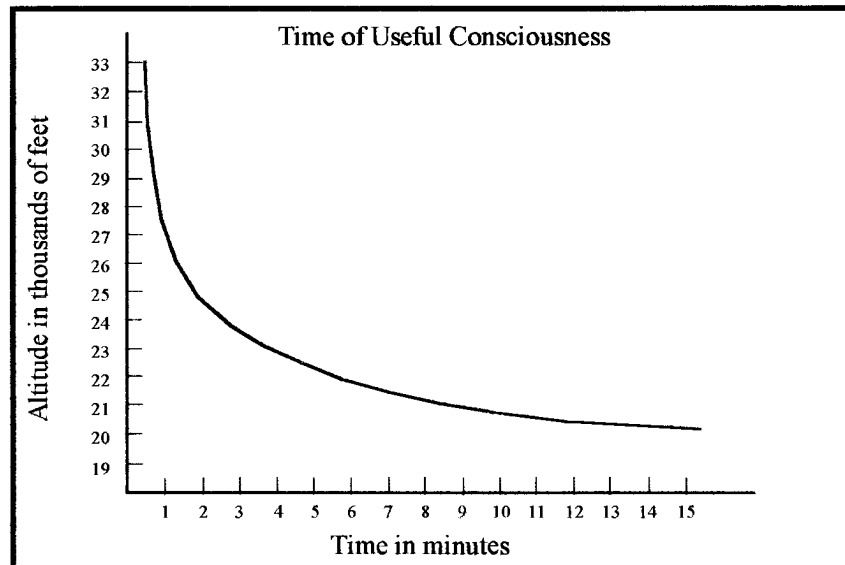
1. Increased breathing rate, headache and fatigue.
2. Light-headedness or dizziness.
3. Tingling or warm sensations, sweating.
4. Poor co-ordination, impairment of judgement.
5. Loss of vision or reduced vision, sleepiness.
6. Cyanosis (discoloration of the fingernails)
7. Behaviour changes, feeling of well being, or euphoria.

8.7.3. What to do if you suspect Hypoxia.

When flying alone you must continually question your judgement if you are to notice the first telltale signs of hypoxia. If you feel that you may be suffering from hypoxia you must act immediately and take the following actions:

1. Turn the oxygen to 100%
2. Dial in a pressure setting on the regulator (if applicable) This will help force oxygen into the lungs.
3. Control the rate and depth of breathing. This will help control hyperventilation.
4. Start descending immediately. **NEVER** continue the climb.
5. Check all connections. One may have come loose and be the cause of the problem. Reconnect anything that has become disconnected, but still continue your descent and land.

8.7.4. The graph below shows the time of useful consciousness over a variety of heights.



8.8. Hypothermia

8.8.1. Hypothermia is the second danger which may be encountered whilst flying at altitude. It may be a nice warm summer day on the ground but at 20,000 feet it could be well below freezing. Consider the fact that our wave season runs through the coldest months of the year and you have a situation where it could be well below zero degrees centigrade at only a few thousand feet. Hypothermia is a sudden and catastrophic loss of body heat. This loss can bring on delirium and unconsciousness and is often fatal. The only cure is to get warm fast. If hypothermia is to be avoided pilots are advised to dress in clothing which will protect them from extreme cold.