

British Balloon and Airship Club

**Crew Training Manual
and
Crew Qualification Scheme**



BBAC Crew Training Manual and Crew Qualification Scheme

Compiled by Rick Hatton

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This Manual should be considered as a live document. Suggested amendments should be forwarded to the Crew Training and Qualification Scheme Co-ordinator at the address given in Aerostat and on the BBAC Website.

Note:

Balloon Crew Log Books, which may be used in association with the Crew Training and Qualification Scheme, may be obtained from:

BBAC Crew Training and Qualification Scheme Co-ordinator - address given in the latest Aerostat or on the BBAC Website.

Cameron Balloons – St John Street, Bedminster, Bristol, BS3 4NH
Tel: 0117 963 7216

Zebeedee Balloon Service – Hayward Cross, Hungerford, Berkshire, RG17 0QD
Tel: 01488 681527

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Section 1: Introduction

General, Responsibilities, Basic Safety

1.1 General

1.1.1 It was in a hot air balloon that man first flew. During the 200 years since that first flight, balloon and airship pilots have relied on skilled crews to assist them to complete enjoyable and safe flights.

1.1.2 The BBAC Crew Qualification Scheme is a voluntary scheme, designed to recognise the skills of existing crews, to provide standards for newcomers and to promote an accepted standard of excellence that will be recognised world-wide.

1.1.3 This manual details the agreed standards for crew duties and may be used by all BBAC members. All members are encouraged to use the manual not only as a training resource, but also in order to qualify under the BBAC Crew Qualification Scheme.

1.1.4 Three levels of qualification are available, BBAC Crew, BBAC Senior Crew, and BBAC Crew Master. The requirements of each qualification are detailed in Annexe A of this manual.

1.2 Responsibilities

1.2.1 At all times during the preparation for flight, the flight, and post flight operations of a balloon, the Pilot, known as the P1 (Pilot in Command), has a responsibility for the safety of the crew, passengers, onlookers and equipment.

1.2.2 The Crew is responsible to the Pilot, and will carry out tasks allocated by the Pilot or Crew Chief, to assist in the safe preparation of the balloon for flight.

1.2.3 Once the balloon has taken off, the Crew Chief designated for that flight assumes responsibility for the safety of the ground crew engaged on the retrieve. This responsibility continues until the Crew Chief has received a face to face briefing from the Pilot following the landing.

1.3 Basic Safety

1.3.1 Always wear a strong pair of gloves, leather gloves are recommended.

1.3.2 Long sleeved tops and trousers should be worn. Clothing should not be made of synthetic fabrics that could melt onto the skin in cases of fire emergencies.

1.3.3 Stout shoes or boots are recommended.

1.3.4 Loose clothing and long hair should be fastened so that there is no danger of catching in equipment.

1.3.5 No smoking during preparation, inflation and packing away.

1.3.6 Never allow yourself to be lifted off the ground, even if this means that the balloon equipment is damaged, or the balloon leaves the ground.

1.3.7 Never wrap ropes attached to the balloon around your body or limbs in such a way that you cannot let go immediately.

1.3.8 If at any time in doubt, ask the Pilot for advice. If you see anything which you feel may be important tell the Pilot.

Section 2: Flight Planning

Weather Forecast : Operating Limits : Take-off Site : Maps : Bringing the Crew Together : Emergency Retrieve Number : Retrieve Book

2.1 Weather Forecast

2.1.1 The first consideration when planning a balloon flight is the weather conditions that will prevail during the flight period. Wind speeds on the surface and at altitude, visibility and the likelihood of rain are the prime factors to be considered. Knowledge of the operating limits of the balloon, and sources of weather information are as important for the crew as well as the pilot.

2.1.2 The BBAC Met. Form (example at Annexe B) should be used to prepare a written meteorological forecast for the flight. Information to complete the form can be obtained from a number of sources, many of them advertised in the Aerostat, the journal of the BBAC, and other aviation publications. Some BBAC regional groups also provide a balloon meteorological forecast.

2.1.3 The sections of the form are provided to complete the following information.

A: Forecast Area - This may be in quite simple terms such as “*South West England*”, or “*Bristol area*”.

B: Period - This the period for which the forecast is valid, and should be expressed in local time.

C: General Synoptic Situation - The familiar phrases of all weather forecasts such as : “*A ridge of high pressure is moving east across the area*”

D: Winds - Standard aviation forecasts give wind direction and speed at designated altitudes. A typical statement may be; “2000 feet, 270, 15 knots, veering, plus 10°.

Translated this means that the wind at 2000 feet altitude is **coming from the direction** of 270 degrees on the compass (*the West*), at a speed of 15 **nautical miles per hour** (*since a nautical mile is longer than a statute mile this means that the wind is a little faster than 15 m.p.h.*).

The trend is that the wind will **veer** that means the direction will change in a clockwise direction, toward the north in this case. (*A backing wind is changing in an anti-clockwise direction, in this case therefore toward the south*).

The last figure given is the temperature at the altitude, given in degrees Celsius.

Surface winds are seldom given in aviation forecasts since they are less important to powered aircraft and are affected by local factors, such as the lie of the land. When they are given in a forecast they may be expressed as a general terms, such as “*North Easterly*”.

Special Balloon forecasts often refer to the **Gradient Wind** as well as the surface wind. In this case the Gradient wind is the wind at 2000 feet altitude, and will be given as a direction in degrees (*from which the wind is coming*) and a speed in knots.

E,F,G: Clouds - Clouds are of many types, and are a good indication of the general situation of the weather system. The most usual types of cloud are cumulus (Cu.), strato - cumulus (Sc.) and stratus (St.). Cumulus are the individual white fluffy clouds, sometimes quite tall with a dark base, and can produce showers. Strato - cumulus are flatter and tend to bunch together. When they become flat and appear as a sheet they are known as stratus.

Cloud cover is a measurement of how much cloud there is in the sky. This expressed as eighths of the sky, (*also known as oktas*). So 8/8 or eight oktas is a fully covered sky, whilst 4/8 or four oktas is a half-covered sky.

The base of the cloud is the altitude in feet at which the cloud starts. The tops are the greatest altitude to which the cloud reaches. Some clouds can reach great heights. Cumulus may develop into the very high, and extremely dangerous cumulo - nimbus (Cu.Nb.) storm clouds.

H: Surface Visibility - The heading is slightly confusing since this measurement is of unobstructed visibility that may only occur at a reasonable height. Visibility distances are clearly an important part of flight planning both for pilot and crew and are expressed in kilometres or k.

K: Remarks, Warning, Thermal Activity, Etc. - This may contain anything from a strong wind warning to details of the availability of the next forecast.

L: QNH - This is a measurement of barometric pressure and will be used to set the altimeter on the balloon. The code 'QNH' is part of a series of information codes which go all the way back to the days of Morse code.

The two of these codes most often heard are QNH and QFE. Both are pressure settings in millibars to be applied to the altimeter. QFE refers to a particular point on the earth, usually an aerodrome runway. An aircraft altimeter set to an aerodrome QFE will read zero when the aircraft lands on the runway. A clear aid to landing with safety.

To move from one aerodrome to another, or in the case of a balloon, launch site to a landing site, it is important to be safe over all of the land in between. In order to do this an average pressure setting for the region should be set, this is known as the regional QNH. If the flight is to be conducted under the control of an Air Traffic Control unit, then the QNH issued by that unit must be used to provide safe separation of all aircraft.

M: Sunrise and Sunset - Given in local time and specific to the area of the forecast. The aviation definitions of dawn and dusk are 30 minutes before sunrise and 30 minutes after sunset. Flying outside these times is night flying and requires special training and qualifications.

N: Further Outlook - Future developments, this will help in the planning of other later flights.

O: Met Station - Issued at -The origin and time of issue of the forecast are important factors in applying the forecast and ensuring that the forecast is valid.

2.2 Operating Limits

2.2.1 A balloon must not be flown free or tethered in winds of greater than 15 knots on the surface or if there is any extensive thermic or cumulo-nimbus activity. Below 3000 feet above ground level (agl) and outside Controlled Airspace a balloon should have a flight visibility of at least 1500 metres, be clear of cloud and in sight of the ground. These conditions are known as Visual Meteorological Conditions, VMC.

2.2.2 Under low cloud the noise of the burner in flight is reflected toward the ground and may cause severe distress to livestock. For this reason it is recommended that a balloon should be able to reach 1000 feet agl whilst retaining sight of the ground.

2.2.3 Although it is legal to fly up to 30 minutes after sunset, flying into the dusk is to be discouraged. The BBAC expects all balloons to be landed before sunset, and earlier if possible.

2.3 **Take-off Site**

2.3.1 The direction that a balloon will fly after take-off is an important factor in selecting a take-off site. The balloon's track, the direction it is forecast to fly, will be the opposite of the forecast gradient wind direction. Hence a wind of "340°, 12kts" should cause the balloon to track across the land at 12 knots on a track of 160 degrees, (*track can be calculated by adding or subtracting 180 degrees from the forecast wind direction*).

2.3.2 Bearing in mind the direction that the balloon is forecast to fly a suitable takeoff site can be decided upon to avoid flying over difficult terrain, or for example into the sea! In the normal area of operations, pilots and crews will already know a number of sites that provide the ideal conditions for a takeoff site, and may already have the landowners permission to use them.

2.3.3 When choosing a new take-off site a number of factors should be considered.

- **Access** - Vehicle access should be as easy as possible, and should under no circumstances give any possibility of damage when entering, operating in or leaving the field.
- **Inflation Point** - Balloon inflation is best carried out where there is some shelter from the prevailing surface wind. Safety and public consideration however are overriding factors in choosing the actual inflation point. Once inflated the balloon should be able to takeoff without danger of collision with downwind obstacles. The balloon should be capable of inflation without touching obstacles to each side during inflation. A balloon is a large object and can roll from side to side in some conditions. Inflation should be carried out as far from dwellings, concentrations of people and animals as possible. The inflation should also be carried out such that a BBAC Sensitive Area is not breached during take-off or climb to flying altitude.
- **Permission** - If all of the conditions above can be satisfied the landowner's permission is required before inflation and takeoff can be completed. If the site is to be used regularly any conditions of use, such as "*not Sunday mornings*" or "*only balloons of the Loamshire Balloon Group*" should be agreed with the landowner. An agreed statement of conditions should be made in writing and signed by the landowner and participating pilots or group representatives.

2.4 **Maps**

2.4.1 Once the launch site has been decided upon and the forecast track of the balloon is known the maps required for the retrieve can be prepared.

2.4.2 Maps used in the UK for retrieve will normally be the Ordnance Survey 1:50000 scale Landranger series that represent the ground with conventional symbols at a scale where 1 cm represents 0.5 km.

2.4.3 Although most pilots will carry two sets of maps, one for flying and one for the retrieve, a well organised crew should be prepared to provide their own maps on their own home ground, marked with the latest information. It is worth highlighting the grid numbers for easy reference.

2.4.4 Maps marked up with the BBAC Sensitive Areas are an advantage for retrieving. Although a good retrieve can be made using unmarked maps advanced knowledge of where the balloon should not land, and any height restrictions in flight, will make following the balloon a lot easier.

2.5 **Bringing the Crew Together**

2.5.1 Three crew and a pilot is the minimum recommended team for operating a balloon of any size.

2.5.2 Bringing these people together at the right place and time may be the responsibility of the designated Crew Chief of the team.

2.5.3 Arranging to meet somewhere close to, but not on, the designated launch field is the preferred way of bringing the team together. Reducing the number of vehicles arriving at the launch field will ensure that there is the minimum of disruption or noise for neighbours and potential damage to the field. The only vehicle on the field itself should be the balloon-towing vehicle.

2.6 *Emergency Retrieve Number*

2.6.1 Even in these days of good radios and mobile telephones, communication can breakdown during a retrieve. Both Pilot and Crew Chief must have a guaranteed way of communicating with each other once they are both on the ground. A well-tried method is to designate an Emergency Retrieve Number, which will be answered by a third party who can then pass messages as appropriate. Balloon fiestas and meetings often provide this service; an individual team flying alone will need to make this arrangement for each flight.

2.7 *Retrieve Book*

2.7.1 The Retrieve Crew may need access to detailed information about the flight, the weather, the pilot and passengers, contact numbers, and emergency and incident control procedures. All of this information is best kept in a plastic 'display folder' with about 20 clear plastic display 'envelopes'. A suggested layout for this folder is at Annexe C. The basic formats suggested can be used within the envelopes, the information being written in water soluble pen on the envelope surface and cleaned after each flight. If crewing regularly for a particular balloon some information can be entered directly on the sheets.

Section 3: Equipment Layout and Assembly

General : Layout : Bottom End Assembly and Preparation : Envelope Preparation and Attachment.

3.1 General

3.1.1 Assembly of the various components of the 'Bottom End' (basket, burner, fuel tanks, etc.) and the 'Envelope' into a complete balloon will vary according to the Pilot's wishes, balloon type and manufacturer's flight manual. What follows is a generic method that should be used as a basis for gaining experience with different balloons and pilots.

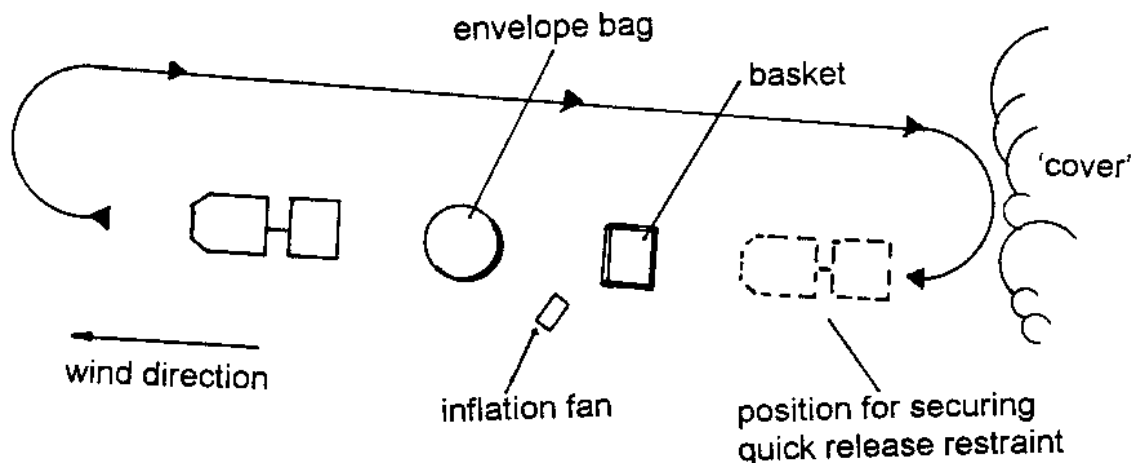


Figure 1 Take-off Site Layout

3.2 Layout

3.2.1 The balloon-towing vehicle should be positioned facing downwind, with the unloading doors, or trailer doors just beyond the point at which the basket is to be assembled. The basket should be positioned so that the 'quick release' restraint can be secured both to the burner frame and to a tether point. Normally this will be the front of the towing vehicle, which following unloading will be positioned 'behind' or upwind of the basket. Space needs to be left for this manoeuvre. The restraint can be attached to a suitable fixed object such as a tree, but damage to this object and the balloon, which could rest against the tree once inflated, should be considered.

3.2.2 The Basket, Fuel Tanks, Burner, Flexible Poles (uprights), Pole Covers (*suedes*) and Fan should be unloaded. The vehicle may be moved forward some 10 metres and the envelope, contained in its bag should be unloaded. (*On larger balloons it is common to open the envelope bag inside the vehicle or trailer and deploy the envelope by driving the vehicle forward.*)

3.2.3 The vehicle should now be positioned upwind of the basket such that the restraint can be attached to a suitable point on the front of the vehicle. Attachment to the front is recommended since the engine block is the heaviest part of the vehicle and will provide the greatest degree of security during inflation. Attachment to any part of an empty trailer although often convenient can lead to some interesting 'flying trailer' incidents and is to be actively discouraged.

3.3 Bottom End Assembly and Preparation

3.3.1 The basket should be positioned upright, and oriented as it will be in flight. Normally this means the step hole in one of the longer sides should be upwind.

3.3.2 If the fuel tanks are not already fitted in the basket this should now be completed. Tanks are placed in the basket corners, and secured by straps. Two tanks is the minimum required for flight. The layout of the tanks is unimportant if liquid pilots lights are in use. For vapour pilot lights at least one Master tank and one Slave are required. A Master Tank has a Pilot Light vapour off-take valve (*normally red*) and connection, as well as a liquid off-take valve and connection for the main burner. A Slave Tank has only a liquid takeoff and valve. If a double burner is to be used two Master tanks will be required.

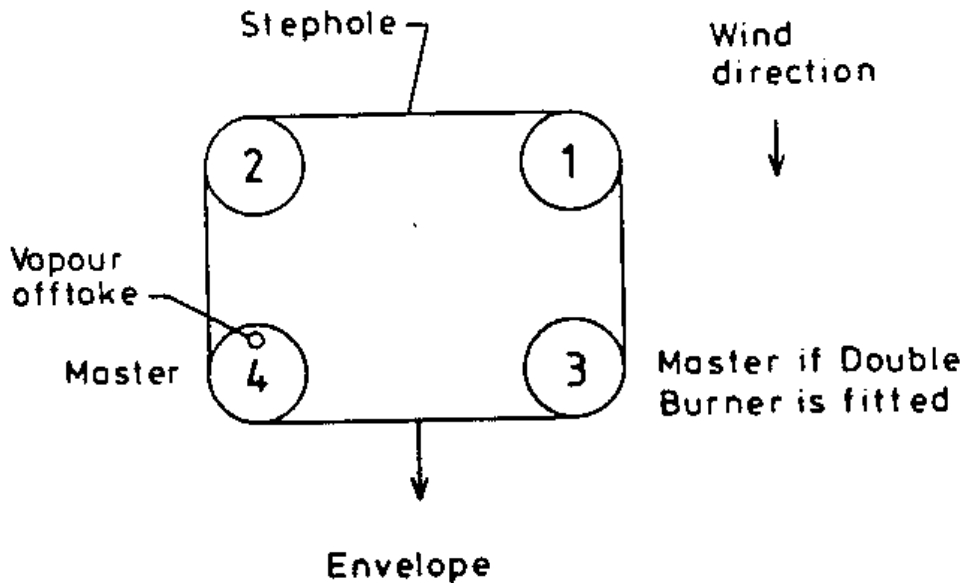


Figure 2 Flight Tank Layout in Upright Basket

3.3.3 Master tanks should always be fitted at the downwind, front side of the basket. The vapour takeoff point should be positioned away from the front side of the basket so that when the basket is placed on its side for inflation the valve is at the top rim of the tank. This will ensure that vapour and not liquid is taken off during inflation. Slave tanks should be fitted such that the liquid takeoff will be at the lower rim of the tank when the basket is placed on its side for inflation.

3.3.4 The four nylon poles should be fitted to the basket sockets once the tanks are secure. The burner is placed such that the corner sockets engage on the top of the poles, and the burner pressure gauges are to the rear, upwind side of the basket. Many Pilots and Crews find it easier to fit the burner to the poles on the ground and then hoist the poles and burner into position in the basket sockets.

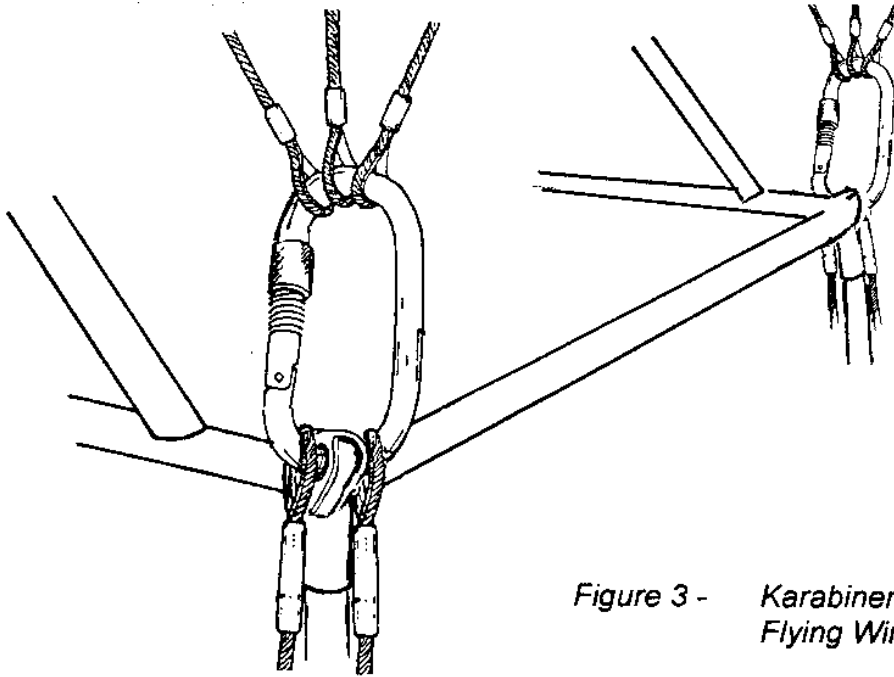


Figure 3 - Karabiner / Burner Frame / Flying Wire connections

Figure 3 Karabiner / Burner Frame / Flying Wire Connections

3.3.5 Karabiners that pass through the eyes of the basket cables and the burner corner lugs secure the burner and poles to the basket. The karabiners when correctly fitted should stand upright, screwgates closing upwards and on the outer corners of the burner frame. The straight sides of the karabiner should be toward the centre of the long sides of the burner frame, this will ensure that the loads from the restraint tether are taken on the straight sides of the karabiner and not on the screwgate. In order to achieve this take the karabiner, open the gate and pass it through the basket cable eye, and burner lug in a motion toward the centre of the burner longest side. Where required pass through another basket cable and close the karabiner, but do not screw up the screwgate. Now work the karabiner round, moving toward the outside of the basket until the desired position is achieved.

3.3.6 Fit the padded covers (suedes) enclosing the poles, cables and fuel hoses, Start the zips when fitted at the top and close downwards. Vapour hoses where fitted in the downwind pole covers, liquid hoses in the upwind pair. ensure that there is sufficient slack at the top of the hose for full and free movement of the burner gimbals. Some makes of balloon have the fuel hoses outside the covers. Balloons fitted with rotation vents normally have the hoses down the back poles.

3.3.7 The fuel hoses can now be connected to the appropriate tanks. Tanks should be connected according to the Pilot's wishes. The normal method where four tanks are fitted and a vapour pilot light is in use, is to place the tanks with vapour connections downwind, liquid upwind. Where a tank is not fitted the fuel connection moves forward to the corresponding downwind tank that will now supply both vapour and liquid fuel. The Pilot is normally responsible for turning on the fuel.

3.3.8 If the Pilot wishes to carry out a burner test it should be completed now. Just before using the main burner or the whisper burner, during the test, the Pilot should warn the crew by saying 'Burner Test' at a volume they can all hear.

3.3.9 Once the burner test is completed the Pilot will have closed all valves and vented or 'burnt out' all hoses. The basket should now be placed on its side, the burner downwind, be careful the burner coils may be hot. Before this manoeuvre is undertaken the Crew Chief should check that all fuel valves are closed and hoses are vented.

3.3.10 Once the basket is laid on its side the burner should be pointed toward the ground for safety.

3.3.11 The restraint 'V' bridle should be fitted to the upper karabiners with the basket laid on its side. The restraint 'V' bridle karabiners should be screwed closed, those on the burner frame left open. The security device of the restraint quick release, normally a pin with a red streamer, should be checked as correctly in place.

3.4 Envelope Preparation and Attachment

3.4.1 The balloon envelope will have normally been packed away in the envelope bag with the bag lid flap downwind, positioning the bag in this orientation may assist in unpacking the envelope without twists.

3.4.2 The flying wires and bottom nomex panels, including the scoop should be removed from the bag with care. Also ensure that the free ends of the ripline and any control lines are freed from the envelope bag.

3.4.3 The easiest way to ensure that the flying wires are attached in the correct way, and not twisted or kinked is to lay out the mouth of the envelope on the bag, spreading the wires 'spiders web' style.

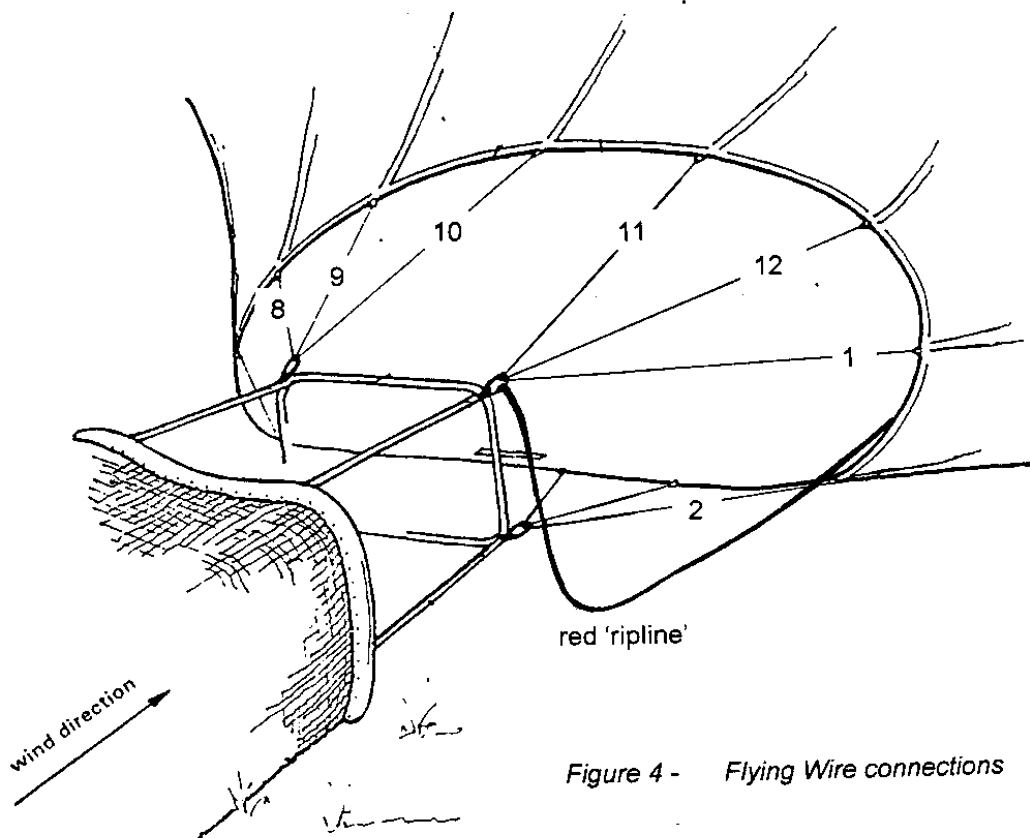


Figure 4 - Flying Wire connections

Figure 4 Flying Wire Connections

3.4.4 Flying wires are numbered at the sleeve that protects the attachment between the wire and the load-tape. The sleeves are often in coloured groups, an 8-wire envelope will have 4 groups of 2 wires, and a 12-wire envelope will have 4 groups of 3 wires, and so on. The number 1 wire always attaches to the upper left karabiner viewed from the envelope bag, and is the lowest of its group of wires. Hence, in a 12-wire configuration, viewed from the envelope bag the wires attach as; upper left 1,12,11 - upper right 10,9,8 - lower right 7,6,5 - lower left 4,3,2.

3.4.5 Attach the lower wires first. Taking them from the 'spiders web' layout place the wires between the fingers of one hand and move down the wires to the eyelets. Ensure that the scoop is outside, beneath, all of the lower wires. Feed the wires in the correct sequence onto the karabiner. Repeat the process with the upper sets of wires.

3.4.6 Check the attachment of the wires by lifting the upper, innermost wire and following it back to the sleeve. Lift this sleeve, follow the edge of the balloon mouth to the next sleeve checking that the wires from the two sleeves are not crossed. Continue the process until the lowest wire has been checked. Repeat the process on the other side of the mouth. Once this check has been carried out all four screwgates on the karabiners can be screwed shut, thumb tight and then moved back one quarter of a turn to prevent jamming when under load.

3.4.7 The red ripline should be attached to the upper left karabiner, below the number 1 wire, by its clip. Some pilots like the ripline to be knotted round the burner frame as well as clipped to the karabiner. Other control lines, and steering vent lines should be attached as the Pilot directs.

3.4.8 The Pilot or Crew Chief should check:

- Vehicle handbrake on and in gear. Keys in ignition.
- Restraint correctly attached to vehicle or other suitable point.
- Restraint attached to upper burner karabiners, restraint karabiner screwgates closed.
- Flying wires correctly attached and all burner karabiner screwgates closed.
- Ripline (red) attached to burner karabiner at wire 1.
- Other control lines attached as required.

Once this has been done the envelope is deployed by walking forward with the envelope bag, allowing the envelope to unpack. Larger balloons may be deployed by driving forward with the bag in the vehicle or trailer, the envelope being guided out to avoid damage. The envelope bag should be folded and attached to the basket if required.

3.4.9 The envelope fabric should be spread out pulling sideways on the load tapes only. A good guide to which tapes to pull is to follow the top wire of the bottom set first on each side, followed by the bottom wire of the upper set on each side. The Crown Line should be deployed downwind to its full extent. During the layout the envelope should be checked by all crew members for any form of damage the pilot should be informed of any damage detected. The envelope bag should be packed away, and normally attached round a pole at the rear of the basket. Do not attach round a fuel hose.

3.4.10 The balloon is now ready for cold inflation.

Section 4: Crew Duties and Briefing

General : Crown Line Crew : Mouth Crew : Inflation Fan Crew : Crowd Control : Fire Extinguisher : Retrieve Briefing.

4.1 General

4.1.1 Before the noise of inflation starts the Pilot should ensure that all members of the crew are briefed as to their duties. This requirement may be delegated to the Crew Chief.

4.1.2 Crew members can carry out one or more of the following duties :

- Crown Line
- Mouth
- Inflation Fan
- Crowd Control
- Fire Extinguisher

4.2 Crown Line Crew

4.2.1 The Crown Line is used to restrain the balloon during inflation. This ensures that the balloon does not oscillate, and does not rise until it is buoyant enough to pull the basket upright.

4.2.2 One person is usually sufficient for this task on balloons up to 90,000 cubic feet volume. In adverse, gusty conditions two people may be used on the crown line with the knowledge of the Pilot.

4.2.3 During the early part of the cold inflation the crown line crew will assist the Pilot in securing the Parachute Valve in the top of the envelope. The parachute valve is fixed by centring lines to the upper part of the envelope. An arrangement of pulleys and a fixed attachment point enables the parachute valve to be pulled down into the envelope in flight, by the rip line. This enables hot air to escape from the envelope and will cause a descent of the balloon. To keep the parachute valve in place during inflation it is secured by 'Velcro' tabs on the envelope and parachute valve. The tabs are numbered on the envelope, and numbered at the point at which the centring lines are attached to the parachute valve, the tabs may also be colour coded. The two similar numbered tabs should be brought together and sealed. There are often intermediate tabs between the numbered tabs.

4.2.4 As the envelope fills with cold air, the deployment of the load tape web at the crown and the correct attachment of the crown rope should be checked. The parachute lines should also be checked to ensure that they are not tangled round the pulley, and that the rip line has not become disengaged from the pulley.

4.2.5 Hot Inflation Signal - The Pilot will agree with the Crown Crew a signal which can be made from the basket end of the layout to the Crown Crew. This signal will normally be a 'thumbs up' from the pilot. A reply from the Crown Crew of 'thumbs up' will indicate to the pilot that all is well with the top of the envelope and that hot inflation can commence. Any 'thumbs down' should be investigated by the Pilot.

4.2.6 Crown Crew Briefing

- Refuse all offers of assistance from onlookers.
- Inform the pilot if anything looks wrong at the top of the envelope.
- Always stay at the end of the crown line - do not attempt to feed out the rope.
- Do not loop the line around your body or limbs. The most effective technique is to face the balloon with the rope passing over one shoulder, diagonally across the back and down the outside of an arm, with the hand in the loop at the line end. The free hand can be used in front of the body to steady the line.
- During Hot Inflation - Slowly let the balloon rise until the whole parachute valve is visible. Then resist any further rise until this is no longer possible. If the envelope moves from side to side follow the movement, don't fight it.
- Move forward step by step, under control until the balloon is vertical.
- Wait with the crown line slack until the Pilot calls you in.
- Clip the crown line to a karabiner on the burner.
- Stand by the basket ready to restrain it.
- At no time allow yourself to be lifted from the ground - let go first.

4.3 *Mouth Crew*

4.3.1 Two members of the crew assist the inflation by holding open the mouth of the envelope. They should stand outside the wires, and by lifting at the wire sleeves create the largest opening possible. If the lower lip of the envelope is lifted by the fan draft it may be restrained by trapping the lower wires under a foot, but care should be taken not to become entangled.

4.3.2 The Pilot will indicate to the mouth crew that Hot Inflation is about to start by giving a 'thumbs up' to each member of the mouth crew. If happy to proceed with the inflation the mouth crew will reply with a 'thumbs up'. The Pilot should investigate any contra indication. The Mouth Crew should watch the pilot throughout the inflation.

4.3.3 During hot inflation mouth crew may move behind the lower, Nomex, fire resistant panels of the envelope, whilst retaining control of the mouth.

4.3.4 As the envelope fills first with cold air and then with hot air the mouth crew should pass the edge of the mouth hand over hand, enabling the mouth to fully deploy and open. Control should be retained by continuing to hold a convenient wire sleeve. As the envelope rises during the final phases of hot inflation the mouth crew should allow the envelope to rise under control until it rises beyond reach.

4.3.5 The mouth crew may be asked by the Pilot to attach the scoop to the downwind karabiners. The crew should ensure that the Pilot is aware that this is about to be done. The Pilot should not burn whilst the crew are carrying out the operation.

4.3.6 Once the envelope is upright, and the scoop is secure the mouth crew should stand on each side of the basket, assisting the restraint of the basket by placing 'hands on' the rim of the basket.

4.3.7 Mouth Crew Briefing

- Wear full body cover, with clothing and gloves of natural or heat resistant fibre.
- Present the pilot with a fully open envelope mouth, in front of the burner.
- Hold the mouth at the wire / load tape sleeve. If needed trap a lower wire under a foot. Do not step inside the wires.
- Mouth Crew on the Pilots right may need to hold the red ripline slack away from the burner flame.
- As the envelope rises change your grip toward the lower edge of the mouth. Do not hold onto the scoop, but once the envelope is vertical, under the pilots instruction attach the scoop to the downwind karabiners.
- Assist with the restraint of the basket.
- Do not allow yourself to be lifted off the ground - let go first.

4.4 Inflation Fan Crew

4.4.1 The inflation fan is driven by a petrol engine, and rotates at high speed. It is probably the most dangerous piece of ballooning equipment. A member of the crew must be briefed to ensure the safe use of the fan. The member of crew may be a dedicated fan crew where possible, but may combine this task with the of mouth crew (normally the crew to the left of the Pilot).

4.4.2 The fan crew should check during the equipment layout that there is sufficient fuel in the engine tank to complete a full inflation.

4.4.3 The fan crew should be familiar with the controls of the fan motor, the ignition switch, fuel control and throttle, and choke.

4.4.4 The fan should be positioned as required by the pilot, normally on the left of the pilot, level with the basket top, and about one meter from the basket. The fan should face such that the airflow created will enter the envelope through the mouth. If there are methods of preventing the fan moving such as wheel brakes, or lowered wheels these should be engaged. A fire extinguisher must be available for immediate use of the fan crew.

4.4.5 The fan should be started when indicated by the Pilot, and run at reduced throttle until the parachute valve is secure. As indicated by the Pilot the fan should then be run at increased throttle to fill the envelope with cold air. It may be necessary to move or tilt the fan to ensure the most efficient filling of the envelope.

4.4.6 The fan should be run at high throttle during the initial phase of the hot inflation, but the speed should be progressively reduced until the lower edge of the envelope lifts from the ground at which point and on the Pilots signal the fan should be switched off.

4.4.7 The fan controls should be returned to normal travelling state, (ignition off, fuel off, choke engaged). The fan should then be cleared from the immediate area, alongside the vehicle or trailer is a good safe place. The fan should never be moved when running.

4.4.8 Fan Crew Briefing

- Ensure that you are familiar with the fan controls.
- Ensure that there is a fire extinguisher easily available to you.
- Agree a set of hand signals with the pilot for, 'Hot inflation about to start' ; 'Reduce fan speed' ; 'Stop fan and clear fan from area'.
- Direct the output from the fan into the mouth.
- If you see any problems with the inflation 'blimp' the throttle as a signal to the pilot and crew. If there is a major problem cut the fan and take action.
- Return the controls to travelling state and place the fan in a safe place once the fan is finished with during inflation.

4.5 **Crowd Control**

4.5.1 Balloons create a great deal of interest and a crowd will often assemble to watch a balloon inflation and take-off. Civil Aviation Authority rules state that only persons directly involved with a balloon, the Pilot and Crew, should be near the balloon during preparation, inflation and take-off. An indicated safe distance from all elements of the balloon for the public is 20 metres.

4.5.2 Where possible a member of crew should be briefed to be responsible for crowd control. If no specific crew member is available the Crew Chief should combine this duty with others.

4.5.3 At the start of the layout ask people to stay away from the balloon equipment. Ask the crowd to remove equipment, such as pushchairs and bicycles to the safe distance.

4.5.4 The interesting part of the balloon is the basket area and this is where most crowds will gather. Do not ignore the rest of the area however, regular movement round the balloon, as part of the inflation checks should ensure that the crowd is kept to a safe distance.

4.5.5 One surprisingly simple but effective way of keeping the crowd back is to lay a spare tether rope in a circle from the front wheels of the restraint vehicle, round the basket and under the envelope about 10 metres up the envelope. Once asked not to step over the rope most people will respect the request. This method does of course require preparation during the layout, before the envelope is laid out.

4.5.6 Where possible crew should wear team shirts, ballooning shirts or other recognisable clothing identifying them as crew. Again reasonable members of the public will recognise the crew and not impede the progress of the inflation and take-off.

4.6 **Fire Extinguisher**

4.6.1 At least one fire extinguisher should be available in the area of the fan and basket during inflation.

4.6.2 One member of crew may be designated as the fire extinguisher operator. This member of crew should be familiar with the controls and use of the extinguisher.

4.6.3 Fire extinguisher crew should remain in the area of the basket during inflation and react as required to any fire situations.

4.7 Retrieve Briefing

4.7.1 The Pilot should give the Crew Chief a Retrieve Briefing. This brief should cover -

- Expected track of the flight.
- Expected duration of the flight.
- Any planned intermediate landings or flight exercises.
- Contact mobile telephone numbers of Pilot and Crew Chief (where appropriate).
- Emergency Retrieve Telephone Number.
- Any special instructions regarding routes or driving conditions.

4.7.2 The Retrieve Briefing is often best given before the noise and activity of the inflation starts.

Section 5: Inflation

Cold Inflation, Hot Inflation

5.1 Cold Inflation

5.1.1 The Pilot or Crew Chief should again check:

- Vehicle: handbrake on and in gear. Keys in ignition.
- Restraint attached to vehicle or other suitable point.
- Restraint attached to upper burner karabiners, restraint karabiner screwgates closed.
- Flying wires correctly attached and all burner karabiner screwgates closed.
- Ripline (red) attached to burner karabiner at wire 1.
- Other control lines attached as required.

5.1.2 Crew Briefing - The Pilot should tell all crew that cold inflation is about to start. The crew should take the positions for inflation as they have been briefed. If radios are to be used for the flight, a Radio Check for communication between the balloon and the retrieve vehicle should be carried out at this point, before the noise of the inflation starts. (see Annexe D for Radio Procedure)

5.1.3 The Pilot assisted by the crew will continue to check that the envelope is filling with cold air and that all attachments and controls remain ready for hot inflation and flight.

5.2 Hot Inflation

5.2.1 The pilot assisted by the Crew Chief if required should make the following checks:

- Vehicle handbrake on and in gear. Keys in ignition.
- Restraint attached to vehicle or other suitable point.
- Restraint attached to upper burner karabiners, restraint karabiners screwgates closed.
- Flying wires correctly attached and all burner karabiner screwgates closed.
- Ripline (red) attached to burner karabiner at wire 1.
- Other control lines attached as required.

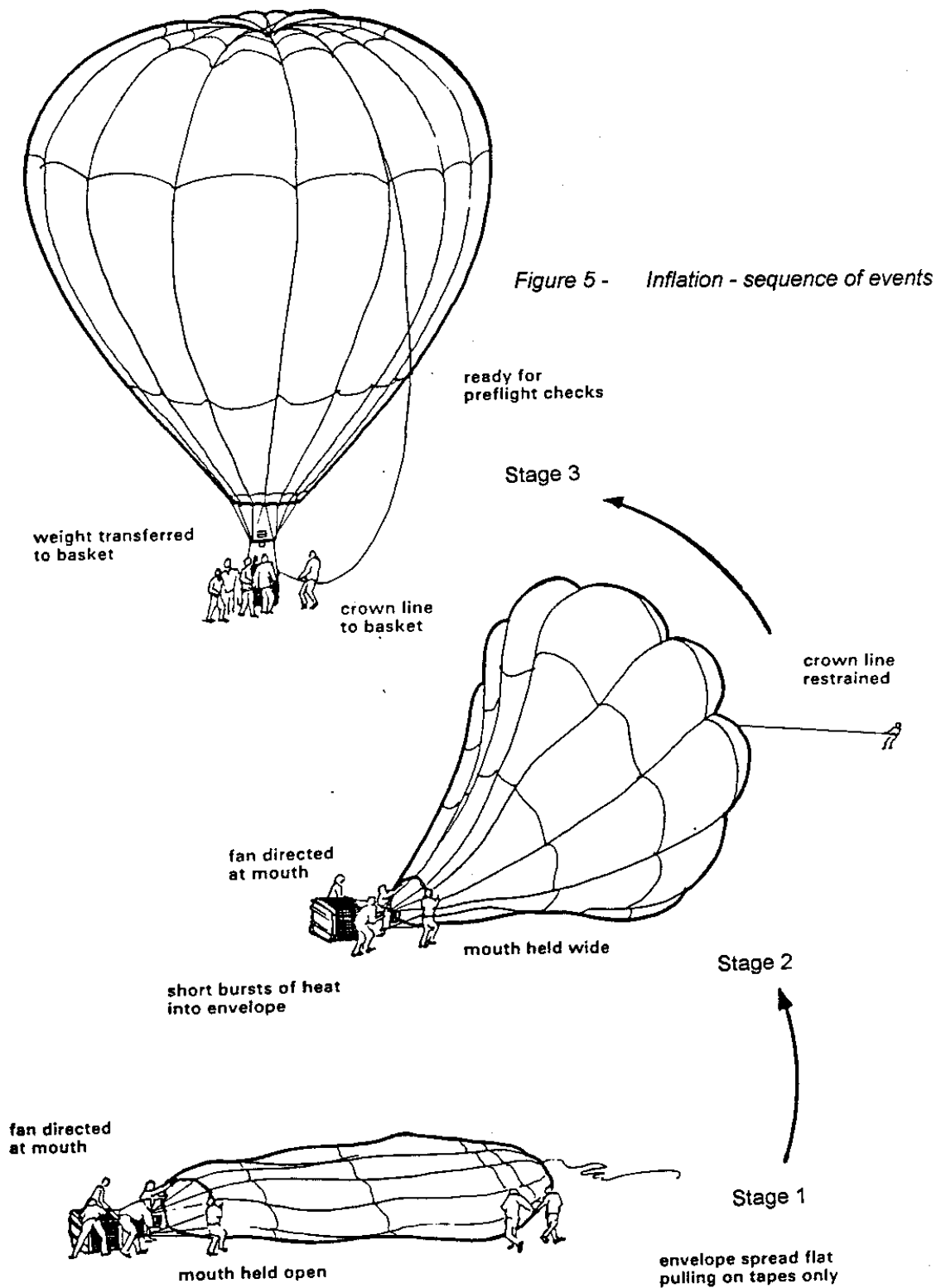


Figure 5 - Inflation - sequence of events

Figure 5: Inflation - Sequence of Events

5.2.2 The Pilot should signal to the Crown Crew that Hot Inflation is about to start and should receive a 'thumbs up' from the Crown Crew. Similar signals should also be exchanged between the Pilot and Mouth Crew before hot inflation is started.

5.2.3 All crew members should carry out the tasks they have been briefed for during the hot inflation. Once the balloon is upright all crew should assist the Pilot in preparations for take-off by placing 'hands on' the basket. The Pilot should complete all pre take-off checks and brief any passengers. The balloon is then ready for take-off.

5.2.4 Where radios are being used a second radio check between balloon and retrieve should form part of the Pilots pre take-off checks.

Section 6: Take-off and Post Take-off

Take-off : Post take-off

6.1 Take-off

6.1.1 The Pilot will normally ensure that the balloon is buoyant and ready to fly whilst the crew steady the basket. The Pilot will remove the safety pin from the restraint quick release and ask for 'all hands off', the Pilot may ask for 'hands on' again repeating the 'off' and 'on' until the balloon is buoyant. If the pilot calls 'hands off, stand clear' Crew should step away from the basket and raise their hands so the Pilot can see them. Crew members should ensure that they are clear of the restraint and quick release during take-off.

6.1.2 In congested take-off sites, in company with other balloons, a member of crew, normally the Crew Chief, will stand well clear of the balloon in a position where the airspace immediately above the balloon can be seen. This member of the crew should indicate to the Pilot when a take-off will be safe, and that no other balloons are passing immediately over the balloon. This is best done by maintaining a 'thumbs down' signal changing only to 'thumbs up' when a safe take-off can be completed. At large balloon meets there are often 'launchmasters' who will perform this task.

6.2 Post take-off

6.2.1 The Crew Chief should note the time of take-off. The Crew Chief now assumes responsibility for the retrieve crew.

6.2.2 All equipment should be packed away in the vehicle and trailer, and secured for movement. Any Flight cylinders should be secured upright.

6.2.3 Retrieve crew members should be assigned duties of Driver, Navigator, and Radio Operator.

6.2.4 The Crew Chief should inspect the take-off site to ensure that all equipment has been loaded and that no damage has been caused.

6.2.5 When possible a compass bearing on the balloon should be taken after a few minutes. This will give an indication of the balloon's Track, and will greatly assist in the early moments of the retrieve.

6.2.6 The retrieve vehicle should then be directed out of the take-off site, respecting all Landowner Relation rules as appropriate.

Section 7: Retrieve

General : Following the Balloon : Incident Control : Making Contact : Landowner Relations : Retrieve Entry to the Landing Field : Packing up the Balloon : Post Flight Landowner Relations

7.1 General

7.1.1 If flying a balloon is a science then carrying out the retrieve is undoubtedly an art!

7.1.2 The basic principle of a retrieve is, of course, to follow the balloon, and under ideal circumstances to be at the landing site as the balloon lands. Balloons fly almost straight tracks in normal weather conditions, there will be slight variations according to flying altitude, but in general the flight path will not vary from a general track direction. UK country road systems do not follow such simple rules. On average a retrieve will travel some 4 to 6 times as far as the balloon during a retrieve. This means of course that the retrieve will also travel much faster than the balloon.

7.1.3 Navigation for the retrieve is a skilled task, involving navigating the vehicle, and plotting the course and predicted course of the balloon.

7.1.4 Many navigators read the road ahead out to the driver, much as rally navigators do. The navigator needs to be sure at all times of the vehicle position, using any information from the map to verify the position. When informing the driver of the balloons position the navigator can use the clock method, where 12 o'clock is directly ahead and 9 o'clock is to the left. Giving an estimated distance and altitude will also assist in detecting the balloon.

7.1.5 The actual map reading carried out by the navigator should be methodical and of course accurate. It is often a good idea to mark the map with a soft pencil, ringing road junctions as the retrieve goes through them, and marking confirmed balloon positions with a cross. A time noted against balloon positions will assist in calculating the balloon's airspeed.

7.1.6 Good teamwork between the navigator and driver should ensure the safe passage of the retrieve. Decide on direction at junctions before the junction, not on it. Park well off the road, clear of other traffic, drive at moderate speeds, in particular on country roads. The retrieve is just as capable of upsetting the local people by bad driving as the Pilot may be by bad flying.

7.2 Following the Balloon

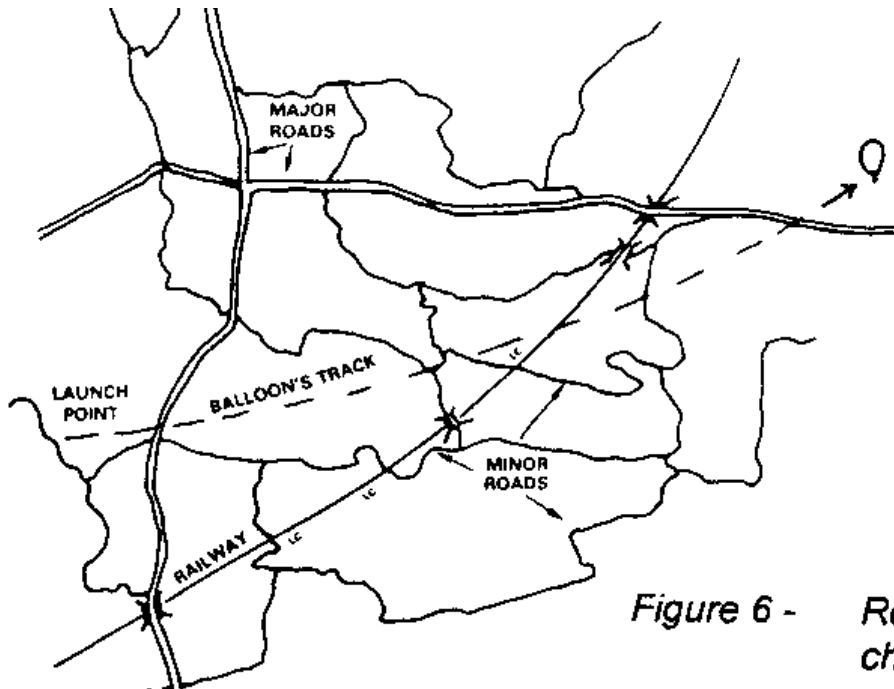


Figure 6 - Retrieve - choice of routes

Figure 6 Retrieve - Choice of Routes

7.2.1 Remember other road users will find the sight of the balloon a novelty, and may drive in an unpredictable manner, the driver needs to take extra care when in traffic.

7.2.2 There is a simple choice to be made, follow the balloon as closely as possible using all available roads, or predict the balloon's track and use more major roads to get ahead to the expected point of landing. (Basic map reading techniques are detailed in Annexe E).

7.2.3 The method used is often a personal preference, dictated also by the expected speed of flight and the nature of the country and road system.

7.2.4 During slow flights it is often possible to keep up with the balloon, and in effect remain underneath for the whole flight. Under these circumstances the retrieve will often witness the landing and be able to start the process of obtaining the landowners permission to complete the retrieve by entering the landing field.

7.2.5 During faster flights or in difficult country it is often better to predict the balloons flight track, and by finding a linear road the balloon should cross, moving quickly ahead to that feature. If it is possible to stop in a safe place giving a view of the approaching balloon it may be possible to predict where the balloon will cross the feature move the retrieve directly to that point. A series of such manoeuvres will give a confirmed track for the balloon and will make each step of the retrieve easier.

7.2.6 Unless that balloon is seen landing the most difficult part of the retrieve is immediately after landing. Where possible the Pilot will have given a landing warning such as "Landing in 2 minutes", and may have been able to indicate an OS Grid square or indication such as " 2 Kilometres West of Loamville" for the landing. If such warnings are given the retrieve should approach the indicated area and wait. It is very tempting to dash about the countryside looking for the balloon, but this is seldom productive save in additional practise in trailer backing and manoeuvring.

7.3 Incident Control

7.3.1 Unfortunately in very rare circumstances, during the flight, some form of incident may happen to the balloon, retrieve, or concerning the land over which the balloon has flown.

7.3.2 Such incidents can be very stressful unless an agreed strategy has been put into place. This strategy will involve the availability of information, contact telephone numbers and standard procedures. Notes on Incident Control are at Annexe F.

7.4 Making Contact

7.4.1 The Pilot will attempt to make contact with the retrieve as soon as the balloon is secure and safe following the landing. Air band radios are not designed to work ground to ground and therefore may not be the best method of contact. As a general rule the Retrieve Crew should not initiate radio calls. Constant retrieve 'chatter' on the radio is unprofessional and may be a danger to other balloons still airborne. Mobile phones are a secure method of communication, but must not be used in flight. The use of the Emergency Retrieve Number system will ensure contact between retrieve and balloon.

7.4.2 The minimum message to be passed should be of the nature "*Landed at Grid 123456, approach from the South East*". Where the contact may be difficult a rendezvous may be designated a little way from the landing point. A member of the flight crew should then walk out to that point in order to brief the retrieve. This procedure prevents unnecessary driving about in an area, which is likely to be owned by the same landowner as the landing field.

7.4.3 The retrieve may be able to ask local spectators about the balloons flight and landing, but beware they are not used to seeing balloons and may badly out on their estimates of direction of flight and landing places.

7.4.4 In close country, or where the balloon is out of sight of the road, a marker placed at the access gate to the landing field can be of assistance to the retrieve. Markers may be a small flag, competition streamer or even a fuel tank placed in the gateway and in clear view from each approach direction.

7.5 Landowner Relations

(See Annexe G for details of the BBAC Code of Conduct)

7.5.1 No vehicle and no persons additional to the flight crew should enter the landing field without the landowner's permission. The next task of the retrieve is therefore to obtain this permission. Some pilots elect to travel with the retrieve to carry out this task.

7.5.2 Local spectators may be able to indicate the landowner's name and location, failing this a call at the most local farm or house may provide the same information.

7.5.3 Face to face meetings are preferable with landowners, but in the case of remote landowners a phone call may be sufficient. Needless to say all instructions given by the landowner should be obeyed to the letter. The majority of landowners are very helpful suggesting the right way to approach the field and other 'lie of the land' information.

7.5.4 It should be remembered that the 'no vehicles on the land without permission' rule applies to farmyards and drives as much as fields. Sweeping down the drive unannounced, or turning the trailer in the farmyard will not endear you to the landowner, in particular at the end of early morning flights. In all cases put yourself in their shoes, what would you think?

7.6 Retrieve entry to the Landing Field

7.6.1 Where the balloon can be seen from the entry gate the retrieve should drive to the balloon using the edges of the field until at the closest point to the balloon. No other vehicle or person should enter the field. Drawing the retrieve vehicle up to the balloon some 2 metres away and alongside the basket will make loading easy and will prevent unnecessary driving around in the field. Where the balloon cannot be seen from the gate a member of the flight crew should guide the retrieve from the entry gate.

7.6.2 When permission for vehicle entry cannot be obtained or is denied the balloon will be 'carried out'. The retrieve vehicle should be positioned in a safe location close to the landing field gate or other access point. A member of crew should remain with the vehicle. All other members of the crew should assist in packing up and carrying out the components of the balloon. Spectators should be discouraged from entering the field and 'helping'.

7.7 Packing up the Balloon

7.7.1 Now that the balloon and crew are together the Pilot assumes responsibility for the whole crew and it's actions.

7.7.2 The first priority is to pack up all of the balloon equipment and leave the field in a safe, professional and quick manner. When passengers are present and not required to assist with the packing up they should leave the field and get into the passenger retrieve vehicle. This is not the time or place for post flight celebrations, or story telling.

7.7.3 Packing up is the direct reverse of the layout and assembly. Before starting the Pilot or Crew Chief should check that the fuel is turned off at the tanks and that the fuel lines have been vented.

7.7.4 The crown line should be recovered and coiled at the crown of the balloon. If the landing has resulted in a 'drag landing' the crown line may still be attached to a karabiner on the burner frame, the line being underneath the spread envelope. Unclip the crown line and free it from the envelope by lifting the fabric clear. Do not attempt to pull the crown line free as this can damage the envelope. If the crown line is damp it can be put into a plastic carrier bag, inside the envelope bag, to prevent the damp spreading to the fabric. If this is done and the balloon is then stored for some time the crown line needs to be released to dry out.

7.7.5 The envelope should be lifted with care to form a fabric 'sausage' downwind from the basket. It may be necessary to expel the air from the envelope by carefully crawling up the sausage, keeping feet off the fabric, from basket to crown. Safety of the fabric is of course vital here if the nature of the ground, or for example stubble from an old crop may damage the envelope it is better to squeeze the air out between the knees, and hence off the ground.

7.7.6 The envelope can now be packed away in the envelope bag using any method favoured by the Pilot. Flying wires should only be detached from the karabiners when the majority of the envelope is in the bag. Flying wires should be placed on top of the lower Nomex panels of the envelope according to the Pilots instructions and covered by the scoop before the bag 'lid' is placed over the envelope and the envelope bag secured.

7.7.7 The basket should be de-rigged in the upright position each item of equipment being packed away as required and placed where appropriate back in the basket. Fuel tanks requiring refuelling may be removed at this time and placed in the vehicle or trailer separately.

7.7.8 All equipment is then loaded in the vehicle or trailer. A final inspection of the site is made by the Pilot or Crew Chief and the retrieve departs the field, leaving all gates as found.

7.8 Post Flight Landowner Relations

7.8.1 Where no Landowner contact has been possible and a 'carry out' performed, details of the balloon, pilot, time and place of landing should be left at the landowners farm, house or office.

7.8.2 Where permission has been given it is courteous to call quickly on the landowner, explaining that the balloon is now clear of their land and thanking them again for the co-operation.

Section 8: Refuelling

Properties of Liquid Petroleum Gas : Storage and Handling : Refuelling Procedures : Emergency Procedures

- Only re-fuel if you have been trained to do so. There are a number of different storage and refuelling methods. Always ask if you are not familiar with a particular set up.
- If you have not refuelled from 104s or using a hand pump, electric pump or gravity always ask.
- If you are refuelling at a new site always ask how the owner wants things done. The tank owner will take the view that you are acting safely, not that you do not know what you are doing: *"I have not re-fuelled here before can you please explain how you prefer it to be done"*

8.1 Properties of Liquid Petroleum Gas

There are a number of Liquid Petroleum Gases (LPG) but Propane is the one most normally used as fuel for balloons.

8.1.1 Propane is highly inflammable, even in small quantities, when mixed with air. A proportion of some 2% to 10% of propane in a propane and air mixture is flammable. Atmospheres containing over 10% Propane can be explosive.

8.1.2 Propane is colourless as a gas, but will be seen as a liquid white spray when vented from a fuel tank. In the natural state propane is odourless, for this reason an odour is mixed with the gas to aid the detection of leaks.

8.1.3 Propane is almost one and one half times heavier than air. For this reason any free gas will collect in containers, hollows in the ground and for example in drains.

8.1.4 Liquid propane can cause severe cold burns when in contact with the skin and can damage the eyes. When propane is changing from a liquid to a gas there is a sharp drop in temperature which causes cold burns on the skin. This drop in temperature can also cause water vapour to freeze inside an open valve blocking it open.

8.1.5 Propane is stored as a liquid under low pressure. The gas 'boils off ' when this pressure is released. Propane at 20 degrees Celsius is at a pressure of some 100 pounds per square inch. When released one volume of liquid propane will form some 270 volumes of propane gas.

8.2 Storage and Handling

8.2.1 Propane for ballooning will be supplied or stored in a bulk tank, in 47kg supply cylinders ('red tops' or '104s') or in balloon fuel tanks. The following sections deal with the handling of tanks or cylinders, bulk tanks should be installed and used in accordance with the suppliers recommendations. All cylinders, vehicles or trailers used for transporting LPG cylinders and all storage areas should be signed with LPG hazard and 'No Smoking' signs.

8.2.2 It is recommended that the number of cylinders or tanks stored should be kept to a minimum. No more than 4 flight tanks should be stored together.

8.2.3 Cylinders should always be stored in a well-ventilated area, and away from drains and hollows in which any escaped propane could collect. Cylinders should be stored at least 4 meters from all sources of ignition such as electrical appliances, switchboards and naked flames. They should not be stored with other combustible fuels or where the cylinder will be exposed to excessive heat.

8.2.4 When moving cylinders treat them with respect. Larger cylinders may need two people to carry them. When LPG cylinders are transported in vehicles or trailers they should be secured to prevent movement. Cylinders should, whenever possible, be secured upright as the pressure relief valves only work correctly when in vapour. All vehicles or trailers used to transport LPG cylinders should be equipped with low level vents that allow the escape of any leakage, preventing a build-up into a potentially explosive mixture.

8.2.5 If a cylinder or flight tank is found to be leaking and the leak cannot be prevented the cylinder should be removed to an open area, away from public and thoroughfares. Warning notices 'Leaking gas - no naked flames or smoking' should be erected in the area and the cylinder supervised until all gas has been vented. The cylinder should then be returned to the supplier, or authorised repair station.

8.2.6 When fitting fuel or refuelling hoses ensure that all mating surfaces are undamaged, and clean of dirt or grease. After connecting hoses check for leaks by feel, smell and sound. Confirmation of a leak can be made using soapy water or a proprietary bubble spray. Don't look for leaks in the dark with a naked flame!

8.2.7 The most effective way to fight a propane fire is to turn off any source of liquid or vapour. If this is not possible then a dry powder (blue), or BCF (green) fire extinguisher should be used to extinguish the flames, the source of the vapour or liquid gas being turned off as soon as possible once the flames are extinguished.

8.3 Refuelling Procedures

8.3.1 Choose a well-ventilated refuelling area, where any vapour or gas can disperse readily and where the sounds of refuelling will not disturb neighbours. Remember that on still days the vapour or gas may remain in the area for some time after refuelling has been completed. Grass or earth sites are preferred. Hard or gravel surfaces bring a chance of sparks being created from footwear or metal equipment with the resultant ignition risk.

8.3.2 Ensure that the minimum number of crew is in the area of the refuelling and that other persons are well clear of potential hazards. Ensure that where practical 'LPG' and 'No Smoking' signs are erected.

8.3.3 Crew involved in refuelling should wear clothing that covers arms and legs, and wear stout gloves. Thick rubber gloves are preferred. The wearing of goggles is also recommended. All pockets should be checked for matches, mobile phones and radios, which could cause ignition of escaped propane.

8.3.4 Ensure that a suitable fire extinguisher is available, dry powder (blue) or BCF (green).

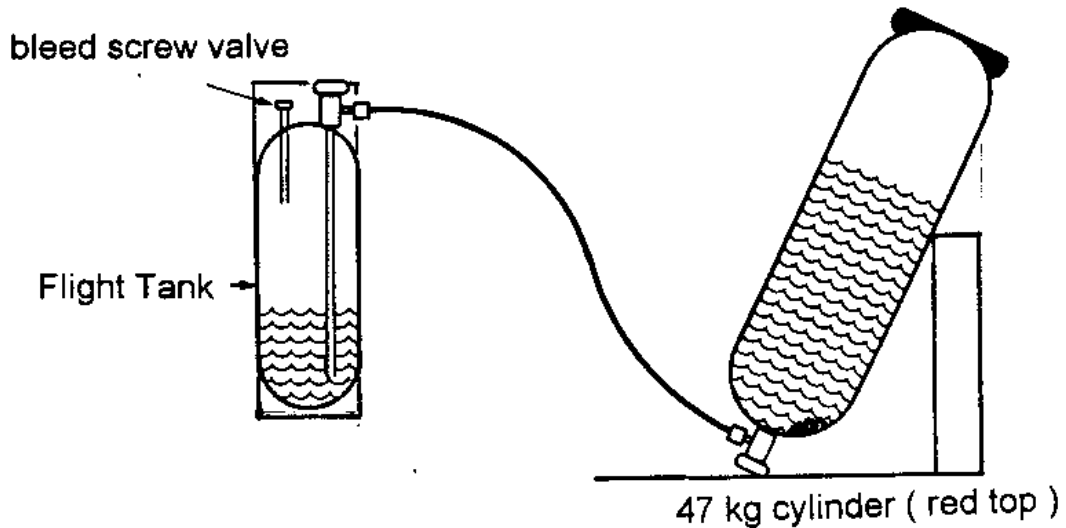


Figure 7 Refuelling – using 47 kg vapour take-off cylinders

8.3.5 If 47kg, red top, cylinders are being used to refuel the flight tanks the type of cylinder being used must be determined. 'Red top', 47kg cylinders, are available with a liquid take-off (duo-valve) or a vapour only take-off valve. The liquid take-off type of cylinder can be used upright to supply the flight tank. If the 47kg cylinder has a vapour take it must be inverted to obtain liquid. Such inversion should be carried out with care and the cylinder secured at an angle of about 45 degrees in order to trap any solid residues in the shoulder of the cylinder and to give access to the valve.

8.3.6 It is recommended that flight tanks be removed from the basket for refuelling. This prevents any possible hazards from accumulated propane in the basket or trailer, and isolates each tank from the others. Where removal is not possible the flight tanks must be attached to an earthing lead (a crocodile clip attached to an electrical lead in its turn attached to a metal spike firmly driven into the ground). Venting tubes long enough to discharge over the basket top and clear of the trailer should be attached to the flight tank bleed screws.

8.3.7 Refuelling should follow the following procedure -

- Ensure that both supply and flight tank valves are closed.
- Connect refuelling hose to flight tank and supply cylinder (if a bulk tank is being used the tank hose should be connected to the flight tank).
- Check for leaks.
- Open the supply cylinder or bulk tank valve.
- Open the flight tank valve.
- Check again for leaks, feel or listen to the supply hose to check that liquid propane is flowing into the flight tank.
- Open the bleed screw valve on the flight tank.
- Watch the flight tank contents gauge to check the filling and to see when the tank is almost full.
- Watch for a squirt of liquid propane from the bleed screw valve, indicating that the tank is full. Immediately close the flight tank valve.
- Close the bleed screw valve.
- Close the supply cylinder or bulk tank valve.
- Disconnect the flight tank from the supply hose.
- 'Pop' the self-sealing valve on the flight tank, with a non-metallic object.

(This will release the small amount of propane inside the valve and will prevent sticking or ruptured valves if the propane expands if the temperature rises)

8.3.8 If refuelling is being undertaken by a single crew member only one flight tank should be refuelled at a time. This ensures that any emergency can be dealt with quickly and effectively. Wherever possible it is better to refuel with assistance.

8.3.9 When a refuelling hose has been used ensure that it is vented of all propane before being stored.

8.3.10 When refuelling is complete all flight tank valves and bleed valves should be checked as off and the flight tanks secured in the basket or trailer, upright for transportation.

8.4 Emergency Procedures

8.4.1 In the event of a fire attempt to extinguish the fire by turning off the propane source first. If this is not possible then extinguish with a fire extinguisher but note that the leak may well be present and an explosive mixture will begin to form again.

8.4.2 If a fire cannot be extinguished in less than 30 seconds evacuate the area to a minimum safe distance of 75 metres.

8.4.3 Notify the Fire Brigade, ensuring that they understand that this is a propane fire and other cylinders may be involved.

8.4.4 When flight tanks become heated they will vent propane vapour or liquid through the pressure relief valve in a very large jet of propane / flame. The valve may reset but will open again when the relief pressure is reached.

8.4.5 Any flight tank or cylinder involved in a fire must be marked, and not used until it has been returned to the manufacturer or authorised repair agent for inspection.

Section 9: Post Flight

9.1.1 The ideal circumstance is to leave all of the balloon equipment ready for the next flight.

9.1.2 Crews should assist the Pilot in packing the balloon away in the vehicle or trailer, checking and securing all equipment.

9.1.3 The fan fuel and oil states should be checked and replenished as required.

9.1.4 Crew members keeping a Crew Logbook for the Crew Qualification Scheme, or for personal interest, should enter the details of the flight in the logbook and ask the Pilot to initial the entry.

Section 10: Tethering

General : Display Tether : Close Tether : Inflation : Safety

10.1.1 There are three ways that a balloon may be tethered, during a normal take-off using the quick release, a close tether where the basket does not leave the ground, often used during night glows, and a full display or pilot training tether.

10.1.2 As with all balloon operations the final decisions regarding tethering are the Pilots. Balloons are not certified for tether operations in winds of over 15 knots. The nature of a tether means that winds of less than 15 knots that contain significant gusts will exceed the safe tether limits.

10.1.3 The quick release tether is only used during a normal take-off and should never be used to replace other tether equipment.

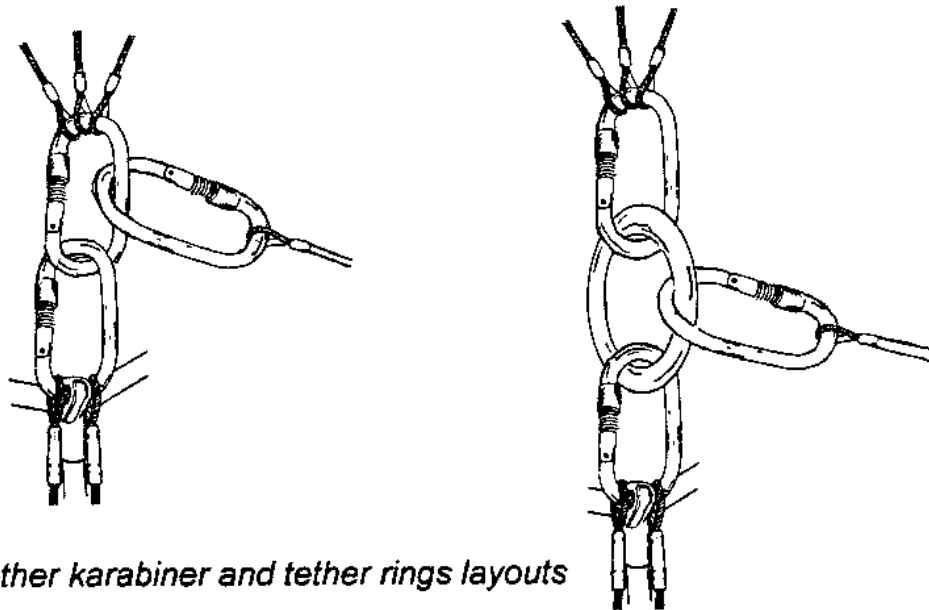


Figure 8 - Tether karabiner and tether rings layouts

Figure 8 Tether Karabiner and Tether Ring Layouts

10.1.4 All tether equipment, ropes and karabiners should be checked regularly by the crew during a tether. Crowd control is an important Crew task, watch out for spectators standing close, or even astride tether ropes.

10.2 Display Tether

10.2.1 The main tethering loads should be taken on a wire 'V' bridle attached to the upwind karabiners, opposite the scoop. In order to isolate the burner frame from the additional forces of the tether either additional karabiners are placed between the burner frame karabiners and the flying wires, or tether rings are placed between the two sets of karabiners. This results in a burner frame, karabiner, tether ring, karabiner, flying wire sequence.

10.2.2 Tether ropes of at least 4 tonnes breaking strain are attached to the single point of the 'V' bridle by means of a 5 tonne karabiner (normal flying karabiners are rated at 2.5 tonnes). Loops in tether ropes should be formed using the bowline knot. It is possible to untie a bowline without effort even when the rope has been subject to considerable stress.



Figure 9 Bowline and Bowline on a Bight Knots

10.2.3 The upwind tether ropes should be attached to fixed tether points. Tether points should be a substantial tree or vehicle. There is some flexibility in the selection of tether points but posts, railings, bollards, gateposts and other 'man made' objects should not be used. The permission of the keeper, owner or driver of a vehicle is of course required. It is better if the driver remains with the vehicle during the tether. Light cars should only be used for balloons of less than 56000 cubic feet volume.

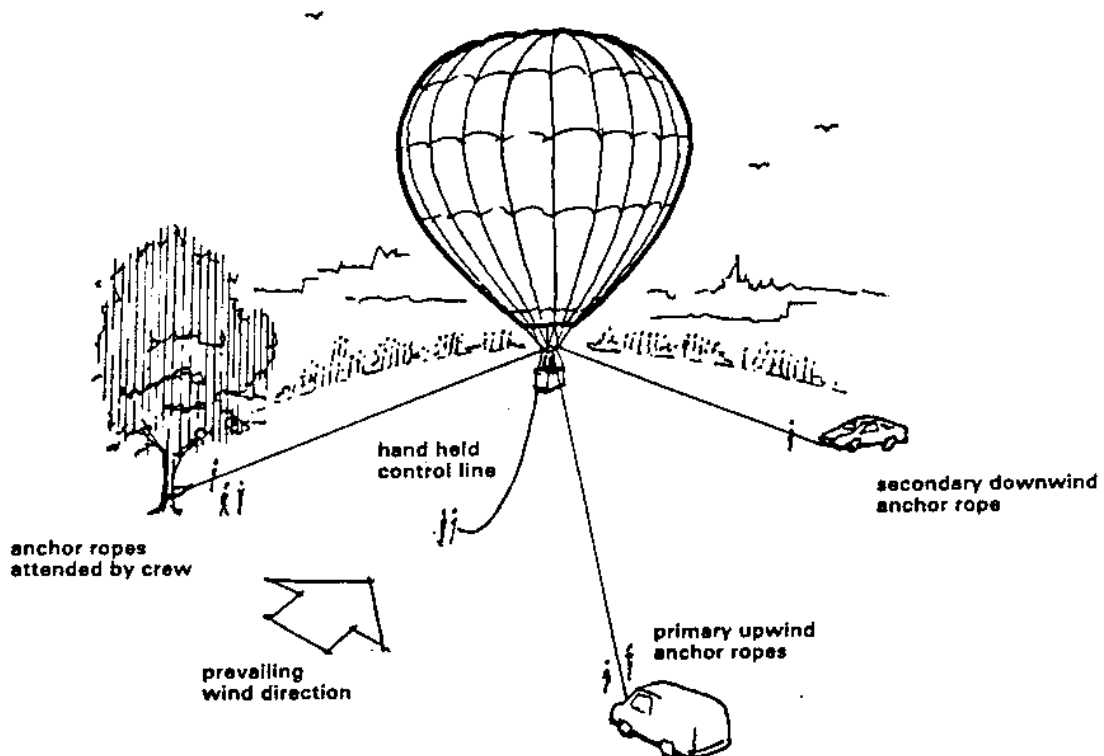


Figure 10 Tether layout - The Tether Triangle

10.2.4 The placement of the upwind tether points and ropes is designed to limit the movement of the balloon in the horizontal and vertical plane. The lengths of the ropes should be such that at full stretch they retain the balloon clear of any person, vehicle or structure (not being used during the tether) and will remain at a height of less than 90 feet.

10.2.5 A third tether rope, the downwind control rope, should be attached using a second 'V' bridle, to both downwind karabiners. The down wind tether rope will be used to control the height of the balloon, and in light winds can be used to control horizontal movement. Although in light winds the downwind rope may remain slack it must be secured to a tether point in the same way as the other tether ropes. Attachment to the front of a suitable vehicle will enable, by moving the vehicle, the maximum height of the tether to be controlled.

10.3 Close Tether

10.3.1 A close tether is performed when the balloon is to be restrained with the basket on the ground at all times. The normal quick release should be replaced with a length of tether rope, and a 'V' bridle connected to the 'upwind' karabiners on the burner frame. The length of the tether rope should be sufficient to enable a normal inflation and may be shortened once the balloon is inflated to retain the basket on the ground. Close tethers are almost always performed using the retrieve vehicle as the tether point.

10.4 Inflation

10.4.1 The balloon should be laid out and all tether ropes attached before inflation. It may be convenient to attach the tether ropes with the basket in its tether ground position, and upright before the envelope is attached as normal.

10.4.2 It is expected that the balloon will be inflated using either a close tether or the normal quick release tether. The use of another vehicle, or the down wind vehicle is the most convenient way to achieve this. Once inflated and stable but not buoyant the balloon can be controlled by the crew whilst the vehicle returns to the downwind point and the downwind tether is attached.

10.4.3 The balloon in a tether is capable of flight and should be prepared for flight with all the required equipment for flight. This way if the very worst happens, and the tethers break, the balloon can be flown safely away.

10.5 Safety

10.5.1 Crew and passenger safety is of particular concerns during tethers. The normal golden rules apply -

- Do not allow yourself to be lifted off the ground
- No rope or control line attached to the balloon should be placed round the body or limbs.

Additional rules for tethers are -

- Watch the balloon at all times if inside the 'tether triangle'
- Never stand directly under the basket.
- Do not stand on or step over the tether lines
- Non crew members should be escorted when inside the tether 'triangle'

10.5.2 The pilot remains responsible for the whole operation, but should be actively assisted by the Crew Chief. The Pilot should communicate with the Crew Chief who in turn can organise the remainder of the crew to carry out the required task. There is a temptation for 'too many cooks' during a tether, ensure that the lines of communication are understood and used correctly.

Annex A: BBAC Crew Qualification Scheme

A1: General

A1.1 BBAC Crew Qualifications can be obtained at three levels - BBAC Crew, BBAC Senior Crew and BBAC Crew Master. Each qualification requires proof of crewing experience, knowledge and the completion of a short test of knowledge.

A1.2 Applications for qualifications must be made on the appropriate form, copies of which are at the rear of this Annexe. Photocopies of the forms and completed question papers are acceptable if you do not wish to remove them from this manual. Each application must be certified by an 'Examiner' who is a BBAC Instructor, or affiliated Regional Club Training Officer. The Examiner will inspect the applicants Crew Log for proof of experience and will administer the short test of knowledge. Each application also requires the signature of a pilot or pilots for whom the applicant has acted as crew.

A1.3 Qualified crew will receive a certificate signed by the BBAC President. Qualified crew will also receive a Crew Qualification document. This document contains space to record other relevant qualifications, for example, first aid and fire fighting. Qualified crew will also receive an enamel badge and the right to purchase clothing bearing the BBAC Crew Qualification logos.

A1.4 Fees for crew qualifications, to cover the costs of providing the certificate, qualification document and badge are included in the purchase price of this manual. An original application form must be used for each application for qualification.

A1.5 All applicants for crew qualifications are expected to be members of the BBAC either in their own right or as part of a family membership.

A2: BBAC Crew

A2.1 This qualification is intended for younger crew members as an introduction to the sport and a start on the crew qualification scheme. It is also relevant for crew who do not hold a driving licence or who are unable to drive retrieve vehicles because of licensing or insurance restrictions. Whilst there is no lower age limit for this qualification all applicants should be capable of understanding the principles of ballooning safety and be physically capable of carrying out all crew duties required at this level.

A2.2 The requirements for qualification as BBAC Crew are:

- 6 months experience as crew for one pilot.
- 12 flights / launches as crew.
- 4 times as Mouth Crew.
- 4 times as Fan Crew.
- 2 times assisted at the Crown
- Correctly answer 15 questions for BBAC Crew in the Crew Training Manual.

A3: BBAC Senior Crew

A3.1 The requirements for qualification as BBAC Senior Crew are:

- 6 months experience as crew for two pilots.
- 12 flights / launches / retrieves as crew.
- 4 times as Mouth Crew.
- 4 times as Fan Crew.
- 4 times as Crown Crew.
- 6 retrieves as Crew Chief.
- Correctly answer 20 questions from the questions for Senior Crew in the Crew Training Manual.
- Correctly complete the Crew Radio Procedure Assessment.
- Certification at a Landowner Relations Seminar.
- Full UK driving licence for vehicles used as retrieves.

Experience gained whilst undertaking the 'BBAC Crew' Qualification may count against any of the above requirements.

A4: BBAC Master Crew

A4.1 This qualification is intended for crew already experienced in crew duties and qualified at BBAC Senior Crew level. The additional requirements for BBAC Master Crew qualification are:

- Certification as BBAC Senior Crew for two years
- Crew for 100 flights / launches / retrieves
- Acted as crew for 5 tethered flights
- Acted as regular Crew Chief for at least two pilots
- Correctly answered 20 questions for Master Crew in the Crew Training Manual
- Correctly complete the Crew Radio Procedure Assessment

A5: Accreditation of Prior Experience

A5.1 It is recognised that there may be BBAC members with a wide experience of crewing who wish to apply for qualifications but have no records of previous crew experience. Applications will be considered for Senior Crew qualification which fulfil the following requirements:

- Statements from two pilots as to the applicant's prior experience over a minimum of a six-month period, including where possible a statement as to the number of flights/launch/retrieves for which the applicant has acted as crew
- Correctly answer 20 questions from the question for Senior Crew in the Crew Training Manual
- Correctly complete the Crew Radio Procedure Assessment
- Certification at a Landowner Relations Seminar
- Full UK driving licence for vehicles used as retrieves

A5.2 Applications for Master Crew qualifications using accreditation of prior learning are expected to be rare. In these circumstances an application for a Senior Crew qualification should be made first, as in A3.1 above with an additional letter explaining why the award of Master Crew is considered appropriate.

Application for BBAC Crew qualification

First name(s)

Surname

Address
Postcode

BBAC Membership No

Age (if under 18)

Training Pilots Declaration: *The above applicant has been a member of my crew during a training period of at least six months, and has the knowledge and experience I would expect from a BBAC Crew.*

Name	Signature	PL No
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Examiner's Declaration: *I have examined the crew logbook of the above applicant and have seen evidence of*

6 months experience	12 crew experiences
---------------------	---------------------

4 times as Fan Crew	4 times as Mouth Crew
---------------------	-----------------------

2 times as Crown Crew (assisted)

The applicant has correctly answered 15 questions from the question bank using questions from the (enter letter) set. The completed question papers are enclosed. I am satisfied that the applicants experience and knowledge are up to the standard required for BBAC Crew.

Examiner's Name	Signature
Qualification: <i>Instructor Number or Training Officer appointment)</i>	

Forward this original form together with the completed written question paper to the

BBAC Crew Training and Qualification Scheme Co-ordinator
- address given in the latest Aerostat or on the BBAC website.
{Details forwarded will be kept on a computer database}

Application for BBAC Senior Crew qualification

First name(s)

Surname

Address	Postcode
---------	----------

BBAC Membership No	LRO Certificate No.
Driving Licence Number	
BBAC Crew number (if you already hold a 'BBAC Crew' qualification)	

Training Pilots Declaration: The above applicant has been a member of my crew during a training period of at least six months, and has the knowledge and experience I would expect from a BBAC Crew.

Name	Signature	PL No
Examiner's Declaration: <i>I have examined the crew logbook of the above applicant and have seen evidence of</i>		
6 months experience	12 crew experiences	
4 times as Crown Crew	4 times as Mouth Crew	
4 times as Fan Crew	6 retrieves as Crew Chief	
Crew Chief for one other Pilot		
<i>The applicant has correctly answered 15 questions from the question bank using questions from the (enter letter) set. The completed question papers are enclosed. I am satisfied that the applicants experience and knowledge are up to the standard required for BBAC Crew.</i>		
Examiner's Name	Signature	
Qualification: <i>Instructor Number or Training Officer appointment)</i>		

Forward this original form together with the completed written question paper to the

BBAC Crew Training and Qualification Scheme Co-ordinator
 - address given in the latest Aerostat or on the BBAC website.
 {Details forwarded will be kept on a computer database}

Application for BBAC Master Crew qualification

First name(s)

Surname

Address
Postcode

BBAC Membership No Crew Number

Training Pilots Declarations (two required) :*The above applicant has been a member of my crew over a period of at least six months, and has the knowledge and experience I would expect from a BBAC Master Crew. The applicant has regularly acted as Crew Chief.*

Name	Signature	PL No.
Name	Signature	PL No.

Examiners Declaration: *I have examined the crew log book of the above applicant and have seen evidence of*

Experience over 2 years following Senior Crew qualification

Crew Chief for at least 2 Pilots

100 launches / flights/ retrieves

Crew for 5 tethered flights

The applicant has correctly answered 20 questions from the question bank using questions from the (enter letter) set. The completed question paper is enclosed. The applicant has also reached the required standard in the Crew Radio Procedure Assessment. I am satisfied that the applicants experience and knowledge are up to the standard required for BBAC Master Crew.

Examiner's Name	Signature
Qualification: <i>Instructor Number or Training Officer appointment)</i>	

Forward this original form together with the completed written question paper to the

BBAC Crew Training and Qualification Scheme Co-ordinator
- address given in the latest Aerostat or on the BBAC website.
{Details forwarded will be kept on a computer database}

Notes for Crew Qualification Examiners

1. You should be a CAA Examiner (Balloons and Airships), a BBAC Instructor or an appointed Training Officer of a BBAC affiliated Club or Region. When signing Crew Qualification applications please quote your Examiner Number, Instructor Number or appointment.
2. You are asked to examine the candidate's Crew Logbook and verify that the experience levels quoted on the application and in Annex A: to the Crew Training Manual have been demonstrated by the candidate.
3. You are then asked to conduct a test, appropriate to the qualification level being examined, outlined in the following sheets. The test should be conducted as a written test using the papers in this Annex. You are asked to 'mark' all written papers yourself, swapping between candidates for marking is not acceptable. For each candidate you should nominate a letter in the range A to E. The candidate should then answer all questions alongside the nominated letter. Completed question papers should be included with the application forwarded by the candidate.
4. Lastly you are asked to conduct a short verbal Crew Radio Assessment. The outline for this is attached. The candidate may nominate a balloon callsign and retrieve callsign if required. If this nomination is not required you are asked to invent an appropriate callsign for both balloon and retrieve and use these throughout the assessment.
5. Thank you for your very valuable assistance to the BBAC Crew Training and Qualification Scheme. With your help in preparing crews for the future ballooning will remain the safe, trouble free sport we all enjoy.

BBAC Crew Qualification Questions

You should be taking this test as a written test. Your examiner will have told you which lettered questions you should answer. In each case write True or False against the question.

Complete all 15 Questions and hand back the paper to the examiner.

True/False

Basics

- A Crew members should not wear gloves to avoid damaging the envelope.
- B Stout shoes are recommended for all crew.
- C Smoking is not permitted for crew during inflation.
- D Its OK to let your feet leave the ground as long as its only a few inches.
- E To get a better grip you may wrap ropes round your arms.

Weather

- A A wind given as '120 / 10' is coming from 120 at 10 knots.
- B A wind that is veering is changing direction clockwise.
- C A sky with 4 oktas cover is fully covered in cloud.
- D QNH is the regional pressure setting on the altimeter.
- E Sunrise is defined as 20 minutes before dawn.

Assembly of the Balloon

- A The scoop fits on the upwind side of the envelope skirt.
- B Flying wire No. 1 is attached to the upper left karabiner, viewed from the envelope
- C The red ripline attaches to the karabiner with wire 6 also attached.
- D When laying out the balloon the middle wire and tape should be used to spread the envelope.
- E When spreading out the balloon you should only pull on the fabric.

Assembly (continued)

- A The red ripline attaches to the karabiner with the number 1 flying wire.
- B You should spread the envelope by pulling on the load tapes.
- C The scoop should be attached to the karabiners during layout.
- D Flying wire number 1 attaches to the lower left karabiner viewed from the envelope.
- E The red ripline is clipped to a karabiner at the same time as the crown line.

Crew Duties - Crown

- A Two people is the maximum crew on the crown rope of a 90,000 cu ft balloon.
- B You should loop the crown rope round your waist in gusty weather.

- C You should start at the middle of the crown rope and work toward the end as the balloon rises.
- D You should refuse all offers of assistance, from onlookers, with the crown.
- E Once the balloon is upright the crown crew should run to the basket.

Crew Duties - Mouth

- A Mouth Crew should wear clothing to cover bear arms and legs.
- B It's OK to be lifted off the ground by a few inches as a mouth crew.
- C The scoop should be fitted as soon as the envelope is upright.
- D Mouth Crew should never stand inside the flying wires during inflation.
- E The fan should be switched off as soon as the pilot starts burning.

Crew Duties - Crowd, Fire, and Retrieve Briefings

- A Any crowd should not come closer than 5 metres from the balloon.
- B The fire extinguisher should be kept in a safe place, like the trailer, during inflation.
- C The retrieve briefing should include the possible track of the balloon.
- D The retrieve briefing should include the Emergency Retrieve Telephone No.
- E The retrieve briefing should include the landing time.

Crew Duties (continued)

- A Blue or Green label or body extinguishers should be used on propane fire.
- B The CAA recommends that spectators should be 20 metres from a balloon inflating.
- C The retrieve should wait until the balloon reports a track before leaving the launch field.
- D The three main tasks during a retrieve are driver, navigator and radio operator.
- E Retrieves should 'Radio Check' the balloon every five minutes.

Inflation

- A The vehicle handbrake should remain off during the inflation.
- B A radio check should be conducted before the fan is started.
- C The pilot will check with the Crown Crew before starting a hot inflation.
- D The pilot need not check with the Mouth Crew before first burning.
- E The crew should start packing up once the balloon is upright.

Post take-off and Retrieve

- A The Crew Chief is responsible for the crew after take-off.
- B A compass bearing on the balloon will indicate the balloon's track.
- C By using major roads a retrieve often travels half the distance that the balloon travels in flight.

- D The Crew Chief is responsible for inspecting the take-off site for lost equipment or damage.
- E A Crew Chief may be asked to watch the airspace above the balloon during take-off.

Landowner Relations

- A All farm gates should be closed after you.
- B No vehicle should enter private land without the owners permission.
- C If the gate is open, it's OK to use the field for a take-off site.
- D Spectators should be encouraged to help pack away the balloon quickly.
- E Retrieves should take the shortest route from the gate to the balloon.

Landowner Relations (continued)

- A Vehicles should stick to the edges of fields as far as possible.
- B Gates should be left as found.
- C People who know the landowner can give permission for the retrieve to enter the land.
- D If the landowner cannot be contacted you must carry out and leave a note for the landowner.
- E It is OK to turn the trailer round in a field, as long as the balloon is not there.

Refuelling

- A Propane is explosive if mixed with air at a concentration of more than 10%.
- B Propane is a white coloured gas.
- C Liquid propane causes no harm to the bare skin of an experienced crew.
- D One volume of liquid propane when released forms 270 volumes of gas.
- E It is normal to store up to 6 flight cylinders together.

Map Reading

- A The two letter codes on maps refer to the 100-kilometre square partly covered by that map.
- B The UK OS National Grid has small squares 10 kilometre square.
- C A four-figure grid reference has an accuracy of 1000 metres.
- D A six-figure grid reference is accurate to the nearest two metres.
- E Converting a magnetic bearing to a grid bearing you subtract 5 degrees.

Incident Management

- A If the person making a complaint can't give the balloon registration you should not bother with a report.
- B It is important to fight a propane fire for at least two minutes before giving up.
- C Calling the police from a mobile phone you should dial 112.

BBAC Crew Training Manual and Crew Qualification Scheme

- D People in a balloon basket, hanging from electricity wires should jump out as soon as possible.
- E It is vital to stop any bleeding before any other type of First Aid.

Check your answers.

You should have answered 15 questions all from the same letter group.

BBAC Senior Crew Qualification Questions

You should be taking this as a written test. Your examiner will have told you which lettered questions you should answer. In each case write True or False against the question.

Complete all 20 Questions and hand back the paper to the examiner.

True/False

Basics

- A Crew members should not wear gloves to avoid damaging the envelope.
- B Stout shoes are recommended for all crew.
- C Smoking is not permitted for crew during inflation.
- D Its OK to let your feet leave the ground as long as its only a few inches.
- E To get a better grip you may wrap ropes round your arms.

Weather

- A A wind given as '120 / 10' is coming from 120 at 10 knots.
- B A wind which is veering is changing direction clockwise.
- C A sky with 4 oktas cover is fully covered in cloud.
- D QNH is the regional pressure setting on the altimeter.
- E Sunrise is defined as 20 minutes before dawn.

Assembly of the Balloon

- A The scoop fits on the upwind side of the envelope skirt.
- B Flying wire No. 1 is attached to the upper left karabiner, viewed from the envelope
- C The red ripline attaches to the karabiner with wire 6 also attached.
- D When laying out the balloon the middle wire and tape should be used to spread the envelope.
- E When spreading out the balloon you should only pull on the fabric.

Assembly (continued)

- A The red ripline attaches to the karabiner with the number 1 flying wire.
- B You should spread the envelope by pulling on the load tapes.
- C The scoop should be attached to the karabiners during layout.
- D Flying wire number 1 attaches to the lower left karabiner viewed from the envelope.
- E The red ripline is clipped to a karabiner at the same time as the crown line.

Crew Duties - Crown

- A Two people is the maximum crew on the crown rope of a 90,000 cu ft balloon.
- B You should loop the crown rope round your waist in gusty weather.

- C You should start at the middle of the crown rope and work toward the end as the balloon rises.
- D You should refuse all offers of assistance, from onlookers, with the crown.
- E Once the balloon is upright the crown crew should run to the basket.

Crown Duties (continued)

- A Only the top Velcro tabs on a parachute valve are attached during inflation.
- B It is OK to loop the crown rope round a shoulder and hold the end loop in your hands.
- C You should slowly let the balloon rise during hot inflation, until the whole parachute is visible, then resist another rise until this is no longer possible.
- D Crown Crew should only bring the crown line in when instructed to do so by the Pilot.
- E You should feed the crown rope out hand over hand as the balloon rises.

Crew Duties - Mouth

- A Mouth Crew should wear clothing to cover bare arms and legs.
- B It's OK to be lifted off the ground by a few inches as a mouth crew.
- C The scoop should be fitted as soon as the envelope is upright.
- D Mouth Crew should never stand inside the flying wires during inflation.
- E The fan should be switched off as soon as the pilot starts burning.

Crew Duties - Crowd, Fire, and Retrieve Briefings

- A Any crowd should not come closer than 5 metres from the balloon.
- B The fire extinguisher should be kept in a safe place, like the trailer, during inflation.
- C The retrieve briefing should include the possible track of the balloon.
- D The retrieve briefing should include the Emergency Retrieve Telephone No.
- E The retrieve briefing should include the landing time.

Crew Duties (continued)

- A Blue or Green label or body extinguishers should be used on propane fire.
- B The CAE recommends that spectators should be 20 metres from a balloon inflating.
- C The retrieve should wait until the balloon reports a track before leaving the launch field.
- D The three main tasks during a retrieve are driver, navigator and radio operator.
- E Retrieves should 'Radio Check' the balloon every five minutes.

Inflation

- A The vehicle handbrake should remain off during the inflation.
- B A radio check should be conducted before the fan is started.
- C The pilot will check with the Crown Crew before starting a hot inflation.

- D The pilot need not check with the Mouth Crew before first burning.
- E The crew should start packing up once the balloon is upright.

Inflation (continued)

- A The best way to hold the mouth during inflation is from behind the nomex skirt.
- B It is OK to trap a flying wire under your foot at the beginning of inflation.
- C Only the top tabs of a parachute need to be fixed at the crown end.
- D Restraining the basket is best done by placing hands on the basket top.
- E The fan should stay in its inflation place until the balloon has taken off.

Post take-off and Retrieve

- A The Crew Chief is responsible for the crew after take-off.
- B A compass bearing on the balloon will indicate the balloon's track.
- C By using major roads a retrieve often travels half the distance that the balloon travels in flight.
- D The Crew Chief is responsible for inspecting the take-off site for lost equipment or damage.
- E A Crew Chief may be asked to watch the airspace above the balloon during take-off.

Landowner Relations

- A All farm gates should be closed after you.
- B No vehicle should enter private land without the owners permission.
- C If the gate is open, it's OK to use the field for a take-off site.
- D Spectators should be encouraged to help pack away the balloon quickly.
- E Retrieves should take the shortest route from the gate to the balloon.

Landowner Relations (continued)

- A Vehicles should stick to the edges of fields as far as possible.
- B Gates should be left as found.
- C People who know the landowner can give permission for the retrieve to enter the land.
- D If the landowner cannot be contacted you must carry out and leave a note for the landowner.
- E It is OK to turn the trailer round in a field, as long as the balloon is not there.

Refuelling

- A Propane is explosive if mixed with air at a concentration of more than 10%.
- B Propane is a white coloured gas.
- C Liquid propane causes no harm to the bare skin of an experienced crew.
- D One volume of liquid propane when released forms 270 volumes of gas.

- E It is normal to store up to 6 flight cylinders together.

Refuelling (continued)

- A Crew involved with refuelling should wear cotton gloves.
- B Escaping propane gas disperses easily on still windless days.
- C Half-full flight tanks can be refuelled in the basket without special equipment.
- D When the bleed valve squirts liquid propane it should be shut off before the tank valve.
- E A single crew member should not refuel more than 4 tanks at a time.

Map Reading

- A The two letter codes on maps refer to the 100-kilometre square partly covered by that map.
- B The UK OS National Grid has small squares 10 kilometre square.
- C A four-figure grid reference has an accuracy of 1000 metres.
- D A six-figure grid reference is accurate to the nearest two metres.
- E Converting a magnetic bearing to a grid bearing you subtract 5 degrees.

Map Reading (continued)

- A To take a bearing the compass needle should line up with the red lines on the housing and point to the North arrowhead.
- B Plotting a bearing on the map the compass housing red lines should line up across the map.
- C The OS Landranger series of maps covers the UK in 24 map sheets.
- D Details of the magnetic variation are printed in blue at the top of an OS map.
- E OS maps have the symbol key across the bottom of the map.

Incident Management

- A If the person making a complaint can't give the balloon registration you should not bother with a report.
- B It is important to fight a propane fire for at least two minutes before giving up.
- C Calling the police from a mobile phone you should dial 112.
- D People in a balloon basket, hanging from electricity wires should jump out as soon as possible.
- E It is vital to stop any bleeding before any other type of First Aid.

Incident Management (continued)

- A Injured persons should be removed by the quickest means to hospital.
- B Propane fires should be fought with blue or green fire extinguishers.
- C Clearing the balloon from overhead power wires should be a top priority.
- D Giving an emergency service RV a little way from the incident is a good idea.

E The first priority in propane fires is putting the fire out.

Check your answers.

You should have answered 20 questions all from the same letter group.

BBAC Master Crew Qualification Questions

You should be taking this as a written test. Your examiner will have told you which lettered questions you should answer. In each case write True or False against the question.

Complete all 20 Questions and hand back the paper to the examiner.

True/False

Group 1

- A Only the top Velcro tabs on a parachute valve are attached during inflation.
- B Stout shoes are recommended for all crew.
- C Liquid propane causes no harm to the bare skin of an experienced crew.
- D If a V bridle is used the single karabiner attaching it to the tether rope should be 5 tonnes breaking strain.
- E "2000 feet, 270, 15 knots, veering, plus 10" in a weather forecast means that at 2000 feet there is a wind blowing west at 15 knots.

Group 2

- A The scoop fits on the upwind side of the envelope skirt.
- B A tethered balloon should be fully equipped for free flight.
- C The red ripline attaches to the karabiner with wire 6 also attached.
- D "2000 feet, 270, 15 knots, veering, plus 10" in a weather forecast means that at 2000 feet the temperature is 10 degrees Celsius
- E When spreading out the balloon you should only pull on the fabric.

Group 3

- A Crew members should not wear gloves to avoid damaging the envelope.
- B You should spread the envelope by pulling on the load tapes.
- C The Gradient Wind is the wind at 2000 feet.
- D Flying wire number 1 attaches to the lower left karabiner viewed from the envelope.
- E The red ripline is clipped to a karabiner at the same time as the crown line.

Group 4

- A Two people are the maximum crew on the crown rope of a 90,000 cu ft balloon.
- B You should loop the crown rope round your waist in gusty weather.
- C Smoking is not permitted for crew during inflation.
- D When laying out the balloon the middle wire and tape should be used to spread the envelope.
- E On an OS Landranger map a distance of 0.5 cm represents 1 kilometre.

Group 5

- A The red ripline attaches to the karabiner with the number 1 flying wire.
- B It is OK to loop the crown rope round a shoulder and hold the end loop in your hands.
- C You should never stand directly under the basket during a tether.
- D Crown Crew should only bring the crown line in when instructed to do so by the Pilot.
- E You should feed the crown rope out hand over hand as the balloon rises.

Group 6

- A Mouth Crew should wear clothing to cover bare arms and legs.
- B One volume of liquid propane expands to 270 volumes of propane gas.
- C You should slowly let the balloon rise during hot inflation, until the whole parachute is visible, then resist another rise until this is no longer possible.
- D You should refuse all offers of assistance, from onlookers, with the crown.
- E The fan should be switched off as soon as the pilot starts burning.

Group 7

- A Any crowd should not come closer than 5 metres from the balloon.
- B The fire extinguisher should be kept in a safe place, like the trailer, during inflation.
- C At 20 degrees Celsius liquid propane is at a pressure of some 100 pounds per square inch.
- D QNH is the regional pressure setting on the altimeter.
- E The retrieve briefing should include the landing time.

Group 8

- A Blue or Green label or body extinguishers should be used on propane fire.
- B The CAA recommends that spectators should be 20 metres from a balloon inflating.
- C You should start at the middle of the crown rope and work toward the end as the balloon rises.
- D Mouth Crew should never stand inside the flying wires during inflation.
- E Retrieves should 'Radio Check' the balloon every five minutes.

Group 9

- A The vehicle handbrake should remain off during the inflation.
- B A reef knot is the best way to form loops for tether attachments.
- C The scoop should be fitted as soon as the envelope is upright.
- D The retrieve briefing should include the Emergency Retrieve Telephone No.
- E The crew should start packing up once the balloon is upright.

Group 10

- A The downwind tether rope need not be attached to a fixed point or vehicle.
- B It is OK to trap a flying wire under your foot at the beginning of inflation.
- C Only the top tabs of a parachute need to be fixed at the crown end.
- D Restraining the basket is best done by placing hands on the basket top.
- E The fan should stay in its inflation place until the balloon has taken off.

Group 11

- A The Crew Chief is responsible for the crew after take-off.
- B A compass bearing on the balloon will indicate the balloon's track.
- C By using major roads a retrieve often travels half the distance that the balloon travels in flight.
- D The pilot need not check with the Mouth Crew before first burning.
- E Three light cars will form good tethering points for a 77,000 cubic foot balloon.

Group 12

- A All farm gates should be closed after you.
- B No vehicle should enter private land without the owners permission.
- C Standing on tether ropes during the tether prevents the knots becoming too tight.
- D Spectators should be encouraged to help pack away the balloon quickly.
- E Retrieves should take the shortest route from the gate to the balloon.

Group 13

- A Vehicles should stick to the edges of fields as far as possible.
- B Gates should be left as found.
- C People who know the landowner can give permission for the retrieve to enter the land.
- D The three main tasks during a retrieve are driver, navigator and radio operator.
- E It is OK to turn the trailer round in a field, as long as the balloon is not there.

Group 14

- A Propane is explosive if mixed with air at a concentration of more than 10%.
- B Propane is a white coloured gas.
- C The pilot will check with the Crown Crew before starting a hot inflation.
- D One volume of liquid propane when released forms 270 volumes of gas.
- E It is normal to store up to 6 flight cylinders together.

Group 15

- A Crew involved with refuelling should wear cotton gloves.

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- B Escaping propane gas disperses easily on still windless days.
- C Balloons are not to tether in winds of more than 15 knots.
- D If the landowner cannot be contacted you must carry out and leave a note for the landowner.
- E A single crew member should not refuel more than 4 tanks at a time.

Group 16

- A The two letter codes on maps refer to the 100-kilometre square partly covered by that map.
- B The UK OS National Grid has small squares 10 kilometre square.
- C A four-figure grid reference has an accuracy of 1000 metres.
- D Crew should escort Non Crew members when inside the 'Tether Triangle'.
- E Converting a magnetic bearing to a grid bearing you subtract 5 degrees.

Group 17

- A To take a bearing the compass needle should line up with the red lines on the housing and point to the North arrowhead.
- B Plotting a bearing on the map the compass housing red lines should line up across the map.
- C The OS Landranger series of maps covers the UK in 24 map sheets.
- D Details of the magnetic variation are printed in blue at the top of an OS map.
- E OS maps have the symbol key across the bottom of the map.

Group 18

- A The breaking strain of all tether ropes should be at least 4 tonnes.
- B It is important to fight a propane fire for at least two minutes before giving up.
- C Calling the police from a mobile phone you should dial 112.
- D People in a balloon basket, hanging from electricity wires should jump out as soon as possible.
- E It is vital to stop any bleeding before any other type of First Aid.

Group 19

- A Injured persons should be removed by the quickest means to hospital.
- B Propane fires should be fought with blue or green fire extinguishers.
- C Clearing the balloon from overhead power wires should be a top priority.
- D Giving an emergency service RV a little way from the incident is a good idea.
- E The first priority in propane fires is putting the fire out.

Group 20

- A A wind given as '120/10' is coming from 120 at 10 knots.

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- B A wind that is veering is changing direction clockwise.
- C A sky with 4 oktas cover is fully covered in cloud.
- D When the bleed valve squirts liquid propane it should be shut off before the tank valve.
- E A Close tether can be conducted using the quick release.

Check your answers.

You should have answered 20 questions all of the same letter group.

Crew Radio Procedure Assessment

Notes for Examiners.

Please use this framework to conduct a short verbal assessment of Crew Radio Procedure. This assessment is for applicants for BBAC Senior Crew and BBAC Master Crew. It is intended that a full balloon flight is simulated. The first two transmissions should be used in all assessments, as should the last two. Please select four other transmissions from the centre section to complete the simulation of a full balloon flight. Retrieve replies should be similar to those indicated.

Please hand the Crew Radio Procedure Assessment - Retrieve Briefing sheet to the candidate.

Note Callsigns to be used

BALLOON

RETRIEVE

Transmissions to be used in all assessments

First radio check

BALLOON to RETRIEVE	Radio Check - Over
---------------------	--------------------

expected RETRIEVE reply	Strength five - Over
-------------------------	----------------------

BALLOON	You strength five also - Out
---------	------------------------------

Pre take-off checks

BALLOON to RETRIEVE	How do you read - Over
---------------------	------------------------

expected RETRIEVE reply	Strength Five - Over
-------------------------	----------------------

BALLOON	Roger Out
---------	-----------

Select four transmissions from those below:

Prompt the retrieve to find out the balloon speed and track

RETRIEVE to BALLOON (expected)	Request your Track and Speed - Over
--------------------------------	-------------------------------------

BALLOON	Track - One Seven Zero - Speed One Zero - Overhead Loamville in one five - Read back - Over
---------	---

expected RETRIEVE reply	Track - One Seven Zero - Speed One Zero - Overhead Loamville in one five - Over
-------------------------	---

BALLOON	Correct - Out
---------	---------------

Changing Frequency

BALLOON to RETRIEVE	Changing to Loamville Approach - Leaving this frequency for one zero - Over
---------------------	---

expected RETRIEVE reply	Roger - call on return - Out
-------------------------	------------------------------

Returning to retrieve frequency

BALLOON to RETRIEVE	How do you read - Over
expected RETRIEVE reply	Read you five - Over
BALLOON	You Fives also - Out

Requesting Information

BALLOON to RETRIEVE	Request your present grid - Over
expected RETRIEVE reply	Grid - Four Seven Nine - Six Three Two - Read Back - Over
BALLOON (with an error)	Grid - Four Seven Five - Three Six Two - Over
expected RETRIEVE reply	NEGATIVE - Grid - Four Seven NINE - Six Three Two - Over
BALLOON	Grid - Four Seven NINE - Six Three Two - Over
expected RETRIEVE reply	Correct - Out

Requesting Information

Prompt the Retrieve to find out the balloons expected landing time

RETRIEVE to BALLOON expected	Request your estimated landing time - Over
No reply from the BALLOON	
RETRIEVE to BALLOON expected	Acknowledge my last - Over
BALLOON	Negative - Say again - Over
RETRIEVE expected reply	Request your estimated landing time - Over
BALLOON	Landing in One Five - Over
RETRIEVE expected reply	Landing in One Five - Out

The following two transmissions to be used in all assessments

Preparation for landing

BALLOON to RETRIEVE	Landing - Grid - Eight Two Four Seven - Read Back - Over
RETRIEVE expected reply	Landing - Grid - Eight Two Four Seven - Over
BALLOON	Correct - Out

Landed

BALLOON to RETRIEVE	Landed at Grid - Eight Two Two - Four Seven One - approach from South West - RV Great Farm - Read back - Over
---------------------	---

RETRIEVE expected reply

Landed at Grid - Eight Two Two -
Four Seven One - approach from
South West - RV Great Farm - Out

Crew Radio Procedure Assessment

RETRIEVE Briefing Sheet

Your Examiner is going to simulate the Balloon during a few short radio transmissions. You should reply as required. You may also be asked to find things out from the Balloon use the correct radio procedure to do this.

Note Callsigns to be used

BALLOON

RETRIEVE

The Balloon transmissions are perfectly readable at all times.

Your position at present is: **Grid 479632**

The Emergency Retrieve Number is: **0345 479632**

Notes:

Annex B: BBAC Met Form

A FORECAST AREA.....

B PERIOD from.....to.....
 (All heights are above sea level; all times are local times)

C GENERAL SYNOPTIC SITUATION

D	WINDS Direction / Speed (degrees true and knots)	Trend	Temperature
---	--	-------	-------------

SURFACE.....

1,000 ft.

2,000 ft.

5,000 ft.

CLOUD TYPE	COVER	BASE	TOPS
E		
F		
G		

H SURFACE VISIBILITY.....

K REMARKS, WARNINGS, THERMAL ACTIVITY, ETC.

L QNH.....

M SUNRISE.....SUNSET.....

N FURTHER OUTLOOK.....

O MET STATION.....ISSUED ATHRS.

Annex C: Retrieve Book

C1: General

C1.1 Once the balloon has taken off the only possible contact, before landing, with the Pilot and passengers is via the airband radio. There are circumstances when the retrieve may need to know details of the balloon, the pilot and the passengers. The radio is for flight safety and should not be used to pass such information. Dealing with anything from a minor overflying incident to a major accident will be made much easier if the required information is to hand on the ground.

C1.2 The easiest way to keep this information is in a plastic 'display' folder, which contains a number of clear plastic wallets. Each sheet of information can be prepared in advance, and completed in water-soluble pen on the surface of the wallet, or for regular crews in ink on the sheets themselves.

C2: A Suggested Layout

C2.1 The layout of the Retrieve Book is of course personal preference, the following suggested order may assist in preparing the book.

• Balloon Details <i>(a copy of the balloon insurance certificate may be included)</i>	Appendix C	(i)
• Retrieve Brief	Appendix C (ii)	
• Meeting Task Brief	Appendix C (iii)	
• Pilot and LRO Details	Appendix C (iv)	
• BBAC Met Form	Annex B: to this manual	
• Electricity Supply	Appendix C (v) (vi) (vii)	
• BBAC Code of Conduct <i>the edition circulated yearly with Aerostat may be more convenient)</i>	Annexe G to this manual	
• Incident Management	Appendix F (i) - F(iv) to this manual	

C3: Commercial Operators

C3.1 A great deal of the above information is already required by Air Law to be available on the ground in respect of commercial balloon operations.

Balloon Details

Registration:

Name:

Type:

Pilot:

Mobile Number:

Emergency Retrieve Number:

Passengers

Name:

Contact Number:

Name:

Contact Number:

Name:

Contact Number:

Name:

Contact Number:

Retrieve Brief

Forecast Track:

Forecast Duration:

Intermediate Landings:

Balloon Mobile Number:

Emergency Retrieve Number:

Special Instructions:

Balloon Meeting Task Brief

Meeting Location:

Date:

Time:

Task:

Special Instructions:

Administration:

Pilot Details

Name:

Address:

Mobile Number:

Home Tel No:

LRO Details

Regional LROs

Landowner Relations Officer:
Peter Vale, 29 Grove Meadow,
 Cleobury Mortimer, Kidderminster
 DY14 8AG. Tel 01299 270 238,
 fax 01299 271901, mob 0378 880599
 email petergvale@compuserve.com

PENNINE
 Chris Oxby – 01302 856252
 Maps: 80, 81, 87, 88, 92, 93, 99, 100, 101, 104, 105,
 106, 107, 111, 112, 113

NORTH WEST
 Graeme Church – 01254 247014
 Maps: 85, 86, 89, 90, 91, 96, 97, 98, 102, 103,
 108, 109, 110

EAST MIDLANDS
 Andrew Selby – 01509 890348
 Maps: 119e, 120, 121, 122, 128e, 129, 130, 131,
 140ne, 141n

OSWESTRY
 Mark Cambridge – 01691 682672
 Maps: 117, 125, 126, 137

EASTERN
 Ron Weyda – 01255 507661
 Maps: 132, 133, 134, 143, 144, 154, 155, 156,
 167, 168, 169

CHILTERN
 Doug Beckwith – 01604 832740
 Maps: 140se, 141s, 142, 151e, 152, 153

WEST MIDLANDS
 Richard Riley – 01527 831647
 Maps: 118, 119w, 127, 128w, 138, 139, 140w,
 149, 150, 151w

3-4-40
 Barry Conway – 01865 874859
 Maps: 164s, 174, 175

CINQUE PORTS FLYING CLUB
 Alan Munn – 01424 441030
 Maps: 179, 188, 189, 199

SURREY & SUSSEX
 Robin Shapland – 01798 343298
 Maps: 186, 187, 197, 198

MID HANTS
 Gary Madelin – 01252 727129
 Maps: 175s, 185, 186

WESSEX
 Philip Hossack – 01672 563379
 Maps: 175s, 185, 186

WESTERN
 Ian Martin – 01454 281586
 Maps: 162, 163, 171, 172, 173, 180, 181, 182,
 183, 190, 191, 192, 200, 201, 202, 203, 204

BLACK HORSE
 Steve Humphries – 01494 538865
 165

LONDON
 Dave Morgan – 0181 590 0877
 Maps: 167, 177, 178

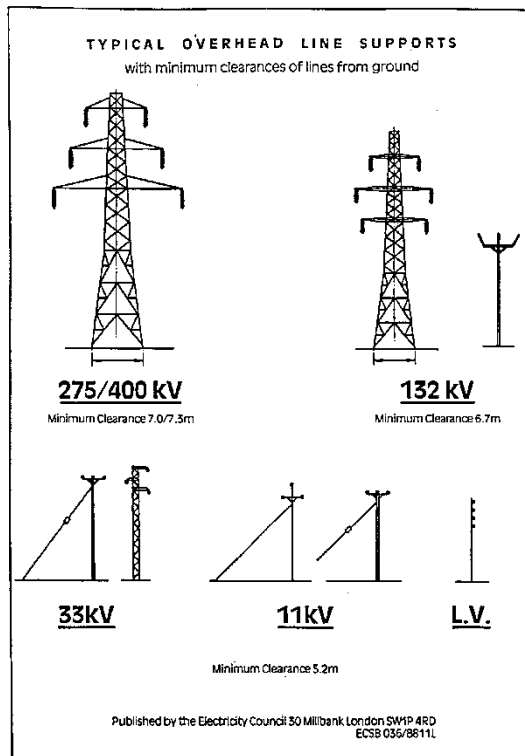
WALES
 Wyn Morgan – 01792 899333
 Maps: 114, 115, 116, 124, 135, 136, 145, 146,
 147, 157, 158, 159, 160, 161, 170, 171

SCOTLAND
 Ailsa Spindler – 01738 621149
 Maps: 01 - 79, 82, 83, 84

Landowner Relations Seminar
Co-ordinator: Wendy Rousell,
 49 Duke St, Wellingborough, Northants
 NN8 2HL Tel 01933 275398
 Email W.Rousell@btinternet.com

landowner relations

Electricity Supply



electricity emergency numbers UK and Eire

East Midlands Electricity plc

0800 363 363
0800 626 555
0800 056 80 90
in order of preference

Eastern Electricity plc

0800 783 88 38 priority over all other calls

London Electricity plc

(0800 096 90 00)
all cables for this area underground so unlikely to be the appropriate company

Manweb plc

0845 272 24 24 queue poss

Midlands Electricity plc

0345 331 331 queue poss

Northern Electric plc

0800 66 88 77

Northern Ireland Electricity plc

0345 643 643

Norweb plc

0800 195 41 41

Manx Electricity

01624 687 687

Jersey Electricity Company Ltd

01534 505 663
Power Station/Paul Swan/
24hrs

Scottish Hydro-Electric plc

0800 30 09 99 and ask for ext 4219 Portnacraig Main Control Room

Scottish Power plc

0845 27 27 999

Seaboard plc

0800 783 88 66 queue poss

South Wales Electricity plc

0800 052 04 00

South Western Electricity plc

0345 651 651 definite emergency number
0800 36 59 00 recently introduced emergency number

Southern Electric plc

0345 70 80 90

Yorkshire Electricity Group plc

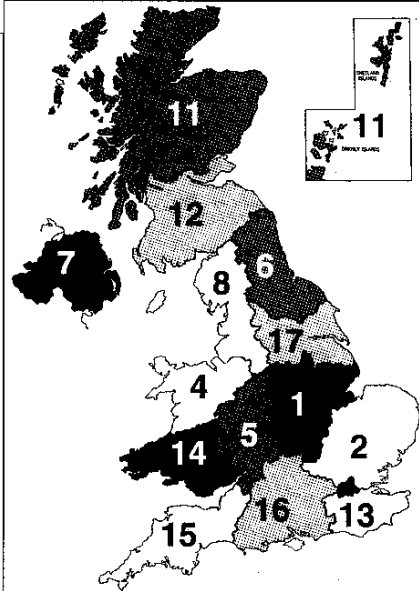
0800 37 56 75

Electricity Supply Board, Eire

112 general emergency services from mobiles only
999 general emergency services from land lines only

States of Guernsey Electricity Board

01481 455828 24hrs



- | | |
|--------------------------------|------------------------------|
| 1 East Midlands Electricity | 10 Jersey Electricity |
| 2 Eastern Electricity | 11 Scottish Hydro-Electric |
| 3 London Electricity | 12 Scottish Power |
| 4 Manweb | 13 Seaboard |
| 5 Midlands Electricity | 14 South Wales Electricity |
| 6 Northern Electricity | 15 South Western Electricity |
| 7 Northern Ireland Electricity | 16 Southern Electric |
| 8 Norweb | 17 Yorkshire Electricity |
| 9 Manx Electricity | |

Compiled May 1999. While every effort has been made to ensure that this information is correct, we cannot accept responsibility for inaccuracies or omissions.

Reproduced from Aerostat (June 1999) who can accept no responsibility for inaccuracies or omissions

Annex D: Radio Procedure

D1: General

D1.1 Radio is the normal means by which Pilots and Ground Crew communicate with each other during flight. It is also the means by which the Pilot may communicate with Air Traffic Controllers during flight.

D1.2 Balloon to ground communication for retrieve messages is conducted on a frequency of 122.475 MHz, VHF. This is a common frequency within the UK for balloon to retrieve communication; all other users in the area will hear anything you say. Used properly, the information and instructions transmitted are of vital importance in assisting the safe operations of balloons. The use of non-standard procedures and phraseology can cause misunderstanding. Incidents and accidents have occurred by the use of non-standard phraseology. The importance of using correct and precise standard phraseology cannot be over emphasised.

D2: Operation of Aircraft Radio

D2.1 Except for a student pilot flying in the course of his training an appropriate radiotelephony licence must be held by anyone operating an aircraft's radio communication equipment. Such equipment must itself be licensed, and operated only in accordance with the conditions of that licence. (Air Navigation Order 1989, Article 38)

D2.2 It is clear from the above that the Pilot must hold a UK Civil Aviation Authority (CAA) Flight Radio Telephony Operator's Licence in order to use the radio from the balloon. It is also clear that all radio equipment must be licensed.

D2.3 The CAA has, for the time being, granted a concession for the operation of ground based, air band, radios used by balloon retrieve crews. This concession applies to radio equipment fixed to transmit and receive only on the balloon frequency of 122.475 Mhz. The concession is that any person who has been instructed in the correct use of the equipment may use the radio to communicate with a balloon in flight or preparing for flight. (The implication regarding equipment is that any multi-channel ground radio must be fixed or locked on the balloon frequency before any unlicensed person uses the radio).

D2.4 BBAC Crew Qualifications at Senior Crew and Master Crew levels contain tests of knowledge and experience in radio use. Anyone qualified under this scheme can be said to have received instruction in the correct use of the radio. All crew intending to use the radio should use this Annexe and the Crew Radio Procedure questions in the Senior Crew question bank to ensure that they have received instruction before first using the radio.

D3: Transmitting Technique

D3.1 The following transmitting techniques will assist in ensuring that transmitted speech is clearly and satisfactorily received.

- (a) Before transmitting check that the receiver volume is set at the optimum level and listen out to ensure that there will be no interference with a transmission from another station.
- (b) Be familiar with microphone operating techniques and do not turn your head away from it whilst talking or vary the distance between it and your mouth. Severe speech distortion may arise from:
 - Talking too close to the microphone
 - Touching the microphone with the lips
- (c) Use a normal conversational tone, speak clearly and distinctly.

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- (d) Maintain an even rate of speech not exceeding 100 words per minute. When it is known that recipients will write down elements of the message, speak at a slightly slower rate.
- (e) Maintain the speaking volume at a constant level.
- (f) A slight pause before and after numbers will assist in making them easier to understand.
- (g) Avoid using hesitation sounds such as 'er'.
- (h) Depress the transmit switch fully before speaking and do not release until the message is complete. This will ensure that the entire message is transmitted. However do not depress the transmit switch until ready to speak.
- (i) Speak clearly and use standard radiotelephony (RTF) words and phrases wherever possible.

D4: Transmission of Letters

D4.1 The words in the table below shall be used when individual letters need to be transmitted. The syllables to be emphasised are underlined.

<i>Letter</i>	<i>Word</i>	<i>Appropriate pronunciation</i>
A	Alpha	<u>AL</u> FAH
B	Bravo	<u>BRAH</u> <u>VOH</u>
C	Charlie	<u>CHAR</u> LEE
D	Delta	<u>DELL</u> TAH
E	Echo	<u>ECK</u> OH
F	Foxtrot	<u>FOKS</u> TROT
G	Golf	GOLF
H	Hotel	HOH <u>TELL</u>
I	India	<u>IN</u> DEE AH
J	Juliet	<u>JEW</u> LEE <u>ETT</u>
K	Kilo	<u>KEY</u> LOH
L	Lima	<u>LEE</u> MAH
M	Mike	MIKE
N	November	NO <u>VEM</u> BER
O	Oscar	<u>OSS</u> CAH
P	Papa	PAH <u>PAH</u>
Q	Quebec	KEH <u>BECK</u>
R	Romeo	<u>ROW</u> ME OH
S	Sierra	SEE <u>AIR</u> RAH
T	Tango	<u>TANG</u> GO
U	Uniform	<u>YOU</u> NEE FORM
V	Victor	<u>VIK</u> TAH
W	Whiskey	<u>WISS</u> KEY
X	X-ray	<u>ECKS</u> RAY
Y	Yankee	<u>YANG</u> KEE
Z	Zulu	<u>ZOO</u> LOO

D4.2 The above letters should be used to spell out words or abbreviations where this will assist understanding. It is common aviation practise not to spell out clearly understood abbreviations such as RV (Rendezvous), ETA (Estimated Time of Arrival), QNH (Regional Pressure Setting) and the like. Abbreviations such as these may be transmitted, as they would be spoken in normal speech.

D5: *Transmission of Numbers*

D5.1 The syllables to be emphasised are underlined

<i>Numeral or numeral element</i>	<i>Latin alphabet representation</i>
0	<u>Z</u> ERO
1	<u>W</u> UN
2	<u>T</u> OO
3	<u>T</u> REE
4	<u>F</u> OW ER
5	<u>F</u> IFE
6	<u>S</u> IX
7	<u>S</u> EV EN
8	<u>A</u> IT
9	<u>N</u> IN ER
Decimal	<u>D</u> AYSEEMAL
Hundred	<u>H</u> UN <u>D</u> RED
Thousand	<u>T</u> OUSAND

D5.2 All numbers except whole hundreds, whole thousands and combinations of thousands and whole hundreds shall be transmitted by pronouncing each digit separately. Whole hundreds and whole thousands shall be transmitted by pronouncing each digit in the number of hundreds and thousands followed by the word HUNDRED or THOUSAND as appropriate. Combinations of thousands and whole hundreds shall be transmitted by pronouncing each digit in the number of thousands followed by the word THOUSAND and the number of hundreds followed by the word HUNDRED.

<i>Number</i>	<i>Transmitted as</i>	<i>Pronounced as</i>
10	One Zero	WUN ZERO
75	Seven Five	SEVEN FIFE
100	One Hundred	WUN HUN DRED
583	Five Eight Three	FIFE AIT TREE
2500	Two Five Hundred	TOO FIFE HUN DRED
11000	One One Thousand	WUN WUN TOUSAND
25000	Two Five Thousand	TOO FIFE TOUSAND
38143	Three Eight One Four Three	TREE AIT WUN FOWER
TREE		

D5.3 Numbers containing a decimal point shall be transmitted as prescribed with the decimal point in appropriate sequence being indicated by the word 'DECIMAL'.

<i>Number</i>	<i>Transmitted as</i>	<i>Pronounced as</i>
118.1	One One Eight Decimal One	WUN WUN AIT DAY SEE MAL WUN
120.37	One Two Zero Decimal Three Seven	WUN TOO ZERO DAY SEE MAL TREE SEVEN

D5.4 When it is necessary to verify the accurate reception of numbers the person transmitting the message shall request the person receiving the message to read back the numbers.

D6: Transmission of Time

D6.1 When transmitting time only the minutes of the hour are normally required. However, the hour should be included if there is any possibility of confusion. *The word 'hours' may be used to indicate a time. Time used for balloon transmissions will normally be local time.* Time checks should be given to the nearest minute.

Message	Transmitted as	Pronounced as
Landing in 10 minutes	Landing In One Zero	LANDING IN WUN ZERO
Time Check 0823 now	Time Check Zero Eight Two Three Hours Now	TIME CHECK ZERO AIT TOO TREE HOURS NOW
Expect to be overhead Bristol at 0730	Expect To Be Overhead Bristol at Three Zero	EXPECT TO BE OVERHEAD BRISTOL AT TREE ZERO

(All Annexe D3: to D6: above, less italics, from CAP 413)

D7: Standard Words and Phrases

D7.1 The following words and phrases shall be used in radio communications as appropriate and have the meaning given below:

Word / Phrase	Meaning
ACKNOWLEDGE	Let me know that you have received and understood the message.
AFFIRM	Yes
APPROVED	Permission for the proposed action granted.
CANCEL ...	<i>Annul the previous message referred to</i>
CHANGING TO	I intend to call.....on <i>another</i> frequency
CONFIRM	Have I correctly received the following.. or did you correctly receive?
CORRECT	That is correct
CORRECTION	An error has been made in this message (or message indicated). The correct version is.....
GRID	<i>The figures which follow are a grid reference.</i>
HOW DO YOU READ	What is the readability of my transmission.?
I SAY AGAIN	I repeat for clarity or emphasis.
NEGATIVE	No or Permission not granted or That is not correct.
OVER	My transmission is ended, I expect a response from you.
OUT	This exchange of transmissions is ended and no response is expected.
PASS YOUR MESSAGE	Proceed with your message
READ BACK	Repeat all, or a specified part of this message back to me exactly as received.
REPORT	Pass requested information.
REQUEST	I should like to know or should like to obtain....
ROGER	I have received and understood your last transmission. Note : Under no circumstances to be used in reply to a question requiring a direct answer in the affirmative or negative.
SAY AGAIN	Repeat all or the following part of your transmission.
SPEAK SLOWER	Reduce the rate of your speech.
STANDBY	Wait and I will call you.

VERIFY	Check and confirm.
WILCO	I understood your message and will comply with it.

(above table, except italics, extracted from CAP 413)

D8: Callsigns

D8.1 All transmissions should contain the Callsign of the transmitting station. The callsign can also be used to refer to other stations. The use of personal names should be avoided during transmissions.

In the example transmissions which follow:

The Balloon transmission is black on shading like this

The ground station transmission is black on clear like this

D8.2 All aircraft, including balloons, have registration letters; these form the normal callsign of the balloon. When first used between two radio stations the full callsign should be used, in following transmissions a shortened version using the last two registration letters, or a shortened title are used: e.g. -

Balloon Control - Golf Alpha Bravo Charlie Delta - request take-off

Control - Charlie Delta - once Zulu Yankee is clear you are clear for take-off

Charlie Delta - take-off after Zulu Yankee - wilco

D8.3 Balloon names may also be used as a call sign, so if the balloon G - ABCD is known as "Rainbow" this name can be used : e.g. -

Balloon Control - Rainbow request take-off

However in crowded airspace, such as at a major balloon fiesta there may be more than one 'Rainbow' so care must be exercised. If in doubt use the full registration as a callsign.

D8.4 Retrieve callsigns can pose a problem. The most simple solution is to adopt the balloons last two registration letters or the name callsign and add 'Retrieve': e.g.-

Charlie Delta Retrieve - Charlie Delta - landing in five

Retrieve - roger

or

Rainbow Retrieve - Rainbow - landing in five

Retrieve - roger

D9: Radio Check

D9.1 Any user can check the strength and readability of their radio transmissions by requesting a 'Radio Check' or 'How do you read' from another station. 'Radio Check' is normal at the start of transmissions, just after the radio has been turned on, whilst 'How do you read' is used as a normal transmission check or when having recently changed frequency.

D9.2 The strength and readability is reported by both stations on a scale of 1 to 5:

<i>Scale</i>	<i>Meaning</i>
1	Unreadable
2	Readable now and then
3	Readable but with difficulty
4	Readable
5	Perfectly readable

D9.3 Hence, during inflation, having just switched on the radios, and in perfect reception conditions:

Charlie Delta Retrieve - Charlie Delta - Radio Check

Charlie Delta - Charlie Delta Retrieve - strength five

Charlie Delta - you strength five also

Later in the flight if there is any doubt about the quality and strength of the transmissions:

Charlie Delta Retrieve - Charlie Delta - how do you read

Charlie Delta Retrieve - strength three {*readable but with difficulty*}

Charlie Delta - I read you four {*readable*}

D10: Example transmissions

D10.1 Using the above procedures a typical series of conversations between balloon and retrieve during a flight may be:

First radio check

Charlie Delta Retrieve - Charlie Delta - Radio Check - Over

Charlie Delta Retrieve - strength five - Over

Charlie Delta - You strength five also - Out

Pre take-off checks

Charlie Delta Retrieve - Charlie Delta - How do you read - Over

Charlie Delta Retrieve - Strength Five - Over

Charlie Delta - Roger Out

In Flight Information

Charlie Delta - Charlie Delta Retrieve - Request your Track and Speed - Over

Charlie Delta - Track - One Seven Zero - Speed One Zero - Overhead
Loamville in one five - Over

Retrieve - Confirm overhead Loamville in one nine - over

Charlie Delta - I say again - overhead Loamville in one five - Over

Retrieve - one five - Roger Out

Changing Frequency

Charlie Delta Retrieve - Charlie Delta - Changing to Loamville Approach -
Leaving this frequency for one zero -
Over

Charlie Delta Retrieve - Roger - call on return - Out

Returning to retrieve frequency

Charlie Delta Retrieve - Charlie Delta - How do you read - Over

Charlie Delta Retrieve - Read you five - Over

Charlie Delta - You Fives also - Out

Preparation for landing {ETA = Estimated Time of Arrival}

Charlie Delta Retrieve - Charlie Delta - Report your ETA at Little Loam - Over

Charlie Delta Retrieve - Wilco - Standby

Charlie Delta - Retrieve - reference your last - ETA one three - Over

Charlie Delta - Roger Out

Landed {RV = Rendezvous}

Charlie Delta Retrieve - Charlie Delta - Landed at Grid eight seven two - four
five one - approach from South West -
RV Great Farm - Read back

Charlie Delta Retrieve - landed grid eight seven two - four five
one - approach from South West - RV
Great Farm - estimate you in five

Annex E: Map Reading

E1: Maps

E1.1 The Ordnance Survey Landranger Series, at a scale of 1: 50,000, are the maps most usually used by both balloon and retrieve crews. This series covers the UK in 204 sheets, each marked in a clear way with the features of the countryside. Conventional symbols are used to designate roads, villages, power lines and the like as well as the typography of the ground using Contour Lines to signify heights and features. All of these symbols are explained in the right hand margin of each map sheet.

E2: The National Grid

E2.1 Worldwide references to parts of the surface of the world can be given by quoting the Latitude and Longitude. This system is difficult to manage and the accuracy of the reference given varies depending where you are on the surface.

E2.2 In the UK a reference grid has been devised which can quickly give an accurate point on the ground to an easily achieved accuracy of 100 metres.

E2.3 The whole of the UK is divided into 100 kilometre squares. Two letters identify each square. Since each map sheet in the Landranger series covers a 40km square it is often easier to refer to maps by number rather than the national grid letters. It must be remembered however that Global Positioning Systems (GPS) now used by many pilots continue to report the grid letters.

E2.4 The national grid squares are divided into 1,000 meter or 1 kilometre squares. The lines that make these divisions are numbered from left to right, - west to east and hence called Eastings and bottom to top, - south to north and hence called Northings. A single square can be given a unique reference using the lower left corner of the square as the reference number, quoting the Easting to the left first then the Northing at the bottom.

E2.5 The square, in the diagram (Figure 11) below, with the road junction is 3452. Reference to a Grid Square can often be of benefit during a retrieve. The balloon may not be able to estimate an exact spot for landing but may be able to indicate a grid square in which the landing will take place, the retrieve can then go to that square and await a more accurate reference. This 'square' reference may be referred to as a 'four figure reference'.

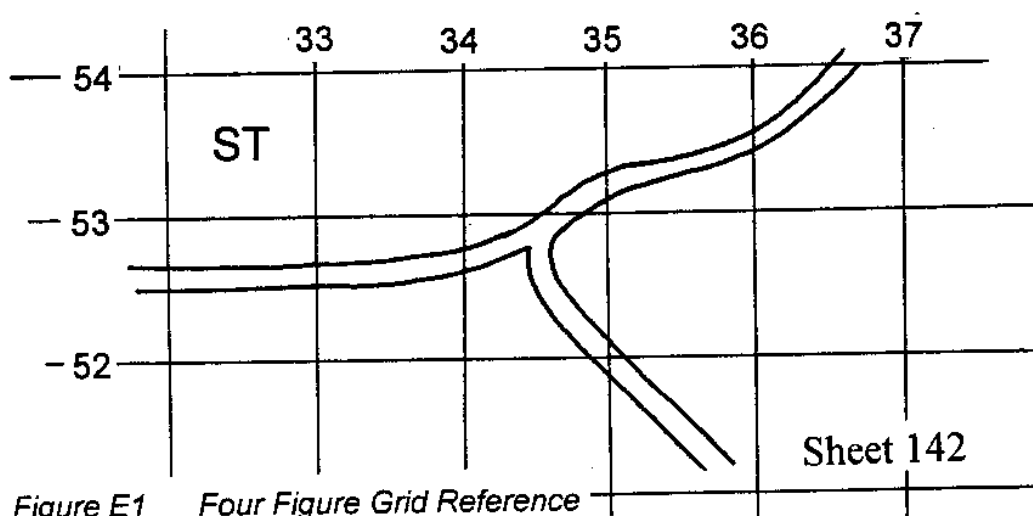


Figure 11 Four Figure Grid Reference

E2.6 To make a more accurate reference we must divide the bottom and left sides of the 'square' into tenths. Estimating how many tenths to the right of the Easing gives the complete Easing reference, in the same example (copied below) this becomes 344. Making the Nothing reference complete by a similar process gives a Nothing reference of 528. The complete 'six figure' reference, accurate to 100 metres is therefore 344528. It is possible to purchase a prospect 'roomer' with the tenths marked to make the estimation easier.

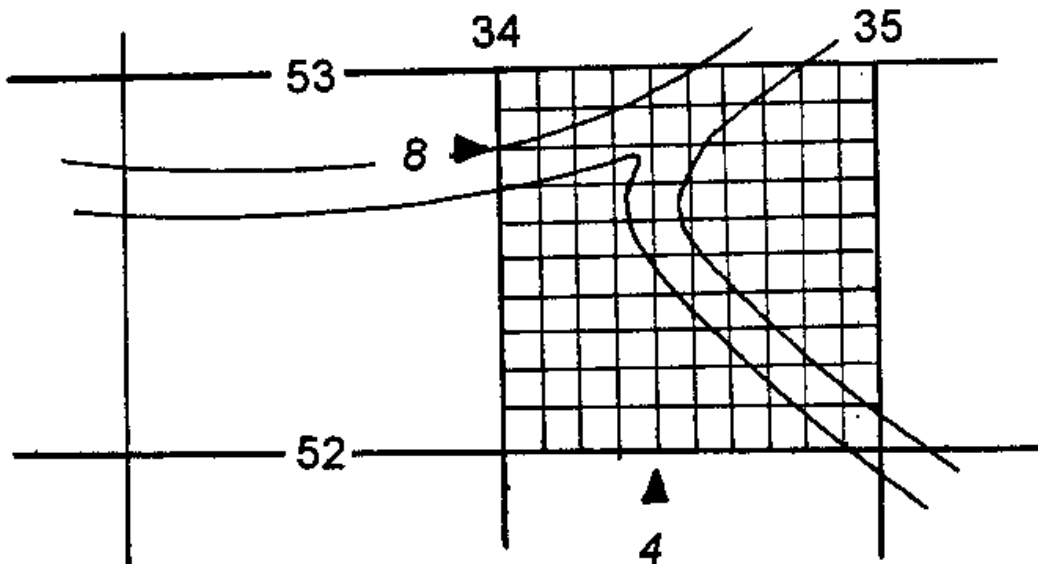


Figure 12 Six Figure Grid Reference

E2.7 The unique 'official' reference to the road junction would be ST 344528, or using the easier sheet number system - Sheet 142 344528.

E3: Direction

E3.1 Direction is always expressed in degrees, starting at North - 0 degrees or 0°, passing through East at 90° South at 180° and West at 270°.

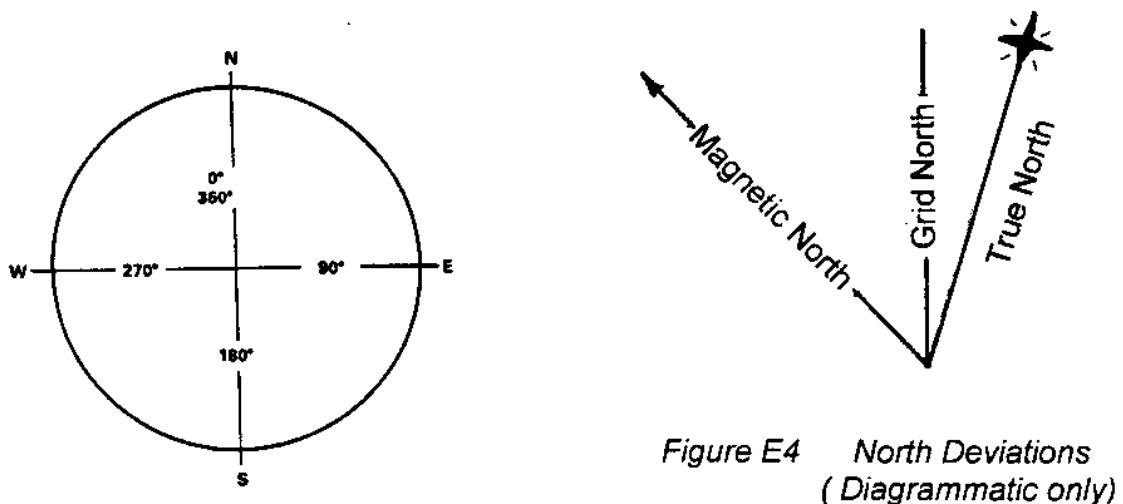


Figure E4 North Deviations (Diagrammatic only)

Figure 13 North Deviations

E3.2 A compass points to magnetic north, which in UK is to the west of 'true north'. When the UK National grid was established the Castings lines were aligned to give best coverage of the UK and hence are along another 'north line' known as 'grid north'. The amount of variation between magnetic north and grid north is marked on all Landranger maps at the central top margin in blue type.

A typical Statement may be:

" Grid Magnetic Angle 05° 00' (89 mills) W of Grid North June 1990 at the centre of the sheet Annual Change about 09' (2½ mills) E". In other words 'the magnetic pole was 5° to the west of Grid North in June 1990 but moving, because the earth wobbles on it's axis, to the east, decreasing by 9 minutes of arc per year'.

E3.3 Such accurate calculations are not required however for ballooning (except in Competition or Badge tasks). Just remember if a bearing is taken on a balloon and converted to the track which the balloon is making across the ground, to plot that track on the map you should reduce the bearing by 5° to get an accurate picture of the balloons movement over the ground.

Remember - "Mag to Grid - Get Rid"

E4: Taking a bearing

E4.1 Taking a bearing on the balloon or on land features from the balloon may be required during flights. A number of 'sighting compasses' are available although a plastic compass marked with degrees and having a moveable compass needle housing can be used to good effect.

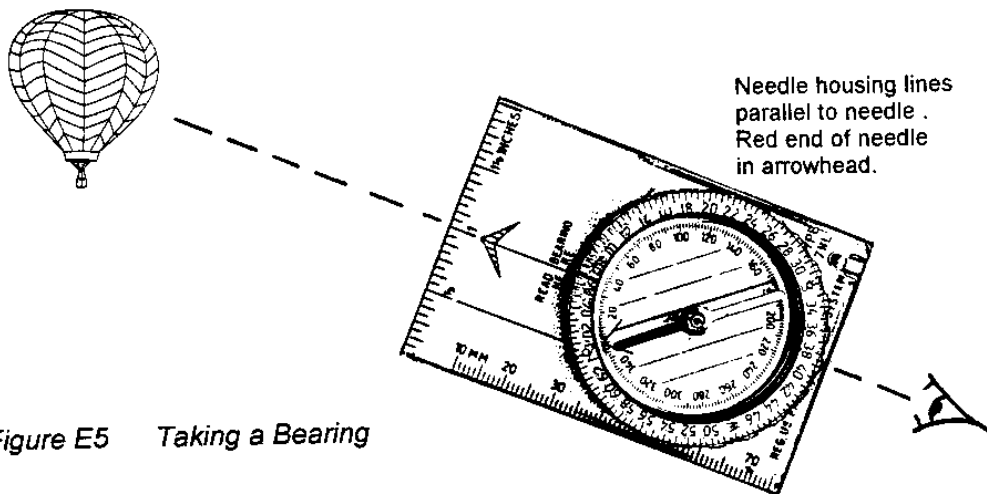


Figure E5 Taking a Bearing

Figure 14 Taking a Bearing

E4.2 Point the red line and arrowhead on the long side of the compass base, often marked "Read Bearing Here" toward the balloon. Move the needle housing until the red lines on the base are parallel to the compass needle and the arrow head is at the red end of the compass needle. The reading by the black mark on the housing above the legend "Read Bearing Here" is the bearing to the balloon. If you are measuring the bearing from the launch site this is the track of the balloon and can be used to predict the future flight path of the balloon.

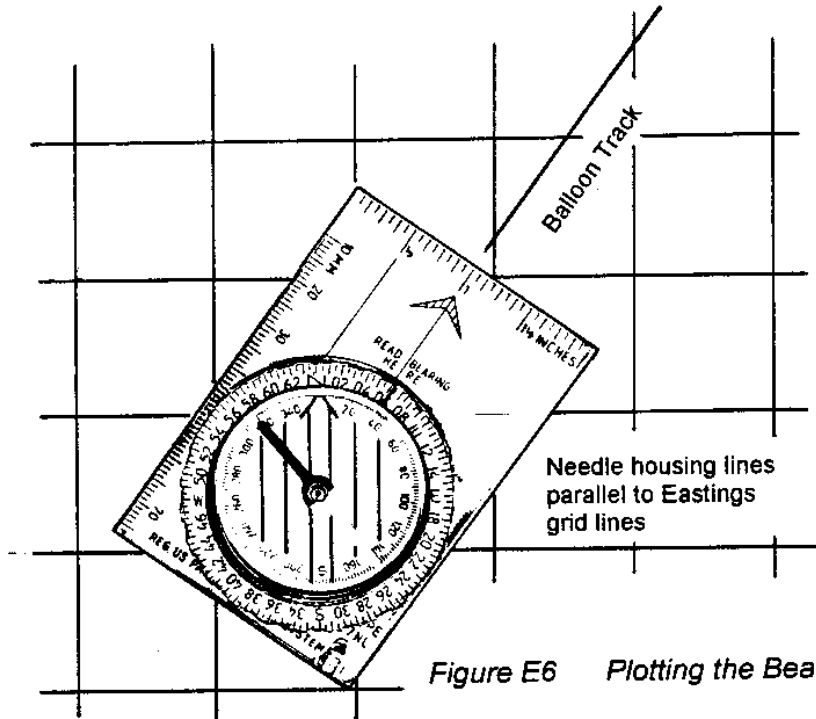


Figure E6 Plotting the Bearing on the Map

Figure 15 Plotting the Bearing on the Map

E4.3 To plot the balloon track on a map place the compass directly on the map with the centre, the needle pivot at the place where the bearing was taken. Move the needle housing reducing the reading by 5° (remember Mag to Grid - Get Rid). Now move the whole compass, not moving the needle housing, until the red lines inside the housing are parallel with the grid lines. The red line and arrowhead used to sight the balloon before now indicate the balloon's track.

Annex F: Incident Management

F1: General

F1.1 Balloon crews may, in rare circumstances, be present at various forms of incident. These incidents may involve the balloon, its' pilot and passengers, in a major accident involving injury, a road traffic accident or a more minor landowner relations incident.

F1.2 In order to deal with these incidents it is best to be prepared, to have thought through what to do, who to tell, and what records to keep. Included in this Annexe are framework documents, which may assist both in preparation and during the management of the incident.

F2: Landowner Relations Incidents

F2.1 During a retrieve it is possible that you will be stopped by a landowner with a complaint about the flight of a balloon. If you are retrieving at a balloon meeting this complaint may not be about 'your' balloon, and even if flying alone you have no knowledge if there are other balloons about. The first rule therefore is to be calm, sympathetic, and business like, but never admit liability - you are merely the reporting mechanism.

F2.2 Follow the layout of the 'Landowner Relations Incident Report' at Appendix (i). It may be better to write the information direct onto the paper rather than using washable marker on the Crew Book envelope.

- Note the Name, Address, Telephone Number and Interest of the complainant or reporting person.
- Obtain from the complainant a description of the balloon, including where possible the registration letters.
- Make notes on the nature of the incident. Include either directly or by your translation of the description a Grid Reference for the incident and a Track for the balloon involved.

F2.3 You must now make a judgement. Was this your balloon? If you believe that it was, then the best approach is to say something like, "From your description the balloon you saw may be the balloon we are retrieving. Only the pilot can be sure. Once we have retrieved the balloon the pilot will return to speak to you". Then give the complainant the name and contact details of the pilot. It is best that you do not give any further balloon details such as registration if the complainant has not already reported them to you.

F2.4 If retrieving during a balloon meeting you should in addition leave any form of details issued by the meeting organiser which will be quoted on the meeting landing cards or meeting details. These could be the meeting control telephone number and organisation address.

F2.5 If there is any kind of problem with a landowner following the landing of the balloon a similar sequence of events should be followed. Do your best to calm the situation and arrange for the Pilot to speak with the landowner as soon as possible. It may be worthwhile explaining that until the balloon is deflated the Pilot has a duty for the safety of the passengers and the balloon. The pause whilst deflation takes place often also deflates the anger of the landowner!

F2.6 If the description is not your balloon, even if you recognise the balloon, all you can do is to agree to pass on the complaint to the meeting organiser or local LRO. Leave the appropriate contact details with the complainant. If the incident is to become a formal notification to the local LRO the appropriate BBAC Sensitive Area reporting form should be used.

F3: Major Incidents

F3.1 The important tasks when managing a major incident are:

- Minimise or remove the possibility of further injury or damage
- Call for help
- Render First Aid
- Record what you and others saw and did.

F3.2 Follow the layout of the Major Incident Framework at Appendix (ii). Complete the form directly onto the paper, this will form part of the eventual incident report.

F3.3 Minimise or remove the possibility of further injury or damage.

Secure the area. Prevent as far as possible others becoming involved in the incident. This may mean preventing as far as possible spectators trying to 'help' and, for example, in the case of a traffic accident controlling the traffic on each side of the site.

Remove the danger. Fight any fires; remember Propane fires should only be fought closely for 30 seconds before clearing the area. If the incident is an electricity 'wire strike' report the strike immediately to the electricity company including as much detail as possible about line location, line type, and any markings on the 'pylons'. You should under no circumstances try to remove any part of the balloon equipment from the wires. Wire strikes need careful and close management. Most power line injuries occur either through fire resulting from burning propane or from falling from the basket. If the balloon occupants survive the first five seconds of the impact and the balloon is not on fire they are safest where they are and should be actively encouraged to stay with the balloon and await rescue by the professional services.

F3.4 Call for Help

The sooner you report the incident the sooner professional help will arrive to manage the incident. The quickest way to start receiving professional advice is to contact the Police, this can be done via the well know '999' number from fixed phones or '112' from mobiles.

You will need to describe the nature of the incident including a comment regarding fire and type of fire, number of people involved and type of injury, location, and provide a contact number. The police control room will decide the response and contact the other agencies needed to manage the incident.

It is better to provide a rendezvous location which all emergency services can reach without problems and guide them from there than to try and describe the exact detail of the location, in particular when in the depths of the country.

F3.5 Render First Aid

The amount of assistance that can be given to the injured depends on the skills and experience of those available. The watchword is don't interfere unless you are confident of your abilities or life is in real danger. No injured persons should be moved, and certainly not removed to hospital by the retrieve or other persons. If you are unable to prevent such removal, by others, you should record: the name of the injured removed, the vehicle registration number of the vehicle removing them, the drivers name and contact number, the proposed destination hospital. The police incident controller will require all of this information later.

Rendering First Aid should follow a simple sequence. Move the injured person only as a last resort in order to save life:

- Remove the danger
- Check for breathing, and where required resuscitate.
- Take measures to stop bleeding
- If concussed ensure that the injured is observed to prevent further injury when 'coming round'
- Cover and dress wounds
- Immobilise fractures.

F3.6 Record what you and others saw and did:

Start compiling an incident report. This should include what you observed, what you did, and the contact details of any other witnesses.

Much of the information regarding the balloon, pilot and passengers will be available from a correctly completed Crew Book.

F4: Commercial Operators Disaster Management Plan

F4.1 The measures described above should be included in a company 'Disaster Management Plan' that will have been copied for use by crews of commercial ballooning operations. Guidelines particular to commercial operations Disaster Management Plans have been made available to commercial operators by BABO.

Landowner Relations Incident Report

Date:	Time:
-------	-------

Incident Reported by:

Name:
Address:
Telephone Number:

Description of Balloon:
Registration?

Description of Incident:

Time of Incident:

Grid Reference of Incident:

Track of Balloon:

✂ -----

Your Details:

Name:	Contact Tel:
-------	--------------

Pilot Name:	Contact Tel:
-------------	--------------

Meeting Organiser	Contact Tel:
-------------------	--------------

Major Incident Framework

REPORT TO POLICE: Phone 999 or 112 from mobiles

Your Name:

Your Contact Telephone No:

Your Position (Crew Chief etc):

Location of Incident:

Nature of Incident:

Number of People Involved:

Nature & Number of Injuries (if known):

Emergency Services RV:

Contact at Police / Report Number:

(fill in during call to police)

Wire Strike Report

Electricity Company:

(from Crew Book)

Telephone No:

(from Crew Book)

Your Name:

Your Contact Telephone Number:

Your Position (Crew Chief etc):

Location of Incident:

Type of Line/Pylons:

Pylon Identification, Numbers, Letters etc

Nature of Incident:

Electricity Company Contact / Report Number:

(fill in during call)

Draft Incident Report

Time of Incident:

Location of Incident:

Grid Reference of Incident:

Nature of Incident:

Actions:

999/112 Report to Police at: (time) By:
(contact/report number given by Police)

Electricity Company Report:
(contact/report number given by Electricity Company)

Actions to Remove Danger:

Actions to render First Aid:

Witnesses

Name:

Contact Number:

Name:

Contact Number:

Annex G: BBAC Code of Conduct for Pilots and Farmers

(as agreed with the NFU and the CLA) 1996 Edition 2

Introduction

It is vital that there is co-operation on both sides to obtain the goodwill of pilots and farmers. It is hoped that a smooth relationship can be achieved if both parties adhere to the recommendations listed in this Code of Conduct. The fifty local and regional BBAC Landowner Relations Officers 'LRO' network in conjunction with the NFU representatives and CLA regional secretaries are keen to facilitate better co-operation and communication between pilots and farmers and accordingly have drawn up the following Code:

In this Code the word pilot shall include pilots, owners or operators. The word farmer shall include farmers, landowners or occupiers.

A. FOR PILOTS

1. Insurance

All balloonists should have insurance cover of at least £500,000 and as much as they can afford for third party damage sustained by farmers. No pilot should be allowed to participate in an organised event without evidence of adequate insurance. Event organisers will check that all Pilots have effective cover in Great Britain. All balloons should be inspected by a BBAC Inspector every year or 100 hours. This inspection is currently free to BBAC Members for private balloons although travelling and expenses may be charged.

2. Flight Planning

1. Do not fly unless you are reasonably certain that your flight path will be over country which is suitable for landing. From May to August pilots should avoid flying over large areas of standing cereal crops in light wind conditions.
2. Pilots should have maps marked with up-to-date sensitive areas covering the planned flight. This information is available in the Pilots (Monthly) Circular issued to all pilot members and other members on request. Pilots flying outside their usual area should contact the local 'LRO' before flying. On completion of a flight, please report to the local LRO any information that may be useful for other pilots.
3. Organisers of balloon meets should include a reference to this Code of Conduct in their literature and should explain the main requirements at pre-flight briefings.

3. The Take-Off

1. Always obtain permission from the landowner before driving on to a field.
2. Check that during the climb-out immediately downwind of the take-off site, the balloon will not have to fly low over livestock. Remember that animals in adjacent fields can be easily frightened resulting in injury that may or may not be apparent at the time and thereby causing the farmer to suffer loss.
3. Climb to above 500ft as soon as possible to avoid unseen animals downwind.
4. Pilots should brief their crew and any other helpers regarding the position of field gates on landings.

4. In the Air

1. The Air Navigation Order requires that an aircraft (balloon) must not fly closer than 500ft to any person, vessel, vehicle or structure except where taking off or landing. Use of the quieter liquid fire burner is recommended when coming below 1000ft to find a suitable place to land. Pilots should try also to avoid flying low over livestock buildings on an approach to their landing spot.
2. If it appears that livestock have been disturbed for any reason, note the location of the incident and check the cause and after effects with the appropriate farmer as soon as possible after landing. If the pilot cannot locate the farmer then approach the local 'LRO' (who will have access to local NFU Group Offices or CLA Regional Offices). If this still proves unsuccessful then seek assistance from the local police station

5. The Landing

1. Select a landing field that should cause the least possible inconvenience to the farmer. Particular care should be taken during the spring and summer months when standing crops (including long grass for making hay or silage) cover large areas of the countryside. Remember the risk of fire when landing in dry conditions from July to September and extinguish pilot lights before touchdown.
2. Ensure that the ground below and ahead is clear of livestock, overhead power lines, buildings or other property that could be damaged.
3. If an emergency dictates a choice between landing in a growing crop or disturbing animals, opt if possible for the crops since any damage is likely to be capable of easier assessment.
4. Immediately after landing take all reasonable steps to discourage onlookers from coming on to the field since damage caused by such inquisitive bystanders in tramping crops may be considerable.
5. Pilots should never make tethered flights or re-inflate the balloon in the landing field or carry out an intermediate landing unless they have obtained permission to do so from the farmer.

6. Record and Retrieve

1. Always contact the farmer, or in his absence a responsible agent (for instance close family or an employee), and obtain details from them giving authorisation to retrieve the balloon. This should be done before the pilot allows his vehicle to come on to private property. Always use a Landing Record card approved by the BBAC, NFU/CLA with all the relevant details.
2. Any request made for a retrieval fee should be negotiated along the lines of BBAC, NFU, CLA guidance given from time to time.
3. If the pilot is unable to contact any appropriate person then he should leave his Landing Record Card in a sensible place and take all reasonable measures to obtain the farmer's name, address and telephone number and contact him as soon as possible afterwards.
4. Pilots should ensure that all farm gates are left as they were found.

7. Post Flight

1. If contacted by a BBAC 'LRO' for further information about a particular flight, then the pilot should co-operate by providing details as soon as possible. If a claim is being made against the pilot's insurance policy then notify insurers

immediately. If the claim is likely to be within the pilot's Excess on his policy the parties are strongly recommended to attempt to negotiate and settle the matter once the farmer has satisfied the burden of proof showing that the damage sustained is most likely to have been caused by the balloon in flight or on landing.

B. FOR FARMERS

1. It is important that farmers are courteous and co-operate with the pilot. If there is any difficulty encountered then the matter should be handled with tact and the services of the representative organisations should be utilised.
2. Where a Landing Record Card is delivered to a farmer then in return the farmer should agree to provide his own details to identify himself.
3. Whenever there is a difficulty with retrieval of a balloon, then the farmer should give reasonable assistance as requested by the pilot to ensure that it is recovered as soon as possible without damage. Any extra expense that is incurred in helping the balloonist should be reimbursed on a reasonable basis to be fixed at the outset.
4. Farmers are reminded that it is illegal to impound balloons. Any damage caused to the balloon by the farmer is recoverable by the pilot through the County Court. Once the farmer has received sufficient details from the Landing Record card he should not unreasonably object to the retrieval of the balloon.
5. If any damage has been caused then the farmer and balloonist should attempt to agree a statement of facts as to the alleged damage that has been caused at the scene of the landing. If it is possible to discuss settlement there and then to prevent future delays through correspondence then cross refer to paragraph 7.1 above.
6. Failing other local practice any request for a recovery fee (which is accepted without prejudice to any potential claim for damage caused) should be £3.00 per head in the basket with a minimum of £10.00.

Annex H: Acknowledgements

H1: Illustrations

Thanks are given for the kind permission to reproduce the following illustrations

- Figure 2 Cameron Balloons Flight Manual Issue 6, 1988 (revised 1989) para 4.2.3
Figure 3 *Based on* Thunder and Colt Ltd. Flight Manual Issue 5, page 26
Figure 4 *Based on* Thunder and Colt Ltd. Flight Manual Issue 5, page 26
Figure 5 Thunder and Colt Ltd. Flight Manual Issue 5, page 30
Figure 6 *Based on* The Ballooning Manual, Bob and Carol Howes, Airlife, page 100
Figure 7 *Based on* Ballooning Handbook, Don Cameron, Pelham Books, page 143
Figure 10 Thunder and Colt Ltd. Flight Manual Issue 5, page 95
Figure C1 Training Manual, BBAC, First Edition, between pages 61 / 62

All other Figures without acknowledgement are the author's copyright.

H2: Other Crew Manuals

Thanks are given to the following for the inspiration and help given by their own crew manuals:

Flying Pictures (Balloons) Ltd
Balloons over Egypt - Crew Chief Training
Polomoche Balloon Team Crew Training Manual

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