ORGANIZING THE CAMP

In many survival situations there will already be someone in a position of responsibility who will head the organization of the camp and lead the development of survival plans. If no established command structure exists among a group of survivors, an organizing committee should be established and individuals nominated and elected with particular responsibilities, perhaps on a rotational basis if it is a large group and rescue does not come quickly. Experience must be pooled and immediate steps taken to discover what skills individuals can contribute.

A roster is essential for such daily chores as collecting firewood and water, foraging, cooking, latrine digging and maintenance tasks, and for hunting and trapping.

In a group of survivors there may be all kinds of people of different ages and experience. People will have varied skills and enjoy doing different tasks. Everyone who is fit and able should take their turn at the unpleasant tasks, unless their skills are so much in demand that it would be a waste of their abilities, but individuals should do what they are good at – and be encouraged to develop skills for which they show an aptitude.

Not only should everyone do their fair share but keeping busy eliminates boredom and keeps up morale. Anyone who is sick or injured gets the lightest jobs and is best employed around camp until they have recovered. In a group there should always be someone in camp, and they should be able enough to operate the signals should a search aircraft appear. If you have sufficient numbers do NOT venture from the camp in less than pairs.

Except in the desert, where the day will be largely spent sheltering from the sun and early morning and evening are the times for activity, daytime is likely to be fully occupied. Evenings, however, may drag if not occupied by hunting. A gathering around the camp fire will help establish a pattern and provide a sense of discipline and normality. It will give an opportunity to debrief on the day's events, to plan for tomorrow and to discuss new strategies.

Music can be a great morale booster. If no instruments were carried or survived, simple ones such as percussion or pan-pipes can easily be improvised, and everyone can sing after a fashion.

Sing-songs, dancing, charades, quizzes and story-telling all have their place and you may have talents which can create more elaborate entertainments. For private recreation any books will be

invaluable and you can make pieces for board games such as draughts and chess, using stones for counters or carving simple playing pieces.

Even the lone survivor requires discipline and order. A regular routine will help morale and exactly the same care must be taken to ensure that the camp is kept in good order. At first there may be so much to do that the individual is too tired to think of recreation, but boredom is even more dangerous for a person on their own and objectives should be set each day whether practical or for amusement.

CAMP HYGIENE

Keeping healthy is an important factor for survival, so strict hygiene should be practised, not only personally but in the planning and running of a camp. Rubbish and latrines must be kept away from the camp to reduce the threat from flies and, since most of the common diseases in a survival situation are water-borne, pollution of drinking water must be rigorously avoided. Food scraps and other rubbish should be burned in the fire if possible.

Camp layout

Select sites for all camp activities so that they do not interfere with each other or pollute the living and cooking areas. If you are camped by a river or stream, fix specific sections for activities and keep to them. Latrines should be dug downhill of the camp and away from the water supply so that there is no possible risk of seepage polluting either.

Activity areas

Establish a water point from which drinking water will be collected and ensure that no one washes, cleans pots, scrubs clothes or otherwise uses the stream upstream of this point. Downstream choose a wash point for personal ablutions and clothes washing and further downstream of that select a place to be used for cleaning cooking utensils.

Latrines and rubbish disposal should be well away from the camp – and preferably downwind – but not so far away that it is inconvenient and people are tempted to go elsewhere. If necessary cut a track to it to make access easier.

REMEMBER: NEVER urinate or defecate in or near your water supply.

Latrines and rubbish disposal

It is important that proper latrines be established, even for the lone survivor. With a group separate latrines for the sexes may make a mixed group feel more comfortable, and as much privacy as possible should be provided. Rubbish, after checking that it really has no useful value, should be burned, and what cannot be burned should be buried.

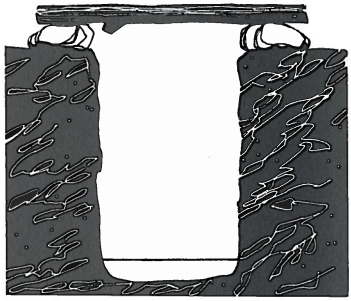
Even if you have it, do NOT use disinfectant in a latrine. Lime or disinfectants would kill the useful bacteria that break waste down and then it WILL start smelling! After defecating cover the faeces with earth. Add small amounts of water which will promote the bacteria.

Make a latrine cover to keep out flies and remember always to replace it, or flies that have walked all over faeces may walk all over your food and start a cycle of infection.

If, after a time, a latrine starts to smell, dig a new one. Fill in the old latrine. Build a new seat and burn old timbers and covers.

DEEP TRENCH LATRINE

Dig a trench about 1.25m (4ft) deep and 45cm (18in) wide. Build up the sides with logs or rocks and earth to make a comfortable sitting height sealing the gaps between them. Lay logs across to leave only a hole for use (or several if you are a large group and making a communal latrine). Empty wood ash on the logs to make a seal – it will also deter flies.



Make a lid of smaller wood to cover the opening or use a large flat rock or a large leaf weighted down with stones. Always remember to replace it.

URINAL

Dig a pit about 60cm (2ft) deep. Three-quarters fill it with large stones and then top up with earth, with a cone made from bark set into it as a funnel. Site it close enough to the camp to ensure that people bother to use it.

Incinerator

If there is too much waste for the camp fire to burn, make a separate fire in the latrine area. If a large can is available use it as an incinerator. Bury any unburned refuse in a garbage pit.

CAMP DISCIPLINE

- Do not prepare game in camp: bleed, gut and skin on the trap line. This attracts game to the traps where you want them, not into your camp.
- Keep food covered and off the ground. If kept in trees make sure it is proof from tree-dwelling animals.
- Replace lids on water bottles and containers immediately after using them.
- Stow spare clothing and equipment in your shelter. Do not leave it lying where it can get wet or burned.
- Have a place for everything and keep things tidy: a tree for mess tins and cooking utensils – hook them on twigs and branches, a place for mugs and spoons – and keep everything off the ground. Fit a box as a cupboard on a tree trunk.
- Never leave the fire unattended.

Soap

Washing with soap removes natural oils, leaving the skin less waterproof and more prone to attack by germs. In survival circumstances it is a mistake to wash with soap too often. However, soap is the most widely used antiseptic, better than many others, such as iodine, which destroy body tissue as well as germs. It is ideal for scrubbing hands before administering first-aid for wounds. Save supplies for this.

Soap-making

Two ingredients – an oil and alkali – are needed to make soap. The oil can be animal fat (including fish) or vegetable, but not mineral. The alkali can be produced by burning wood or seaweed to produce ash.

METHOD: Wash ash with water. Strain and boil with the oil. Simmer until excess liquid is evaporated and allow to cool. This soap will clean the skin but is not antiseptic. Adding horseradish root or pine resin to the brew will make it antiseptic.

Experiment will be necessary to get the balance in the mixture right. Start with more oil than alkali because too much alkali will dry the skin, leaving it sore.

TOOLS

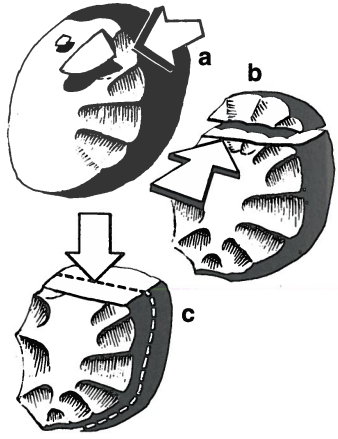
Before humans discovered metals, and learned to work them, tools were made from stone (especially flint, obsidian, quartz, chert and other glassy rocks), bone and other natural objects. Stones can make efficient hammers, alone or lashed onto a handle if in a shape that can be easily secured. The glassy stones can be knapped (chipped and flaked) to make a sharp edge; some other kinds of stone, such as slate, can also produce a knife edge, though they may not have the strength to be used for percussive blows.

The best start for a stone implement is a split cobble, perhaps from a stream bed, or split by a blow from another smooth, hard pebble, so that a flat face is produced. The blow should be at an angle of less than 90 degrees or the shock will be absorbed within the pebble. Once the split is made, other layers can be broken off. Flakes can be removed around the edge of the flat face by hitting edge-on with another stone. Delicate work can be produced by hitting and pressing with a softer tool such as deer's antler. If a flat face is produced, end-on blows can make thin blades.

Making stone implements is not a skill that can be quickly acquired and you may have to be very persistent.

Bones can be used as tools — antlers and horns make useful digging implements, gougers and hammers. They can also be cut with stone tools or ground with coarse stones. You may have the advantage over the prehistoric toolmakers, whose skills you are copying, of having a knife or other metal implement to help you to carve bone.

Some woods, such as the Mulga tree of Australia, used by the Aborigines for spears, are hard enough to make effective blades for hunting and cutting.



STONE TOOLS

One technique for producing an axehead: First the stone is split and the edges partly shaped (a), then a platform is created on one side (b) from which a series of flakes can be struck vertically down (c).

The final shaping can then be done. Hit with softer stones, and hit and press small flakes away with a piece of antler or hard wood.

It may take a lot of patience to acquire tool-making skills but even practise flakes may be useful as scrapers, for cutting edges and as arrowheads.

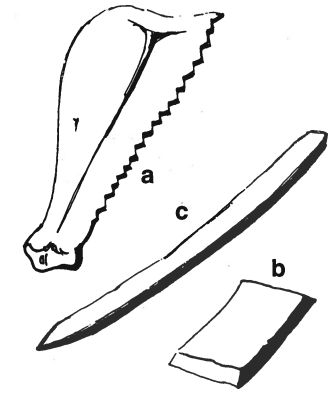
BONE TOOLS

A shoulder blade provides a good shape for an effective saw (a).

First it should be split in half then teeth can be cut along it with a knife.

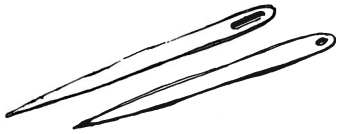
A small bone scraper (b) could also be made, the edge ground sharp.

Ribs are good bones for shaping into points (c).



BONE NEEDLE

Choose a suitably sized bone or flake of bone and sharpen to a point. Burn an eye with a piece of hot wire, or lacking that, scrape with a knife point or piece of flint. DON'T heat the knife in the fire.

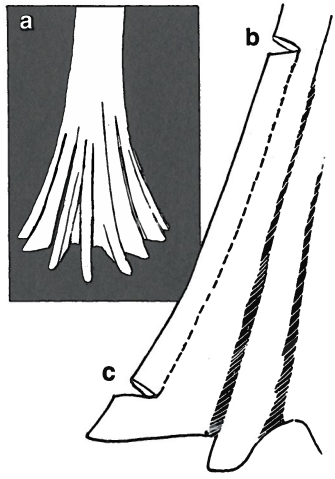


AXES

A fire axe is part of the equipment of any boat or plane, but an axehead, to be fitted to an improvised handle, is a useful additional piece of equipment for anyone to carry. One of about 500–750g (1–1½lb) is ideal. Use your knife to fashion a handle when needed.

AXE HANDLE

Any straight, knot-free hardwood is suitable – ash and hickory are ideal. In the tropics the flukes of a buttress tree (a) are excellent: slightly curved, straight-grained and easy to work.



Cut two notches into the fluke of a buttress spaced to the desired handle length (b to c).

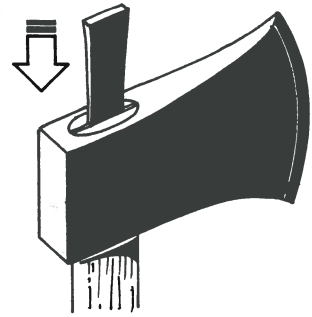
Hit along the side of fluke close to the cuts. It will split away at their depth.

FITTING THE HEAD

Whittle the handle into shape with one end cut to fit the hole in the axehead, cutting a notch in that end. Make a wedge to fit the notch.

With the head in place drive in the notch then soak the axe in water overnight to tighten the head on the shaft.

Always check axeheads for tightness before using them.



FITTING A STONE AXEHEAD

Select a hardwood handle. Tie a band of cord around it about 23cm (9in) from one end. Split the end down as far as this band (use your knife and a wedge or the piece of flint you have made for the axehead). Insert the flint and tie the end to secure.

This mounting will split wood but will not be very effective for chopping it.

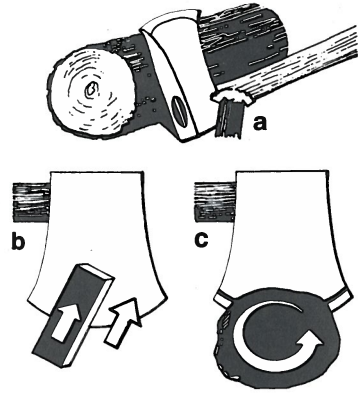
Sharpening an axe

An axe with a blunt edge becomes no more than an inefficient hammer so keep it sharp, it will save energy. A file is best for getting rid of burrs, and a whetstone for imparting the sharp edge. A file is a one-way tool – it works when pushed, not pulled.

Prop axehead between a log and a peg (a). Always try to sharpen INWARDS from cutting edge to avoid producing burrs.

Use a file or rougher stone first to remove rucks and burrs (b). Then finish with a smoother stone, using a circular motion. Don't drag the stone off the cutting edge. Push ONTO blade. (See Knives in Essentials).

Turn the axe over. Repeat the process circling in the opposite direction.



Using an axe

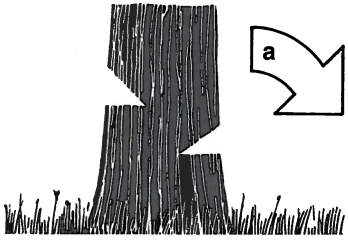
Most people have a natural prime hand and swing. Use an axe in a way that is comfortable to you, swinging it in an arc that feels natural with a firm grip and ALWAYS away from your body, hands, and legs. Make sure that, if you miss the tree or other point of aim and follow through, the axe will not strike you or anyone else. NEVER throw an axe on the ground. Sheath it or bury the blade in a log.

Tree felling

Check overhead for dead branches, which may fall and injure you, and for hornets' nests. Clear branches or creepers which could deflect your blows. If roots or the bole spread out at the bottom, build a platform to reach a thinner diameter trunk and reduce the effort of chopping. Ensure such a platform is stable and that you can jump off it quickly if the tree falls the wrong way!

Work at a comfortable height and try to cut downwards at 45 degrees, although every now and then a horizontal blow is needed to clear the cut.

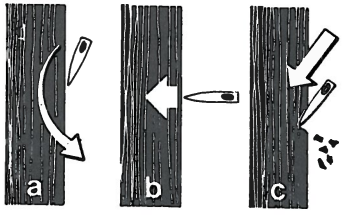
Cut from both sides of the tree, first chopping out a notch at an angle of about 45 degrees and another on the opposite side at a lower level, ON THE SIDE TO WHICH YOU WANT THE TREE TO FALL (a). Do not cut through more than half the tree before starting the other notch.



If two people are at work on opposite sides this is particularly important. A leaning trunk or a tree with most of its branches on one side will fall in the direction of its weight and the placing of the cuts will not affect it.

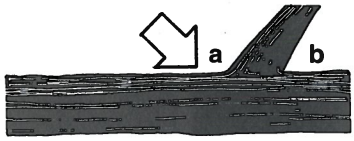
A steady rhythm of blows will cut more effectively than trying to make fewer big blows. If you put too much effort behind the axe your aim will suffer and you will soon tire. Let the weight of the axe do the work.

Alternating the angle of stroke will prevent the axe from jamming. Too steep an angle will cause the axe to glance off the trunk (a). Dead-on will make it jam or be inefficient (b). Aim for 45 degrees (c).



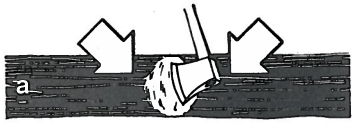
TO REMOVE BRANCHES

Cut off branches from the outside of the fork (a), not the inside (b).



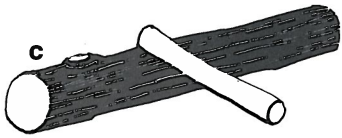
SPLITTING LOGS

Stand behind a large log with feet well apart. Swing down to cut the side away from you (a).

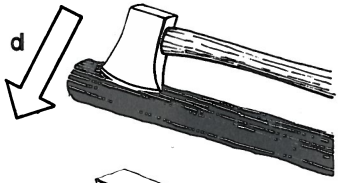


Do NOT chop downwards (b).

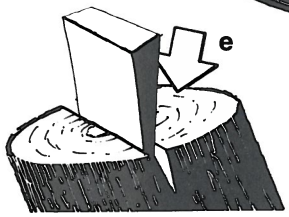
To split a smaller log, angle against another log (c). DO NOT PUT YOUR FOOT ON IT.

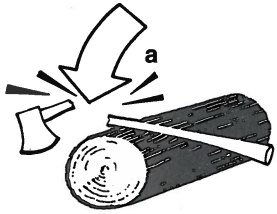


Alternatively, hold smaller log against cutting edge of axe and bring both down together (d) on to a larger log. (Not to be tried holding too short a log for safety.)



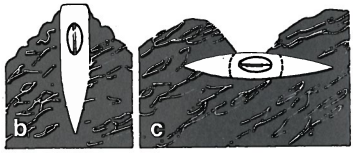
If in doubt split larger logs with a wedge and a rock (e). DO NOT HOLD WOOD UPRIGHT IN YOUR HAND AND ATTEMPT TO SPLIT WITH AXE.





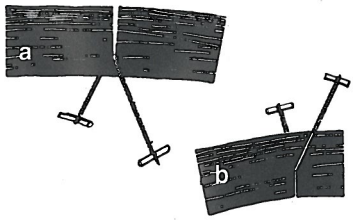
BROKEN HANDLES

Using an axe takes practice and while gaining experience axe handles often get broken – usually because the head misses the target and the handle takes all the blow (a). To remove a broken handle, the easiest way is to put it in a fire, burying as much as possible of the metal in the earth to prevent it losing temper – single-headed (b), double-headed (c).

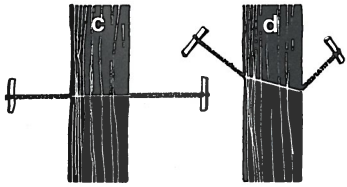


USING A FLEXIBLE SAW

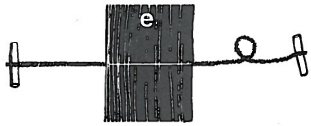
Always use a flexible saw so that the cut opens up (a) rather than closes tight (b) on the saw, causing it to jam. Do not pull too hard or the saw may break.



At all times keep the wire taut (c) pulling in a straight line, never at angles (d).

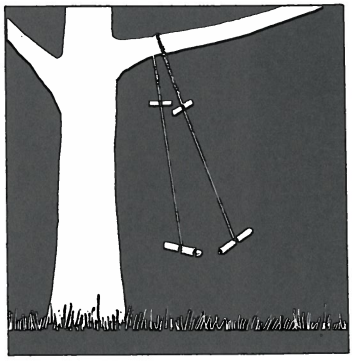


With two people the rhythm must be carefully maintained. If a kink is produced in the saw (e) it may break.



It is usually easier for a single person to cut a log by pulling upwards (f). Support the log to keep it off the ground and give it an angle to keep the cut open.

Alternatively, to remove a branch, pull down from above the head (g). This could be dangerous.



Very high branches can be removed by attaching strings to the saw toggles to give extra reach. This is dangerous. Keep your eye on the branch and be prepared to jump out of the way.

FURNISHING THE CAMP

BEDS

Sleep is the great regenerator and a comfortable bed is worth a little effort. Some form of bedding should always be used to avoid lying directly on cold or damp ground. In tropical climates it is always better to raise the bed into the air, both to keep off wet earth and to provide a current of cooling air. In cold climates, when no permanent shelter has been erected, choose fuel which will keep the fire going through the night and build a screen to reflect heat back on to your sleeping space.

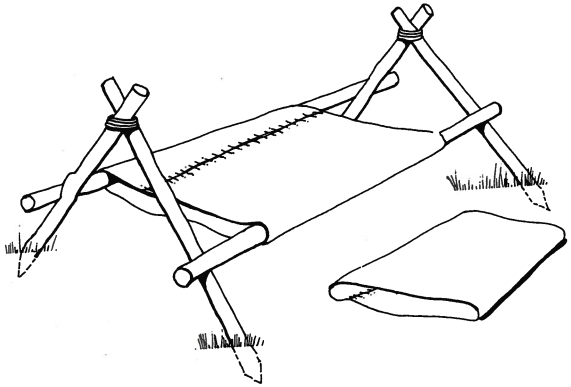
When the ground is dry, or under shelter, stones heated in the fire (but see *WARNING* in *Fire*) and then buried under a thin layer of soil beneath the bedding will keep their heat through most of the night, adding to your comfort.

A-frame beds

An A-frame forms a strong construction and will keep you off the ground. Drive two pairs of posts into the ground at an angle, leaving a little more than your height between the pairs. Lash the tops together. If the ground is hard, cross-members will be needed between the feet of each A-frame and between the two A-frames.

Tube bed

This simplest form depends on having or making a tube of strong material, sewn or thonged together. A large heavy-duty plastic bag is suitable, but not thin plastic. Really toughly made clothing could serve but would usually make a rather narrow bed.



Do not risk this method with any fabric that might give under your weight or with seams that might come apart.

Make A-frame supports and choose two fairly straight poles, each slightly longer than the distance between the frames, and pass them through the tube of plastic or fabric. Place them over the frames so that they rest on the sides, the tube preventing them from slipping lower.

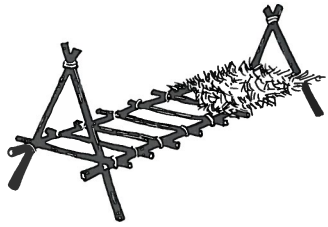
Bough bed

Where conifers are growing, fir tree branches arranged in alternate layers will be comfortable and their fragrance will ensure a good night's sleep.

Ladder bed

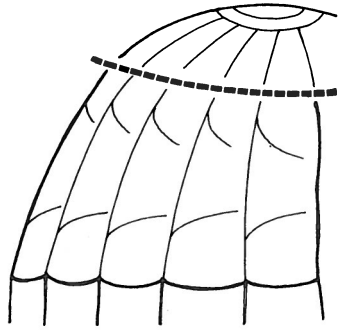
Make A-frame supports and select poles as for the tube bed, but you will also need a number of cross-pieces – how many will depend upon the size of the sleeper and the kind of bedding to be used. Springy saplings will be more comfortable than boughs, provided they are strong.

Lash the end 'rungs' to the A-frames, jutting out either side. Make these of strong timber and lash them securely. Fit the ladder over the frames and lash in place. Lay bedding of bracken, ferns or leaves.



Hammocks

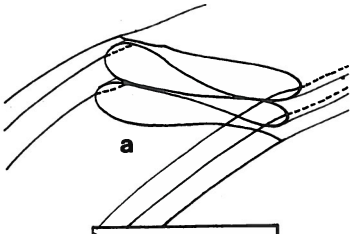
It takes a little practice to sleep in a hammock – in a string one you must push the sides outwards so that it cups around you.



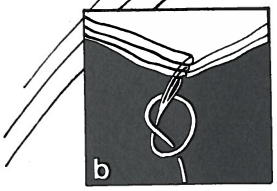
PARA-HAMMOCK

It is possible to make a hammock from a parachute. The rigging lines run through the fabric right up to the apex. Cut five panels as shown but do not cut the rigging lines above.

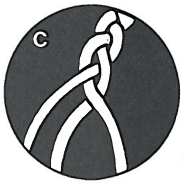
Overlay the panels as shown (a) and flatten out.



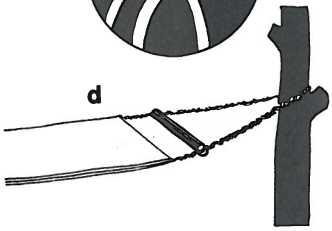
Grasp the three rigging lines in the corner and tie, close to the fabric, in an overhand knot (b).



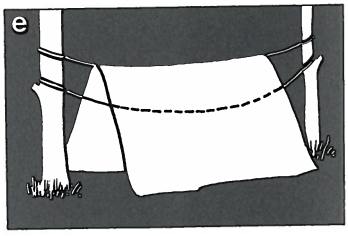
Then plait the three lines together (c) (see Knots).



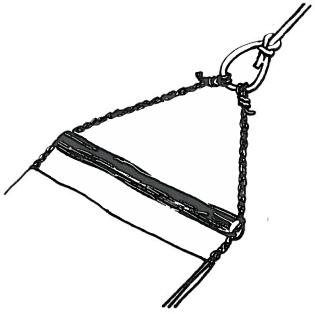
Insert spacer bars, notched at each end (d) to take the lines and tie your hammock to two convenient trees or stout posts.



If you rig a line over the hammock (e) you could drape a groundsheet or poncho over you to form a quick shelter. If you do this be sure one end of the hammock is secured with a quick-release knot (see Knots*). It might be necessary to get out of the hammock in an emergency.*

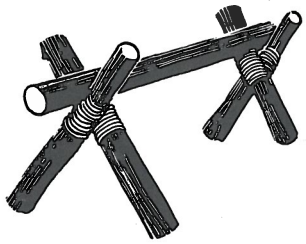


If you have another piece of rope, or plait some from unused rigging lines, you could tie both the hammock strings to a fixed loop, such as a bowline (see Knots*). Experiment with different ways of suspending your hammock, until you find the most stable and comfortable.*

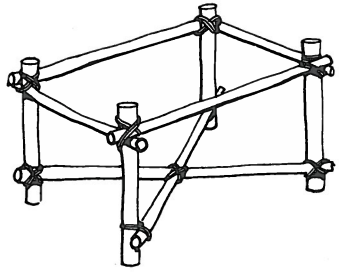


SEATS

Never sit on damp ground. Use something, even if it is only a log. If there is no ready-made seat available, lash together a couple of low A-frame supports and rest another bough across them.

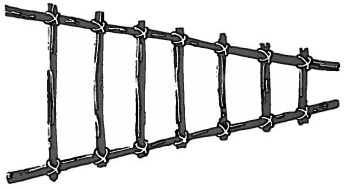


Make a simple box frame with cross-members linking legs from short lengths of wood. To make a seat: weave vines or twine back and forth or sew on a piece of canvas or plastic with thongs. Failing these, try a flat piece of wood or metal laid across, or thin springy saplings lashed to the frame and interwoven.



LADDER

Food-collecting, shelter-building, trap-setting and a whole lot of other tasks will be easier with a ladder. This one is easily made by lashing cross-pieces to two long poles. Because these are set at an angle, not parallel, the rungs will not be able to slip down.

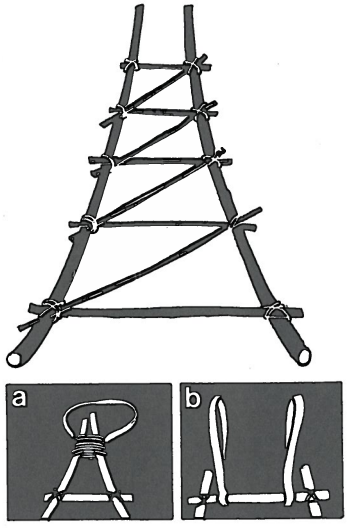


TRAVOIS

For bringing fuel or your prepared kill back to camp, or for other loads, a travois will work if the ground is fairly smooth – it will not on rough and boulder strewn terrain. Choose two boughs with some spring to them and lash cross-pieces, as for the ladder. Add additional struts to provide closer support.

Pull the load on its 'runners' like a sled. If you are pulling loads over a short distance, lash the runners to come to a single grip (a). For a larger version leave the last space clear or fit leather or fabric shoulder straps to haul it by (b).

(For carrying equipment and sledges see *On the Move*).



ANIMAL PRODUCTS

SKINS AND FURS

All animals provide skins. Their condition will depend on how carefully they were removed, the way the animal was killed (which may have damaged the skin), the age of the animal and time of year (mating season, moult and change of season can affect the amount and colour of fur in some species). Common defects are due to parasites, disease, malnutrition and scars from fight injuries.

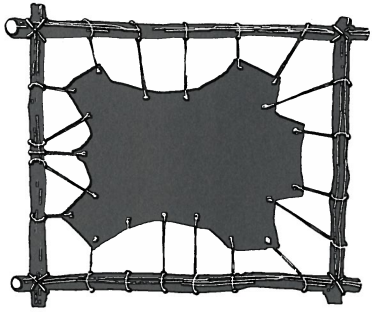
Snakes, lizards, crocodiles and other reptiles all provide excellent skins. So do large birds such as ostriches. Some aquatic mammals, seals and their relations, are fur-bearing, like land mammals, and whales and dolphins have strong hides. Sharks also have a hide, instead of scales like most other fish. Birds can be skinned with the feathers attached and used to make warm clothing or bed covers. Skin is a source of food and in circumstances of acute shortage can be eaten, even after being preserved and used for clothing, but it is very tough and takes a lot of digesting. There are cases of people surviving by eating their boots, though it should be emphasized that in all such cases plentiful water was available.

Skins and hides are composed of water and proteins and decay quickly if they are not specially treated to preserve them. How they are treated will depend upon whether you want to retain the hair or fur, but the initial stages will be the same in both. To make moccasins, shelters, laces, thongs, water bags or canoes, the hair is removed, but for warm clothing, bedding or a good insulating groundsheet it should be left on.

Properly prepared skins will be supple, yet strong, and resist tearing, abrasions, deformation or stretching. They are comfortable to wear, with good thermal insulation, but permeable to air and water vapour.

CLEANING THE SKIN

Make cleaning and drying a skin easier by stretching it on a frame. Do not make the holes for the cords too close to the edge. Remove fat and flesh by scraping the skin, using an edge of bone, flint or other rock, or even wood. Take care not to cut the skin. Remove every trace of flesh. Ants and other insects may help you if you lay the skin on the ground. Keep watch that they do not start to consume the skin itself.



To cure furs

Stretch the skin as tight as possible and leave it in the sun to dry out. All the moisture must be drawn from it so that it will not rot. Rubbing salt or wood ash into the skin will aid the process.

Do not let the skin get wet, or even damp, until the process is complete. Do not leave it where it will be exposed to rain or risk a covering with morning dew.

Keep it absolutely dry. If little or no sun is available, force dry over a fire, but keep the skin out of the flames and use only the heat and the smoke (which will aid preservation). Keep it away from the steam from any cooking pots.

Leather-making

After cleaning, place the skin in water and weight it down with stones. Leave it until the fur can be pulled out in handfuls – usually 2–3 days.

Make a mixture of animal fat and brains, simmered over a fire till they form an even consistency.

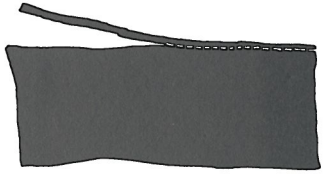
Scrape the skin on both sides, removing hair, and grain. Keep it wet. Work sitting down with the skin over your knees. Keep manipulating it.

Work the fat and brains mixture into the inner side of the still-wet skin, stretching and manipulating as you do so.

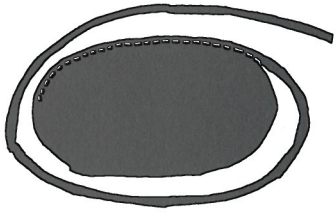
Dry the skin in the smoke over a fire, keeping it well away from the flames. The smoke sets up a reaction with the solution you have rubbed in to make the skin supple.

Laces and lashings

Hide is one of the best materials for lashings and for thongs to lace things together.



Cut short laces straight from the skin, along its length.



To obtain a greater length cut in a spiral – keep the width consistent or the thonging will have weak points.

Sinew as thread

The hamstring and the main sinews of the legs – especially of the larger animals – can be dried and used as thread to stitch hides together for shelter and clothing. Recognize them by their strong, white, cord-like appearance.

You can also use them for bowstrings and short ropes. They make excellent bindings for arrowheads. Sticky when wet, they dry hard.

Bladder

The normal function of the bladder is to hold water, so naturally the bladder of a large animal can be used as a water carrier – so can the stomach. Tie off the openings to seal them.

CLOTHING

When inadequately or unsuitably clothed for the situation you can improvise or supplement protection in many ways. Weaving fibres will only be practicable in a long-term situation and skins will not be available at first. Salvage towels, blankets, tablecloths, cushions, seat-covers, curtains, sacking from the wreckage – with a bit of initiative any kind of fabric can be used for garments, bedding or shelter.

Improve insulation and increase warmth by adding layers. Wear one sock on top of another and stuff dry grass or moss between them. Grass, paper, feathers, animal hair, etc, can be stuffed between other layers of clothing – newspapers give excellent insulation.

Waterproofing

Use plastic bags and sheets to improvise waterproofs or cut off large sections of birch bark. Discard the outer bark and insert the soft and pliable inner layer under the outer clothing. It will turn away much of the rain. Other smooth barks that peel easily can be used, but birch is best.

In the longer term, improve water-repellent qualities by rubbing animal fat or the tallow from suet into your clothing. Do NOT do this in situations of intense cold, where the reduction in insulation would be too great a loss and rain rarely a threat.

Footwear

Never underestimate the heavy wear and tear of rough ground on

your feet. Climbing over rock and scree can soon destroy a pair of smart city shoes. High heels and sandals will soon break or wear in rough conditions.

- Cut shoe soles from rubber tyres, make holes around the edges for thongs to tie them over wrapped feet, or to sew onto fabric uppers.

- Several layers of wrapping are better than one on the feet. Tie on with thongs or use a triangular shape. Fold one point back over toes, make slits in front. Bring other points from behind the heel, through slits and tie around ankle.

- Moccasins can be cut from a single piece of leather, about 8cm (3in) bigger all round than the actual sole of your foot. Thong in and out around the edges and gather them in over wrapped feet. Tie off the gathering thongs, and weave another back and forth over the foot to make more secure. Alternatively, given more time and patience, more traditional moccasins can be made from a thickish hide sole, side strips and an upper. Measure around your foot first.

Goggles

To protect from glare at sea and in snow or desert cut a strip of material, paper, bark – but not metal – to tie over the eyes (or over the whole face in cold climates). Eskimos often carved goggles from wood. Make narrow slits for the eyes. Add extra protection by blackening beneath the eyes with charcoal to reduce glare.

Needle and thread

The Agave plant produces fibres for ropes and mats that are too rough for clothing but the end of the leaf is almost always a hard point which can be extracted with a fibre attached. It makes a perfectly threaded needle!

Clothing tips

- Tie long leaf strips and fibres around a belt or neck band to hang down as a 'grass' skirt or cape.

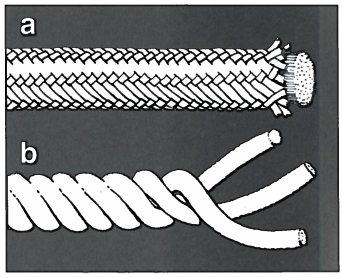
- Cut a head hole in a blanket or carpet and use as a poncho. Tie at waist or thong sides.

- Small skins are easily thonged or sewn together. Fur on the inside will give greater insulation but on outer garments the suede side sheds snow better.

ROPES AND LINES

There are thousands of uses for ropes and line, from securing constructional joints to making candle wicks, for rappelling down a cliff face to making snares and nets. Traditional materials for rope include hemp, coir (coconut fibre), Manila hemp (from the Abaca plant), henequin and sisal (both from species of Agave). Rope can be made from any pliable, fibrous material producing strands of sufficient length and strength. Much modern rope is made from nylon and other man-made fibres. They have the advantage of great inherent strength, lightness, resistance to water, insects and rot. However, nylon rope should not be the automatic choice if choosing equipment.

Nylon has the disadvantage that it can melt if subjected to heat – and friction on a rope produces heat. It is also slippery when wet. While its tensile strength is good, nylon also tends to snap if subjected to tension over an edge – it does not have to be a very sharp edge.



TYPES OF ROPE
Kernmantel type (a) encloses a central core of strands in an outer sheath. Easier to handle, except when wet or icy, but not so strong as hawser. It can unravel if cut. Traditional hawser-laid rope (b) has three bundles of fibres twisted together. If one is severed the others may hold.

Choosing rope

Match type, thickness and length of rope you carry to the demands you expect to make on it. Nylon will have advantages in very damp climates and when weight is critical but remember its drawbacks. Thicknesses of 7mm (5/16in) and below are difficult to handle.

Rope about 9–10mm (3/8in) is usually recommended for lashings, throwing and mountaineering. It can be used for safety lines and for climbing, provided belay and abseiling techniques are used – it is not thick enough for a hand over hand and foot grip. A length of 30–40m (100–125ft) would then be as much as can be carried without encumbrance.

Climbing rope must be elastic, to absorb some of the shock, without putting enormous strain on anyone who falls. See if it has the approval of official mountaineering bodies or conforms to the British Standard 3184 (for hawser-laid ropes).

Taking care of rope

Rope should be protected from unnecessary exposure to damp or strong sunlight and (in the case of natural fibres) from attack by rodents and insects.

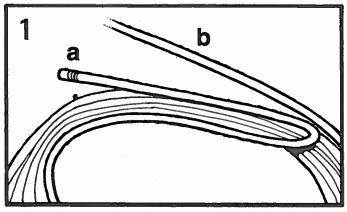
If it does get wet, do not force-dry it in front of a fire. Do not unnecessarily drag it along or leave it on the ground. Dirt can penetrate and particles of grit work away at the fibres from inside the rope. If weather conditions will make drying possible, it is worth trying to wash a very dirty rope in clean water.

Try to keep a rope for the job for which it was intended – do not use climbing rope as clothesline or lashing if you can avoid it – though in a survival situation you may have to use the same length for many purposes.

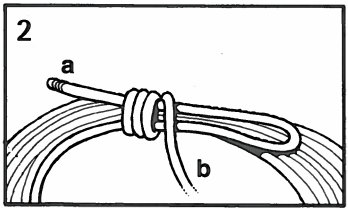
Whipping the end of the rope (shown later) will prevent it fraying. To prevent a rope becoming tangled, store and carry it in a coil or skein. It will be easier to handle and to pay out when needed.

Rope is valuable equipment. You may have to trust your life to it. Do your best to keep it in good condition.

SIMPLE COIL



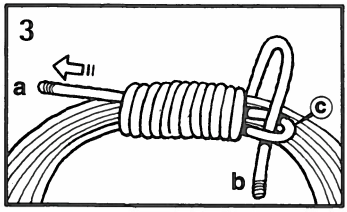
1 *Make a coil of rope 35–45cm (14–18in) in diameter, keeping each circle of the rope alongside the next without twisting or tangling. Leave a length at each end ready for fastening.*

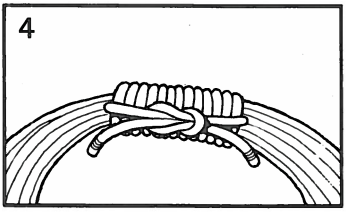


2 *Bend one end (a) back along the coil and wrap it with the other end (b).*

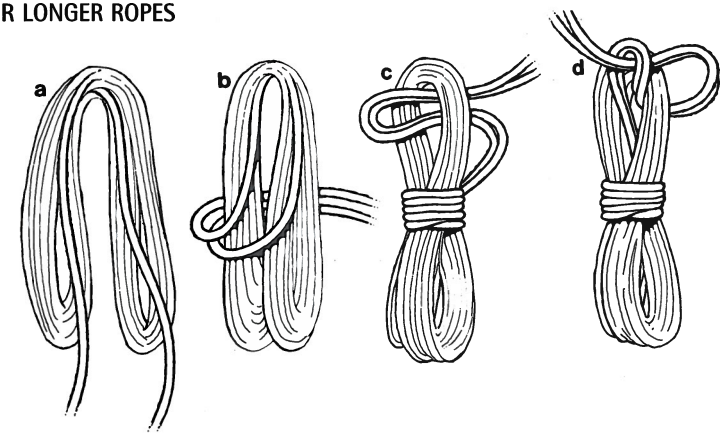
3 *Feed the 'wrapping' end through the loop (c) and pull (a) to secure.*

4 *Tie off with a reef knot – shown later.*





FOR LONGER ROPES



If you wish to carry long ropes over your shoulder or suspended from a belt or from your pack, form a skein.

Loop the rope backwards and forwards over your arm, letting it hang down about 35–60cm (18–24in) long. Leave the ends free (a).

Take both ends together and wrap them several times around the skein (b). Make a loop and take this through the top part of the skein (c) and, finally, pass the ends through this loop (d).

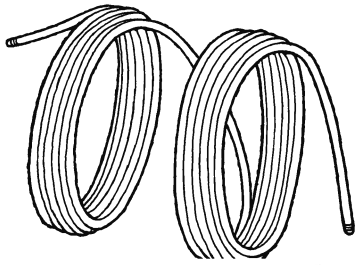
Now tie off on to your pack with a reef knot.

Throwing a rope

It is easier to throw a coil of rope than to attempt to sling a loose end – whether you are throwing upwards or outwards – and it helps to split the coil so that it doesn't tangle. Have a large knot or weight on the throwing end. Make sure that you keep hold of the other end!

Think about the anchored end and what will happen to it when the other end reaches its target. If throwing a lifeline, for example to a fast-moving raft on water, are you going to be pulled into the water yourself? Anchor the end to a tree or weight. Always overthrow a lifeline so that the recipient stands a good chance of catching part of the rope, even if they miss the end.

Coil half the rope onto the fingers and palm of the right hand, then raise the index finger and coil the remainder onto the other fingers only. Pass the second coil back to the left hand.



As you throw, release the right-hand coil a split second before the left. Anchor your end if you think there will be sudden strain on it and your position is precarious.

FOR A LONG THROW

Tie a suitable missile to the end of the rope (a). Coil the rope carefully on the ground or loop it loosely over the other hand so that it will pay out freely as you throw the missile.

Don't risk loosing your end of the rope. Tie that to an anchor, a heavy stone for instance. Use a killick hitch (shown later).

If throwing a weighted rope over a branch keep out of its path as it swings back towards the throwing point! If throwing a lifeline don't knock out the person that you are trying to help!

ROPE-MAKING

Vines, grasses, rushes, barks, palms and animal hairs can all be used to make rope or line. The tendons from animals' legs also make good strings, but they tend to dry hard (very useful for binding on arrow and spear heads).

The stems of nettles make first-class ropes and those of honeysuckle can be twisted together to make light lashings. The stronger the fibre, the stronger the rope. Some stiff fibres can be made flexible by steaming or by warming.

While pliable vines and other long plant stems can often be used, as they are, for short-term purposes, they may become brittle as they dry out. A rope made from plant fibres twisted ('spun') or plaited together will be more durable.

Sources of fibres

- **Nettles** (*Urtica dioica*) are an excellent source of fibres but require preparation.

Choose the oldest available plants and those with the longest stems. Soak them in water for 24 hours, then lay them on the ground and pound them with a smooth stone. This will shred the outer surface exposing the fibrous centre. Tease and comb to remove fleshy matter. Hang to dry.

When dry, remove and discard the outer layer. 'Spin' fibres into long threads. Plaiting or twisting together to make a strong rope.

- **Palms** usually provide a good fibre. Leaves, trunks and stalks can all be used. The husk of coconut is used commercially to make ropes and matting.

- **Dogbane** (*Appocynam cannaninum*) stems also provide very good fibre, with which it is easy to work.

- **Barks** Willow bark especially produces very good fibre. Use the new growth from young trees. The dead inner bark of fallen trees and tree branches should not be overlooked. But if the tree has been down too long it may have decayed too much, so test it for strength.

- **Roots** The surface roots of many trees make good lashings. Those that run just under, or even on the surface, are often pliable and strong. The roots of the spruce are very strong. The Indians of North America used them to sew birch bark together to make canoes.

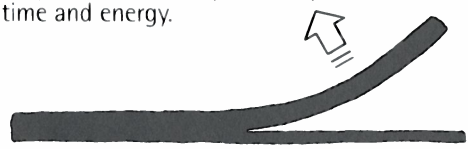
- **Leaves** Plants such as those of the lily family, especially aloes, have very fibrous leaves. Test by tearing one apart. If it separates into stringy layers it can provide fibres to make into rope. Soak to remove the fleshy parts.

- **Rushes, sedges and grasses** should be used when still green. Pick the longest specimens available.

- **Animal tendons** are useful for tying one thing to another. They must be used wet.

SPLITTING CANES

Bamboo, rattan, and other types of canes, vines and bark all need to be split to be used for any kind of rope-making. If you try to pull away thin strips, these tend to run away to nothing. To avoid this problem pull on the thick part to separate it from the thin. It saves both time and energy.

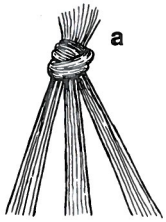


TESTING FIBRES

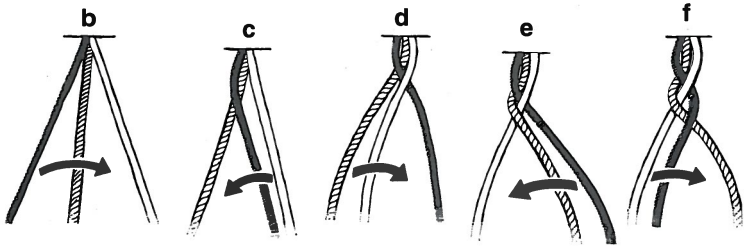
Tie two lengths together using an overhand knot. Try pulling it apart, using a reasonable amount of strength. If it snaps the fibre is too brittle. If it is too smooth, it will slip apart. Suitable fibre will 'bite' and hold together.

Plaiting rope

An easy method for the less experienced is to twist and plait strands. If you make three thin plaits, these can then be plaited together again for a thicker, stronger rope. If you are lengthening the strands as you plait, stagger the places at which you feed in new fibres.



Take a bundle of fibres, tie the ends together, anchor it firmly and split into three separate strands (a). Bring the left strand into the centre (b), then the right over it (c). Then bring what is now the left strand to the centre (d) and so on (e–f). Keep twisting the strands and keep the plaiting as tight and even as you can make it.



SPINNING A ROPE

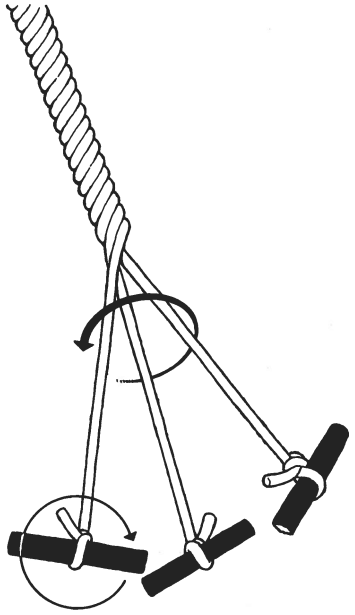
Twist fibres together (shown here clockwise, but what is important is to keep to the same direction). Feed in lengths of new fibres as you go so that their ends are staggered.

When you have produced three lengths of fibre, anchor all three at one end and continue to twist each of them until quite tight. Temporarily fastening a toggle to the end of each will make twisting easier.

Now draw all three strands together and twist all three anti-clockwise – the opposite direction.

Continue to add and twist until you have produced the amount of rope you need. You will need to secure a completed section in a cleft stick to keep it tight as you work. Wrap the rope around a tree trunk, to keep the working length short.

To make a thicker rope repeat the process with three 'ropes' you have already made or plait three simple ropes together.



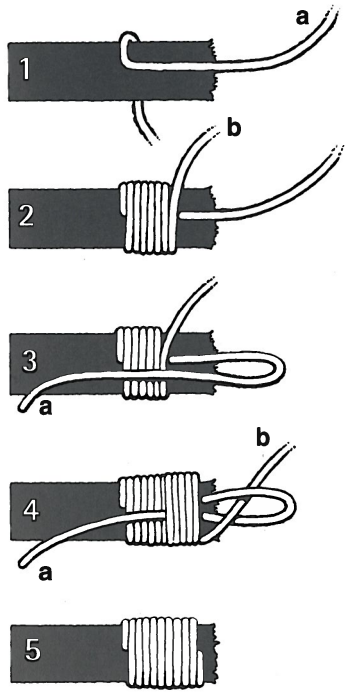
REMEMBER: When making rope try to keep the thickness of the strands equal and even along their lengths. It is where a lay has a thin section that the rope is most likely to break.

Whipping ropes

The end of a rope must be secured in some way so that it does not unravel. To prevent the strands from fraying, bind the rope with twine.

Good binding, or 'whipping', MUST be tight and neat to be effective. If it is too slack it will work loose or fall off. It is difficult to make good whippings with thick cord and very thin is prone to slip. Experience will enable you to match the thickness to the job.

Use the whipping technique to add a comfortable grip to the handles of axes and parangs or, thicker, to replace the handle of a knife.



1 *Lay a length of twine along the side of the rope, leaving its end (a) projecting a hand's length beyond the rope's end.*

2 *Whip the twine (b) around the rope, working towards the end and gradually covering the piece you have laid along it.*

3 *Now form the loose end of the twine (a) into a loop and lay it back along the whipped section.*

4 *Carry on with the whipping covering the loop until you have nearly reached the end of the rope.*

5 *Now pass the end (b) whipping through the loop and pull the short end (a) tight. Trim off ends neatly.*

KNOTS

There is a knot for every job and it is important to select the right one for the task in hand. You never know when you may need to tie a knot so learn their uses, and how to tie each one – well enough to tie them in the dark and under all kinds of conditions. Learn to untie them too – the only thing that is worse than tying a knot that comes undone is a knot that CANNOT be undone at a crucial moment.

In the instructions for individual knots that follow the end of the rope or cord being used to tie the knot is referred to as the 'live end' to distinguish it from the other end of the rope, or 'standing part'.

Reef knot

Also known as the square knot, this is perhaps the best known of all knots. It is used for tying rope of the same thickness and will hold firm even under strain, yet may be fairly easily untied.

It is NOT reliable for ropes of different diameters, nor should it be used with nylon – it will slip.

Reef knots can be tied in other materials – it is a good knot to use in first aid. It will lie flat against the patient.

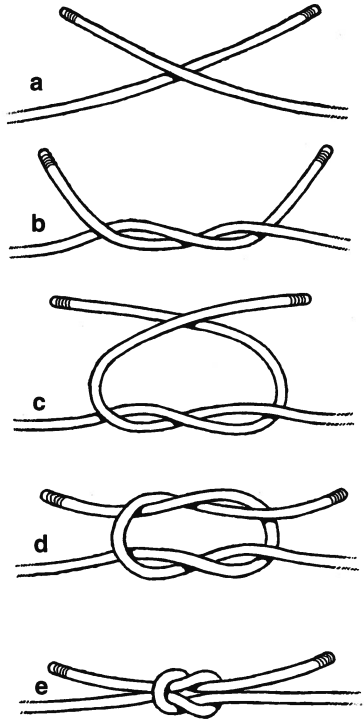
Pass the RIGHT end over the LEFT (a) and then under it (b).

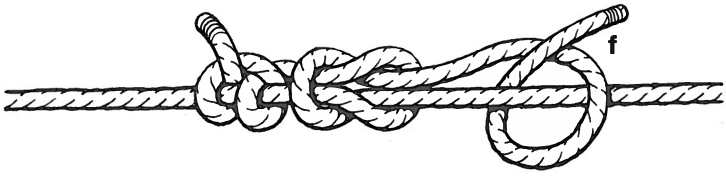
Then take the LEFT over the RIGHT (c) and under it (d).

Check it – the two loops should slide on each other. If you have crossed the wrong way you will have a 'granny', which may not hold and is difficult to untie if subjected to strain.

Tighten by pulling both the strands on each side, or just the live ends, but be sure it tightens properly (e).

To be doubly sure, finish off the knot by making a half-hitch with the live ends on either side of the knot (f).



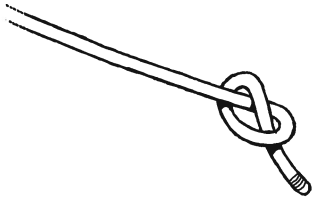


SIMPLE KNOTS

These are some of the simplest knots. They are quickly made, and studying them will help you understand some of the more complicated knots that follow.

OVERHAND KNOT

The simplest of all knots. Make a loop and pass the live end back through it. It has little purpose on its own except to make an end-stop on a rope, but it is part of many other knots.



OVERHAND LOOP

A very quickly made knot for throwing over a projection. The loop is fixed and cannot be tightened so the projection must point away from the direction of strain. Double the end of the rope and tie an overhand knot with the loop.

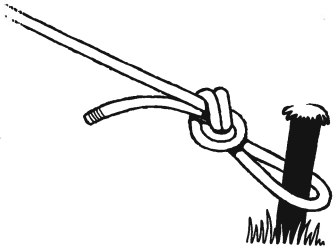


FIGURE-OF-EIGHT

This makes a much more effective end-stop than the overhand knot. Make a loop. Carry the live end first behind, then around, the standing part. Bring it forward through the loop.

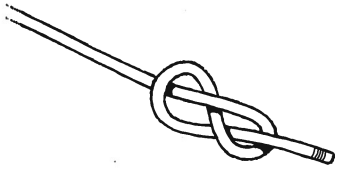
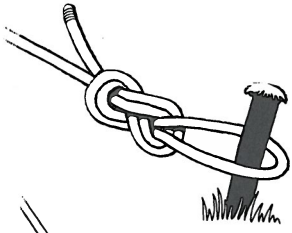


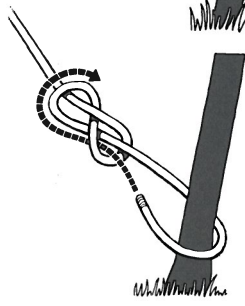
FIGURE-OF-EIGHT LOOP

More secure than the overhand loop, this is made in the same way as the figure-of-eight, but with the line doubled, using the loop as the live end. It can be used over a spike anchor for a belaying rope.



REWOVEN FIGURE-OF-EIGHT

A useful anchoring knot where the top end of a projection is out of reach. Make a loose figure-of-eight along the rope. Pass the live end around the anchor and feed it back around the figure-of-eight, following exactly. Ease tight.



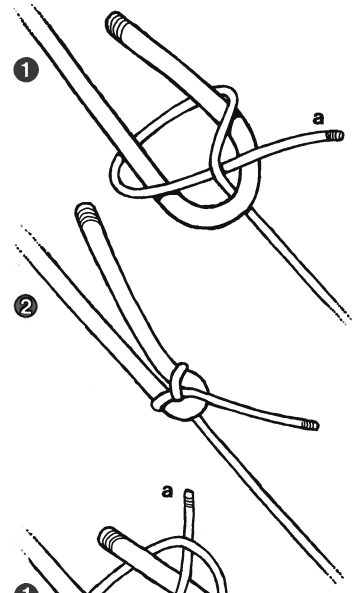
JOINING ROPES

SHEET BEND

Used for joining ropes of the same or different thicknesses. It can be more effective than the reef knot with those of equal thickness. It is ideal for joining different materials, especially wet or frozen ropes.

Simple to tie, using up little of the rope length and swiftly unknotted if it has not been subjected to strain. It never slips if correctly made and strain is not erratic.

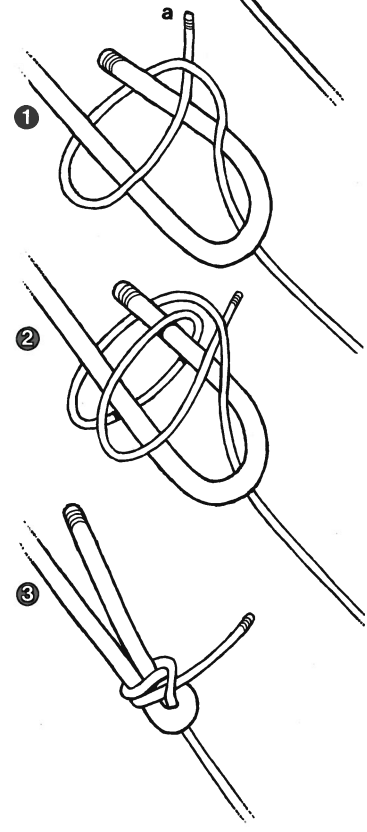
1 *Make a loop in one rope. Take the live end of the other (a) right around behind the loop to the front, where it is carried under itself and then tucked up through the loop.*
2 *Draw it tight and ease into shape as strain is increased.*



DOUBLE SHEET BEND

A knot that is even more secure than the sheet bend. It is useful with wet ropes, especially if they are of very different thickness, but provides a good strong join in ropes of even thickness too. It is useful where strain is not constant and an ordinary sheet bend may slip.

1 *Make a loop in the thicker rope. Take the live end of the thinner rope (a) through the loop, beneath the thicker live end and then forward on the outside of the loop and right around it. Bring the thin live end back between itself and the outside of the thick loop.*
2 *Take the thin line end completely around the loop again and back through the same place on the outside of the thick loop.*
3 *Draw it tight and ease into shape.*



If not tightened these knots tend to work loose. Do NOT use with smooth materials such as nylon fishing line.

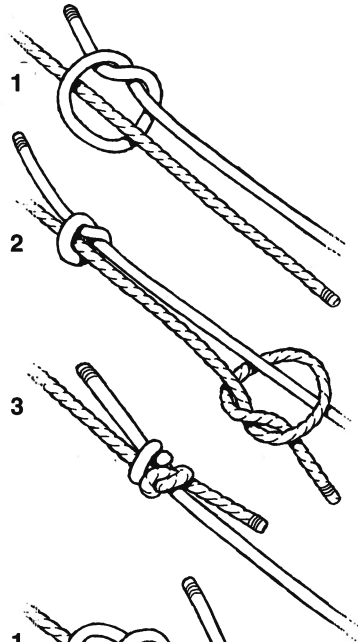
FISHERMAN'S KNOT

A useful knot for joining together springy materials such as vines or wire. It is good for wet or slippery lines and particularly suitable for joining gut fishing line – soak the gut first to make it pliable. Very secure, it will hold well with thin lines but is very difficult to untie. Use when you do not trust the reef knot or sheet bend. It is NOT recommended for bulky ropes or nylon line.

1 *Lay lines beside each other, the ends in opposite directions. Carry the live end of one line around the other and make a simple overhand knot.*

2 *Repeat with the live end of the other line.*

3 *Partially tighten the knots and slide them towards each other. Ease them to rest well against one another, completing the tightening process.*



DOUBLE FISHERMAN'S

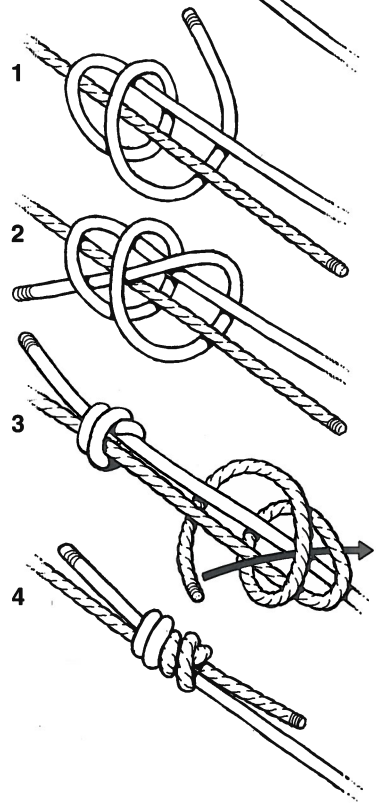
This is a stronger version of the fisherman's knot. It should NOT be used for nylon fishing lines, nylon ropes, or bulky ropes.

1 *Carry the live end of one line around the other, then around both.*

2 *Carry the live end back through the two loops you have just made.*

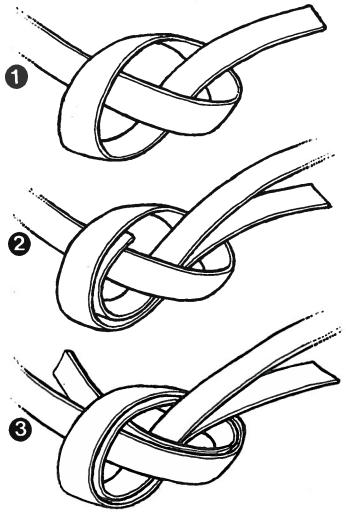
3 *Repeat the pattern with the end of the other line.*

4 *Slide the two knots together and tighten them, easing them to rest well against each other. Apply strain gradually.*



TAPE KNOT

A useful knot for joining flat materials such as leather or webbing straps, tape and possibly even for joining sheets or other fabrics when improvising an escape rope. Experiment!



1 *Make an overhand knot in the end of one 'tape'. Do not pull it tight.*

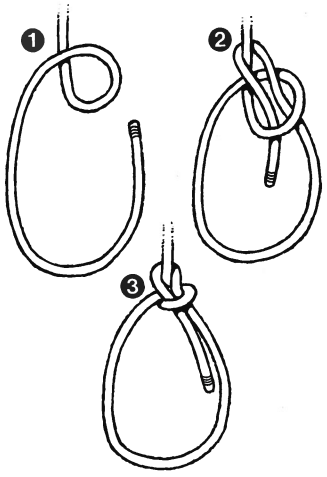
2 *Feed the other tape through it so that it follows exactly the shape of the first knot.*

3 *The live ends should be well clear of the knot so that they will not slip back when you tighten it.*

LOOP-MAKING

BOWLINE

This quickly tied knot makes a loop that will neither tighten nor slip under strain. It is used in the end of a lifeline or wherever such a fixed loop is needed.



1 *Make a small loop a little way along the rope.*

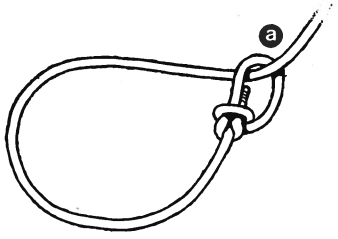
2 *Bring the live end up through it, around the standing part and back down through the loop.*

3 *Pull on the live end to tighten, easing the knot into shape. Finish off with a half-hitch.*

RUNNING BOWLINE

Use in any situation requiring a loop which will tighten easily. Make a small bowline and pass the long end of the rope through the loop.

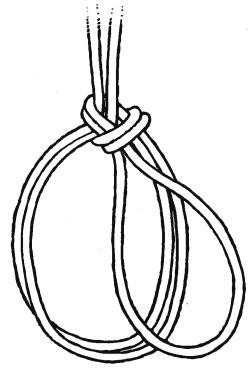
Never tie a running bowline around the waist, particularly when climbing. It acts like a hangman's noose and could kill.



TRIPLE BOWLINE

Another bowline, made with a double line. Form a loop, pass the doubled live end through the loop, behind the standing part and back through the loop. This produces three loops which can be used for equipment haulage, or as a sit-sling or lifting-harness with one loop around each thigh and the other around the chest.

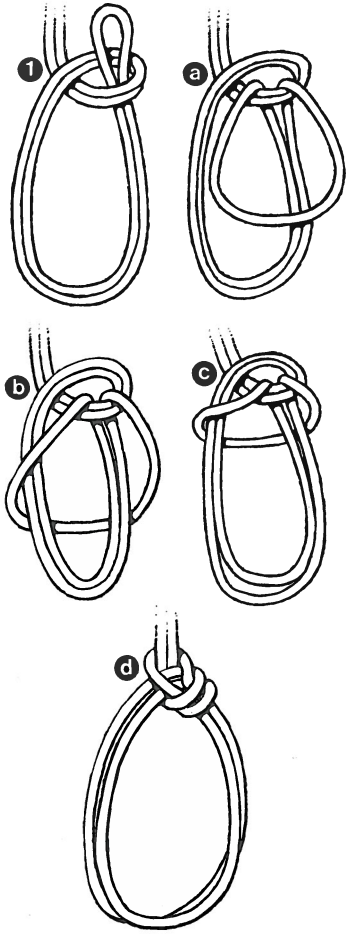
It takes some practise to get the proportions right – so learn to tie the triple bowline BEFORE you need to use it.



BOWLINE-ON-THE-BIGHT

This is useful to support or for lifting anyone from a crevasse or elsewhere from which they cannot climb out. Make it with a doubled line, producing two loops which will neither tighten nor jam. It forms a kind of bosun's chair, one loop fitting around the buttocks, the other around the upper body. As with the triple bowline, practise this knot BEFORE you need to know how to use it.

You may find many uses for fixed double loops. House- and ship-painters have been known to support their hanging platforms with a knot like this at each end. If the platform has a pole projecting at each corner, the loops of the bowline-on-the-bight can be slipped over. Notch the poles to prevent the ropes slipping off.



1 *Using the doubled line, form a loop and pass the live end through it.*

2 *Bring this end down (a) and over the end (b) of the larger double loop now formed. Ease it back up to behind the standing part (c). Pull on the large double loop to tighten (d).*

MANHARNESS HITCH

Also known as the Butterfly knot or Artillery knot, this makes a non-slip loop. It has the advantage that it can be made along the length of the rope, but does not require access to an end. Several loops could be put on a rope for harnessing people to pull together in haulage or raising a weight. Also a good way of preparing a rope for climbing. Toes and wrists can be put into the loops to carry the weight so that a rest can be taken when tired.

1 *Make a loop in the rope.*

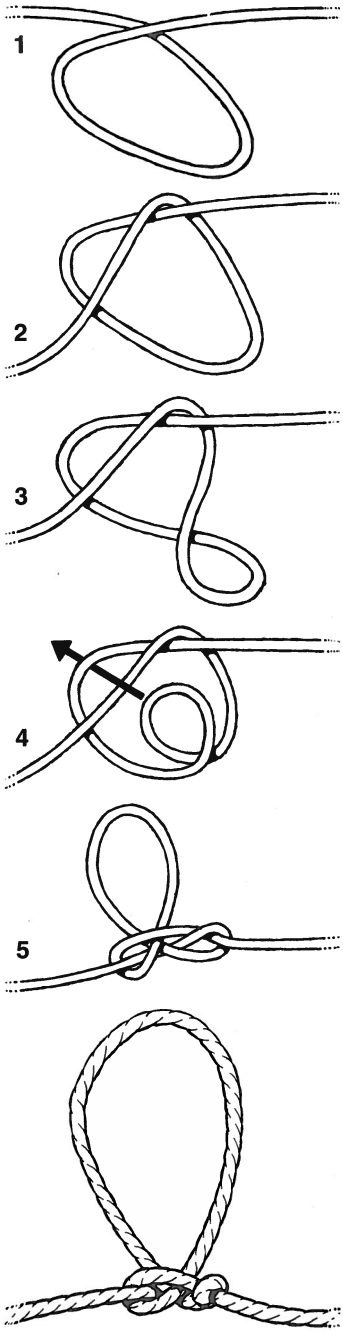
2 *Allow the left side of the rope to cross over the loop.*

3 *Twist the loop.*

4 *Pass it over the left part of the rope and through the upper part of the original loop.*

5 *Pull the knot gently into shape, ease tight and test it carefully.*

NOTE: *If this knot is not eased tight correctly it is possible to end up with a slipping loop.*

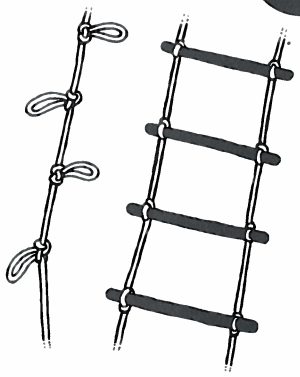


Different ways of making this knot may be found where the loop is not twisted at 3. The final strength of the loop does not appear to be affected either by making this twist or not, nor if the twist should straighten out in use.

LADDERS

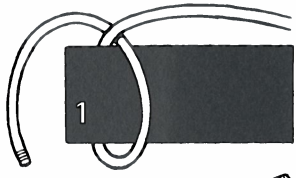
A ladder can be made by simply tying as many manharness hitches in a rope as you need for hand and foot holds. It could also be made with rungs, using strong sticks or pieces of wreckage.

Use two ropes or a long rope, doubled, with manharness hitches placed equally along both sides to make a rope ladder. Pass sticks through the corresponding loops, as you make the loops and ease tight to hold the sticks firmly. Allow the sticks to project a reasonable distance on either side of the ropes for safety and test each for strength.

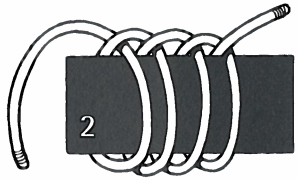


LADDER OF KNOTS

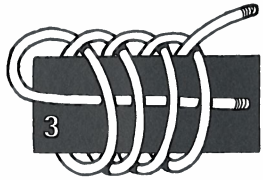
A series of overhand knots tied at intervals along a smooth rope will make climbing it much easier. There is a fast way of making these, once you have the knack.



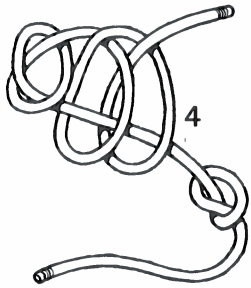
1 *Leaving a reasonably long free end, make a half-hitch near the end of a short piece of branch or log.*



2 *Continue making loose half-hitches along the log – the diameter of which will fix the spacing of the knots.*



3 *Pass the start end back through all the loops and then slide them all off the end of the log.*



4 *As each turn of rope comes through the centre of the half-hitch loops to the other end, shape and tighten each knot.*

If you know the length of your rope you can estimate the number of knots you need. With a half-hitch for every knot, choose a thickness of log to allow the required number of turns – and therefore the required number of knots.

HONDA KNOT

This is another knot that makes a free-running noose – but this one gives a clear circular loop suitable for throwing – it is a lassoo.

You may find a use for this lassoo in many ways but, in a survival situation, if you have only one length of rope, it would be unwise to spend much time and energy trying to catch animals in this way. It takes a lot of practice. When you really need the rope it may be worn and damaged from your lassooing efforts. However, it is worth making one to experiment with so that you have the skill already, should you need it for actual survival conditions.

a *Start with an overhand knot.*

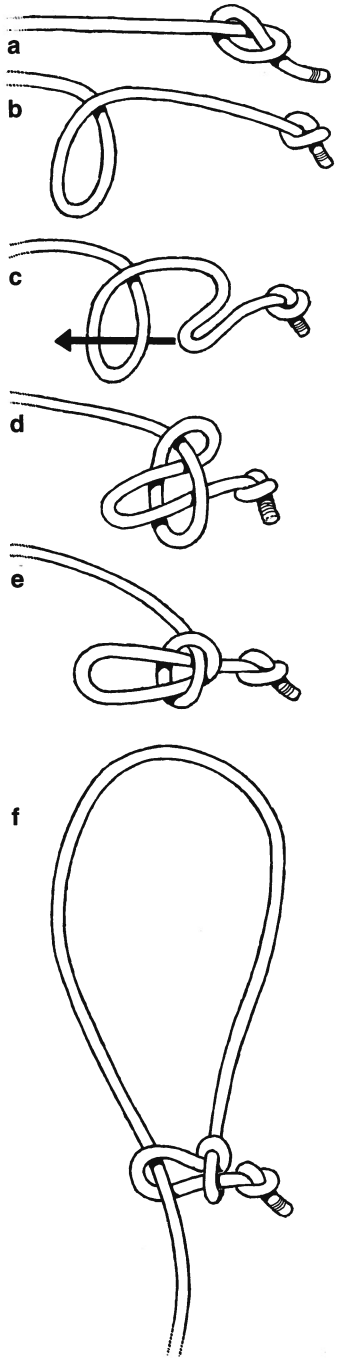
b *Form a loop further down the rope.*

c *Double the rope into a bight between loop and knot.*

d *Pass the bight through the loop.*

e *Tighten the loop around the bight.*

f *Pass the long end of the rope through the new eye formed by the bight.*



Before trying to use a lassoo on an animal consider its strength against your own. A large animal can – and almost certainly will – run. If you are not holding the rope firmly it may be dragged away and you will lose your meal and your rope. If the rope is anchored to you, YOU may be dragged along and severely injured. Can you make use of a firm anchor to carry the strain? A turn around a tree trunk or a rock may secure what is too powerful for you to restrain on your own.

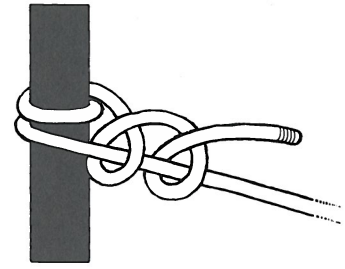
HITCHES

These are knots for attaching ropes to posts, bars and poles.

ROUND TURN AND TWO HALF-HITCHES

This is the best way to secure a rope to a post. It can take strain from almost any direction.

Carry rope around behind the post, then around again. Bring live end over and back under the standing end and through the loop thus formed. Tighten and repeat the half-hitch to make the knot secure.



CLOVE HITCH

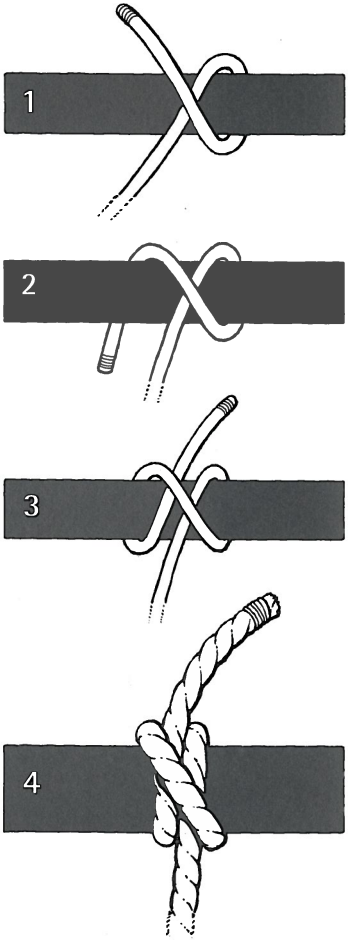
An effective attachment when strain is perpendicular to the horizontal. It is not so good when strain comes at an angle or the direction of strain is erratic – this could loosen the clove hitch.

1 *Pass the live end over and around the bar.*

2 *Bring it across itself and around the bar again.*

3 *Carry the live end up and under itself moving in the opposite direction to the standing end.*

4 *Close up and pull tight.*

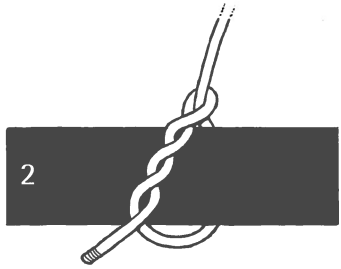


It is possible to make a clove hitch in loops on a rope and to put the whole knot ready-made on to the spar – if you have access to the spar end. Many experienced knot-makers do this. Make a loose clove hitch and slip it off the spar. Lay it down and copy the loops formed by the rope. Slip onto the spar and tighten.

TIMBER HITCH

This knot is used mainly as a start knot for lashings, but can also be used for hoisting and for dragging or towing heavy logs.

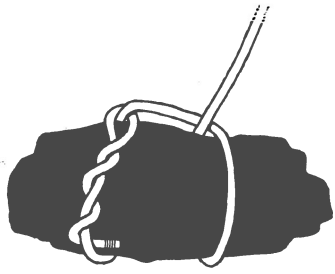
1 *Bring the live end around the bar and loosely around the standing end.*



2 *Carry it forward and tuck it beneath the rope encircling the bar. Twist it around as many times as comfortably fit. Tighten the knot by gently pulling on the standing end until a firm grip is achieved.*

KILLICK HITCH

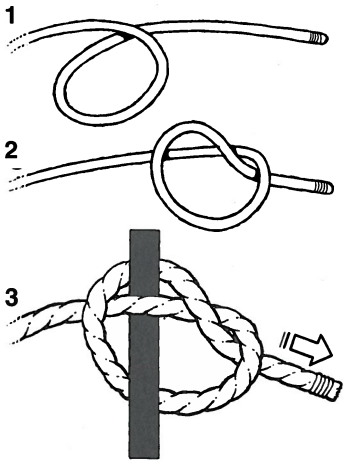
Also known as the Anchor hitch – use it for securing a line to an anchoring weight. It can be used to secure an actual anchor for use in water or to hold back one end of a throwing line.



Make a timber hitch around one end of the rock or weight and tighten. Carry the line along the weight and make a half-hitch.

MARLIN SPIKE HITCH

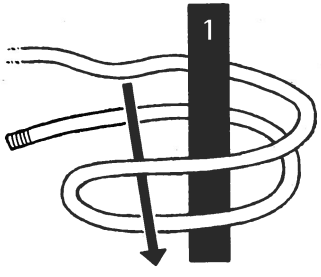
This is an instant, but temporary, knot for securing a mooring line to a post, or for dragging over the top of any upright peg or pole. It is particularly useful when tightening lashings. By temporarily attaching a short stout stick to the line it is possible to gain extra purchase on the line to administer a firmer pull.



1 *Form a loop in the rope – study the drawing carefully.*

2 *Bring one side of the loop back up over the standing end.*

3 *Drop this over the pole – the pole coming between the extended loop and the standing part. Pull the live end to tighten.*



QUICK-RELEASE KNOT

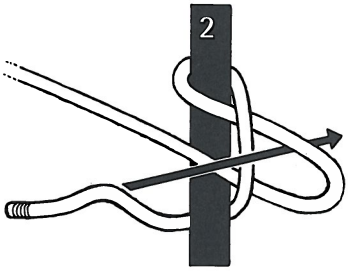
Variously known as the Highwayman's hitch, Thief hitch and Thief knot. This knot is secure but will come untied with a single sharp tug on the live end. It is recommended for temporarily anchoring lines while working – or for situations which need a quick release.

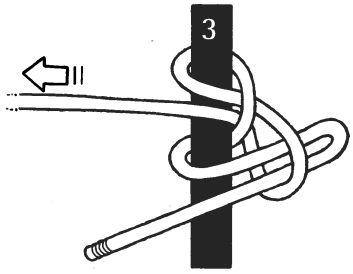
1 *Carry a bight around a post or rail.*

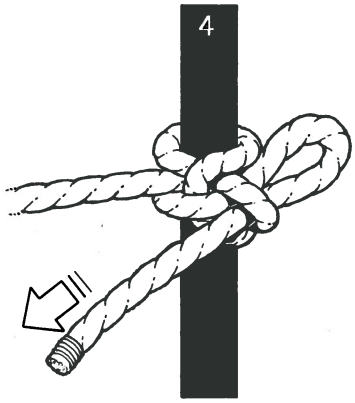
2 *Bring a bight from the standing end through the first bight.*

3 *Form the live end into a further bight and push the doubled end through the loop of the second bight. Pull on the standing end to tighten the knot.*

4 *To release pull sharply on the live end.*



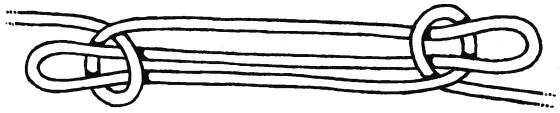


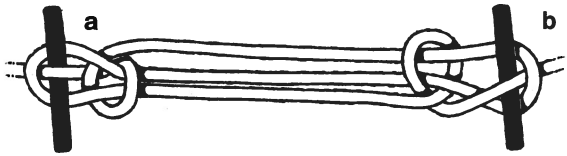


SHORTENING ROPE

SHEEPSHANK

Treble the line. Form half-hitches in the outer lengths and slip them over the adjoining bends. Or, instead of half-hitches, when a loop is formed in the standing part, pull a bight through it and slip this over the bend in the rope. Tighten as you gradually increase tension.





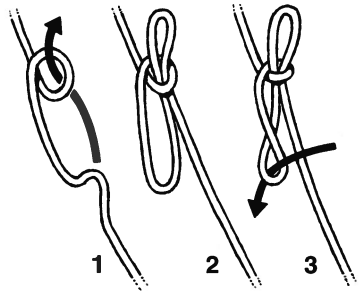
Make a sheepshank more secure by passing a stick through the bend and behind the standing part (a). Or, if you have access to the rope's end, pass that through the bight (b). A stick would make this more secure.

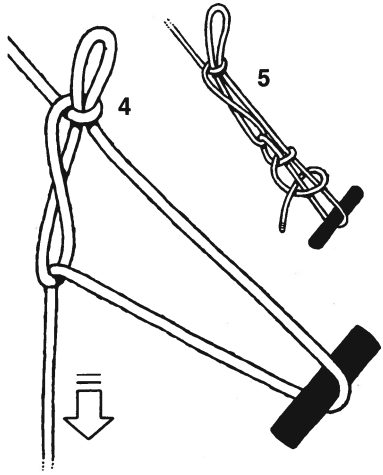
Never cut a rope unnecessarily – you never know when you may be glad of its full length. A knotted rope has only half the strength of a continuous one. Use the sheepshank to shorten it or to exclude a damaged or weakened section.

SECURING LOADS

WAKOS TRANSPORT KNOT

A knot invaluable for securing a high load to boat, raft, sledge, etc, or for tying down a roof. Maximum purchase is achieved by pulling down with all your weight and finally securing with two half-hitches. If it comes loose undo the hitches, retighten and secure. This knot can also be used for a line across a river or chasm which needs tightening from time to time.





1 *Make a loop in the rope. Further down, towards the end of the rope, make a bight.*

2 *Pass the bight through the loop.*

3 *Make a twist in the new lower loop. Pass the end of the rope around securing point and up through this twist.*

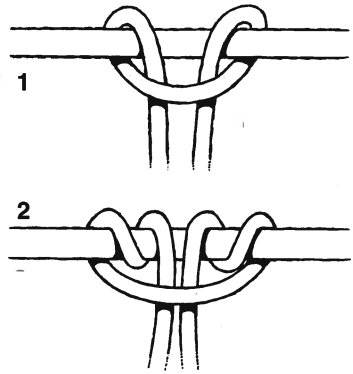
4 *Pull on end to tighten.*

5 *With the end make two half-hitches around lower ropes to secure. Undo these to adjust and retighten.*

PRUSIK KNOT

A knot that makes a sliding loop, especially useful when attached along a climbing rope. It will not slip under tension, but will slide along the rope when tension is released. Also useful for ropes that need retensioning from time to time, such as tent guylines.

A pair of prusik knots along a rope provide hand and foot holds for climbing or for swinging along a horizontal line. They are slid along the main rope as you proceed.



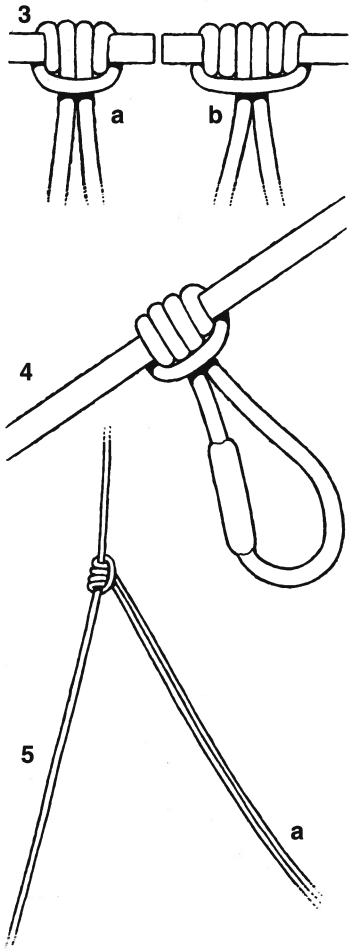
1 *Pass a bight around the main rope and pull the ends through. Keep this loose.*

2 *Take the ends over again and back down through the loop. Ease tight. Do not allow the circuits to overlap.*

3 *This gives the appearance of four turns on the main rope (a). Mountaineers sometimes take the ends round again and back through the loop to give the appearance of six turns on the main rope (b).*

4 *The prusik knot can be made using a fixed spliced loop – in which case pass the bight over the main rope and back through itself, and repeat.*

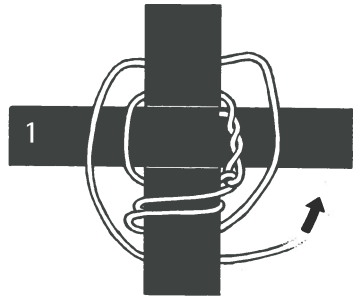
5 *For use as a tensioning line attach along the guy rope etc and secure ends (a) to an anchor.*



Note: *When used for climbing, or travelling along a rope, a spliced loop is safest (as 4). If you have no spliced loop, join the ends after the knot is made. Test joins rigorously before relying upon them.*

LASHINGS

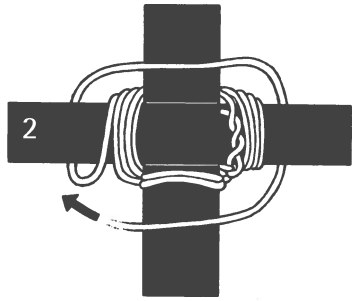
Methods of lashing spars, logs, poles etc together differ according to the position of the components. Learn these techniques. They will be invaluable in making shelters, rafts and other structures.



SQUARE LASHING

This is for lashing spars which cross. Most effective when they do so at right-angles.

1 *Make a timber hitch carrying the line alternately above and below both spars in a complete circuit before securing it. Then carry the rope over and under both spars in an anti-clockwise direction.*



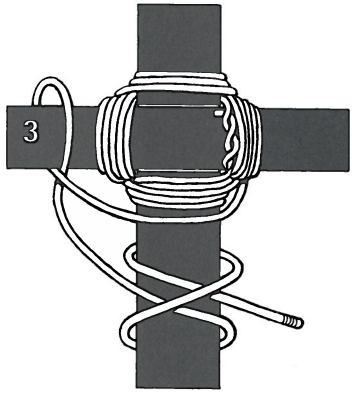
2 *After three or four circuits make a full turn around a spar and circuit in the opposite direction.*

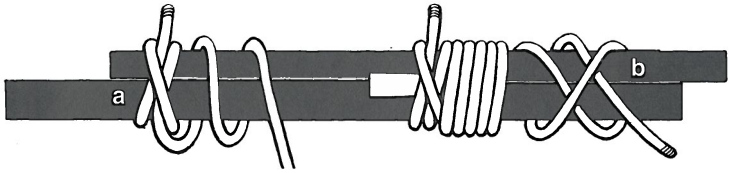
3 *Complete the circuits with a half-hitch around one spar and secure with a clove hitch on a spar at right-angles.*

ROUND LASHING

This is for lashing spars alongside each other or extending the length of a spar.

Begin with a clove hitch around both spars (a), then bind rope around them. Finish knot with a clove hitch at the other end (b). Force a wedge under the lashings to make them really tight. If the spars are vertical bang the wedge in downwards.





DIAGONAL LASHING

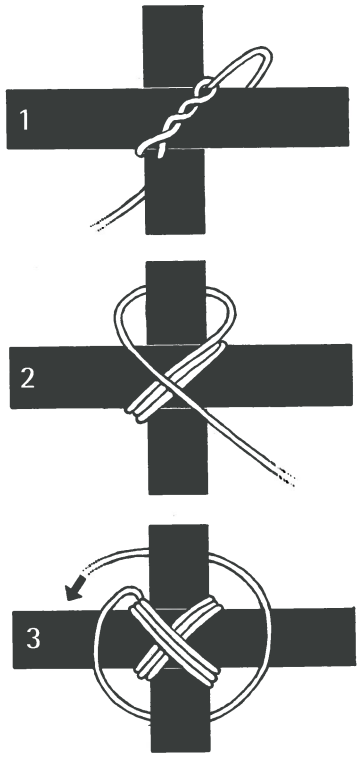
An alternative to square lashing which is more effective when spars do not cross at right-angles, or more especially when the spars are under strain and have to be pulled towards one another for tying.

1 Begin with a timber hitch around both spars, placed diagonally.

2 Frap both spars with a few turns of rope over the timber hitch, then make a full turn under the bottom spar.

3 Frap across the other diagonal, then bring the rope back over one spar and make two or three circuits of the spars above the upper spar and below the lower.

4 Finish with a clove hitch on a convenient spar.

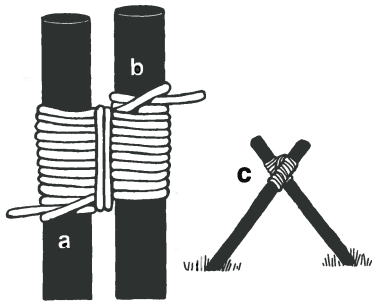


SHEAR LASHING

For tying the ends of two spars at an angle, when making an A-frame, for example.

Begin with a clove hitch (a) around one spar. Bind around both spars – this binding should not be very tight. Bring rope between the spars and frap a couple of times around the binding. Finish with a clove hitch around the other spar (b). Tighten by opening up the shears (c).

A similar method can be used around three poles to make a tripod. Make turns around all three legs and frappings in the two gaps. The feet of A-frames and tripods should be anchored to stop them spreading.



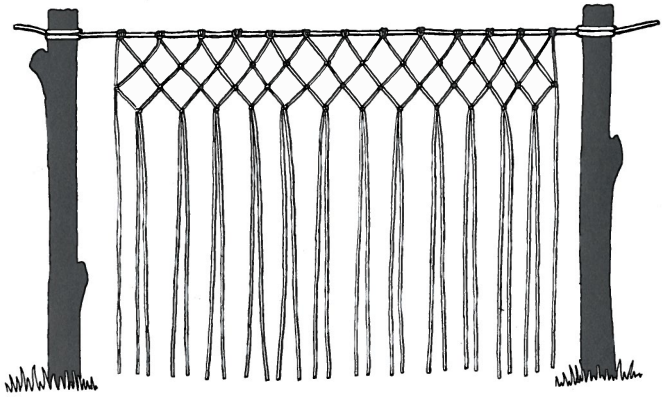
NET-MAKING

Nets can be made either by making knots along pre-cut lengths of line or by 'knitting' mesh row by row. They are not only useful for fishing. A gill net can also be hung between trees to catch birds and a purse net, made from twine, can be placed over animal burrows. Use the same techniques to make a hammock from strong twine.

Gill net

Make this from parachute cords or from two thicknesses of twine. Parachute cord consists of an inner core of fine line within an outer core. Pull the fine inner line out and cut it into manageable and equal lengths (or cut lengths of thinner string). Their length will determine the depth of your net, which will be about 3/8 that of the length of line.

Decide how wide you want your net and set two poles that distance apart. Tie a length of parachute cord outer (or thicker twine) between the two. Cut a piece of wood about 3.5cm (1¼in) across. Use this as a gauge to space out the thinner vertical threads (inner core).



Prusik knot

Overhand knot

Fold each length double and use the bight to make a Prusik knot over the top cord and repeat across its length. Slide the Prusik knots along to space them out equally using your gauge.

For the first row, working from left to right; ignore the very first individual strand, but take the second of the pair. Hold it with the first strand of the next pair and tie both together in an overhand knot. Take the remaining strand with the first of the next pair and knot. Continue along the line, using your gauge to control spacing.

Proceed to the next row in the same way but this time include the outside lines to produce a row of diamonds. Continue until the line is used up.

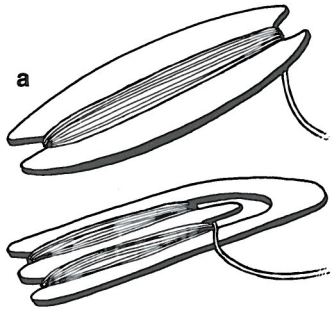
To finish off the bottom, stretch another thicker line across between the supports and tie off all the inners (or thinner strings) in pairs around it. Carry each pair around it twice. Separate the pair and tie off around the pair.

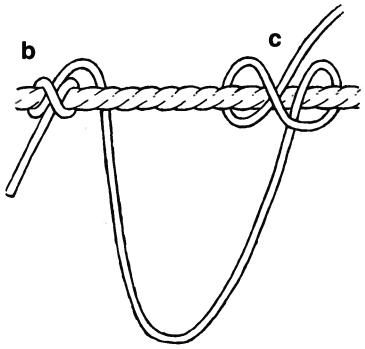
Complete the net by securing the top and bottom lines at each corner of the net so that the net will not slip off the ends. Any surplus can be used for attaching the net to supports and weights to keep it in position when in use.

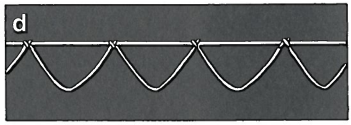
'KNITTING' A NET

A method suitable for nylon fishing line or any other fine line. You need a horizontal string between posts, a mesh gauge, and a 'needle'.

Make the 'needle' (a) about 15cm long x 2·5cm wide (6 x 1in) from hardwood or bamboo. Make a notch at either end and wind line around the whole needle; or try something more traditional like the lower drawing. The needle must be smooth. The line is gradually unwound as you make the net.





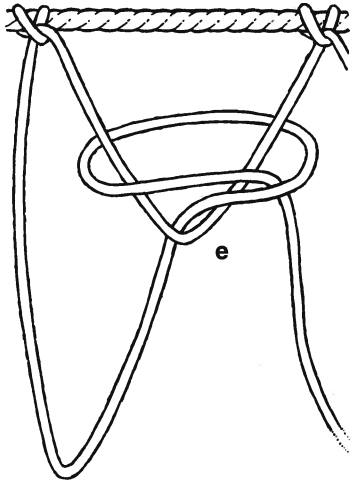


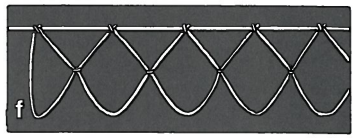
To make the net, tie a top line of required length between uprights. Begin by tying a clove hitch with thinner line (b). Take the needle behind the top line and bring it forward to make another clove hitch (c). Repeat along the line, spacing the knots out with your gauge (d).

When the top row is complete go to the other side of the posts (easier than working backwards) and make the next row. Make each new loop large enough to form a square of the mesh (half-square at each outside edge). Take the needle through the loop of the row above from behind, round the back of the loop and then through the front of the loop it makes (e). Adjust the depth with your gauge before you tighten (f).

Switch sides again and work back in the opposite direction for the next row and continue until the net is the required length.

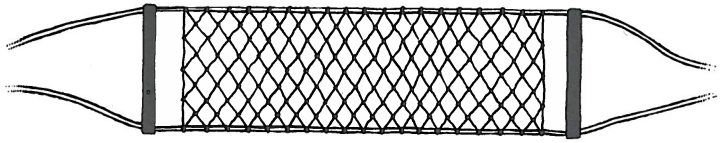
Tie off the bottom line with another thicker twine using the same knot but keeping the line straight without loops. Leave some free line at both ends. Tie in the ends at the top corners and the net is complete.



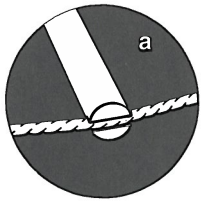


Net hammock

Make a net about 75cm (2½ft) across and wider than your height. Use good strong twine or rope for the top and bottom lines – double twine would be a good idea, the ends have to carry your weight. Leave those ends long enough to suspend the hammock by.



Cut two spacer bars to keep the hammock 'open.' Notch the ends and slip the cords into the notches (a). To simplify hanging the hammock you could tie each pair of end lines to a fixed loop such as a bowline. Then fix one end with a round turn and two half-hitches, the other with a quick-release knot, in case you ever need to leave the hammock in a hurry.

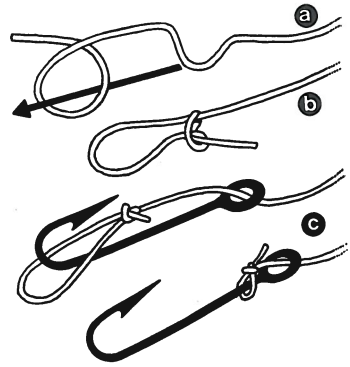


FISHING KNOTS

HOOK ON TO GUT

Turle knot *Soak the gut. Thread it through eye of hook. Make an overhand loop and pass a bight through it (a) to form a simple slip knot (b).*

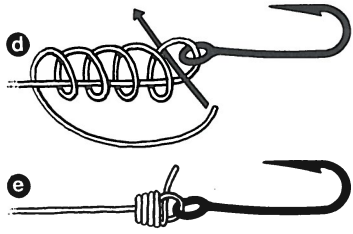
Pass hook through slip knot (c) and pull tight around shank.



HOOK ON TO NYLON # 1

Half-blood knot *Thread end through eye. Make four turns around standing part. Pass live end through the loop formed next to the hook (d).*

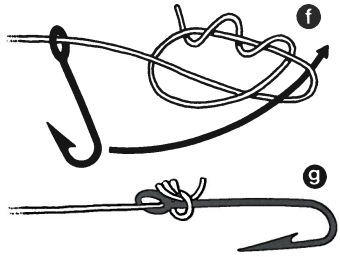
Pull taut and snip off fairly close to end (e).



HOOK ON TO NYLON #2

Two-turn turf knot *Thread the hook. Pass the live end around the standing part to form a loop and through it. Twist live end twice around side of loop. Hold the loop and pull the twists tight. Pass the hook through the loop (f).*

Pull on standing part to tighten loop on hook (g).

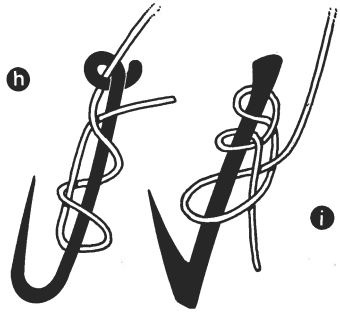


JAM KNOTS

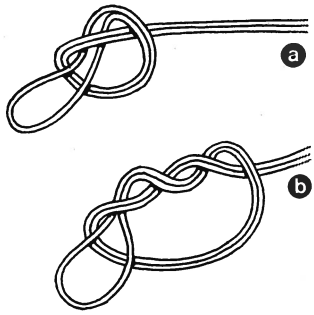
For securing improvised hooks to gut or cord.

With an eye: Thread gut. Make two turns around hook and bring live end up through turns (h). Ease tight and test for strength.

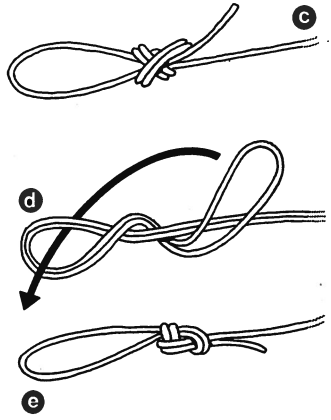
Without an eye: Make loop around lower part of shaft. Make two half-hitches from upper end downwards and pass live end through lower loop (i). Pull on standing part to tighten.



LOOP IN NYLON #1
Double overhand loop *Double the line to make a bight. Tie an overhand in it (a). Twist the end through again (b). Pull tight (c) and snip off end.*



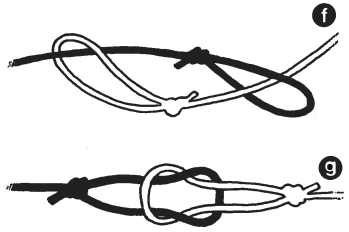
LOOP IN NYLON #2
Blood bight *Form a bight. Twist the end of it back around the standing part (d). Bring end back through new loop (e). Pull tight and snip off loose end.*



JOINING LOOPS
Can be used in nylon line but will work for different strong materials. A Fisherman's knot is recommended for gut, which probably could not stand the strain of this method.

With free ends: *Pass each line through the other loop (f) and pull tight (g).*

With only one end free: *Make loop on one line. Take the live end of the other line through the loop, around it and back through and then tie off with either of the knots for hooks on to nylon.*



HOW TO BE ECO FRIENDLY

Whatever your situation, and wherever your camp, survival must always take priority and in actual fact a group of survivors will have very little impact on their immediate environment. Having said that you should try not to decimate the area you find yourself in and always try and leave a place better than you found it. There are a number of ways in which you can ensure this happens: only take standing dead wood for a fire, only catch sick, lame, or lazy animals, and if you're cutting saplings you're encouraging growth in any case.

6
READING THE SIGNS

Being able to read and make a map is only the beginning of being able to find your way about. You must learn to interpret the signs found on the ground itself and in the air.

If you do not have a compass, there are a number of ways of creating your own. The sun and stars can provide firm orientation – a variety of methods are available for finding direction in both northern and southern hemispheres.

An ability to anticipate the weather can also be a valuable asset in the wild and simple guidelines for prediction and the interpretation of cloud patterns equip the survivor with more skills.

READING THE SIGNS

Before embarking on any expedition you will have learned all you can about the terrain, equipped yourself with maps, if available, and worked out routes. Memorize the lie of the land, the direction in which rivers flow, the high ground, the prominent features, the prevailing winds, the weather patterns to expect and any known hazards, check the phase of the moon and times of first and last light – all of which will be invaluable knowledge if you find yourself in difficulties. In a case of accident you may find yourself in a totally unknown territory and have to find out everything about your location from the land itself.

In choosing a camp site, tracing water and finding the other necessities for survival you will need to interpret the surrounding countryside – the other side of a hill may offer quite different conditions – and if you decide not to stay put you will have to interpret both the general geography and the particular landscape as you proceed.

MAPS

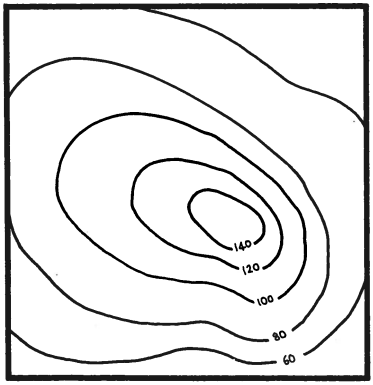
Choose maps carefully, making sure that they are to a scale that will be useful to you and show helpful information. A very large-scale map that shows every footpath and building will be no use at all if you are driving a thousand miles along a motorway. Everything will be shown in great detail but only a tiny fraction of the journey will appear on one sheet and you would have to pile the car with maps and change from one to another every few miles. On the other hand few motoring maps give much information about the nature of the terrain or show features which would help a walker choose their route. Sailors must be equipped with accurate charts so that they can keep to safe waters. The surface below the sea can be as varied as that above. Flyers will need to know what altitude obstructions are and what turbulences occur near mountains which make it safer to fly higher. From the air the pattern of the land may show plainly but its contours are flattened out; without interpretation, a map looks rather like that to many people.

Maps and terrain

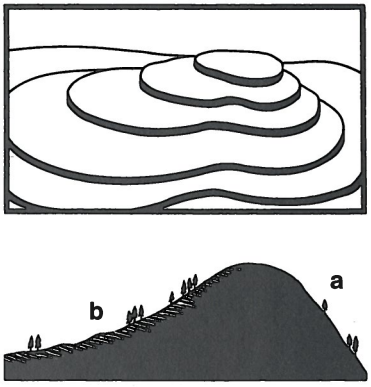
Height cannot be reproduced on flat sheets of paper so altitudes are recorded at regular intervals (usually every 50ft or every 15m

according to the measure used) and every point at this height is joined up by a line – the contour line. In most cases these lines join up to form a complete shape, some sort of irregular oval with bulges here and there. If they suddenly stop against another line that means that there is an abrupt change of height – in fact, a cliff or a very steep fall.

The only contour line that you can see in nature is that of sea level along the coast (and even that is not quite true because of tidal variation) but you can imagine the contour lines as the edges of flat disks and that these are ranged equidistantly above each other. If you threw a cloth to rest over them it would link them together in a shape that would be approximately like a hill or other feature. However, you do not have a record of exactly what happens between those contour lines and there will not necessarily be an even slope connecting them. There could be outcrops of rock, hollows – any manner of variation within that 15m or 50ft. From the relative positions of one height to another you could make a pretty good guess as to what the ground surface was like, but you could not be sure. There may therefore be features that, because they fall between the contour lines, make no appearance on your map.



The contour lines on the map represent a series of points at the same distance above sea level and do not record what happens in between. When the contours are closely grouped the change in height is more rapid (a). Conversely, greater spaces between the contour lines indicate gentler slopes (b).



Interpreting maps

Remember that the intervals between the contour lines are the distances between horizontal points at the same theoretical height – not the actual distance on the slope of the ground. They are

measured in units that show relative positions and are not to a scale as is the horizontal plotting.

It is a common error to think of a group of contour lines indicating a rise in the ground comparable to the scale of the distance shown between them – but the scale of a typical walkers' map is 1:50,000 and 10m on that would be only .02mm. Contours spaced 5mm apart on the surface of the map would be at a horizontal distances of 250m and the gradient only 1 in 25.

Scale

Before you can begin to use a map you must understand its scale. This may be shown by a scale bar marked with miles or kilometres to the size that they are shown on the map or it may be given as a ratio – 1:50,000 means that every measure on the map represents a distance 50,000 times greater on the ground.

Key

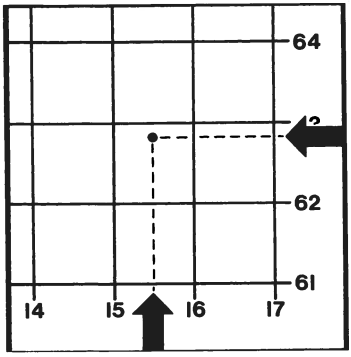
There will usually also be a key to the symbols used within the map to represent natural and manmade features – rivers, roads, buildings, types of woodland or swamps, types of beach. What is shown, and how, will vary greatly. If there is no key on the individual map or on its wrapping make sure that you find out what symbols mean in that map series. Some will be fairly evident: if the map is in colour rivers will almost certainly be in blue, marshes will usually be indicated by stylized tufts of reed.

Not all features can be shown to exact scale. Roads and paths will probably be given standard widths to match the kind of track they are rather than their exact measurements, and streams and rivers will be similarly standardized. The British Ordnance Survey (OS) maps, for instance, show waterways as a single blue line, gradually increasing in width until it represents a width of 8m (27ft) across a stream, whereupon a double line is used, giving you an immediate indication that you have a river at least that wide to cross. There are similar standardizations on all maps. Once you have mastered the way that information is shown, maps will tell you a great deal.

Grids

Maps almost always carry a grid of lines which divides them up. This is either based on degrees of latitude and longitude or a special grid developed by the mapping authority. The advantage of the special grids is that they are usually planned to form squares based on ground measurement which can help you rapidly assess

distances. On the British OS maps, for instance, the grid lines are 1km apart and the diagonal across them is 1½km. If you want to find, or report, a position it can be described by a coordinate made up from the line references from two adjoining sides of the map. To anyone using a map with the same grid this will immediately locate the 'box' in which it appears. Dividing the square by eye into further tenths pinpoints the location. This provides an easy way of telling rescuers of your location or of fixing a rendezvous point with them.



The point marked with a dot can be described as 15.5 x 62.8 using the coordinates from the sides of this grid. This system requires that squares are mentally divided into tenths in each direction. The 'map reference' is normally expressed as six digits: 155628. Any letter area codes on the map should be included.

North on maps

Unless they are lines of longitude, the grid lines on a map are not an indication of north and south, though they may sometimes be close to it. Remember that a compass points not to true north but to magnetic north – and the difference between the two varies both according to where you are in the world and because magnetic north is slowly changing its position. To take accurate bearings you need to know these variations, but even a rough idea of orientation will help you to match you map to the landscape.

If you have an adjustable compass and information on the deviation of it and of your map grid from true north you can carefully match up all of them so that even in poor visibility, or where landscape features are beyond your horizon, you can take accurate bearings and follow them.

Many maps indicate the deviation or the direction of magnetic north. If this is not given you can find it from the North Star or by using the watch method to point to north. Use the Southern Cross in the same way in the Southern Hemisphere to establish south (both are illustrated later).

Local magnetic variation

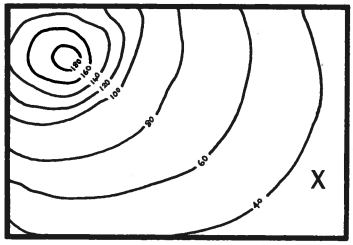
To find the local magnetic variation, when not recorded on a map, point the compass at the North Star. Note the difference between the pointer and indicated north.

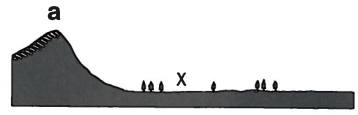
Lining the compass up with the grid lines on the map you can discover their variation, if there is one. If you then propose to walk on magnetic bearings you must remember to compensate for the variation.

Map-reading skills should be learned by anyone planning an expedition and are particularly important in mountainous country. Compasses are available mounted with calibrations, scales and direction markers which make this kind of orientation easier. Check them out and have them explained to you.

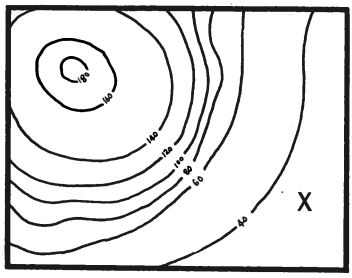
In a survival situation you will probably have to manage without such sophistication. If unable to make appropriate corrections, continually check your position against visible features.

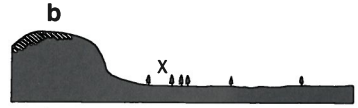
Gradients





A concave slope (a) (where you can see the top from the bottom) has the higher contours close together.





A convex slope (b) (where you cannot see the top from the bottom) has the low contours close together.

Measuring distances

As-the-crow-flies distances can be measured by using any straight edge and matching it up against the scale bar or multiplying by the ratio of the map's scale. Meandering routes can be followed with a piece of thread which can then be straightened out. Gradients can make an appreciable difference to distances and must be allowed for – a gradient of 45 degrees, for instance, will

add another 82m to a horizontal map distance of 200m (328ft becomes 725ft).

Your own maps

The survivor may not be lucky enough to have a map and should then set about making one. With a map you will always be able to find your way back to camp – essential if you are going for help for the sick, children or elderly survivors left behind.

It is not possible for you to measure exact contour heights, but you can devise your own system for indicating the contours.

Find the best vantage point and look out over the terrain. Climbing a tree may give a better view. Note the direction of the ridges, count how many you can see. Between each ridge there is probably a stream or river flowing, you cannot be sure – there will be a lot of 'dead ground', territory you cannot see. Make a general map with blank patches and then fill them in as you gain more information from other vantage points and from your explorations on the ground.

Mark anything of interest on your map: watercourses, rocky outcrops, isolated trees, strangely shaped features that will act as landmarks, and areas of different vegetation. You can plot positions of your traps, animal lairs, good places for foraging for food and fuel or finding useful stones for implements. It will be much easier for you or your companions than relying on your memory or vague descriptions.

SURVIVAL SCENARIO

You are navigating your way across unfamiliar terrain – what's the most important thing to watch out for?

One of the most common errors people make is to overestimate how much ground they have covered. It is usually much less. One way around this is to fit the ground where you are to the map rather than the map to where you think you are.

DIRECTION FINDING

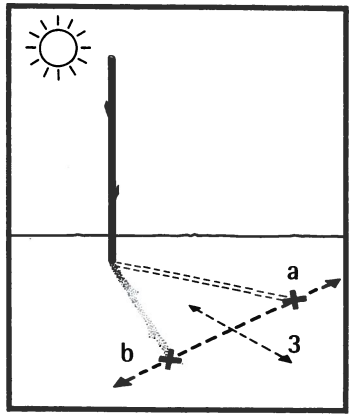
The earth's relationship to the rest of the solar system and the position of the stars in the sky help to locate any position on its surface. Its revolution on its axis produces the changes from light to darkness and its orbit around the sun produces the seasons, for the earth is tilted at an angle to the sun and first the north and then the south becomes nearer to it, the closest point traversing from the Tropic of Cancer (23.5°N) to the Tropic of Capricorn (23.5°S), the sun being above

Cancer on 22 June and above Capricorn on 22 December. It is above the Equator on 21 March and 21 September.

The sun rises in the east and sets in the west – but not EXACTLY in the east and west. There is also some seasonal variation. In the Northern Hemisphere, when at its highest point in the sky, the sun will be due south; in the Southern Hemisphere this noonday point will mark due north. The hemisphere will be indicated by the way that shadows move: clockwise in the north, anticlockwise in the south. Shadows can be a guide to both direction and time of day.

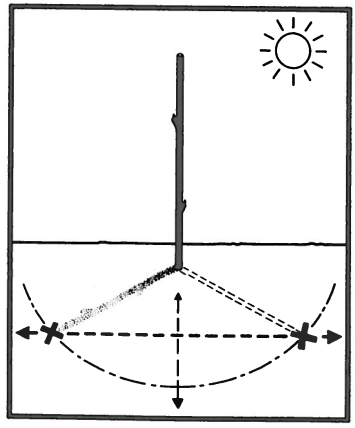
SHADOW STICK METHOD #1

On a patch of flat, clear ground place a metre-long (3ft) stick as upright as possible. Note where its shadow falls and mark the tip with a pebble or stick (a). Wait at least 15 minutes and mark the new shadow tip (b). Join the two and you have the directions of east and west (3) – the first mark is west. North-south will be at right angles to this line. This method works at any time of day when there is sunshine and at any latitude. Use it for spot checks as you proceed.



SHADOW STICK METHOD #2

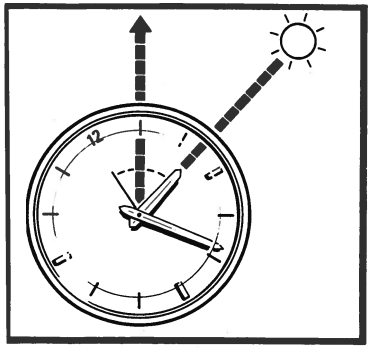
Another, more accurate, method – if you have the time – is to mark the first shadow tip in the morning. Draw a clean arc at exactly this distance from the stick, using the stick as a centre point. As midday approaches the shadow will shrink and move. In the afternoon, as the shadow lengthens again, mark the EXACT spot where it touches the arc. Join the two points to give east and west – west is the morning mark.



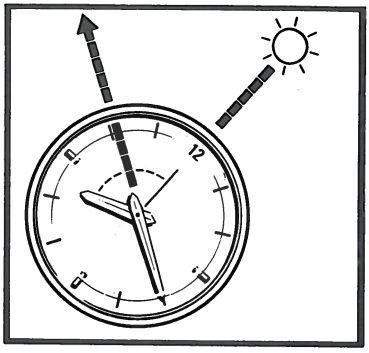
Direction by watch

A traditional watch with two hands can be used to find direction, provided it is set to true local time (without variation for summer daylight saving and ignoring conventional time zones which do not match real time). The nearer the Equator you are the less accurate

this method will be, for with the sun almost directly overhead it is very difficult to determine its direction.



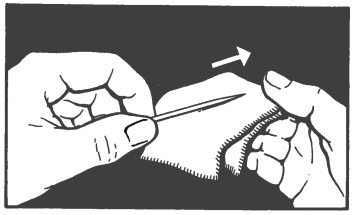
Northern Hemisphere *Hold the watch horizontal. Point the hour hand at the sun. Bisect the angle between the hour hand and the 12 mark to give a north-south line.*



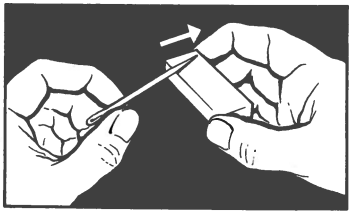
Southern Hemisphere *Hold the watch horizontal. Point 12 towards the sun. A mid-point between 12 and the hour hand will give you the north-south line.*

IMPROVISED COMPASSES

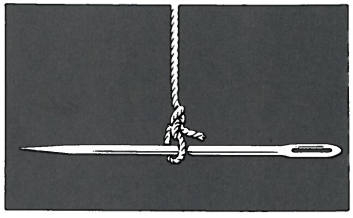
A piece of ferrous metal wire – a sewing needle is ideal – stroked repeatedly IN ONE DIRECTION against silk will become magnetized and can be suspended so that it points north. The magnetism will not be strong and will need regular topping up.



Stroking with a magnet, should you have one, will be much more efficient than using silk – stroke the metal smoothly from one end to the other IN ONE DIRECTION ONLY.

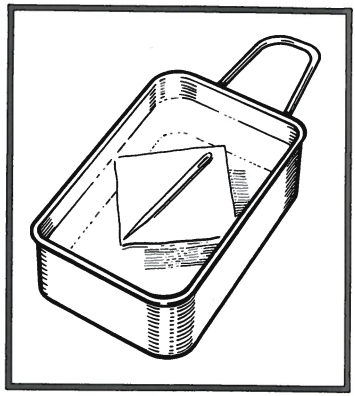


Suspend the needle in a loop of thread, so that it does not affect the balance. Any kinks in or twisting of the thread must be avoided.



FLOATING NEEDLE

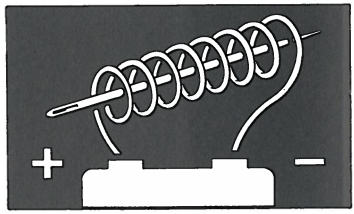
A suspended needle will be easier to handle on the move but in camp or when making a halt a better method is to lay the needle on a piece of paper, bark or grass and float it on the surface of water.



USING ELECTRICITY

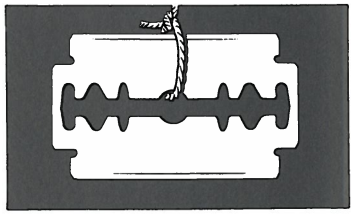
If you have a power source of two volts or more (a small dry battery, for instance) the current can be used to magnetize the metal. You will also need a short length of wire, preferably insulated.

Coil the insulated wire around the 'needle'. If it has no ready-made insulation wrap a few layers of paper or a piece of cardboard around the needle first. Attach the ends of the wire to the terminals of the battery for five minutes.



RAZOR BLADE COMPASS

A thin flat razor blade can also be used as a compass needle because it is made of two metals bonded together. It can be magnetized simply by stropping WITH CARE against the palm of the hand. Suspend it.



Use other methods to establish which general direction is north and then identify which end of your new compass needle is which and mark one of them. Top up your needle's magnetism from time to time, and always check your reading with the sun. A 'wild' reading may be given if large amounts of ferrous metal are nearby.

Plant pointers

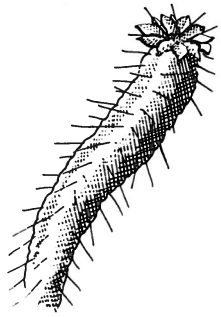
Even without a compass or the sun to give direction you can get an indication of north and south from plants. They tend to grow towards the sun so their flowers and most abundant growth will be to the south in the Northern Hemisphere, the north in the South.

On tree trunks moss will tend to be greener and more profuse on that side too (on the other side it will be yellowish to brown). Trees with a grainy bark will also display a tighter grain on the north side of the trunk.

If trees have been felled or struck down the pattern of the rings on the stump also indicates direction – more growth is made on the side towards the Equator so there the rings are more widely spaced.

There are even species of plant known for their north-south orientation:

North Pole Plant *which grows in South Africa, leans towards the north to gain full advantage of the sun.*



Compass Plant *of North America directs its leaves in a north-south alignment. Its profile from east or west is quite different from that of north or south.*

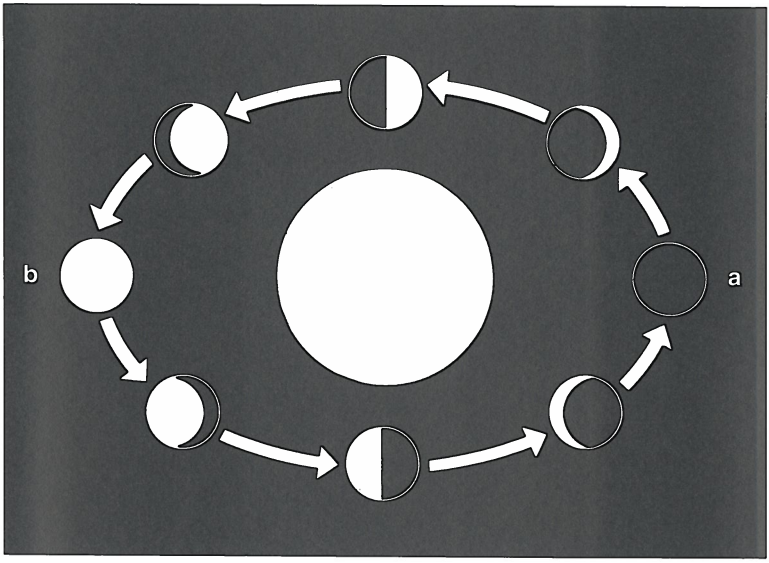
The wind direction

If the wind direction of the prevailing wind is known it can be used for maintaining direction – there are consistent patterns throughout the world but they are not always the same the whole year round.

Where a strong wind always comes from the same direction plants and trees may be bent in one direction, clear evidence of the wind's orientation. But plants are not the only indication of wind

direction: birds and insects will usually build their nests in the lee of any cover and spiders cannot spin their webs in the wind. Snow and sand dunes are also blown into distinctive patterns by a prevailing wind which blows from the outside of the high central ridges.

Making use of the moon



The moon has no light of its own, it reflects that of the sun. As it orbits the earth over 28 days the shape of the light reflected varies according to its position. When the moon is on the same side of the earth as the sun no light is visible – this is the 'new moon' (a) – then it reflects light from its apparent right-hand side, from a gradually increasing area as it 'waxes'. At the full moon it is on the opposite side of the earth from the sun (b) and then it 'wanes', the reflecting area gradually reducing to a narrow sliver on the apparent left-hand side. This can be used to identify direction.

If the moon rises BEFORE the sun has set the illuminated side will be on the west. If the moon rises AFTER midnight the illuminated side will be in the east. This may seem a little obvious, but it does mean you have the moon as a rough east-west reference during the night.

Direction by the stars

The stars stay in the same relation to one another and pass over the same places on the earth night after night. Their passage over the

horizon starts four minutes earlier each night – a two-hour difference in time over a month. If you study a star at a certain position at a certain time one evening and then check its position the next evening at the same time you will find that it has moved one degree of arc anticlockwise in the Northern Hemisphere, clockwise in the Southern. Rising in the east, stars attain a zenith and set on the western horizon at the same distance from their zenith as they rose.

The stars have been studied for thousands of years and the groups, or constellations, in which they appear to the naked eye were named in ancient times after the animals and mythological figures that their shape suggested.

In the Northern Hemisphere there are groups of stars that remain visible throughout the night, wheeling around the only star that does not appear to move – the Pole Star (a valuable navigation aid, for it is located almost above polar north). In the Southern Hemisphere the Pole Star is not visible and there is no comparable bright and stable southern star, but direction finding in the southern hemisphere makes use of a constellation called the Southern Cross, in a way that is explained later.

The northern sky

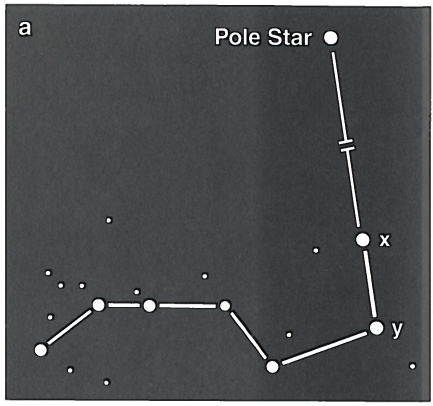
The main constellations to learn are the Plough, also known as the Big Dipper (diagram 'a' on page 362), Cassiopeia (diagram 'b' on page 362) and Orion (diagram 'c' on page 362), all of which, like all stars in the northern sky, apparently circle the Pole Star (illustrated in diagram 'a'), but the first two are recognizable groups that do not set.

These constellations come up at different times according to latitude and Orion is most useful if you are near the Equator.

Each can be used in some way to check the position of the Pole Star but once you have learned to recognize it you probably will not need to check each time.

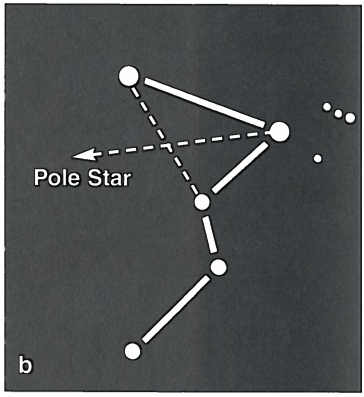
A line can be drawn connecting Cassiopeia and the Plough (the Big Dipper), through the Pole Star. You will notice that the two lowest stars of the Great Bear point almost to the Pole Star. It will help you to find these constellations if you look along the Milky Way.

The Plough (the Big Dipper) (a) *is the central feature of a very large constellation, the Great Bear (Ursa Major). It wheels around the Pole Star. The two stars Dubhe (x) and Merak (y) point, beyond Dubhe, almost exactly to the Pole Star about four times further away than the distance between them.*

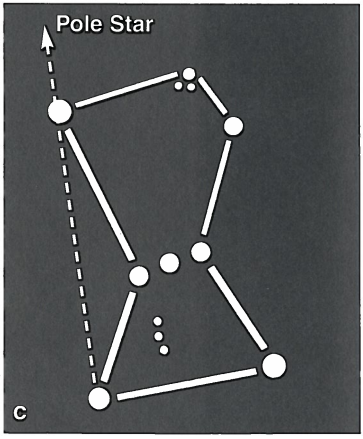


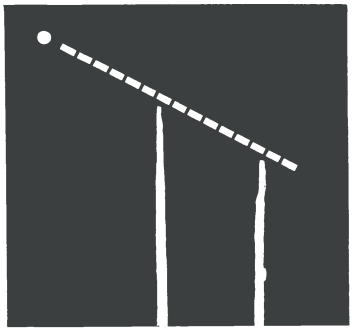
Cassiopeia (b) *is shaped like a W and also wheels around the North Star. It is on the opposite side of the Pole Star and about the same apparent distance away as the Plough (the Big Dipper).*

On clear, dark nights this constellation may be observed overlaying the Milky Way. It is useful to find this constellation as a guide to the location of the Pole Star, if the Plough is obscured for some reason. The centre star points almost directly towards it.



Orion (c) *rises above the Equator and can be seen in both hemispheres. It rises on its side, due east, irrespective of the observer's latitude, and sets due west. Orion appears further away from the Pole Star than the previous constellations. He is easy to spot by the three stars making his belt, and the lesser stars forming his sword.*





Other stars *that rise and set can be used to determine direction. Set two stakes in the ground, one shorter than the other, so that you can sight along them (or use the sights of a rifle propped in a steady position). Looking along them at any star – except the Pole Star – it will appear to move. From the star's apparent movement you can deduce the direction in which you are facing (See info. box).*

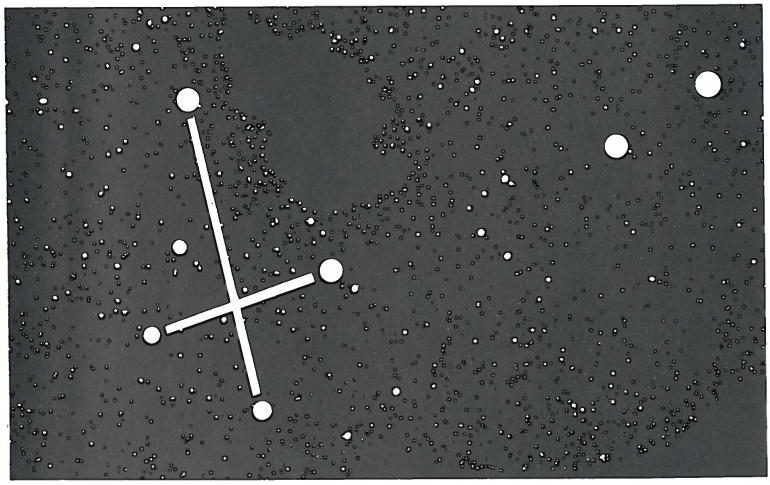
INFO.

Apparently rising = facing **east**
Apparently falling = facing **west**
Looping flatly to the right = facing **south**
Looping flatly to the left = facing **north**

These are only approximate directions but you will find them adequate for navigation. They will be reversed in the Southern Hemisphere.

Reading the southern sky

There is no star near the South Celestial Pole bright enough to be easily recognized. Instead a prominent constellation is used as a signpost to south: the Southern Cross (Crux), a constellation of five stars which can be distinguished from two other cross-shaped groups by its size – it is smaller – and its two pointer stars.

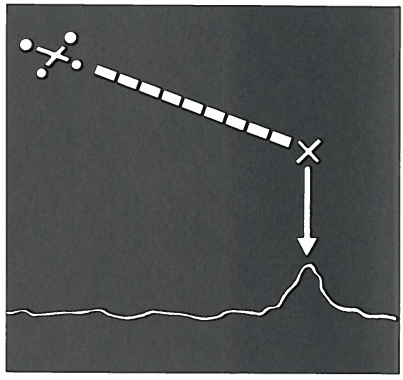


Finding the Southern Cross

One way to find the Southern Cross is to look along the Milky Way, the band of millions of distant stars that can be seen running across the sky on a clear night. In the middle of it there is a dark patch where a cloud of dust blocks out the bright star background, known as the Coal Sack. On one side of it is the Southern Cross, on the other the two bright pointer stars.

FINDING SOUTH

To locate south, project an imaginary line along the cross and four and a half times longer and then drop it vertically down to the horizon. Fix, if you can, a prominent landmark on the horizon – or drive two sticks into the ground to enable you to remember the position by day.



WEATHER SIGNS

Weather is much more localized than climate. Although it is possible to generalize about the weather to be expected in different parts of the world, and in some territories weather patterns are very stable, the geography of one small area may make it differ considerably from that adjoining.

Weather patterns are produced partly by the broad movements of wind and water over the whole globe and partly by localized differences in temperature and air pressure which cause air movements. These produce winds and carry rain.

In general, air moves from high-pressure areas into low-pressure zones, with warm air expanding and rising, cooler air moving in underneath. The warm air takes up moisture but at higher altitudes, or when some other cause brings down its temperature, the moisture begins to condense as cloud and eventually will fall as rain.

The most obvious example is where mountains force air currents upwards, rain falling on the slopes. In some places so much water is lost that on the far side of the range there is a dry 'rain shadow' territory.

However, that does not necessarily mean that if, from the dry terrain, you climb and cross the ridge you will move into a well-watered zone. The mountain zone may continue some way before the area of great precipitation is reached, or some earlier physical feature may have caused clouds to shed most of their rain.

Coastal areas

In coastal areas, whether of an ocean or an inland sea or lake, there will usually be a wind pattern that reverses from day to night. Water absorbs and loses heat less readily than the land and consequently it tends to be cooler than land during the day and warmer at night. The temperature difference affects the air above it and during the day breezes usually blow from sea to land, at night the wind changes and blows off the land.

Where an island is close to a large land mass these patterns may be overlaid by a broader air movement but a very regular pattern of day-night change in wind direction suggests a large body of water in the direction from which the day wind blows.

Winds

Winds can carry scents with them, providing information about the place from which they blow. Even to the untrained nose the smell of the sea will be recognizable, and to the shipwrecked survivor the smells of vegetation will indicate the direction of land. However, do not rely entirely on the nose, use other evidence to confirm its message.

Where winds tend to maintain direction they can be an aid in keeping to a course, but some other check should also be regularly made to keep direction.

Study the direction of the wind and the accompanying weather. Make a note of them. Dependent always upon barometric conditions, wind from a certain direction is always likely to bring a similar kind of weather. It is a guide for weather prediction.

If a wind is strong and dry the weather will remain constant until the wind drops or veers, then it may rain.

If it is foggy and misty you may get condensation but you will not get rain – but if a wind rises and blows away the fog it may turn to rain.

On a fine day a noticeable increase in the strength of the wind indicates a weather change. (See also *Hurricanes and Tornadoes* in *Disasters*.)

CLOUDS

Watch the way that clouds change, for clouds are the most reliable of weather signs.

Clouds are formed from masses of water vapour which becomes visible as it condenses with cooling. If cooling continues the droplets increase in size until, too heavy to remain airborne, they fall as rain. When their temperature rises sufficiently they evaporate and the cloud disperses.

There are ten main types of cloud formation. Approximate altitudes are given for each type. The same shapes occur at lower altitudes in polar regions.

The higher the clouds the finer the weather.

Small black clouds scudding beneath a dark stratus layer often bring showers.

Clouds hanging on high ground indicate rain, unless they move by midday.

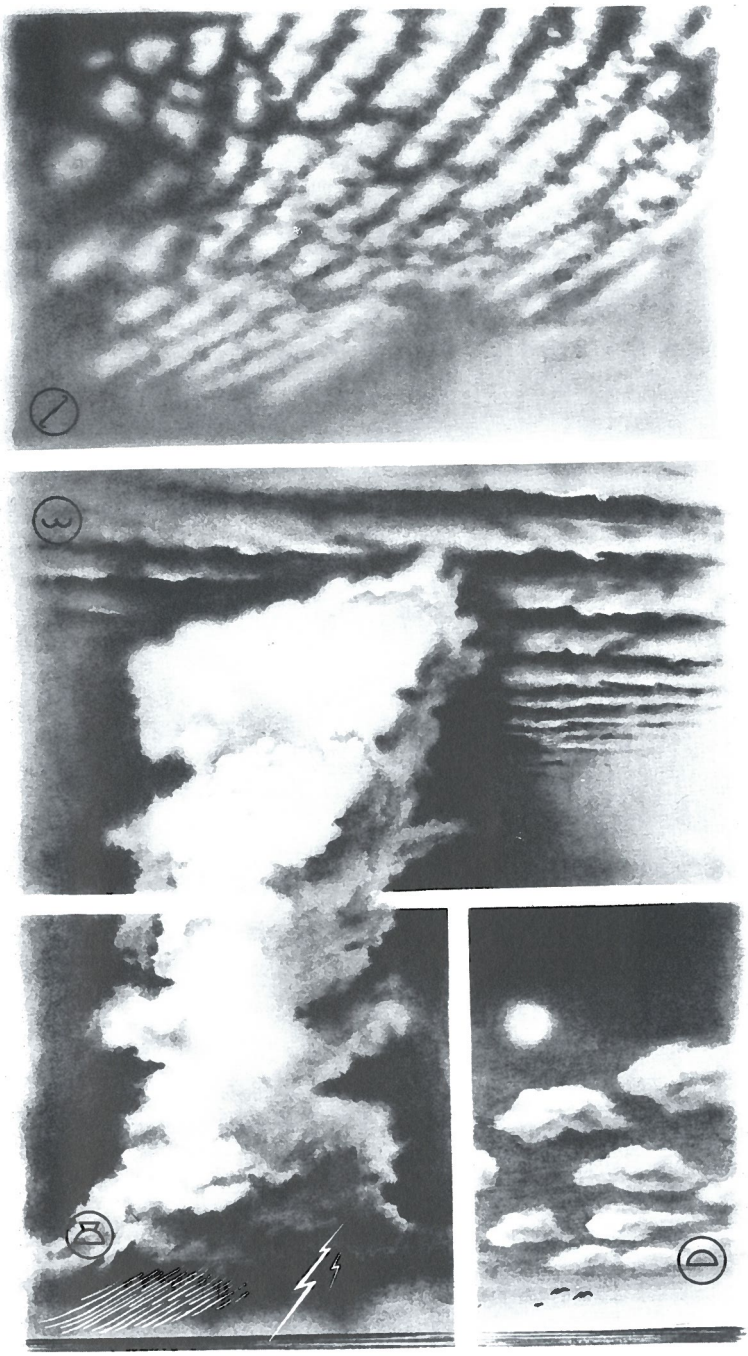
Cirrocumulus clouds *are small rounded masses, looking like rippled sand and often referred to as a 'mackerel sky'. Normally an omen of fair weather, they usually follow a storm and dissipate, leaving a brilliant blue sky.*

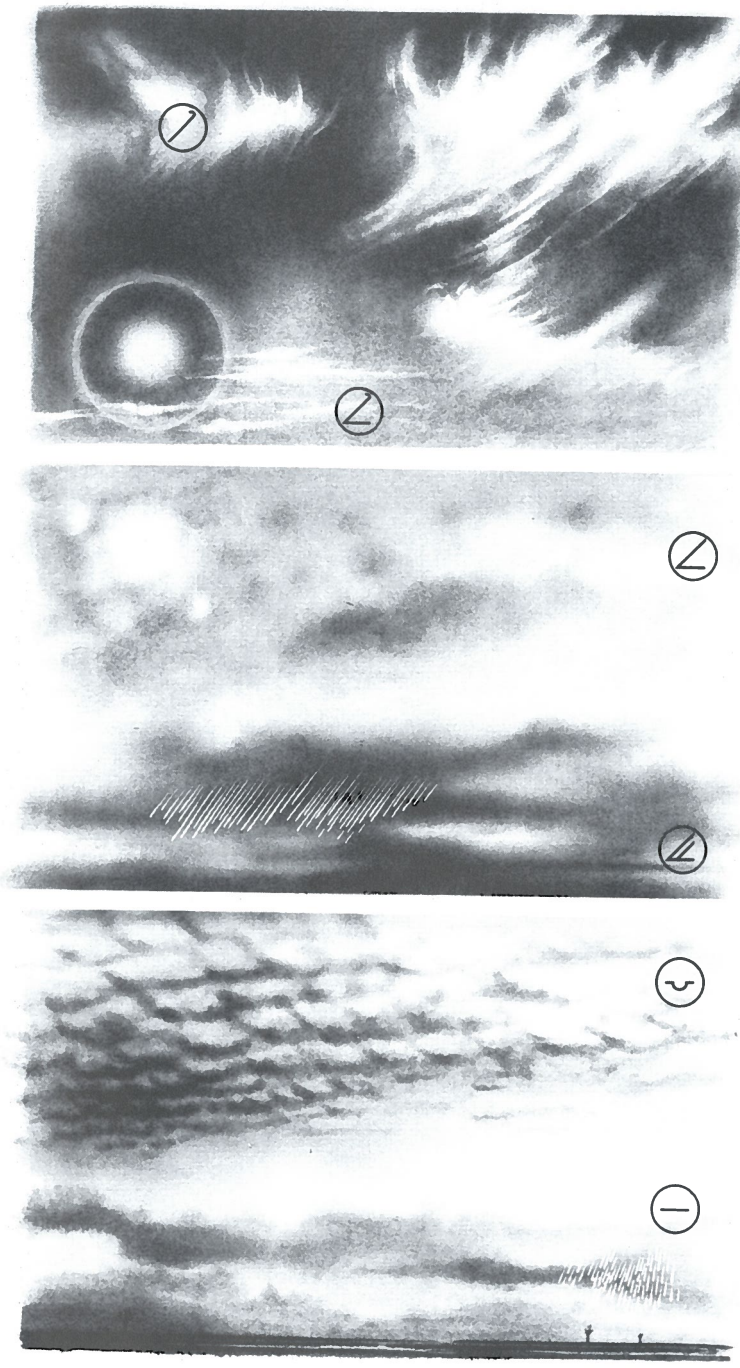
Altocumulus clouds *are fair weather clouds, similar to cirrocumulus but on a larger scale, thicker, not so white and with shadows in them. They usually appear after a storm.*

Cumulonimbus clouds *are low thunder clouds. Dark and angry looking, they may tower to 6,000m (20,000ft) with the top flattening out in what is often called an anvil top. This is a cloud that brings hail, a strong wind, thunder and lightning. False cirrus appears above, false nimbostratus below.*

Cumulus clouds *are very easy to recognize: fluffy white clouds, not unlike cauliflowers. They are usually an indication of fair weather when widely separated but, if they become very large and develop many heads, they are capable of producing sudden heavy showers.*

Cumulus clouds at sea in an otherwise cloudless sky are often an indication of land beneath them.





Cirrus clouds *are high, wispy clouds formed from ice crystals which give them a white appearance. Often called 'mares' tails', they are seen in fine weather.*

Cirrostratus clouds *are clouds made up of ice particles and look like white veins. These are the only clouds which produce a halo around the sun or moon. If it gets bigger it means fine weather, smaller a sign of rain.*

If the sky is covered with cirrus clouds and the sky above them darkens and the formation changes to cirrostratus it is an indication that rain or snow are coming.

Altostratus clouds *form a greyish veil through which the sun or moon may appear as a watery disk. If wet weather is approaching the disk will disappear and the cloud thicken and darken until it begins to rain.*

Nimbostratus clouds *form low, dark blankets of cloud and spread gloom. They mean rain or snow within four or five hours and usually the rain continues for hours.*

Stratocumulus clouds *form a low, lumpy, rolling mass, usually covering the whole sky, though often thin enough for the sun to filter through them. Light showers may precipitate from these clouds but they usually dissipate in the afternoon and leave a clear night sky.*

Stratus clouds *are the lowest of clouds and form a uniform layer like fog in the air – they are often described as hill fog when they occur. They are not a normal rain cloud but can produce a drizzle. When they form thickly overnight and cover the morning sky they will usually be followed by a fine day.*

PREDICTIONS

To be caught in bad weather could be fatal to survival. There is a time to go out or move on and a time to shelter. With an awareness of certain signs, short-term weather predictions can be made to help decide which to do.

Before setting out on any activity take note of the weather and any changes that are likely. Learn to observe all wind and pressure changes and keep a record of the weather and the conditions which precede it and what they develop into.

Wildlife indicators

Animals have great sensitivity to atmospheric pressure which aids them in forecasting the weather a day or two in advance.

Insect-eating birds, such as swallows, feed higher in good weather, lower when a storm is approaching.

Unusual rabbit activity during the day, or squirrels taking more food than usual to the nest, may be a prelude to bad weather.

Nature, however, does not go in for long-time forecasting. A squirrel's hoard of nuts is an indication of its industry, not the intensity of the coming winter. The depth of a bear's den has no relation to its severity, but reflects the soil conditions. A particularly big crop of berries is the result of previous bad conditions, the tree producing extra fruit to give the species more chance of survival.

Fireside clues

If the smoke from the camp fire rises steadily the weather is settled and likely to remain fine. If it starts swirling, or being beaten downwards after rising a short way, it indicates the likely approach of a storm or shower.

Wooden tool handles tighten at the approach of stormy weather. Salt picks up increasing dampness in the air and will not run.

'Feelings in your bones'

Curly-haired people find their hair becomes tighter and less manageable as bad weather approaches – and the same happens to animal fur. Anyone with rheumatism, corns or similar ailments can usually tell when wet weather is coming by an increase in their discomfort.

Sound and smell

When wet weather is on the way sounds tend to carry further than usual and distant noises seem more clear – the moisture-laden atmosphere acts like an amplifier. But compare like to like – remember, sound always travels better over water.

The smell of trees and plants becomes more distinctive before the arrival of rain, the vegetation is opening ready to receive it.

Signs in the sky

'Red sky at night, shepherd's delight, red sky in the morning, shepherd's warning' is one of the oldest of weather sayings. Since a red sun, or a red sky at sunset, indicates that the atmosphere holds little moisture it is unlikely that rain or snow will occur within the next two hours, but equally a red sky in the morning is a fair indication that a storm is approaching.

A grey morning is usually the start of a dry day. The dull colour is the result of dry air above the haze formed by the collection of dew on the dust particles suspended in the lower atmosphere.

An evening sky that is grey and overcast indicates rain – the dust particles are so laden with moisture that they will soon drop as rain.

Early morning mist lifting from a valley is a sure sign of fair weather. In hilly country, if mist has not lifted by noon, it is set in for the day and will probably turn to rain during the late afternoon.

A clear night sky is an indication of good, settled weather. At the end of summer it may also be a warning of frost: at night clouds insulate the surface of the earth against loss of heat. Without them frost is more likely. Cold air, being heavy, fills the hollows – avoid camping in them.

A clear sky one night, followed by one with only a few stars visible, indicates a change of weather.

A corona, a coloured circle visible around the sun or moon, can be used to forecast the weather accurately. An enlarging ring is a sign of good weather – the enlarging circle shows that moisture in the atmosphere is evaporating and day or night will be clear.

A shrinking corona around the sun or moon is a sign of rain.

Green light blinking from an afternoon sun indicates fair weather for at least 24 hours. A rainbow in the late afternoon is also a sign of fair weather ahead.

7
ON THE MOVE

Having chosen a course and planned a route, you must be able to maintain direction, to match your progress to the type of terrain and the nature of the survival group, and to exploit any techniques that make progress easier. This section deals with skills needed on the move. It should be read in conjunction with the techniques described earlier in *Climate and Terrain*.

Careful reconnaisance may be necessary to choose the easiest routes – which may not be the obvious or the quickest ones. Groups must be organized to suit the least able, or provision made for carrying them.

Waterways can offer the easiest routes to move along, if they are easily navigable and you are able to construct a raft. They can also present formidable barriers if they lie across the route you have to follow. Rivers can be dangerous. You must learn to assess the hazards they present and select the best places and methods of crossing, if crossing is unavoidable.

ON THE MOVE

Whether setting off on a hunting expedition or beginning the trek back to civilization, you will need skills in negotiating terrain and in navigation – either to ensure your return to camp or to keep to your chosen route. Even if you do not have a map, your own reconnaissance will have established your immediate terrain. Guessing what is beyond is much more problematic if you have to assess it for yourself.

On short expeditions take note of the terrain as you move outwards to ensure that you can find your way back to camp. Over short distances physical features will be your guide and you can also mark your trail, but when going further or striking back to civilization you will need all the navigational aids available.

The decision to move

Except when local dangers or the need to find water and food make it imperative that you move away from the site of your accident to make camp, you will stay close in the hope of rescue (see Survival case study p.391). If you have injured persons and only limited food and water, it would make sense to send a party to contact help while others stay to care for the sick. The fittest and most able should be chosen to make the trek – unless they include a trained medic, who should stay with the sick.

But what if no rescue comes? Local resources may become exhausted: you go further each day to collect firewood, the game in the area has gone, plants, fungi, fruits and nuts are more difficult to find or require long forays out of camp. Under survival conditions there is also an increased risk of disease from staying too long in one place. Even with the strictest sanitary management the chance of disease gradually builds up.

All these will be pressing you to move. Whether that be a move to new territory or the beginning of a trek back to civilization, many of the same problems will occur and – since there are few situations so idyllic that survivors will prefer their new life to their old – it would be sensible to plan any move as the first stage of the journey out. The exceptions will be where there are still sick people on their way to recovery, or better resources are needed to provision a push through alien territory. A move to a more comfortable camp in a more hospitable area will provide better chances of recovery for the injured or sick and the chance to build up the necessary surplus and equipment ready for the final trek.

If you have a map or a clear idea of your location make for the nearest known settlement. If you have no idea where you are then the best course is usually to follow waterways DOWNSTREAM, for they will clearly define a route and generally lead to populated areas.

BE AWARE

Deciding which way to go will be influenced by all the information you have been able to gather, by the fitness and endurance of the party and by the nature of the terrain. Always remember that the most direct-looking route may not be the easiest to travel.

Even if you are simply changing the location of your camp there is no point in just moving a mile away – as you will soon have the same problems that made you decide to leave your first camp. The territory will not be entirely fresh. Move two or three days' journey at least so that fuel, flora and fauna will all be undisturbed.

Although you may expect similar resources to be available, as long as you are travelling through similar terrain, remember that you have been hunting and foraging with experience of where things are best found or trapped and with known supplies of fuel and water. You will have to find your basic needs in new territory and when you move into different terrain availability may change dramatically – for better or worse.

Preparations

Before you finally abandon camp leave signs that will make it clear you have been there and have moved on (see *Signalling* in *Rescue*). Leave a message giving a list of who is in the party and details of your intentions. Mark the trail as you proceed so that if searchers do find the camp they will be able to follow you.

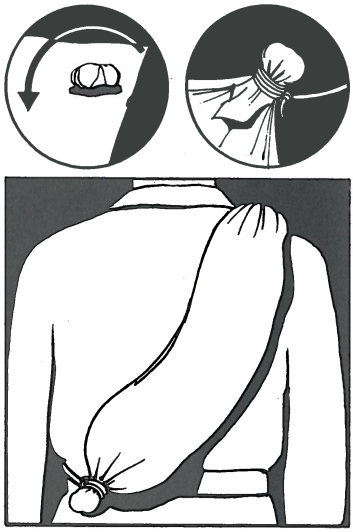
Build up a stock of preserved food, make water bottles and larger containers too if you envisage crossing waterless territory, litters or other means of transporting any remaining sick, the old or very young. Make suitable foot-coverings and clothing for everyone and packs to carry equipment and supplies. Some form of transport may be possible – a sledge or raft. Take shelter material with you – cloth, canvas, ponchos, even sticks if they are likely to be scarce in the terrain you are crossing. A shelter which can be quickly re-erected, will conserve energy for more urgent gathering than roofing materials and supports. Naturally, you will take signalling gear, for you may find an opportunity to make that vital contact which will bring rescue.

Study weather patterns carefully to choose a time for travel when the weather is likely to be settled.

HUDSON BAY PACK

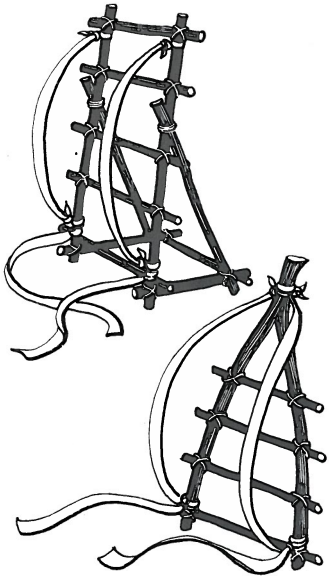
A comfortable and easily improvised way of carrying equipment, this needs strong and preferably waterproof material about 90cm (3ft) square, two small stones and cord or thonging more than long enough to loop across the body.

Place stones in diagonally opposite corners of the cloth. Fold ends of cloth over stones. Tie cord below the stones, securing them in position. The stones in turn prevent the cord slipping off. Lay cloth on the ground and roll possessions up tightly. Wrap pack around the body, either across the back or around the waist.



BACK-PACK FRAME

Make a ladder frame to fit against your back, with a right angle projection at the bottom secured by side struts. Add shoulder straps and a belt loop. Use this to support a bag, a bundle of supplies or equipment tied into place.

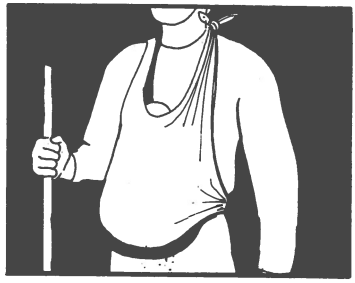


FORK FRAME

A quicker, but less-efficient support can be made from a forked bough with cross-pieces to which baggage can be tied.

BABY BAG

Carry babies and small children papoose style on your back or front. Tie lower corners of a rectangle of cloth around the waist, pop the child in and tie the upper corners around your neck. Pad at neck to ease pressure or chafing.



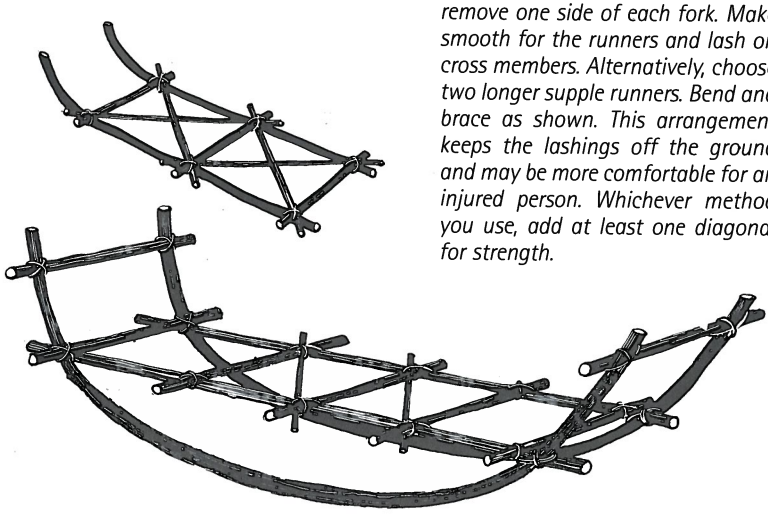
Carrying people

Pickaback and fireman's lifts are impracticable for long distances and stretchers are difficult to handle. Sit small children on a back-pack frame or make carrying chairs on poles to be borne by several people. If you are alone, try a sledge or travois (see *Furnishing the camp* in *Camp Craft*). Equipment can be carried in the same way.

Making a sledge

Sledges are particularly useful on snow and ice, when they will move most smoothly, but may also be used on smooth ground. The shape of the front runners is critical, especially on snow. You can make use of doors and cowlings from a crashed aircraft or vehicle in the construction. Tie lines to the front runners with a bowline to the people hauling – ideally two at the front, and two at the rear as brakemen on gradients. Test thoroughly before using on a long trek.

Choose two forked branches and remove one side of each fork. Make smooth for the runners and lash on cross members. Alternatively, choose two longer supple runners. Bend and brace as shown. This arrangement keeps the lashings off the ground and may be more comfortable for an injured person. Whichever method you use, add at least one diagonal for strength.



PLANNING

If you are on very high ground, above a large plain, it may be possible to plot out a route with some precision. In most situations visibility will be restricted and you will have to guess what is over the furthest ridge and what occupies the 'dead' ground ahead. Even when you can see the terrain ahead, it is difficult to see the details. What looks like a manageable slope may prove a barrier when you get closer to it. If you have them, make good use of field glasses in studying every potential route.

To see further you may consider climbing a tree – but keep close to the trunk and test each branch before risking your weight on it. This is NO time to risk a fall.

Following rivers

Following a watercourse, however small, offers a route to civilization and a life-support system on the way. Most rivers lead eventually to the sea or great inland lakes. Apart from the rare exception where rivers suddenly descend beneath the earth, they offer clearly defined routes to follow. Sometimes, in their upper reaches, they may cut through gorges and it can be impossible or inadvisable to take a route along their banks, which may be steep, rocky and slippery. In that case take to high ground and cut off the bends, following the general course of the stream.

On more level ground a river is easier to follow and may well have animal trails beside it which you can use. In tropical conditions the vegetation is likely to be denser by the river – for the light can reach below the trees, and the banks may be hard to negotiate. If the river is wide enough it would be worth considering building a raft. Even if there is no bamboo, which makes an ideal raft-building material, there are likely to be sound fallen trees for timber.

When, on flat plains, a river makes huge meanders, the inside of the loops may be swampy and prone to flooding – you can recognize such very wet ground by the lushness of the vegetation and rush-like plants. Avoid marshy areas if you can, and cut across the loop.

Maintaining direction

Having decided upon a direction, try to maintain it. Choose a prominent feature in the distance and keep heading towards it. Travelling through forests makes orientation very difficult and a compass becomes a valuable asset.

If you are in featureless territory, but in a group of three or more, separate to follow each other at wider intervals and look back frequently. If you are following in each other's tracks those behind you will be directly behind each other. If the party always moves on in relay – one moving on ahead, then resting while everyone else moves up from the rear – the straight line will be maintained. On your own you can try to align yourself by looking backwards at your own tracks if they are visible, as they are likely to be on snow or sand. Better still, you can set up sticks or piles of stones in alignment with each other so that you can check that you are not deviating from your route.

If possible skirt rocky outcrops and areas of dense vegetation and, once on high ground, stick to it until certain that you have found the spur down which you can make the best progress in the desired direction.

MOVING IN GROUPS

Always move in an organized manner, in some kind of formation, and not as an unruly gaggle. This way it will be easier to check that no stragglers have been left behind and to ensure that there is help for anyone in difficulty. Before setting out for the day, have a briefing to discuss the route, any obstacles expected and any special procedures.

Divide responsibilities

One person becomes a scout, responsible for selecting the best route, avoiding dead falls, loose rocks etc and finding the best way down a slope.

Number two is responsible for making sure the scout, who will be preoccupied with skirting obstacles, maintains correct overall direction. Others should relieve them frequently, for the lead scout's job in particular is very tiring.

The rest of the party should keep their eyes open for edible plants, berries and fruits and everyone should be responsible for at least one other person to ensure that no one drops by the wayside. A head count and check on everyone's condition is particularly important after a river crossing or negotiating a particularly tricky stretch of terrain. Someone should initiate equipment checks at frequent intervals.

Always travel in at least pairs – and be especially careful in bad weather, and if you have to travel at night, that you do not get split

up. It is usually the person in front who gets split off from the group – people are more likely to remember to look for the stragglers. The scout climbs over an obstacle, the second person sees the scout struggling and then sees an easier route to take – the rest of the party follow and the lead person is separated from the group. This is when the benefit of EVERYONE knowing the proposed route, and nominating prominent features as rallying points, is apparent. If separated or in an emergency everyone knows where to regroup.

Availability of water, fuel and plants may be an indication of what is available in similar locations further ahead. An eye should always be open for places that offer good shelter – if the weather suddenly turns bad you can backtrack to one of them.

PACE AND PROGRESS

- A large group can send an advance party ahead with the responsibility for clearing the route and setting up the night's camp, ready for the slower-moving injured or less able. A clear trail will make the carrying of baggage and any unfit people much easier. Sick and injured should be provided with fully-fit escorts in case they encounter any difficulties.

- Ensure that the lead person in the party does not go too fast for those behind. After an obstacle wait and allow everyone to catch up before moving on.

- It is best to try to maintain an even pace – smooth, pendulum-like movement tires the legs less than a jerky pace or flexing the knees. It helps to swing the arms – and they should certainly not be pushed in the pockets, especially when going up or down hills for if you then slip you have less chance of stopping yourself falling or sliding.

- Rest frequently (whether in a party or alone). Stop, sit down and see how everyone is doing. Adjust loads which are uncomfortable and repack them if necessary. On average take a break of 10 minutes every 30–45 minutes, depending on the terrain and condition of the group.

- On steep ground the pace should be shortened, on easy ground lengthened. On descents avoid overstepping for this jars the body and increases fatigue.

- On steep or slippery ground ropes can provide a hand hold to help people negotiate a particularly tricky stretch (quite apart from abseiling and other climbing techniques). They will be an asset on scree, as much as on icy slopes.

- You can also use a line with Prusik knots attached so that the young and aged can be tied to a fixed rope for extra safety (see *Knots* in *Camp Craft*).

- In estimating distance you have covered allow 3km (under 2 miles) per hour, but going uphill knock off a third.

WALKING AT NIGHT

Negotiating unknown territory at night can be very dangerous, but may be necessary in an emergency, or there are circumstances – in the desert for instance – when it may be more comfortable to travel at night.

The night is never completely dark and outdoor vision is not totally lost, even for man. However, because it is difficult to see things clearly you are easily disoriented, which leads to a feeling of being lost. A compass is a great help in maintaining a heading and dispelling any such fears. It is always darker among trees than out in the open – so keep to open country if you can.

When looking at an object at night it is best to look at one side of it and not directly at it. It is difficult to distinguish anything in a dark central mass but the edges show more clearly and in poor light objects at the edges of your vision are often seen more distinctly.

Once the eyes get accustomed to the dark, more and more is seen as 'night vision' is acquired. It takes about 30–40 minutes for the eyes to get accustomed to the dark. Once this is achieved, the eyes must be protected from bright light or the night vision will be impaired for quite a while. If there is an unavoidable reason for having to use a light, cover one eye so that the vision in that eye at least will be retained. If, for instance, you need to consult a map, a red filter over a torch will help you to retain your night vision.

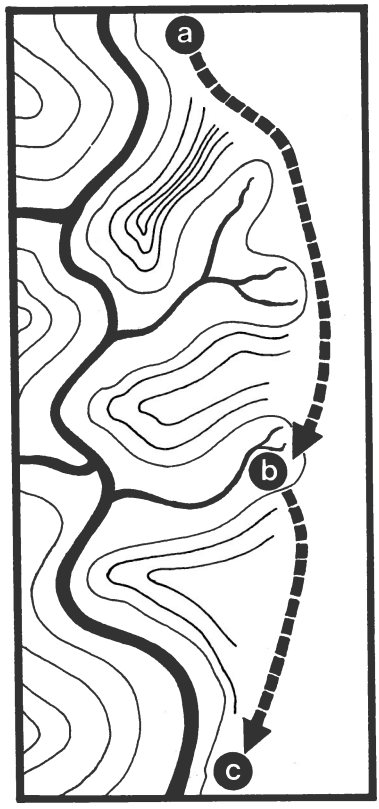
The ears are good sensors in the dark – the sound of a river, for instance, provides a good guide to how fast it is flowing. Vegetation can be smelt in the dark and familiar smells can aid identification.

Walk SLOWLY in the dark and test each step before putting all your weight forward. If going down a slope use a shuffling step.

UPLAND TRAVEL

In mountainous and hilly country it is best to keep to high ground – it makes navigation easier. Rivers may be in steep-sided gullies and have rapids, falls, and slippery rocks that are difficult to negotiate on foot. You could end up spending an unhealthy length of time in the water.

Use spurs to climb out of valleys and get on to the ridges. If they are very exposed you may have to drop down into the valleys for shelter at night and to find water but you will be able to cover more ground than by negotiating the spurs.



It is no use following a river if it winds in deep valleys through very hilly country. By climbing from the valley at (a) and following the ridge, steep and tiring descents and climbs are avoided.

At (b) a night halt is taken dropping down to the first available water source. This could provide shelter too, which may be unavailable on an exposed ridge.

Be aware of fading light and your own flagging energy. Look for shelter before they are exhausted.

Do not go down to the valley bottom if you can find shelter and water on the way. Not only will you save energy, you may be warmer.

Pockets of cold air are quite often trapped in the bottom of valleys.

If you carry water and shelter materials, stay on the high ground, choosing the most sheltered spot.

Then the route follows the ridge further before dropping down into the widening main valley to follow the watercourse again at (c). Follow the tip of a spur to go down into the valley when a river gets larger and the valley opens out.

Steep slopes

In mountainous country and on high hills, snow and ice may be encountered, and even without them such country can be dangerous

with loose scree, steep slopes and crags that have to be negotiated.

Traverse steep slopes in a zig-zag and as you change direction always set off with the uphill foot. This avoids having to cross your legs over each other, which can make you lose balance. When climbing steep slopes lock your knees together after each step – this rests the muscles.

Descending steep slopes, keep your knees bent. Try to go straight down – and if you are picking up too much speed, sit back. Avoid loose rocks and scree but, if you have to negotiate loose surfaces, it helps to dig in the heels and lean back while descending. When climbing, test every foothold before putting your weight on it. Don't step on stones or logs on steep slopes, they may dislodge.

With practice it is possible to jump down loose ground – dig in the heels and slide – provided that there are no sudden drops below. Keep the feet square and shoulder width apart and allow yourself to slide. As you increase in speed, dirt will build up under your feet and you will lose control. Jump and start again. If the slope is very steep abandon this method – abseiling (rappelling) is the answer (see *Mountains* in *Climate and Terrain*).

JUNGLE TRAVEL

In dense jungle you may have to cut your way through if there is no way of going round. Chop downwards and as low as possible at the stems on both sides so that they fall away from the path you are making, not across it. Avoid leaving spikes standing, bamboo points can be lethal if someone stumbles. High growth and creeper can often be cut and travelled over.

Jungle vegetation seems to be covered in thorns and spikes. You may have to twist and turn to avoid vegetation that seems to surround you. Rushing only makes it worse. Those types of the climbing palms, atap and rattan, that are known as *nanti sikit* – 'wait-a-while' – in Malaya and similar names elsewhere, have thorns like fish hooks at the end of the leaf. When snared by them you must back off and untangle. Don't try to tear through wait-a-while vine – it will strip you naked. You'll soon see why it got its name! However it has many uses and rattan is one of the best of jungle water vines.

Keep feet covered to protect them from sapling spikes, snakes and chigoes (chiggers). Stop frequently to remove parasites. Chigoes ignored for more than an hour or so will cause infection.

WATERWAYS

If a river is wide enough to be navigable, it will be easier to float on it than to walk beside it. The long-term survivor could experiment with making canoes – burning out the centre of a tree trunk to make a dug-out or covering a frame of willow with birch bark or skins – or copying boats made from reeds like those built by the ancient Egyptians and Mesopotamians, which can still be found today at places such as Lake Titicaca in Peru.

All are difficult to make well enough to stand up to water travel and even among the peoples for whom making them is a traditional skill, they are usually the work of specialists.

RAFTS

More practical for the survivor will be to construct a raft, which will not capsize so readily if the structure is not perfect. All boats and rafts must be soundly tested in safe water near the camp before setting out on a journey.

In jungle terrain especially you may find that the river, beside which you have camped, has been swelled by seasonal rains to make rafting a viable proposition. Here, too, you may find ample timber, either bamboo (which is ideal) or uprooted trees which are sound and unrotted. If you have to cut timber choose leaning trees for they are the easiest to drop. With dead falls the top of the trunk is usually sound enough to use for a raft.

You can use oil drums or other floating objects to support a raft, and if there is no supply of strong timber a sheet of tarpaulin or other waterproof material can be used as a man-carrying version of the coracle described later for floating equipment across a river.

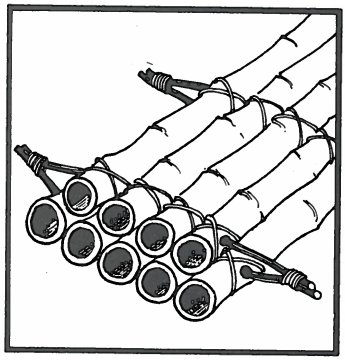
Never take chances with a flimsy raft on any water. On mountain rivers there are often rapids which only a really tough structure will survive. On the wide lower reaches there will be a long way to swim to the bank if you have a raft break up under you.

Travelling by raft

Tie all equipment securely to the raft or to the safety line, making sure that nothing trails over the edges where it could snag in shallows.

Everyone aboard should have a bowline attached around the waist and secured to a safety line or to the raft.

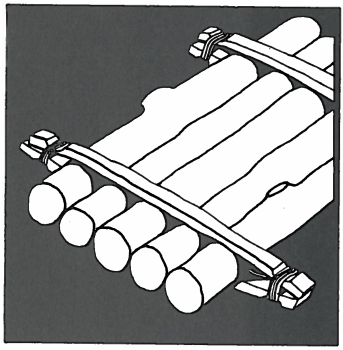
BAMBOO RAFT



A single layer will not support you unless it is very long, so go for a two-layer model.

Cut thickish bamboo in 3m (10ft) lengths. Make holes through the canes near the ends and half-way along. Pass stakes through these holes to connect the canes. Lash each of the canes to each of the stakes with twine, rattan or other vines or cable. Make a second deck to fit on top of the first and lash the two together.

GRIPPER BAR RAFT

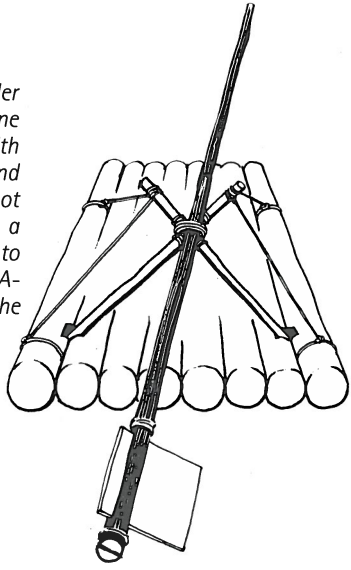


This is the quickest raft to build. You need logs for the deck and four thickish stakes with some pliability which are long enough to overlap the width of the deck.

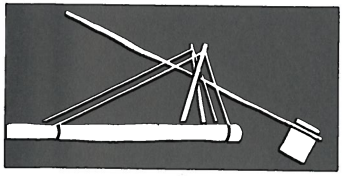
Place two of the stakes on the ground and lay the logs over them.

Place the other stakes on top. Tie each pair of stakes firmly together on one side. Then, with a helper standing on top to force the other ends together, tie these so that the logs are gripped between them. Notching the ends of these gripper bars will stop the ropes from slipping.

STEERING



To steer the raft make a paddle rudder and mount it on an A-frame near one end of the raft. Secure the A-frame with guy-lines to the corners of the raft and tie the rudder on to it so that it does not slip. The rudder can also be used as a sweep for propulsion. You may need to notch the raft for the base of the A-frame. The guy-lines could be tied to the cross-pieces.



Lifelines should be long enough to allow free movement, but not so long that they trail in the water. In narrow swift-flowing rivers with dangerous rapids and waterfalls it is better not to tie on. If the raft gets out of control and is swept towards dangerous water, it is better to head for the bank.

In shallow water the best means of controlling a raft is like a punt, but preferably with two long poles – with one person poling at one front corner of the raft, and another at the diagonally opposite back corner.

If the survival group is a large one, several rafts will be needed. The fittest should be on the first raft, carrying no equipment or provisions. They can be lookouts and give early warning of hazards to be avoided. If they have to abandon their raft no kit will be lost.

Waterfalls and rapids can be heard some time before you reach them, and often are indicated by spray or mist rising in the air. If uncertain about the safety of the stream ahead, beach or moor the raft and carry out a reconnaissance on foot.

If you reach a difficult or dangerous stretch of water unload the raft and take to the bank, carrying all the equipment downstream of the dangerous waters. Having posted someone downstream where the river becomes safe and manageable to recover the raft, release the raft and let it drift down through the difficult stretch. It will probably need repairing but at least YOU will be safe and have all your equipment.

REMEMBER:

Only raft by day, NEVER in the dark. At night secure the raft firmly – so that it will still be there in the morning – and make temporary shelter on higher ground away from the river.

Bogs and marshes

If you cannot avoid crossing a marsh make your way by jumping from tuft to tuft of grass. If you find yourself sinking into a bog, 'swim' with a breast-stroke to firm ground – don't try to jump. Spreading your body over the surface distributes your weight. Use the same technique in quicksand.

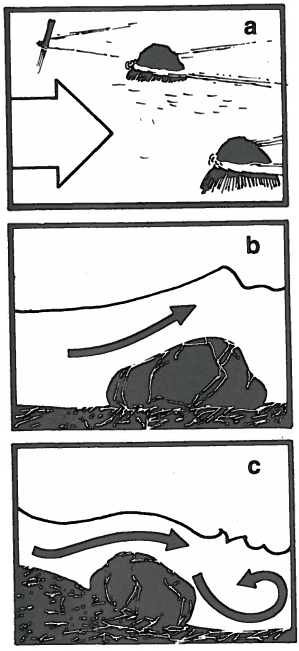
CROSSING RIVERS

The headwaters of a river will be narrow and swift-running. Although banks may be steep and rocky it will usually be possible to find a place to cross. Where the water is shallow you may be able to wade – but test ahead with a pole for hidden depths. You may find rocks to provide stepping stones across or be able to place them for small streams.

Some members of a party may be able to leap across a narrow chasm or from boulder to boulder across the stream bed, but that is not much help if others cannot make it. A slip on a boulder is an easy way to sprain an ankle.

The estuary of a river is wide with strong currents and is subject to tides – which can influence some rivers many miles from their mouths. Avoid crossing there, unless equipped with boat or raft, go back upstream to an easier crossing place.

On any wide stretch, and especially when near the sea, do not set off, even with boats or rafts, immediately opposite the point you hope to reach, but consider how the current will affect your passage and make allowances.



STUDY THE WATER

The surface movement of a stream or river can tell you a great deal about what is beneath. The main flow of the current is usually evident from a chevron shape of smoother water around any rock or projection (a), the V widening downstream.

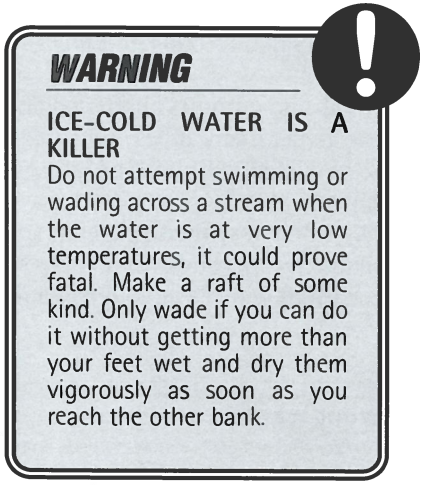
Waves that appear to stay in one position on the surface (b) are usually evidence of a boulder on the bottom deflecting water upwards.

Closer to the surface an obstruction will create an eddy downstream of it where the surface water appears to run back against the main flow. If a large boulder coincides with a steep drop in the level of the bottom (c) these eddies can produce a powerful backward pull downstream of the obstruction and pull swimmers in – they are VERY dangerous.

Wading across

Even quite wide rivers may be comparatively shallow and possible to wade across, but never underestimate any stretch of water. Cut a stick to aid balance and cross facing towards the current and you will be more able to avoid being swept off your feet. Roll trousers up, so that they offer less surface to the current, or if they are going to get wet anyway take them off so that you have them dry for the other side. Keep your boots on, they will give a better grip than bare feet. Undo the belt fastening of a back-pack so that you can slip it off easily if you get swept over. But don't lose hold of it. It will almost certainly float and you can then use it to help right yourself.

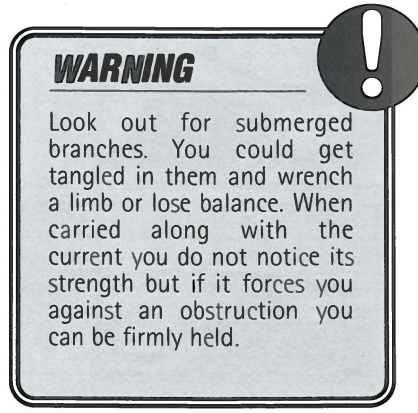
Turn at a slight angle, your back towards the bank you want to reach, the current will move you in that direction. Do not take strides but shuffle sideways, using the stick to test for depth and trying each foothold before using it.



Crossing as a group

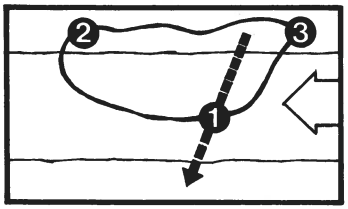
If a group of people are wading across together, they should line up behind the strongest, who crosses as described above. The others each hold the one in front at the waist and move in step, offering less obstruction to the current.

Alternatively a group can link arms side-by-side and hold on to a pole or branch to keep them in alignment. They cross facing the bank and moving forwards. Only the side of the first person opposes the current and the group provides stability for all of them.

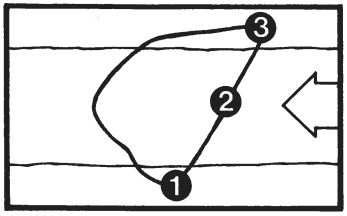


Crossing with ropes

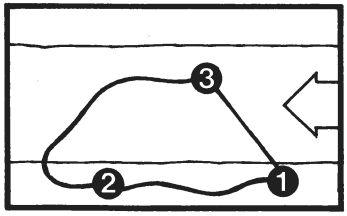
If a rope is available it can make wading safer – but you need a loop of rope three times as long as the width of the stream and there must be at least three people in the party. Two of them always control the rope to keep it out of the water as much as possible and to haul the crosser to the bank if difficulties are encountered.



The person crossing is secured to the loop, around the chest. The strongest person crosses first. The other two are not tied on – they pay out the rope as it is needed and can stop the crosser being washed away.



When he reaches the bank, 1 unties himself and 2 ties on. 2 crosses controlled by the others. Any number of people can be sent across in this way.



When 2 has reached the bank, 3 ties on and crosses. 1 takes most of the strain, but 2 is ready in case anything goes wrong.

RIVERS ARE DANGEROUS

Never enter the water unless there is no other way of getting across and choose a crossing point carefully.

- Avoid high banks that are difficult to climb out on.
- Avoid obstructions in the water.
- Current is likely to be fastest on the outside of bends and steep banks may be undercut making landing impossible.
- Look for an even section of river bed – shingle is the best surface for wading.

Swimming across

If you can't swim DON'T try – rely on others to get you across with the help of some sort of float. Even the strongest swimmers should make use of flotation aids when crossing a river – and for non-swimmers they will be essential. They will reduce the expenditure of energy and help to keep clothes and kit dry. Do not swim with your clothes on. Once wet they will give you no protection from cold – dry they are something warm to put on when you have crossed.

Always make sure you have found a place on the other side where you will be able to get out of the water. If there are no beaches you will need supports to haul yourself up on to the bank – but avoid tangles of branches in the water where you might get trapped. Enter the water well upstream to allow for the distance that the current will carry you down as you cross. Better to overestimate and be a little longer in the water, than pass your landing place.

Check the strength of the current by watching floating logs and flotsam and study the water surface for hidden obstructions and eddies.

If you hit weed in the water adopt a crawl stroke to cut through it. Once a strong swimmer has cleared a passage others will be able to follow through in the channel made.

Flotation aids

Fuel cans, plastic bottles, logs – anything that floats can be used. If you have a waterproof bag put your clothes and belongings inside, leaving plenty of air space tie the neck and then bend it over and tie again and use it as a float. Hang on to it and use just your legs to propel yourself.

- Without a bag, but with a waterproof sheet, pile twigs and straw into the centre to create air pockets and then pile your clothes and equipment on top before tying up the bundle securely.

- Do not attempt to sit on the bundles or place your weight on them.

- With a group of people, split into fours. Each four should lash their bags together and use them as support for an injured member of the party or a non-swimmer.

- If no waterproof material is available, make a small raft or a coracle to float your things on. Bundle your belongings and, if heavy, make the raft two-layered so that only the lower layer sinks into the water and your kit stays dry.

SURVIVAL CASE STUDY

This is a case study that I use when I do talks about survival situations. It has nothing to do with any personal experience that I have had, although it is a true story.

In this documented account from the 1950s, a family of three – a father, mother, and child – set off by small plane from the east coast of the United States to get to California. After various stops for fuel and rest the family arrived safely at their destination, although the father, who was the pilot, reported a minor fault when the plane landed for the final time. When the family were ready to head back east he went up for a test flight to make sure that the repairs he had requested were successful.

However, what they failed to do was to register a flight plan, and this proved to be a fatal error. You should always tell someone where you are going and how long you expect to be, otherwise no one will realise you are missing and think to look for you. I suspect that that there were a number of failures on this occasion and the airport should have insisted on some sort of flight plan. Nonetheless, when the plane crashed in the Trinity Mountains in northern California, nobody knew they were missing.

Despite their initial error in failing to alert the authorities about their route, this family was trained in survival techniques and, having survived the impact, remained alive for the next ten days. They then made the decision to leave the wreckage in search of civilization. And this is where they finally fell down; they didn't know how to effectively navigate and they left the security of the wreckage. Survival skills are very important but you also need to know the best possible way to get to safety. The family were eventually discovered only a number of days after they had died, only 50 km (30 miles) from the nearest road.

The lessons to be learnt from this case study are that you should always let people know where you are, stay where you are for as long as possible, but if you really feel that you must leave the area (and I don't recommend this) try to leave behind a message with your future movements. In this case the family had left a diary that was found by rescuers, revealing their whereabouts.

8
HEALTH

When no professional medical help is available, survivors have to undertake medical tasks which should normally be left to those with special training.

Traditional first-aid procedures are designed to cope with minor problems and to sustain a seriously injured person until they can receive expert treatment. However, if there is no possibility of outside help in time to save a life, the survivor may sometimes have to take drastic measures. Some of the advice given in this section is intended ONLY for such circumstances.

In the treatment of diseases and disorders the experience of centuries of herbal treatments and natural remedies can be put to good use, when no prepared drugs are available – or to reserve supplies for more serious need. Herbal medicines given here use only simple methods of extraction and preparation.

FIRST AID

Maintaining health is of primary importance to the survivor. Do not take any unnecessary risks which could lead to injury. Aim at a varied and balanced diet and make sure that you get adequate rest.

In the initial stages of the survival situation none of these may be possible but, once you have a camp established, food sources and water found, a disciplined approach will enable you to conserve energy and resources. Away from people, you are not exposed to contagious infections, unless you brought them with you. Although some diseases are insect- or waterborne, sensible precautions – especially boiling water and properly cooking food – will protect you from many infections.

Extreme climatic conditions bring their own dangers and an awareness of symptoms will help you to treat yourself and others. Inexperience or ill-luck may lead to injury, however careful you are, and an understanding of practical first aid – improvising where medical equipment is not available – is a basic survival skill. In accident situations such improvisation may be the first key to survival for those involved, when rapid action is essential. Any expedition should have at least one person with suitable specialized medical knowledge – but EVERYONE should know how to deal with basic injuries, disorders and diseases.

PRIORITIES

In an accident involving many injured people you must know which patients to treat first. When a patient has multiple injuries, breathing, heartbeat and bleeding should be given priority. Assess the injuries and handle in the following sequence:

- -Restore and maintain breathing/heartbeat
- -Stop bleeding
- -Protect wounds and burns
- -Immobilize fractures
- -Treat shock

NOTE: Before approaching any accident victim, check for danger to yourself and protect yourself from it. Look out for electric cables, gas pipes, falling debris, dangerous structures or wreckage. Give initial check-up without moving the patient, if possible, but – if there is continuing danger – move the patient and yourself to a safer location.

REMOVE FROM DANGER

First reduce any further danger to the casualty or yourself by moving them to safety – away from a burning vehicle or building. In the case of a road accident, stop the traffic. With electrocution, switch off the current. If you can't, stand on dry nonconductive material and push or lever the patient from the power source with a dry nonconductive pole or stick BEFORE touching them. If gas or poisonous fumes are threatening, turn them off at source and take casualties to fresh air.

There is always a risk in moving patients with unknown injuries but, if they are further threatened, they must be moved to have any chance of surviving. People with spinal injuries are at greatest risk when moved – the spinal cord could be severed. The only safe way to move them requires several people (see *Fracture of the spine*).

Unconscious casualties

If a person is unconscious first check whether they are breathing and begin artificial respiration immediately if necessary. Check for external bleeding and injury, trying to establish the cause of unconsciousness.

BREATHING BUT UNCONSCIOUS

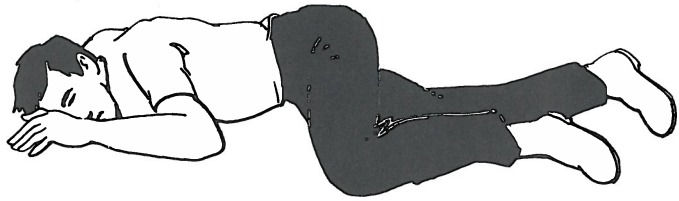
If the patient is breathing, and does not appear to have any spinal injury, check that there are no obstructions in the mouth, deal with any serious bleeding and place him or her in the recovery position. If lying on the back you will need gently to turn the casualty on one side, usually most easily done by grasping clothing at the hip. This produces a stable position so that any liquids or vomit produced from the stomach or nose will not enter or block the lungs and the tongue will not fall back and block the airway.

WARNING

Do NOT place a casualty with a suspected spinal injury in the recovery position. Use an artificial airway to maintain their respiration and as a means of administering mouth-to-mouth resuscitation.

CHECK BREATHING AND HEARTBEAT!

RECOVERY POSITION



Move the arm and leg on one side of the body outwards to stop the patient lying flat, elbow and knee should both be bent. Turn the head in the same direction. Lay the other arm down along the other side of the patient. Allow the other leg to bend slightly.

Pull the jaw forward to check that the tongue is at the front of the mouth and not blocking the airway. Loosen tight clothing.

BREATHING AND PULSE

Normal breathing is quiet and easy. Noisy breathing, froth around the nose or lips and blueness around the lips and ears are all signs of difficult or obstructed breathing. Check breathing regularly by listening carefully near the nose and mouth. Remove obstructions and, in the absence of breathing, give artificial respiration. Check at neck or wrist for pulse.

Cessation of breathing

This dire emergency may be caused by:

- Blockage of upper air passages caused by face and neck injuries or foreign bodies
- Drowning or electric shock
- Choking
- Inflammation and spasm of air passages caused by inhalation of smoke, gases or flame
- Lack of oxygen
- Compression of the chest

CHOKING AND BLOCKAGES

If breathing has stopped immediately remove any obstruction in the airway and give artificial respiration.

Clear the airway of any foreign matter: weed, vomit, false teeth or food. Sweep the mouth with a finger and ensure the tongue has not fallen back to obstruct the breathing passages.

If someone appears to be choking, but can breathe and cough, their own coughing is more effective than your aid. A blow on the back may sometimes help. If the victim cannot speak use the Heimlich manoeuvre with adults, but see other methods for special cases.

HEIMLICH MANOEUVRE

Stand or kneel behind casualty, arms around them. Clench one hand over the other, thumb side of fist pressing between waist and bottom of ribs. Apply pressure and jerk quickly upwards four times.

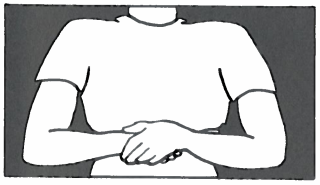
IF THIS DOES NOT WORK

Give four sharp blows to the back between the shoulder blades to loosen object and four more 'hugs'. Stop when victim starts breathing or coughs loudly.

REPEAT if this does not succeed at first. DO NOT GIVE UP! Be ready to give artificial respiration, if the blockage is removed, but the patient does not start breathing. Lay an unconscious patient on his or her back, kneel astride, place your hands, one on top of the other, with the heels resting above the navel, and make quick thrusts up to the centre of the ribcage. If the blockage does not appear to shift, quickly roll patient on to side and strike four times between the shoulder blades. Repeat as necessary.

SURVIVAL SELF-HELP

If alone, use the Heimlich manoeuvre by pulling or pushing against a blunt projection – an earth bank, a fallen tree (or a chair back in a domestic situation).



Choking: Special cases

Babies:

Support the baby, face down, straddling your forearm, with the head definitely lower than the chest. Use the heel of the free hand to give four quick blows between the shoulder blades.

Place free hand on back of baby's head and turn over. Use two fingertips to press four times, quickly and fairly firmly, on centre chest. REPEAT. Be ready to give 'mouth-to-mouth (and nose)' if breathing stops.

Children:

With small children hold them upside down and strike four rapid blows between the shoulder blades using the heel of the hand. With older children place across the knee, or bend forward from a sitting position, supporting chest with one hand while administering blows with other. Alternatively, perform Heimlich manoeuvre using two fingers of each hand instead of fists. (Not breathing – see *Artificial Respiration.*)

Pregnancy and obesity:

Abdominal Heimlich manoeuvre impossible. Position fists instead against the middle of the breastbone and follow similar procedure. (Not breathing – see *Artificial Respiration.*)

Drastic action

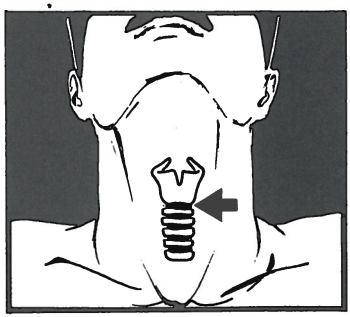
On the rare occasion when repeated attempts with the Heimlich manoeuvre fail to dislodge an obstruction, drastic action is required: a cut into the patient's throat below the obstruction. Also used in cases where an injury to the jaw prevents the patient from breathing, this is a technique only for a life-or-death situation. It is risky for the untrained, but worth trying to save a life in cases where the casualty will certainly die without it. There is no significant bleeding if you use the Crico thyroid technique, which is superior to a tracheotomy (where the cut is made below the Adam's apple).

Preparation

You need a sharp blade, a scalpel or a penknife, not a wide knife, and a hollow tube (a ballpoint pen case, a CLEAN fuel or hydraulic line from a vehicle, tubing from a back-pack, a small syringe and even a hollow plant stem have been used).

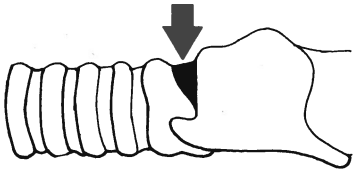
They should be sterilized if boiling water or a flame is available, but do not waste time getting them. WARNING: Contamination with oil or petrol from a dirty vehicle hose could produce chemopneumonia.

1 *Lay casualty on back, shoulders elevated, head and neck presenting a straight line.*

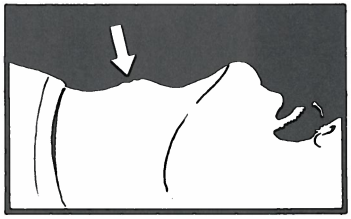


2 *Run a finger down the Adam's apple – the bone-like projection on the front of the neck (more prominent in men than women) and find another small projection just below it. Between the Adam's apple and this smaller projection you will find a central valley.*

3 *Make an incision here at the exact midpoint. Keep the incision small but deep – straight down for about 1–2cm (3/8–3/4in) – note the distance on the blade beforehand. You will feel the blade move more easily as it cuts through to the windpipe. Do NOT push down further.*

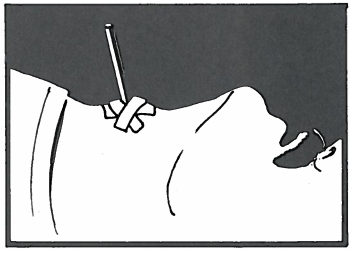


ALTERNATIVE: For the incision, pierce with a wide-bore needle – producing less bleeding (and considered preferable by doctors). A kit is produced and should be included in pare-medical equipment.



4 *Twist the blade sideways to open up cut.*

5 *Insert the tube in the incision and push it down to keep the cut open and allow air into the lungs. Once in place, secure firmly with adhesive tape or bandage to keep it upright and prevent it falling out.*



Once the airway is clear, whether natural or artificial, if the patient is still not breathing, artificial respiration must be carried out.

Preventing asphyxiation

Pressure:

Any compression of the chest can cause asphyxiation. A climber who slips and is held suspended by a rope around his chest will find it extremely difficult to breathe. Pass down a rope with a loop (bowline or manharness hitch, see *Knots* in *Camp Craft*) to stand in and relieve the pressure.

An avalanche of snow, or a fall of earth can exert pressure on the chest and make breathing difficult. Adopt a crouched position if possible, with bent arms and elbows tucked well in and this will protect the chest.

If a person is trapped under wreckage with pressure on the chest, and the weight cannot be lifted off, use a lever to lift it and prop securely.

Smoke and gas:

To prevent smoke entering the lungs, place fine mesh material over the nose and mouth to filter it. Smoke can be seen and there is a chance of avoiding it. Gases cannot usually be seen and safety is gained only in fresh air upwind of them, or with a respirator. Casualties must have fresh air.

Lack of oxygen:

Oxygen can be used up in a shelter which lacks ventilation or becomes blocked and sealed by rubble or snow. This is a danger in igloos especially if draughts are sealed. With a stove or fire, not only is the oxygen used, even more seriously, carbon monoxide is produced. Casualties must have fresh air.

Carbon monoxide poisoning:

This gas is DEADLY in confined spaces, but the occupants rarely recognize its presence. The symptoms of carbon monoxide poisoning resemble those of an overdose of alcohol: memory and judgment are impaired, an increase in confidence and a disregard of danger.

Always ensure that you have adequate ventilation, especially when using stoves. Adjust any burning with a yellow flame. Light a candle in your shelter. If the flame gets longer and higher – or in extreme cases shoots to the roof – there is a severe lack of oxygen and it is high time to ventilate. Once again, it is neccessary for casualties to have fresh air.

NOT BREATHING AND NO PULSE

Drowning

Symptoms: Can occur through fluid blockages but generally patient will be in water or have face in liquid. Face, especially lips and ears, livid and congested. Possibly fine froth at mouth and nostrils – it is the froth that is blocking the air passage.

Do not attempt to remove liquid from lungs – you can't. Begin artificial respiration as early as possible. If still in water, support floating body and begin mouth-to-mouth resuscitation after quickly removing weed, false teeth or any other mouth obstructions. On land Holger Nielsen method can also be used.

Electrocution

Symptoms: The cause will usually be obvious. Electrocution may stop the heart and muscle spasms may throw the victim some distance. Electrical burns will be much deeper than their appearance suggests.

Never touch the victim until current is off or contact broken. If an appliance is involved it may be possible to break contact by pulling on insulated cable. But beware of any liquids which will conduct current – victims may urinate. Give artificial respiration and treat for cardiac arrest if necessary before treating burns. TAKE NO RISKS.

Lightning

Symptoms: Another form of electrocution. The victim is usually stunned and falls unconscious. Clothing may catch fire as well as patient having electrical burns, which will be more severe where watches, jewellery, buckles or other metal objects are worn.

Give artificial respiration if necessary and treat burns. Prolonged resuscitation may be needed. Recovery is often delayed.

Poisoning

Symptoms: Poisons which enter the lungs or affect the nervous system can produce asphyxia.

Heart attack

Symptoms: Severe pain in the chest, shortness of breath patient feeling giddy, possibly collapsing to ground, and often anxious. Heavy sweating, irregular pulse, blueness of lips or skin.

If breathing fails give artificial respiration and external heart compression if the pulse stops.

ARTIFICIAL RESPIRATION

Mouth-to-mouth ('Kiss of life')

The fastest and most effective method. Begin as soon as the airway has been cleared. Normal recovery is rapid, except in cases of electric shock, drugs and carbon monoxide poisoning. In these cases nerves and muscles are paralyzed or carbon monoxide has displaced oxygen in the bloodstream. Be prepared to carry on a long time.

If face is injured, or poison or chemical burns are suspect use the Silvester method.

With patient lying on back, hold jaw well open, bending head back (prevents tongue falling and blocking airway). Hold nostrils closed with other hand. Check mouth and throat clear of obstruction. Place mouth over patient's mouth and exhale.

Watch for chest to rise as you blow gentry into patient's lungs. (If chest does not rise, turn him on his side and thump between shoulder blades to remove obstruction.) Remove mouth. Take a deep breath while checking chest falls automatically. You should feel or hear air returning.

REPEAT, as quickly as possible for the first six inflations, then at 12 per minute until breathing is established.

For a child: Do not blow. Exhale normally, or in gentle puffs for a baby. Give first four inflations as quickly as possible. Blowing forcefully into a child's mouth may damage delicate lungs.

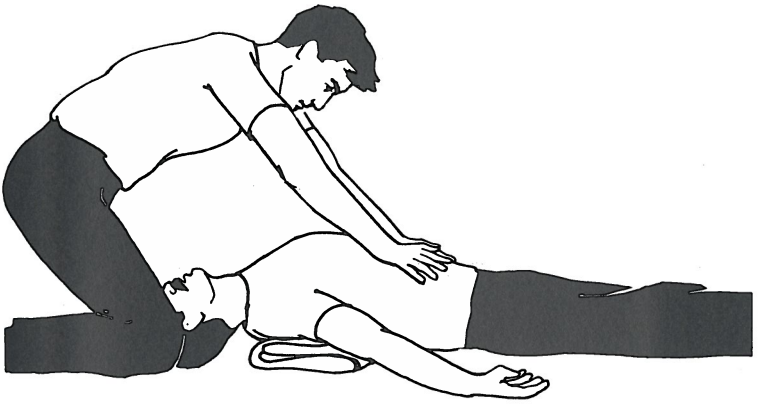
Mouth-to-nose: Use if you cannot seal your lips around victim's mouth, holding his mouth closed. For babies, cover both nose and mouth with your lips.

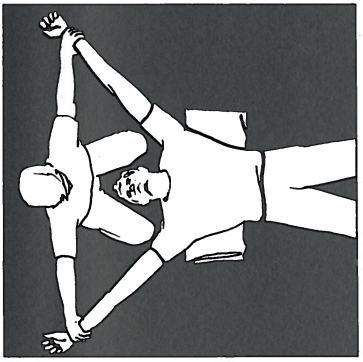
KEEP GOING!

With any form of resuscitation the first five minutes are probably the most critical but, if breathing does not start, keep artificial respiration up for at least an hour. In a group take turns. CHECK HEARTBEAT.

Artificial respiration: with facial injury

Silvester method: Recommended when poisoning or facial injury prevent mouth-to-mouth resuscitation, especially when patient may need cardiac compression (which can be done by the same first-aider).





With casualty lying on back, raise shoulders with pad of folded blanket or clothing. Kneel astride casualty's head.

Place hands flat over lower ribs and rock forward to press steadily downwards. Lift casualty's arms upwards and outwards as far as possible.

REPEAT rhythmically about 12 times per minute for adults. If there is no improvement turn patient on side and strike briskly between shoulders to remove any possible obstruction before resuming the cycle.

DON'T GIVE UP! Resuscitation techniques have saved the lives of victims of drowning, hypothermia and electrocution after three hours without spontaneous breathing.

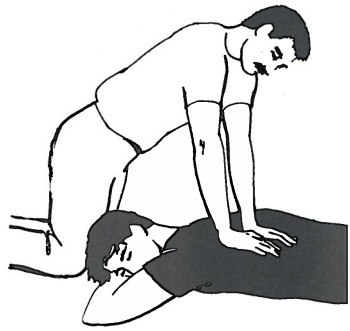
Artificial respiration: face down

Holger Nielson method: This is the technique recommended for resuscitating a drowning victim if mouth-to-mouth is not practicable, or if patient cannot be turned on back. Casualty lies face down; liquids can flow freely from the mouth and will not cause choking.

Place with head turned to one side, arms bent, forehead resting on hands. Loosen tight clothing and ensure tongue is brought forward, mouth clear of weed, mud etc.

Face the casualty, kneeling on one knee at head, placing your hands over shoulder blades, thumbs touching and fingers spread. Perform the following procedure to a count of eight:

1-2-3 *Rock forward with arms straight, producing gentle, even, increasing pressure. (About 2 seconds)*
4 *Rock back, sliding hands to grasp patient's upper arms. (1/2-1 second)*



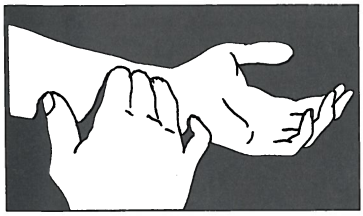
5-6-7 *Pull and raise patient's arms gently by rocking further backwards. (2 seconds) Avoid raising patient's trunk or disturbing head too much.*
8 *Lower patient's arms to ground and slide hands back to initial position. (1/2-1 second)*

REPEAT 12 times per minute.

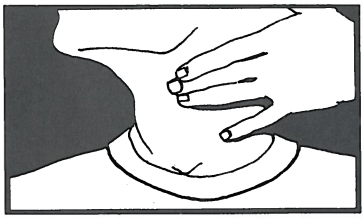
NOTE: If the patient's arms are injured, place a folded garment under the forehead and lift under the armpits. This is not a practicable method if ribs or shoulders are badly damaged.

AFTER BREATHING HAS BEEN RESTORED: Place patient in recovery position – after all forms of resuscitation. But NOT in cases of spinal injury.

IS HEART BEATING?



TAKING PULSE AT WRIST
Rest fingers lightly at the front of the wrist, over the radial artery, about 1cm (⅜in) from thumb side at lower end of forearm.



TAKING PULSE AT NECK
Turn face to one side. Slide fingers from Adam's apple into groove alongside. Other pressure points can also be used.

Normal pulse

In a relaxed adult 60–80 per minute (average 72); in young children it is much higher, at 90–140 per minute. Excitement increases rate.

Don't waste precious time – count the beats in 30 seconds and multiply by two. Use a watch with a seconds hand to keep timing accurate and note down result.

If there is no pulse

If you cannot feel a pulse and the pupils of the eyes are much larger than normal, start cardiac compression while artificial respiration is continued. The mouth-to-mouth and the Silvester methods allow both activities to be carried out at the same time.

Cardiac compression

Regardless of which method of resuscitation is used, if there is no pulse and after 10–12 breaths there is no apparent improvement in the casualty's condition, cardiac compression (external heart massage) should be started.

NO TIME TO LOSE!

First place the casualty on a firm surface – let them lie on the ground, chest up. Using the edge of the hand strike firmly on the lower part of the breastbone (the central bone between the ribs). The jarring may start the heart. If there is still no pulse proceed with compression.

Kneel beside the casualty. Place heel of one hand on lower half of breastbone (sternum), the central bone between the ribs. Make sure it is not on the end of, or below, the breastbone. Place heel of other hand over it. Keep rest of hand OFF chest. Keeping arms straight, rock forward and press down 10 times after two consecutive breaths.

In adults press down about 4cm (1½in). Repeat at least 60 times per minute. Press smoothly and firmly. Erratic or rough pressing could cause further injury.

Infants and children require less pressure and more pushes. For babies and small children light pressure with two fingers is enough at a rate of 100 times per minute. For older children up to ten years, use the heel of one hand only and push 80–90 times per minute.

Note: Check for dilation of pupils of eyes and return of pulse in neck artery which indicate success. ARTIFICIAL RESPIRATION MAY STILL BE NEEDED.

Artificial respiration with compression (Cardiopulmonary resuscitation)

If alone: Use mouth-to-mouth or Silvester methods of resuscitation, giving a repeated pattern of 15 heart compressions followed by two rapid lung-inflations.

If two first-aiders: Give five heart-compressions followed by one deep lung-inflation. Repeat. First-aider giving inflations should also note neck pulse and pupils.

Once breathing has been restored, it must be maintained. Lay the patient in the recovery position (EXCEPT when spine or neck injured) which reduces risk from liquids they may bring up as they recover. Check condition regularly.

If available use ARTIFICIAL AIRWAY to keep airway open in unconscious patients.

RECOMMENDED EQUIPMENT

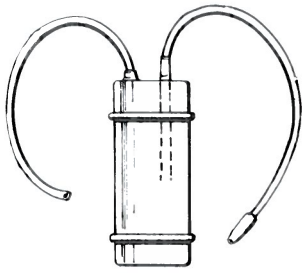
ARTIFICIAL AIRWAY

Before use inspect both the patient's and artificial airway.

Insert the artificial airway to a third of its length, end pointing to the roof of the mouth, then turn it through 180° to point down the throat.

Once it is in place patient will be able to breathe. A mucus build-up may start coughing and gurgling. Clear it with an extractor.

MUCUS EXTRACTOR



Placed down artificial airway, its one-way valve allows mucus to be sucked out without risk of swallowing. One was probably used on you first thing after birth! Without one you can use any tube or straw (preferably sterilized), trying NOT to swallow the mucus yourself.

DANGEROUS BLEEDING

An average person has up to 6.25 litres (11pt) of circulating blood. The loss of 0.5 litre (¾pt) causes mild faintness, 1 litre (1¾pt) faintness – with an increase in pulse and breathing, 1.5 litre (2½pt) collapse. More than 2.24 litre (4pt) may even cause death. Immediate steps must be taken to stop the flow of blood. However, once a small haemorrhage has been stopped, blood volume is quickly restored with fluid from the tissues – the resulting slight anaemia is not important. Body fluids must be replaced by giving water, so that the fluid balance is restored.

PRIORITIES

Blood transports life-giving oxygen. When bleeding is coupled with cessation of breathing treat both concurrently. Get the patient breathing AND staunch the bleeding.

Bleeding from veins and capillaries can be stemmed by simple pressure over the bleeding point, with or without a dressing, and minor arterial bleeding may also be controlled with local pressure. Extremity wounds should be elevated above the heart, still applying pressure.

You can use anything to staunch the flow of blood – a hand, handkerchief, blouse – but use the cleanest material possible and apply it rapidly and firmly. There is danger of infection from unsterile material but, if a person is bleeding to death, there is no time to worry. Death is more certain from serious bleeding.

Maintain a continuous, firm pressure for 5–10 minutes and you will stop the bleeding. Resist the temptation to lift and look. If blood seeps through the pad place another on top. Large dressings of absorbent cotton wool (known in the army as shell dressings) are ideal for stopping bleeding. Include them in your medical kit. Secure with the attached bandage and then with a further crepe bandage which will maintain the steady pressure required.

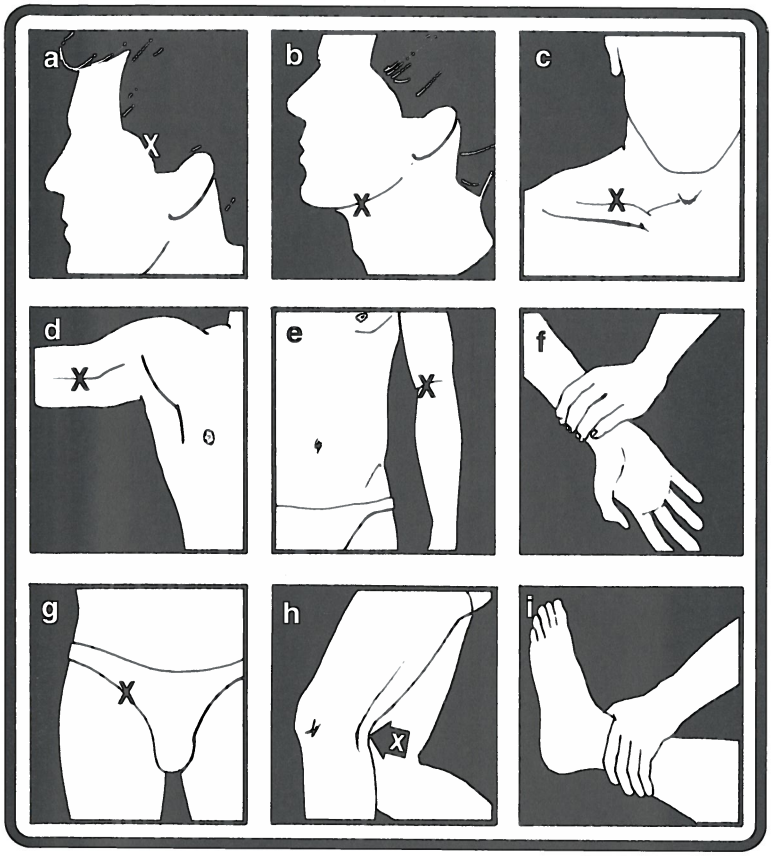
Arterial bleeding

This is the most serious type of bleeding and speed is essential to stop it. Bleeding from an artery comes in powerful, rapid spurts, in time with the pulse. It can be temporarily controlled by compressing an artery where it crosses a bone, against that bone, at pressure points. Precautions must be taken, if at all possible, to prevent the spread of diseases such as HIV, but it is accepted that if you are faced with this emergency you are unlikely to have gloves, etc.

PRESSURE POINTS

These are places where arteries run close to the surface over a bone so that they can be pressed against it, cutting off the flow of blood. Each is effective for arterial blood loss from the area specified. Watch the wound. If blood flow is not immediately reduced, move fingers until it is.

- **Temple or scalp:** Forward of/above ear (a)
- **Face below eyes:** Side of jaw (b)
- **Shoulder or upper arm:** Above clavicle (c)
- **Elbow:** Underside of upper arm (d)
- **Lower arm:** Crook of elbow (e)
- **Hand:** Front of wrist (f)
- **Thigh:** Mid-way on groin/top of thigh (g)
- **Lower leg:** Upper sides of knee (h)
- **Foot:** Front of ankle (i)



Tying arteries

In the case of major wounds to which a pressure dressing cannot be applied, where access is restricted or a limb partially severed, trace the bleeding artery and tie it off.

This is hazardous for the untrained – arteries often have accompanying nerves and including them in a clip or tie could cause permanent damage, such as loss of function of a limb.

Apply a temporary tourniquet to control the bleeding – but you may have to release spurts of blood to find the artery.

Sterilize a piece of fishing line, thread or fine string by boiling or soaking in alcohol. The contents of a hip flask or a perfume bottle will remove bacteria. Cleanliness is essential. Boil all dressings and bandages. Scrub the hands thoroughly in boiled water, using soap if available.

Clean the wound with sterile (boiled) water and gently explore it with a clean finger to locate the severed artery. Tie it securely with the sterilized thread. This is the one time that an open wound is touched.

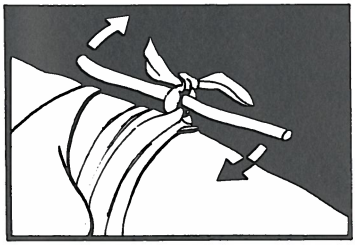
If the artery is completely severed, its ends may retract making them more difficult to locate. If you are sure the bleeding vessel is in a piece of tissue then the whole area can be sewn up, using a large needle.

Cautiously relax the tourniquet as soon as possible to check whether your handiwork has been successful. Make sure there is not more than one major bleeding vessel. If you see more bleeding, immediately tighten the tourniquet and try again. Other smaller vessels will supply sufficient blood to maintain the life of the limb.

Do NOT leave the tourniquet in position.

Tourniquets

There are only two places where a tourniquet may be placed: on the upper arm, just below the armpit, and around the upper thigh. Preferably use a piece of cloth at least 5cm (2in) wide. If you have to use anything thinner (wire or cord), you MUST apply over a fold of clothing to reduce discomfort and avoid damage to nerves or flesh.



Wrap around limb three times and tie half knot. Place stick, or similar object over knot and tie a double knot over it. Twist stick, tightening band until bleeding stops.

Tourniquet must be tight enough to arrest blood supply but relaxed frequently, so after applying WORK FAST.

Release COMPLETELY when job is done.

WARNING

A tourniquet cuts off the blood flow and if left on too long can cause serious damage – even loss of a limb.

- **ONLY** use a tourniquet on a limb. **NEVER** on head, neck or torso.
- **NEVER** cover a tourniquet. If you have to leave one unattended write TK and time applied on victim's forehead with felt-tip or lipstick.

Check circulation

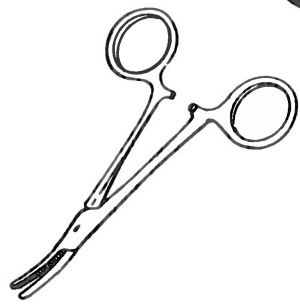
After bandaging a limb, check frequently that neither toes nor fingers are blue, cold or numb. If they are, loosen the dressing. If you do not GANGRENE MAY DEVELOP, perhaps resulting in the loss of a limb.

For the same reason do NOT use a tourniquet (except when tying arteries). First try direct pressure. Then use pressure points, still keeping direct pressure on the wound. If wound is at an extremity keep it elevated at all times.

RECOMMENDED EQUIPMENT

HAEMOSTAT

This instrument, like a pair of lockable pliers, can be clamped on a blood vessel, stopping the flow and making it easier to tie off. Haemostats have many applications and are worth including in a medical kit. They are ideal for holding needles while sewing – even tough leather can be stitched. AVOID clipping nerves.



LESSER BLEEDING

Venous bleeding

Bleeding from a vein is not so dramatic as arterial bleeding. The darker venous blood flows more slowly. There is time to select the best available dressing. If blood welling up from a deep wound makes the exact point of haemorrhage difficult to locate, use a large pad and apply pressure over as wide an area as possible. After 10 minutes you will probably be able to secure this pad in place – you can use a tie or strips torn from clothing, the broader the better so that they do not cut into the casualty's flesh.

Capillary bleeding

Capillaries are tiny blood vessels that will stop bleeding by themselves. Do not waste time on capillary bleeding, it is never serious. Deal with essential things first and dress later.

INTERNAL BLEEDING

This serious condition is common after a violent blow to the body, broken bones, bullet or deep penetration wounds. At first there may be little evidence of internal injury, perhaps only slight bruising under the skin. The patient will feel light-headed, restless and faint, and look pale with the skin cold and clammy to touch and the pulse weak but very fast.

Bleeding into the tissues occurs with all fractures and bruises and a fractured thigh may result in the loss of one or more pints of blood at the fracture site.

Symptoms

Subsequent signs of internal bleeding, which also give an indication of the source of haemorrhaging, include:

- From kidneys or bladder: red or wine colouring to urine
- From lower bowel: blood passed with faeces
- From upper bowel: partly digested blood gives black tarry appearance to faeces
- From stomach: blood vomited. If bright red from fresh bleeding. If like brown coffee grounds, has been in stomach some time
- From lungs: coughed up blood, frequently as red froth.

Treatment

Lie the patient flat with the legs elevated, making it easier for the heart to pump blood to the head. Keep patient moderately warm but do not overheat – this would result in blood being diverted to the skin. Serious internal bleeding may occur if an organ such as a kidney, liver or spleen has been damaged. The only treatment is nursing care. Hope for early evacuation.

NOSE BLEED

Treat by sitting patient up with head slightly forward and pinch the soft part of the nostrils for five minutes. Encourage patient to breathe through the mouth. They must not sniff. Loosen any tight clothing.

WOUNDS AND DRESSINGS

Open wounds are always a hazard because of the risk of infection by bacteria. Most important of these is the *Tetanus bacillus*, which causes lockjaw. Tetanus immunization is a wise precaution for everyone, and essential for outdoor adventurers and travellers.

Wounds caused by glass, metal or burns are usually clean wounds. All foreign bodies must be extracted. This is usually left for trained medics – but should be done in a survival situation. Sterile haemostats or tweezers are the best tools for the job. A wound that has been in contact with the ground or dirty clothing MUST be cleaned and ALL dead flesh removed.

Cut away the clothing from the wound site, clean the vicinity and irrigate the wounds to wash out all the dirt. Clean a wound from the centre outwards, do NOT swab from outside in. Dry and apply a clean dressing. Immobilize the wound in a position that is comfortable.

Dressings should be changed if they become wet, omit an offensive smell, or if pain in the wound increases and throbs, indicating infection.

Local infection can be treated by soaking in hot salty water, or applying poultices. Poultices will draw out the pus which accompanies infection and help to reduce swelling. Anything that can be mashed can be used for a poultice: rice, potatoes, roots, shredded tree bark and seeds are all suitable. Clay can also be used. Boil them up and wrap in a cloth. Apply to the infected area as hot as can be tolerated – do not risk scalding. The human body has a tremendous capacity for resisting infection if given proper rest and nutrition.

Applied heat also aids healing. A warm rock wrapped in cloth can be used to provide it.

SOAP IS ANTISEPTIC

Soap is an excellent antiseptic and good for washing wounds. Use boiled water to wash your hands before cleaning a wound. Wash the wound in boiled water – if none is available use urine. Urine is a sterile fluid and will not introduce infection. It also has the slight beneficial effect from the uric acid which helps to clean the wound.

Stitching wounds

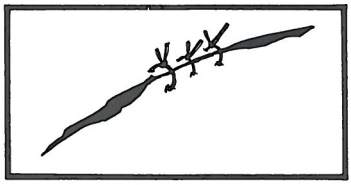
Minor wounds can be closed by suturing, if there are no medics available to do it. (Haemostats are again useful for this.) This is recommended where a clean cut caused by a knife needs closing and for facial injuries which interfere with eating or breathing.

First clean the wound thoroughly, then stitch across it, or use butterfly sutures (from your survival kit) which can be applied without any special skills. Some tribal peoples use the Fire ant to do the job, making it bite across the wound and then snapping the head off so that its mandibles hold the wound together.

STITCHES

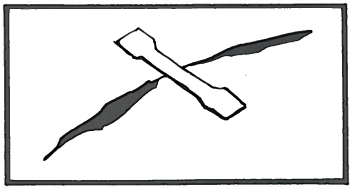
With a sterilized needle and thread or gut, make each stitch individually, beginning across the mid-point of the wound.

Draw the edges together and tie off thread, then proceed working outwards.



ADHESIVE SUTURES

Use butterfly sutures or cut adhesive plasters in butterfly shape. Draw edges of wound together. Apply plaster to one side of wound, close up as much as possible and press down other side of plaster.



If the wound becomes infected – red, swollen, tense – remove some or all the stitches to let pus out. Leave to drain.

Open treatment

'Open treatment' – covering with a dressing but not suturing – is the only safe way to manage survival wounds, apart from those mentioned. If unable to thoroughly clean a wound it must be left open to heal from the inside. It will form infection resistant tissue, recognized by its moist red granular appearance – a healthy sign in any wound.

Despite precautions there will always be some degree of infection. Deep wounds may have to be drained and occasionally it may be beneficial to open an abcess (an accumulation of pus) and insert sterilized loose packing in the form of a bandage or a cloth. Leave a tail hanging out, preferably with a safety-pin in the end.

Allow wound to drain for a few days. If lancing or reopening a wound, sterilize your blade to prevent the introduction of new bacteria. Packing keeps wounds covered, but allows them to drain as they heal from inside. Reduce packing as healing progresses, until able to remove it all and cover with a dressing.

Chest wound: One of the greatest dangers with a chest wound is having the chest collapse. This is called a 'sucking chest wound'. In such wounds the chest sucks air through the wound into the space around the lung, rather than into the lung. The hole must be sealed to enable the casualty to breathe properly. The waterproof wrapper of a field dressing (or a plastic film from a cigarette packet or aluminium foil preferably coated with petroleum jelly) can be placed over the hole, with the clean inside against the wound, and taped in place. Tape is applied to the sides and top of the wrapper, leaving the bottom edge free. This prevents air being sucked in, while allowing any that has already entered to be forced out as the casualty exhales.

Abdominal wounds: These are serious because of the danger of damage to the internal organs and of internal bleeding. No solids or liquid must be given. Thirst can be relieved by using a damp cloth to moisten the lips and tongue of the patient. If the gut is extruded it must be covered and kept damp. Do not attempt to push it back into place. (That would make difficulties for a surgeon after rescue.) If no organs extrude dress and bandage firmly.

Head injuries: Head injuries pose problems of possible brain damage and wounds may interfere with breathing and eating. Ensure that the airway is maintained and that the tongue has not fallen to the back of the throat. Remove any false or detached teeth. Control bleeding. The conscious casualty can sit up, but the unconscious patient must be placed in the recovery position, provided that no neck or spinal injuries are present. (See *Fracture of the skull*).

Amputation: If a person is trapped by a limb in a burning wreck, or similar situation, drastic action may be required to extricate them. You may have to trade a limb for a life, if otherwise they would be burned to death, for example.

Time is critical if you are working under pressure with increasing risk to yourself and the patient, from fire or other danger. But you must still take as much care as possible.

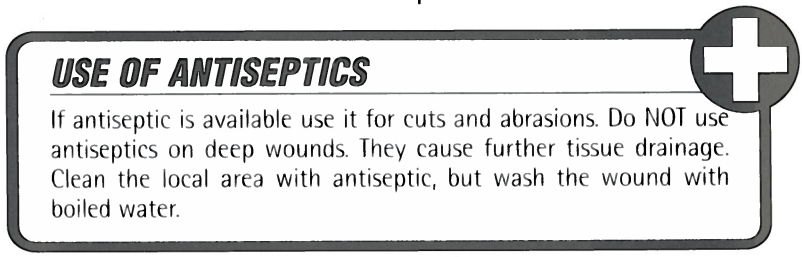
If a limb is trapped, cut as close to the wound site as possible – which will probably mean cutting through bone. A saw of some sort is required. The flexible saw in your survival kit was originally a surgeon's tool and will do the job. If no saw is available, or amputation is because of gangrene, sever at the nearest joint.

First apply a tourniquet and be ready to tie off arteries as they are exposed, or use haemostats if available.

Make an incision in the skin and into the underlying tissue. Allow the skin to retract, then sever the muscles. They will retract too, leaving the bone or joint exposed. Saw through the bone or cut through the joint. Tie off arteries, if not already done, but leave the stump open to allow for drainage. Apply a light bandage to protect the stump.

Traumatic amputation

If a limb is torn off as a result of accident there is very little bleeding. The damaged muscle in the wall of the artery goes into spasm and shuts off the artery. You will be able to examine the wound and tie off all the arteries exposed.



BURNS

Burns, which are a common injury in aircraft accidents, cause severe pain and fluid loss. Victims are VERY susceptible to shock and infection.

The skin area of the body affected can be used to assess the possibilities. Burns extending over 50 per cent or more of the body are usually fatal, if extensive medical facilities are not available. As a rough guide to area affected:

Head = 9 per cent
Arms = 9 per cent each
Front of torso = 18 per cent
Back of torso = 18 per cent
Genital area = 1 per cent
Front of legs = 9 per cent each
Back of legs = 9 per cent each

Extinguish burning clothing

It is vital to extinguish burning clothing without fanning the flames. Most people will instinctively run away from the danger but, as they do so, the draught will encourage the flames to increase.

Get the victim down on the ground and roll over, if possible covering him or her with a blanket, poncho or sleeping bag. If necessary roll on the victim yourself to extinguish the flames (this is when you find out who your real mates are!).

Remove the victim's smouldering clothing and any constricting garments, jewellery, etc, which may become tighter if swelling occurs. It is important to remove smouldering clothes at once, for they retain heat and can be hotter than the flames themselves.

Reduce the temperature

Drench the burned tissues with water to cool them. Ideally submerge under slowly running cold water for at least 10 minutes.

Do NOT even think of using anything to soothe the burns. Neither antiseptic, butter, grease, lard, calamine lotion, Vaseline nor anything like them should be applied. Resist the impulse! Cooling should continue until it produces no further relief and withdrawal from water does not lead to increase in pain.

After the initial cooling leave burns alone except for applying dressings, as dry and sterile as possible, to resist infection. Put dressings between burned fingers or toes before bandaging to prevent them sticking to each other.

Later, hardwood barks such as oak or beech, which contain tannin can be boiled up in water. When cool it can be applied to the damaged areas to soothe burnt flesh.

Give fluids

Fluids must be given to replace those lost. Give small cold drinks frequently. If possible add a half teaspoonful of salt – or even better a pinch of bicarbonate of soda – to a pint of water. If you have no salt, give the patient small amounts of boiled animal blood to drink.

Types of burns

Deep burns are charred or white in appearance, possibly with bone and muscle visible. By a merciful act of nature these burns are painless as the nerve endings have been destroyed. Superficial burns are very painful and, if covering a large area,

fluid loss can create even greater shock than for deep burns. The skin will blister but these blisters should NEVER be deliberately burst. If there are burns about the face and neck ensure airway is clear.

Scalds:

Are wet burns caused by hot liquids, whether water, steam, oil or even a poultice. Treat as for dry burns.

Mouth and throat burns:

Possible from inhaling flame or hot gases, accidentally drinking from a very hot vessel – or swallowing very hot liquids or corrosive chemicals. Give sips of cold water to cool. Swelling in the throat may affect breathing and artificial respiration may be required.

Eye burns:

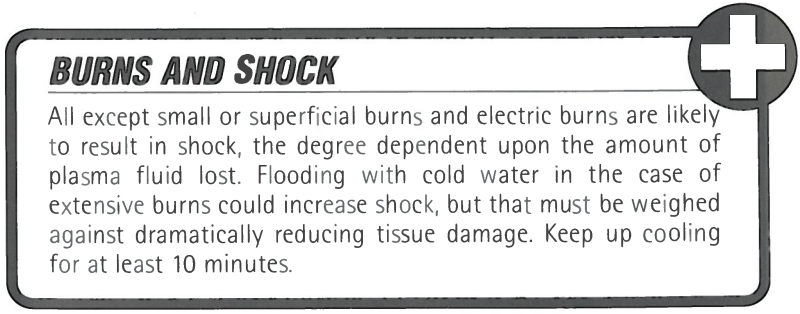
Spitting fat or corrosive chemicals may burn the eyeball. Hold the lids open and pour plenty of water over it to wash out chemicals. Tilt head so that chemical is not washed into mouth or nose or into other eye if only one is affected.

Chemical burns:

Use copious amounts of water to dilute and wash off chemicals. Remove clothing that may retain corrosive substances. Do not attempt neutralizing acid with alkali or vice-versa; chemical interaction will produce more heat. Continue to treat as for heat burn.

Electrical and lightning burns:

Check respiration. Treat as for heat burns. Take no risks if current still live.



FRACTURES

Accidents may produce sprains and bruises, broken arms and legs and compression fractures of the back. Broken bones should be examined early, before swelling complicates location. Always look before touching and moving an injured person. However, treat asphyxia and bleeding first and do not seek to set a fracture in an urgent emergency when there are others with more pressing injuries to treat. Immobilize before moving, if possible, and finish treatment later.

There are two types of fracture: open and closed. In an open fracture the bone may push through the skin or there may be a wound leading down to the fracture. In these fractures infection can gain direct access to the bone and they must be treated very seriously. If the limb is grossly distorted by the fracture it must be straightened before splinting. It will be painful. If the patient is unconscious do it straight away.

Fractures which neither penetrate the skin nor are exposed to the air are known as closed fractures.

Symptoms

- Pain, usually severe, aggravated by attempted movement of injured part.
- Tenderness, even with only gentle pressure.
- Swelling (caused by loss of blood into the tissues), later showing discoloration or bruising.
- Deformity: apparent shortening of a limb, irregularity either visible or to touch, unnatural movement, limp and wobbly limbs – compare a suspect area with the unharmed opposite side.
- A grating sound when limbs are moved (do NOT move limbs deliberately to check for this).

Compare injured limb with opposite unharmed limb.

Reduction

If medical help is expected, immobilize closed fractures and leave them for professional treatment, but – if none can be expected – 'reduce' them as soon as possible after injury, before a painful muscle spasm sets in.

Apply traction (a slow, strong pull – not a tug) until the overriding edges of fractured bone are brought into line. Check alignment with the other limb. Then splint and immobilize, keeping

up the traction to ensure it does not slip back. A splint will now be needed and can be made from all sorts of material – ski sticks, branches, ships spars, parts of wreckage, driftwood, rolls of newspaper, etc.

NOTE: Separate all hard splint material from the skin with padding – moss is useful for this – or pressure sores may develop.

IMMOBILIZATION

Immobilize the whole length of the limb. Use slings to support bent-arm fractures. If no splint is available, or to increase immobilization, strap injured limb to uninjured limb or to body. Insert padding in any natural hollows to keep limbs in position. Secure firmly above and below fracture and below nearest joints. Tie with any soft materials available. Place all knots on same side, giving easy access, and use reef knots or reef bows.
CHECK CIRCULATION PERIODICALLY.

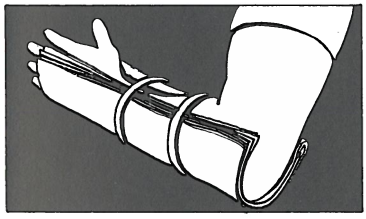
Sling materials

Triangular bandages are excellent for making slings (See *Bandaging*) – but slings can also be improvised from pieces of clothing, belts, etc, as shown in these illustrations. Do NOT tie splints directly over injury or allow knots to press against the limb.
CHECK CIRCULATION.

- FRACTURE OF ARM BELOW ELBOW
- FRACTURE OF HAND OR FINGERS

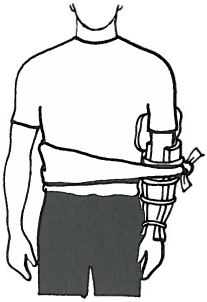
Place sling (in this case a long-sleeved sweatshirt) between arm and body. Immobilize from elbow to mid-fingers with a padded splint. Take one arm of shirt behind head and tie to other on opposite side to injury. Knot below elbow to stop slipping.

Arm is elevated to prevent severe swelling.



FRACTURE AT ELBOW

If elbow is bent: *support in narrow sling. Bind across upper arm and chest to prevent movement. Check the pulse to ensure that an artery has not been trapped. If no pulse try straightening the arm a little to see if it will return. If there is no pulse medical aid is urgently needed.*

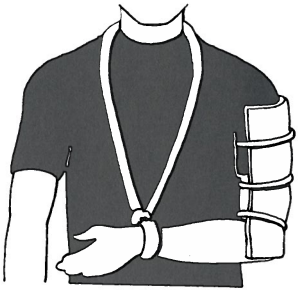


If elbow is straight: *do not bend it. Place pad in armpit and strap arm to body or place padded splints either side of arm.*

FRACTURE OF UPPER ARM

Place pad in armpit. Splint from shoulder to elbow on outside of arm.

Narrow sling at wrist. Bind arm and chest.



- FRACTURE OF SHOULDER BLADE
- FRACTURE OF COLLARBONE

Make sling to take weight off the injured part.

Immobilize with bandage across arm and body.

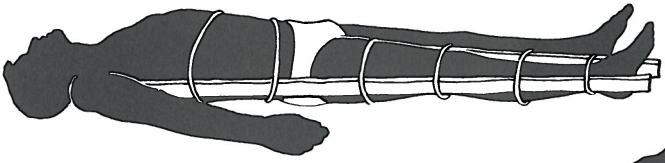
WARNING

CHECK periodically that circulation is not impeded. Blue or ashen fingers and toes are the obvious danger warnings that straps and dressings are too tight.

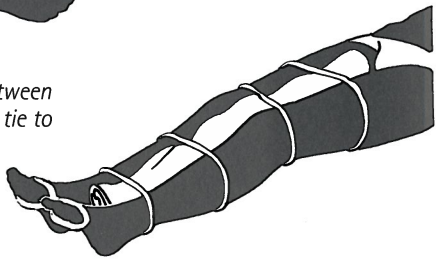
For any fracture of the thigh or lower leg a figure-of-eight bandage should be applied, binding the feet and ankles of both legs. This controls rotation and counters shortening.

FRACTURE OF HIP OR UPPER LEG

Place splint on inside leg and another from ankle to armpit. Use a stick to push tying bands under hollows of injured leg.

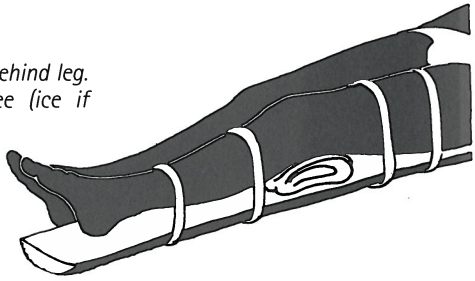


If no splints are available pad between legs (a folded blanket is ideal) and tie to sound leg.

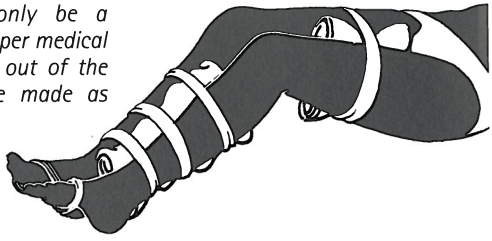


FRACTURE TO KNEE

If leg is straight: place splint behind leg. Apply cold compress to knee (ice if possible).

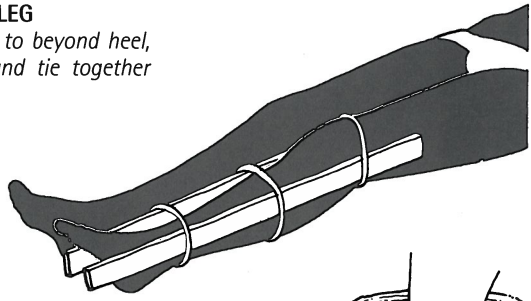


If leg is bent and you cannot straighten: bring legs together, place padding between calves and thighs and strap in those places. This can only be a temporary measure until proper medical help is available. If help is out of the question, the leg must be made as straight as possible.



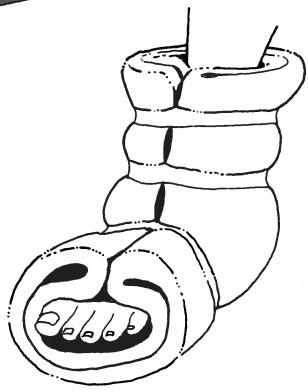
FRACTURE TO LOWER LEG

Splint from above knee to beyond heel, or pad between legs and tie together (see Fracture of hip*).*



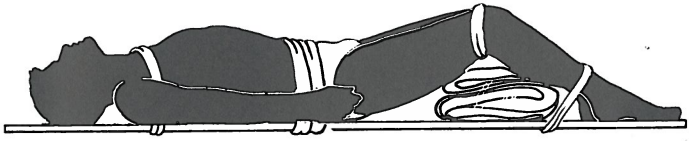
FRACTURE OF ANKLE OR FOOT

Not usual to splint. Elevate foot to reduce swelling. Immobilize with pillow or blanket folded around ankle and under foot, strapped twice at ankle and once under foot. Alternatively: if no wound, leave shoe or boot to provide stability. Do NOT allow casualty to put weight on foot.



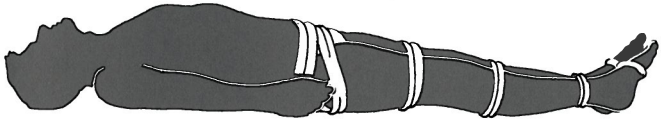
FRACTURE OF PELVIS

Symptoms include pain in the groin or lower abdomen. Pad between thighs. Tie at knees and ankles. Place pillow support beneath bent legs and strap to flat support (door, tabletop, stretcher) at shoulder, waist and ankle.



OR

Place padding between legs. Bandage around feet, ankles, knees and with two overlapping bandages over pelvis.



Fracture of the skull

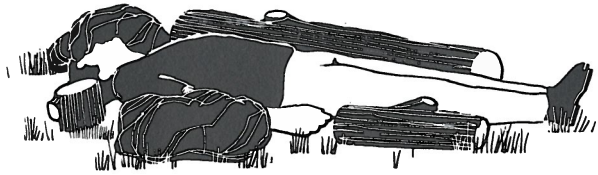
Blood or straw-coloured fluid seeping from the ear or nose may indicate a fractured skull. Place the casualty in the recovery position,

with the leaking side down. Allow the fluid to escape – bandaging or plugging could cause a build-up in the skull and pressure on the brain.

Keep a careful check on the casualty's breathing. Completely immobilize and keep comfortable.

Fracture of the spine

Must always be suspected when a casualty complains of pain in the back or neck, with possible loss of sensation in the lower limbs. Test for 'feeling' by gently touching the limb. Ask casualty to move fingers and toes. Warn the patient to lie still. If medical assistance is expected and the area is safe, immobilize by placing soft but solid objects such as luggage or padded rocks to prevent movement of head or body.



Fracture of the neck

If a neck fracture is suspected, it is ESSENTIAL to immobilize it with a cervical collar, or to place a bag of earth or something similar against either side of the neck to prevent movement.

CERVICAL COLLAR

Make from rolled-up newspaper, folded towel, car mat etc. Fold to about 10–14cm (4–5½in) wide – distance from top of breastbone to jaw. Fold in edges to make narrower at back than front. Overlap around neck. Secure in place with a belt or tie.

Whilst the patient's shoulders and pelvis are firmly held, place pads of some material between the thighs, knees and ankles. Tie the ankles and feet together with a figure-of-eight bandage. Apply broad bandages around the knees and thighs. Keep completely immobilized and hope for early rescue.

SPRAINS/DISLOCATIONS

Sprains

A sprain occurs at a joint and is caused by the wrenching or tearing of tissues connected with the joint. The symptoms are pain, swelling and the later appearance of bruises. If in doubt whether a sprain or a break, treat as a fracture.

Sprains are best exercised through a full range of movements, but NOT put under very painful stress, which could cause permanent damage. Bathe sprains with cold water to reduce swelling. Support with a bandage – crepe if possible (it should not constrict). Elevate the affected limb and rest completely.

If you sprain an ankle and have to keep on walking keep your boot on. If you take it off, the swelling will stop you putting it back on. Left on, the boot acts like a splint.

Dislocations

Dislocations are usually caused by a fall, blow or sudden force applied to a joint which pulls it apart. There is pain and obvious deformity, often with one end of the bone clearly felt under the skin. There is no grating sound, for the bone ends are not usually damaged. Muscle spasms 'fix' the bone in position, making it very painful to replace. Shoulders are especially prone to dislocation.

Dislocated shoulder: Take off your shoe and put foot in patient's armpit. Pull on arm.

An alternative, but more risky method, flexes the elbow at a right-angle and uses it as a lever.

Support arm with a sling and immobilize with a bandage across chest and rest completely.

Dislocated finger: Replace by pulling on finger, then gently releasing it so that the bone slips back into place. It helps if someone else can hold the patient's wrist.

Try this only gently with the thumb. If it does not work first time on the thumb, leave well alone or you will do more damage.

Dislocated jaw: Usually caused by a blow – though sometimes by yawning! Place pad of cloth over lower teeth on each side. With patient's head resting on a firm support, press downwards on these pads with your thumbs, simultaneously rotating the dislocated side of the jaw backwards and upwards with your fingers. It should snap into place.

Bandage around the head and under jaw and leave supported for two weeks. Feed soft foods.

SHOCK

Shock can kill. Its prevention and treatment must be a major objective of first aid.
The signs of all types of shock are:

- State of collapse
- Extreme pallor
- Cold sweaty skin
- Feeble but rapid pulse
- Excitement and apprehension

Nervous system: This initial shock produces an acute slowing of the heart with dropping blood pressure. In severe injuries, it can stop the heart. Pain and excessive nerve stimulation are the main causes.

Shock from blood loss: Delayed shock may occur a few minutes to many hours after an injury. It is brought on by blood loss, burns, abdominal injuries and continuing considerable loss of fluid due to vomiting or diarrhoea. Blood poisoning from injuries and infection produces another kind of shock.

Treatment

Lay the survivor flat and elevate the legs. Loosen tight or restrictive clothing around the neck, chest or abdomen. Rest and reassure.

Do NOT give liquids. Maintain body heat but do not add heat – warming the surface of the body will draw blood away from the internal organs which need it most.

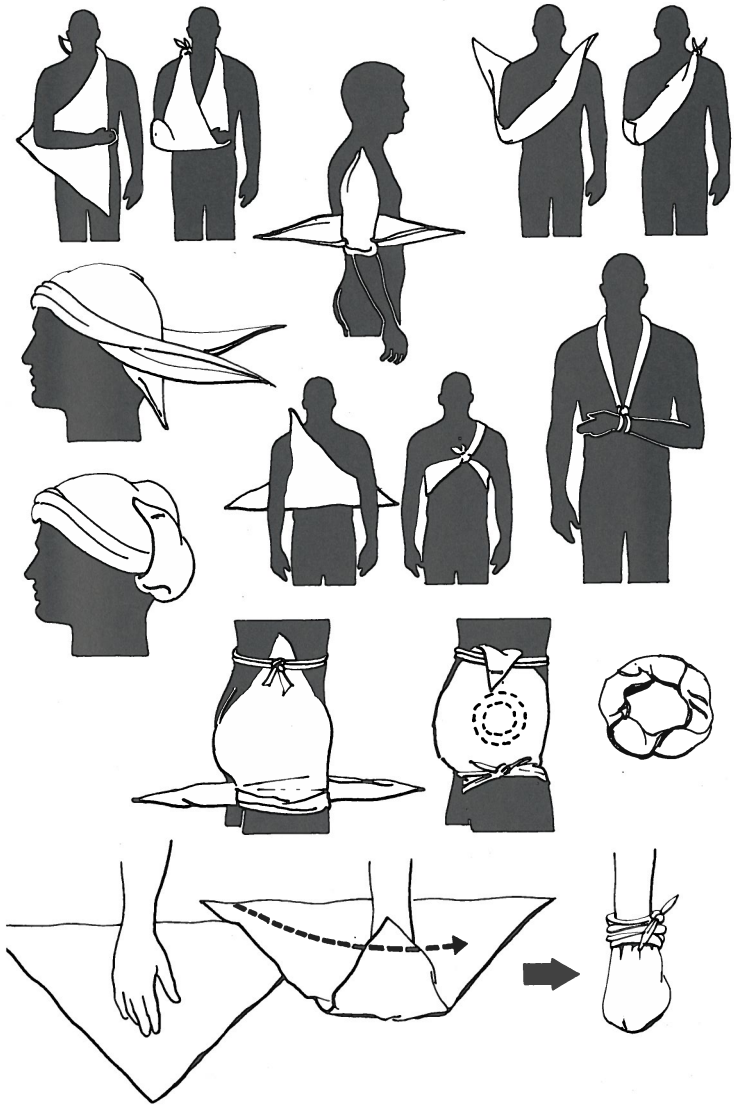
Your attitude and actions are very important in treating shock. If you appear calm and in charge of the situation the patient will feel cared for and respond. Stay with them if you can, do not leave a shock victim on their own. Holding a hand is calming and reassuring and a moist cloth wiped occasionally across the forehead often helps.

Stand by to give mouth-to-mouth resuscitation and cardiac compression if the patient's breathing or heart stops. Treat all injuries and relieve pain with drugs if available. Shock can take a long time to pass, do NOT move unnecessarily and encourage rest.

BANDAGING

Triangular bandage

A triangular bandage, with its short sides not less than 1m (3ft), is a versatile dressing. Use for slings, or folded to make a wide range of bandages and supports.



Roll and improvised bandages

Roll bandages are usually of open weave gauze but those of crepe material (which stretch) are easier to apply, less likely to come loose and apply pressure more evenly. Adhesive tapes can be useful for fixing dressings to areas that are difficult to bandage. Some people are allergic to them – in which case use the tape to fix bandage to bandage.

All kinds of material, especially clothing, can be used to improvise bandages and supports, but they should never exert more pressure than is required, nor cut into the flesh.

Dressings

Dressings usually consist of a pad of cotton wool covered with gauze and attached to a bandage or an adhesive strip, in a sterile wrapping. Apply without touching the dressing pad. Improvise dressings from the cleanest material available. Do not use cotton wool directly on an open wound. It will adhere to the surface. Change dressings when they become wet, smell, or throbbing of the wound indicates infection.

Simple bandaging

Bandages should be applied firmly enough to stop slipping, but NOT so tight as to interfere with circulation or cause pain. Even with improvised bandages you will find application easiest if you roll the bandage to begin with. Unrolling the bandage as you apply it will help to keep the bandage smooth and evenly applied.

Always begin bandaging with a firm oblique turn to anchor it. Each turn should overlap the previous one by two-thirds, with the edges lying parallel. Tuck in the ends of bandages below the last layer and secure with a safety pin or adhesive tape, or split the end, take ends in opposite directions and tie in a reef knot away from the wound.

- **Hand:** Begin at wrist. Carry bandage over back of hand, around fingers (just below finger nails), across the palm and around the wrist. Repeat until the hand is covered and the bandage secure.
- **Foot:** Begin at ankle to prevent slipping. Follow technique for hand bandaging.
- **Forearm or foreleg:** Begin at the lowest point. Work upwards.

- **Elbow or knee:** Begin with a turn around the joint then alternately above and below it.
- **Upper arm or leg:** Apply as a figure-of-eight spiral. If bandaging begins over knee or elbow simply carry on upwards in this manner.

BE AWARE

- Do not join bandages with knots. If you need to use separate strips, bind new one over that already applied to hold it in position.
- Always tie a finishing knot or bow over the uninjured side or uninjured limb, or the casualty will be uncomfortable.
- Use reef knots or bows which are easy to untie. Try to keep knots or fastenings on the outside so that they are easily accessible to remove or change dressings.
- Check regularly that bandages are not too tight. Look for any sign of blueness at extremities that would indicate restricted circulation.
- Pass bandages under a casualty making use of the natural hollows of the body: neck, waist, crotch, knees.

MINOR AILMENTS

In a survival situation even the most minor ailment should NOT be ignored. Small problems become larger if they are untreated. Anything which puts strain upon the body will make you less able to deal with other problems and stresses.

Do NOT be tempted to deal with corns and callouses by cutting them out. You risk opening up a channel for infection which could be worse than the corn.

Blisters

Usually a problem on the feet, though hands not used to survival tasks and tools may blister too. Reduce the risk by wearing gloves or wrappings on the hands. Choose tool handles carefully and shoes that fit perfectly! Badly fitting boots can skin you. Break them in by soaking in water and rubbing in oils to make them supple.

One of the main causes of foot blisters is socks falling down and rucking. This is frequently a problem after wading through water.

Pull them up and, if necessary, tie them to the top of your boots. It is preferable to wear two pairs of socks – an inner of nylon, next to the skin, and an outer pair of wool. This stops them from slipping.
Treatment: Wash the area of the blister. Sterilize a needle. Pierce the blister near its edge. Gently press out fluid. Cover with cloth and tape or bandage into place.

Objects in the eye

First inspect the eyeball and the lower lid, pulling it downwards to see the inside surface (ask the patient to look upwards). Remove any foreign body with a moist corner of cloth.

If you can see nothing there, and the problem is under the upper lid, you may be able to brush it out by pulling the lid down over the lower lashes and letting them brush it out. If that does not work, grasp upper lashes between thumb and index finger and pull lid up. If doing this for someone else, it is best if you place a matchstick or small twig over the lid and fold the lid back over it. Get the patient to look down. Inspect both eye and underside of lid. Remove with a moist corner of cloth, a clean fine brush or even a feather. If doing this to yourself, look in a mirror, rather than try to work by touch.

Earache

Unless due to an infection this is usually due to the pressure of wax on the eardrum – but it can be unbearable. Warm up a few drops of any edible oil available, pour it into the ear and plug with cotton wool. The heat alone will be soothing and the oil will soften any wax.

Toothache and tooth loss

Usually caused by a cavity in a tooth or by a filling falling out, exposing a nerve, toothache is a problem you can well do without in a survival situation.

Treat it by plugging the hole to cover the nerve and the pain will subside. The resin from a pine or similar tree will help. Scar the trunk and gum will ooze out. Soak up a small amount on cotton wool and use this to plug the hole.

If a tooth is knocked out in an accident, put a cloth pad on the empty socket and apply pressure by biting down on it to stop bleeding.

Take care of your teeth. Use splintered soft woods and plants for brushing. Strip the inner core of parachute cord to use as dental floss.

PAINKILLERS

Morphine

Morphine is the standard accepted analgesic carried as part of the medical kit of planes and ships and by the military. A very powerful painkiller, usually given by injection, it is excellent for treating casualties in great pain and minimizes the effect of shock, but it has several side-effects.

It depresses the breathing, indeed may stop it altogether. It causes nausea. It should NOT, therefore, be given to cases already likely to be affected in these ways.

Morphine comes in tubonic ampoules which contain 10–15mg. The needle is fixed and can be self-injected. Choose the largest muscle available for the injection. If self-administered, the upper quadrant of the thigh. If injecting a patient, the upper outer quadrant of the buttocks.

USE MORPHINE FOR:

- Fractures
- Amputations
- Serious burns
- Abdominal injury of a straightforward perforation by a sharp object

DO NOT GIVE MORPHINE TO:

- People with respiratory difficulties, such as head and chest wounds
- Snake-bite victims (snake venom affects the respiratory system)
- Children or pregnant women
- Casualties who have lost a lot of blood
- Crush type injuries with suspected internal damage

WARNING

MORPHINE CAN BE LETHAL

An overdosage of morphine will kill. Do NOT repeat for at least three hours. Once a patient has been injected record the time and dosage, preferably on the forehead of the parent, and pin the empty syrette to their collar.

Temgesic tablets

These are an alternative to morphine. They are slower to take effect but can be used when morphine cannot, when there are abdominal wounds for instance. They are placed under the tongue and should not be chewed or swallowed. Give 1 tablet for moderate pain, 2 when severe, not more than 4 times a day. Can produce drowsiness and hallucinations. Do NOT give to children or pregnant women.

Drugs for minor pain

Aspirin and Paracetamol are the best drugs for general pain relief. Aspirin will also help to control fever in 'flu-like illnesses. Do NOT give aspirin to people prone to indigestion, stomach ulcer, etc – it can cause irritation to, and bleeding from, the lining of the stomach.

MOVING THE INJURED

Anyone with injuries to the spine or lower limbs should be carried on a stretcher if possible.

A stretcher can be improvised by passing two poles through pieces of sacking, heavy plastic bags or clothing – jerseys, buttoned jackets, shirts etc. Or from blankets folded around one pole, then wrapped under and over another. Or from doors and tabletops. If no poles are available roll in the sides of a blanket and use the rolls to give a firm grip when carrying. Always test an improvised stretcher with a fit person before using it for the injured.

REMOVING FROM DANGER

You may have to move even a person with spinal injuries, if they are in further danger. If three or four people are available roll the patient on to an improvised stretcher. Do not bend or twist. One person should be responsible solely for maintaining stability of the head and neck. Another holds the shoulders. If there is no stretcher or board roll onto a blanket or coat. Support the head and torso steady even if the legs drag.

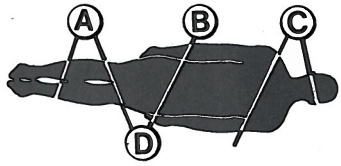
If working alone do not attempt to turn casualty over. Pull by the shoulders if face down, by the ankles if face up, in the direction in which the body is lying. Do not twist. On rough ground or steps drag from behind, pull by shoulders, resting head on your forearms.

Loading a stretcher

If the patient is on a blanket, or can be rolled on to one, the edges of the blanket can be rolled to give a firmer grip. Methods of lifting without a blanket depend upon the number of helpers. When lifting with others, agree signals first for synchronizing movements.

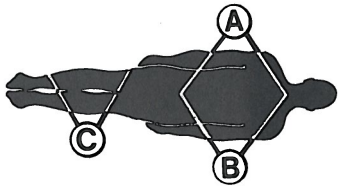
WITH 4 PERSONS

Three lift from same side, C supports head and shoulders. D hooks fingers with adjoining hands of B and C to aid lift. A, B, C support while D places stretcher in position. D helps lower casualty.



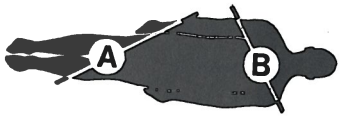
WITH 3 PERSONS

Place stretcher at patient's head. C lifts at knees. A faces B, locking fingers under shoulders and hips. Move casualty from foot of stretcher to over it.



WITH 2 PERSONS

Both stand astride casualty. B links arms beneath shoulders. A lifts with one hand beneath thighs the other beneath knees. Both move forward to above stretcher. Use this technique in narrow spaces, even if more help is available.



Lifting on your own

If help is available do NOT attempt to move an injured person on your own. If there is no alternative, relate the method to the weight and condition of the casualty – and the distance to be carried. Do not choose a method you cannot sustain. Dropping the patient will not only risk worse injury but will reduce the victim's trust in you. If the victim is too heavy to lift, drag them on a blanket or a coat.

Cradle: Suitable for small children or the very lightweight. Lift with one arm beneath the knees, the other around the shoulders. With some weights it will be easier to support in a sitting position.

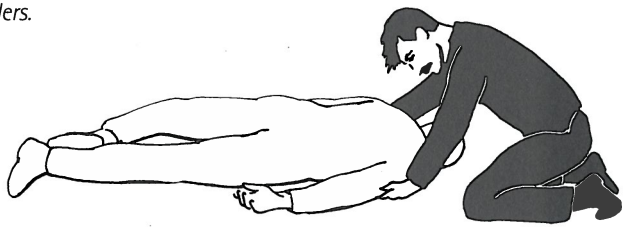
Crutch: Place and hold casualty's arm around your neck (not an injured arm). Put your arm around casualty's waist. Give extra support by grasping clothing at hip.

Pickaback: Crouch while casualty puts arms around your neck. Lift legs on either side of your body. Casualty must be conscious and injuries must permit them to maintain hold onto your shoulders or around your neck.

Fireman's lift

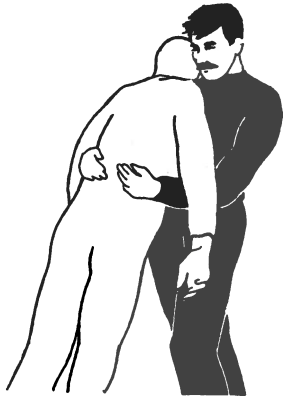
Not a suitable method with a heavy casualty. With conscious person help them to an upright position. If on a chair allow them to fall forward over your shoulders. Otherwise, the method is as for the unconscious.

If casualty is unconscious: *Place face down. Kneel at head. Slide hands under shoulders.*



Lift casualty under armpits to kneeling position, then to upright. Raise casualty's right arm (with your left hand).

Alternatively: *With casualty on back, lift from behind. Stand astride casualty, facing head. Lift under armpits, to kneeling position. Then drag back to straighten legs. Manoeuvre forward to standing and support under armpits. Raise casualty's right arm and quickly move under it, release it and end up face-to-face, still supporting him. Raise his right arm (with your left hand).*



If casualty is conscious: *Bend to place your head under casualty's arm (at same time lifting it over your head). Bend further, placing your right shoulder level with casualty's lower abdomen.*

Go down on to your right knee if you wish. Allow weight to fall across your shoulders and back. Place your right arm between or around legs.

Transfer casualty's right wrist to your right hand and lift, taking weight on your right shoulder. Press down on your left knee with your left hand to help push yourself up.

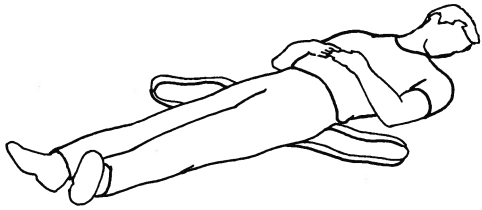
This is a relatively comfortable position in which weight is spread across your shoulders. But casualty's head is hanging down – bad for head or facial injuries.

Lifting with a sling

Another method for lifting an unconscious person, and the best one-man carry for a long distance. A sling is needed which is wide enough not to cut into the casualty, and long enough to go over your shoulders and twice across the victim's back. Two triangular bandages, a rifle sling, broad belts or luggage straps of webbing or leather could all be used. If rope is used, it must be padded to prevent it cutting or chafing.

MAKE SLING

Form sling into a continuous loop and place beneath casualty's thighs and lower back.

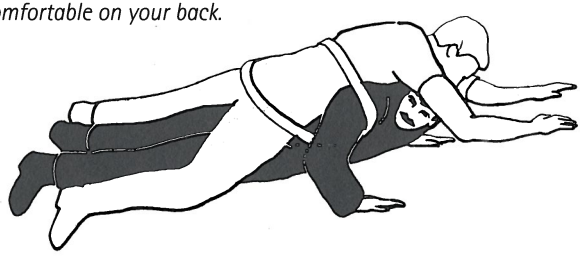


LIE BETWEEN CASUALTY'S LEGS

Thrust arms through loops. Tighten some of slack in sling. Grasp casualty's hand and grip trouser or leg on injured side of body. Turn away from the injured side rolling over so that casualty lies on top.

ADJUST SLING

To make body comfortable on your back.

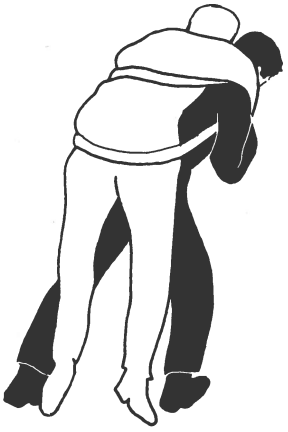


RISE TO A KNEEL

The belt will lift the casualty on your back. If the belt feels loose, or the casualty feels unsafe, return to previous position and adjust straps. Use a hand on the raised knee to help push yourself upright.

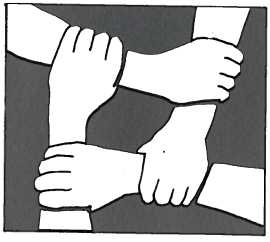
CARRYING THE CASUALTY

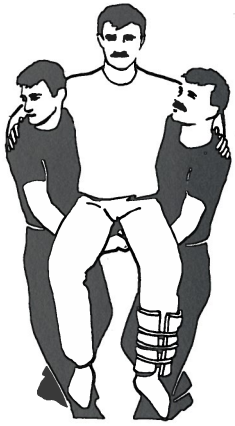
The weight is now carried over your back. You can hold the casualty's wrists to steady the weight but should be able to proceed with both hands free.



Two-persons seat

If the casualty is able to use his or her arms, placed around the carrier's shoulders, two people can make a four-handed seat. Grip as shown: right hand on your left wrist, left on the other person's right.





Casualties unable to use their arms can be lifted by the carriers stooping on either side and reaching across the casualty's back, gripping clothing if possible. The forward hand is slipped beneath the thighs and gripped in a padded finger hook-grip.

EMERGENCY CHILDBIRTH

The stress of an emergency sometimes precipitates labour. The signs include a low backache, regular contractions in the lower abdomen, a discharge of bloodstained mucus and sometimes the 'breaking of the waters'.

Sterilize scissors or a knife and three 20cm (8in) lengths of string. Prepare a comfortable and clean surface for the mother. Have plenty of hot water available.

Helpers should scrub their hands thoroughly and should not include anyone with any sign of a cold or infection or with sores on their hands.

First stage of labour

Uterus contracts at 10–20 minute intervals. Increase in bloodstained mucus. Cramp-like pains lasting up to a minute become increasingly more frequent. This stage may last several hours.

Second stage

Half litre (1pt) or more of water flows out in a rush – the 'breaking of the waters'. Mother should lie on her back. During contractions she should bring her knees up and grasp them with her hands, bending her head towards them and holding her breath. She should rest between contractions.

When a bulge appears delivery is near. Mother should adopt a delivery position. Either: Lying on side with knees drawn-up and

buttocks near the edge of a bed, tabletop, etc, or crouching (which is often a better position if the mother feels strong enough).

Delivery

Mother should NOT hold her breath and should NOT bear down during contractions. She should take short breaths with her mouth open. By panting she makes it easier for the baby to emerge slowly and smoothly. If mother makes a bowel movement during delivery wipe clean from front to back.

- The baby's head usually emerges first, but not always.
- Tear any membrane covering the baby's face.
- If the umbilical cord is around the baby's neck – ease it over the head or loop it over the shoulder.
- Support the baby's head in the palm of your hands. As the shoulders appear support body under armpits and lift towards mother's abdomen. Be prepared for the baby to be very slippery.
- Ensuring that no tension is put on the cord, place the baby by mother's legs (or if she is lying on her back, not side, between them); head lower than body.
- If baby does not appear head-first and delivery is held up for more than three minutes after shoulders emerge, pull very gently.

After delivery

Bind a cloth around baby's ankles. Hook one or two fingers under cloth to support baby, hanging head downwards, to allow fluid to drain from its mouth and nose. Hold head slightly back and mouth open. Wipe away any mucus or blood. When the baby cries lay it by its mother's breast.

If it does not cry and does not show any signs of breathing within two minutes of delivery begin very gentle mouth-to-mouth resuscitation.

Better now for mother to lie on her back, with legs apart, for delivery of placenta (afterbirth), usually about 10 minutes later. After delivery of placenta, or after cord has stopped pulsating, the blood should flow out of the cord into the baby, the cord becoming white instead of blue.

Firmly tie a piece of sterile thread around it 15cm (6in) from baby's navel. Then tie with another thread at 20cm (8in). Check that the first tie is really secure or the baby may lose blood. With sterile

scissors or knife sever the cord between the two ties. Place a sterile dressing over the cut end. Leave for 10 minutes then check that there has been no bleeding. Tie a further thread 10cm (4in) from the baby.

Wash the mother, give her hot drinks and encourage her to sleep.

BITES

Mammal bites

Animal bites are chiefly dangerous because of the infections that can result from bacteria in the animal's mouth. Rabies, the most serious, is almost always fatal if it has developed sufficiently to produce the symptoms of increasing irritability, dislike of light, hydrophobia (violent aversion to water) and paralysis. Under emergency survival conditions, with no vaccine, there is no hope of treating it. Great care must be taken that the victim does not transmit the disease to anyone else. Felines, canines and apes and many other animals can carry rabies, there is even a form carried by bats.

If you are bitten at any time in a survival situation, even if the bite heals and all seems well, you MUST report the bite when you are rescued. You should be examined by a doctor.

Any bite could also cause tetanus. Anti-tetanus shots are sensible for everyone and rabies vaccine for those travelling in areas where rabies may be expected.

Thoroughly cleanse all animal bites, washing for at least five minutes to remove saliva and wash out any infection. Then deal with bleeding, dress and bandage.

Snake bites

Few snake bites are fatal if anti-venom is available. The victim who is rushed to hospital within an hour or two is usually treated in time, provided the kind of snake is known so that the correct anti-venom can be prepared. Under survival conditions access to anti-venom is unlikely and the victim may not be so lucky but, fortunately, only a small proportion of snakes are venomous.

The fangs which discharge the poison of many snakes are set at the front of the upper jaw and leave distinctive puncture marks as well as the pattern of the bite (those of Coral snakes of the Americas may not be noticeable).

Non-poisonous snakes can also administer a savage bite. If you are not certain whether a snake was poisonous or not, treat as poisonous (though it may calm the patient to say that it was not a poisonous snake).

TREATMENT: The aim is to prevent poison spreading through the body. Reassure the victim. Make them relax, resting with the bitten area lower than the heart. Wash away any venom on the surface of the skin, with soap if possible. Place a restricting bandage – NOT a tourniquet – above the bite, and bandage down over the bite. For instance, if the victim has been bitten on the ankle, start bandaging at the knee. This bandage prevents the toxin from spreading rapidly and being taken up by the lymphatic system.

Place wound in cool water – a stream for instance. Use ice if available to keep as cool as possible.

The casualty will almost certainly need treatment for shock and may also require artificial respiration, keep a check on breathing.

Never cut a snake bite or try to suck out the poison.

Venomous and dangerous animals

For identification and details of SYMPTOMS (see *Dangerous Creatures* colour illustrations).

Spider bites

Spider bites should be treated in the same way as snake bites. A cold compress (like a poultice, but cold – ice wrapped in a cloth is ideal, if available) helps to reduce pain.

Stings

Scorpions can inject powerful venom. Bee, wasp and hornet stings can cause severe reactions in some people. Multiple stings are very dangerous – the amount of toxin and the inflammation this causes, may affect respiration.

Bee stings are left in the skin and should be carefully removed. Do not squeeze the stinger end or more venom will be injected. Stroke the sting with the side of a needle to draw it out – DON'T prod with the point.

Treatment is again like that for snake bite.

Chiggers, Ticks, Mosquitoes

Most small insect bites are a nuisance rather than a danger, but some can carry diseases. (See *Warm climate diseases*, this section, and *Tropical regions* in *Climate and Terrain*.)

GENERAL POISONING

The quickest way to remove a poison that has been swallowed is to vomit it up – but this is DANGEROUS in the case of caustic chemicals and oily substances that can produce further damage when being brought up. In cases of suspected plant poisoning always induce vomiting by putting a finger down the throat.

In ordinary domestic as well as survival conditions food and drink containers may have been wrongly used to store toxic substances (despite the fact that it is against the law in Britain). Always check they actually contain what the label says and take particular care that hungry or thirsty children do not help themselves to cream sodas that are actually the camp fuel or bleach reserves.

An effective 'universal' antidote, which will also help to absorb a poisonous liquid can be made up from tea (tannic acid) and charcoal – with an equal part of milk of magnesia if available – or just use charcoal. The aim is to absorb the poison so that it passes out of the system with the charcoal.

Contact poisons

Some plants, such as Poison Ivy, Poison Sumac and Poison Oak, can produce considerable skin irritation. Some people seem to have immunity, but it is not necessary permanent. Some people may have mild or extreme allergic reactions when touching other plants. All skin that has been in contact with the plant should be thoroughly washed with soap and water. It is most important to remove and wash all contaminated clothing since once the irritant oil is on the clothing it can spread to other parts of the body.

Alcohol can then be used to neutralize any oil left on the skin or clothing.

Severe cases may require treatment for shock.

WARNING

If handling a plant has produced a severe reaction, DO NOT PUT YOUR HAND TO YOUR FACE – ESPECIALLY THE EYES OR MOUTH – OR TOUCH THE GENITALS until it has been well washed. These sensitive parts of the body can react with swellings and rashes which can interfere with breathing or cause urinary blockage.

Chemical poisons

Chemical poisons should be sluiced off the skin with water. If skin has been damaged, treat as for burns (see also *Burns*).

WARNING

Sluicing with water may worsen the effects of some chemicals. You MUST know the properties of chemicals to which you are exposed, and the appropriate action to take in case of accident.

GENERAL DISORDERS

Conditions such as constipation and diarrhoea are to be expected, with the jolt to the system that the survivor may have experienced. Failure to defecate or urinate is not unusual in shipwreck situations. Coping with new and perhaps initially distasteful foods may also bring a feeling of nausea.

Small digestive upsets are relatively insignificant in survival conditions, but symptoms which suggest a more serious condition should not be ignored.

Lack of food will itself place a strain upon the body and stress may cause headaches and other disorders. Women survivors may find that menstruation ceases while under severe stress conditions.

However, if food is adequate in quantity the best treatment for digestive problems is to fast for a day and to rest, though in hot climates you should take fluids.

Fevers

Treat the symptom with rest and aspirin and look for the cause of the fever.

Pneumonia

Characterized by a rapid rise of temperature, often with chest pain, sputum mixed with blood, headache, weakness and, later, delirium. Pneumonia has many causes – most commonly a bacteria which attacks the lobes of the lungs. Without antibiotics careful nursing is all that you can do.

Encourage the patient to walk and to do deep breathing exercises. Keep the patient warm and encourage him or her to take frequent sips of hot water. Stay with the patient as much as possible and give verbal encouragement.

DISEASES

There are three main causes of infectious diseases: bacteria, viruses and rickettsiae. Then there are the problems caused by large parasites such as internal worms, scabies and the tropical larvae of the warble fly and the tiny chigger (chigoe).

Diseases caused by bacteria include dysentery, cholera, tuberculosis and diptheria. Viruses cause the common cold, influenza, measles, and poliomyelitis. Rickettsiae, germs which are neither bacteria, nor viruses, cause typhus, scrub typhus and Rocky Mountain spotted fever.

Most of the common infectious diseases which are familiar to everyone from childhood will respond to careful nursing. They are 'caught' from another person. Unless already carried by the party (or humans with whom you come into contact), neither these nor contagious and sexually transmitted diseases are likely to occur. Some human parasites, such as the itch mite which cause scabies, cannot live for very long off a human body so they too will only be a problem if you have brought them with you.

SCURVY

A deficiency disease due to lack of vitamin C, this used to be the scourge of sailors on long voyages. The survivor with access to fresh fruit and vegetables is not at risk. The desert- or sea-survivor is likely to succumb to thirst or hunger well before this problem becomes acute. Symptoms include bleeding gums, loose teeth, easy bruising and breathlessness.

Relying entirely upon hunting and fishing could make this a problem, especially in polar areas, if you have no vitamin tablets left. Always aim for a balanced diet to avoid this and other deficiency diseases.

Precautions

The diseases to which the survivor is most likely to be exposed, especially in tropical countries, are those carried in water or by insects and food animals.

Since the symptoms of tropical disease will be less familiar to most survivors, the most common will be dealt with in more detail so that they can be recognized. Where drugs are not available, treatment of disease will largely be a matter of dealing with

symptoms and making the patient as comfortable as possible. Some remedies from natural sources can be prepared.

However, prevention is better than treatment. Measures to avoid diseases should include all suitable immunization before travelling (especially to the tropics) and then giving meticulous attention to the following precautionary procedures:

- Purify drinking water
- Clean hands when preparing or eating food
- Wash and peel fruit
- Sterilize eating utensils
- Cover the body to reduce risk of insect bites
- Wash clothes and hold over smoke if louse-ridden
- Wash body (but avoid swallowing possibly contaminated water when washing or swimming)
- Bury excreta
- Protect food and drink from flies and vermin

Nursing/isolation

When infectious disease does occur it is important to isolate it. Contact with other members of the group should be kept to a minimum. All utensils used by the patient should be boiled. Cuts and sores should be closely covered, so that they are not exposed to infection. Hands should be thoroughly washed after treating the patient.

Avoid splashing with mucus from the patient's coughing or sneezing, which may carry germs. Take special care that the patient's faeces are disposed of without risk of infection to the handler and buried where they cannot spread infection or be disturbed.

WATERBORNE DISEASES AND EXCREMENTAL DISEASES

The simplest rule to prevent catching these diseases is BOIL ALL WATER – do not even clean your teeth or rinse your mouth when bathing with water that could be impure. Cover cuts and wounds and avoid unnecessary standing in water in areas where you could be at risk. Adopt rigid hygiene procedures, especially with regard to food preparation and cooking and eating utensils.

WARM CLIMATE DISEASES

In addition to the diseases already described the following are prevalent in warm and tropical climates – although they can occur elsewhere if there are carriers of the infection. (See also warnings against animals more likely to carry parasites and food poisoning, such as salmonella, in *Food*.)

Waterborne diseases

BILHARZIA – A disease of the bowel or bladder, caused by a microscopic fluke or worm, which spends part of its life cycle in a water snail and part in the human liver. It is endemic in parts of Africa, Arabia, China, Japan and South America. It enters the body either through drinking infected water, or through broken skin.
Main symptom: An irritation of the urinary tract.
Can be treated: With the drug Niridazole in recommended doses.

HOOKWORMS – Another parasite that can enter the body in infected drinking water or penetrates bare skin, usually through the feet. The larvae travel through the bloodstream to the lungs, where they may cause pneumonia, are coughed up and swallowed to develop into worms, about 1·25cm (½in) long, in the intestine, causing anaemia and general lethargy. Common in many warm countries including the southern United States. Keep your boots on!
Can be treated: With the drugs Alcapar and Mintazol in recommended doses. A decoction of bracken is also a powerful de-wormer.

AMOEBIC DYSENTERY – Transmitted through contaminated water and uncooked food, this form of dysentery is largely found in the tropics and subtropics, though sometimes encountered in the Mediterranean.
Symptoms: It does not necessarily produce a temperature, but the victim will feel fatigued and listless. Faeces may be solid, but will smell foul and carry blood and mucus looking like red jelly.
Treatment: Administer fluids, maximum rest and correct dosage of Flagyl.

Insect-borne diseases

Dengue, malaria and yellow fever are all transmitted by mosquito bite. A course of tablets, begun before exposure, can protect you from malaria.

There is no defence against the others, except keeping the skin covered by wearing long sleeves and trousers, especially at night, sleeping under a mosquito net if possible and using insect repellents.

Remember: Do NOT increase risk by camping near stagnant water and swamps.

MALARIA – Not restricted to the tropics, although probably the first disease the tropics call to mind. It could occur anywhere the anopheles mosquito is found, and was once prevalent in swampy areas of southern Italy and other parts of Europe. Transmitted through the saliva of the female mosquito, it produces recurrent fever. Although sweating, the patient feels intensely chilled and shivers violently. There are four kinds of infection. One produces almost continuous fever, accompanied by delirium or coma. Two kinds produce fever every 48 hours and the fourth kind, fever every 72 hours.

Treatment: Quinine is the traditional treatment but paludrine, chloroquine, darapryn and other anti-malarial drugs are now available. Protection can be obtained by starting a course of tablets before visiting an infected area. This is so the body can get used to the tablet and if any of the symptoms are unbearable an alternative found.

Taking 2 Paludrine daily and 1 Nivaqin tablet weekly is still recommended and now comes as a pack. But take advice from your doctor on their effectiveness. They must be continued even after returning from abroad. Follow pharmacist's instructions carefully.

However, in certain areas of the world, conventional anti-malarial drugs like Paludrine are now ineffective. Different species of mosquito have become immune. Areas in particular include Africa and the Far East. Check with your travel agent for up-to-date information.

Larium is now the drug to take for complete cover, but it has some nasty side-effects. These include nausea, vomiting, diarrhoea, abdominal pain, dizziness, loss of balance, anxiety, hallucinations and sleep disorders. The dose is 1 tablet per week and should be started 2–3 weeks before the trip.

There is another way to use Larium, which a lot of overseas workers practice. They don't take anything so the signs and symptoms of malaria are not masked in any way. At the first sign of malaria they begin immediately on a course of Larium which is a cure. It should be taken 4 weeks after return from abroad.

A relatively recent drug, called Malarone, has proved to be 98 per cent effective with fewer side-effects.

DENGUE (BREAKBONE FEVER) – Dengue fever lasts for about a week, with headaches, pains in the joints and a rash. Unlike malaria, one attack by this virus usually confers immunity. The type of mosquito that carries dengue is just as likely to bite in day and night. There is no drug to treat dengue.

YELLOW FEVER (BLACK VOMIT) – Prevalent in Africa and South America, Yellow fever first produces headaches, limb pains and fever. The mouth feels swollen, vomiting may produce blood and the eyes are bloodshot. After three or four days the fever is reduced but there is constipation, pain in the kidneys and urination becomes less and less. There is increased vomiting and the skin takes on a yellowish tone before recovery.
Treatment: Rest and nursing.

SANDFLY FEVER – A disease mainly of the grasslands of the sub-tropics and the Mediterranean. A small fly bite, usually on ankles, wrist or neck, produces an itching which is aggravated by scratching and can lead to sores which are an entry for further infections. Headache, bloodshot eyes and 'flu-like symptoms may also occur. The fever usually lasts about three days before subsiding.
Treatment: Rest and liquids.

SCRUB TYPHUS (TSUTSUGAMUSHI DISEASE) – Also known as mite fever, and occurring widely through eastern Asia and Australasia, this is carried by mites whose larvae live on rodents. The mites transmit the disease by biting, often in the groin or on the neck. The bite usually goes unnoticed, but a sore will develop in a few days in the bite area. Severe headache, shivering and fever develop within 10 days.

The disease is similar to other forms of typhus, with a rash appearing after about a week, and is treated in the same way. Infection is more likely in areas of thick dry vegetation. Avoid such places, sleep at least 30cm (1ft) from the ground and use insect repellent to avoid this disease.

TYPHUS – There are two forms. Epidemic typhus is carried by body lice which transmit it to humans. Endemic, or murine, typhus is transmitted by the rat flea. Both are diseases associated with dirty, overcrowded conditions and more likely to be diseases of disaster aftermath than survival in remote places.
Symptoms: Both forms produce headache, nausea and, after about four days a rash which spreads from the armpits to the chest,

abdomen and thighs. Victims may recover after about 12 days, or fall into delirium, coma or death.
Treatment: Antibiotics. There is also a vaccine available.

ROCKY MOUNTAIN SPOTTED FEVER – Also known in Brazil as São Paulo fever, this is another type of typhus, spread by ticks. As the name suggests, it is also found in the western United States.
Symptoms and Treatment: As for typhus, but the rash tends to be most severe on wrists and ankles.
Small parasites which burrow beneath the skin, such as the tear-shaped, bristly larvae of the warblefly, or the tiny chigoe, which makes red pinpricks where it lodges on the skin, should be removed before they can open up a route for further infection.

WARM CLIMATE AILMENTS

PRICKLY HEAT

Miliaria, or prickly heat, can occur whenever people are exposed to very hot conditions without acclimatization. Heavy sweating, coupled with rubbing by clothing, can produce blockages in the sweat glands and an uncomfortable skin irritation. Heavy exertion may precipitate miliaria, which is aggravated by sunburn and eczema. Babies are very vulnerable.

Excess sweat does not clear sufficiently quickly, the glands are blocked and the cooling effect of sweating is lost. Taking more liquid, especially hot drinks, may produce more sweat, and make the situation worse. Remove clothing, wash the body with cool water and put on dry clothes. Small amounts of tiger balm applied to the upper lip may distract from the itching and antihistamine relieves the discomfort.

HEAT CRAMPS – These are usually the first warning of heat exhaustion and occur in the muscles which are doing most work: arms, legs and abdomen. Usually due to lack of body salt (produced by excessive sweating – especially if no salt has been taken).
Symptoms: Shallow breathing, vomiting, dizziness.
Treatment: Move to shade. Rest. Drink water with a little salt dissolved in it – only a pinch to a half-litre or pint.

HEAT EXHAUSTION – Exposure to high temperature and humidity, with loss of body fluids through excessive sweating, produces heat exhaustion. It can occur without direct exposure to the sun – lying on hot ground with poor ventilation for instance.
Symptoms: Face pale, skin cold yet sweating, pulse weak. Accompanied by dizziness, weakness and perhaps cramps. Patient may become delirious or unconscious.
Treatment: As for cramps.

HEATSTROKE – The most serious result of overexposure to or overexertion in the sun.
Symptoms: Hot dry skin, face flushed and feverish – but sweating stops. Temperature rises, pulse becomes fast and strong. Severe headache, often with vomiting. Unconsciousness may follow.
Treatment: Lay in shade, head and shoulders slightly raised. Remove outer clothing. Cool body by wetting underclothing with TEPID water (cold water would push the core temperature up) and fanning. Do NOT fully immerse in water – sprinkle it over the patient. Then lay in a damp hollow with plenty of ventilation. When consciousness returns give water to drink. When temperature returns to normal, replace clothing, keep warm to prevent chill.

Immediate immersion in cold water is very dangerous but in extreme cases, where risk of death or brain damage outweighs shock from immersion, could be used AFTER initial cooling begins to take effect. Slowly lower the body into water, feet first, massaging extremities to increase blood flow and aid dispersal of heat from body's core. Remove as soon as temperature falls – be prepared to cover patient if it plummets. You may need to cool and cover several times before temperature becomes stable.

SUNBURN – Actual burn, with blistering (not just tanning) is a real danger, especially with pale and sensitive skins. If more than two-thirds of the body is affected it can prove fatal.
Treatment: Avoid further exposure – keep in the shade. Take pain killers if available. Cover all blisters with dressings but DO NOT BURST.

SORE EYES – Sore eyes may be due to glare – especially at sea and in desert and snow-covered locations (see *Snow-blindness* on p.453) – or to excessive exposure to the sun or dust particles.
Treatment: Rest in shade, covering eyes after washing out foreign bodies and bathing in warm water. Use a mask and darken below eyes with charcoal to avoid recurrence.

DEHYDRATION

Dehydration becomes increasingly noticeable as more body fluid is lost. Water makes up 75 per cent of the body weight – about 50 litres (11 gallons) for the average man. Survival is unlikely if more than one fifth of this is lost.

Fluid loss 1-5 per cent: Thirst, vague discomfort, lack of appetite, flushed skin, impatience, sleepiness, nausea.

Fluid loss 6-10 per cent: Dizziness, headache, laboured breathing, no salivation, indistinct speech, unable to walk.

Fluid loss 11-20 per cent: Delirium, swollen tongue, unable to swallow, dim vision, numb and shrivelled skin.

In the latter stages: There is gross muscular weakness and mental capacity is impaired – you must make your plans at the start when you can think clearly – and then stick to them.

COLD CLIMATE HAZARDS

It is not only in the polar regions that low temperatures create health hazards. Prolonged exposure to cold is dangerous anywhere. Take precautions against all these conditions.

HYPOTHERMIA – Technical name for the condition where the body cannot generate heat as fast as it looses heat and its temperature falls below normal. It is caused by exposure to wind, rain and low temperatures and also brought on by:

- Exhaustion
- Inadequate clothing
- Inadequate shelter
- Inadequate food intake
- Lack of knowledge and preparation

The conditions which aggravate hypothermia are exactly those likely to occur in the polar regions – though it can occur under any cold conditions, especially as a result of wind chill. It is a common problem of any very cold spell, especially among the underprivileged elderly. It is a killer and must be treated as soon as it is recognized.

Prevent it by sheltering when conditions are bad and by keeping dry. Avoid overexertion and if in a group use the 'buddy system'. If one person goes down with hypothermia others in the group may also be near to it. Check everyone for symptoms.

Signs and symptoms: Irrational behaviour, typified by sudden bursts of energy followed by lethargy. Slowing down of responses, failing to respond to questions or instructions. Sudden uncontrolled fits of shivering. Loss of coordination, stumbling and falling. Headaches, blurred vision and abdominal pains. Collapse, stupor or unconsciousness.

Aggravating factors: Soaked clothing, with high winds. Low air temperature accompanied by high winds. Immersion in water. Any injury that immobilizes and reduces the ability to produce heat. Anxiety and mental stress. Unusual thinness.

Treatment: Prevent any further heat loss. Shelter from wind and weather. Replace wet clothing with dry. Start at the head, by putting on a hat. Remove clothing from the waist up and replace with dry clothes. Then remove clothing from the lower body. This helps preserve the core temperature. Insulate patient from the ground and apply warmth (other bodies, hot rocks). Give warm fluids and sugary foods – but only if conscious.

In advanced hypothermia the body loses the power to rewarm itself. However, it must still be rewarmed from the inside, because fast external heating would drive cold blood into the core, further aggravating the situation. Place warmth in the following places: pit of stomach, small of back, armpits, back of neck, wrists, between thighs. These are places where the blood is near the surface and will carry the heat through the body.

Do not apply or administer alcohol. It opens blood vessels at the surface of the skin, allowing heat to be lost more rapidly.

The patient is NOT cured when his or her temperature reaches normal. Body reserves must be built up until the ability to generate heat internally returns.

A foil blanket will reflect heat and aid care in sub-zero conditions.

HEAT LOSS: GENERAL RULES

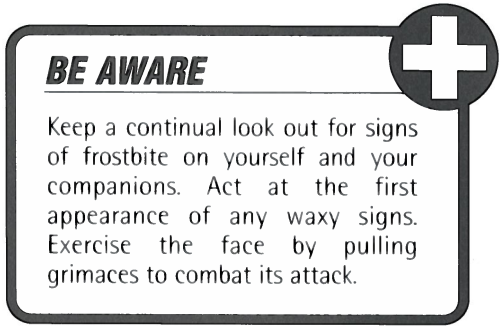
If heat is lost rapidly – rewarm rapidly
If heat is lost slowly – rewarm slowly

FROSTBITE – Frostbite occurs when the skin and flesh freeze – when reduced to a temperature of -1°C (30°F). Frostbite affects all exposed parts of the body and the regions furthest from the heart which have the least powerful circulation: hands and feet, nose,

ears and face. It can be light or deep according to the degree of exposure.

The first signs are often a prickly feeling as the skin freezes. Then rather waxy-looking patches on the skin which feel numb – and later hard and pebbly with considerable pain, swelling, reddening and blistering before the deadening and dropping off that is the final stage.

Frostnip: Affects only the skin. To treat it place the affected part in a warm area. Put hands under your armpits or in your crotch. Put feet against a friend's stomach (you may not stay friends for long!). Thawed out frostbite will be painful.



Deep frostbite: A much greater problem. Protect the affected area from greater injury. Do NOT rub with snow. Do NOT expose to an open fire. The best treatment is to thaw the injured area gradually with warm water at a temperature of about 28-28·5°C (82-83°F) – about the temperature which your elbow can comfortably bear. If too hot, cool down to the right temperature then apply to the affected areas.

Advanced frostbite: May cause blisters to form which can become infected and form ulcers. These tissues become grey, then black and die and will eventually fall off. Do NOT burst blisters and NEVER rub the affected part. Severe pain is an indication that the part has been warmed too quickly. Use 'animal warmth' only.

SNOW BLINDNESS – A temporary form of blindness, caused by the high intensity and concentration of the sun's rays, which are reflected from the snow-covered ground or ice (and also from ice crystals in the clouds). It occurs most frequently when the sun is high, but can also occur when there is no direct sunlight – during a bright overcast period in polar and alpine regions.

Symptoms: First the eyes become sensitive to the glare and then blinking and squinting begins. Vision takes on a pink hue, becoming redder. If not checked at this stage the eyes begin to feel as though they have sand in them.

Treatment: Get into a dark place and blindfold the eyes. Heat aggravates the pain so apply a soothing cool wet cloth to the forehead. The condition corrects itself in time. Prevent further exposure by wearing goggles and black beneath the eyes with charcoal to reduce the glare (see *Climate and Terrain*).

CARBON MONOXIDE POISONING – A risk that is a byproduct of incomplete combustion in a badly ventilated area – which may result from overzealous efforts to prevent draughts. All forms of fire and stove are a potential cause if used in confined spaces without adequate ventilation. The carbon monoxide which builds up is colourless and odourless, so is difficult to detect. It may cause slight headache, dizziness, drowsiness, nausea or even vomiting – but these signs can go unnoticed and progress to unconsciousness without warning. Unless discovered promptly it will be fatal.
Treatment: Simple – and prevention even simpler – VENTILATE. There is no treatment if you are on your own so ensure that such conditions cannot develop. Remove the patient to fresh air and encourage him or her to breathe evenly and regularly. If unconscious and not breathing, apply artificial resuscitation. Keep patient warm and ventilate the offending shelter.

TRENCH FOOT – This occurs when feet are immersed in water for long periods, or are damp and cold for a long time. Tight-fitting boots accelerate the condition. This is a serious malady and its onset is hastened by exhaustion, coldness and lack of food, drink or sleep.

Prevent trench foot developing by keeping the feet dry. Wear boots that fit correctly, exercise the legs and toes and inspect feet regularly.
Symptoms: Feet feel as though they have pins and needles. Numbness sets in and is interspersed with sharp pains. On inspection feet appear purple with swelling and blisters.
Treatment: Dry the feet, but do not rub or damage blisters. Elevate feet and cover to keep warm – but improvise a cage to take weight of coverings. Do NOT apply artificial heat. Do NOT massage. Rest and warmth are the cure.

SURVIVAL CASE STUDY

My medical training came in handy on many occasions, especially in remote areas. Everyone should have some knowledge of first aid so they can at least help in an emergency.

In the early days of the Borneo campaign, to win the confidence of the locals we set up a 'hearts and minds' campaign. This included medical treatment which quickly helped form a bond with the local tribes, who came from many miles around with a variety of illnesses, fevers and trauma.

One day a fisherman was carried in with his left foot covered in rags. The smell got stronger as he got nearer, and when the foot was unwrapped I had to hold my breath. The whole foot was bloated and oozing pus. He was feverish and rambled on about being hit by a boat propeller. After trimming away the rotten flesh and administering a course of penicillin his recovery was amazing. Undoubtedly he would have died from septicaemia, but after seven days treatment, he was walking again.

The locals were amazingly receptive to modern drugs, and so care must always be taken when administering any drugs to them, as they have built up a natural and inherited immunity to illnesses such as tropical fevers which can be eradicated by taking just one pill. Just one anti-malaria pill, for example, can wipe out thousands of years of the locals' natural immunity in seconds, leaving them open to the mercy of the disease.

Our fame spread and our queue of patients got longer. Most days we treated cuts, fractures and other similar ailments. As their confidence in us grew so did the challenge of treating some cases. The locals carried out their own childbirth relying on tried and tested methods, unless something went wrong – then they would come to me. There was, and still is, a very fine line to be trodden – do I assist or not? If I assist and it goes wrong I will lose face, contradicting the reason we are there in the first place. But if I don't assist I still lose face, as well as the trust we had built up. It's all down to training and the amount of knowledge you have. I was lucky enough in that I got involved with a difficult birth and it turned out fine.

NATURAL MEDICINE

Natural remedies are available for many human illnesses if you know where to look. For thousands of years drugs and treatments have made use of all kinds of herbs, plants and natural substances and many of the drugs still in use today are derived from plant sources. Not all the traditional medicines have been endorsed by modern doctors, some were based more on an association of the plant than with its medical properties – though strangely, colour and appearance does often seem to be indicative. Plants such as scarlet pimpernel and burdock, used to clear the blood, are mainly red; those that treat jaundice, including agrimony, hawkweed and dandelion, are yellow. Sometimes a name reminds us of the old medical usage – lungwort for instance, or eyebright.

Cruel to be kind

Sick survivors need your care and attention, but they must also be kept interested and optimistic. If a man with pneumonia is left to curl up in a corner of the shelter, he will probably die. Get him on his feet and keep him occupied with minor tasks. Give him plenty of fluids and coax him to eat. Do not let him lie down. The hepatitis case must be forced to eat. You cannot allow either strength or morale to be depleted.

It is not only plants that can replace your medical supplies, or to supplement your store. Urine can be used as an antiseptic to wash out wounds. If the patient is fussy, use their own. If sick enough, they won't care whose. Maggots too have been used to clean wounds. In tropical countries an open wound is soon infested with them – but they do keep it open and clean until better treatment can be given. Keep watch that they do not devour good tissue.

Fire has been used for centuries to clean wounds. Cauterizing with heat requires fortitude in the patient – but, if they can stand it, and you have ammunition, placing powder around a wound and lighting it can prevent gangrene. Some people believe that the best way to seal a stump after an amputation is to cauterize (as used to be done to criminals who had their hands chopped off) – but the shock of this on top of the shock of injury will kill some people.

Modern drugs

Many modern drugs such as cocaine, morphine and digitalis are derived directly from plants, but extracting them is NOT straightforward. Often poisons are involved which could be VERY

DANGEROUS if any attempt was made to use such plants in treatment. What follows is a list of plants and the medical uses to which the survivor can put them – in simple preparations. Although many modern drugs are made from tropical plants, and indigenous medicine has many plant ingredients, most of these plants are found in temperate regions for they are the ones which have been most documented and which you have a reasonable chance of recognizing.

Plant preparations

Leave all poisonous plants alone and be sure that you have properly identified the plant. As a general rule plants will be most potent when in flower. Note that different parts of a plant may have different uses.

Infusions are usually made from leaves or flowers and decoctions from roots. The methods are described below. Divide the amount made into three doses to take in one day. Always prepare infusions, decoctions and poultices freshly, just before using. Never keep for more than 12 hours.

Plants vary in potency depending on the season in which they are picked. Do not think you will do more good by taking or administering larger doses – you won't and you may do harm.

Don't expect miracles overnight. Give the treatment a fair chance to work.

To make an infusion

Cut and crush the herb so that juices and oils are more readily available. You need a slack handful of herb to a half-litre (¾pt) of water (30g to 50cc/1oz to 20fl.oz). Pour boiling water over it. Stir. Leave to cool. There is no need to strain – the herb will sink to the bottom.

If you cannot boil water use half the amount of cold water and stand the vessel in the sun. If there is no sun or no water try sucking or chewing the leaves, extracting as much of the juices as possible, then spit out the pulp.

To make a decoction

Usually a preparation from roots. Cut, scrape and mash root. Soak in water (handful to 85cc/1½pt) for at least half an hour. Bring to boil, simmer until liquid reduces by one-third.

To make a poultice

Mash up root, leaves or all of the herb and make into a flat pad. If too dry add water. Apply to affected part and cover with a large leaf,

bind in position. Poultices can be applied to stiff joints, sprains and pus-filled sores.

Expressed juice

Reduce stem and leaves of the plant to a juicy mush by crushing with hands, rocks or sticks. Squeeze juice only into a wound and spread pulp around infected area. Keep in place with a large leaf and bind.

Splinting agents

The roots of Comfrey and, to a lesser extent, Solomon's seal, are so rich in starch that they will set hard when they have been well boiled and reduced. Allow to cool slightly and pack around an injured limb or joint. Good for holding poultices.

REMEDIES

STOPPING BLEEDING

Dove's-foot crane's-bill: Expressed juice
Giant puffball: Packed as poultice
Periwinkle: Expressed juice of leaves
Plantains: Pounded leaves as poultice
Self-heal: Expressed juice
Stork's-bill: Expressed juice of leaves
Woundwort: Expressed juice

CLEANSING RASHES/ SORES/WOUNDS

NOTE: *Use these plants externally to bathe the skin or where indicated, as a poultice. Apply two or three times a day.*

Burdock: Decoction of root; crushed raw root and salt for animal bites
Camomile: Infusion of flowers as poultice
Chickweed: Expressed juice of leaves
Cleavers: Infusion of whole plant, except roots
Comfrey: Decoction of root as poultice
Dead-nettle: Infusion of flowers and shoots
Docks: Crushed leaves
Elder: Expressed juice of leaves
Elm: Infusion of bark
Horehound: Infusion of whole plant, except roots.
Mallow: Decoction of leaves and flowers as poultice
Marsh mallow: Decoction of root infusion of leaves and flowers; as poultice
Oak: Decoction of bark
Sanicle: Infusion of whole plant, except roots
Scurvey grass: Crushed leaves
Shepherd's purse: Infusion of whole plant, except roots; as poultice
Silverweed: Infusion of whole plant, except roots
Solomon's seal: Decoction of roots; as poultice
St John's wort: Infusion of flowers and shoots
Sorrel: Crushed leaves
Tansy: Crushed leaves
Watercress: Expressed juice
Woundwort: Infusion of whole plant, except roots
Yarrow: Infusion of whole plant, except roots

ANTISEPTIC

NOTE: *These plants can be used externally or internally. They are particularly useful for wounds that become infected.*

Garlic: Expressed juice
Mallow: Infusion of leaves and flowers
Marsh mallow: Decoction of root; infusion of flowers and leaves
Horseradish: Decoction of root
Thyme: Infusion of leaves and flowers

ACHES/PAINS/BRUISES/STIFFNESS

NOTE: *Where indicated, use externally.*

Balm: Infusion of leaves
Birch: Infusion of leaves
Borage: Infusion of whole plant, except roots
Burdock: Decoction of root
Camomile: Expressed juice of flowers applied to swellings
Chickweed: Infusion of whole plant, except roots
Comfrey: Decoction of root applied to swellings
Cowberry: Infusion of leaves and fruits
Dock: Crushed leaves applied to bruises
Dove's-foot crane's-bill: Infusion of whole plant, except roots, applied to swellings
Elm: Infusion of bark
Figwort: Decoction of whole plant except roots; use externally to draw bruises and blood clots
Garlic: Expressed juice applied to swellings
Horehound: Expressed juice or leaves to earache
Poplar: Infusion of leaf buds
Solomon's seal: Decoction of root; use externally
Sorrel: Crushed leaves applied to bruises
St John's wort: Infusion of flowers and shoots applied to bruises
Tansy: Crushed leaves applied to bruises
Willow: Decoction of bark

FEVERS

NOTE: *These plants will induce perspiration to break a fever.*

Camomile: Infusion of leaves and flowers
Elder: Infusion of flowers and fruit
Elm: Decoction of bark
Feverfew: Infusion of whole plant, except roots
Lime: Infusion of flowers

COLDS/SORE THROATS/ RESPIRATORY

Agrimony: Infusion of whole plant, except roots
Angelica: Decoction of root
Bilberry: Infusion of leaves and fruits
Bistort: Infusion of whole plant, except roots
Borage: Infusion of whole plant, except roots
Burdock: Decoction of root
Camomile: Infusion of flower; use as gargle
Colt's-foot: Infusion of leaves and flowers
Comfrey: Infusion of whole plant
Great mullein: Infusion of whole plant, except roots; decoction of root as gargle
Horehound: Infusion of whole plant, except roots
Horseradish: Raw root
Lime: Infusion of flowers
Lungwort: Infusion of whole plant, except root
Mallow: Infusion of flowers and leaves
Marsh mallow: Decoction of root; infusion of leaves and flowers
Mint: Infusion of whole plant, except roots
Mountain evens: Infusion of whole plant; use as gargle
Nettle: Infusion of leaves
Oak: Decoction of bark, use as gargle
Plantain: Infusion of leaves and stems
Poplars: Infusion of leaf buds
Roses: Decoction of hips

Sanicle: Infusion of whole plant, except roots
Self-heal: Infusion of whole plant, except roots; use as a gargle
St John's wort: Infusion of flowers and shoots
Thyme: Infusion of leaves and flowers
Willow: Decoction of bark
Yarrow: Infusion of whole plant, except roots; use as inhalant

SETTLING STOMACH

Balm: Infusion of leaves
Bilberry: Decoction of fruit
Bracken: Infusion of leaves
Bramble: Infusion of leaves
Dandelion: Decoction of whole plant
Horseradish: Infusion of root
Mint: Infusion of whole plant, except roots, with crushed charcoal
Solomon's seal: Decoction of root
Sanicle: Infusion of root
Yarrow: Infusion of leaves and flowers

DIARRHOEA

NOTE: *Take two or three times daily until symptoms subside.*

Bilberry: Decoction of fruit
Bistort: Infusion of whole plant, except roots
Bramble: Infusion of leaves or decoction of fruit
Cowberry: Decoction of fruit
Elm: Infusion of bark
Great burnet: Infusion of leaves and shoots
Hazel: Infusion of leaves
Marsh mallow: Infusion of leaves and flowers; decoction of root
Mint: Infusion of whole plant, except roots
Mountain evens: Infusion of whole plant, except roots
Oak: Decoction of bark
Plantain: Infusion of leaves and stems
Periwinkle: Infusion of leaves; NOT to be used for long periods
Silverweed: Infusion of whole plant, except roots

CONSTIPATION

Agrimony: Infusion of whole plant, except roots
Barberry: Expressed juice of fruit
Common cleavers: Infusion of whole plant, except roots
*Couch grass (*Elymus*): Decoction of root*
Dandelion: Decoction of whole plant
Elder: Expressed juice of fruit
Feverfew: Infusion of leaves and flowers
Rowan: Expressed juice of fruit
Rose: Decoction of hips
Walnut: Decoction of bark

HAEMORRHOIDS

NOTE: *Apply externally, two or three times a day.*

Bilberry: Expressed juice of fruit
Camomile: Infusion of leaves and flowers
Elm: Decoction of bark
Lesser celandine: Expressed juice of leaves
Oak: Decoction of bark
Plaintain: Expressed juice
Poplar: Decoction of leaf buds
Silverweed: Infusion of whole plant, except roots
Solomon's seal: Decoction of root

BE AWARE

For Headaches: Willow leaves and bark make a decoction containing Salicin, a constituent of Aspirin.
For Healing: Express the juice from Comfrey leaves to aid tissue regrowth.

EXPELLING WORMS

Bracken: Infusion of roots
Feverfew: Decoction of leaves and flowers
Figwort: Infusion of whole plant, except roots
Tansy: Infusion of leaves and flowers; use sparingly in small amounts

Tropical Medicinal Plants

Many thousands of tropical plants are known to have medicinal properties and are used by tribal peoples. Relatively few have been studied by Western scientists or are widely known. The following are a few of the many plants which may be of use, but lacking accurate information on medicinal plants you will do better to take medicines with you. NEVER experiment with something you cannot positively identify.

Copperleaf *(Acalypha indica) is one of several similar shrubs in India and southeast Asia, reaching 2–3m (6–10ft), with oval to heart-shaped leaves that are often variegated in shades of red, bright pink and green. In Malaya, the leaves are dried and drunk like tea. A decoction of roots and leaves is laxative and restorative.*

Alstonias, *including* Alstonia scholaris *are found from India east to Phillipines and south to Indonesia and parts of Australia. Boil the bark in water to produce a tonic, reduce fever, relieve diabetes and kill internal parasitic worms.*

Antelaea azadirachta *occurs from India to China and Indonesia. A decoction of leaves and bark will help to suppress malaria and dysentery. Use oil from seeds to treat ulcers and skin complaints.*

Bruceas *occur in many, fairly similar forms from India east to China and south to Australia. All parts are bitter tasting. Take seeds of* Brucea sumatrana *for diarrhoea and dysentery. Crushed leaves relieve external bleeding and sooth boils and insect bites.*

Elettaria cardamomum *is a relative of ginger, found in India eastwards, and is a tall, herbaceous plant with thick, fleshy rhizomes and a long, branched head of flowers. Use seeds or expressed juice of fruit for settling the digestion and relieving nausea.*

Cinchonas, *China Barks or Red Barks (*Cinchona*), large trees, typically with red-brown trunks, wild in tropical South America, have been taken all over the world. Take a decoction of the quinine-containing bark to suppress malaria.*

Horseradish Tree *(Moringa oleifera, see* Tropical plants *in* Food*) is a fairly common edible plant of the tropics. Use expressed juice from the roots and leaves to treat skin eruptions and inflammations.*

Kibatalia arborea *is another Asian tree whose bark, when cut, yields a latex-like sap. Use this sap, in small amounts, to treat worms.*

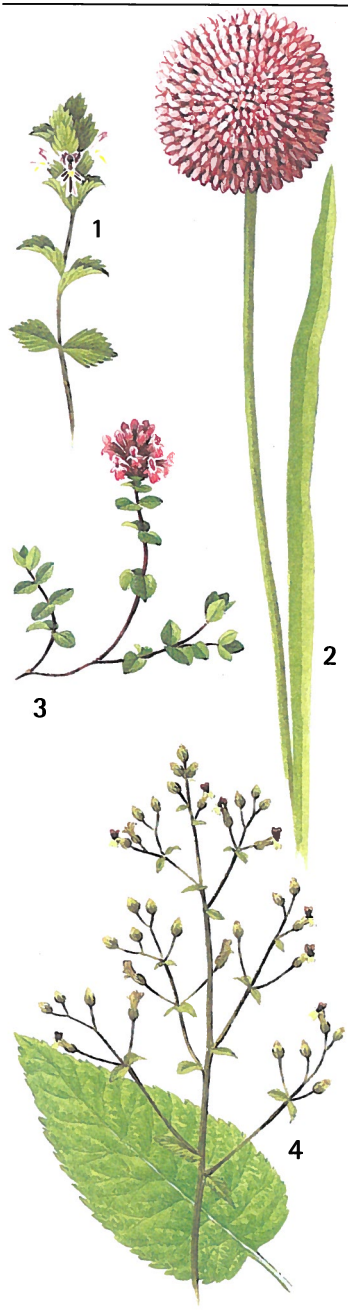
Sida cordifolia *is an erect, downy annual, up to 1m (3ft) tall, with oblong toothed leaves and yellowish flowers. It occurs from India east to Taiwan. Use an infusion of the leaves for coughs and fevers. The seeds are mildly laxative.*

Pergularia extensa *has stems with stiff spreading hairs, broadly oval leaves up to 15cm (6in) long and small greenish-white flowers. It grows in tropical Africa. Use tender leaves and shoots as a potherb or in a strong infusion to treat tapeworm and diarrhoea. Use a poultice of leaves on boils, abscesses and wounds.*

Crateava religiosa *is found from India east to Papua New Guinea and Polynesia. A decoction of bark and leaves relieves upset stomachs, feverish aches and pains.*

Baobabs *(Adansonia, see* Desert plants *in* Food*) Scrape gum off the bark. Use to treat worms and diarrhoea.*

MEDICINAL PLANTS



These medicinal plants are found in temperate climates. Many are very common and all are quite safe. Use them to staunch bleeding and heal wounds, for fevers, colds and digestive upsets and other treaments as described. Some have several uses, but they have been grouped here under their most common applications.

GENERAL AND ANTISEPTICS:

1 Eyebright *(Euphrasia officinalis) grows to about 30cm (1ft), with oval, often downy leaves and white flowers tinged violet or purple-veined and with a yellow spot in grassy places, often in mountains, in Eurasia. A strained infusion of the whole plant is excellent for eye infections. It is also said to ease hayfever, catarrh and nasal congestion.*

2 Garlics *(Allium) occur in many varieties in most temperate and, now, tropical parts. The smell will lead you to them; most have long, strap-like leaves arising from the bulb and a tall stem topped with a cluster of small pinkish or white flowers. The bulb is powerfully antiseptic; use as expressed juice externally diluted with water to treat wounds and swellings, and eat garlic to treat and to prevent colds. It also contains a natural antibiotic.*

3 Wild Thyme *(Thymus serpyllum) is small, aromatic, mat-forming, with small oval leaves and reddish-purple flowers; in dry grassy places in western Eurasia, but other species occur elsewhere. Use its antiseptic qualities in an infusion for coughs and colds, or as a potherb.*

4 Figwort *(Scrophularia nodosa) grows to 90cm (3ft), with square stems, pointed oval leaves and red-brown flowers; in woods, clearings and scrub in Eurasia – there are many*

different kinds. Apply as a decoction to reduce swellings, sprains, boils and bruises, to dissipate blood clots, and for treating haemorrhoids.

BLEEDING:

5 Self-heal *(Prunella vulgaris) is a downy, creeping plant with pointed oval leaves and heads of violet flowers; in dry grassy and waste places in Eurasia. Use as expressed juice to staunch bleeding or by infusion for internal haemorrhage.*

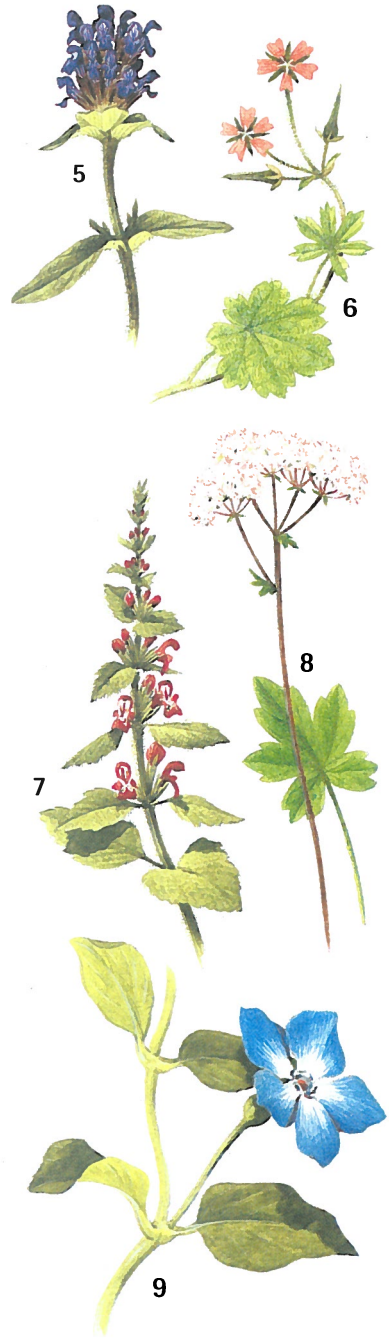
6 Dove's-foot Crane's-bill *(Geranium molle) grows to 30cm (1ft) with a hairy stem, deeply lobed leaves and small, pinkish, five-petalled flowers; in dry grassy and waste places. Use as expressed juice to staunch bleeding or as a decoction for internal haemorrhage.*

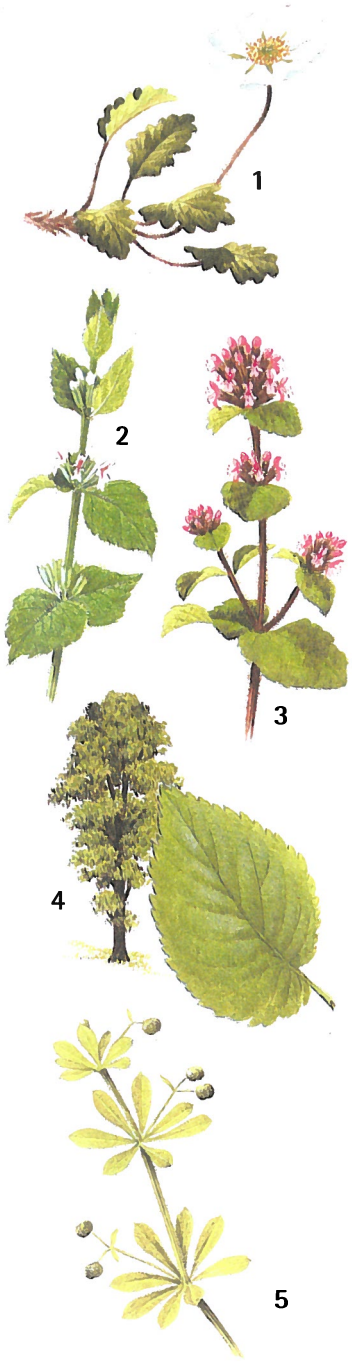
7 Marsh Woundwort *(Stachys palustris) is strong-smelling, hairy, up to 90cm (3ft) tall, with toothed, heart-shaped leaves and spikes of dark pink to purple, white-blotched flowers; usually found in damp places; similar species by woodland edges and shady waste place. Use as expressed juice to staunch bleeding or by infusion for bathing aches, sprains and wounds.*

8 Sanicle *(Sanicula europaea) grows to 50cm (20in), with hand-shaped, deeply lobed leaves and tiny white or pinkish flowers in a compact head; widespread in woodland in Eurasia. Use as expressed juice to staunch bleeding or by infusion for internal haemorrhage.*

9 Greater Periwinkle *(Vinca major) grows to 50cm (20in), with leathery, evergreen, broadly spear-shaped leaves and large blue-violet flowers; in woody, scrubby and rocky places in Eurasia. There are many kinds of periwinkle in other parts of the world. Use expressed juice externally to staunch bleeding.*

Plantains (see *Edible plants* in *Food*) *provide juice for treating wounds and for treating chest complaints..*





INTESTINAL PROBLEMS:

1 Mountain Avens *(Dryas octopetala) resembles a creeping wild strawberry, with well-lobed leaves, paler below, and large white, yellow-stamened flowers; in mountainous rocky and northern Arctic areas. Use an infusion of stems, leaves and flowers for diarrhoea or as a gargle.*

2 Balm *(Melissa officinalis) is lemon-scented and hairy, growing to about 60cm (2ft), with toothed, oval, greenish-yellow leaves and whorls of small white flowers at the leaf bases; in grassy places in the warmer part of Eurasia. Use an infusion of the whole plant for fevers and nausea. Can also be used to ease painful menstruation.*

3 Water Mint *(Mentha aquatica) is aromatic, hairy, always near fresh water, with toothed, pointed oval leaves, a purplish stem to 80cm (32in) and clusters of pinkish flowers. Use an infusion of the leaves for diarrhoea, as a digestive and heated to induce perspiration in fevers. Similar mints are also effective. If made too strong the infusion may become emetic (cause vomiting).*

4 Elms *(Ulmus) are tall trees with large, oval, toothed leaves, green disc-shaped fruits and, often, suckers at the base of the trunk. Use a decoction of the bark for diarrhoea and skin eruptions.*

5 Cleavers or **Goosegrass** *(Galium aparine) is straggling, with long prickly stems, whorls of narrow prickly leaves and small white flowers; widespread on moist, woody and waste ground. Young plants can be boiled and eaten like spinach. Use an infusion to ease constipation. Give frequent doses, mixed with an equal quantity of Marsh Mallow for cystitis.*

6 Agrimony *(Agrimonia eupatoria) grows to 90cm (3ft), with a downy stem, toothed, spear-shaped leaflets, greyish below, and a tall spike of yellow flowers; in dry grassy places – there*

are several different kinds. Use an infusion of the whole plant to ease constipation and acid stomach. Also use to treat cystitis, giving small doses frequently.

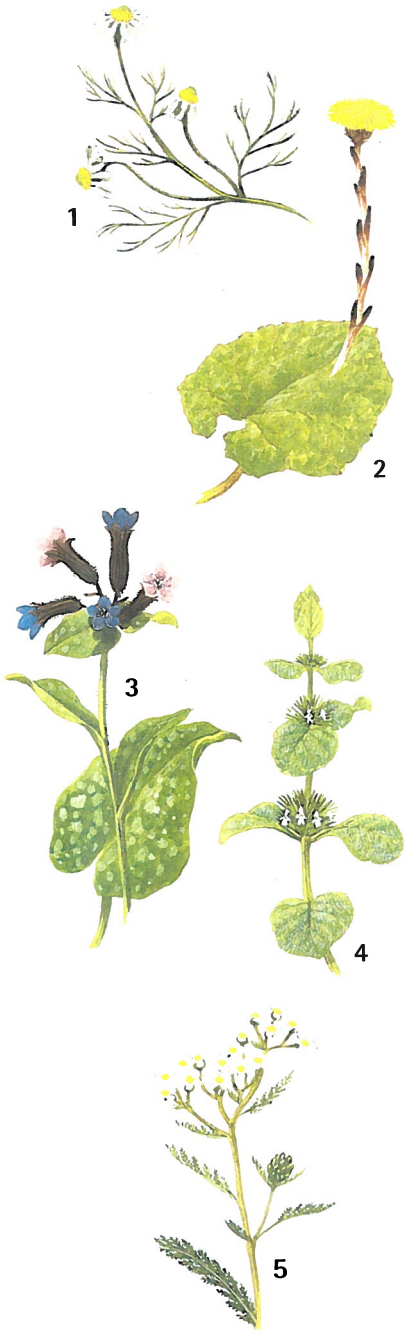
7 Lesser Celandine *(Ranunculus ficaria) grows to 20cm (8in), with shiny, dark green, heart-shaped leaves and yellow flowers, in wet woodland and damp ground in Eurasia. Apply the expressed juice externally for haemorrhoids; do NOT confuse with its poisonous relatives, the buttercups.*

8 Solomon's Seal *(Polygonatum) are small, patch-forming, with arching stems bearing tube-shaped greenish-white flowers; in woody, scrubby areas. Use a decoction of the root externally for haemorrhoids and bruises, or take an infusion for nausea. The starchy root is edible like parsnips, but when boiled and dried it sets hard as makeshift plaster for a splinting agent. Either an infusion, or a poultice made from the powdered root, will ease bruising. Berries are POISONOUS.*

Silverweed *(see Edible roots in Food) also provides an infusion for the treatment of digestive disturbance and haemorrhoids.*

FEVERS, COUGHS AND COLDS:

9 Feverfew *(Tanacetum parthenium) is very aromatic, growing to 45cm (18in), with delicate yellowish leaflets and many daisy-like flowers; in waste and grassy places in Eurasia. Eating the leaves eases headaches and migraines, but in some people this can cause blistering in the mouth. It is safer to use an infusion of the whole plant for fevers, headaches and general pains, or as a tincture for insect bites. Frequent small doses of a hot infusion help regulate contractions in childbirth.*



FEVERS, COUGHS AND COLDS CONTINUED:

1 Camomile *(Chamaemelum nobile) is aromatic, creeping, with finely dissected leaves and daisy-like flowers; in grassy places in Eurasia. Use an infusion of the whole plant for fevers, headaches, migraines, and colds, or the expressed juice of the flowers for aches and strains. It has a calming influence especially on nervously excited children.*

2 Colt's Foot *(Tussilago farfara) is common from late winter on bare and waste ground. Large, yellow dandelion-like flowers top asparagus-like stems; heart-shaped leaves follow the flowers. Use the leaves by infusion for colds and coughs.*

3 Lungwort *(Pulmonaria officinalis) is downy, up to 30cm (1ft), with pale-spotted spear-shaped leaves and bell-shaped pink or purplish-blue flowers; in mixed woods and scrub in Eurasia. An infusion of the whole plant is excellent for chest complaints and useful for diarrhoea. For coughs use with equal parts of Colt's Foot.*

4 Horehound *(Marrubium vulgare) is thyme-scented, downy, with squarish stems to 50cm (20in), roundish, crinkly, greenish-white leaves and whorls of whitish flowers; in dry scrubby places in Eurasia. Use an infusion of the whole plant for chills and respiratory disorders; oil expressed from the leaves soothes earache. It is a good cough treatment for children. In large doses it is a laxative.*

5 Yarrow *(Achillea millefolium) is downy, aromatic, up to 60cm (2ft), with dissected, feathery, dark green leaves and heads of tiny white or pink flowers; in grassy places. Use an infusion of the whole plant, but NOT the roots, for colds and fevers. It also hastens clotting of the blood in an injury and reduces blood pressure and bleeding in haemorrhoids.*

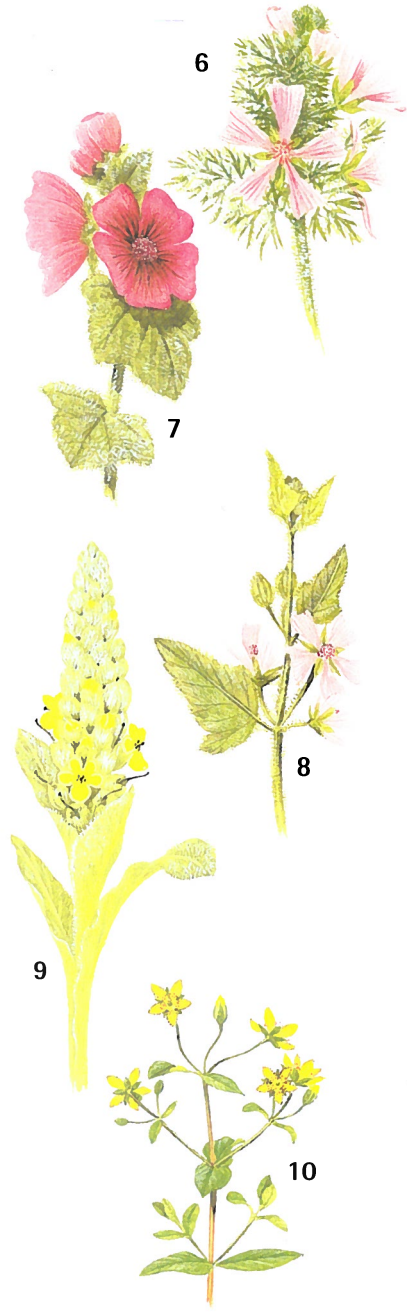
6 Musk Mallow *(Malva moschata) grows in grassy and scrubby places to about 60cm (2ft), with a hairy stem, deeply divided leaves and large, pink, five-petalled flowers. Mallows are widespread and come in many varieties. Use this like Marsh Mallow (8).*

7 Tree Mallow *(Lavatera arborea) grows to 3m (9ft), with a hairy stem, woody at the base, ivy-shaped leaves and pink-purple flowers streaked darker purple; in rocky coastal areas from Europe to Asia Minor. Use this like Marsh Mallow (8).*

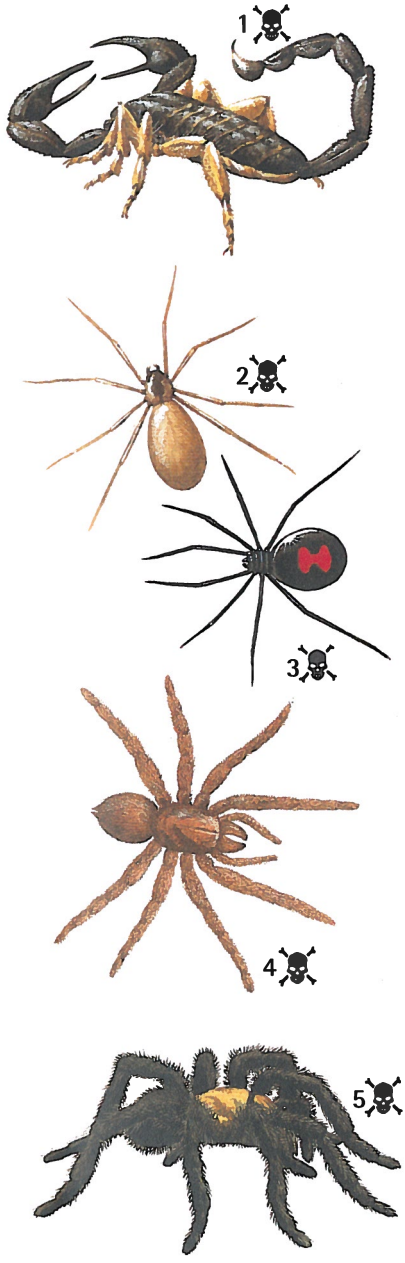
8 Marsh Mallow *(Althaea officinalis) grows to 90cm (3ft), downy grey, with large lobed leaves and pale pink flowers. The cooked root is excellent to eat. Use an infusion of the whole plant for chest complaints or one just of the root to relieve giddiness caused by loss of blood and to clean wounds and sores. A rubbing with bruised leaves soothes insect bites; boiled leaves are a good poultice for skin eruptions. An infusion of the leaves will relax and soothe irritation and inflamation of the alimentary system.*

9 Great Mullein *(Verbascum thapsus) is covered in pale woolly down, growing to 2m (6ft), with large spear-shaped leaves and a dense spike of five-petalled yellow flowers; in dry, warm grassy places. Use an infusion of flowers and leaves for coughs and chest complaints, or a decoction of the root as a gargle. Powder the flowers to make a sedative and pain-relieving tea.*

10 St John's Wort *(Hypericum perforatum) grows to 60cm (2ft), with small, oblong, translucently spotted leaves and a head of golden-yellow flowers that exude a red juice when crushed; in open woods, grassy and bushy places. Use an infusion of the whole plant for colds and chest complaints.*



DANGEROUS CREATURES



The insects and other creatures shown here are not a major problem for survivors if sensible precautions are taken – but can easily become one if not treated with respect.

1 Scorpions *are found in deserts forests and jungles of tropical, subtropical and warm temperate areas, one kind living at 3600m (1200ft) in the Andes, and are mainly nocturnal. Most desert kinds are yellowish to light green, those from moist or higher mountain areas brown or black. Average size is 2·5cm (1in) but giants in southern Africa and New Guinea reach 20cm (8in). Some burrow but they are usually found under tree bark, rocks, or other shelter, including your gear. The sting is in the tail. Many kinds cause only trivial discomfort, a few produce nerve toxins causing temporary paralysis for 24–48 hours. Some scorpions from the Middle East, Brazil and west Mexico can inflict a fatal bite, but this is very rare and death is more likely in young children and the old or ill, who offer little resistance to it.*

2 Recluse *or* **Fiddleback Spider** *(Loxoscees reclusa) of North America is recognised by a violin shape on the back of the head. There are several different kinds, but* L. reclusa *is the worst. Bite produces fever, chills, vomiting, joint pain and spotty skin, within 24–48 hours. Although rarely fatal, tissue degeneration around the wound can cause disfigurement, or even lead to amputation, if left untreated.*

3 Black Widow *or* **Hourglass Spiders** *(Latrodectus) occur in warmer areas, including deserts, over much of the world. Small, dark, all can be recognized by the red, yellow or white markings on the abdomen, hourglass-shaped in some. Bites produce severe pain, sweating, shivering and*

weakness, disabling the victim for up to a week. Rarely fatal.

4 Funnelwebs *(Atrax) are large greyish or browny spiders of Australia. Chunky, with short legs, their name alludes to their web's shape. Nocturnal, and not found in hot, dry, sunny conditions. A bite can kill; symptoms as for the Black Widow.*

5 Tarantulas *(Theraphosidae and Lycosa) are very large hairy spiders of tropical America; one kind occurs in southern Europe. Of menacing appearance, but although a bite is painful the poison is fairly mild and not disabling.*

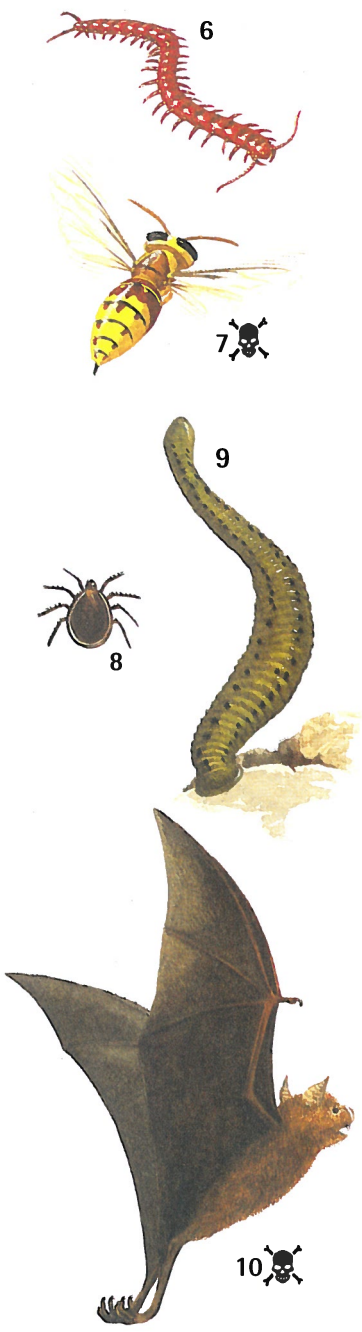
6 Centipedes and millipedes *are mostly small and harmless but some tropical and desert kinds may reach 25cm (10in). Their feet have sharp claws, which can puncture the skin and cause infections, and a few kinds have a poisonous bite. Brush off in the direction they are moving – there is less chance of them digging into you.*

7 Hornets *occur in swarms and make nests that are guarded ferociously. Some tropical kinds are very aggressive and very poisonous, and should be well avoided. The sting is like being punctured by a hot rivet and several at once could be fatal.*

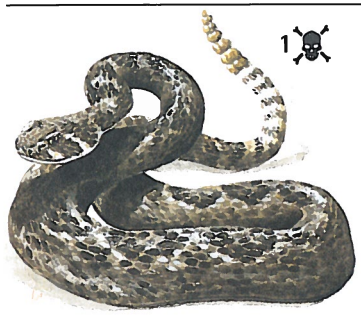
8 Ticks *are large and common in the tropics; flat-bodied and round, with a small biting head that eats into a wound. Do not pull off; the head will remain and cause infection. Use heat, petrol, alcohol or hot water to make it drop off.*

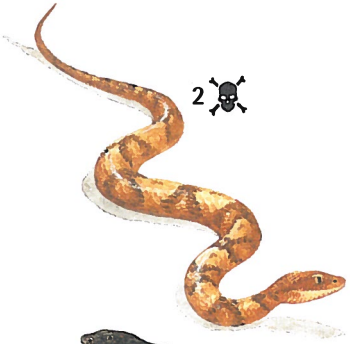
9 Leeches *are blood-sucking worm-like creatures of tropical jungles and other moist areas, waiting, thread-like, on vegetation before attaching themselves to a victim. Better not to pull off: remove with fire or a pinch of salt. Leeches often carry infections.*

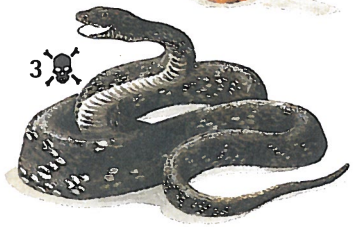
10 Vampire Bats *(Desmodus) occur in Central and South America. Small, nocturnal, they suck the blood of sleeping victims. Their bites may carry rabies. Keep covered at night in these areas.*



POISONOUS SNAKES







WARNING

Unless indicated to the contrary, these snakes should be regarded as deadly poisonous. Do NOT approach, provoke or handle.

SAFETY RULES

- **Watch where you step:** *On average snakes eat only once a week. After eating and at the times when they shed their skin they are sluggish and more easily trodden on.*
- **Look closely** *before parting bushes, picking fruit, some snakes are arboreal.*
- **Never tease, pick up or corner:** *A few snakes, such as the Bushmaster of South and Central America, Black Mamba of Africa and King Cobra of Asia will attack when cornered or guarding a nest.*
- **Use sticks, not hands** *to turn over stones and logs and for digging.*
- **Wear stout boots** – *if you have them. The teeth of many snakes are too small to penetrate them.*
- **Check bedding, clothes, packs** *before putting them on. Snakes may use them as shelter.*
- **Stay calm** *if you encounter a snake. Do not move suddenly or strike at it. Back off slowly. In most cases the snake will be only too eager to escape.*
- **To kill:** *If you have to kill a snake use a long stick, preferably with a spring to it, and a single chopping blow to the back of the head. Make it effective first time – a wounded snake is very dangerous.*

NORTH AND SOUTH AMERICA

1 **Rattlesnakes** *(Crotalus and Sistrurus). Many kinds occur in all parts of North America, varying from 45cm (18in) to over 2·1m (7ft). All have a chunky body, wide head and rattle on the end of the tail that is usually but not always sounded as a warning. The largest are the various Diamondbacks,*

with distinctive diamond-shaped blotches.

2 Copperhead *(Agkistrodon contortix) averages 60–90cm (2–3ft), with a stout body coloured buff or orange-brown with rich brown bands and a copper-red head; mainly in the eastern United States. Fairly timid; bites are only rarely fatal.*

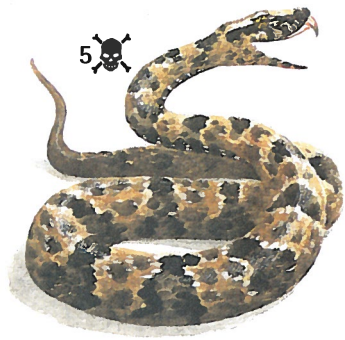
3 Cottonmouth *or* **Water Moccasin** *(Agkistrodon piscivorus) averages 60–130cm (2–4ft) with a thick brown or brownish-olive body, sometimes blotched, and a yellowish, also blotched, belly; the inside of the mouth is white. Aquatic, in and by freshwater in the southern United States. Belligerent – do not annoy!*

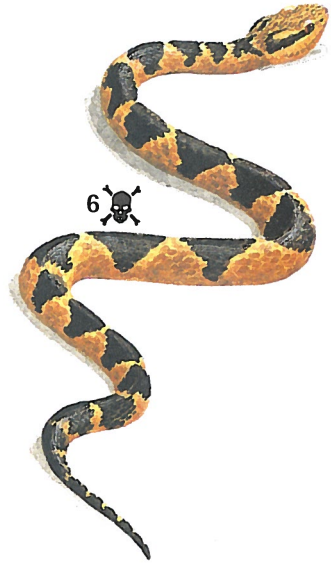
4 Tropical Rattlesnake *(Crotalus durissis) averages 1·5–2m (5–6ft), with diamond-shaped marks, two dark stripes on the neck and a rattle on the tail; nocturnal, in drier areas from South America north to Mexico. Large, aggressive, very dangerous.*

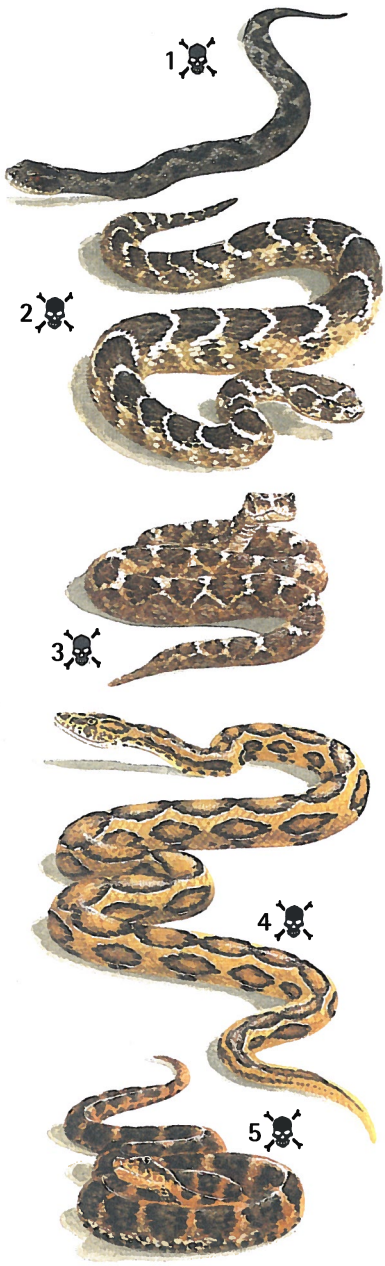
5 Fer de Lance *(Bothrops atrox) is brownish with paler geometric markings and averages 1·3–2m (4–6ft); causes many deaths. Its many relatives vary from grey to brown or reddish with similar markings.* Bothrops *vipers occur in South America north to Mexico; some are arboreal. All loop their body before striking.*

6 Bushmaster *(Lachesis muta) is large-headed, pinkish-brown marked with large dark brown triangles and averages 2–2·6m (6–8ft) or more; nocturnal, in lowland forests, often using burrows and holes, in Central and South America. Vicious if cornered; the most feared of all New World snakes.*

7 Coral Snakes *average 45–90cm (1½–3ft), are slender and strikingly coloured in bands of black and red separated by bands of yellow or white; from the southern United States into South America. (Similar kinds occur in Southeast Asia.) Small-mouthed, reluctant to bite but deadly.*







There are NO rules for identifying poisonous snakes. Cobras usually show hoods and rattlesnakes rattles on their tail, but these are NOT reliable guides. Poisonous snakes must be learned individually. If in doubt, treat every snake as poisonous.

EUROPE

1 Adder *(Viper berus) averages 30–75cm (12–30in), varying from olive-grey to reddish-brown with a zigzag pattern of darker colouring; especially on heaths, moors and open areas, into mountains. The only poisonous snake of northern Europe, hardly ever fatal, but with larger and more dangerous relatives in southern Europe.*

AFRICA AND ASIA

2 Puff Adder *(Bitis arietans) is thick-bodied, short-tailed and large-headed, straw-brown with darker markings and averages 90–130cm (3–4ft), in semi-arid areas often near water, of Africa and the Arabian Peninsula. Similar relatives occur in other habitats. Many different vipers are found in all parts of Africa and Eurasia, from sandy areas to thick jungle.*

3 Saw-scaled Viper *(Echis carinatus) is rough-scaled, pale reddish to sandy-brown with darker markings and white blotches, and averages 40–55cm (16–26in); in arid areas from North Africa west to India. Vicious, common; causes many fatalities.*

4 Russell's Viper *(Vipera russelli) averages 1–1·25m (40–50in), brownish, with three rows of spots formed of white-bordered black rings with a reddish-brown centre; in most areas except thick forest from Pakistan east to Taiwan. Responsible for most viper bites in the area.*

5 Malay Pit Viper *or* **Moccasin** *(Calloselasma rhodostoma) averages 60–80cm (24–32in) and is fawn,*

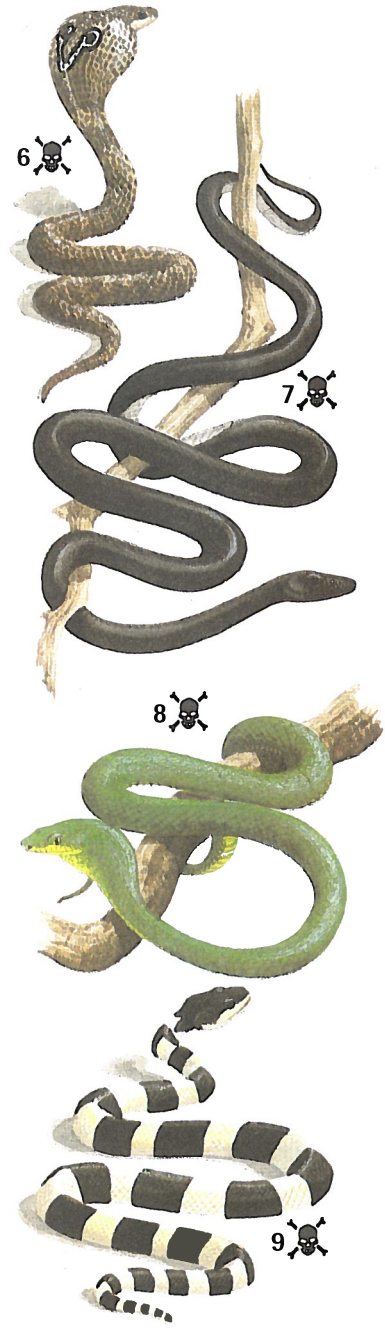
reddish or grey marked with geometric patterns, the belly yellowish or spotted greenish-brown in light growth in south-east Asia and parts of Indonesia. A frequent cause of bites and with many relatives in the area. AVOID any that resemble it.

6 Cobras *occur from Africa east through India to Indonesia and the Philippines. They usually average 1·5–2m (5–6ft) and, when alarmed, are recognizable by the raised head and spreading, often marked, hood. Common in some areas, especially rocky and semi-arid ones.*

7 Mambas *(Dendroaspis) are small-headed, very slender, typically with large green or greyish scales and averaging 1·5–2·1m (5–7ft); in Africa south of the Sahara, usually in trees but the large Black Mamba* D. polylepis *is largely terrestrial. Often quick to strike, fatal in almost all untreated cases.*

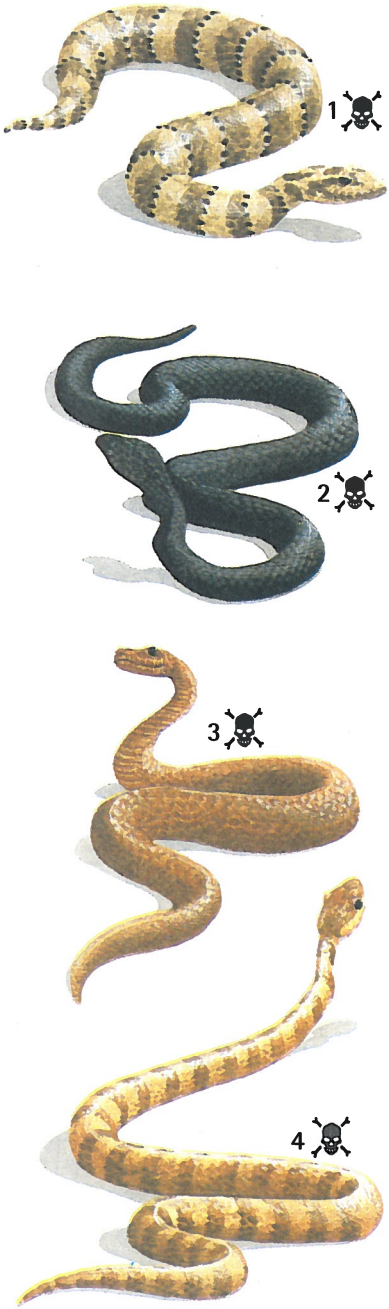
8 Boomslang *(Dispholidus typus) averages 1·3–1·5m (4–5ft), very slender, varying from greenish to brownish or blackish; in trees and very hard to spot, in savannah parts of Africa south of the Sahara. Highly venomous; it inflates its throat when alarmed.*

9 Kraits *(Bungarus) average 90–150cm (3–5ft), are small-headed and some have black and white or black and yellow bands down the body, in both open and forested areas from India to Indonesia. Nocturnal, inoffensive, but bites are often fatal.*



SPITTING SNAKES

A few cobras, including the ringhals of southern Africa, spit poison as well as bite. This is a purely defensive measure and is not dangerous unless the poison reaches an open cut or the eyes. If it does, wash out immediately with water or, in an emergency, with urine.



AUSTRALASIA

1 Death Adder *(Acanthophis antarcticus) is brownish, reddish or grey with darker banding, thick-bodied and averages 45–60cm (18–24in); in sandy areas of much of Australia, Papua New Guinea and some nearby islands. Well camouflaged; highly venomous, but not so dangerous as the Tiger Snake and Taipan.*

2 Australian Black Snake *(Pseudechis porphyriacus) averages 1·5–2m (5–6ft), slender, bluish-black with a bright red belly; in or near fresh water over much of Australia. There are several different kinds. Very rarely fatal, it flattens its neck when aroused.*

3 Australian Brown Snake *(Pseudonaja textilis) is slender, yellowish-grey to brown with a pale belly and averages 1·5–2m (5–6ft); in drier parts of Australia and Papua New Guinea. There is more than one kind. Aggressive and very poisonous.*

4 Tiger Snake *(Notechis scutalus) averages 1·3–1·6m (4–5·5ft), thick-bodied, large-headed, tawny-ochre banded with greenish-yellow, grey or orange-brown; in semi-arid areas of Australia and in Tasmania. Aggressive, very poisonous, the principal cause of fatal bites.*

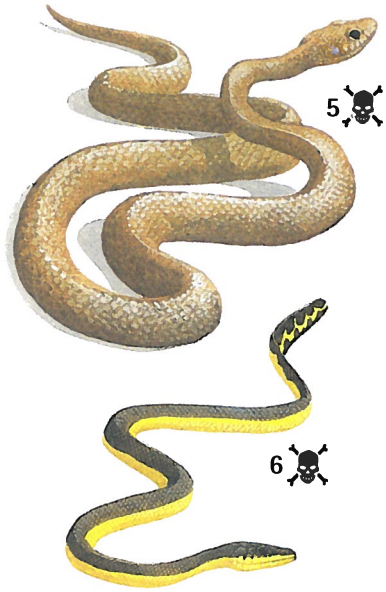
5 Taipan *(Oxyuranus scutellatus) is uniformly light to dark brown with yellowish-brown on the sides and belly and may grow to 3·5m (11ft); in open and forested parts of northern Australia. Ferocious when provoked, deadly poisonous.*

6 Sea Snakes *occur in the Indian and Pacific Oceans; some are partly terrestrial, in estuaries and coastal swamps. They vary in colour and size, averaging 1·3–1·5m (4–5ft) with a flattened, paddle-like tail. Their scales distinguish them from eels. Not aggressive, but some are the most venomous snakes of all.*

Snakes have excellent camouflage, only movement gives them away. In snake-infested areas you will pass many every day without ever noticing them.

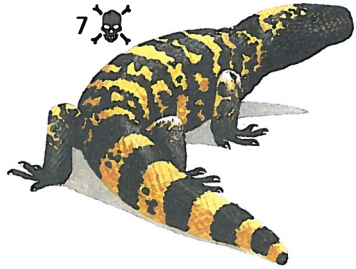
The chances of being bitten are small and all but the worst cases recover. In Malaysia, more people are killed each year by falling coconuts and in India rat-bites produce many more cases for hospitalization!

A bite from a poisonous snake should always be taken seriously, but there are degrees of severity. When biting in self-defence, many snakes inject only a little venom, occasionally none at all. If the snake is out of condition or has recently bitten something else, its venom may not be fully potent and there may be only a little in its venom sacs. Clothing or shoes may have deflected the full force of the bite. In many poisonous snakes the dose of venom needed to kill a man far exceeds the amount that can be injected in one bite.



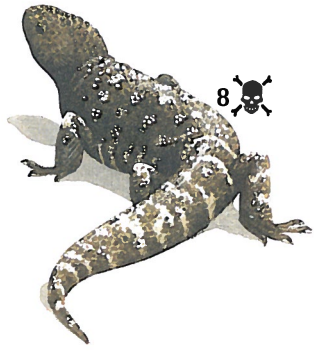
SNAKE FREE!

There are NO poisonous snakes in New Zealand, Cuba, Haiti, Jamaica, Puerto Rico, Ireland, Polynesia and the polar regions.



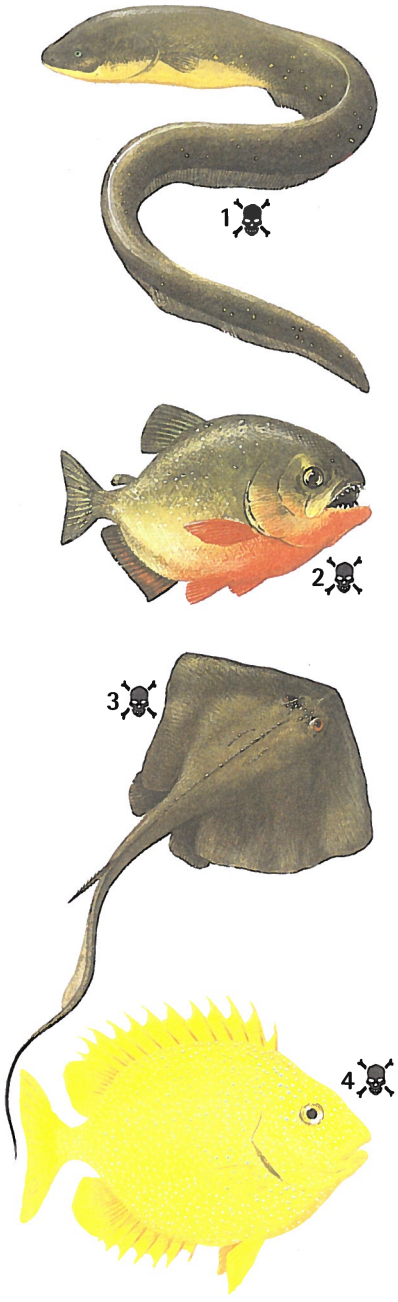
LIZARDS

7 Gila Monster *(Heloderma suspectum) is a lizard found only in the deserts of Arizona, Mexico and nearby areas. Large rounded head, thick chunky body, short stumpy tail and brightly patterned in yellow. Averages 37–45cm (15–18in). Bite is poisonous but likely only when handled.*



8 Beaded Lizard *(Heloderma horridum) resembles the Gila Monster but is darker and larger, with a slenderer tail, and spots rather than a mottling of colour; in a few arid parts of Mexico and Central America. Docile, but the bite is poisonous. Do not handle.*

DANGEROUS SEA CREATURES



These fish and sea creatures are dangerous. Most are either poisonous to touch or have poisonous flesh.

RIVER DANGERS

1 Electric Eels *(Electrophorus electricus) may reach nearly 2m (7ft) long and 20cm (8in) thick, rounded, coloured olive to blackish, and paler underneath, native to Orinoco and Amazon river systems of South America. Often prefer shallow water where there is more oxygen. The shock from a large one can be 500 volts, enough to knock a man off his feet.*

2 Piranhas *(Serrasalmus) occur in the Orinoco, Amazon and Parguay river systems of South America. They vary in size but may be up to 50cm (20in) long and are all deep-bodied and thickset, having large jaws with razor-sharp interlocking teeth. They can be very dangerous, particularly in the dry season when the water levels are low.*

SEA AND RIVERS

3 Stingrays *(Dasyatidae) are a danger in shallow waters, especially tropical ones, and not only on sandy shores. Very variable, but all with the distinctive ray shape though hard for the wader to spot. A few kinds occur in rivers in tropical South America and West Africa. The freshwater stingrays rarely exceed 30cm (1ft) long. They do not occur in rivers that flow into the Pacific. Venomous spines in the tail can inflict severe, sometimes fatal, injury.*

SALTWATER DANGERS

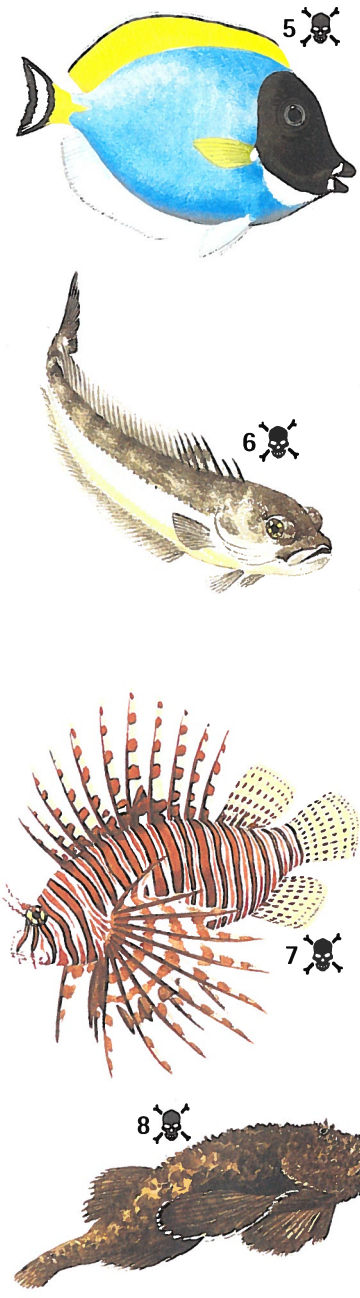
4 Rabbitfishes *or* **Spinefeet** *(Siganidae) occur mainly on reefs in the Indian and Pacific Oceans, averaging 25–30cm (10–12in); edible but with sharp spines in most fins. These are said to be venomous. Handle with care.*

5 Tangs *or* **Surgeonfishes** *(Acanthuridae) average 20–25cm (8–10in), deep-bodied, small-mouthed, very colourful, with lancet-like spines on the sides of the tail that can inflict severe wounds when it is lashed. In all tropical waters.*

6 Venomous Toadfishes *(Batrachoididae) occur in tropical waters off both coasts of Central and South America. Averaging 3–4cm (7–10in), they are dull-coloured and large-mouthed. They lie buried in sand and have sharp, very poisonous spines on the back.*

7 Scorpionfishes *or* **Zebrafishes** *(Scorpaenidae) are found mostly on reefs in the tropical Indian and Pacific Oceans. Averaging 30–75cm (12–30in), very variable, but usually reddish with long, wavy fin rays and spines. A sting is intensely painful. Less potent relatives occur in the Mediterranean and Atlantic.*

8 Stonefishes *(Synanceia) occur in the tropical Pacific and Indian Oceans. Reaching 40cm (16in), their drab colours and lumpy shape make them almost impossible to see. When trodden on, dorsal spines inject venom that is agonizingly painful, in the worst cases fatal.*



The venomous Toadfish, Stonefish and Zebrafish are edible. If you land one strike it on the head and handle only when completely dead, and then with great care.

Though not venomous, there are other fish with dangerously sharp spines, which are not always easy to detect, except at close quarters. The spines usually occur on the back but may also be on fins on the side of the fish. Even a small spine can inflict a bad prick with consequent risk of infection. Large spines — and some spiny catfish grow as large as a man — are as effective as stilettos.

Sea urchins can also inflict painful injuries and Sea anemones can sting.

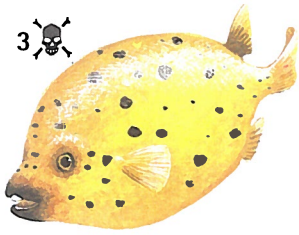
1 Weeverfishes *(Trachinidae) tapering, dull-coloured, about 30cm (1ft) long, lie buried in sand off the coasts of Europe south to West Africa and the Mediterranean. Venomous spines on back and gills produce disabling pain. Soothe it by applying very hot water.*

POISONOUS TO EAT

Many inshore fish, living in reefs and lagoons, are poisonous to eat. The majority are confined to the tropics but, wherever you are, be wary of eating any fish that you cannot identify.

Some fishes that are otherwise good to eat, such as the Barracuda and Snapper, are inedible when taken from reefs and lagoons, where they will have absorbed poisonous substances with their own food.

The most poisonous kinds, such as puffer fish, usually have rounded bodies with hard, shell-like skins covered in bony plates and spines. They also commonly have parrot-like mouths, small gill openings and either lack pelvic fins or have only a small one.



2 Porcupine Fishes *(Diodontidae) occur in all shallow tropical waters. Variable, reaching 50–60cm (20–24in), but when alarmed all inflate into a very spiny ball. Their flesh is poisonous.*

3 Puffer Fishes *(Tetraodontidae) occur in all tropical and many warmer temperate waters, a few kinds in rivers in south-east Asia and tropical Africa. Stout-bodied, rounded, 15–75cm (6–30in) long, most kinds with spines; when alarmed they puff up into a ball. Their blood, liver and gonads are poisonous; 28mg (1oz) can kill.*

4 Triggerfishes *(Balistridae) occur in huge variety, mostly in shallow tropical seas. Deep bodied, compressed, usually under 60cm (24in), with very large, stout dorsal spines. Many kinds are poisonous to eat. Avoid them all.*

OTHER SEA CREATURES

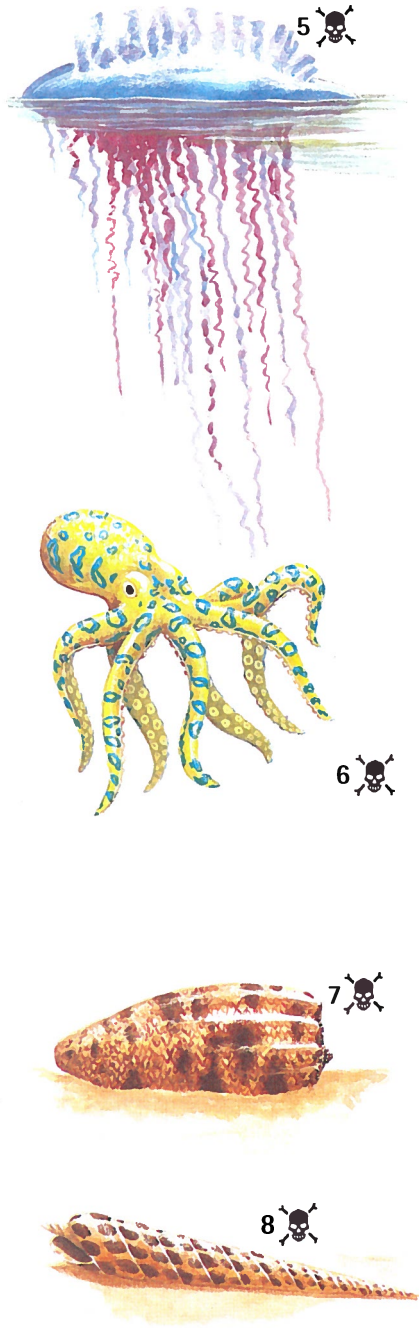
5 Portuguese Man-of-war *(Physalis physalis), not a jellyfish but a colony of hydroids, is mainly sub-tropical but common in the Gulf Stream which may take it to British shores. Southern currents carry it, for example, to New Zealand. The floating bladder may be only 15cm (6in) long, but the tentacles, which carry stinging cells, can stream out for 12m (40ft). Not fatal but enough to incapacitate, so extremely dangerous.*

The Common Jellyfish *(Aurelia aurita), a milky saucer-shape with purplish horseshoe marks inside, is not dangerous to humans but many others are, especially the* **Sea wasps** *or* **Box Jellyfish** (Chironex fleckeri), *with a cube shaped bell 25cm (10in) long and clusters of tentacles at the corners up to 9m (30ft) long. In big doses venom can be fatal. Avoid all jellyfish streamers – even when washed up on the beach.*

6 Blue-ringed Octopus *(Hapalochlaena lunulata), small, sometimes only fist-sized, found off eastern Australia, particularly around the Great Barrier Reef, is greyish white with iridescent ring-like markings. Very poisonous, potentially lethal bite if trodden on or handled. Treat all tropical reef octopuses with caution.*

7 Cone shells *(Conidae), subtropical and tropical gastropods, have a venomous harpoon-like barb. All are cone shaped but shell patterns may be obscured by a membrane. Some very poisonous, a few, in the Indo-Pacific, lethal. DO NOT TOUCH.*

8 Augers *or* **Terebra Shells** *(Terebridae) temperate and tropical seas, particularly the Indo-Pacific, also have a stinging barb. They are much thinner and longer than cone shells. The sting is not as serious as the Cone's, but do NOT eat.*



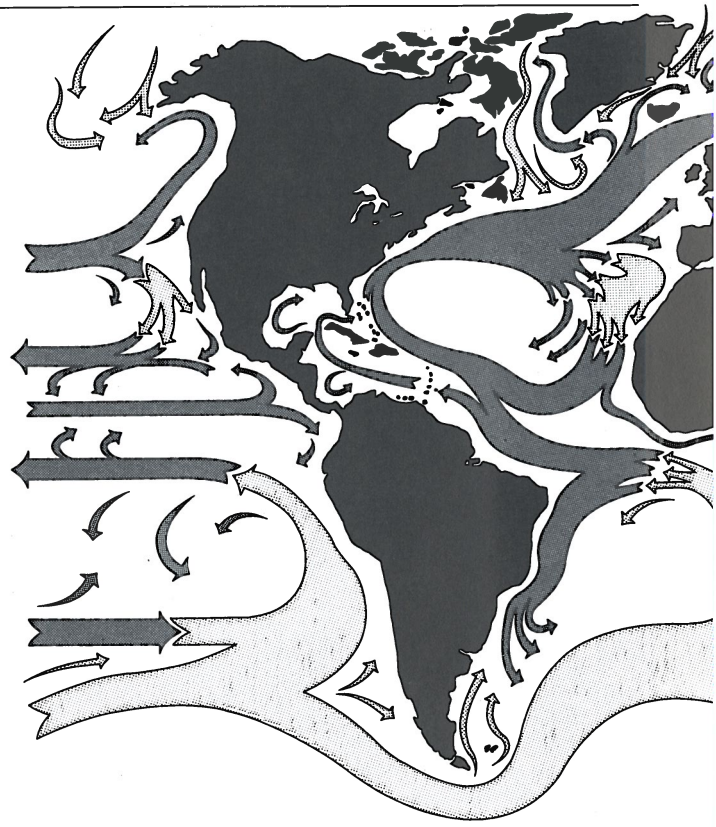
9
SURVIVAL AT SEA

Conditions of survival at sea are perhaps worse than those of any other environment and make the sternest demands. Planes and boats carry survival equipment, but even getting into a dinghy in a heavy sea can be difficult.

Once any emergency supplies of food and water run out, sources are not reliable – so any possibilities of obtaining food from the sea and collecting drinking water must be exploited to conserve supplies as long as possible.

Not all fish are edible and some are even dangerous to handle. Shark dangers are often exaggerated, but should not be ignored. Appropriate action is needed to avoid or deter them. A difficult coast can make even a final landfall hazardous, so heed the advice on lessening the risks.

SURVIVAL AT SEA



Four-fifths of the earth's surface is open water – probably the most frightening of all environments, and the most difficult in which to survive. In cold water the body soon becomes chilled and even in a boat wind can chill the body rapidly. Alone in cold water your chances are not good without equipment.

If you know your location and the main ocean currents you may be able to predict where they will carry you, though it will be very slowly. Warm currents, such as the Gulf Stream, across the North Atlantic, are rich in fish and sea creatures.

Coastal waters are also often rich in sea foods – but there are dangerous species, such as sharks, and poisonous species, mainly living in shallower water near lagoons and reefs in warmer climates. Fresh water is a bigger problem if you have no means of distilling sea water.

Lifeboat drill

Lifeboat drill is carried out on every ship soon after it sails and should become a well-rehearsed procedure. Passengers are instructed in how to fit lifejackets, how they are to proceed to their lifeboat stations, and what to take with them. Sailors in small boats should also devise such a drill and instruct everyone on board.

SURVIVAL SCENARIO

Is it easier to survive in warm or cold waters?

A survival situation at sea in warmer climates is preferable to cold-water survival. You can only survive for a short time in cold water before hypothermia sets in. If you do find yourself going into cold water take as much survival kit as you can, and then get out of the water asap. If you are in a lifeboat, establish a routine so that order is maintained in the boat.

If the signal is given to abandon ship put on warm, preferably woollen, clothing including hat and gloves and wrap a towel around your neck. Clothes will not drag you under if you end up in the water and they will help ward off the worst enemy – exposure. Take a torch if you can and grab chocolates and boiled sweets if they are handy. Do NOT push or shout or you may start a panic – an orderly embarkation into lifeboats and on to rafts or dinghies will be faster in the long run and establish a calmer attitude.

Don't inflate your lifejacket until you leave the ship or plane. On small boats lifejackets should be worn all the time. They are brightly coloured and are usually equipped with a whistle, light, marker dye and – when for use in warmer waters – a shark repellent.

If you have to jump overboard, first throw something that floats and jump close to it.

Abandoning ship

Abandoning a ship or ditching from a plane, it is essential that you take what equipment you can with you. A lifejacket or lifebelt will save a lot of energy that you might otherwise expend in trying to keep afloat. But even without one it is not difficult to float in the ocean. The human body is of lower density than saltwater and anyone who has learned to relax in the water is not in immediate danger from drowning. However, panic or fear make relaxation difficult and many find floating difficult under these conditions. Without a lifejacket or lifebelt, air trapped in clothing will help buoyancy – a good reason for keeping your clothes on despite the frequent advice that you should strip them off.

MAN OVERBOARD!

If you have been swept overboard your first aim, apart from keeping afloat, will be to attract attention. Sound travels well over water – shouting and splashing can be effective. Wave with one arm above the water (not both, you will go under) – movement will make you more noticeable.

If you are wearing a lifejacket – and on a small boat you always should be – it will probably be equipped with a whistle and a light, as regular-issue 'Mae Wests' usually are.

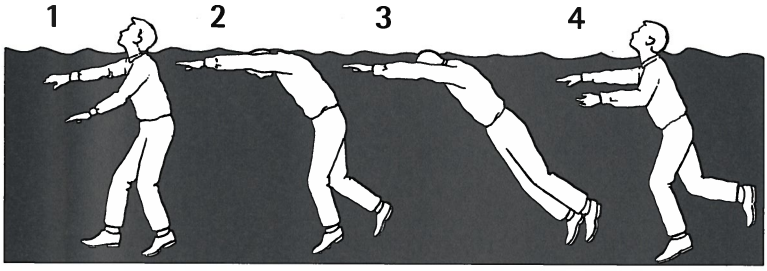
Swimming

Swim slowly and steadily. If you are abandoning a sinking boat or aircraft get upwind and stay clear of it. Keep away from any oil or fuel slick.

If there is a fire and you have to enter the water, or swim through flames, jump into the water feet first and up wind, swimming into the wind using a breast stroke, try to make breathing holes by splashing the flames away from the head. If the fire is not too extensive it is best to swim underwater until clear of that danger.

If there is a danger of an underwater explosion while you are in the water, the risk of injury will be reduced if you swim on your back.

If within sight of land don't battle against the ebb, relax and float until it turns and helps to carry you to land. If the sea is too rough to float on your back adopt this technique.



1 *Float upright in the water and take a deep breath.*
2 *Lower your face into the water (keeping your mouth closed) and bring your arms forward to rest at water level.*
3 *Relax in this position until you need to take in more air.*
4 *Raise your head above the surface, treading water, and exhale. Take another breath and return to the relaxed position.*

Flotation 'bags'

You can improvise a short-term flotation bag from a pair of trousers. Knot the bottoms of the legs, sweep them over the head to fill with air, then hold the waist below the water to trap the air inside, making the legs into water wings to lean on.

Immediate action

Once you are clear of the wreck and have got your bearings, inflate your dinghy or look out for a boat or raft or wreckage which can offer support. If there is no boat or dinghy grab as much flotsam as possible to use as a raft. Tie it together with anything that is available – ties, belts, shoelaces, spare clothing. Salvage any floating equipment.

Inflating a dinghy

Aircraft and many boats and ships carry dinghy-type lifeboats. Many are self-inflating and activated by saltwater immersion.

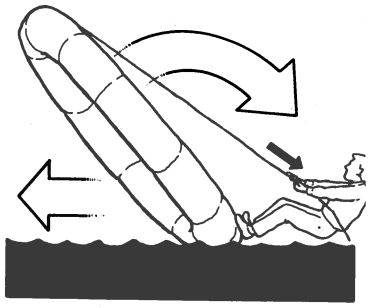
If they do not inflate automatically, there is a pump provided. There are several inflation points because the dinghy is built in sections, so that if one compartment is punctured the others will still keep the dinghy afloat.

Boarding an inflatable dinghy

Get aboard as soon as possible. If you are already in the water move to the end (not the side) of the dinghy, place one leg over the edge and roll into the dinghy.

Do NOT jump into a dinghy from above, you may damage it.

To haul someone else aboard a dinghy, raft or lifeboat hold their shoulders and lift one leg over the end, then roll them in. Discourage them from putting their arms around your neck – they could pull you into the water. Then tie yourself and others to the dinghy.



RIGHTING AN INFLATABLE DINGHY
Most dinghies have righting straps on the bottom, and larger ones have a righting line attached to one side. Grab it from the opposite side, brace your feet against the dinghy and pull. The dinghy should rise up and over, pulling you out of the water momentarily. In heavy seas, or a high wind, this can be extremely difficult.

Ensure that the dinghy is fully inflated. It should be firm – not rock-hard. If it is not you will need to inflate it with your own breath or a pump. The valves are one-way and air will not escape when you take off the protective cap.

Check for leaks. Escaping air will cause bubbles under water and above water will make a hissing sound. Deal with them with conical plugs that you will find in the dinghy kit. They screw into holes and seal them. You will probably also find a supply of rubber patches and adhesive.

Make daily checks of inflation and leaks. If you suspect a leak on the underside swim under and insert a plug.

SURVIVAL AFLOAT

Rafts, boats and dinghies are built to carry a limited number of survivors. The lives of those aboard will be even more endangered if these numbers are exceeded.

The safety of the majority must be the priority. Place the infirm, youngsters and any injured in the dinghy or boat first and as many of the able-bodied as the boat is made to accommodate. The rest must hang on in the water. The fit survivors aboard should rotate with those in the water on a regular and frequent change-over rota. But remember that exposure to cold water, to the inexperienced and even the young and fit, can be fatal.

Stow all the gear in any stowage places provided and tie everything securely. Check that there are no exposed sharp objects which will damage an inflatable. Ensure that anything that will spoil if wet is in a waterproof container and kept out of the water.

Check all signalling equipment: flares, rockets, heliographs. If distress signals have already been sent out you will need them to attract the attention of rescue parties when they are searching for you.

If a distress call has gone out giving your position it is best to try to maintain location, so put out a sea anchor. This should look like a large canvas bag. Streamed out from the boat it will keep it into the weather and slow down drift.

You can improvise a sea anchor from any weighted object securely tied to a line. Even clothing could be used, possibly tied to a paddle with reef knots.

If you do not know where you are do NOT attempt to navigate until you have established your position, but if you can see the shore head towards it.

SURVIVAL PRIORITIES

- PROTECTION from the elements and the effects of exposure.

- LOCATION Try to establish where you are and the best way of attracting rescue.

- WATER Take stock of supplies. Ration it at once. Start collecting any rain.

- FOOD Don't eat, unless you have sufficient water. Check all rations available, stow them securely. Start fishing as soon as possible.

PROTECTION

Even if you are alone keep a log on a daily basis. This will occupy the mind and help keep you oriented. First record names of survivors, date and time and position of accident, weather conditions, equipment salvaged, and record sightings and circumstances daily.

In a cold climate

If the water is cold it is essential to get out of it as soon as possible. You need to counter the chilling effect of the wind, especially if you are wet. Keep the boat or dinghy as dry as possible. Bail out all the water and rig up an awning to keep out spray if you can find any material to use for it.

Dry all wet clothing and if there is no dry clothing to put on squeeze out as much water as possible and then put the clothes back on.

Maintain body heat by wrapping all parts in any available material, such as parachute or canvas. If in a group of survivors huddle together to keep warm. To prevent stiffness to muscles and joints, and to keep the circulation going, do mild exercises, such as stretching and arm circling. Be careful not to disturb the balance of the raft or boat by excessive or sudden movement.

Most modern dinghies have a built-in shelter. If yours does not, rig up a windbreak and a spray shield. Stretch any material that is available across to keep out spray and breaking waves. With adequate shelter and warm clothing, exercise will protect against the risk of frostbite.

In a hot climate

Take off unnecessary clothing, but still keep the body covered. If exposed directly to strong sun always keep the head and neck covered to avoid sunstroke or burn. Protect the eyes from the sun glare by improvising eye shields.

During the day damping down clothes with sea water will help to keep the body cool but make sure that you are thoroughly dried out by evening, for nights can be very cold – and remember that darkness comes quickly in the tropics. Remember also that prolonged contact with sea water can cause sores on the skin.

When it is very hot let out some air from an inflated dinghy, for air expands with the heat – you will need to release the valves. Reinflate in the evening when it cools.

WATCHES AND LOOK OUTS

In a group assign watches. There should be a look out all the time – even in darkness. Each watch should be for a short period to avoid exhaustion and lack of concentration. It is better for everyone to have several watches a day than for any one person to have long periods on duty.

It is the responsibility of the watch to look out for shipping, aircraft, signs of land – and for seaweed, shoals of fish, birds, wreckage. They should also inspect the raft for signs of leakage or chafing.

IS LAND NEARBY?

When there is no land in sight you may find some of these indicators of land and the direction in which it may be found:

Clouds:

Cumulus clouds in an otherwise clear sky are likely to have been formed over land.

In tropical waters a greenish tint on the underside of clouds, known as lagoon glare, is produced by the reflection of sunlight from the shallow water over coral reefs.

Birds:

A lone bird is not a reliable indication of land, and after rough weather birds can be blown way off course, but few seabirds sleep on the water or fly more than 100 miles from land. Their direction of flight is usually outwards from land before noon and return in the late afternoon. The continuous sound of bird cries is usually an indication that land is not far distant.

Driftwood:

Driftwood, coconuts and other drifting vegetation are often a sign that land is near (though they can be carried right across an ocean).

Sea movement:

The pattern of the swell may indicate land. A change in its direction may be caused by the tide pattern around an island.

Prevailing winds build up a swell pattern and the swell is less if the water is protected by land. If the wind is constant but the swell and waves decreasing you can be fairly certain that land lies to windward.

Sea colour:

Water that is muddy with silt is likely to have come from the mouth of a large river.

TRAVELLING

If an SOS has been successfully sent, or you know that you are in or near regular shipping lanes, it is usually preferable to stay in the same vicinity for 72 hours.

If none of these circumstances hold, then no time should be lost in getting underway to take advantage of initial fitness and energy, especially if land is known to be near and downwind.

If there is no land nearby, assess the nearest shipping lane and head in that direction.

DECIDING FACTORS

Take these factors into consideration in making your decision whether to stay or travel:

- The amount of information signalled before the accident.
- Is your position known to rescuers? Do you know it yourselves?
- Is the weather favourable for a search?
- Are other ships or aircraft likely to pass your present position?
- How many days supply of food and water do you have?

Your craft will move with the wind and current. In the open oceans currents seldom exceed a speed of 9–13km (6–8) miles per day. Take in the sea anchor. Use the wind if you can. In a craft with no keel it is only possible to sail full tilt with the wind or at most at an angle of 10 degrees off it.

Use a paddle as a rudder. If the wind is against your chosen direction stream the sea anchor to maintain position.

To use the wind

Inflate the dinghy fully and sit high. Improvise a sail if you do not have one. Do not secure its lower edges but hold the lower lines or the bottom of the sail so that if there is a sudden gust of wind you can release them and the raft is not capsized.

In rough water

Stream out the sea anchor from the bow. It will keep the bow always into the wind and prevent capsizing. Keep low in the raft. Do not sit on the sides or stand up. Never make sudden movements. If there are several rafts or dinghies, tie them together.

SIGNALLING AT SEA

Flares, dye markers and movement of any kind are the ways of attracting attention at sea. If you have no signalling equipment, wave clothing or tarpaulins and churn the water if it is still. At night or in fog a whistle is useful for maintaining contact with other groups of survivors.

If a radio transmitter is part of the equipment aboard a life-raft instructions for its operation will be found on its side. Frequencies are usually preset at 121.5 and 243 megacycles and the range is about 32km (20 miles). Transmit at frequent intervals but exercise discretion in using battery-operated transceivers. The batteries are precious. (See *Signalling* in *Rescue*.)

Sea markers, which release dye into the water, are only of use in daytime. Unless the seas are very rough they will be conspicuous for about three hours.

Pyrotechnic equipment must be kept dry and secure. Read instructions carefully and beware of fire hazards. Day-and-night flares are particularly useful – one end produces smoke for daytime use. When firing flares and rockets you are holding a dangerous firework in your hand, so be very careful that you do not point them downwards or towards yourself or another person.

Use flares only when you are sure that they will be seen and fire to make sure that they are – when a plane is flying towards you, for instance – not when it has gone past. (See *Signalling* in *Rescue*.)

Most rescues have followed after heliograph signals have

attracted attention. Any shiny, reflective surface can be used to signal in this way.

HEALTH

Exposure and severe hydration are likely to be the biggest problems for the ocean survivor. Seasickness can increase dehydration.

Constipation, and often either difficulty in urinating or very concentrated urine, are not unusual in sea survival conditions. Do not attempt to treat them or you could force further liquid loss.

If feeling sick, try not to vomit and NEVER induce vomiting.

Continued exposure to saltwater can produce skin eruptions. Do not attempt to prick or squeeze any boils or blisters. As a precaution do not damp yourself down too often with salt water to keep cool. If there is any soreness, STOP.

Protect the eyes from glare off the sea with a mask and, if sore eyes are produced by glare, moisten a cloth with sea water and bandage this over the eyes and rest them. Do not do this for too long. The skin may become sore.

Immersion foot (see *Health*) can be a problem if subjected to very long exposure in a boat or dinghy awash with water. Exercise will help protects you from it and from frostbite and exposure. Keep well covered when resting and, when on watch, gently exercise the limbs.

WATER

Although a minimum 1 litre (1¾pt) a day is necessary to keep fit, it is possible to survive on 55–220cc (2–8oz).

Even if you have a good water supply, ration it at once (see p.40), reflecting these minimum needs until you can replenish your supply. Do not relax the ration until final rescue, for you have no idea how long you will have to last out.

Reducing water needs

Take all the usual precautions against water loss (see *Water* in *Essentials*). Reduce sweating as much as possible. Make use of breezes and use sea water to cool the body. If it is very hot, shade limited and the waters safe take a dip over the side – but first check your safety line. You should ALWAYS be tied on. Beware of dangerous fish and be sure that you can get back aboard.

If seasickness threatens take anti-sickness pills, if they are available, as soon as you start to feel queasy, for vomiting will lose valuable fluids.

If you are low on water do not eat, especially not protein foods – which include fish and seaweed – that require a lot of water to digest. Carbohydrates (sugars and starches) require less water for digestion.

WATER RATIONS

DAY 1:
NO WATER. The body is a reservoir and has a store.

DAYS 2–4:
400cc (14fl oz) if available.

DAY 5 ONWARDS:
55–225cc (2–8fl oz) daily, depending on the climate and water available.

When drinking, moisten the lips, tongue and throat before swallowing.

Gathering freshwater

Use every possible container to collect rainwater night and day – you will usually see a rain squall coming and have time to rig up a catchment from canvas or plastic, which will hold much more than cans.

At night rig canvas with edges folded to catch any dew.

When it rains drink your fill – but slowly, for if you have been on short water ration you will vomit if you gulp it down.

Stow as much in containers as you can. Drink up puddles in the boat first. But be careful in heavy seas as the water will be contaminated with salt. Water is good ballast in an inflatable – fill it to the brim and it will still float.

Sea Ice

Ice can produce drinking water. But new sea ice is salty. Use only old sea ice, which is blue-grey in colour and with rounded contours. It can be melted or sucked for the ice loses its salt after a year or more. In summer, pools on old sea ice may be drinkable (if they are not wave splashes). Taste very carefully before drinking, for drinking any salt will aggravate thirst.

Water from fish

Drink the aqueous fluid found along the spine of large fish and in the eyes. Carefully cut the fish in half to obtain it and suck the eye. If you are so short of water that you need to do this then do NOT drink any of the other body fluids for they are rich in protein and fat and will use up more of your reserve water in diges ion than they supply.

Treatment of sea water

Liferaft equipment may include solar stills and chemical desalination kits. They carry their own instructions. Set solar stills out immediately, but use the desalination tablets only when the weather is unfavourable for the stills and dew or rain catchment is ineffective.

REMEMBER:

DO NOT drink sea water

DO NOT drink urine

DO NOT drink alcohol

DO NOT smoke

DO NOT eat, unless water is available

Sleep and rest are the best way of enduring periods of reduced water and food – but make sure that you have adequate shade when napping during the day.

If the sea is rough, tie yourself to the raft, close any cover and ride out the storm as best you can. RELAX is the keyword – at least TRY to relax.

FOOD

Conserve any emergency food supplies until really needed, even then only taking a small nibble, and try to live off natural foods.

Fish will be the main food source. There are some poisonous and dangerous ocean fish but in general, in the open sea, out of sight of

land, fish are safe to eat. Nearer the shore there are fish that are both dangerous and poisonous to eat, including some, such as the Red Snapper and Barracuda, which are normally edible but poisonous when taken from the waters of atolls and reefs.

Flying fish will even jump into your boat!

Fishing

- Do NOT handle fishing line with bare hands and never wrap it around the hands or tie it to an inflatable dinghy. The salt which adheres to it can make it a sharp cutting edge – a danger both to the raft and to your hands.

- Wear gloves if they are available or use a cloth to handle fish to avoid injury from sharp fins and gill covers.

- Fish and turtles are attracted to the shelter from the sun provided by a dinghy or raft and will swim under it. If you have a net pass it under the keel from one end to the other (you need two people to hold the ends).

- Use a torch to attract fish at night – or on a moonlit night lower a piece of cloth, tinfoil or metal into the water to reflect the moon and it may also draw fish to it.

- Improvise hooks from whatever is available. Small folding pocket-knives, pieces of jagged metal, wire. Small bright metal objects may serve as 'bait' – including buckles, spoons and coins.

- If using a metal spoon or spinner keep it moving by paying out and reeling in. Let the 'bait' sink and then retrieve it.

- Use offal from caught fish for bait.

- Fish flesh spoils easily and in the tropics must be eaten fresh unless the air is dry – which is unlikely in the tropical oceans.

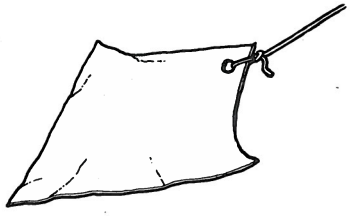
- In cooler zones excess fish can be dried in the sun for future meals. Clean and gut before drying.

Birds

All birds at sea are also potential food. They will be attracted to a raft as a potential perching place. Keep still until they settle and you may be able to grab them, especially if they are exhausted by flying in bad weather.

You may also catch birds using lines trailed in the water with hooks or gorges baited with fish.

A diamond-shaped tin gorge, wrapped with fish, and trailed behind the craft will attract birds. When a bird siezes the 'fish', the gorge should lodge across its gullet.



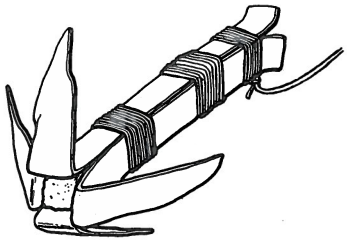
Seaweed

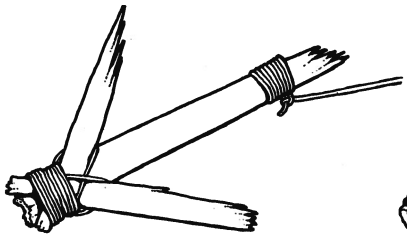
Seaweed not only occurs on shorelines but, far out in some oceans, there are floating forms, especially the *Sargassum* species of the Sargasso Sea and the North Atlantic Drift, which is found in many warm waters, and others which grow in the colder waters of the southern Atlantic and Pacific. Since raw seaweeds are tough and salty they are difficult to digest raw. They absorb fluids so should not be eaten when water is short.

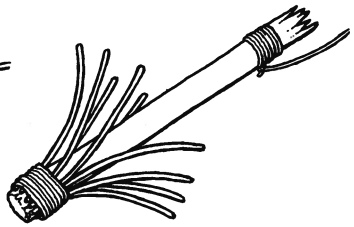
Seaweeds may also provide food in the form of the small crabs and shrimps living on them and small fish that you may shake out from among them if you haul some weed aboard. These small decapods are mottled brown in colour, like the weed, so are not easily seen on it.

Plankton, strained from the water, can also be a useful food source, especially in the cold southern waters (see *Polar food* in *Climate and Terrain*).

Make a grapple hook by lashing pieces of wood or metal wreckage together to form a multiple hook. Attach it to a line and trail it behind, or throw it out to rake in weed. You can use it for gathering other drifting wreckage to consolidate a makeshift raft.







DANGEROUS FISH

Poisonous fish

Many reef fish have toxic flesh, some species at all times and in others only at certain times of year. The poisons are present in all parts of the fish, but especially in the liver, intestines and eggs.

Fish toxins are water soluble – no amount of cooking will neutralize them. They are tasteless – so the standard edibility tests (see *Food*) are useless. Birds are least susceptible to the poisons so do not think that because a bird can eat a fish, it is a safe species for you to eat. Cats appear less affected, though dogs and rats are as susceptible as humans.

The toxins will produce a numbness of the lips, tongue, toes and tips of the fingers, severe itching and an apparent reversal of temperature sensations. Cold things seem hot and hot things cold. There will probably also be nausea, vomiting, loss of speech, dizziness and a paralysis that eventually brings DEATH.

As well as those fish with poisonous flesh (see colour section) there are those which are dangerous to touch. Many kinds of ray have a poisonous barb in their tail; there are also species that can deliver an electric shock. Some reef fishes, such as Stonefishes and Toadfishes, have venomous spines which, although seldom fatal, can be VERY painful, causing a burning sensation or even agonizing pain out of all proportion to the apparent severity of the wound.

Jellyfish, which are sometimes barely noticeable in the water, can carry powerful stings. The Portuguese Man-of-War (not a true jellyfish) is a bluish bladder-like creature with a small fluted sail. Do not enter the water if you see these creatures. They trail very long 'streamers' which carry dangerous and painful toxins.

Aggressive fish

There are also a number of ferocious fish which should be avoided. The bold and inquisitive Barracuda has been known to attack man. It may charge lights or shiny objects at night. The Sea Bass, which can grow to 1·8m (5½ft), is another to keep clear of, and the Moray Eel, which has many sharp teeth and grows to 1·5m (5ft), can also be aggressive if disturbed. Sea snakes are venomous and sometimes occur in mid-ocean. They are unlikely to bite, but AVOID.

SHARKS

Only a handful of attacks by sharks are recorded each year, and only a minority are fatal. However, the survivor at sea is more vulnerable than the beach swimmer to whom statistics largely refer. Very few types of sharks are considered dangerous to man.

Six sharks account for most human casualties: the Great White, Mako, Tiger, Hammerhead, Bull and Grey Nurse. The Great White is the largest, but size is not an indication of danger and bears no relation to the likelihood of attack. A shark smaller than a man can still kill a swimmer. Basking Sharks and Whale Sharks may be 13.3m (44ft) long but they feed on tiny plankton and are not a problem.

Ocean sharks have the ability to kill but, in the tropics, their food is so abundant that they are not usually ferocious. These sharks are usually cowards and can be scared off by the jab of a stick, especially on the nose. However, making a commotion may ATTRACT sharks from a distance.

Sharks live and feed at considerable depths and for most of the time feed off the ocean bottom, but hungry sharks will follow fish to the surface and into shallow water. When it explores such water a shark is likely to be DANGEROUS.

A shark's usual diet includes fish, squid, crabs and a variety of other marine animals but it seeks food that is EASY to get and especially goes after stragglers from schools of fish or wounded prey. Sharks will follow a ship to scavenge refuse thrown overboard.

The shark feeds most actively at night and at dusk and dawn. Its small eyes have limited vision and it locates its prey by smell and vibrations in the water. It will be attracted by blood from wounds, body wastes and rubbish. Weak and fluttery movements will draw a shark's attention because they suggest a vulnerable, wounded creature. It will be repelled by strong, regular movements and loud noises.

Man's strange appearance is new to a shark and clothing produces a confusing shape. A group of clothed humans bunched together will be safer than a single individual. If a shark keeps its distance, it is only curious. If it circles inwards and begins sudden movement, the likelihood of attack is greatly increased.

Sharks cannot stop suddenly or turn quickly. A good swimmer can evade a single large shark by making rapid changes of direction which the shark cannot match.


1
2
3


4
5
6
7

FALSE ALARM

Not every fin showing above the surface is attached to a shark! The wing tips of large rays may break the surface and appear to belong to a pair of sharks moving, unnaturally, in perfect synchronization. The fins or flippers of whales may also appear – likewise those of porpoises and dolphins, which are harmless and will probably show themselves more completely.

The sharks shown here have been known to attack man.

1 Great White Shark *(Carcharodon carcharias) grows to 6m (18ft) but usually less, grey above, white below, very thick bodied, with pure black eyes and a stubby conical snout; in all oceans but mostly off southern Africa, east and west North America and southern Australia and New Zealand.*

2 Mako *(Isurus oxyrichus) averages 2–3m (6–10ft), heavy bodied, ultramarine blue above, creamy-white below; in all oceans but most abundant in warm temperate waters. A very fast swimmer, occasionally leaps from the water.*

3 Tiger Shark *(Galeocerdo cuvieri) averages 3–3.5m (10–11ft), heavy bodied, barred or blotched above when young, when mature more evenly greyish above, white below, with a very wide head and jaws and abruptly squared-off snout, in all tropical and subtropical waters, often close inshore.*

4 Barracudas *(Sphyraena) are not sharks but thin, torpedo-like fishes, bluish-barred above, brilliant silver below, with a protruding mouth packed with sharp teeth, some kinds growing to 2m (6ft), in all tropical waters. Very fast, darting, often in shoals, usually dangerous only when there is blood in the water.*

5 Hammerhead Sharks *(Sphyrna) are immediately recognizable by their distinctively flattened hammer-like head. There are several different kinds, the largest reaching 6m (18ft); in all tropical and subtropical waters.*

6 Bull Shark *(Carcharhinus leucas) is found in the tropical west Atlantic with close relatives off southern Africa and in the Indian Ocean. Stout, grey above and white below, up to 4m (13ft). Aggressive, and dangerous in its liking for shallow water and ability to ascend far up rivers.*

7 Nurse *(Ginglymostoma), such as the Grey Nurse of eastern Australian waters, reach over 4m (13ft) heavily built, large-finned, greyish above and white below. Often found very close inshore.*

If you catch a shark

If a small shark is accidentally hooked it can be hauled to the side of the raft or boat, the head pulled clear, and clubbed hard before hauling aboard. Make sure it is really stunned before approaching and finishing it off with more blows to provide shark steaks.

DON'T try this with a large shark. It could injure you and your craft. You must cut your line and sacrifice part of it, for the shark's threshing will soon attract its fellows.

Protection against sharks

Unless wearing a lifejacket or travelling in a craft equipped with shark repellent, the risk is great to anyone in the water, but it is not a foregone conclusion that shark attack will occur. Shark repellent may not be 100 per cent effective – but even so, only use when absolutely necessary. Remember – you can only use it once.

In the water:

If sharks are present try to avoid passing body wastes, which could attract the sharks' interest. If you must urinate do it in short, sharp spurts and allow it to dissipate between spurts. Collect faecal matter and throw it as far away from you as possible. If you vomit try to hold it in the mouth and reswallow it, but if this proves impossible throw it as far away as possible.

If it is necessary to swim use strong, regular strokes, avoiding schools of fish.

If a group of people are threatened they should bunch together and face outwards. To ward off attack kick outwards and punch out with a stiff arm using the heel of the hand – like a sports 'hand-off'.

Make loud noises by slapping the water with cupped hands. Put your head under the water and shout. These measures are more effective with a group but can work even when you are alone and under attack. If you have a knife, be prepared to use it. Let the shark take it fully in the snout, or go for the gills and eyes.

On a raft or boat:

Don't fish when sharks are around and don't throw waste overboard (including excrement and fish offal). Let go of baited hooks. Do not trail arms or legs in the water. If a shark threatens to attack discourage it with jabs to the snout with a paddle or pole. Remember – a large shark could also take a bite out of a boat or raft.

BE AWARE

If you have shark repellent, follow manufacturer's instructions – but use only if the situation is very grave. The repellent will soon dissipate in the water and become ineffective. Choose your moment well, since you can only use it once.

MAKING A LANDFALL

When you approach land try to select a landing point where it will be easy to beach or where you can safely swim ashore. Take down the sail and keep watch for rocks. The sea anchor will keep you pointing at the shore and will slow down your progress, giving you more time to steer away if you are heading for rocks. Try not to land with the sun in your eyes, which will make it more difficult for you to see rocks and difficulties.

A sloping beach with a small surf is the ideal place to choose – if you have any choice. If you can time it right, ride the back of a breaker. To avoid being swamped or turned sideways by an oncoming crest of a wave paddle hard, but do not overshoot a breaker which is carrying you along. In very heavy surf turn the vessel to face seaward and, as a wave approaches, paddle into it.

As you approach note the lie of the land: the location of high ground, types of vegetation, possible watercourses. You will see features which may be invisible from the shore. If with companions, choose a rendezvous spot to meet at if the boat breaks up and you are separated.

If you reach land at night wait until morning to beach if you can, there are too many dangers you can fail to spot in the dark.

If you float into an estuary make every effort to reach a bank. The turning tide could carry you back out to sea. Take in the sea anchor and, to gain ground, make the boat as light as possible. Bail out an inflatable and inflate it to the maximum. This enables you to make the most of the incoming tide.

If you are being swept back out to sea by the ebb, ballast the dinghy by part filling it with water and stream the sea anchor.

SURVIVAL TIP

Keep yourself tied to your raft. Even if it is overturned or damaged and you are rendered unconscious, you stand a chance of surviving. Alone in the water and dashed on the rocks – you are DEAD.

Swimming ashore

If you have to swim ashore on to rocks in a heavy sea keep on clothing, shoes and lifejacket if you have it. Raise your legs in front of you to take the shock of impact with rocks on the soles of your feet; absorb it in bending the knees.

10
RESCUE

Signalling is necessary to attract rescue and codes may be necessary for communication once a contact has been established. It will help the placing of signals, and increase their effectiveness, if the patterns used for search patrols are understood.

If survivors are being air-lifted out it may be necessary to prepare a landing place for aircraft or helicopters – so suitable locations are described and the precautions you should take in the presence of a helicopter.

SIGNALLING

The first requirement for rescue is to let others know of your situation and, if possible, your location. Once you are in contact you can pass on other information.

The obvious technique is to use a mobile or satellite phone, which should be used sparingly, but if you don't have the luxury of such systems then there are a number of internationally recognized distress signals. The letters SOS (for Save Our Souls) is probably the best known. It can be written, transmitted by radio, spelt out by semaphore or sent in Morse code by any method.

The signal 'Mayday' (a phonetic rendering of the French *m'aidez* – help me) is the one used in most radiotelecommunications by ships and planes.

Vehicle or aircraft wreckage

If you are with a stranded vehicle or downed aircraft it may provide many useful signalling aids. If there has been no fire there will be supplies of fuel, oil and hydraulic fluid which can be burned. Tyres and electrical insulation on a fire will generate black smoke.

Glass and chrome make great reflectors, especially engine cowlings and hubcaps. Lifejackets, dinghies, and parachutes are all brightly coloured and eye-catching. Arrange these colourful and shiny objects around your location where they will be most visible and attract attention.

Switch lights on at night – or if batteries are running low keep them in reserve to flash headlamps, sound the horn and otherwise attract attention, when passing aircraft or signs of possible searchers are observed.

Fire and smoke

Fire – both flames and smoke – is an excellent way of attracting attention. Establishing signal fires is one of the primary tasks once the immediate needs for treatment of injury and provision of shelter from harsh elements have been met. In a large group some people should set about gathering fuel for a campfire and for signal fires as soon as possible.

Where to site signals

When siting signals take full account of the terrain. Choose high points for light signals. If you are on a ridge, erecting an unusual silhouette may attract attention. If you are laying out marks on the

ground, use level ground or ensure that they are on slopes that are not likely to be overlooked in the usual pattern of aerial search.

SURVIVAL TIP

It is usual for planes to fly over hilly territory from the lower to the higher ridges. This creates the problem that the slopes behind the ridges may be hidden as the plane approaches. If in doubt, signals nearer the tops of ridges should be seen from whichever direction the rescue aircraft is travelling.

International codes

When contact has been established more complex international codes (shown later) will enable you to signal your basic needs, if verbal communication is not possible.

With air- or sea-rescue it may then be necessary to prepare a landing strip or to help rig lines or apparatus, and some knowledge of basic procedures will greatly facilitate the operation. (See *Helicopter rescue.*)

Transmitters

Dinghies, liferafts and even personal lifejackets are sometimes equipped with transmitters which send out bleeps indicating position, though these are not usually effective over a very long range. Many emergency radio transmitters are also very limited in range and to avoid wasting precious batteries should be held in reserve until there is some chance of their signals being picked up. With effective radio apparatus, however, distress signals should be sent out immediately and transmitted at regular intervals.

Check instructions on all transmitting apparatus. Ship and plane transmitters can operate on many wavelengths, but some emergency equipment is set to fixed distress channels.

Generally speaking, the portable VHF transceivers used by mountaineering teams can communicate only with stations in a direct line of sight and without any intervening obstruction (though sometimes a permanent relay station may be established on a strategic high point). Such sets are usually tuned to a mountain rescue frequency but procedures should be established before departure.

If you have a working transmitter, check the battery situation. Can the vehicle engine still be used to generate electricity or recharge the batteries? Conserve fuel for this purpose and plan your transmissions to a pattern rather than attempting long continuous periods on the air. If anyone picks up your signal they can then work out that they can expect it again.

Noise

Noise is also an excellent way of attracting attention if you know that people are within earshot. The International Mountain Distress Signal, apart from signalling SOS, is six whistles a minute (or six waves, light flashes, etc.) followed by a minute's silence, then repeated. A shout may be enough if you are trapped, or near help but too injured to reach it.

Be imaginative

Do not reject even such ideas as the message in a bottle. This particular method has a low chance of success if you are shipwrecked in the middle of the Pacific but on a river a more noticeable floating object which carries a clear message might well attract attention – a small raft with a bright sail labelled SOS for instance. Use your imagination to think of ways that will attract attention to you and your plight, without using up valuable energy and resources.

Moving on

If you decide that rescue is unlikely, and that your best plan is to make your own way back, you should leave clear signs behind so that if searchers do track down the disaster spot they have an indication of the route that you have taken. On your way you may have more success in attracting attention if closer to regular flight routes or in more open territory.

SIGNALS AND CODES

Fire signals

Three fires is an internationally recognized distress signal. Ideally they should be placed in a triangle at equal distances apart, an arrangement which also makes them easier to feed with fuel, but if that is not possible any grouping serves, provided that the fires are clearly separated. However, if fuel is scarce, or if you are too badly injured or too weak from

BE AWARE

Almost any signal repeated six times will serve as a distress signal. Depending on your location, this could be six fires, six columns of smoke, six loud whistles, six gunshots – even six flashes of light. If using noises or lights, wait one minute between each group of six signals.

hunger to maintain several fires, use only your campfire.

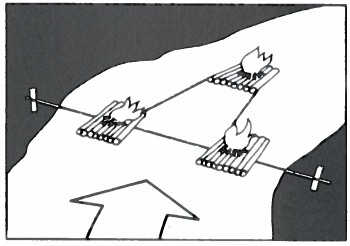
You can't keep signal fires going all the time but they should be prepared, covered to keep them dry, and maintained, ready to be lit to attract the attention of any passing aircraft. Build them with plenty of easily ignited tinder so that they will get going rapidly when lit. Birch bark makes an ideal tinder. Other tinder materials are described under *Fire* in *Camp Craft*.

Petrol can be used as a firelighter but DON'T just pour it on the fire. Use a piece of rag as a wick, soak it in petrol and lay it to the tinder. Don't light it straight away. Carry the fuel can off to a safe distance and wait a few seconds before lighting the wick. If a fire does not light first time pull the tinder apart, checking that there are no sparks or embers still burning, before adding extra petrol.

BE AWARE

- Keep a stock of green boughs or supplies of oil or rubber close by to create smoke if needed.
- Among vegetation or close to trees, build an earth wall around each fire to contain it.
- There is no point building fires among trees where they cannot be seen, the canopy will block out the signal. Place them in a clearing.

If by a lake or river, build rafts to place your fires on and anchor or tether them securely in position. Arrow indicates direction of current.



Torch trees

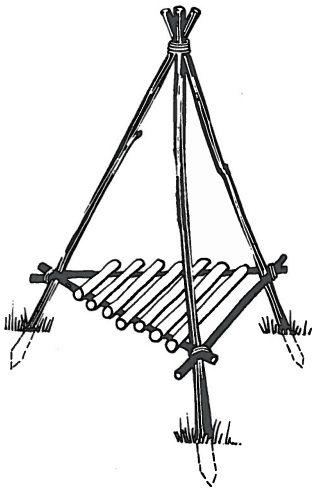
Small isolated trees make excellent fire signals. Build a fire between the boughs. Use plenty of dry twigs – old birds' nests make good fire starters. This fire will ignite the foliage and produce plenty of smoke. If a tree is dead start a fire at its base. It will burn for a long time leaving you free to attend to other signals.

NOTE: Do not risk starting a forest fire. Apart from the damage this will cause, your life will be in greater jeopardy.

Luminous cone fires

On a clear and open site make a tripod with a platform to support a fire. The platform keeps the tinder off damp ground, or you can store more firewood beneath it. Use a covering of evergreen boughs to keep the cone dry; they will burn brightly and give off a good smoke.

Cover the complete cone fire with bright coloured material, if available – a parachute would be ideal. This will not only keep the fire dry and ready to burn, but will itself be noticeable during the day. Whip it off when you ignite the fire – you may not attract attention the first time.



Keep these tripods well maintained, ensuring that wood is dry enough to light at a moment's notice and that the supply is not poached for other uses. Drive the pole ends into the ground to prevent tipping over in strong winds.

When alight the glow of this cone can be seen for miles. In an exposed location a smaller fire inside a conical tent or tepee of parachute fabric will also make a noticeable beacon. Ensure there is a smoke and heat outlet at the top of the tepee and keep the fire under control. If it is on a slope add fuel from the side or above the fire so that you do not excessively mask the firelight – though some flickering of movement before it may help to attract attention.

Use wreckage to help fire-signalling

Stand a fire on a piece of metal from an aircraft or vehicle. It will keep kindling from damp ground, when hot will increase convection and make the fire burn brightly and, if polished, will act as a reflector intensifying the brightness. Three such fires become an immediately recognizable distress signal.

Smoke indicators

During daylight smoke is a good locator, so have plenty of smoke-producing material ready to put on your fires. Choose this material to give off a smoke that shows up well against the surroundings.

Light smoke will stand out against dark earth or dark green forest. Produce it with green grass, leaves, moss and ferns. Any wet material will produce a good smudge fire and damp mats and seat covers will smoulder for a long time. This will also keep flying insects at bay.

Dark smoke will show best against snow or desert sand. Use rubber or oil to produce it. If atmospheric conditions make the smoke hang in layers along the ground then build up the fire to increase its heat. Thermal currents will then take the smoke to a good height.

BE AWARE

Smoke not only helps the pilot of a rescue aircraft find you, it also shows the surface wind direction. Make sure that smoke is downwind of the landing site and of any panel codes that you have laid so that it does not obscure them from above.

GROUND-TO-AIR SIGNALS

These letters are internationally recognized emergency signals. FILL is a useful mnemonic for remembering the main ones. The single bar: I is the most important and the easiest to make. A pilot will risk a great deal to answer such an emergency. Make them as large and as noticeable as possible using colour contrast or shadow. A recommended size is 10m long and 3m wide (34ft and 10ft) for each symbol, with 3m (10ft) between symbols.

Lay or make these panel codes out in the open, avoid steep gullies or ravines and do not make them on reverse slopes. Use the marker panels from your survival pouch (see *Essentials*), or if you do not have these — improvise. Lay out pieces of wreckage or dig out the signs as a shallow trench, banking up the earth so that it increases the depth of the shadow. Use rocks or boughs to accentuate it.

On snow, even tramping out the symbols will show clearly until the next snowfall.

Once contact has been made, a message dropped or signalled by the aircraft can be answered with A or Y (affirmative) and N (negative) signals, or Morse code or body signals.

GROUND-TO-AIR CODE

Serious injury – immediate casevac (casualty evacuation) – (can also mean NEED DOCTOR)

Need medical supplies

Need food and water

Negative (No)

Affirmative (Yes) – (Y will also be understood)

All is well

Unable to move on

Am moving on this way

Indicate direction to proceed

Do not understand

Need compass and map

Think safe to land here (Broken at angles, means ATTEMPTING TAKE-OFF)

Need radio/signal lamp/battery

Aircraft badly damaged

Night signals

These signals will attract attention during daylight, even if you are asleep or injured. If you have a supply of petrol or other inflammable substances, you can make signals which will work at night. Dig or scrape an SOS (or any symbol) in the earth, sand or snow and, when the signal is needed, pour petrol into it and ignite it.

NOTE: You MUST destroy these signals if rescued. They will go on working long after you have gone.

MESSAGE SIGNALLING

You do not need to learn a complicated system of semaphore. The international Morse code can be transmitted by flashing lights on and off, by a simple heliograph, by waving a flag or a shirt tied to a stick or using sound.

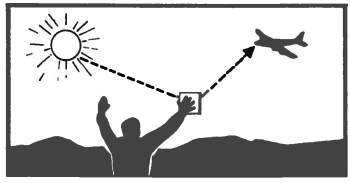
NOTE: Don't rely upon your memory – carry a copy of the code on your person. Even if you are a regular user and know it backwards others may need it who do not.

There is a procedure to follow when sending and receiving messages. Learn the special codes to make the operation easier.

Heliograph

Use the sun and a reflector to flash light signals. Any shiny object will serve – polish a tin lid, glasses, a piece of foil – though a hand-mirror is best. Sustained flashes are dashes and quick ones dots. If you do not know Morse code, even random flashes should attract attention. At least learn the code for SOS.

A flash can be seen at a great distance and even when you do not have a specific contact to aim for may attract someone's attention. It's worth trying, since it requires little energy. Sweep the horizon during the day. If a plane approaches closely make intermittent flashes or you may dazzle the pilot. Once you are certain you have been seen, STOP signalling.



SINGLE-SIDED REFLECTOR
With an improvised reflector pick up the sunlight to get an image on the ground or some other surface and lead it in the direction of the aircraft or other potential contact.

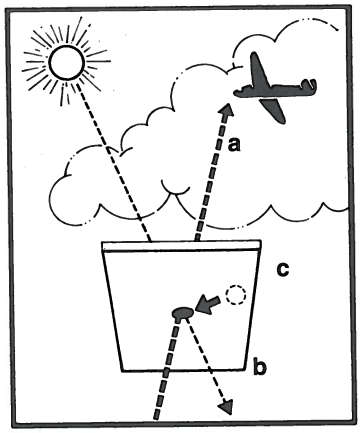
USING HELIOGRAPH

If you have a double-sided reflector and can punch a hole in it you will have something close to a standard issue heliograph.

Sight the person, plane, ship, etc, that you wish to contact through the hole in the heliograph (a) in the general direction of the sun, so that the sun will shine through the hole (b). You will see a spot of light on your face (c).

Angle the mirror so that the dot of light on your face 'disappears' back through the hole in the mirror – still sighting your contact.

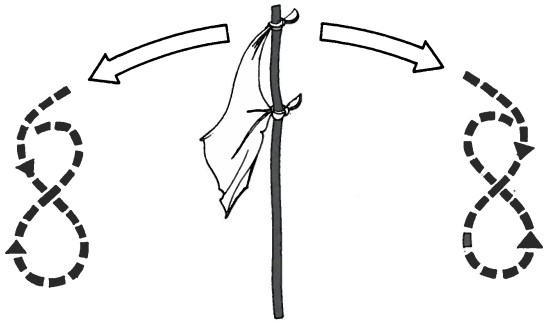
If the sun is at such an angle that this manoeuvre does not work bring the mirror close to your eyes and a hand lined up between you and the contact. Angle the mirror to flash on to your hand, then move the hand away.



NOTE: Practice this form of signalling, but unless you are in a survival situation, do NOT signal to aircraft or 'transmit' messages which could cause alarm or danger to others.

Rag signals

Tie a flag or a piece of brightly coloured clothing to a pole and move it left for dashes and right for dots. Exaggerate each movement with a figure-of-eight movement.



For a 'dot' swing to the right and make a figure-of-eight.

For a 'dash' swing to the left and make a figure-of-eight.

This simple signing may work without figure-of-eight movements at closer range. Keep 'dash' pauses on the left, slightly longer than 'dot' movements to the right.

INFO.

MORSE CODE

A	.–	N	–.	1	.––––
B	–...	O	–––	2	..–––
C	–.–.	P	.––.	3	...–––
D	–..	Q	––.–	4	....–
E	.	R	.–.	5	.....
F	..–.	S	...	6	–....
G	––.	T	–	7	––...
H	....	U	..–	8	–––..
I	..	V	...–	9	––––.
J	.–––	W	.––	0	–––––
K	–.–	X	–..–		
L	.–..	Y	–.––		
M	––	Z	––..		

SENDING SIGNALS

AAAAA* etc.– Call sign. *I have a message*
AAA* – End of sentence. *More follows*
Pause – End of word. *More follows*
EEEEE* etc.– Error. *Start from last correct word*
AR – End of message

RECEIVING SIGNALS

TTTTT* etc. I am receiving you
K – I am ready. *Start message*
T – Word received
IMI* – Repeat sign. *I do not understand*
R – Message received

** Send as one word. No pauses*

USEFUL WORDS

SOS	...–––...
SEND	...|.|–.|–..
DOCTOR	–.–.|–––|–.–.|.|–..–|–.–
HELP	....|.|.–..|.––.
INJURY	..|–.|.–––|..–|.–..|–.––
TRAPPED	–|.–.|.–|.––.|.–.–|.|–..
LOST	.–..|–––|...|–
WATER	.––|.–|–|.|–.

BODY SIGNALS

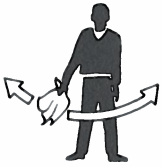
This series of signals will be understood by airmen and can be used to signal to them. Note the changes from frontal to sideways positions and the use of leg and body posture as well as hand movements. Use a cloth in the hand to emphasize the YES and NO signals. Make all signals in a clear and exaggerated manner.

Pick us up

Need mechanical help

Land here

Yes



No

All is well

Can proceed shortly

Have radio

Do NOT attempt to land here

Need medical assistance

Use drop message

Response to body signals

To acknowledge messages received from the ground, the pilot of an aircraft will perform one of these manoeuvres:

Message received and understood:

In daylight – flying the plane and tipping the wings in a rocking movement side to side

At night – flashing green lights

Message received but NOT understood:

In daylight – flying the plane in a right-handed circle

At night – flashing red lights

MOUNTAIN RESCUE CODE

These sound, light and pyrotechnic codes are recognized internationally by mountain rescue services:

Message: SOS

Flare signal – Red

Sound signal – 3 short blasts, 3 long, 3 short

Repeat after 1 minute interval

Light signal – 3 short flashes, 3 long, 3 short

Repeat after 1 minute interval

Message: HELP NEEDED

Flare signal – Red

Sound signal – 6 blasts in quick succession

Repeat after 1 minute interval

Light signal – 6 flashes in quick succession

Repeat after 1 minute interval

Message: MESSAGE UNDERSTOOD

Flare signal – White

Sound signal – 3 blasts in quick succession

Repeat after 1 minute interval

Light signal – 3 flashes in quick succession

Repeat after 1 minute interval

Message: RETURN TO BASE

Flare signal – Green

Sound signal – Prolonged succession of blasts

Light signal – Prolonged succession of flashes

Flares

Any flare will be investigated during a search, regardless of colour, but choose one best fitted to the location.

- In closely wooded country green does not stand out but red does.
- Over snow white merges – green and red are best.

Familiarize yourself with the types of flare. Make sure you understand the instructions, for some flares eject a white-hot ball of magnesium that will burn a hole in anything it hits – your chest or dinghy – if they are misdirected.

Types of flare

Some flares are hand-held and reversible. One end produces smoke for daytime use, the other a flare for use at night. The higher these are held the easier they are to see. Flares and rockets which are fired into the air will be visible for a greater distance. One type reaches a height of 90m (300ft) where a parachute opens holding the flare suspended for several minutes. Other rockets produce a loud bang and colour balls.

Keep flares dry and away from naked flames and heat sources. Ensure that safety pins are in position and will not accidentally drop out, but also check that they are not bent over in such a way that they could not be quickly removed when necessary.

Handling flares

Hand-held flares are cylindrical tubes with a cap at each end. The top cap is often embossed with a letter or pattern so that it can be identified by touch in the dark. Remove it first. Then remove the base cap to expose a short string and a safety pin, or other safety device. Point the flare upwards and away from you and anyone else in case you accidentally fire it. Remove the pin, or turn to the fire position. Hold the flare at arm's length, at shoulder height, pointing directly upwards. Sharply pull the firing string vertically downwards. Brace yourself as you do so for there will be a kickback. Some flares and maroons have a spring mechanism trigger like that of a mousetrap.

Very pistols fire various cartridges. To fire them load the pistol, point it skywards, cock the hammer and then squeeze the trigger.

Mini-flares are more usual equipment today, lighter than Very pistols but as effective (see *Survival*

kit in *Essentials*). They require handling with the same care. To use, screw a flare of the selected colour into the end of the discharger, aim skyward, pull back striker – FIRE!

INFORMATION SIGNALS

These are signals to leave behind if you leave the scene of the crash or abandon camp.

Make a large arrow shape to indicate the direction in which you have set off which will be visible from the air and other direction markers which can be interpreted at ground level.

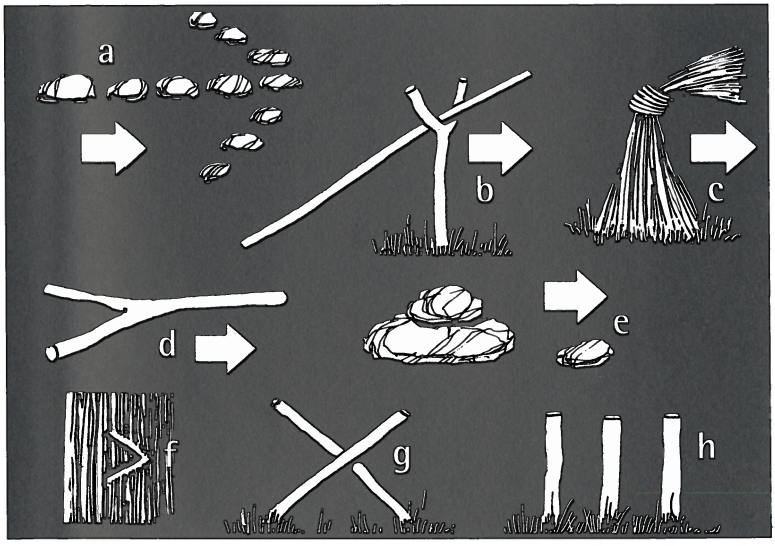
Signs on the ground will draw attention to your presence or past presence and the direction markers will help rescuers to follow your trail. Continue to make them, not only for people to follow but to establish your own route if you wish to retrace it and as a guide if you lose your sense of direction and start going back on your trail.

At camp leave written messages in containers to detail your plans. Hang them from tripods or trees and draw attention to them with markers.

Direction markers could include rocks or debris placed in arrow shape (a), stick left in crooked support, top in direction followed (b), grasses tied in an overhand knot with end hanging in direction followed (c), forked branches laid with fork pointing in direction followed (d), small rocks set upon larger rocks, with small rock beside (e), indicating a turn or arrow- or arrowhead-shape notches cut in tree trunks (f).

A cross of sticks or stones (g), means 'Not this way.'

Signal danger or emergency with three rocks, sticks or clumps of grass, prominently displayed (h).



SEARCH

Awareness of search procedures will show how important it is for any expedition or trip to register its route plans and for survivors to stay as close as possible to that course, to set clear signals to draw attention to their location and to mark any camp they have abandoned (leaving information about their subsequent plans).

A search will start from the last known location and sweep on the proposed route. An assessment will be made of probable strategy adopted, given the terrain and the weather conditions. In mountain areas, for instance, it is likely that strong winds would make the survival party use the lee sides of ridges and descend from high ground. If no trace is found of them on the expected route these are the areas in which the search will be concentrated.

The effect of contour will be considered: by studying the ground the search party may assume that survivors were forced off route by the lay of the land. To make the searchers' job easier, make a cairn of rocks or other noticeable construction on prominent ground where it cannot fail to be noticed and leave a message there in a waterproof bag or in the pocket of a colourful piece of clothing. Give information on your intentions and on the state of your party.

If your route has been checked and the obvious refuge places in the locality searched, the rescuers will extend the search to cover the whole area of your disappearance. Ideally this will be done from the air but severe weather which creates bad flying conditions and poor visibility may mean it has to be done on foot, even if planes are available.

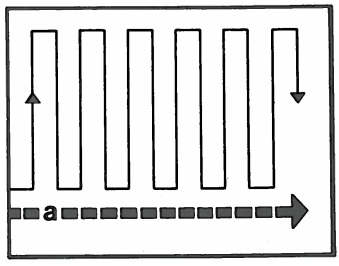
The number of searchers and the type of terrain will dictate the search pattern best suited to the situation.

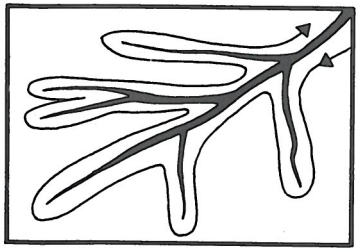
SEARCH PATTERNS

The first search will be made along the route you were supposed to have taken.

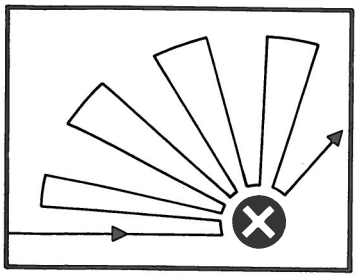
BASE LINE

Base line, or box search, is carried out when there has been a high wind or bad weather conditions on your known route (a). Searchers should deduce that you may have veered from the route to the leeside of a slope for shelter.





WATERCOURSE
Watercourse search takes in all the tributaries, using the main stream as base-line. This is undertaken when your last known position was on or near a river.



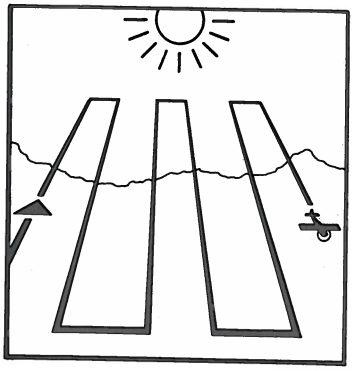
FAN
Fan search is used when your last known position (x) is fairly certain but it is impossible to deduce the direction you may have taken.

Aerial search

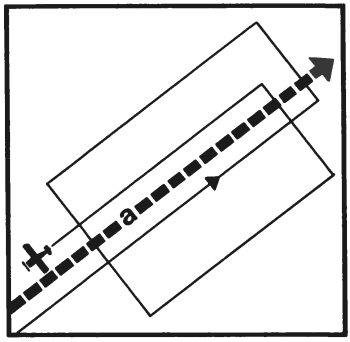
Search patterns from the air cover both sides of the intended flight path of missing aircraft or your known route.

If weather conditions are favourable a night search can be made, for lights will be clearly visible and the search can be made from a greater height so that a wider area can be covered in each sweep. If this does not produce results the area will still be rechecked by daylight.

If you are signalling to an aircraft and it turns away – keep watching. It may be following one of those recognized search patterns and you will be able to anticipate critical moments for signalling.

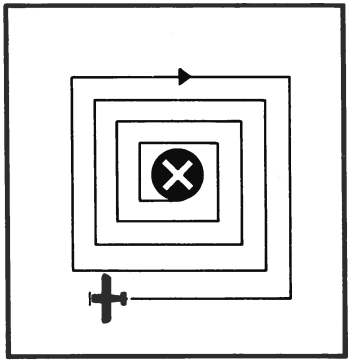


CREEPING LINE
Creeping line search, beginning in a corner of the search area, is particularly useful when only a single aircraft is available. It follows parallels which should be towards and away from the sun for a land search so that any reflection from a missing aircraft or other wreckage and signals will be more easily seen.



TRACK CRAWL

The primary search pattern, or track crawl search, parallels both sides of a missing aircraft's expected flight path (a), or travelling known land route. After flying for one hour, turn around and fly the reverse pattern.

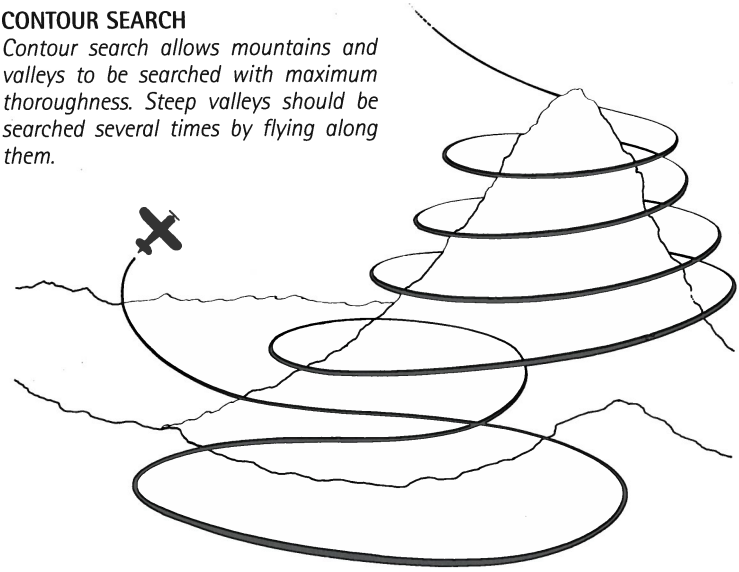


SQUARE SEARCH

Square search is useful when a comparatively small area is to be covered. Search starts in the last known location (x) and works outwards. If unsuccessful fly over last known location and start search in other direction. This ensures both sides are covered.

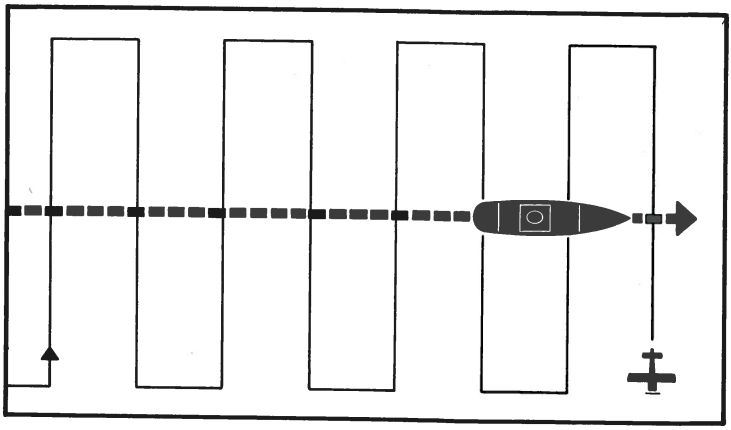
CONTOUR SEARCH

Contour search allows mountains and valleys to be searched with maximum thoroughness. Steep valleys should be searched several times by flying along them.



Combined searches

At sea a combined sea-and-air search is desirable. If the aircraft locates survivors the ships can pick them up. The ship can also act as a datum point for all aircraft. Rescue aircraft are equipped with supplies to drop to survivors to help them as they await pick-up by a surface vessel.



HELICOPTER RESCUE

While aeroplanes are used for the search, helicopters are used in most countries to carry out the actual rescue, especially on land. Where possible the 'copter will make a landing to take on survivors and fly them out. It may be possible for the pilot to find a convenient landing site nearby to which survivors can make their way, but it will be easier for the survivors to check out suitability at ground level and to create a site if necessary.

The helicopter will require an obstruction-free approach and exit path, both INTO the prevailing winds. The ground should be level (the slope should not exceed seven degrees – a gradient of 1 in 10). The touch-down surface should be firm and free of loose materials – remove leaves, twigs, everything. There must be no holes, tree stumps or rocks which could cause damage to the aircraft.

Selecting a landing site

Look for a natural clearing. In close country a river bank on a large bend is often the best natural landing place (LP).

Alternatively climb a spur and select a level piece of ground free

of large trees. If you need to, cut down trees to clear more space. The trees will fall down the spur without blocking the area and a clear approach and exit path can be obtained across the spur. Do not attempt cutting a landing place on flat ground; it will take forever to create a clear approach and exit.

LANDING PLACE

PREPARING SITE

A level cleared area is needed at least 26m (85ft) in diameter. A further 5m (17ft) is needed all around, cleared to a height of 60cm (2ft). There should be a clear approach path into the prevailing wind with no obstructions within an angle of 15 degrees of the central landing pad.

Mark the touch-down point with an H. You can make it from inlaid rocks (keeping the surface smooth), clothing securely anchored, or panel markers. On snow, trample it down firmly to prevent it swirling and, in dry areas, water the surface to keep the dust down.

READY-MADE PAD

If a spur, mound or area of raised ground is nearby, this will be easier to clear and will provide an easy approach and exit across the spur if the wind direction is satisfactory.

MOUNTAINOUS TERRAIN

The payload of the helicopter is cut drastically with increased altitude so, if possible, make the landing site below 1830m (6000ft).

In mountains updraughts and downdraughts of air can be considerable according to the pattern of the land and its relationship to prevailing winds. Select a site that gives maximum lift in the direction in which the helicopter will take off.

Soft wet snow will cling to the helicopter and hamper its take off. Try to compact the landing surface as much as possible. Powdery snow will swirl under the rotors' downwash and restrict the pilot's vision. Stamp this down, too.

Non-landing rescue

In an emergency, helicopters will take considerable risks to rescue survivors. They may hover with one skid on a rock to make embarkation possible – but whenever it can be done create a proper landing place and minimize risks.

Most helicopters are equipped with a winch. If a landing place is out of the question you can be lifted from the ground while the helicopter hovers. All that is needed is an opening or clearing through which to extricate you.

Wind indication

It is important to indicate the direction and strength of the wind at the landing place so that the pilot can select the best approach, and keep the aircraft stable while carrying out the rescue. Smoke is an ideal indicator, but do not place it so that it obscures the touchdown area.

If a fire is not practical make a T sign from contrasting material and place it at the downwind edge of the landing place with the horizontal bar of the T placed upwind.

If there is nothing to make a T shape from, a person standing on the far downwind side of the landing place with their arms outstretched and with their back to the wind can form a living symbol for the pilot. Don't make this signal till you have to – and then only in the correct position. It is very similar to another body signal, which means 'need help'.

Night rescue

The helicopter will itself have powerful lights by which the landing or lift off of survivors can take place but you will need lights to bring the pilot in to the landing place. Flares and fires will give an indication of your position once the helicopter is within range.

If you are illuminating from the ground with torches, vehicle headlights or other beams shine them skyward at first to attract attention but, once the pilot has seen you, keep the beams low so that they do NOT dazzle the pilot, and shine them on to the touchdown or winching area.

Sea rescue

If survivors are being winched up from a ship it will help the pilot to place the deck at an angle of approximately 40 degrees to the right of the eye of the wind. If you can control the vessel give a wind speed over the deck of about 29kph (18mph).

HELICOPTER PRECAUTIONS ON LANDING

- When a helicopter touches down at the LP the rotors will be turning. The approach to the aircraft is therefore particularly important both for your own safety and that of the helicopter.

- NEVER approach from the rear. This is a blind spot for the crew and the tail rotor is unprotected. On sloping ground always approach up the slope – bringing you up below the blades.

- NEVER approach down a slope close to the helicopter. You could be at risk from the blades.

- Make sure that you are not carrying anything which could foul the main rotor. If carrying a radio, stow the aerial.

- Keep all sharp objects away from the body panels of the helicopter. They are of light gauge alloy and easily damaged.

- Sit in the seat allocated to you by the crewman, fasten the seat belt and keep fastened until told otherwise.

- Do not attempt to alight until the engine has been shut down after you have landed – even then, wait for directions.

Winching techniques

A double lift is the usual method but a single lift is sometimes used.

Double lift: With a double lift a crewman is lowered on the winch with another strop for the survivor. During the lift the crewman supports the survivor with his legs, gripping with them around the midsection, and supports the head with his hands. After the strop has been put in place and tightened keep arms down by the sides and do not lift them – just lie back and enjoy it!

Single lift: With a single lift you fit yourself into the strop. When you have placed it under your armpits and securely tightened the grommet give the 'thumbs up' sign. Once acknowledged make no further signals until aboard the chopper – if you raise your arms you risk slipping out of the strop!

SURVIVAL CASE STUDY

I often use this case study because it highlights exactly how not to plan and execute an expedition. The main lessons to be learnt are: plan adequately, keep the group together, don't underestimate the environment you are going to, and ensure that you start with enough supplies for survival and for rescue.

While exploring Lows Gully, on Mount Kinabalu in Malaysia, in 1994, two British officers and three Hong Kong Chinese soldiers were trapped for 16 days with only enough rations for three days. At the time they were found, following a huge rescue operation by the British and Malaysian military, medics said that they were on the point of starvation. Mount Kinabalu is not considered a tough climb. The plan was to travel light, so armed with ten days' rations and a video camera, but without radio and flares, they descended into the abyss of Lows Gully.

On the morning of the third day, the expedition reached the edge of the abyss and the men saw for the first time the task ahead of them. The team was split into two groups as not all of the men were in good enough shape to continue with the descent immediately. The fittest men forged ahead while a second group rested with the intention of following when they were ready.

When the second team finally began their descent they had only three days' rations left and, with novice climbers, they made slow progress. Meanwhile, at the bottom of the gully, and with only 4 days' rations left, the advance team began to negotiate their way out of danger, but they met with the gully's unique and unpredictable weather system: mists over the mountain gave way to torrential rains and with nowhere else to go, the water poured down into the gully. In the days that followed, as they slowly struggled through the undergrowth, the team leader and one other team member became separated from the other three in their group. Unable to find them, the two men were forced to continue. With no rations, they attempted to live off the forest, but with dire consequences as one of them became violently ill.

On their return, after 17 days, they learned that the other three in their party had already made it back safely. But the second team were still stranded. The Malaysian Army and a Royal Air Force rescue team were dispatched to search for the team and, after ten days, a Malaysian helicopter finally spotted them and rescued the group. It was 31 days since they had set out.

11
DISASTERS

Accidents or isolation are not the only causes of a survival situation. There are many natural and man-made forces which can produce disasters demanding the same survival skills. Drought, fire, earthquake and flood, for instance, can strike both in the remote survival camp and at home. The survivor should know the techniques for dealing with a forest fire but it is just as important to know how to escape from a burning building or even the site of a bomb explosion.

Home front faces the problems of coping with survival on your own doorstep if the services and supplies on which we normally depend are cut off.

DROUGHT

Drought, caused by long periods of dry weather or insufficient rainfall, creates desert in areas where it is a permanent condition. Elsewhere, drought may be a regular seasonal feature for part of the year – and predictable year after year. Where it is balanced by a wet season, water can be stored to last through the dry months. The underground stone-cut or concrete-built cisterns of ancient and modern Mediterranean civilizations collect the rainfall of the wet season for the long dry summer.

In temperate regions, if rainfall drops far below the normal, periodic drought may be produced with vegetation unable to obtain water to compensate for what it loses to the air. In cases where the dry spell may not be so obvious but there is still insufficient moisture to provide that needed by the plants, a condition known as 'invisible drought' occurs. The death of vegetation causes deprivation right through the food chains that are based upon it. If the drought becomes severe, dead and dying animals may even pollute the water supplies that still remain.

Fire risk

The corpses of dead animals should be buried in deep graves. Dry ground can be very hard, but burying is the best way to remove these possible sources of infection. They could be burned, but since drought leaves everything tinder dry, the risk of fire spreading is considerable and it could easily get out of hand. Each year fires rage in southern France, California and Australia and, without water to check the flames, they spread rapidly. If you must have a fire, dig down to bare earth and keep the fire small and attended at all times.

Hygiene

In houses, lack of water for washing and sanitation can bring the risk of infection. If the water level in a water closet no longer seals the S-bend, disease may spread from the sewers and personal hygiene may suffer from lack of washing. Do not use the WC but leave sufficient water in the bowl to form a barrier. Make an outdoor latrine to use instead (see *Hygiene* in *Camp Craft*).

Sweating will help to keep pores open and free of dirt, but, even when you need all available water for drinking, try to clean hands after defecation and before preparing food.

Store and conserve water

If a monsoon does not start at the expected time, or a hot dry summer produces a parching of the earth, take precautions by storing as much water as possible and using it wisely. Keep it covered and shaded to avoid evaporation.

Dig a pit for a storage cistern in a shady spot, avoiding tree roots. Line it with a polythene sheet or with cement if available (but don't fill it up until the cement has had a chance to thoroughly dry). If you live in a clay area, dig a pit and line it with clay. If you build the concrete or clay up into a partial dome, it will help to keep the contents cool and leave a smaller opening to keep covered.

NEVER waste water. Water used for cooking can later be used for washing. Boil all drinking water. If a well runs dry you may gain more water by digging deeper, but the further you dig, the further you deplete the water stored in the earth.

In areas with cold nights the drop in temperature may condense the moisture in the air. Use the techniques to catch it described for desert survival (see *Essentials* and *Climate and Terrain*).

SURVIVAL ADVICE

If drought persists, especially over more than a year, desert conditions may begin to develop. Evacuation may be the only solution if water supplies cannot be brought in.

High ground will show greater variation between day and night temperatures and will offer better chance of dew to collect in the early morning. It may also offer the advantage of cool breezes.

Drought can strike anywhere. Even in areas of heavy rainfall, such as Assam, there has been drought when the monsoon has failed.

WARNING

- In conditions of severe drought be especially careful of contamination of water supplies. Disease from dead animals may be rampant. However thirsty you are, boil all water before drinking.
- Flies may be a serious problem at first – ensure that all foodstuffs are covered. Protect from dust, which may become a hazard as top soil is blown away.
- When nature is disturbed in this way, animals act abnormally. Crazed by thirst, normally docile creatures may attack you.

FIRE

Fire requires heat, fuel and oxygen and produces smoke, heat and toxic gases. It may spread by heating its surroundings through direct contact (conduction), through rising gas and smoke (convection) or through heat rays (radiation). Convection is usually the most serious of these forms of heat transfer.

The best protection from fire is prevention. Carelessness with lighted cigarettes and burning matches is the cause of many fires. The sun shining through an abandoned bottle or a piece of broken glass can start a blaze in a dry season.

Fire can strike anywhere – at any time. Precautions should always be taken. Vehicles and buildings SHOULD ALWAYS be equipped with fire extinguishers. Managed forestry plantations are divided by broad paths as fire breaks. Equipment for beating out flames should be found in numerous places. YOU should know how to use it.

FOREST FIRES

If you are present where a fire starts (or where a camp fire accidentally spreads) in woodland, or on heath or grassland, your first action should be to SMOTHER IT.

The first sign of an approaching forest fire will be the smell of smoke. Then you will probably hear the fire before you see flames. You may notice unusual animal behaviour before you realize the cause.

Escape route

If caught in an area where fire is raging, and when it is far too late to put it out yourself, do NOT immediately flee – unless the fire is so close that there is no choice.

Although you may feel that clothing hampers your movement, do NOT discard it for it will shield you from the full force of radiated heat.

Smoke will indicate the direction of the wind – the fire will be travelling fastest in that direction. If the wind is blowing away from you, towards the fire move INTO the wind. Head for any natural fire break – such as where there is a swathe through the trees, where the flames should be stopped. A river is the best break – even if the flames can leap it you will be reasonably safe

in the water. In forestry plantations look for the roadways and firebreaks.

Do NOT run wildly. Choose your escape route. Check the surrounding terrain and the wind direction to assess the possible spread of the fire.

If the wind is blowing towards you the fire is likely to travel more quickly – and the flames can leap a larger gap. Fire travels faster uphill so do NOT make for high ground. Try to go around the fire if possible – but some forest fires burn on a front several kilometres wide. If you can neither skirt or outdistance the blaze take refuge in a large clearing, deep ravine, watercourse or gulley.

Into the fire

Sometimes the best escape route may be to run THROUGH the flames. This is impossible if they are very intense and the area covered by the actual fire is great. In a large clearing or on heathland, however, it may be possible to run through less dense fire to refuge on the already burned-out land. Cover as much exposed skin as you can and if you have water available tip some over you to damp down clothing, hair and any flesh you have not been able to cover. Dampen a piece of cloth to cover your nose and mouth.

Thick vegetation will burn fiercely and slow you down – so choose the spot for your breakthrough with care. Make your mind up, then do not delay. Take a deep breath. Cover your nose and mouth to keep out smoke and RUN.

FIGHTING A FOREST FIRE

In areas where there are forestry plantations you should see racks of fire-beating equipment at intervals along the main routes. This consists of bundles of twigs (usually birch), tied in a broom, and spade-shaped beaters with rubber blades. They can be effective in putting out the beginnings of a blaze.

Despite the name, do NOT beat rapidly with them – that will only help to fan the flames and spread sparks. The object is to SMOTHER the fire by bringing the beater down over the flames to extinguish them. The flat blades are particularly effective in smothering a fire beginning among leaves and undergrowth.

If no equipment is available use a coat or blanket to smother the fire and to cut off oxygen from the flames – or use a leafy branch to beat it out.

STAY IN A VEHICLE

If caught in a forest fire in a vehicle, stay inside and keep the windows tightly shut. Turn off the ventilation system. The car will give you some protection from radiant heat. Drive away from the fire if you can but, if immobilized, stay put.

People have survived by staying in a vehicle until the glass began to melt, by which time the fire had moved beyond them. If they had panicked and run into the fire they would have died.

There is a danger of a petrol tank exploding but your chances are much greater than outside, if the fire is intense around the vehicle.

Going to earth

If there is no natural break or gully in which to shelter and the fire is too deep to think of running through it, you may have to seek the protection of the earth itself.

People have survived fierce fires by digging themselves in and covering themselves with earth, allowing the fire to burn over the top of them. The risk is considerable, not just from heat but from suffocation: fire burns up oxygen.

Scrape as much of a hollow as you can, throwing the earth on to a coat or cloth if you have one, then pull the cloth over you with its earth covering. Cup your hands over your mouth and nose and breath through them. This won't increase the amount of oxygen, but it will cool down and filter the very hot air and sparks, which can damage the respiratory system. Try to hold your breath as the fire passes over.

Fight fire with fire

It may be possible to use fire itself to create protection, if there is no way of getting out of the path of the fire or of going through it – but it is still some distance away.

The technique is to burn a patch of ground before the main fire reaches it. With nothing left to ignite, the flames cannot advance, giving you a place of refuge. The main fire must be sufficiently far away for your fire to burn a space it cannot jump before it arrives.

Light your own fire along as wide a line as possible – at least 10m (33ft) wide, but 100m (330ft) would be better. It will burn in the same direction as the main fire, creating a break which you can move into. Make sure you determine the wind direction correctly.

WARNING

Winds may be swirling and fires create their own draughts, so you may still have to make a dash through your own flames. The main fire must be far enough away for your own fire to burn and pass. Do NOT underestimate the speed at which flames travel – they may be approaching faster than you can run. Do NOT light another fire unless you are desperate and fairly certain of the outcome.

BURNING BUILDINGS

Smoke will usually be the first indication of fire. If the fire is still small, attempt to extinguish by covering with a blanket or thick curtain (to deprive the flames of oxygen), or using sand, water or fire extinguisher as available and appropriate.

Electrical fires

If there is any possibility of a fire being caused by an electrical fault, do NOT use water until the power has been turned off, preferably at the mains. Turn off gas at the mains too. If television sets or computer VDUs catch fire do NOT use water on them. Even after being disconnected, there is sufficient residual electrical charge to give you a shock (even to kill you) and the cold water may make the tube explode. Smother them and approach from behind because of the risk of the tube exploding.

FIRE EXTINGUISHER

PULL – or otherwise to release any lock

AIM – at the base of the fire

SQUEEZE – or press the handle/trigger

SWEEP – from side to side

Check to see what kind of extinguisher you have. Some are designed for small, simple fires and contain water – they are NOT suitable for oil or electrical fires. Others are designed for oil, grease, paint or solvent fires (a chip pan or petrol spillage, for instance). A third type is for electrical fires or those where live cables are exposed. A multipurpose dry-chemical type extinguisher can be used on most kinds of fire.
KNOW HOW TO USE YOUR EXTINGUISHER!

Evacuation

If the fire is already too big to fight with the resources available, evacuate the building. Turn off power at the mains. Close all reachable doors and windows. Try to contain the fire while evacuation is completed and to prevent the fire's spread before fire-fighting services or rescuers arrive.

Fire travels upwards faster than downwards – though a collapsing floor or wall will carry the flames to a lower level. Staircases, lift-wells and ventilation shafts are particularly dangerous.

NEVER use a lift during a fire. If you need to move down a building, use a smoke-free staircase.

Before opening any doors look for smoke around their edges and check for heat. Metal doorknobs are a good test. If they feel warm do NOT open the door – use the back of your hand for the test. Grasping the knob could cause a burn. A stout door can keep back flames for 30 minutes or more (but do not rely on this with thin-panelled modern doors – unless they are fire doors).

SURVIVAL ADVICE

If there is no alternative to going into a burning room: brace your foot against the door and open it only a crack – this will help to stop it being forced wide open by the pressure of hot air and gases inside. Crouch low to enter, opening the door as little as possible. This will expose you to less smoke and heat and give less chance for the fire to pass through the gap. Close the door behind you to delay the fire's spread.

Waiting for rescue

If you find yourself isolated and unable to get to safety, go to a room as far from the fire as possible (but NOT on a higher level unless you are certain that rescuers with long ladders or other equipment are very close). If there is a choice, pick a room with the softest ground outside, no railings below or where there are bedclothes or curtains which you can knot into a rope. Lawns, flowerbeds, even gravel paths are softer than cobbles, concrete or paving. If you are eventually forced to drop down on to hard concrete a sloping surface will be likely to do you less damage.

Close the door and fill any gaps around it with curtains, mats or other thick material, which will take time to catch alight. Wet them if you can. If the alarm has not already been given try to attract attention through the window.

To break the window, use a piece of furniture. You could kick it out, but do not bring your foot back quickly – you will have to negotiate broken glass. If you have to use your hand, wrap it first and punch. Alternatively, when protected by a thick jacket, an elbow may be effective.

Preparing to 'jump'

If no rescue is forthcoming do NOT jump – drop. Tie sheets, blankets, mats, loose covers and other strong material together to make a rope – even if it does not reach the ground it will reduce the distance you will have to fall. Tie them with reef knots and test that each is firm by pulling. Push a heavy piece of furniture over to the window and secure one end of your rope to it, or tie your rope to heating pipes – or smash the window and tie on to a thick part of the frame. If the rope is not long enough drop cushions, pillows, a mattress – anything which will soften your landing, below the window.

If there is nothing to use as a rope, lower yourself out of the window and hang from the sill. If there is no sill hang from the bottom of the window frame.

SURVIVAL ADVICE

Do NOT jump out – unless there is a party of firefighters waiting to catch you in a blanket. Where there is something to break your fall make use of it, do not try to drop clear. A car roof makes a good cushion to drop on for it will give slightly to your weight.

BEWARE: Trees may break your fall, but there is a risk of your being impaled on the branches.

Dropping from a height

Having taken every recommended measure to reduce the height of your fall, think of protecting your head – a motor-cycle crash helmet is ideal but a jersey or towel wrapped round your head like a turban will help.

When you are as low as possible, and ready to drop, push yourself away from the building with the side of one foot and, as you let go, turn away from the wall and bend the knees. Leave the arms up to protect the sides of the head.

As you land bend the knees more and roll over on to one side, carrying the roll on to your back (still protecting your head and with your legs in the air). This helps spread the impact over a larger area and increases your chances.

Falling onto a slope

Face down the slope as you drop, with legs together, with the knees slightly bent. Bring the head down on to the chest and the elbows tightly into the sides, the hands protecting the head. Land on flat feet, allowing the knees to bend fully, rolling forward in a tight somersault. It is the method that parachutists use.

WAIT UNTIL THE VERY LAST CHANCE OF RESCUE BEFORE RISKING A DROP GREATER THAN 4M (13FT).

ESCAPING THROUGH FIRE

- If forced to travel through flames to reach safety, cover yourself (including your head) in a blanket, curtain or overcoat – wet it if you can – then take a deep breath and go.
- If your clothes catch alight do NOT stay on your feet when out of the fire. The flames and smoke will travel up your body, over your face and into your lungs.
- Do NOT run – this will only fan the flames.
- Roll on the ground and try to wrap yourself in something that will smother the flames – a mat, blanket or overcoat.
- If someone else comes running out of a fire with their clothes alight, push them to the ground and use the same methods of denying the flames oxygen. Do NOT hug them to you or your clothes may catch fire.

VEHICLE FIRES

The greatest danger with cars is the risk of the fuel tank being ignited – it could explode like a bomb, scattering burning petroleum everywhere. The aim is to control the fire before it can reach the tank. Everything has a flash point and a fuel tank is more at risk than most things. Usually a fuel line (if not armoured) will catch fire first, acting as a fuse which eventually ignites the tank.

In a garage

If a car catches fire in a confined space, such as a garage, smoke and toxic fumes will soon build up. Try to put the fire out first – but if that is not practicable remove the car from the building, before it further endangers life and property.

Do NOT get into the car. You can do everything from outside including steering. If possible, push or pull the car out. If your car

has a button starter, select a low gear or reverse and use the starter to bounce the car out. With conventional ignition, turn the key in short bursts. BE PREPARED. The car will jerk forward violently.

FIRE EXTINGUISHER

KEEP IT WHERE YOU CAN REACH IT!
DON'T keep your fire extinguisher in the boot/trunk – keep it in the passenger compartment where you can get at it immediately. Any impact could distort the boot lid and prevent you opening it.

In a crashed car: doors may jam. If it catches fire get through any window or kick the windscreen out.

If the fire is inside the car: use the extinguisher or smother it with a rug or coat. Synthetic materials used in upholstery in many cars burn rapidly and give off thick smoke and toxic gases. These will persist even when the flames are out so get out into the air as soon as possible.

If the fire is also on the outside: amid spilt fuel for example – keep the windows shut and drive out of the danger zone, abandoning the car as soon as it is safe to do so.

FIRES IN THE AIR

Aeroplanes are equipped with automatic extinguishers for engine fires and hand-held extinguishers in the cabin. Action should be taken immediately. On civil airlines summon a steward or air hostess immediately you suspect fire – they know where equipment is and how to use it. Avoid creating panic in other passengers. If you see smouldering or flames, smother with an airline blanket or clothing.

The main fire dangers are: before take-off when there is volatile fuel and vapour around the plane and especially when landing under difficult circumstances when fuel tanks could be ruptured and electrical or friction sparks ignite aviation spirit. Every safety precaution is taken to ensure that fire is not a hazard.

CHEMICAL AND BIOLOGICAL WARFARE

Terrorism is not new. The destruction of property, murder, threats, fear and panic have long been the tools of those who believe that violence is a means of achieving political and criminal goals. What makes modern terrorists distinct from their historical predecessors is the technology at their disposal and the greater range of opportunities for terrorism which modern life provides.

The global nature of media coverage and the publicity it can give has also fuelled the use of terrorism. There is no doubt, also, that some nations finance and support the activities of terrorists in other countries with which they have political difference.

More value is now placed on the lives of ordinary people, the more innocent the victim, the better for terrorism. The reality is that we are ALL potential targets and that we are ALL vunerable.

Certain countries of the world pose a real threat by producing vast amounts of lethal bacteria and chemicals. These are relatively easy to disperse and threaten large areas of the globe.

Biological agents fall into two groups, pathogens (germs) and toxins. Pathogens are living micro organisms that cause lethal incapacitating diseases like anthrax. Toxins are poisons that are lethal to humans, affecting the nervous system, and causing cell death.

Germs must be inhaled, enter through a break in the skin, or through the digestive tract. They do not react immediately as they must multiply inside the body and overcome the body's defences. This incubation period varies from hours to months depending on the germ. Biological agents are hard to detect, none of our physical senses can detect them. Often the first signs are symptoms of the victims exposed to the agent, and sick-looking plants and animals.

TOXINS

Toxins occur naturally in plants and animals, but can be manufactured and used as weapons which are a thousand times more lethal. Toxins produce a similar effect to chemicals but do not respond to the same treatment. Unlike germs they can penetrate unbroken skin, and their symptoms appear immediately. These include; paralysis, convulsions, fever, blisters/rashes, shock and death.

Protection

If you suspect the presence of biological agents, put something around the mouth and nose to prevent inhalation. It is unlikely that you have a mask so improvise by wrapping a damp cloth around the face. Cover all exposed parts and leave the area as soon as possible. Button/zip-up all clothing. Tuck trousers into socks, and wear gloves. When out of the danger area, wash thoroughly with soap and water. Clean teeth, hair and fingernails. Wash all clothing and equipment in hot soapy water.

ANTHRAX

Anthrax is a disease carried by animals and still kills many humans annually. The disease is transmitted from dead animals in areas like South America, Southern Europe and the Middle and Far East. Signs on the dead carcass include bloating, incomplete rigor mortis, dark coloured blood oozing from nostrils and anus. Avoid all contact and wash thoroughly if accidental contact is made. Seek professional advice soonest. Antibiotics will help, and there is a serum available from the treatment of anthrax.

The early signs of the disease are pustules with dark centres. Anthrax is also produced as a biological weapon.

CHEMICALS

Chemical agents take the form of liquids, gas and aerosols. They may affect breathing, the nervous system or the blood.

Chemical agents are difficult to detect so watch for suspicious signs in your companions. Difficulty in breathing, coughing, itching and tears are the most obvious ones. The landscape will look wasted, with vegetation being discoloured and limp, and maybe dead animals and insects scattered around. Some agents are odourless and others have a distinctive smell. The smell of almonds may indicate a blood agent, and newly cut grass might indicate a choking agent.

Protection

The whole body must be covered with suitable clothing that will prevent the chemicals penetrating. Waterproof outer garments, goggles and mask are essential. Get out of the danger area and decontaminate as soon as possible, the same as with pathogens.

GASES AND CHEMICALS

Explosive gases can occur and build up in caves and mines, but the main dangers to the survivor in the wild will be oxygen deficiency and carbon monoxide poisoning in restricted spaces and shelters.

In house and vehicle fires and in industrial locations there is risk from toxic fumes being produced when plastic and other materials burn. Industrial and road accidents involving chemicals present another danger.

There is little that can be done to protect yourself in a disaster such as that at Bohpal, in India, once they have happened, other than stay indoors and keep your doors and windows closed. But you can try to discover any risks that are likely from industrial or other plant in your area. There should be government and local authority checks and controls operating to enforce proper safety procedures. Many authorities demand labelling of places where chemicals are used or stored – in London, for instance, by a yellow triangle and/or the sign HAZCHEM.

If handling dangerous materials – not just at work, potentially dangerous substances are used in domestic chores, gardening and hobby pursuits – follow recommended safety procedures. AVOID contact with chemicals and inhalation of fumes and take precautions against spillage, shaking, breakage or accidental mixture with other chemicals which could produce a dangerous reaction.

If exposed to fumes or chemical hazard get to fresh air as rapidly as possible and flush away chemicals with copious quantities of water – BUT adding water to some chemicals can cause even more dangerous reactions. Learn the properties of materials you handle or transport and measures for dealing with accidents.

AVOID touching anyone contaminated with chemicals and do NOT give mouth-to-mouth resuscitation until you know what chemicals are involved.

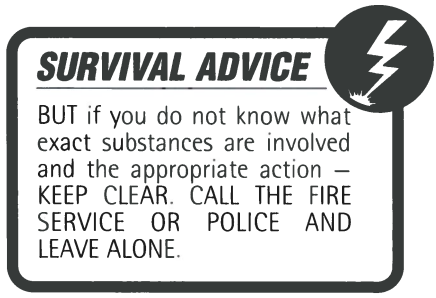
ROAD AND RAIL

Keep well clear of an accident involving a bulk tanker or other vehicle carrying dangerous substances. You may be able to see spillages on the road surface. Gas escapes may NOT be visible.

Chemical fires may be fought by appropriate techniques. If not properly trained and equipped to handle them you may aggravate the situation, endangering yourself and others.

The usual action in such cases will be to cover any flammable substances with foam to exclude oxygen, and to dilute chemicals that do not react dangerously to water with as much water as possible.

There are too many cases on record of public-spirited individuals losing their own lives in such circumstances – like the man who went to aid the driver of an overturned tanker which had been carrying powerful acid. By the time the fire-service arrived his gold wedding ring was all that remained of him.



Vehicles may be painted with a panel warning that they carry potentially dangerous chemicals which includes a code of figures and letters which tell the emergency services what kind of action to take, what kind of protection is essential and whether the chemical is explosive or poisonous. In the British code, for instance, a final E is an instruction to EVACUATE. The figures 1 or 2 at the beginning of the code suggest that water may be used, but that is only part of the information needed – the use of water could produce fumes which demand use of a respirator. Protective clothing may be essential.

Details of these codes are not usually given to the general public, for the information that they provide does not give practical guidance to the untrained, beyond a warning that dangerous materials are carried.

Although the information provided by the codes is valuable to the officers of the emergency services, they do not know the proportions in which spilt chemicals are concentrated, or whether combinations of chemicals could produce results quite unlike those expected. Where dangerous stores and goods in transit are registered with the authorities rescue services may be able to obtain additional information, but uncontrollable elements such as wind direction, temperature and various other factors will all affect the way in which such accidents are handled.

If you see a British hazardous chemical code, an EC Accord Européen Relatif au Transport International des Marchandises Dangereuses par Route (ADR) sign, which gives much less detailed information, or the United Nations International Emergency Action Code (EAC), which only covers a limited number of emergency procedures, KEEP YOUR DISTANCE.

FLOOD

Flooding may be caused by the overflowing of rivers, lakes and reservoirs caused by heavy rains (not necessarily rainfall at the place where the flood occurs); by the build-up of sea or lake water due to the effects of submarine earthquake, hurricanes and freak high-tides and winds; or by the collapse of dams or dykes.

Heavy rain can rapidly produce torrents where there was a dry riverbed, or a build up in a narrow channel or behind a barrier which then gives way to a rushing wall of water that envelopes everything in its path.

Persistent rainfall over a long period after a dry spell and heavy storms should alert you to keep clear of water channels and low-lying ground, but a flood can affect much wider areas. It is always safer to camp on a spur. If the water is rising, move to higher ground. In hilly areas keep out of valley bottoms which are particularly prone to flash floods.

Food is not likely to be a problem, at least at first, for animals will also head for high ground. Both predators and prey are likely to concentrate on getting to safety – but beware of injury from panic-stricken animals in the water.

Drinking water may be difficult to obtain, for the water swirling around you may be contaminated. Collect rainwater to drink and boil any other water before you use it.

Flooded buildings

If you are in a solid building when the water begins to rise, stay where you are if it is rising rapidly. You will be less at risk than trying to evacuate on foot. Turn off gas and electricity and prepare emergency food supplies, warm clothing, drinking water in screw-topped plastic bottles or other well-sealed containers. It is important to keep all water containers sealed to avoid accidental spillage or contamination. If you can, collect a torch, whistle, mirror, brightly coloured cloths, or flags, that would be useful for signalling, and add them to your gear. A camp stove will be valuable for heating food and drinks and for warmth. Candles are also useful – and DON'T forget the matches.

Move upwards

Move to an upper floor, or on to the roof if in a single-storey building. If you are forced to occupy the roof, erect some kind of shelter. If it is a sloping roof, tie everyone to a chimneystack or other

solid structure which can be expected to stay firm. If the water looks like continuing to rise, prepare some kind of raft. If you have no ropes to tie things together, use bed sheets. Unless the water threatens to wash your building away, or rises so high that you are forced to evacuate, stay until it stops rising.

Flood readiness

If you live in a river valley or in a coastal area prone to flooding, find out how high you are above normal water levels. Learn the easiest route to high ground – not necessarily the highway route, for major roads tend to follow drainage channels in valley bottoms. In rainy periods listen out for flood warnings which will often predict the levels to which waters may be expected to rise and the areas likely to be affected.

Even a few inches of floodwater can do a lot of damage and it is worth laying sandbags or plastic shopping bags filled with earth along the bottom of doorways and windows to keep out as much water as possible. If you have a really sound building and doorways, windows and other apertures are blocked, water will not enter. The central heating flue, ventilation bricks and other spaces must all be sealed.

If a high flood is likely, there is not much point trying to keep water out of basements. Indeed, in some houses with basements this could cause extra damage due to uneven pressure on the basement walls. If you are bound to be flooded, you could consider flooding the basement yourself with clean water, so that the pressure is equalized. You will have less filth and debris to clear up later.

Evacuation

If you are abandoning your home bring outdoor furniture and other movables indoors – that will reduce the amount of debris floating or being swept along outside.

When walking or driving to a safer location: Remember that a small drop in the level of the roadway down a hill can make a considerable difference to the water depth.

Do NOT attempt to cross a pool (or a stream) unless you are CERTAIN that the water will not be higher than the centre of the car's wheels or higher than your knees.

If you must cross: use river-crossing techniques (see *On the move*).

If crossing bridges which are underwater: take special care – you may not be able to see that the flood has already swept part of the bridge away.

Flash floods

In times of sudden heavy rainfall keep out of valley bottoms and stream beds both during and after rainfall. Remember that you don't have to be at the bottom of a hill to be caught by water rushing down it – often carrying mud and a deadly debris of broken trees and rocks.

Coastal flooding

Is usually a combination of high tides and winds which make them even higher. Flood warnings will usually be given and evacuation is the best action.

Flood aftermath

As the waters recede they leave a scene of devastation littered with debris and the bodies of flood victims. With decay and the pollution of the water comes the risk of disease and extra precautions are necessary. Burn all animal corpses – do not risk eating them – boil all water before using. Some crops may still be available after the flood waters recede and birds that have escaped the flood will be safe and good to eat.

SURVIVAL SCENARIO

What can you do to prepare for disaster?

Make sure that you are aware of what the dangers are. This may depend upon where you are travelling or what time of year you will be there. You should be aware of what contingencies are in place in case of say earthquake or flood. Ask the locals for advice.

TSUNAMI

A tsunami is linked with an earthquake beneath the ocean, creating a series of waves which can reach more than 30m (98ft) high and causing a considerable amount of damage along coasts.

Warnings of tsunami are issued from the National Oceanic and Atmospheric Administration's Pacific Tsunami Warning System headquarters in Hawaii.

Not all earthquakes cause tsunami, but any earthquake could. Keep away from shores and take to higher ground when there are tremors. Do NOT go to look for a tsunami – if you are close enough to see the wave, you are too close to escape it, unless high above its level. There is little defence against a moving wall of water. Evacuate.

HURRICANE

A hurricane is a wind of high speed – above force 12 on the Beaufort Scale – which brings torrential rain and can destroy any flimsy structures. It is a tropical form of cyclone, which in more temperate latitudes would be prevented from developing in the upper levels of the air by the prevailing westerly winds.

Hurricanes are known by various names around the world:

Hurricane: Caribbean and North Atlantic, eastern North Pacific, western South Pacific.
Cyclone: Arabian Sea, Bay of Bengal, southern Indian Ocean.
Typhoon: China Sea, western North Pacific.
Willy-willy: Northwest Australia.

Hurricanes develop over the ocean when sea temperatures are at their highest, especially in late summer. Warm air creates a low pressure core around which winds may rotate at speeds up to 300kph (186mph) or more, circling anti-clockwise in the northern hemisphere, clockwise in the southern. The strongest winds are usually 16-19km (10-12 miles) from the centre of the hurricane but the centre, or 'eye', brings temporary calm. The 'eye' may be from 6-50km (4-30 miles) across and the largest hurricanes up to 500km (300 miles) in diameter. They can occur at any time of year but, in the northern hemisphere, the main season is June to November – in the southern, November to April (especially January and February). Hurricanes are not a feature of the South Atlantic.

Pattern of the hurricane

Out at sea hurricanes will build up force and begin to veer toward the pole, the wind speed usually being greatest on the poleward side of the eye. They can travel as fast as 50kph (30mph) wreaking devastation on islands and along shorelines they pass over, but usually slowing down when they reach the mainland to a speed of about 16kph (10mph).

Hurricane warnings

Satellite surveillance enables meteorologists to see hurricanes developing far out in the ocean, to track their progress and to give warning of their approach. Some hurricanes move very erratically, so sailors particularly, should monitor forecasts in hurricane areas.

Without radio to alert you, the growth of swell can be an indication of a hurricane – when coupled with other conditions such as highly coloured sunsets or sunrises; dense banners of cirrus cloud converging towards the vortex of the approaching storm; abnormal rises in barometric pressure followed by an equally rapid drop.

SAFETY PRECAUTIONS

Get out of the hurricane's path if you can.

- Hurricane warnings are usually issued when one is expected within 24 hours and will give you plenty of time to evacuate its path, if you are prepared.
- Keep away from the coast, where destruction will be worst, with flooding and a tidal wave, and from river banks.
- Board up windows and secure any objects outdoors that might be blown away.
- At sea take down all canvas, batten down the hatches and stow all gear.

If you are in a solid building and on high ground STAY WHERE YOU ARE – travel in a hurricane is extremely dangerous. The safest place is usually in a cellar or under the stairs. Store drinking water – water and power supplies may be cut off by the storm – and have a battery-operated radio to keep in touch with any instructions issued. If not in a sturdy structure, evacuate to a hurricane shelter. Shut off power supplies before you leave.

Seeking shelter

Outdoors a cave will offer the best protection. A ditch will be next best. If unable to escape lie flat on the ground where you will be less of a target for flying debris. Crawl to the lee side of any really solid shelter such as a stable rocky outcrop or a wide belt of large trees. Beware of small trees and fences which could be uprooted.

SURVIVAL ADVICE

Stay where you are when the hurricane appears to have passed – there will usually be less than an hour of calm as the eye passes and then the winds will resume in the opposite direction. If sheltering outdoors move to the other side of your windbreak in preparation or move to better shelter if close by.

TORNADO

Tornadoes are violent storms associated with low atmospheric pressure and whirling winds. They apparently develop when air at the surface has been warmed and a column of air descends from the base of cumulonimbus storm clouds above. Air rushing into the low pressure area begins to rotate fiercely.

Tornadoes are the most violent of atmospheric phenomena and the most destructive over a small area. Wind speeds have been estimated at 620kph (385mph).

The diameter of the 'twister' at ground level is usually only 25–50m (80–160ft) but, within it, the destruction is enormous. Everything in its path except the most solid structures is sucked up into the air. The difference in pressure outside and inside a building is often the cause of collapse – or 'explosion'. Tornadoes can sound like a spinning top or engine and have been heard up to 40km (25 miles) away. They travel at 50–65kph (30–40mph).

At sea tornadoes produce waterspouts. Although they can occur elsewhere, tornadoes are most prevalent over the prairies of the United States, in the Mississippi-Missouri valley and in Australia. They can develop in a hurricane.

Tornado precautions

Take shelter in the most solid structure available – reinforced concrete or steel-framed if possible, but preferably in a storm cellar or cave. In a cellar stay close to an outside wall, or in a specially reinforced section. If there is no basement, go to the centre of the lowest floor, into a small room or shelter under sturdy furniture – but not where there is heavy furniture on the floor above. Keep well away from windows.

Firmly close all doors and windows on the side facing the oncoming whirlwind and open those on the opposite side. This will prevent the wind getting in and lifting the roof as it approaches and equalize the pressure to prevent the house 'exploding'.

Do NOT stay in a caravan or car, they could be drawn up by the storm.

Outdoors you are vulnerable to flying debris and to being lifted up – though people have been lowered to the ground again unharmed! You CAN see and hear a tornado coming. Get out of the way. Move at right angles to its apparent path. Take shelter in a ditch or depression in the ground, lie flat and cover your head with your arms.

LIGHTNING

The release of electrical charges built up in clouds can be especially dangerous on high ground or when you are the tallest object. In a lightning storm keep away from hill brows, from tall trees and lone boulders. Make for low, level ground and lie flat.

Insulation

If you cannot get away from tall objects, but have DRY material which will provide insulation, sit on it. Rubber-soled shoes may help insulation but are not a guarantee that you will be safe. A dry coil of climbing rope makes good insulation. Do NOT sit on anything wet. Bend your head down and hug your knees to your chest, lifting your feet off the ground and drawing in all your extremities. Do not reach down to the ground with your hands, that could give a contact to conduct the lightning. If you have nothing which will insulate you from the ground lie as flat as you can.

Stay low

You can sometimes sense that a lightning strike is imminent by a tingling in the skin and the sensation of the hair standing on end. If you are standing up, drop to the ground AT ONCE, going first to the knees with the hands touching the ground. If you should be struck, the charge may take the easiest route to the earth through your arms – missing the torso and possibly saving you from heart failure or asphixiation. QUICKLY LIE FLAT.

Do not hold metal objects when there is lightning about and keep away from metal structures and fences. However, do not jettison equipment if you will lose it altogether (when climbing, for instance). A dry axe with a wooden handle may spark at the tip, but is well insulated. Proximity to large metal objects can be dangerous, even without contact, for the shockwave caused by the heated air – as the lightning passes – can cause damage to the lungs.

Shelter

One of the best places to shelter in a lightning storm is at least 1m (3ft) inside a deep cave with a minimum of 1m (3ft) space on either side of you. Do NOT shelter in a cave mouth or under an overhang of rock in mountainous country. The lightning can spark across the gap. Small openings in the rock are frequently the ends of fissures which are also drainage routes and automatic lightning channels.

EARTHQUAKE

Earthquakes are perhaps the most feared of all nature's violence – they come suddenly with little warning. Unlike other natural hazards, such as flood and fire, little can be done to prepare for them. They range from minor vibrations in the earth, detectable only on delicate measuring instruments, to great upheavals tearing whole mountains apart.

Minor earth tremors can happen anywhere, but major quakes are confined to known earthquake belts where buildings could be planned to withstand them or to cause little damage if they do collapse – like traditional buildings in Japan. Modern cities rarely take this into account.

With constant monitoring by seismologists, major earthquakes can be predicted and some evacuation may be possible. Animals become very alert, tense and ready to run.

A detailed knowledge of local geology may indicate the weak points along major fissures but the tremors and the waves of movement through the earth could extend to almost anywhere in an earthquake zone.

Causes

Earthquakes are caused by the sudden release of tension built up in the Earth's crust, as deep as 700km (435 miles) below the surface – but only a rupture in the upper tens of kilometres is likely to produce movement affecting the surface. The shock wave for the 1964 Alaskan earthquake, for instance, was at about 20–30km (12–19 miles) deep.

The earthquake belts lie along the edges of the semirigid plates that form the Earth's crust. The deepest quakes occur along the ocean trenches, forming and destroying volcanic islands. The most violent tend to occur in areas where one plate is thrusting beneath another, as along the west coast of North America, where the San Andreas Fault is a particularly vulnerable zone.

A succession of preliminary tremors, known as foreshocks, often followed by a seismically quiet period, usually precede a major quake, which they can actually trigger. These initial tremors may not be noticeable.

Domestic earthquake precautions

Stay tuned to a local radio station for up-to-date reports and advice if you have warning of a possible earthquake. Turn off gas, electricity and water if advised to do so. Remove large and heavy

objects from high shelves, from which they might fall on you. Put bottles, glass, china and other breakables in low cupboards. Shelves should have a lip or low barrier to stop things slipping off. Cupboard doors should have positive fastening – not just magnetic catches. Secure or remove suspended objects, such as large light fittings and hanging flower bowls.

Have ready in case needed: fresh water and emergency food, a torch, first-aid materials and a fire extinguisher.

SAFETY PRECAUTIONS

KEEP AWAY FROM ANYTHING THAT MIGHT FALL ON YOU: trees in the open air, for they may be uprooted; building in towns, for – even if they are stable enough not to be demolished – pieces may come crashing down. Ideally evacuate to an open area but, if that is not possible – and you may have little time – it is safer to stay indoors. In the street ruptured gas mains and power cables may add to the hazards. People going in and out are the ones at most hazard from falling masonry on buildings.

Indoors

If you are indoors when an earthquake strikes, stay there. Douse fires. Stay away from glass, including mirrors, and especially from large windows.

- An inside corner of the house, or a well-supported interior doorway are good places to shelter.
- A lower floor or a cellar probably gives the best chance of survival. An upper floor could come crashing down with you on it. Make sure there are plenty of exits.
- Get beneath a table or other piece of substantial furniture which will give both protection and an air space.
- In a shop keep away from large displays of goods which could come crashing down.
- In high-rise offices stay put. Never go into a lift. Staircases may attract panicking people. Get under a desk.

In a car

Stop as quickly and safely as you can – but stay in the car. It will offer some protection from falling objects. Crouch down below seat level and you will be a further protected if anything falls on the car. When the tremors cease keep a watch for any obstructions and hazards: broken cables, undermined roadways or bridges which could give way.

Outdoors

Outdoors lie flat on the ground. Do NOT try to run. You will be thrown about and could be swallowed in a fissure.

- Keep away from tall buildings.
- Do not go deliberately underground or into a tunnel where you could be trapped by blockage or collapse.
- If you have managed to get to an open space do not move back into buildings for if minor tremors follow they could collapse any structure left unstable by the first quake.
- On a hillside it is safer to get to the top. Slopes are liable to landslide and there would be little chance of survival for anyone caught in the thousands of tons of earth and rock that could move with terrifying speed. People have been known to survive by rolling into a tight ball on the ground.
- Beaches – provided they are not below cliffs – are initially fairly safe but, since tidal waves often follow a quake you should move off the beach to high open ground as soon as the tremor has finished. Further tremors are unlikely to be as dangerous as a tsunami.

Aftermath precautions

Rupture of sewage systems, contamination of water and the hazards of the bodies trapped in the wreckage can all make the risk of disease as deadly as the earthquake itself. Bury all corpses, animal and human.

- Do NOT shelter in damaged buildings or ruins. Build a shelter from debris.
- Take special care over sanitation and personal hygiene. Filter and boil all water.
- Do not strike matches or lighters, or use electrical appliances, if there is any chance of a gas leak. Sparks ignite gas.
- Check sewage services are intact before using lavatories.
- Open cupboards carefully, objects may tumble out.
- Be prepared for aftershocks.

BE CALM! THINK FAST!

Speed is essential if an earthquake strikes. There is little time to organize others. Use force if necessary to get them to safety or pull them to the ground.

VOLCANO

Active volcanoes are found in the areas of the world which are also most prone to earthquakes – where there is most movement beneath the surface. Long dead volcanoes and evidence of ancient volcanic activity can be found elsewhere – such as Arthur's Seat in Edinburgh, Scotland.

A channel is formed when pressure forces molten rock (magma) to the surface through a fault. The channel is usually the main outlet for further eruptions, though other vents may appear. A major eruption may blow the whole top off a mountain.

The molten rock, usually known as lava when it reaches the surface, may be of two kinds: granite lava, which is viscous and slow moving, and basalt lava, which flows more rapidly at speeds of 8–16kph (5–10mph). Granite lava tends to block the vent of the volcano, eventually cleared by an explosion due to the build up of pressure beneath – showering lava and pieces of mountain around for considerable distances and causing fires.

ERUPTION HAZARDS

Lava

Although it is possible to outwalk or outrun most basalt lava flows they continue relentlessly until they reach a valley bottom or eventually cool off. They crush and bury anything in their path. Lava flows are probably the least hazard to life produced by an eruption, for the able-bodied can get out of their way. Other dangers are NOT so easily avoided.

Missiles

Volcanic missiles, ranging from pebble-size fragments to great lumps of rock and 'bombs' of hot lava, can be scattered over considerable distances. A shower of volcanic ash can fall over a much greater area, some dust being carried to great heights and are dispersed around the world affecting weather conditions.

If evacuating from close to the volcano, hard helmets of the kind worn by building workers, motorcyclists or horseriders will give some protection. Over a wider area, where evacuation may not be necessary, protection should be worn against the effects of ash and any rain which accompanies it.

Ash

Volcanic ash is not ash at all, but pulverised rock forced out in a cloud of steam and gases. Abrasive, irritant and heavy, its weight can cause roofs to collapse. It smothers crops, blocks transport routes and watercourses and, combined with toxic gases, can cause lung damage to the very young, old and those with respiratory problems. Only very close to an eruption are gases concentrated enough to poison healthy people. But, when sulphur dioxide in the ash cloud is combined with rain, sulphuric acid (and sometimes others) are produced in concentrations which can burn skin, eyes and mucous membranes. Wear goggles (ski-goggles or a snorkelling mask which seal around the eyes, NOT sunglasses). Use a damp cloth over mouth and nose, or industrial dust masks if available. On reaching shelter remove clothing, thoroughly wash exposed skin and flush eyes with clean water.

Gas balls

A ball of gas and dust may roll clown the side of a volcano at a speed of more than 160kph (100mph). This phenomenon (called by scientists a *nué ardente* – glowing cloud) is red hot and moves too fast to be outrun. Unless there is a strongly-built underground shelter nearby, the only chance of survival is to submerge underwater and hold your breath for the half-minute or so it will take to pass.

Mudflows

The volcano may melt ice and snow and cause a glacial flood or – combined with earth – create a mudflow, known as a lahar. This can move at up to 100kph (60mph) with devastating effect, as in Colombia in 1985. In a narrow valley a lahar can be as much as 30m (98ft) high. They are a danger long after the major eruption is over and are a potential risk even when the volcano is dormant if it generates enough heat to produce meltwater retained by ice barriers. Heavy rains may cause it to breach the ice.

WARNING

Volcanoes usually show increased activity before a major eruption with rumblings and escapes of steam and gases. Sulphurous smells from local rivers, stinging acidic rain, loud rumblings or plumes of steam from the volcano are all warning signs. Evacuating by car remember: ash may make roads slippery, even if it does not block them. Avoid valley routes which could become the path of a lahar.

NUCLEAR EXPLOSION

Although a nuclear strike is unlikely, many countries have nuclear capabilities and must be regarded as a threat.

The immediate hazards of a nuclear explosion are blast, heat and radiation. The severity of their effects will depend upon the size and type of weapon, distance or height of the explosion, weather conditions and terrain.

Blast

The detonation causes the initial shock-wave. Even more powerful is the compression of the air produced by the rapid expansion of the fireball. The wave of pressure travelling outwards from the point of detonation will collapse buildings, uproot trees and fill the air with flying debris, well before the heat follows. Approximately half the total energy of the explosion is expended in this way.

When the blast wave has passed, air rushes back to fill the void causing further damage. At distances where the initial blast has only weakened structures this vacuum effect will finish the job.

Heat

The thermal radiation (heat and light) that is produced by a nuclear explosion reaches temperatures hotter than the sun. Close to the point of detonation all inflammable materials will be ignited – even vaporized. In the case of the Hiroshima bomb, exposed skin was burned at a distance of 4km (2½ miles). Today's weapons are MANY times more powerful than that bomb and their effects comparably more extensive.

Radioactivity

In addition to the thermal radiation, nuclear fission produces alpha and beta particles and gamma rays. Although radioactive fallout settles to earth, with the appearance of white ash or dust, this is the residue of destroyed matter and not the radioactivity itself. That cannot be detected by human senses. A Geiger counter is required to register its presence, indicated by a dial or a sound signal which becomes increasingly agitated as the radiation increases.

- **Alpha particles:** have low penetrating capabilities and it is easy to shield them off. They cannot penetrate the skin but they do present serious problems if ingested or inhaled.

- **Beta particles:** are only slightly penetrating and heavy clothing and boots will give full protection. On exposed skin they cause burns. If ingested they attack bone, the gastrointestinal tract, thyroid gland and other organs.
- **Gamma rays:** are highly penetrating. They travel much slower than alpha and beta rays, damaging all body cells.

Residual radiation

The initial radiation given off during the first minute of a nuclear explosion can kill – but it lasts only a short time. Once the blast has passed, so has the initial radiation threat. However, exposure to residual radiation can be equally dangerous.

> ***SURVIVAL ADVICE***
>
> Common symptoms of exposure to radioactivity are nausea, vomiting, general weakness. Ulcer-like sores appear on the skin, which tends to take on a grey hue.

The amount of residual radiation depends on how the bomb was detonated. If it was high above the ground and the fireball did not touch the earth little residual radiation is produced – what the strategists call a 'clean bomb'. If exploded on or near the ground, a huge quantity of soil and debris is sucked upwards to a great height and falls back to earth as radioactive dust. Heavier particles fall in the vicinity of the explosion, but lighter ones may be carried by wind over a wide area – spreading the radioactivity.

Radiation does decay. However, while as much as 70 per cent of the particles following an explosion remain radioactive for only one day or less, it takes others years for their radiation to decay.

> ***SURVIVAL ADVICE***
>
> The radioactivity to which an unprotected person could be exposed in the first few hours will exceed that received during the rest of the week. That in the first week will exceed that accumulated during the rest of a lifetime spent in the same contaminated area. It is therefore important to be shielded during the initial stages.

Radiation shelters

In default of a deep bunker equipped with air, water and food supplies, in which to sit out a nuclear conflict and its aftermath, the best protection is a deep trench with a roof covered by a metre or more of earth. If the detonation is sufficiently distant not to

SHIELDING

Strictly speaking, it is impossible to shield completely from all radiation but a sufficient thickness of shelter material will reduce the level of radiation to a negligible level. Below are some materials, and the thickness required to reduce radiation penetration by 50 per cent.

Material	Metres/Feet
Iron and steel	0.21/0.7
Concrete	0.66/2.2
Brick	0.60/2.0
Soil	1.00/3.3
Ice	2.00/6.6
Wood	2.60/8.8
Snow	6.00/20.3

produce total destruction, the trench and earth will protect from blast, heat and radiation.

Look for terrain that has natural shelter, such as ravines, gullies, ditches and rocky outcrops. If you do not have a trench shelter prepared, start digging – FAST! As soon as the hole is big enough, get inside it to continue digging, to minimize exposure to radiation if you are caught-out while still digging. Rig up a roof. Even if only of cloth, it will stop dust falling on you. Penetrating rays can still reach you so try to get a metre of earth above you.

If caught in the open get to your shelter as quickly as possible. Once under cover, remove outer garments and bury them under a foot of soil at one end of the bottom of the shelter. Do not venture out until absolutely necessary and do not re-use your discarded garments. Under no circumstances move out of the shelter in the first 48 hours.

If desperate for water a brief venture out, lasting not more than 30 minutes, is permissible on the third day. On the seventh day a further exposure, of up to half an hour, can be extended on the eighth up to one hour and then from two to four hours for the next four days and from the thirteenth day normal working hours, followed by rest in the shelter.

Decontamination

If your body, or even your clothing, has been exposed to radiation, it must be decontaminated. Once in shelter scrape earth from the shelter bottom and rub it over the exposed parts of your body

and your outer clothing. Brush it off and throw the soil outside. Wipe the skin with a clean cloth if possible. More effectively, if water is available, wash the body thoroughly with soap and water instead of soil.

Medical care

ALL wounds must be covered to prevent alpha and beta particles entering through them. Burns, whether caused by beta particles and gamma rays or by firestorm heat, should be washed with clean water and covered. Urine may be used, if no uncontaminated water is available. The eyes should be covered to prevent further particles entering and a damp cloth placed over the mouth and nose to prevent further inhalation.

Radiation affects the blood and increases susceptibility to infection. Take all precautions – even against colds and respiratory infections.

AFTERMATH

Unless stored in deep shelters, or with special protection, all foodstuffs are likely to have absorbed some measure of radioactivity. Be cautious of foods containing a high salt content, dairy products, such as milk and cheese, and sea foods. After tests it was found that food with salt and other additives had a higher concentration of radioactivity than food without them. The safest canned foods are soups, vegetables and fruits. Cured and processed meat are more readily contaminated than fresh. Bone absorbs the highest levels of radioactivity, then lean meat, with fat lowest.

Water

Unless it is from a protected source, do not drink any water for at least 48 hours after detonation. Avoid water from lakes, pools, ponds and other static surface water. Filter all water and boil it before drinking.

The following sources are the least contaminated (in order of least risk):

1 Underground wells and springs
2 Water in underground pipes/containers
3 Snow taken from deep below the surface
4 Fast-flowing rivers

Dig a hole by a fast-flowing stream and allow water to filter down into it. Scrape off any scum that forms on the surface and scoop up water. Filter it through layers of sand and pebbles (dig deep to obtain these) in a can with holes punched in the bottom, or through a stocking. Boil in an uncontaminated vessel.

Decontaminate utensils by washing thoroughly in fast-flowing or boiled water.

Animals as food

Animals that live underground have less exposure to radiation than those that live on the surface: rabbits, badgers, voles and similar animals are the best bets but, when they venture out, they too will be contaminated. However, such food sources must be made use of. You will increase your own contamination – but the alternative may be to starve.

To reduce contamination from meat do NOT directly handle carcasses, wear gloves or use cloth to cover the hands while carefully skinning and washing. Avoid meat in direct contact with the bone. The skeleton retains 90 per cent of radiation so leave at least 3mm (1/8in) on the bone. Muscle and fat are the safest part of the meat. Discard ALL internal organs.

SURVIVAL ADVICE

Fish and aquatic animals will have a higher contamination than land animals from the same area. Birds will be particularly heavily contaminated and should not be eaten. However, eggs are safe to eat.

Plants as food

Root vegetables with edible tubers growing underground are safest – carrots, potatoes and turnips, for instance. Wash them well and peel before cooking.

Smooth-skinned fruits and vegetables are next safest. Plants with crinkly foliage are the hardest to decontaminate, because of their rough texture. They should be avoided.

Long-term survival

Predictions of the long-term results on the environment of major thermonuclear conflict differ widely. The possibility of a 'nuclear winter', with consequent effect on climate and plant life far beyond strike areas, would make even subsistence agriculture difficult. In the short-term, however, and in the case of limited conflict, the advice in *Home front* will be relevant.

HOME FRONT

You do not have to be miles away from civilization to be caught in a survival situation. Natural disaster, civil disturbance or military action could cut you off from all the usual services and food supplies. Until they can be re-established, you would be left to manage on your own resources and skills.

With no power supplies, central heating, hot water, lighting, air-conditioning and refrigeration would all cease. Battery radios and television would for a time give some news of the rest of the world, if the situation is not global, but post, telephone and newspapers would no longer be available. A generator is an essential back up and a short-wave radio is useful. As mains water supplies ceased to function, so taps would run dry and toilets would become unusable.

In the countryside there would be natural resources to draw upon. In large cities shops would soon be emptied of food – sold or looted – and plants in parks and gardens would be rapidly stripped, once any private stocks had been exhausted. The population would have to make forays out into the countryside to survive, or abandon the town, if not in a siege situation. Suburban dwellers have more vegetable plots and open spaces to provide foodstuffs. They would be less dependent upon shops. Those away from major centres are more likely to have their own food stocks, because they cannot shop at will.

Most families have some food in store. It should be rationed and supplemented with whatever can be found.

FOOD STORES

Storing food is a good habit to get into, especially if you live in an isolated place, which can become completely cut-off. If you have a year's food supply in store, and add to it as you use it, you will not only be able to survive the worst but will be able to live at last year's prices.

The stock does not have to be established in one go. Build it up gradually, taking advantage of special offers in supermarkets. Buy an extra tin or packet and put it by. Store your foods in a cool, dry, dark place and off the ground – moisture and heat cause bacteria and moulds. If stores are left on the floor insects and rodents will help themselves. Make sure that all containers are insect- and rodent-proof.

REMEMBER: Rotate cans, so that the contents do not settle, and separate. Label each can or packet with a colour-fast waterproof pen, noting contents and date of storage. Use in sequence – the oldest first. Store methodically and if a label falls off, you should still have a good idea of the contents.

Choice of foods will depend upon individual taste, but straightforward products (corned beef in preference to beef stew and dumplings) will keep better and can be used in a greater variety of ways. Wheat keeps better than flour – it is less susceptible to moisture, light, insects and temperature change. Wheat found in the pyramids was found in good condition after thousands of years. However, you must grind it to make flour, so invest in a small hand grinder.

Keep it sealed

Screw-top sweet jars are ideal for storage and plastic containers with tight-fitting lids can also be used. Do not over fill them so that they distort and the lid does not fit correctly. Use adhesive tape to seal the lids. Reseal after using some but remember that once opened the contents will begin to deteriorate.

RECOMMENDED FOODS/SHELF LIFE

Wheat	Indefinitely below 15°C (59°F)
Milk powder	2 years
Honey	Indefinitely
Egg powder	2 years
Salt	Indefinitely if absolutely dry
Canned foods	3–5 years (replace regularly)
Oats	Indefinitely
Cooking oil	2 years (replace regularly)

Rations

Complete rations are available with various menus – either freeze-dried or dehydrated. They are lighter and less space-consuming than canned foods. Freeze-dried are best for both taste and texture and retain minerals which are lost in dehydration. Although both need

water for reconstitution they can, in dire circumstances, be eaten as a dry munch.

Vitamins

Multi-vitamin tablets are also a good investment. The body can store up to a month's supply of most vitamins, then health will suffer if they are not replaced. In stress situations they are more rapidly used up. The B family (and minerals, calcium and zinc) are the first to go. Vitamin tablets do not have unlimited shelf-life – check manufacturer's instructions.

Other foods

- **Dried fruit and nuts** are nutritious and should also be included – raisins, sultanas and currants all keep well. Nuts in their shells keep so long as they are dry. Packets of dried salted nuts such as peanuts, brazils and walnuts, are highly nutritious.

- **Potato powder** is a great filler for hungry stomachs and can be prepared in several ways to make it palatable.

- **Brown rice** has more nourishment than long-grain white rice which loses all its goodness when boiled.

Store location

The cooler the storage area, the better the stores will keep – a cellar is ideal but there may be a problem with dampness so keep all the stores off the ground and inspect them regularly. If there is a skylight in the cellar, cover it. The store is best kept dark.

An attic is also convenient for storage – the stores are not in the way of day-to-day activities. However, it may get very warm in summer and access may be difficult – especially if a ladder is the only means of entry – which may be awkward when trying to rotate bulky stores. The roof is also a vulnerable position in most kinds of disaster situations. In an area where hurricanes can be expected an attic is not a good choice. In territory liable to flooding a cellar would be equally at risk. Under the stairs is another area that may offer some protection, though perhaps limited space.

Advantage should be taken of wherever is most conveniently available to store not only food but also medical supplies, disinfectants, cleansing materials – and water. If you divide your stores into more than one area, each with a variety of items, you should be well prepared.

ADD TO YOUR STORES

Toothpaste and soap
Disinfectant and bleach
Washing powder
General medical supplies
Medicines: for dysentery, for stomach upsets, for allergies, general painkillers
Bandages and dressings
Spare batteries

PRIORITIES

In a domestic situation there is likely to be shelter, unless it has been totally destroyed, or the area has become a danger zone and evacuation is imperative. Damage can be patched-up to provide some protection from the elements and more permanent repairs undertaken as soon as possible.

Water supplies are always likely to be a problem – for even during a flood drinking water is scarce. Fortunately there are likely to be some immediate reserves on the premises and, with warning of a crisis, these can be supplemented.

Fire for warmth is less of a problem, since there will be burnable materials in the house and surroundings. Infection may prove the greatest danger and strict hygiene and sanitary practices must be enforced.

WATER

Although a family of four can use a considerable amount of water each week, only a small percentage of this is for drinking – a requirement of about 2 litres (3½pt) per day per person. If warned of a crisis, fill as many receptacles as possible, especially in a hot climate. A bath holds many gallons; increase its capacity by blocking the overflow. Use dustbins, buckets, pots – even strong polythene bags if they are only half filled and securely tied off.

Store water in the dark. If light gets to it green algae will develop. Water is bulky and heavy. Do not store it in the attic or it may bring the ceiling down.

Even without advance warning there will be water in the storage tank, heating pipes, radiators, perhaps an aquarium, and the toilet cistern will hold another few gallons – don't flush it. Outdoors you may have a swimming pool, water butts, or a pond – even water from a car radiator can be utilized. Central heating water is usually treated with a de-oxygenizing agent and a car radiator probably contains anti-freeze, so water from these places is best kept for cleaning purposes. If it has to be used for drinking boil it, collect the steam in clean cloths and wring them out. Then reboil. (Also see *Essentials*.)

Boiled water tastes flat and distilled water has even less taste. It is easy to restore some of its sparkle by putting oxygen back into it: simply pour the water back and forth from one vessel to another. A small piece of wood charcoal placed in the vessel while it boils also helps taste.

FILTERING AND STERILIZING

Filter and sterilize ALL water before using it for drinking. If circumstances make it impossible to boil water sterilize it with chemicals.

FILTERING: Allow water to stand in its container so that sediment settles at the bottom. Then siphon it into a filter made up of a nylon stocking (or other porous material) stuffed with layers of sand (bottom), charcoal and moss (top).

STERILIZING: Clear water: add 2 drops household bleach per litre (1 per pint) or 3 drops 2 per cent tincture of iodine per litre (6 per pint)

Cloudy water: double the quantities of bleach or iodine

Large quantities: half teaspoonful bleach per litre (2 teaspoonsful per gallon)

Cooking in water

Water in which food is to be cooked MUST be boiled for at least eight minutes, but water not boiled for as long can be used for heating cans of food provided it makes no contact with the foodstuff.

Stand the can in water, pierce a small hole in the top to avoid the risk of explosion and plug it with a twist of cloth so that water cannot enter the can.

Alternatively, boil the water, remove it from the heat and place the unpierced can in the water. This takes longer for the can to heat through.

Water catchment

- Catch all available rainwater. Break off lower sections of down pipes and divert the flow into a container such as a dustbin. Even if rainwater is pure, guttering may contaminate it – so sterilize.
- Supplement water receptacles with tarpaulins or plastic sheets supported on sticks. Rinse between showers to reduce tainting.
- Dig a hole and line it with a plastic sheet or concrete for water storage. Cover it to prevent evaporation and debris falling in.
- If the local water table is high you may be able to dig down to water – there may even be a well on your property which could be reopened.
- Solar and vegetation stills (see *Essentials*) are other ways of obtaining water.

Water conservation

Do not waste water washing clothes, other than underclothing. Never throw water away after use. Allow sediment to settle and it can be used again.

It is very important to wash the hands before preparing food, but the rest of the body can wait until it rains. The body produces natural oils and, as long as the pores are kept open, health will not be affected. You soon get used to the smell and social occasions are rare in a crisis situation. If showers are few and far between, use a damp cloth for a strip wash – cloths left out on lawns or bushes over night may gather enough moisture for a wipe down without using up your water stores.

Injured persons must receive priority for bathing and all their dressings should be boiled regularly.

FIRE

The warmth and comfort of a fire are great morale boosters, but its most important use will be for boiling water and preserving food. These must take priority in the use of fuel.

Blocked fireplaces should be opened up again and chimneys checked for obstructions. If they are not clear there is real risk of setting fire to the chimneys themselves and thus to the house.

To clear a chimney

Tie a holly bush or a similar shrub to a long rope and from the rooftop lower the rope down the chimney (a stone tied on the end will ensure it drops). Now pull down the holly bush and it will clear the chimney.

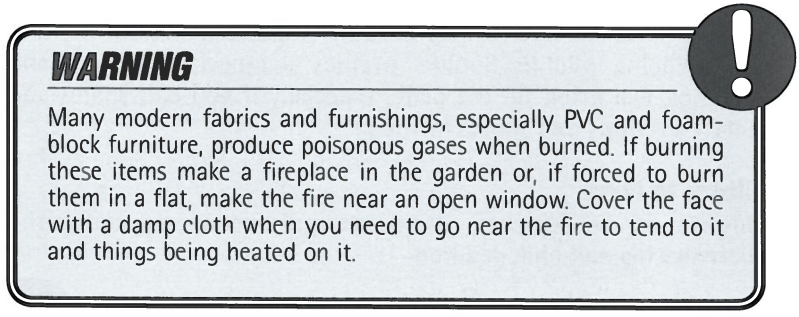
Improvised fireplaces

Where there are no fireplaces metal containers, metal dustbins lids and central heating radiators can all be used to light a fire on. In flats with concrete floors a fire could be lit directly on the floor. If you have a barbecue stand make good use of it.

Never leave a fire indoors unattended. Even one in a proper grate should be allowed to die down for the night, if no one is going to stay up to watch it.

Fuel

Start with garden furniture, trees, shrubs, bean sticks, swings, ladders, tool handles. When these run out start on furnishings. Carpets, curtains and cushions will all burn. Cardboard, books and rolled up newspapers will also give off a surprising amount of heat. All kinds of vehicle fuel can also be burned as well as the conventional heating and lighting oils.



FOOD

- Use the perishable foods first. Fatty foods are the first to deteriorate and canned foods the last.
- Remember that, once electric power fails, the refrigerator and freezer cease to function – though they may take some time to defrost if you open their doors as seldom and briefly as possible.
- Boil milk and it will keep longer.

- Cook meat, wrap it in cloth and bury it in the earth. Cook pork first (which has the highest fat content), then lamb, then beef (which is the best meat to preserve).

- Once meat has been cooked and allowed to cool, do NOT reheat it or you may risk food-poisoning.

SURVIVAL SCENARIO

What should you do in a country where the threat of kidnap is high?

In Columbia, for example, where the threat of kidnap is high, the best thing to do is be a 'grey' person; do not be the first, or last person to do anything, so that you don't stand out. If there's a rescue attempt, get down and take cover.

Food from the garden

Vegetables with four petals, including all the brassicas, from wallflowers to cabbages are edible. Hollyhocks, though not very tasty, are nutritious. Worms, slugs and snails are also edible. AVOID bulbs such as daffodils, tulips and aconites which are all poisonous.

Further afield

Explore parks and open spaces for other vegetation and for hunting and trapping wildlife. Birdlife in cities – especially pigeons and starlings, will often fill the plate, especially if you bait snares and nets. (See *Traps and snares* in *Food*.)

Closer to home

Beware of houseplants, some are poisonous, especially the diefenbachia and philodendron.

SURVIVAL TIP

If food is short there will be none to spare for pets and you CANNOT afford to be squeamish. If the aquarium water has to be drunk don't waste the fish. In fact they'll probably be the easiest to eat even if you don't need the water. The cat is next in the pot. Once dressed it will be hard to distinguish from rabbit. Gerbils, hamsters, rabbits, budgerigars and parrots can all be added to the diet and, unless the dog is an exceptionally good hunter, it should go too.

Preserving food

For methods of smoking, salting and making pickles and chutneys see *Food preservation* in *Food.*

When the fridge no longer functions remove the motor, cut a hole in the bottom, place it on some stones or bricks and with a fire beneath use it as a smoke-house.

SHELTER

The first priorities will be a sound roof over your head and a stable structure. Clear any debris and ensure that there is nothing which could still collapse or fall from above and cause injury. Use slates, tiles and bricks from other buildings to ensure that at least one building is sound.

In cold weather

Conserve resources by living in one room, choosing a ground-floor room with a southern aspect (if you live in the Northern Hemisphere). Block all draughts and avoid opening the door unnecessarily.

If there is a fire burning, make sure that there is adequate ventilation to avoid asphyxiation or carbon monoxide poisoning. Wear warm clothing to help conserve fuel. The more people in the room, the higher the temperature. Rest and keep physical exertion to a minimum.

In very warm weather

Use upstairs accommodation and spread out. Open windows on the downstairs windward side and open all windows on the lee side upstairs. Leave all the doors open and a cool breeze will blow through the house. It is best to rest during the day to conserve energy and fluids, and do any necessary work at night.

Moving

If the house proves beyond repair, or other pressures force you to evacuate, take essential items – food, blankets, tools, medical supplies, containers for water and materials suitable for shelter construction – if they are not likely to be available. Use a pram or a shopping trolley as transportation. Either find an empty house or building, or prepare to set up camp in a location elsewhere.

HYGIENE

Sanitation is very important during the aftermath of any disaster. Open sewers, contaminated water and the build up of rubbish all help to cause and spread disease. Germs carried by rats, fleas and other insects, rapidly multiply. All kinds of waste should be carefully disposed of and all the procedures described (see *Hygiene* in *Camp Craft*) should be adapted to the doorstep situation.

Excreta

Urine is sterile but if large amounts accumulate they smell and attract flies. Use the 'desert rose' urinal, of the kind described in *Camp Craft*. Keep the tube covered. If not used directly, pour all collected urine down the tube.

Build a latrine (again see *Camp Craft*), far enough from the house not to be smelt but near enough to be handy for 'emergencies' – there will be many such emergencies in a survival situation. A box with a hole cut in the base can be used as a thunder box. After use, if there is water available, wash yourself rather than using toilet paper. Wash the hands thoroughly afterwards.

Fit a lid to your thunder box, pile earth around the bottom and then you will contain the smells and keep out flies.

Move all muck with a shovel and avoid hand contact.

Animals

Animals pick up diseases which can be transmitted to humans. If you handle animals, make sure you have no breaks in the skin – or wear gloves. Infection can enter through the smallest of cuts. Cook all meat thoroughly.

Kitchen waste

All biodegradable waste should be stacked in a corner of the garden and composted to enrich the soil. Compost heaps are also a great source of worms, which will add protein to your diet.

However, there should not be much kitchen waste. Do NOT peel potatoes, much of their food value is in the skin. The outer leaves of cabbages which you once discarded, will be edible if you cut them up small.

Non-biodegradable waste – cans and plastics that are not useful in some way – should be burned, flattened and buried. This stops them attracting flies. In warm climates burn ALL waste. Put all the ashes in a pit.

FOOD DISEASES

Salmonella and shigella are diseases transmitted through the oral-anal route, by contaminated hands.

Sores on hands can be a source of entry for staphylococcal food-poisoning with severe stomach pains, diarrhoea and dehydration.

Clostridium botulinum, is a frequently fatal bacillus, which can be produced when canning at home if the temperatures are not high enough – it grows only when oxygen is excluded. There is no reliable way of determining whether food is contaminated so TAKE GREAT CARE if you do your own preserving. A related bacillus causes tetanus.

Communicable diseases

Living in close-knit groups after a disaster increases the risk of passing on disease. Good personal hygiene – as good as possible – can reduce the threat. Isolation of patients with colds or fever is advisable.

Seal dressings and discharges in a polythene bag and burn immediately. Dispose of all faeces and urine in the field latrine – and regularly boil the container used for their disposal.

Personal hygiene

Wash with sand if there is no water available. Don't bite your nails – however stressful conditions may be – or put the fingers to the mouth. Don't pick scabs or sores and keep them covered. Change underclothes regularly and wash them (but don't use drinking water to do so).

SOME USEFUL HERBAL PREPARATIONS

Strawberry roots contain a descaler to clean teeth.

Delphinium seeds can be crushed to treat head lice.

Birch bark can be distilled to produce a tar oil which soothes skin complaints.

Lavender makes a decoction to clean the skin.

(See also *Natural Medicine*.)

POSTSCRIPT

Now you have the benefit of knowledge that it has taken me, and others like me, a lifetime of training and experience to gather. But don't think that just reading this book will have made you a survivor. It has shown you the necessary skills, but it is you who must apply them and you who must have the calibre to cope.

When I am personally teaching soldiers or civilians how to deal with survival situations, part of my job is to ensure their safety. I cannot do that for the reader of this book. I can only give information and advice. I am not there to stop you doing something foolish. I cannot deal with individual specific situations, nor can I ensure that what I have written has been properly understood. I do know that what I have written has saved lives in the past and I believe that it could save more in the future. You must apply survival techniques with caution, for it will be your responsibility – not mine – if you inflict injury on yourself or on others.

The human body has an amazing ability to cope with arduous situations and testing environments. People who have come through, after enduring terrible hardship under seemingly impossible conditions, are living proof of this. Male and female, young and old, they have all had the will to live. Everyone has this basic instinct to some degree and it can be developed by training.

Survival is as much a mental attitude as physical endurance and knowledge. Think of survival skills as a pyramid, built on the foundation of that will to survive. People with it have survived even though they did everything against the rule book. With a little knowledge they could have made their lot much easier. So the next layer of the pyramid is knowledge. It breeds confidence and dispels fears.

The third layer must be training, that does not just mean trying something once but mastering skills and maintaining them. In doing so, you will be keeping your body in training, too.

To cap the pyramid, add your kit. Proper equipment and provisions are common sense, but the survivor does not necessarily know what conditions to equip for. That is where your survival tin will make a tremendous difference to your chances. To the instinct for survival, which you can further develop, add knowledge, training and kit and you will be ready for anything.

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JOHN 'LOFTY' WISEMAN SERVED IN THE SAS FOR 26 YEARS: HIS KNOWLEDGE, EXPERIENCE AND SKILLS ARE UNRIVALLED AND HE IS DEEPLY RESPECTED IN SURVIVAL CIRCLES. HE IS THE FIRST AND BEST EXPERT ON SURVIVAL INSTRUCTION – IN ANY SITUATION.

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