999 (Great Dunmow & Districts) Squadron ATC
First Class Learning Objectives & Revision Notes

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Learning Objectives

Notes

999 (Great Dunmow & Districts) Squadron ATC
ACP 31 V1 – The Air Training Corps
Learning Objectives

After completion of this ACP, you will be able to complete the following objectives. As you progress through the class you should complete each objective and tick it off. This will enable you to monitor your progress in preparation for the exam.

Chapter 1 – The Air Training Corps History

1.1 State the name of the "Father" of the Air cadet Movement.
1.2 Name the organisation from which today's ATC was founded.
1.3 State the meaning of a "Founder Squadron".
1.4 State how a squadron identifies that it is a founder squadron.
1.5 Identify the year in which the ATC was first established.
1.6 Identify the ATC badge.
1.7 State the corps motto.
1.8 State the major policy change in gliding training in 1948.
1.9 State the year in which the cadet flying scholarship was introduced.
1.10 Name the aircraft used for Air Experience flights.
1.11 State the year in which the D of E scheme was introduced.
1.12 State the year in which the Corps banner was presented and the occasion it marked.
1.13 Name the place where the old ATC banner is kept on display.
1.14 Identify the Corps banner.
1.15 Name the report that in 1967 introduced to the syllabus:

a. Staff Cadets
b. Project Training
c. Adventure Training

1.16 Indicate the aims of the Corps as defined by the Royal Warrant.
1.17 State the year in which Air Commodore Chamier died.
1.18 State the year in which girls were first allowed to join the corps.
1.19 Name the prize awarded for outstanding individual performance.
1.20 For the award "The Royal Aero Club Diploma" state:

a. The year it was awarded.
b. The reason it was awarded.
c. Who presented it.

1.21 Name the significant landmark celebrated in 1991.

Chapter 2 – The Air Training Corps Organisation

2.1 State the difference between a detached flight and a squadron.
2.2 List three main duties of the civilian committee.
2.3 State the four classifications or stages of training.
2.4 Identify the rank structure found on a squadron and recognise the proper chain of command.
2.5 Understand the abbreviation NCO.
2.6 List the personal qualities expected of an NCO.
2.7 Name the cadet's own Wing and Wing Commander.
2.8 State the number of Wings in cadet's own Region.
2.9 Name the cadet's own Region and Regional Commandant.
2.10 State the number of ATC Regions.
2.11 State the location of HQAC.
2.12 Distinguish between Affiliation and Parenting.
2.13 State the name of the service unit which has parenting responsibilities for the cadet's own squadron.
2.14 Explain the difference between Public and Non-Public money.

Chapter 3 – Dress and Discipline

3.1 Explain the need for discipline in an Armed Service.
3.2 Explain the difference between imposed and self-discipline.
3.3 Give two examples of items not to be worn with uniform.
3.4 Give examples of situations where uniform can and cannot be worn.
3.5 List the items of clothing that constitute cadet standard dress.
3.6 List the items of clothing that constitute shirtsleeve order.
3.7 State items of uniform not issued.
3.8 Demonstrate the correct method of wearing a beret.
3.9 Name two items of optional dress.
3.10 Give an example when optional dress items may be worn.
3.11 Identify cadet badges as displayed in ACP 30 and state:

a. Circumstances for award.
b. Positioning on uniform.

3.12 State why the salute is given.

3.13 Demonstrate how to salute:

a. With the hand.
b. By giving eyes right/left.

3.14 State the situations when a cadet:

a. Needs to salute.
b. Needs not salute.

3.15 Recognise and state equivalent ranks of the three services.
3.16 Recognise vehicle star plates.
3.17 State the correct method of addressing:

a. Officer
b. Adult/Cadet Warrant Officer.
c. NCO.
d. Civilian Instructor.

ACP 31 Volume 2
The Royal Air Force
Learning Objectives

After completion of this ACP, you will be able to complete the following objectives. As you progress through the class you should complete each objective and tick it off. This will enable you to monitor your progress in preparation for the exam.

Chapter 1

1.1 State the name of the organisations from which the RAF developed in 1918.
1.2 State the year in which the RAF was founded.
1.3 Name the "Father" of the RAF.
1.4 State what the initials RADAR stand for.
1.5 State the name of the RAF's first jet engined bomber.
1.6 State what the initials NATO stand for.
1.7 State the type of aircraft that provided the British strategic nuclear deterrent.
1.8 State the year in which the navy assumed responsibility for Britain's nuclear deterrent.
1.9 State the year in which the Falkland Islands conflict took place.
1.10 State the year in which desert Storm took place.
1.11 Outline why and how NATO's defence strategy has had to change in the early 1990's.

Chapter 2

2.1 State the role of the Defence council.
2.2 State the role of the Air Force Board.
2.3 Name the RAF Commands.
2.4 Name all permanent overseas bases and show correct location on a world map.
2.5 State the roles of at least two RAF groups.
2.6 Give a brief summary of the role of each of RAF commands.

Chapter 3

3.1 Identify the three wings of a typical RAF station.
3.2 State in general terms the roles of:

a. Ops Wg.
b. Eng Wg.
c. Admin Wg.

3.3 State in general terms the roles of:

a. Estates Flight.
b. Catering Sqn/Flt.
c. PMS.
d. Education Sqn/Flt.

Chapter 4

4.1 State the distinction between:

a. Direct Attack.
b. Indirect Attack.
c. Terrorist Attack.

4.2 State the difference between Classified and Unclassified material.
4.3 State the for levels of classified material as:

a. Restricted.
b. Confidential.
c. Secret.
d. Top Secret.

4.4 State the actions taken in the event of Secret or Top Secret material being found.
4.5 State the meaning of the “NEED TO KNOW” principle.
4.6 State actions taken if anything suspicious is seen.
4.7 Demonstrate local procedures taken in the event of:

a. Fire Alarm.
b. Bomb Alert.

ACP 31 Section 4
Initial Expedition Training
Learning Objectives

After completion of this ACP, you will be able to complete the following objectives. As you progress through the class you should complete each objective and tick it off. This will enable you to monitor your progress in preparation for the exam.

Chapter 1

Demonstrate an understanding of the importance of planning an expedition.

1.1 State three things to consider when deciding on the size of the group.
1.2 State the minimum number of people in a group for a walk in normal country.
1.3 Explain the significance of escape routes when planning a walk.
1.4 Demonstrate the ability to estimate time for walking 1 KM:

a. On level ground.
b. Up a gentle slope.
c. Up a steep slope.

1.5 State three things to consider when deciding on a route.
1.6 Explain why it is essential to maintain a good rhythm when hill walking.
1.7 Explain why frequent breaks are to be avoided.
1.8 Demonstrate an ability to plan a short walk of up to 20 Km, in normal country, in the cadet's local area.
1.9 Demonstrate an ability to fill in a route card correctly.

Chapter 2

Appreciate the need to use appropriate equipment and clothing for hill walking.

2.1 List items of personal equipment required for hill walking.
2.2 State what qualities to look for in a good pair of walking boots.
2.3 Describe the precautions that should be taken to avoid blisters.
2.4 Describe a method of treating blisters.
2.5 State three functions of an anorak.

Chapter 3

Display knowledge of some basic camping requirements.

3.1 Explain what is meant by the term "considerate camping".

3.2 Explain the importance of a camp menu.
3.3 State three things to look out for when considering a campsite.
3.4 Explain the precautions one should take when using water from a stream.
3.5 State two methods of sterilizing water.
3.6 State the actions one would take in dealing with your own rubbish.

Chapter 4

Appreciate the need to use appropriate equipment when camping.

4.1 State the function of a waist strap on a rucksack.
4.2 Explain, in general terms, how to pack a rucksack.
4.3 Outline the main features of a tent.
4.4 Name three types of stove.
4.5 List 4 safety factors affecting the use of stoves.

Chapter 5

Explain how the condition Hypothermia can be recognised, treated and prevented.

5.1 Describe typical weather conditions that could lead to Hypothermia.
5.2 State normal body temperature.
5.3 List four symptoms of Hypothermia.
5.4 State what actions to take when treating a casualty suffering from Hypothermia.
5.5 List the precautions you could take to avoid Hypothermia.

Chapter 6

Explain how the effects of heat can be recognised, treated and prevented.

6.1 Name three conditions a person could suffer from if exposed to heat.
6.2 Explain how to treat sunburn.
6.3 Explain how to prevent sunburn.
6.4 State three symptoms of heat exhaustion.
6.5 State the treatment for heat exhaustion.
6.6 State three symptoms of heat stroke.
6.7 State the treatment for heat stroke.
6.8 State the precautions you could take to avoid the above conditions.

ACP 32 Volume 1
Map Reading
Learning Objectives

After completion of this ACP, you will be able to complete the following objectives. As you progress through the class you should complete each objective and tick it off. This will enable you to monitor your progress in preparation for the exam.

Chapter 1 – What is a map?

1.1 State the need for maps.☐
1.2 State the relationship between the prime meridian and the lines of longitude.☐
1.3 State the relationship between the Equator and the lines of latitude.☐
1.4 State the number of minutes in a degree.☐
1.5 Demonstrate how to give an exact location using Latitude and Longitude.☐
1.6 State the meaning of Topographical.☐
1.7 Explain why it is always advisable to use the latest edition of any map.☐
1.8 Explain why it is inadvisable to use ink on a map.☐
1.9 Demonstrate the correct way of folding a map.☐

Chapter 2 – Map Language

2.1 State the units of height used in the M726 Series maps.☐
2.2 Indicate where the Latitude and Longitude information can be found on a M726 Series map.☐
2.3 Indicate where the map identification number can be located on a M726 Series map.☐
2.4 State what GSGS stands for.☐
2.5 Indicate where scales lines are located on a M726 Series map.☐
2.6 Indicate where the revision information is located on a M726 Series map.☐
2.7 State what MSL stands for and how it is derived.☐
2.8 State what the vertical interval is on a M726 Series map.☐
2.9 Identify the correct conventional signs for the following features:

Motorway☐
Main Road☐
Post Office☐
Church☐
Footpath☐
River☐
Canal☐
Railway Line☐
Trig Point☐

Chapter 3 – Scales

3.1 Explain the reason for using scaling in representing an area of ground.☐
3.2 State the three different ways to express scale.☐
3.3 State the amount an area would be reduced if the scale were halved.☐
3.4 Name the type of map that would use a small scale.☐

Chapter 4 – Grid References

4.1 Name the vertical and horizontal lines that make the grid system.☐
4.2 State what UTM stands for.☐
4.3 State that the SW corner of grid squares is used in grid referencing.☐
4.4 Give a four – figure grid reference.☐
4.5 Interpret a four – figure grid reference.☐
4.6 Give a six-figure grid reference.☐
4.7 Interpret a six-figure grid reference.☐

Chapter 5 – Relief

5.1 Explain the meaning of the word relief.☐
5.2 State what methods are used to represent height.☐
5.3 Explain the importance of checking the units of height used on a map.☐
5.4 Identify the signs that represent cuttings, embankments and steep slopes.☐
5.5 Explain what contour lines are.☐
5.6 Explain how contour lines are labelled.☐
5.7 Recognise from contour shape the following features;

Spur☐
Re-entrant☐
Knoll☐
Convex Slope☐
Concave Slope☐

Chapter 6 – Gradients

6.1 Explain what a gradient is.☐
6.2 Explain when one would draw a ground section.☐
6.3 Demonstrate how to draw a ground section.☐
6.4 Calculate the gradient between two points.☐
6.5 Explain the term Intervisibility.☐

ACP 33 Volume 1
History of Flight
Learning Objectives

After completion of this ACP, you will be able to complete the following objectives. As you progress through the class you should complete each objective and tick it off. This will enable you to monitor your progress in preparation for the exam.

Chapter 1 – Lighter-than-air-craft

1.1	Name the French brothers who invented the first hot air balloon.	☐
1.2	Name the inventor of the first Hydrogen balloon.	☐
1.3	State the principles that allow a balloon to fly.	☐
1.4	Describe early attempts made to steer balloons in flight.	☐
1.5	List some of the advantages of air ships.	☐
1.6	State the main disadvantage with Hydrogen filled airships.	☐
1.7	Name the famous Hydrogen filled airship that burst into flames in 1937.	☐
1.8	Name the much safer gas used in modern airships.	☐
1.9	Describe the method used to control the altitude of modern airships.	☐

Chapter 2 – Heavier –than-air-craft

2.1	List the important features of a kite.	☐
2.2	Describe the contribution to aviation made by Sir George Cayley.	☐
2.3	Describe the contribution to aviation made by Otto Lilienthal.	☐
2.4	Describe the contribution to aviation made by the Wright brothers.	☐
2.5	State the aviation achievements made by Louis Bleriot.	☐
2.6	Name the significant achievement in man powered flight – 1977.	☐

999 (Great Dunmow & Districts) Squadron ATC
ACP 34 V1 – Airmanship I
Training Notes

Chapter 1 – Airfields

Layout of an airfield

a. Airfield – An area (including any buildings and support installations) used for the accommodation, take-off and landing of aircraft.
b. Airport – An airfield with additional facilities for freight and passengers (for example customs, money-changing, immigration, baggage areas and restaurants).
c. Aircraft manoeuvring areas – parts of an airfield which have been specially prepared for the movement of aircraft on the ground (for example, Runways, Taxiways, Aircraft Servicing Platforms, Operational Readiness Platforms and Dispersal Hard standings).

Alignment of runways.

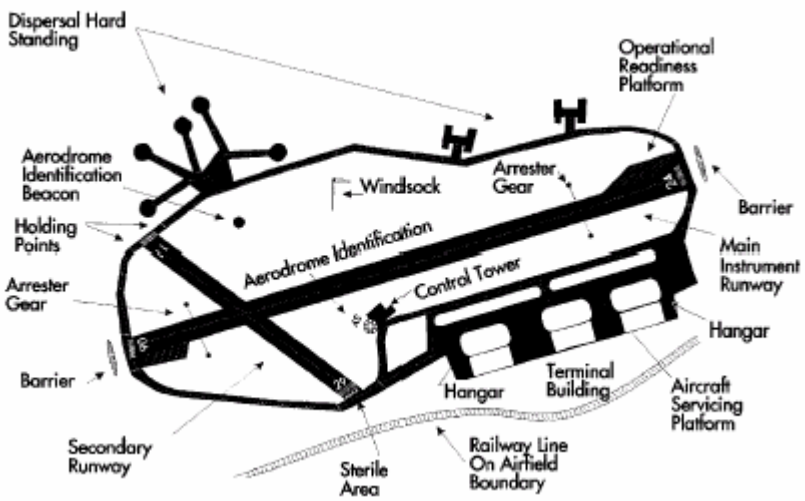
Operations are usually confined to one long runway, or at most two, the longer one being designated the "main instrument runway". This will usually be in line with the prevailing wind.

Three main airfield types.

In summary, airfields fall broadly into three types:

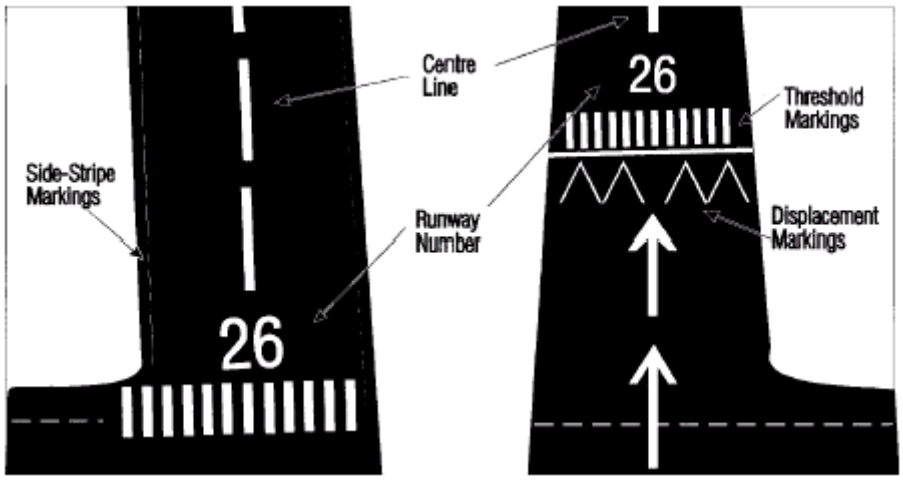
a. The basic grass airfield.
b. The Triangular-patterned runway.
c. The modern main instrument runway.

Features of Main Instrument Runway type.



Runway Numbers

Each runway is marked by two white painted numerals indicating the magnetic headings of the runway direction, taken to the nearest 10^{o}.



For example:

a. Magnetic heading 238^{o} – runway number 24.
b. Magnetic heading 058^{o} – runway number 06.

RHAG

Some runways are equipped with "arrester gear", which can bring an aircraft to a stop in a very short distance. To use this system aircraft must be equipped with a strong hook, which is lowered for landing, to engage a cable suspended across the runway. When the hook engages the cable, the cable is played out, cable braking occurs to bring the aircraft swiftly to a rest. The cable can be braked in a variety of ways: the system in use in the RAF is the Rotary Hydraulic Arrester Gear (RHAG), which relies on large paddles rotating in liquid for it's braking effect.

Facilities of an airfield

a. **Over-run Areas and Arrester Barriers.** Where space permits, areas beyond the ends of the runways are provided for accidental or emergency use by aircraft over-running or under-shooting the runway. These areas also have barriers consisting of large strong nets made of nylon rope. The nets are designed to "catch" the sircraft, stopping it with minimum risk of damage to the aircraft or injury to the crew.
b. **Operational Readiness Platforms (ORPs).** ORPs are specially prepared areas built alongside the end on the runway. They are used for parking aircraft, either for rapid take off with minimal warning or for final flight preparation.
c. **Dispersal Hardstanding.** Many RAF airfields still use widely-dispersed areas, known as "dispersal hardstandings" or "dispersals", for parking aircraft. The aim is to spread the aircraft around the airfield, to make it

more difficult for enemy aircraft to damage or destroy all the parked aircraft during an attack.

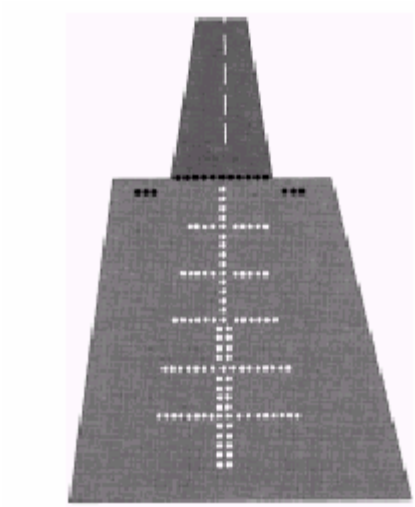
d. **Aircraft Servicing Platforms (ASPs).** ASPs are large paved areas for the servicing and turn around of aircraft.
e. **Taxiways.** Taxiways connect all the various parts of the aircraft manoeuvring areas and enable aircraft to move about easily.
f. **Windsocks.** Normally, there are two or more windsocks on an airfield to provide a quick and easy way of indicating wind direction.
g. **Airfield Identifying Letters.** Each airfield is identified by means of two letters – e.g. SY for Shawbury.

Identifying Hazards.

Any object that might be hit by a taxiing aircraft, or by one landing or taking off is an obstruction. Obstructions must be clearly marked both by day and by night. For example, some specialised vehicles used on the airfield are painted with red and white squares and have yellow roofs. Other vehicles are painted yellow all over. Some vehicles are equipped with a flashing amber light, while others like ambulances and fire engines, have flashing blue lights.

Approach Lighting.

Approach Lighting is installed, usually outside the airfield boundary and often set on poles, to form a special pattern to enable the pilot to judge the aircraft's height and line up with the runway on the approach to land.



Chapter 2 – The Tutor

AEFs

The RAF has 12 units throughout the country known as Air Experience Flights (AEFs). Their role is to provide air experience flying for cadets and they are equipped with Tutor aircraft.

Basic Configuration

The Tutor is a single-engined, low-winged monoplane with a simple clean appearance.

Constructed Material

The aircraft is constructed of modern composite materials, specifically carbon reinforced plastic. This covering will not take the weight of anyone standing on it. When entering or leaving the cockpit therefore, great care must be taken to avoid stepping off the strengthened wing root. The marked "walking strip" is provided – walk only on the strip provided.

Engine and Fuel

The aircraft has a Lycoming engine of 180 horse power which drives a 3-bladed variable pitch, propeller.

One hundred and fifty Litres of aviation gasoline (AVGAS) are carried in two tanks, one in each wing.

Starting Method

The Tutor's engine is started using an electric starter motor.

Flight Instruments and Controls

There are six basic instruments and three controls concerned with the aircraft itself and it's flight through the air:

1. The basic flight instruments are:

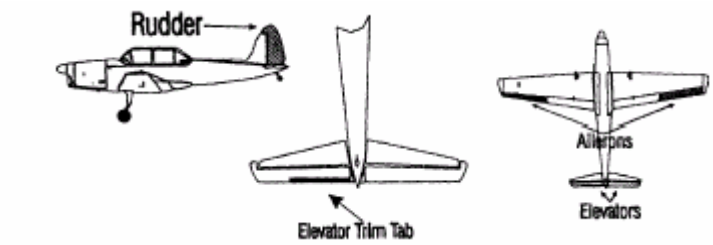
    a. **Attitude Indicator (AI).** The AI indicates the attitude of the aircraft – nose up, nose down, banked to the right or left, etc. It is a gyroscopic instrument.
    b. **Airspeed Indicator (ASI).** The ASI tells the pilot the speed at which the aircraft is travelling through the air. It is calibrated in knots.
    c. **Altimeter.** The Altimeter indicates the aircraft's height above the per-set datum.

d. **Rate of Climb and descent Indicator (RCDI)/Vertical Speed Indicator.** This instrument shows the pilot the rate at which the aircraft is climbing or descending.

e. **Turn and Slip Indicator.** This instrument tells the pilot the rate at which the aircraft is turning, the direction of the turn, and whether the aircraft is skidding or slipping.

f. **Horizontal Situation Indicator (HIS).** The HIS (another gyroscopic instrument), after being synchronised with the compass. Tells the pilot the heading of the aircraft.

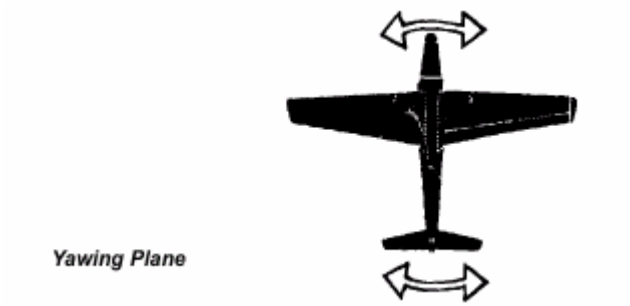
2. The main flying controls operate the elevators, ailerons and rudder and are used by the pilot to manoeuvre the aircraft.



These controls are:

a. **The Control Column**. The control column operates the ailerons and elevators and is used to control the aircraft in the rolling and pitching planes.

b. **Rudder Pedals**. The Rudder is operated by the pilot's feet and causes the aircraft to "yaw" – that is, to turn without banking.



Engine Instruments and Controls

1. **Engine Instruments**

   a. **RPM**. The rpm gauge shows the speed at which the engine is rotating in revolutions per minute (rpm).
   b. **Manifold Pressure (MP).** This instrument gives an indication of how much power is being supplied by the engine.
   c. Temperatures and Pressures. Two small instruments under the left (secondary) AI show various temperatures and pressures within the engine.

3. Engine Controls

   a. **Throttle**. The throttle level is on the centre console. If pushed forward (opened), it increases the engine output – rather like the accelerator pedal on a car.
   b. **RPM Control**. The RPM Control is a blue lever to the right of the throttle. It enables the pilot to adjust the RPM of the engine and hence the efficiency of the propeller.
   c. **Mixture Control**. The mixture Control lever is the red lever next to the RPM Control. It enables the pilot to adjust the fuel/air ratio of the mixture going into the engine.

Chapter 3 – Pre-flight Briefings

The Parachute

The parachute used in the tutor is the back type consisting of the parachute pack, 2 leg straps, a chest strap connecting the shoulder straps and rip cord and handle.

Returning the parachute harness after flight is simple. Release the chest straps first by sliding the metal cover sideways using the thumb catches to unlock it and unhook the two halves. Then release the leg straps.

Life - Preserver

Life-preserving waistcoats are provided with:

a. Whistle and lanyard.
b. A heliograph mirror that can reflect the suns rays to flash signals to rescuers.
c. A light which is battery operated – activates when it comes into contact with water.
d. SARBE. This is a small transmitter and battery which when operated sends out radio signals to search aircraft or surface vessels.

Emergencies

Emergencies in a Tutor – or any other RAF aircraft – are rare. However, even with the best laid plans, things can go wrong. If an emergency does arise the most important things to remember are:

1. DO NOT PANIC
2. DO AS YOU ARE TOLD.

As soon as the captain has ordered "JUMP – JUMP", you should release the aircraft safety harness, stand up in the cock pit and dive head – first over the side of the aircraft, aiming to clear the trailing edge of the wing.

Foreign Object Damage (FOD)

"Foreign objects" being left in the aircraft by careless people have caused numerous accidents. Ordinary items such as coins, pencils and keys might easily foul the flying controls and cause a serious accident. Passengers are to remove everything from their pockets before a flight to ensure that this does not happen. If you do drop something always report it to the captain so that a thorough search can be made until found.

Touch Nothing Until Told

You discovered earlier that an aircraft cockpit is a fascinating collection of knobs, levers, switches, etc. But no matter how intriguing they are, you must touch nothing unless instructed by the captain.

Precautions on the ground

The aircraft movement area can be a dangerous place for the careless. It is vital to keep alert with your eyes and ears open when walking about. One golden rule is never to walk within the propeller disc, even if the engine is stopped.

Colds and Flu

As height above ground increases, the normal air pressure reduces. The human body normally adjusts quite naturally to this without difficulty. However, with a cold, or the after effects of a cold, discomfort may well be experienced in the ears and sinuses. RAF aircrew do not fly in these circumstances and neither should you. If you do have a cold or are still suffering from the after effects of one, tell the escorting officer who will inform the flight commander.

Chapter 4 – VGS and Gliding

Medical and Physical Requirements

Cadets who attend glider flights must be medically fit to obtain the most from the experience.

The minimum weight for gliding is 48 Kg and the maximum is 103 Kg. There is also a maximum height restriction in the Vigilant of 992 mm from the seat to the top of the head (to ensure clearance between head and canopy).

Solo at 16

Cadets begin gliding with a gliding induction course (GIC). Opportunities for pilot training will follow on the gliding Scholarship (GS) course, and cadets who show an aptitude for gliding are able to fly solo at or above the minimum age (by law) of 16 years.

Teamwork

Gliding requires teamwork and a high standard of airmanship if everyone is to enjoy the activity to the full. Working in the open air as part of a team, and enjoying the pleasure of lying in a quiet, vibration free aircraft, makes gliding a really worthwhile experience.

Airbrakes

Airbrakes on Air Cadet gliders are panels that extend upwards from the top surface of the wing. When retracted within the wing the top edge lies flush with the wing surface. When extended they increase the drag and reduce the lift, allowing the glider to descend more quickly without increasing the speed. This enables the pilot to land in a much smaller space than would otherwise be possible.

Flight Instruments.

Although the glider is normally flown by visual reference to the horizon, four flight instruments are fitted for accuracy. Three of these, the **Airspeed Indicator**, the **Altimeter** and the **Turn and Slip Indicator** function is similar to those in the tutor. However, the fourth (the **Variometer**) is specific to gliders. Its purpose is to indicate whether the glider is losing or gaining height.

Launch Orders

"ALL CLEAR ABOVE AND BEHIND" – The pilot asks the wing tip holder to check there is no hazard from above or behind.
"TAKE UP SLACK" –This instruction is passed to the winch driver using either lamp signals or large bats. On receiving the signal the winch driver slowly reels in the cable until it is taut.

When the pilot is satisfied that the slack has been taken up the order “ALL OUT” is given.

Soaring

Soaring is the art of finding rising air and then using it to gain height, thus prolonging the flight.

Chapter 5 – Gliding – Vigilant Mk 1

The Vigilant differs from the other Air Cadet gliders in that it has an engine and propeller so that it can launch itself. It is a low-winged cantilever monoplane with folding wing, a "T" tail, and side-by-side seating with dual controls.

Power is provided by a GROB 2500 E1 horizontally opposed 4-cylinder air-cooled petrol engine. A 100 Litre fuel tank is mounted in the fuselage behind the pilot's seats.

The Vigilant has modern avionics which include a 760-channel VHF radio for both air-to-air and air-to-ground communications. A Secondary Surveillance Radar (SSR) transponder is provided which, when interrogated by ground RADAR. Automatically identifies the aircraft and its position.

The circuit followed by the Vigilant is normally flown at a height of 800 feet.

The Vigilant has airbrakes similar to those of the Viking. They are operated by a lever, each pilot having a control. On final approach the pilot keeps one hand on the control column and the other on the airbrake lever. The airbrakes are locked into the closed position by pushing the lever forward against the over centre lock.

The Vigilant is operated just like other RAF aircraft. The crew carry out checks at each stage to ensure that the aircraft is serviceable and that the correct procedures are being followed.

999 (Great Dunmow & Districts) Squadron ATC
ACP 31 Section 4
Initial Expedition Training Notes

Chapter 1 Hillwalking

As a cadet you will get many opportunities to take part in adventure training, either as part of your normal squadron training or as part of DofE. There is always an element of danger in outdoor activities, so the aim of this section is to give you some basic knowledge to enable you to enjoy outdoor activities safely.

Expedition Planning.

This is the most important part of any expedition. Time spent on planning is never wasted. If you are the leader in charge of a group you will have many things to consider before the expedition gets under way. The first thing you must decide is how many people there will be in the group. This will depend on:

a. The length of the route.
b. The type of ground to be covered eg hills, moorland, rock ridges etc.
c. The weather conditions - wind, rain, mist, snow.
d. The age and fitness of the individuals.

As a general rule hillwalking groups should number between 4 and 6 – the more difficult the route, the smaller the party. Four is the minimum safe number to take in normal country since in the event of an accident, one member of the party can stay with the injured person while the others go for help.

Route Planning.

This is where your skills at map reading are essential. In choosing where to go on your expedition, you must consider:

a. Interest of the party.
b. How to get there.
c. The terrain.
d. Hills.

Escape routes

When planning a route for any expedition it is important that you have alternative plans if things go wrong. For example, if it starts to rain heavily or somebody in the group is particularly tired you may need to cut the walk short – low cloud on a hill may mean a detour around it. You should try to think of all eventualities and never be afraid of turning back if the circumstances dictate.

Walking rhythm

Rhythm is essential to good hill walking; jerky movements, springing and flexing the knees by taking too high a step tire the muscles and should be avoided. The leg should be allowed to swing forward like a pendulum; the natural swing of the body assists this movement. There should be no conscious use of the leg muscles. To assist rhythm and balance the hands should be kept free at all times. Spare clothes, etc., should be carried in the rucksack or tied round the waist.

When to rest

Constant stopping and starting breaks up walking rhythm and should be avoided. Halts should only be made at fixed intervals based on time and ground; these halts should be short, on average 5-10 minutes every hour. Large meals should be avoided 'a little and often' being the better approach to eating during a day on the hills. It is a good plan to retain a portion of the day's food until all difficult ground has been crossed and so maintain a reserve of food in case the unforeseen should occur.

The body needs to replace fluid lost in sweat, in breathing, etc., and contrary to popular belief drinking is to be encouraged, 'little and often' once again being the safest maxim.

Equipment and Clothing.

Each member of the group should have:

a. Map - for short walks in normal country, maps can be shared between 2.
b. Compass - can be shared between 2.
c. Whistle.
d. Rucksack - can be shared between 2-4 people to ease the load.
e. Large polythene bag.
f. Personal first aid kit.
g. Emergency rations - a couple of chocolate bars should be sufficient.

Personal clothing should be:
a. Boots should be comfortable, allowing for one pair of thick socks.
b. Breeches or trousers, but not jeans.
c. Several thin sweaters will give greater warmth and flexibility than one thick one.
d. Waterproof anorak or cagoule.

Boots and care of feet

Boots are essential for comfort, safety and efficiency. Make sure they are broken in before an expedition and that they are kept clean and well maintained by replacement of the natural oils in the leather as necessary. They should offer good ankle support, protecting the sole of the foot from sharp stones and they should be fairly rigid across the sole. Some flexibility in a forward direction makes for more comfortable walking

and a bellows-type tongue helps to keep out the water. The limitations of the vibram or moulded rubber sole should be clearly understood. They are slippery on hard snow or ice, on vegetation of any kind and on wet, greasy rock.

It does not matter what activity is planned, the condition of your feet can make or mar any expedition. Keep them in good order and insist that your companions do the same:

a. Wash them regularly.
b. Use clean, well fitting stockings or socks, a single pair of loop stitched stockings is best or two pairs of woollen ones.
c. Toe nails should be cut straight and kept short.
d. Regular applications of surgical spirit harden the feet.
e. The slightest irritation should be plastered at once.

Blisters

Blisters are uncomfortable and a hindrance and potential danger to the whole party. At the first sign of discomfort, stop and treat the problem. Smear the sore area with antiseptic cream and cover it with a broad plaster - try to shape the plaster to avoid making any creases. Self-adhesive ‘chiropody felt’ is extremely good for covering blisters. If a blister is already present, a small ring of plaster placed around it should keep the pressure off and allow the fluid inside the blister to be reabsorbed into the blood stream. In a severe case, it may be necessary to prick the blister with a sterilised needle, having first washed the feet thoroughly. Allow the fluid to escape and then cover the area with a sterile dressing. Change the dressing daily and allow every opportunity for the area to harden up in the fresh air.

The main item of clothing for any walkers
is the anorak. The anorak has 3 primary functions:

a. To keep water out
b. To allow water vapour to escape
c. To keep heat in

Chapter 2 Campcraft and Expeditions

Considerate camping

One of the main problems with camping is that it is potentially very damaging to the environment. Inconsiderate and incompetent campers can do an enormous amount of harm to sensitive areas of the countryside. Digging rubbish pits or drainage channels, removing turfs and lighting fires, all leave scars that may take years to repair. Those who go camping on the hills have an obligation to ensure that they do nothing which would result in change or harm to the environment.

Food and Cooking

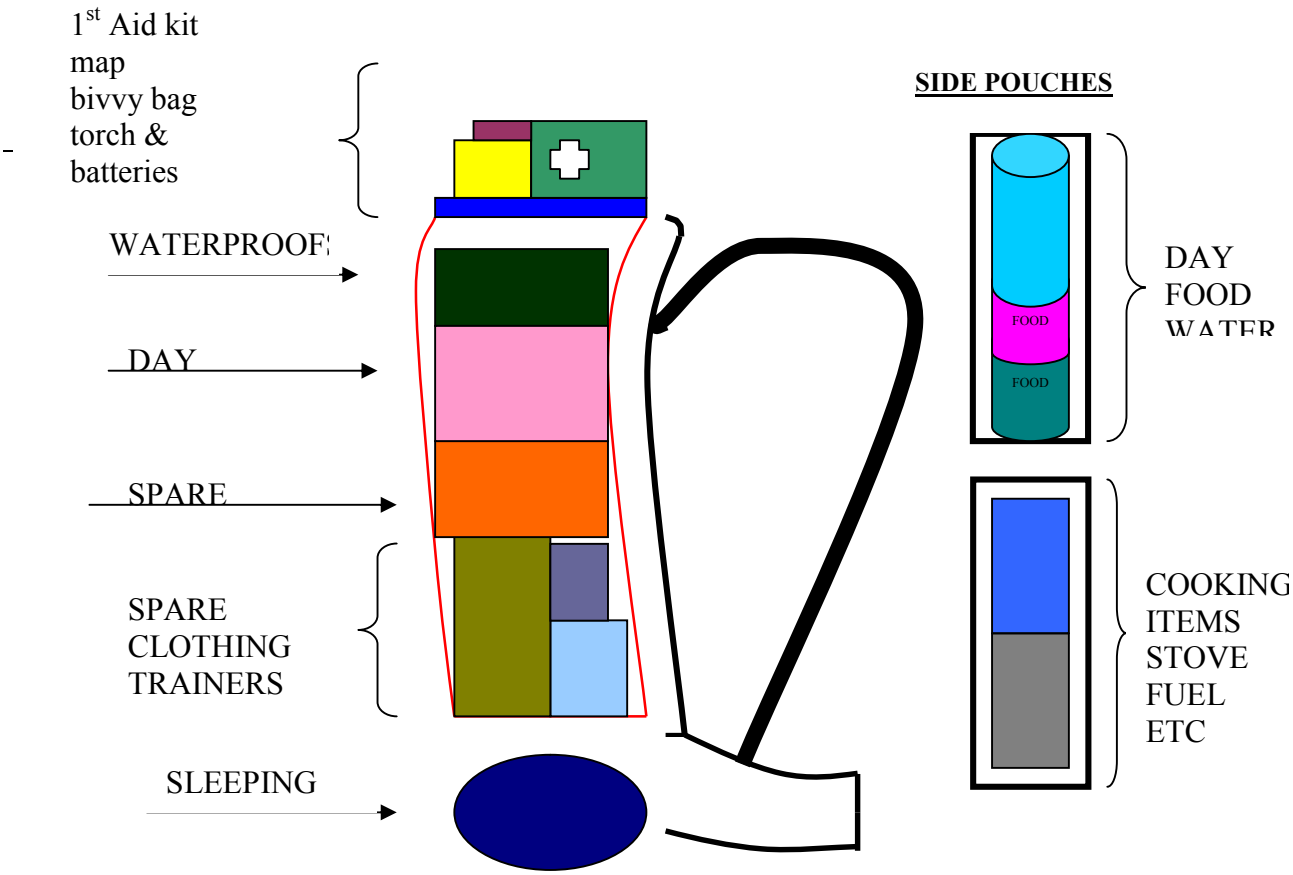
Adequate and appetizing food is a vital part of any expedition. You must always start the day with a good breakfast and finish with a hot evening meal. A hot drink for the group on arrival at the campsite is an excellent morale booster and paves the way for a good meal. There is a good range of dehydrated foods now available on the market, but choose carefully. Select those foods that have a relatively short cooking time, and which can be cooked in a single pot.

Which rucksack

Rucksacks come in all shapes and sizes but all have certain basic requirements. First of all the sack should be made of waterproof material. This will not mean that water will not get in, so you should always use a polythene liner. They should feel comfortable, carry the load high and lie close to the back. Most sacks have a degree of adjustment, but remember they are made in different sizes for different people - make sure yours fits. The straps should be well padded and easily adjusted for length. It should have a waist belt so that some of the load is transferred onto the hips.

Packing

Articles needed during the journey or immediately on reaching the camp site should be on top or in side pockets, i.e. food for the day, first aid kit, tent and so on. Heavy articles should be kept as high as possible. Balance the weight and avoid sharp edges and corners against the back. The stove and fuel should be kept in a well sealed polythene bag and stored in a side pocket or well away from food. Adjust shoulder and waist straps as necessary. All clothing and sleeping bag should be kept in polythene bags and the sack itself might benefit from a 500 gauge polythene bag liner.



NOTE: - THERE IS NO SET RULE FOR PACKING A RUCKSACK,
THIS DIAGRAM IS MEANT AS A GUIDE

Tents

In many respects a tent performs the same function as your outer clothing. It is expected to keep out the rain, protect you from the wind and yet allow water vapour to escape. Further more, a tent needs to be both hard wearing and light in weight. The traditional solution to the waterproofing versus condensation problem is to provide 2 layers - an outer waterproof fly sheet and a lightweight inner tent.

For the wet and windy conditions so common in the U.K. it is advisable to have a sewn-in ground sheet, down to earth all-round fly sheet and strong alloy 'A' poles front and rear. Hoop and dome designs are supported from a framework of flexible fibreglass or aluminium rods. They have the advantage of providing the maximum amount of space for a given floor area, and they use the minimum number of pegs and guys.

Siting the Camp

A good site should provide shelter from the prevailing wind. The ground should be as flat as possible and relatively free from lumps, tussocks and boulders. It should be well drained and safe from potential flooding. A handy water supply is almost essential though don't pitch too near a noisy mountain stream if you want an

undisturbed night's rest. Trees may provide some protection from the wind but don't pitch directly underneath them; although they offer some immediate shelter from the rain, eventually large drops form and these are much more effective in penetrating the fly sheet.

Water

Water should be collected above the site and washing should be done below. It is always advisable to sterilise all water before drinking or cooking. This can be done by either boiling it for about 10 minutes or by using sterilising tablets. Finger nails should be clean and washing of hands insisted on after using lavatories or before handling food.

Take rubbish home

You must not dump or bury rubbish while you are out camping. If at all possible take your rubbish home with you especially if the site is accessible and likely to be used frequently. Tins should be opened at both ends, flattened, tied in a polythene bag and taken home. Glass is unnecessary when plastic containers can be used, but on no account must they be smashed. Take empties home. Polythene bags are particularly lethal to animals.

Stoves

Gas - This is clean, requires no priming, but is expensive and, for half an hour before a cartridge runs out, burns at an infuriatingly low pressure.

Pressure stove - These require priming with solid 'Meta' fuel or meths, but give a wide variety of pressure. They are very cheap to run. Petrol stoves are not recommended for inexperienced young people.

Meths burners - The most popular system is the 'Trangia', which consist of an aluminium body holding a methylated spirit burner. It is light in weight, compact and very simple to operate and burns well in windy conditions.

Safety Factors

Changing Gas cartridges or filling stoves should be done in the open and away from candles or any naked light. You must practice using your stove before setting out on your expedition.

As with all stoves, there is considerable danger of setting the tent alight when cooking is done inside the tent. If cooking outside is not possible because of weather conditions, adequate ventilation must be ensured. In addition to burning up Oxygen, combustion produces Carbon Monoxide gas which may be highly dangerous in a sealed atmosphere.

Gas is heavier than air. During sleep, gas from leaking appliances could accumulate in a layer on the groundsheet (particularly if sewn in). Quite apart from the obvious

danger of explosion, this layer could rise to nose level, with fatal results. Store gas stoves and cylinders outside.

Paraffin pressure stoves in fact burn paraffin vapour and pumping too soon will result in flooding. This causes dangerous flaring and soot is deposited which will ultimately choke the nipple. Pricking (only when needed) to clear stoves, as well as priming, should be done outside, if possible.

Do not overfill a stove. When doing anything to a stove, always remove pans. When stirring pans, always hold on to the handle. Scalding accidents are common. Make sure handles are up or extended properly so that they do not hang down near the flame to become dangerously hot.

Patience is the most important point in stove control.

Chapter 3 Exposure

Man is a homeotherm. This means that he tries to maintain a constant body temperature whatever the temperature of his surroundings. The body core is normally at a constant temperature of 37°C.

Hypothermia

Hypothermia is the condition which arises when there is a progressive fall in body core temperature which if not stopped could lead to unconsciousness, respiratory and cardiac failure and death. Younger people are more likely to suffer from hypothermia because they have lower physical and mental reserves. This fact must be taken into account when you are planning an expedition.

The weather is the biggest factor in the onset of hypothermia and windchill is a force much underestimated. The rain makes clothing wet but the addition of a cold wind means that the body gets cold much more rapidly.

Symptoms

The first symptoms of hypothermia may appear trivial but when more pronounced they can cause real problems. Once these symptoms are spotted the sufferer must be treated or the problem will become worse. The range of symptoms of an advanced case are;

a. Unexpected and apparently unreasonable behaviour often accompanied by complaints of coldness and tiredness.
b. Physical and mental lethargy, including failure to respond to or to understand questions or directions.
c. Some slurring of speech but this is not necessarily a good indicator because the sufferer may have strong speech until shortly before collapse.
d. Violent outbursts of unexpected energy with possible physical resistance to offers of help.
e. Violent language and failure to appreciate something is wrong.
f. Lack of muscular co-ordination leading to erratic movement and falling.
g. Failure of, or abnormality in vision, difficulty in focusing. Once this occurs the case should be regarded as extremely serious.

Once the sufferer has been identified the treatment should begin immediately.

Treatment

Treatment should start by getting the sufferer into some kind of shelter such as, either a tent, bothy, hut or bivouac. The body temperature needs raising but not too quickly. Insulate the sufferer by removing wet clothing and replace with dry then using one or two sleeping bags isolate the sufferer from the ground. If possible place another person into the sleeping bag with the sufferer to provide body warmth.

Give the sufferer some form of sugar that can easily be digested and if a stove is being carried prepare a hot drink. If breathing stops then administer artificial

respiration.

A rescue party may take some time in arriving, dependent on the location, so a careful eye must be kept on the sufferer. If he regains composure do not allow any movement whatsoever - keep him warm and then evacuate with the rescue team. The sufferer may say that everything is fine but a sudden relapse is possible.

Exposure exists. The best way is to avoid it wherever possible. Correct walking equipment and sensible waterproof clothing is essential, the onus being on the leader to check the party for the correct attire and monitor the weather. Parties should carry emergency food and possibly a tent. Ensure that a good meal is taken before commencement of the trek ahead and levels of fitness are checked throughout the journey. If problems arise know how to deal with them. Planning is the key - escape routes and adjustments made to the plan, will mean a safe expedition that can be enjoyed by all.

Sunburn

Lying on a beach and falling asleep is not the only way to get sunburnt. A hot day on the hills can achieve the same thing. Sunlight bounces around and reaches you from all directions. Skin which is not protected against the sun can burn and blister. The best way to avoid sunburn is to protect yourself with a barrier cream or sunblock, which when applied to all exposed skin will block out ultra violet radiation without stopping the sweating process. Treatment for sunburn can be achieved by applying calamine lotion.

Heat Exhaustion

If the water reserves in the body are not sufficient then you will begin to suffer from heat exhaustion. The symptoms range from thirst, fatigue, giddiness, rapid pulse, high body temperature, low urine output to delirium, coma and ultimately death. The only way to avoid heat exhaustion is to keep the body's fluid intake up.

Heat Stroke

This is the most serious of the heat disorders. Heat stroke occurs when the body's temperature regulating system fails. The symptoms are: high body temperature and an absence of sweating (the skin being dry to touch). There will be a lack of co-ordination and the sufferer will end up in a coma and then die if not treated immediately. Initial treatment would be to sponge the sufferer down with water and cover the body with a damp cloth. Alternatively, if it is possible, immerse the sufferer in cold water.

To avoid these types of problems, keep your fluid intake up, do not over work yourself. Take adequate salt in your diet and supplement if necessary.

999 (Great Dunmow & Districts) Squadron ATC
ACP 32 Volume 1 – Map Reading

Chapter 1 – What is a Map?

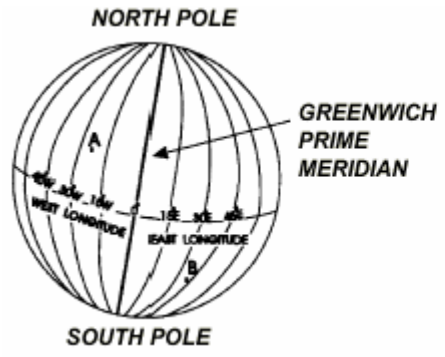
We need maps to find our position, destination and the best route between the two.

If we imagine **a line joining true north and true south, this is the prime meridian**. If we add more lines drawn from pole to pole, these are called **lines of longitude** and are either east or west of the Prime Meridian. Each line is numbered in degrees away from the prime meridian in order to record a position on earth.

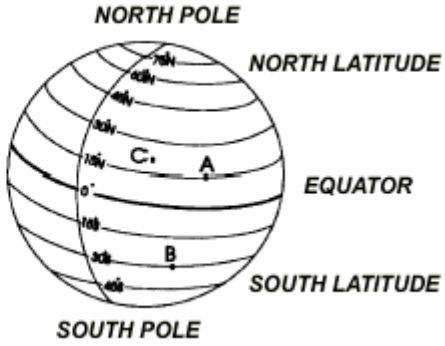
An imaginary line running around the middle of the earth, halfway between the North and South poles is called the equator. If we add more lines running parallel to the equator, these are called **lines of latitude** and are either north or South of the Equator. Each line is numbered in degrees away from the equator to record a position on earth.

These degrees are further broken down into minutes.

1 degree = 60 minutes

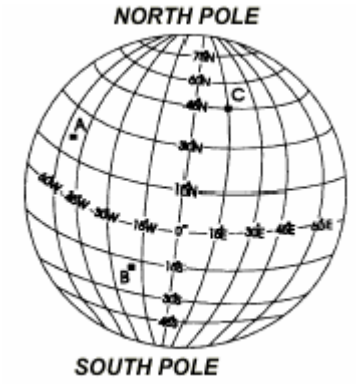


Lines of Longitude



Lines of Latitude

If you put the latitude and longitude lines together on the same globe you will get a matrix. With this system you can give a points exact position by stating its **latitude**, followed by its **longitude** in degrees and minutes.



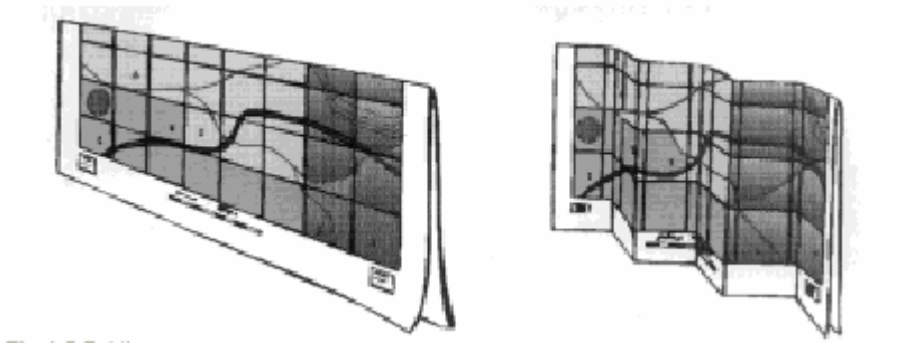
The curved surface of the earth is flattened to fit on paper i.e. a map for easy use. Maps are now made using satellites to ensure that they are even more accurate.

The M726 Series 1:50,000, produced by Ordinance Survey, are the most popular map for walking and are used regularly by the ATC. It is classed as a **topographical map, which shows the shape and surface detail of the land.** This is not the only type of map available; there are maps for several other uses, depending on how much detail is needed. **For example, a 1:25,000 map, with a smaller right hand scale ratio, covers a smaller area and so more detail.**

A map is most accurate on the day that it is produced and will continue to be accurate until the features on it are changed. Before you start to plan an expedition, **check the revision date of the map you are using to ensure it is the latest revision.**

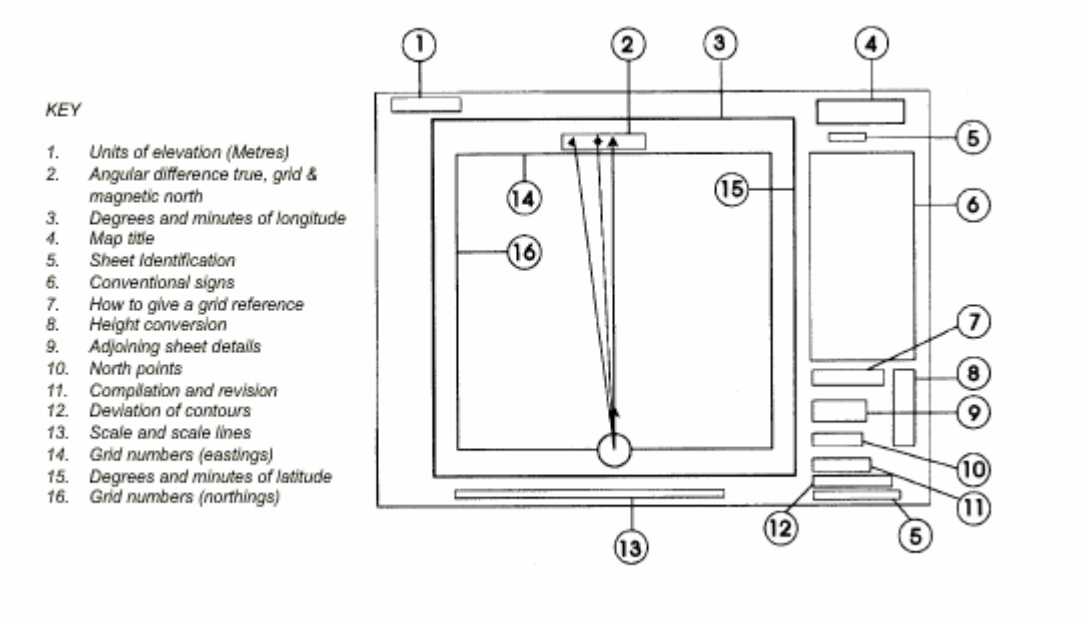
You must look after your map to get the required information from it. **NEVER mark a map with ink, as this will damage the surface when you try to remove the mark.**

A map should be folded in half lengthwise with the outwards, then "concertina wise".



Chapter 2 – Map Language

The **units of height** used on the M726 Series maps are **metres**.



The **lines of latitude** are expressed in degrees and minutes and are marked along the **right and left** (east and west) hand side of the map.

The **lines of longitude** are marked along the **top and bottom** (north and south) of the map.

In map reading there are always references to north. In fact, there are 3 norths:

a. True North
b. Grid North
c. Magnetic North

On the M726 series of maps the **identification box** is found at both the **top and bottom of the right hand column**. This gives details such as:

a. SERIES M726 (type and scaling of map)
b. SHEET 139 (particular area covered by map)
c. EDITION 6-**GSGS** (**G**eographical **S**ection **G**eneral **S**taff, Authority in UK)

The **scale lines** are situated along the **bottom of the sheet** and they give you: distances in nautical miles, statute miles and kilometres.

The revision date is an important feature because it gives the user an idea of how up to date it is. The **revision date** can be found under the heading "COMPILATION AND REVISION" which is in the **lower quarter of the right hand column**.

A contour line is a reddish brown line drawn on the map joining all points of equal height above **m**ean **s**ea **l**evel (**MSL**). Mean sea level is a fixed height approximately halfway

between high and low tides calculated at Newlyn in Cornwall over many years. This MSL gives a common baseline so that anywhere in the UK can be measured to give an accurate height. Contour lines are continuous, except at a cliff edge. Heights are shown in small breaks in the contour line itself and **every fifth line is shown slightly thicker** to make them easier to read. **These contour lines are situated at 10 metre intervals on the M726 Series and the rise or fall between contours is called the Vertical Interval (VI).**

Conventional Signs

Signs and symbols are used to represent features on a map. Typical examples are:

a. Motorway
b. Main Road
c. Post Office
d. Church
e. Footpath
f. River
g. Canal
h. Railway Line
i. Trig Point

Make sure that you can recognise these signs and symbols from your map.

Chapter 3 – Scales

If your map is to cover a reasonable area then everything on the map has to be reduced considerably from its real size. The user would determine the choice of scale from the task required.

There are **three ways to express scale**

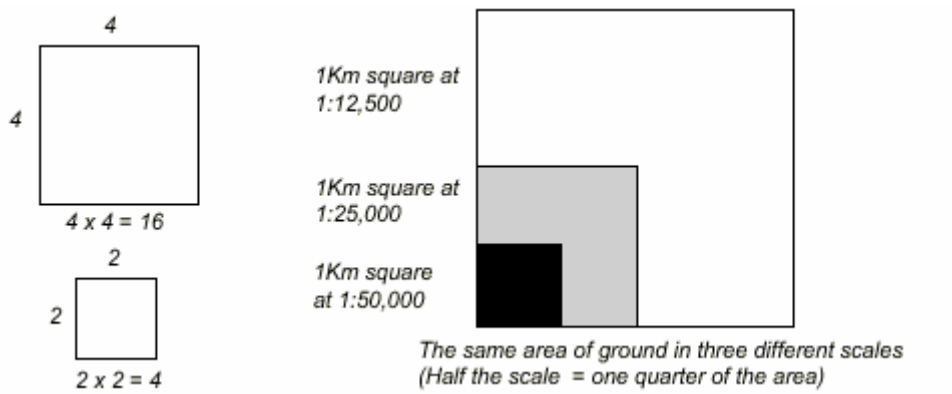
a. **In words** – by saying "so many centimetres to the kilometre". For example a scale of "2cm to 1Km" means that for every 2cm on the map you would travel 1 km on the ground. This is true for one side of a grid on an M726 Series 1:50,000 map.
b. **As a Representative Fraction (RF)** – in this method the scale is expressed in the form of a fraction, for example 1 / 50,000.
c. **As a ratio**: very similar to b, but written as:

1:50,000.

Q: On a 1:50,000 M726 series map, what distance on the ground is represented by 1 cm on the map?

A: 1cm = 50,000cm = 500m = 0.5Km

When using scales, areas of ground will also be proportionally reduced but remember that areas contract rapidly on small-scale maps. For example, if you take a map that is **half the scale** of another then **the area is reduced by a quarter** (not a half). This is because the area of a rectangular figure is length multiplied by breadth. If you therefore halved the scale you will quarter the area of the map.



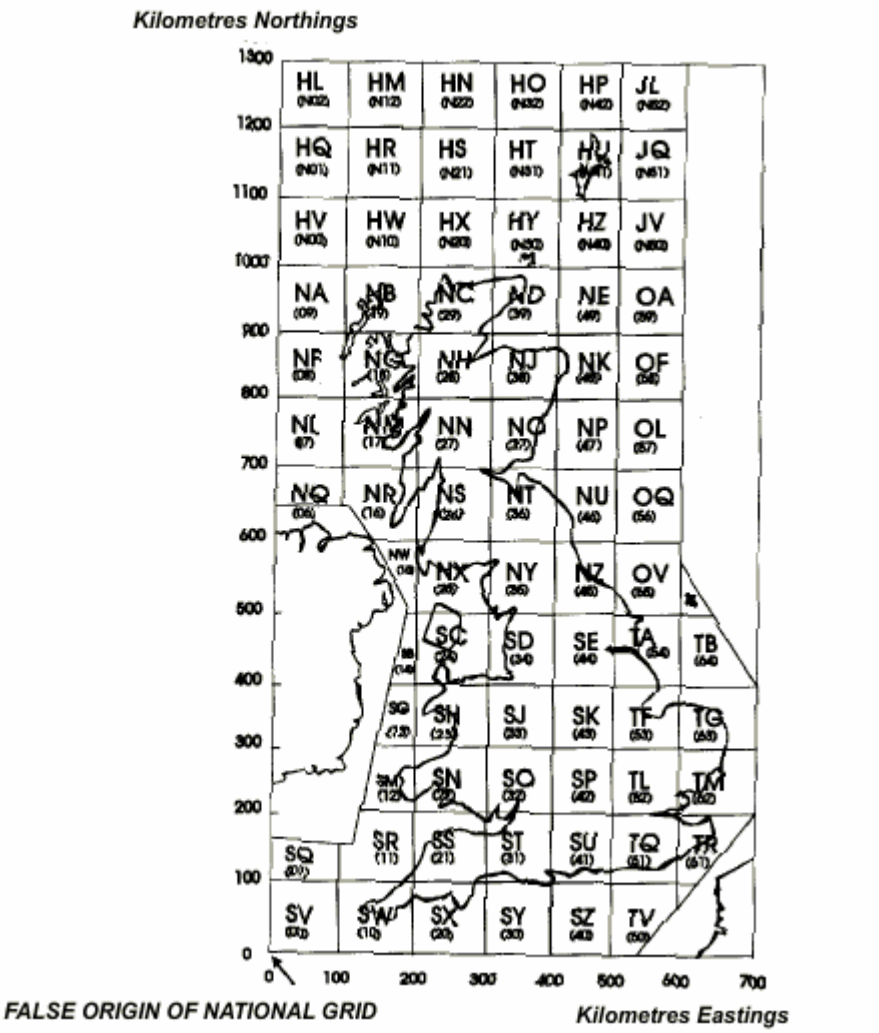
The same area of ground in three different scales (Half the scale = one quarter of the area)

Different types of map use different scales:

Large scale – City or town maps (defined buildings)
Medium scale –Larger areas (buildings as symbols)
Small scale – Atlas (large towns in name only) e.g. **Long distance aeronautical navigation.**

Chapter 4 – Grid References

If you look at a M726 series map you will notice that it is covered in squares. These squares make up a grid that covers the whole area of the map. To cover the UK there is a need for seven 100 Kilometre lines of **eastings (vertical lines)** and thirteen 100 Kilometre lines of **northings (horizontal lines)** from the starting point.

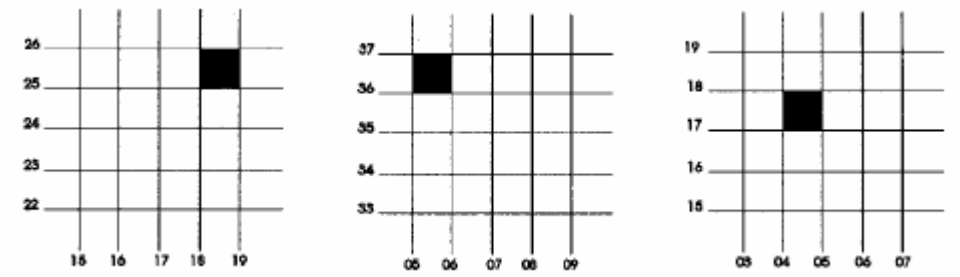


The UK's national grid is not the only one of its kind; nearly every country will have its own. There is also a worldwide grid called **U**niversal **T**ransverse **M**ercator **G**rid (**UTM Grid**).

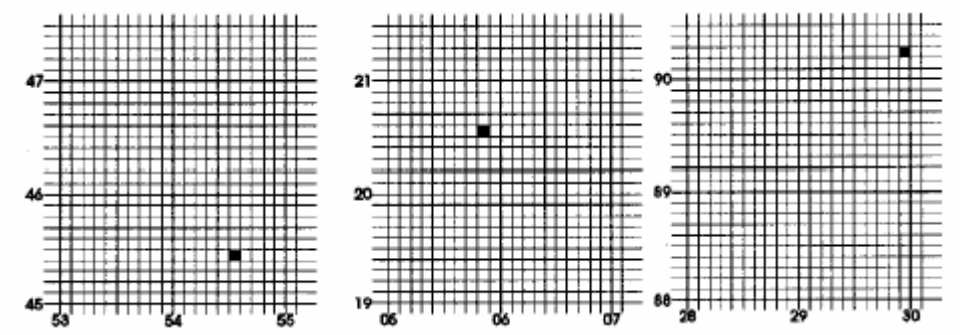
It is fairly easy to locate an object within a 1Km square as long as you know what square it is in. This can be done using Easting and Northing to indicate the **south west (SW) corner** of the square you wish to identify. By using the SW corner, the grid reference is standardised so everyone knows what it means.

When giving a 4-figure grid reference put together the easting and then the northing. This saying will help you to remember the sequence:

Across the hall (eastings) and up the stairs (northings).



To give a 6-figure grid reference you start in the SW corner and give the easting (e.g. 33), then mentally divide the grid into ten parts and estimate how far into the square the object is (say 4). Once this is done put the figure after the first (giving 334) – now you have your easting. Repeat the process for the northing and you will end up with a 6-figure reference number.



Instead of estimating the 10 divisions, a useful device called a “Roamer” can be used. You can find these scales on most compasses designed for navigation on foot.

In the National Grid, the 100Km squares are identified by the use of letters. You would not normally refer to these but there are some cases where you would need to (in the completion of a long trek, crossing into another 100Km square) To provide clarity and to avoid uncertainty the letters would also be added to the grid reference, for example:

SO 080 050

The two letters show that the point is located in one of the grid squares with sides of 100Km.

Chapter 5- Relief

The word "Relief" means the rise and fall of the ground.

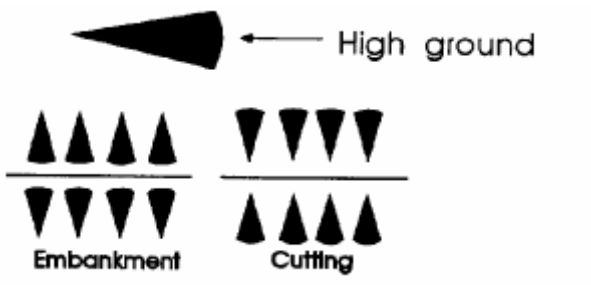
Methods of showing height on a map include:

a. Spot heights and triangulation points.
b. Layer tinting.

Units of height are important, from the planning stage, to the execution of an exercise. 1,000 feet is very different from 1,000 metres.

Methods of showing steep ground include:

a. **Hachures**.



b. Hill Shading

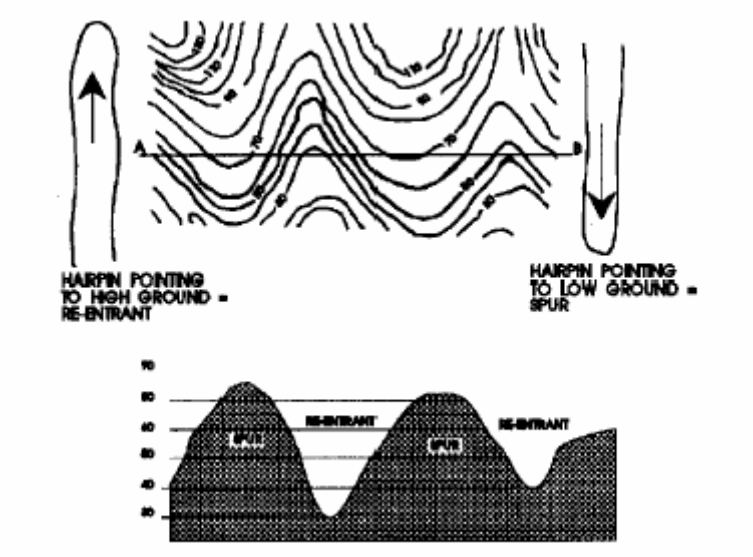
Contour Lines on a map join all the points of the same height together and are the standard way to depict height. Here are some basic points of information:

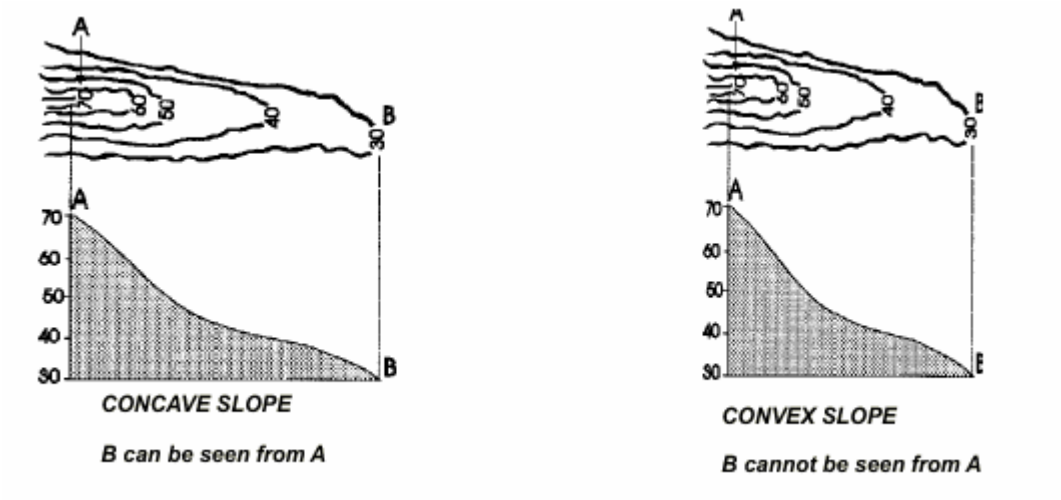
a. Between any 2 contour lines there must be a slope either up or down.
b. Contour lines are continuous and only stop abruptly at a cliff edge.
c. Heights on contour lines are printed so that when you read them the right way up, you are facing uphill.

If 2 contour lines were far apart it would suggest there is a greater distance to travel from one to the other to gain the height. This is better described as a gentle slope. If you see contour lines very close together you would expect to see a very steep slope.

A **Spur** is a piece of high ground jutting from a range of hills into lower ground.

A **Re-entrant** is a narrow valley closed at one end, separating two spurs. They are very similar on the map because the contours for both will have a hairpin shape. If the closed part points in the direction of the lower ground it is a spur. If the closed part points towards the higher ground it is a re-entrant.



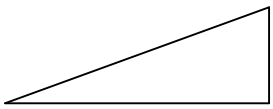


A **Knoll** is a small isolated hill.

Ch apter 6 – Gradients and Intervisibility

The angle or degree of a slope is called a gradient and is expressed as a ratio. Imagine a slope with a gradient of 1:5. This would mean that for every 5 units along the ground (horizontally) the slope will rise or fall by 1 unit. **A gradient of 1:5 would therefore be steeper than 1:15.**

To work out a gradient from a map you need to know both the **vertical interval (VI)** and the **horizontal equivalent (HE).**



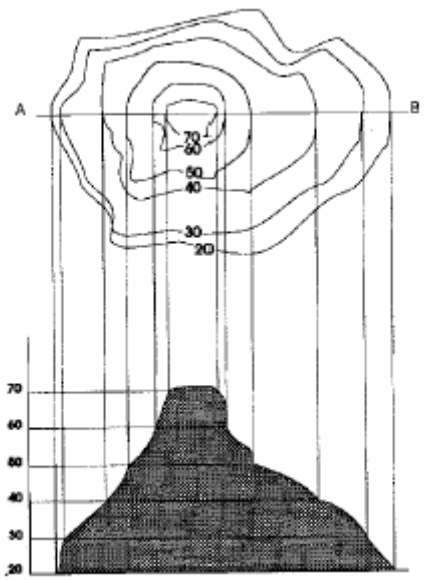
VI

HE

Q: If the VI = 40 and the HE = 2000, what is the gradient?

A:		VI: HE
		40: 2000
	(Divide both sides by 40)	1: 50

If the ground between you and your goal is not clear you may have to draw a cross-section of the land between them. (See ACP for examples)



Intervisibility

When you are map reading it may be necessary to know whether you can pick out a feature or point to help in the next stage of your route.

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Chapter 1 - Lighter-than-air-craft

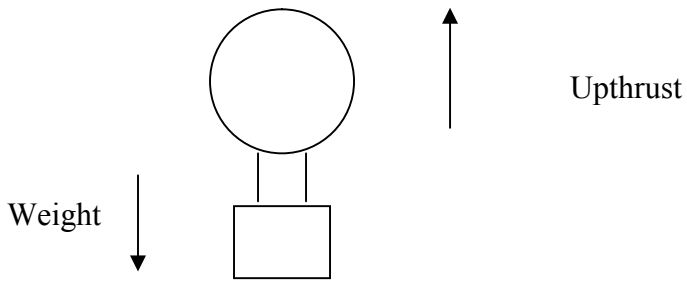
Hot air balloons

In 1783, the Montgolfier brothers built the first hot air balloon, based on the principle of hot air rising and carrying the balloons with it. Later that year Francois Pilatre de Rozier accompanied by the Maquis d'Arlandes became the first men to become airborne.

The gas filled balloon that J. Charles developed and filled with Hydrogen replaced the Montgolfier balloon. His design is still used today; however, today's modern balloons are filled with Helium, which does not burn, instead of Hydrogen.

How a balloon floats

An inflated balloon displaces it's own volume of air and so experiences a lifting force or upthrust. This upthrust is equal to the weight of the air displaced. If the upthrust is greater than the weight of the balloon then the balloon will float.



Controlling the balloon in flight

It was not long after the de Rozier's first flight in the Montgolfier balloon that the potential of such a vehicle for military reconnaissance was seen. But there had to be some way of steering it – a basic balloon is simply carried along by the wind. Early ideas of sails, oars and propellers proved useless. It had to be understood that if a lighter-than-air machine was to be steered, then there had to be a controllable force capable of propelling it independently of the wind. From this realisation, the first airship designs were produced. Engines were attached to provide independent forward motion and using rudders to act on the airflow caused by this forward motion provided control.

Advantages of Airships

1. Quiet
2. Comfortable
3. Able to remain stationary relative to the ground whilst using very little fuel – ideal for scientific and military work.
4. Their size and lifting capacity enabled them to carry large cargoes relatively cheaply.

Modern Airships use Helium Gas

Unfortunately they were filled with Hydrogen gas and many accidents occurred with the airships exploding. The most famous of which was the airship Hindenburg that exploded in 1937. Although the Hydrogen was replaced by Helium gas, people had lost faith in this mode of transport and the industry collapsed.

How are Airships Controlled?

To enable an airship to rise, valves release air from the ballonets into the atmosphere, reducing the weight of the airship and allowing the Helium gas to expand giving more lift. Fig 1-6.

To enable an airship to descend, pumps must force air into the ballonets, increasing the airship weight and compressing the Helium gas so that lift is reduced. Fig 1-7.

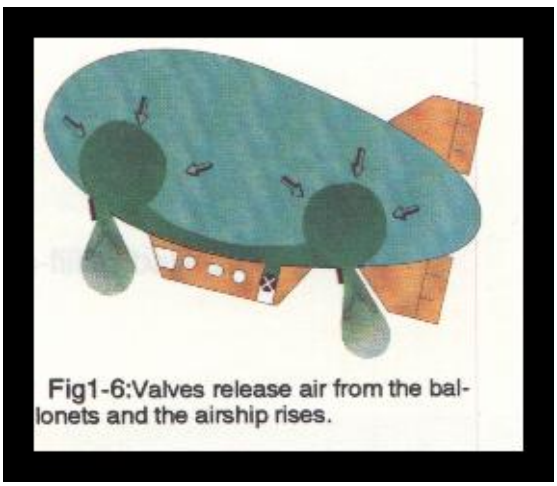


Fig1-6:Valves release air from the ballonets and the airship rises.

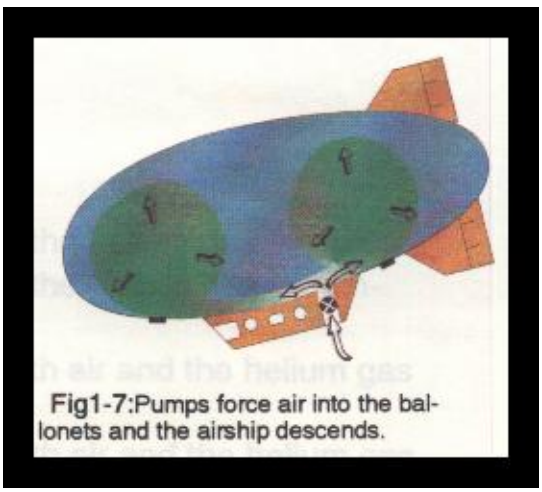
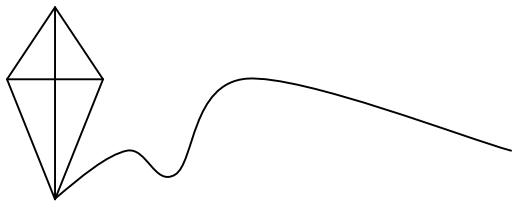


Fig1-7:Pumps force air into the ballonets and the airship descends.

Chapter 2 - Heavier-than-air-craft

How does a Kite Fly?

The most important features of this typical kite are its shape, its tail and the way in which the string is attached. Together, they make sure that the kite flies at the correct angle to the wind. The weight of the kite is balanced by the force of the wind underneath it, and also by a less obvious force called lift, caused by the kite's shape. Lift is produced by the wind passing over the top of the kite creating an area of low pressure, and by the air underneath the kite, at a slightly higher pressure, lifting the kite upwards.



Free Flight

The English Baronet Sir George Cayley built the first model glider in 1804. This device proved that the principles of Heavier-than-air-craft were possible. The German Otto Lilienthal (1848 – 1896) was able to build extremely lightweight gliders enabling him to make thousands of flights. His gliders were the forerunner of the modern hang-glider. In 1848, John Stringfellow successfully flew his model aircraft, which was powered by a steam engine. However, it wasn't until1885 when a German by the name of Gottlieb Daimler developed the first single cylinder internal combustion engine that provided the long awaited power for these aircraft.

The Beginning of Controlled Flight.

On the 17th December 1903 Orville and Wilbur Wright flew their "flyer" for the first time. The important feature of this flight was that man had been airborne and in control of a powered heavier-than-air-craft for the very first time.

Creating Records from Powered Flight.

In 1909 a Frenchman by the name of Louis Bleriot completed the first crossing of the English Channel in a heavier-than-air-craft. His monoplanes were also the first to fly over the Alps, from London to Paris non-stop, the first official carriage of airmail in Britain and the first use of an aeroplane in war.

However, that was not the end of breaking flying records. Amongst others, in 1977, Dr. Paul McCready's Gossamer Condor aircraft, powered and controlled by a racing cyclist was flown in a figure of eight around two pylons. This earned him the Kremer prize.

Aviation experts continue to strive to improve aircraft design. The progress made in aircraft design in the past 100 years has been breathtaking – who knows what the future holds!

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No 8 Rifle

The rifle most commonly used in the ATC is the No8 Rifle. This rifle is a hand operated, blot action, single shot weapon. The backsight is a folding leaf and slide type. The slide is adjustable for ranges of 25, 50 and 100 yards.

NSP's

Normal Safety Precautions (NSPs) are a set of actions you must ALWAYS carry out to make sure the weapon is unloaded and safe. They are:

a. Check to see if the weapon is cocked by looking at the cocking piece
b. Keep the muzzle pointing in a safe direction
c. Pick up the weapon
d. Push the safety catch fully forward (Never apply the safety catch if the bolt is already open as this will damage the weapon causing the safety catch to fail)
e. Open the breech by moving the bolt to the rear
f. Check the chamber is clear

You must ALWAYS carry out NSP's in the following circumstances:

a. At the beginning and end of every lesson, practice or range period
b. Immediately on return to the armoury
c. When handling the weapon over to, or receiving it from, another person
d. If in doubt as to the state of the weapon

Below are some of the rules you must obey when handling a weapon:

a. NEVER point the weapon at anyone, even in fun
b. ALWAYS point the weapon in such a direction that there is no danger if a round is accidentally fired.
c. WHENEVER you pick up a weapon that has NOT been under your direct supervision, check it to make sure that it is not loaded (Carry out NSP's)
d. WHENEVER you hand the weapon to another person, you must first show that person that it is not loaded. If somebody handsd a weapon to you, then you must insist that the same action is taken.
e. NEVER rest the muzzle of the weapon against any part of the body
f. ALWAYS check that the weapon is unloaded before travelling with it in a vehicle
g. NEVER attempt to fire the weapon without first having first the proper instructions and unless you are under supervision
h. Never lean a rifle, whether loaded or unloaded, against a wall or any object. If it falls, it may hit and injure someone or it may suffer damage that will affect its accuracy.

HANDING OVER A WEAPON TO ANOTHER PERSON

Before accepting a weapon from another person you would no doubt want to be absolutely certain that the weapon was in a safe condition. So, check it yourself. You must follow these rules when handing a weapon over to, or receiving a weapon from another person:

a. Carry out NSP's
b. Say to the person who is about to receive the weapon – "The weapon is not loaded"
c. Hand the weapon over with the bolt open – so that the person receiving it can check the chamber

TOET – Test of Elementary Training

Before you are allowed to shoot, you must first take a test on your elementary training. In the test you will be expected to do the following thing without making any safety errors:

a. Pick up a rifle which is lying on the ground and check it to make sure that it is safe.
b. Hand over the weapon to another person
c. Strip and clean the weapon
d. Load the weapon while in the prone position
e. Carry out the correct actions when a stoppage occurs
f. Unload the weapon

LIVE FIRING

It is the responsibility of the RCO (Range Conducting officer) to ensure that EVERYONE on an indoor or outdoor range must wear ear defenders while firing is in progress. You may be lucky at some point in your cadet career to go to an ETR (Electric Target Range)

WEAPONS

The two types of centre fire weapons that you will meet are:

L98A1 – General Purpose Rifle
L81A1 – Target Rifle

ACP 31: Section 6 – Communications
Revision Notes

CHAPTER 1 INTRODUCTION TO RADIO

Communication is an essential part of everyday life. The development of the radio revolutionised communication, especially for the military and emergency services. Radio uses **electromagnetic (em)** radiation to carry sound, in the form of **radiowaves**, from a **transmitter** to a **receiver**. A piece of equipment, which can transmit and receive, is called a **transceiver**.

A **network** is a large number of radio stations working together, all on the same frequency. The Air Cadet Organisation has its own nation wide network. There are two types of networks: **Directed networks** (**Controlled**) have a **Network Control Station** (**NSC**) which any communication passes through before it can reach the other stations. A **free network** is open and has no NCS so any station can freely contact any member of the network.

CHAPTER 2 – RADIO PROCEDURES

There are 3 important principles to know about the correct procedures to adhere to when using radiotelephony (RT):

1. SECURITY

The identity of a station should be kept secret therefore they use unique callsign. **Callsigns** generally consist of three letters and two numbers (and an additional M and number for a mobile unit)

M R A 2 3 (M 2)

M = UK, **R** = R.A.F., **A** = Location, **23** = serial No., **M2**=Mobile unit No.2

In every communication using radiotelephony (RT) you should always assume three elements: **The Sender, The Listeners, and The Interceptors**. Service radio procedures have been developed so that any listeners can understand the message but the interceptors can't, by using codes and phrases.

2. ACCURACY

Voice messages should be clear, logical, and brief. Use the **phonetic alphabet** and **numbers**, correct **phraseology**, and remember **RSVP**.

Rhythm - Speak at a regular rhythm
Speed - Do not speak too fast or too slow
Volume - Make sure you are being heard and can hear others clearly
Pitch - Do not use a very low pitch, try to raise the pitch slightly so it is clear

Phraseology and Phonetics

Common phrases are used because they are quicker, simpler and clearer (the following are just examples - there are more in ACP 31 Section 6):

This is – the callsign of the sender is about to follow
Over - said at the end of each transmission – a reply is required
Out - said at the end of the final transmission – no reply is expected
Wilco - Will comply with the previous instruction
Roger – Message received and understood
Say Again - please repeat the message

The **phonetic alphabet** is used so the letters used can be heard clearly.

Alpha	**K**ilo	**T**ango
Bravo	**L**ima	**U**niform
Charlie	**M**ike	**V**ictor
Delta	**N**ovember	**W**hisky
Foxtrot	**O**scar	**X**-ray
Golf	**P**apa	**Y**ankee
Hotel	**Q**uebec	**Z**ulu
India	**R**omeo	
Juliet	**S**ierra	

Numbers are also said more clearly

0	Zero	**5**	Fife
1	One	**6**	Six
2	Two	**7**	Seven
3	Tree	**8**	Eight
4	Fow - er	**9**	Niner

The frequencies use for mobile radio communication use VHF (**Very High Frequencies**) and UHF (**Ultra High Frequencies**), these are short range – use for training and camps or exercises.

3. Discipline

Always – Use correct procedures, maintain listening radio watch and answer calls promptly and accurately.
Never – Violate radio silence (unless emergency), disclose classified info (including your name, unit, address, etc) or lose your temper or block airways

Sending a Message

When a station first switches on the operator should carry out a "**Radio Check**"; this checks **strength and readability**.

There are 3 parts of the Message:
1. The Call – e.g. **MRG 02 This MRV 12 over**
   MRV 12 This is MRG 02 send over

2. The Text – e.g. **MRG 02 This is MRV 12 move to this location and report on arrival over**

2. The Ending – e.g. MRV 12 This is MRG 02 wilco out

CHAPTER 3 RADIO EQUIPMENT

Base Stations – Fixed installations at Sqn HQ. Range for UHF or VHF Base Station may exceed 50Km.
Mobile installations –(a) Vehicle Equipment – should be robust and efficient with power, because it's carried and powered by vehicles battery. Range approx. 30Km.
(b) Man Portable Equipment – Back-pack or hand portable. Back-pack equipment has a range of approx. 10-15Km because larger battery gives an operational capacity of 12-24hrs. Hand portable transceivers have a range of 1-5Km and battery life of 6-8hrs

DUTY CYCLE

The duty cycle is the **ratio between transmit and receive time**, expressed as a percentage, e.g. 5/10/85%. Meaning the transceiver is used to **transmit** for about 5%, **receive** for about 10% and on **standby** for 85% of its **battery life**. Transmitting takes up much more power than receiving or on standby.

SAFETY PRECAUTIONS

The type of batteries used for radios should be handled with care, especially when not attached to the radio.

OPERATING RANGE AND AERIAL POSITION

Factors which affect range:
1. The frequency band in use
2. The power output of the transmitter
3. The sensitivity of the receiver
4. The efficiency of the aerial system
5. Atmospheric Conditions
6. The position of the aerial

Aerials are very sensitive pieces of equipment and their efficiency can be affected easily by their surroundings. Ideally aerials should be positioned: As high as possible and away from metal structures. Furthermore, Mast type aerials increase the range of a base station.