

Gliding Induction Course - Pre-course Presentation Notes

Aim

These notes are aimed at giving the Air Training Corps squadron instructor the information required to enable him or her to give a brief on the basic effects of controls prior to cadets attending a Gliding School for a Gliding Induction Course visit. Important terms are printed in heavy type. Try to use the correct terms, the nose of the aircraft thus **pitches** up or down or **rolls** left and right. If you use the correct terms from the start, the trainees get into the correct habits straight away. All diagrams can be easily reproduced on a blackboard and questions are included right through the brief to check understanding. An aircraft model will also be useful to demonstrate changes in attitude and the positions of control surfaces.

Safety notes are included at the end. These could be presented as a second lecture after a short break. They are divided into general airfield safety points, notes for Vigilant school visits and notes for Viking school visits.

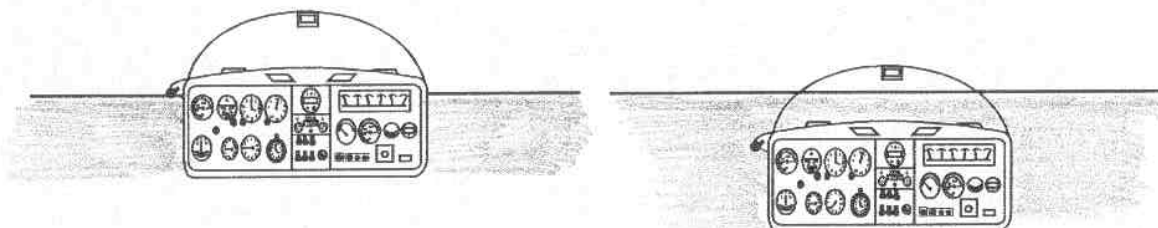
The GIC course is broken into three sections, which can be achieved in three separate visits to the gliding school. The first section deals with control of pitch, the second with control of roll and the third with control of yaw, with an introduction to stalling. At the end of the course the student should have a good idea of how to select attitudes and the basic handling of the glider.

Airmanship; What is it?

Airmanship is probably the most important thing you will learn in your whole flying experience. Put simply airmanship is the ability to follow good practice in order to fly safely and ensure the safety of others. Good lookout is an essential part of airmanship. Two pairs of eyes are better than one and during your flight you will be expected to report any sightings of other aircraft to your instructor. Your instructor will explain the clock code, thus 12 'o' clock is straight ahead and 3 'o' clock directly to your right. 6 'o' clock is directly behind and 9 'o' clock directly to your left. Sightings can be reported as high or low depending on whether they are above or below the horizon.

Attitude: What is it?

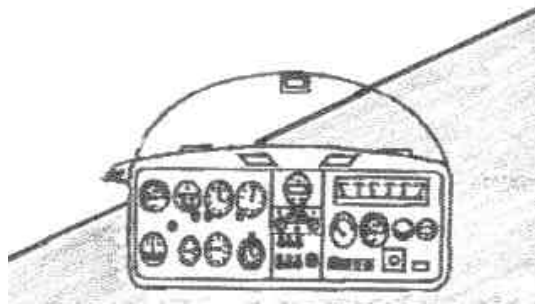
Attitude is the orientation of the aircraft compared to a fixed reference point. In flying we use the horizon as the fixed reference and describe the attitude of the aircraft in relation to it. Thus a nose high attitude would cause the horizon to move down the windscreen and nose low would do the opposite.



Cockpit view in nose high & nose low attitude

How would a right wing low attitude look? Can anyone draw it on the board?

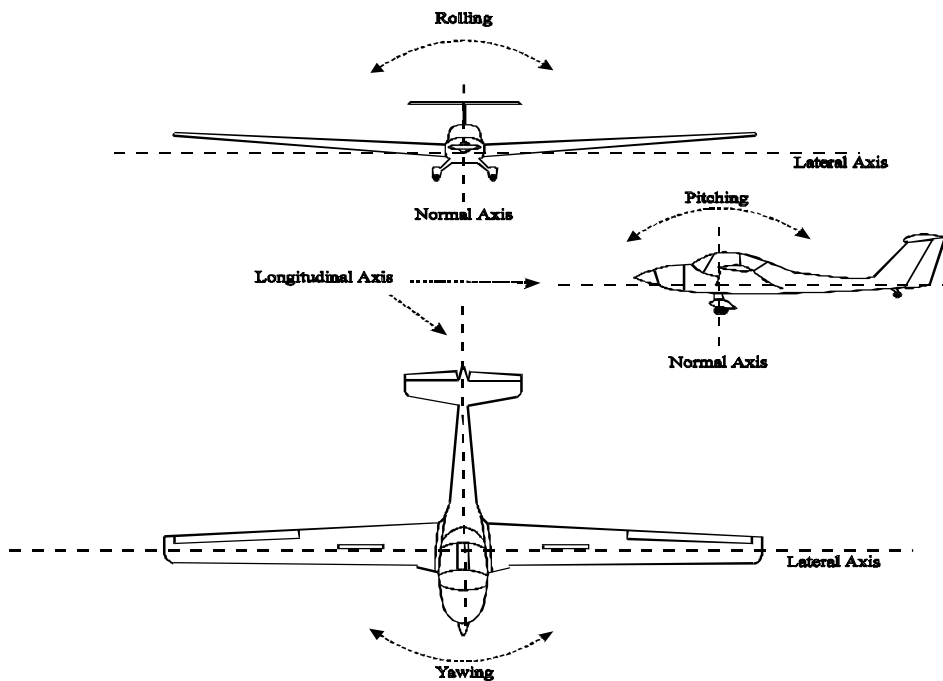
Answer:



When you fly your instructor will demonstrate the level flight attitude. This is the standard attitude at which the aircraft is normally flown for cadet training. In the Vigilant this equates to an airspeed of 60 Knots in the Viking this is 50 Knots. Both the Viking and Vigilant aircraft are very stable and do not require a great amount of force to change their attitude. You will not need to grasp the control column firmly and gentle smooth control movements are all that is required.

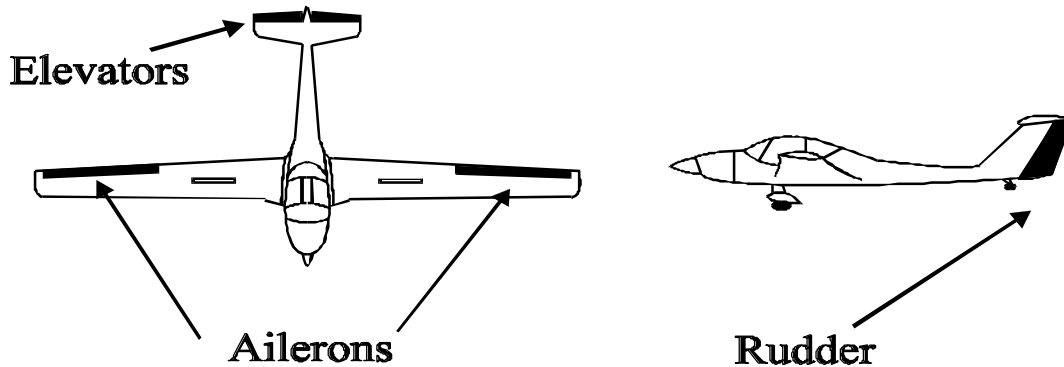
Changing attitude

The aircraft can move in three planes, horizontally, vertically and in or out of the board. It can rotate around 3 axes to achieve this. What is an axis? Think of axle on a car, just as a wheel rotates around the axle (spindle or rod) on a car, so the aircraft can rotate around three imaginary axles known as axes. One goes from wingtip to wingtip (**lateral axis**). Rotation about this axis is known as **PITCH**. Another goes from the point of the nose to the tip of the tail (**longitudinal axis**). Rotation about this axis is known as **ROLL**. The last axis goes vertically down through the cockpit and out the bottom of the aircraft (**perpendicular or normal axis**). Rotation about this axis is known as **YAW**. Note that all axes cross at or near the centre of gravity of the aircraft. This is the balance point and I could balance a model aircraft on my finger at this point.



The three axes superimposed on aircraft

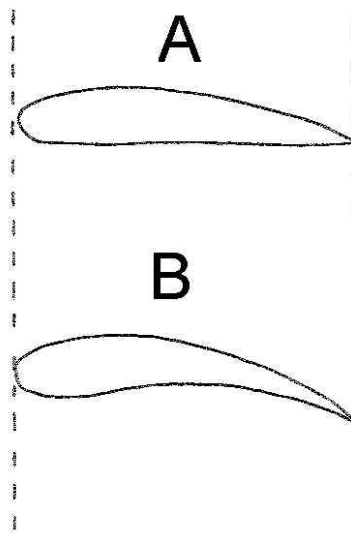
We have three different control surfaces that control our movement around the three axes. The control surfaces on the trailing edge of the tail-plane are known as **ELEVATORS**, they control the aircraft in pitch. The control surfaces on the wing trailing edges at the wingtips are known as **AILERONS**, they control the aircraft in roll. The control surface on the trailing edge of the fin is known as the **RUDDER**, it controls the aircraft in yaw.



The control surfaces & their positions.

How do the control surfaces work?

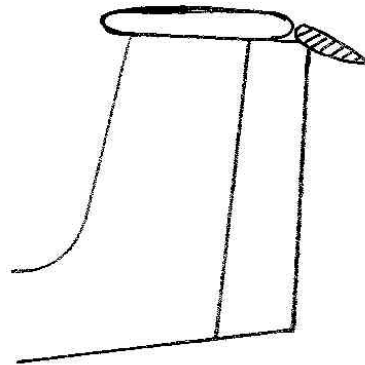
With all the controls in the **neutral position**, the aircraft will continue flying at its present attitude. In order to move around any of the three axes a force has to be generated. Let us go back to basic principles. Consider the two wing cross-sections below and assume they are moving at the same speed through the air. They are the same width (**chord**) and the same surface area but a different shape. One wing is more curved, this curvature is known as **camber**. Which one produces the most lift, A or B?



Two wing sections

It is the wing with the most camber that produces more lift at a given airspeed. However **it also produces more drag**, a point worth remembering for later, when other control effects are

discussed. Now let us consider the tail-plane of the glider with its control surface attached to the trailing edge. What is the control surface called again? – Elevator.



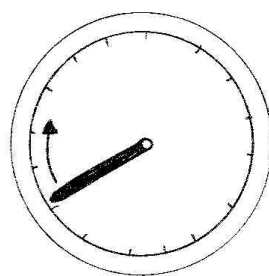
Tail-plane

Now let us move the elevator down. Which wing cross-section does this most resemble, A or B? Do you think the tail-plane will now generate more or less lift?

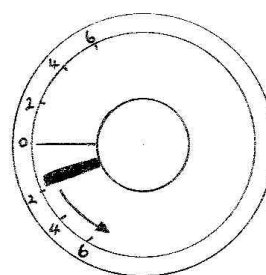
The tail-plane will generate more lift thus causing it to move in an upwards direction, rotating about the lateral axis. Is this going to cause the aircraft to climb or descend? If the tail goes up, the nose will pitch down and the aircraft will descend. What will this look like out of the windscreen? What do you think will happen to the speed? The aircraft will speed up (it is going downhill) and the speed will eventually stabilise at a new higher value.

Let us now look in the cockpit. What changes will have taken place on the instruments?

1. The airspeed will have increased on the Airspeed indicator (ASI).
2. The variometer will show an increased rate of descent.
3. In the Vigilant the artificial horizon will copy the picture seen out of the windscreen.
4. You may also notice that the wind noise increases, especially in the Viking glider.



Air speed indicator



Variometer

In order to move the elevator down the **CONTROL COLUMN** needed to be moved forward from the neutral position thus causing more lift on the tail and therefore the nose to pitch down. What then happens if I move the control column rearwards (**aft**) from the neutral position? What will happen to the speed?

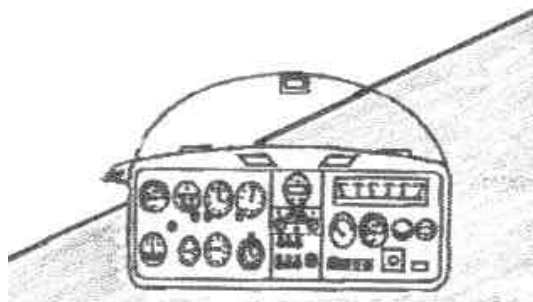
The nose will pitch up and the speed will reduce. What will happen in the cockpit?

1. The airspeed indicator will show a reduction in airspeed.
2. The variometer will show a reduction in the rate of descent.
3. The artificial horizon in the Vigilant will show the change in attitude.
4. You may notice a reduction in the wind noise.

Now let us think about roll. In order to roll to the right which wing needs to generate more lift? – The left wing.

Which wing needs to generate less lift? – The right wing. What is the name of the control surfaces on the wings again? – Ailerons. Which way do the control surfaces have to move in order to achieve the desired effect? Left wing aileron down thus generating more lift, right wing aileron up thus generating less lift. The aircraft will then roll to the right around the longitudinal axis.

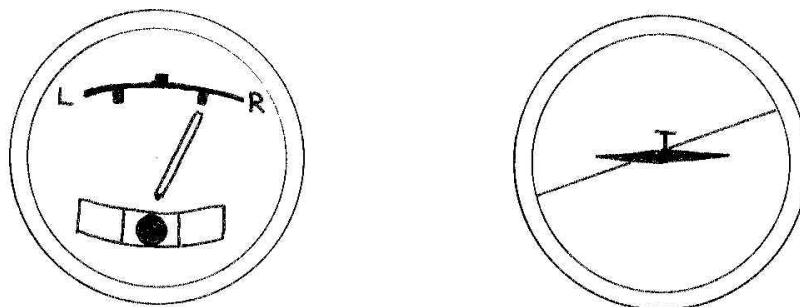
To achieve this control surface movement the pilot moves the control column to the right from the neutral position. The aircraft rolls to the right **and continues to roll until the control column is moved back to the neutral position**. This leaves the aircraft in a banked attitude to the right. How does this look when viewed through the windscreen?



View through windscreen

What effect will this have on the instruments?

1. The aircraft will be turning, so the turn and slip needle will be showing a rate of turn.
2. In the Vigilant the artificial horizon will show the angle of bank.



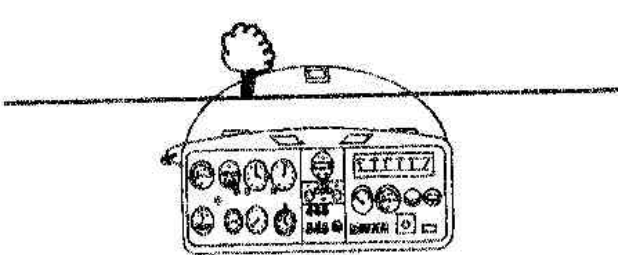
Turn & slip instrument & artificial horizon

So what must the pilot do to roll the wings level again? – Move the control column to the left and when the wings are level again return the control column to the neutral position.

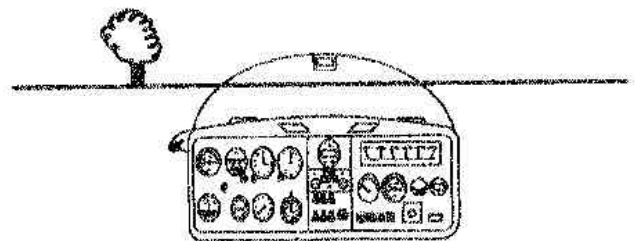
Now let us think about yaw. Which control surface controls the aircraft in yaw? – The rudder. Does anyone know how the pilot moves the rudder? By pushing his left or right foot forward on the **rudder pedals**. By pushing his left foot forward the pilot can **yaw** the nose to the left. It is important to note that the aircraft has not turned but is flying sideways through the air. If the rudder pedals are returned to the neutral position the aircraft will revert to its same heading with the airflow parallel to the fuselage once again. The rudder is not therefore used for turning the aircraft but is used to keep the aircraft in balanced flight with the airflow parallel to the fuselage.

(Instructors note: Cadets sometimes treat the rudder pedals like the handlebars on a bicycle, emphasise that the nose yaws in the direction in which the foot is pushed forward.)

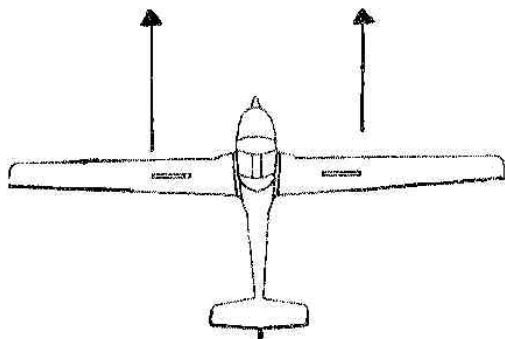
If you select a point on the horizon you will note the point moves left or right as the nose yaws from side to side. Once the rudder pedals are moved back to neutral, the point returns to its original position, so the aircraft has not turned but has been flying sideways through the air.



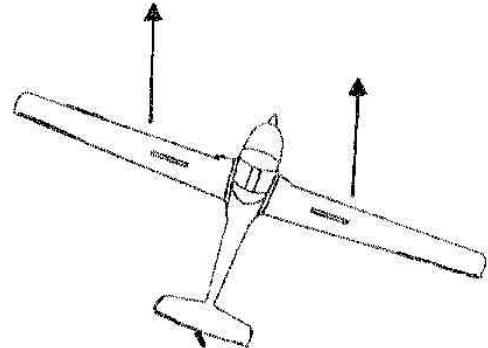
Balanced flight



Nose yawed right (right foot forward)



Balanced flight

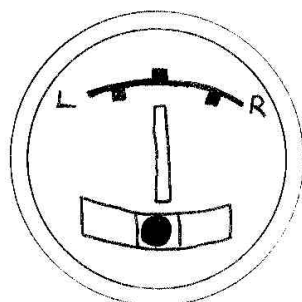


Nose yawed right (right foot forward)

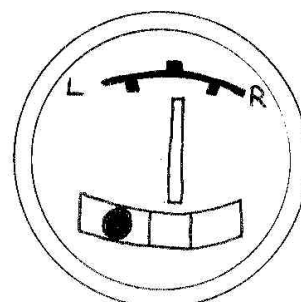
What changes do we note in the cockpit?

1. The ball in the turn and slip indicator will move in the opposite direction to the direction of yaw. Thus when the nose yaws left, the ball moves right showing that the aircraft is not in balanced flight.

Balanced flight



Nose yawed right (right foot)



forward)

To sum up

The aircraft can rotate about 3 axes, the lateral, longitudinal and perpendicular axes. Rotation about the lateral axis is called pitch and is controlled by the elevators on the trailing edge of the tail-plane. Rotation about the longitudinal axis is called roll and is controlled by the ailerons on the trailing edge of the wing tips. Rotation about the perpendicular axis is called yaw and is controlled by the rudder on the trailing edge of the fin. To move the elevators the pilot moves the control column fore and aft, to move the ailerons the pilot moves the control column side to side and to move the rudder the pilot pushes his right or left foot forward on the rudder pedals.

Stalling

It is not intended to go into depth on stalling at this point. However a demonstration stall will be carried out to prove to the student that this need not be an unpleasant experience and that provided good airmanship procedures are followed, it is a perfectly safe manoeuvre to execute.

Firstly, the pilot will carry out some checks to ensure the aircraft is at a safe height, location and configured correctly to undertake a stall. Good lookout is essential and he may ask the student to assist.

There are certain recognised symptoms of the approaching stall, which warn the pilot that a stall is likely to occur. The first of these is a high nose attitude. If the aircraft has a high nose attitude, what do you think will happen to its speed? – It will reduce. If the speed reduces the airflow over the controls will be less, do you think this will make the controls more or less effective? – Less effective. With reduced airspeed is the noise of the rush of air over the airframe likely to be louder or quieter? – Quieter. Thus the four symptoms of an approaching stall are:

- High nose attitude
- Reducing speed
- Light and ineffective controls
- Reducing noise

At the stall the airflow over the wings becomes turbulent and this results in a vibration that can be felt through the controls. This is called **buffet**. The nose will also gently pitch down even though the control column may be fully back. What effect will this have on the rate of descent? – It will increase. One wing may also drop at this point. Thus the symptoms of the stall are:

- Buffet
- Nose pitches down even though control column is back
- Rate of descent increases
- Possible wing drop

Your instructor will recover the aircraft to normal flight by gently easing the control column forward to unstall the wings and return to the normal gliding attitude. The stall is not unpleasant and control is easily regained although there will be some height loss during this manoeuvre.

You can read more about the stall by studying the relevant section in the Principles of Flight manual.

Enjoy your course!

The three elements of the GIC course should enable you to get acquainted with the aircraft and master the basic effects of the controls. Do not be afraid to ask questions of your instructor and

above all enjoy the experience. This is the first rung on the ladder to becoming an instructor yourself one day!

Take a short break here if you wish

SAFETY BRIEF

Airmanship does not begin and end in the cockpit. A good pilot is aware of what is happening around him whilst he is on the ground and operating with and around aircraft. These notes give some basic knowledge but will be expanded upon by the staff at the gliding school.

General

1. When first arriving at an airfield always look for and check out the windsock. Aircraft take off and land into wind, so an awareness of the wind direction will give you an idea of where to look to see if you will conflict with any air traffic.
2. In general the perimeter of an airfield is a relatively safe place to be. So if you have to move from an entry gate to the VGS headquarters for instance, go around the perimeter track paying special attention as you cross the upwind and downwind sectors as this is where aircraft will be taking off or landing. **Always give way to any air traffic.**
3. Your escorting person should have had detailed joining instructions prior to bringing you on the course. If there are any instructions on how and where to drive on the airfield, please follow them to the letter.
4. Around aircraft always walk behind the aircraft and never in front. Both Vigilant and Viking aircraft can move forwards suddenly without warning, so be safe and always go behind.
5. Never move across the centre of an airfield unless you have been given specific instructions to do so. **If in doubt ask!**
6. Wear sensible clothing, you will be required to wear denims or flying coveralls whilst in the aircraft. However airfields are exposed and often windy and cold. Make sure you have adequate warm clothing in winter and cool clothing in summer. Sunscreen cream and a hat are also advisable on hot sunny days and a pair of sunglasses will make your flight much more enjoyable as aircraft are not equipped with sunvisors – why? They would obstruct visibility from the cockpit. Do not wear shoes with a deep tread pattern as these just drag mud and debris into the cockpit.
7. Empty your pockets before donning your flying coveralls. In general aviation there have been many instances of aircraft controls being jammed by a foreign object such as a pen, coin or a tool used in servicing. Aircraft engineers use special procedures to account for their servicing equipment. Do not undo their hard work by dropping something in the cockpit but if you do, immediately report it to your instructor
8. Moving aircraft – You may be required to assist in moving aircraft. You will be shown specifically how to do this by the VGS staff on the day. However you should be aware of the delicate parts of an aircraft that should not be touched when manhandling an aircraft. These are; the canopy and any clear plastic areas, the trailing edges of the wings and tail and the

control surfaces associated with them, the propeller on the Vigilant, any tubes or pipes you see attached to the airframe.

9. You will be shown a passenger safety brief video before moving onto the airfield. Pay attention to it and ask any questions you wish after it has finished.

Vigilant Operations

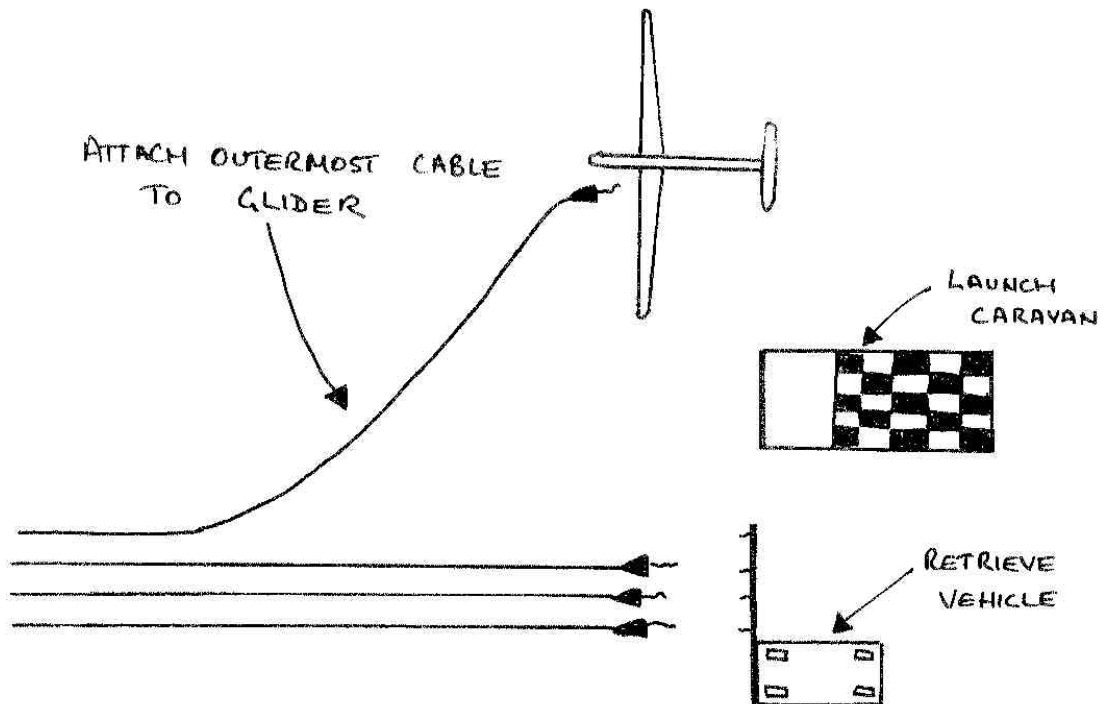
At Vigilant schools cadets have fewer duties to perform as the aircraft will taxi to a point where they can enter or exit the cockpit. However there are some Vigilant specific safety precautions that must be observed.

1. The propeller of any aircraft is potentially extremely dangerous and there have been many instances of people being injured or worse by propellers. **Always** consider the propeller to be live and able to start at any moment. Keep well away from the propeller arc and always approach the aircraft from behind. Never walk in front of a Vigilant, if the engine starts and the brakes are not properly applied it can lurch forward suddenly without warning. **Do not put yourself in danger!**
2. If you need to go back to the building or move around the operating area for any reason, ask the Duty Instructor for guidance first. He may arrange for a vehicle to take you across any potential danger areas. If you do come across an aircraft taxiing then stop, make your intentions clear and allow the aircraft to move first.
3. Aviation gasoline will be present around Vigilant operating areas. Smoking and the use of mobile telephones are prohibited close to aircraft and special precautions are taken whilst refuelling is being carried out. If you wish to smoke or use a mobile telephone on the airfield, seek guidance from the Duty Instructor first.

Viking Operations

Cadets will be expected to carry out far more duties at a Viking VGS operation. The VGS staff will give specific instructions on the day but here are a few safety points worth remembering.

1. Launch cables are potentially dangerous and stretch right across the airfield. Keep well away from them unless detailed to handle a cable for whatever reason. Always consider them to be live and treat them with caution accordingly.
2. If detailed to attach a cable to a glider always take the outermost cable, that is the one nearest to the glider. You will be shown how to attach the cable by the VGS staff.



Launch point layout

3. Cables are towed out from the winch by a vehicle, usually a Land-Rover. There is tension on the cables when the vehicle stops and the driver will reverse a little to remove this tension. Stay well clear of the vehicle until he has finished reversing, remove the cables and indicate to the driver that he is clear to drive away.
4. A person is needed to hold the glider's wings level prior to launch. You will be given instruction on this by the VGS staff on the day. Make sure you keep your fingers well away from the control surfaces on the wing-tips. What are these called again? – ailerons.
5. Prior to launch light signals are given from the launch caravan to the winch driver. A series of long flashes signals the driver to take up any slack in the cable. Once the cable is taut the pilot will indicate "all out", the person in the launch caravan will then change the signal to short flashes and the winch driver will respond accordingly. The light signals are often accompanied by an audible signal as well. If you hear the tone or see the light flashing be aware that a glider is about to launch and stay well clear. As a wing-tip orderly you may be asked to relay the pilot's signals to the caravan, however this will be explained in detail on the day.
6. The pilot cannot see what is above and behind him prior to launch and may ask if all is "clear above and behind". Check the approach area and if all is clear repeat "All clear above & behind sir!" The pilot will then proceed with the launch. If there is traffic approaching to land tell the pilot "glider on approach sir!", he will then delay the launch until the other glider is safely out of harms way. Again this will be explained in detail on the day.
7. The key to safe operating procedure is awareness, try to be aware of what is going on around you and do not be distracted by other cadets.

8. If in doubt, always ask, nobody will mind explaining a point over again. If you see something of concern that has been missed by others, report it. You are an important part of the team and your assistance will be appreciated.