INTRODUCTION

These notes are intended as a guide to personnel who are embarking on field operations with the Division for the first time. It is assumed that you have some interest in outdoor life and have been camping or bushwalking before and have a basic knowledge of camping.

In the past, field parties spent periods of 6-8 months working in inland Australia. It was quite common to spend some months in the bush without seeing a town until moving to a new survey area. Consequently, staff were selected primarily for their desire or proven ability to spend protracted periods in rough conditions away from civilisation. Having selected people of this background they were then trained in the type of survey work the party was going to undertake.

Over the years a high degree of expertise was developed in "bushcraft" skills as applied to operating with vehicles. This knowledge was passed on by example or as anecdotes told around the fire of an evening. The stories stimulated the ingenuity required to keep vehicles mobile, and overcome the natural obstacles encountered in the course of the work. The atmosphere of the group was one of total involvement, with the work and the natural surroundings.

With these influences a style of operation developed which was mobile, flexible and self sufficient. These requirements were important during the time when parties were doing astro fixes, triangulation, tellurometer traversing, aerodist establishment and "remote" operations. The advent of airborne equipment has marked a change in the knowledge that the Division's field staff require.

Today staff are selected primarily on academic and technical qualifications. An outdoor background is desirable but with the airborne work based in towns the degree of "bushcraft" skills is not as essential.

In spite of the changed emphasis our parties will still find instances where people will be working in, or passing through, fairly remote areas. At these times some of the knowledge which used to be commonplace will again be required. These notes, apart from answering some of the questions asked by new field staff, are an attempt to document what used to be verbal information.

In most of the following notes caution is particularly stressed when operating in remote areas and on outback roads. In metropolitan areas people are never far from assistance. This is not so in the outback, even with the advances in radio communication. With the great distances involved any assistance required, no matter how promptly requested, will take time to arrive. For this reason attitudes should be changed to foster self-reliance in individuals, and mutual assistance in the party.

It is also pointed out that each separate vehicle and its crew was and still is, an essential cog in a complex machine and its breakdown would bring the whole complex operation to a grinding halt. Vehicles must arrive at appointed places at the appointed time and this is best achieved by starting early, driving at a pace which enables the driver to cope with the "going" and erring on the side of discretion. DO NOT TAKE RISKS. It is better to be an hour late than days late because of a breakdown trying to hurry through terrain that requires slow going.

CAMPING

When an operation is predominantly camping oriented, field parties are set up to function as groups of two man teams. Each team occupies a vehicle which is equipped to allow them to be mobile and self-sufficient for a number of weeks or longer depending on logistic support.

The style of work in the past has required high mobility, and camping gear has been selected for simplicity and comfort. This allows teams to spend the most productive time on the job, yet allowing a reasonable degree of comfort.

The vehicles are fitted with long range fuel tanks and water tanks. Additional fuel and water may be carried depending on the task, availability of space and weight limitations.

Each vehicle is equipped with a Kimberly tent and sufficient cooking utensils for the team. In addition the vehicle is equipped with an axe, shovel, tow rope, vehicle tools and such other special tools as the job requires, e.g. slide hammer, chainsaw, etc.

The vehicle is "home" to teams on a protracted camping trip and some modification of the vehicle is allowed to make living and working in the bush more comfortable.

The Division has few rules affecting your behavious in camp, apart from the ban of firearms and alcoholic beverages. Common sense and consideration for others has always prevailed and should guide people when living and working together under difficult conditions.

The domestic arrangements are made between the individuals in the team. It is important for hygiene and efficiency, that the camp be tidy and clean. Usually a system is evolved between the members of a team where the work is shared, but when the technical workload is increased the junior member is expected to do more of the work around the camp.

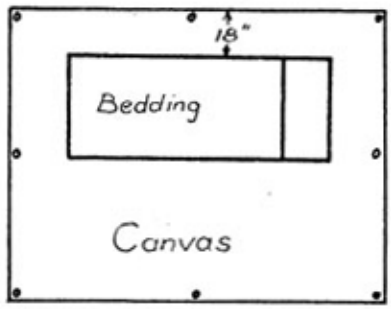
THE SWAG

All personnel on operations which entail camping are issued with a swag. Although heavy and bulky by bushwalking standards it is not usually necessary to carry it any distance, its value lies in its versatility. The large range of climatic conditions which may be encountered can be coped with by altering the arrangement of blankets and sleeping bag.

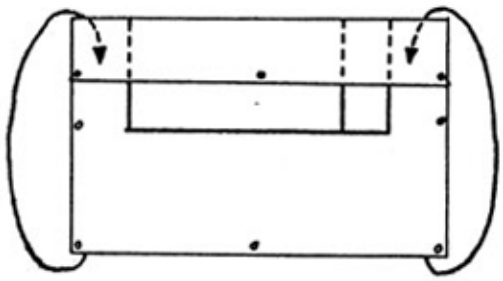
The canvas cover, as well as providing protection for your bedding, can be a sunshade or windbreak and when the bedding is arranged as described later, can provide instant shelter from unexpected overnight rain.

The swag issued consists of a canvas cover, two straps, camp mattress, two blankets, sleeping bag and inner sheet, pillow and case, and mosquito net. The newcomer, when confronted with this formidable stack of bedding, then has the task of transforming it into a bed.

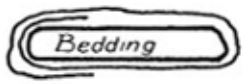
To do this, lay out the canvas cover on the ground and make up your bed on it, i.e. mattress first then blankets and sleeping bag as determined by expected climate and personal need.



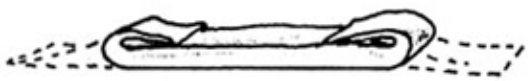
Make up your bedding approximately 18" from one edge. Have the zipper side of the sleeping bag toward this edge.



Fold this edge over the bedding. Then bring the other edge right over the top and tuck it underneath.



End view.



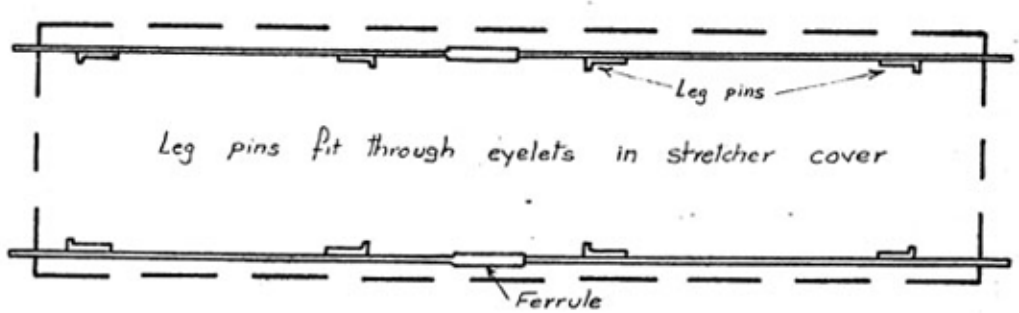
Fold the ends in on top and roll from the pillow end. Secure the roll with the two straps

Store the mosquito net in the pillow case folded flat. This will protect the fragile netting and it will be with you when you need it.

THE STRETCHER

The stretcher is easily erected, comfortable to sleep on, and takes up little room when travelling.

When first issued, or when replacing a worn canvas cover, ensure that the rails are fitted so that the leg pins are inside the rails (see diagram). If fitted incorrectly the cover is stretched unevenly at the leg pins causing the eyelets to strain and the cover to wear rapidly.



The stretcher is made so that it may be broken to half the length when necessary. For normal operations the stretcher can remain in its full length, rolled and tied. Keep the four legs tied together when not in use to avoid loss.

To assemble the stretcher for sleeping, hold it horizontally by one rail and let the other hang at ground level. Start at one end and fit a leg on the lower pin. Rest it on the ground and spring the leg down, slip the leg onto the top pin. Repeat for each leg. Reverse this operation to disassemble.

When making your bed, put the rolled swag at the foot of the stretcher, have the straps placed so that the buckles hang over the end; the rest of the strap lays flat along the stretcher.

Position the stretcher so that your feet point towards the wind when sleeping out in the open.

When not occupied the swag should either be laid flat with both ends and the side flap tucked underneath. In this manner ants and reptiles are prevented from sheltering in your bedding. Many people prefer to roll their swag each day; this gives greater protection and serves a further purpose. In windy conditions a stretcher can be lifted and turned over by a gust of wind, a rolled swag cannot be opened by being dumped on the ground.

Your bedding should be aired as frequently as you are able to manage. If your swag is continually rolled, the blankets and sleeping bag become damp from condensation or perspiration, and they stretch and compress. Airing will dry the bedding and gives it a chance to "spring back" and fluff out. Aired bedding will keep you warmer.

CHAIRS

A folding chair is issued for camping. Like the stretcher, it is not a concession to luxury but an important defence from the small creatures you will encounter around camp.

Don't sit on the ground; centipedes, scorpions, ticks, etc. abound in some areas. Their bite can incapacitate you to varying degrees, depending on personal resistance or allergy. The campfire is an attraction to these creatures and you can lessen the risk of bites by using the chair and stretcher when camping.

THE CAMPSITE

Select a site which is close to a source of firewood. Check for ant nests or other undesirable features.

Don't camp in a dry river bed, outback rivers can rise and flow almost without warning.

Don't camp under picturesque old gum trees, the limbs are brittle and can break off unexpectedly. These trees can shed a limb on a calm, still evening just as easily as during a strong wind.

Have the vehicle positioned so that it may be driven out of a camp without obstruction. Don't have a fireplace or tent blocking the vehicle's way out.

Don't camp directly beside the road when working along roads or driving between work areas. There are very few roads left in this country that don't carry any regular traffic, with the number of unpleasant incidents increasing, it is wiser to find a spot well off the road where you may camp with some privacy.

At a work site, particularly when involved with measuring to distant stations, ensure that vehicles, tents or fires are not on line to where you wish to work. Also ensure, if applicable, that camp lights will not be seen by an observer reading angles to your station at night, or show confusing reflections by day.

In desert areas the top of a sandridge is always a few degrees warmer at night, than the valley between the ridges.

If the work site is to be some distance from the camp and involves walking to and fro, select a camp site near a recognisable feature if possible. In the event of straying from a marked path, particularly at night, this will assist you to find the camp.

Keep the camp site as tidy and uncluttered as possible and don't unload any more gear than the job requires. When finished with equipment, pack it back in its container and load it back in the vehicle. There are times when it may be necessary to pack and move at short notice, i.e. imminent rain, change in program or an emergency. A tidy camp can be packed quickly with less risk of equipment being lost.

When approaching another team's camp site by vehicle take care that you don't get entangled in wire aerials strung between the vehicle and trees. Generators and batteries are often placed under shady bushes for protection from the sun and may be hidden from view. Approach the camp and stop in the track. Check on foot or with the other team before driving in the vicinity of the camp.

FIRES

It is the personal responsibility of all field staff to familiarise themselves with bushfire regulations pertaining to the state in which they are working or travelling. In settled areas these regulations are stringent and penalties severe.

Teams usually cook over an open fire. Select the site of the fireplace carefully, away from overhanging trees, in an area cleared of grass and leaves, and safely away from the vehicle.

Dig a shallow trench in soft ground or two parallel lines of stones in rocky ground. A piece of arc mesh makes a good stand for pots and billies.

A small fire is easier to control when cooking, a large fire will result in burnt food and broken pot handles.

Don't leave a camp fire burning when you leave camp, even for a short time; if the conditions change it can flare and spread.

When finally leaving a camp site, use whatever water you can spare to douse the fire properly then cover it with the spoil from its trench, or rocks.

Store dry kindling and wood under your vehicle at night, this will enable you to readily start a fire in the morning after a heavy dew or shower of rain.

Don't sleep near the fire on cold inland nights, swags have caught fire from blown sparks or bedding trailing into coals. Another aspect is that the light and heat attracts insects, moths, spiders, and all sorts of critters who may be inclined to share your bedding with you.

Spinnifex is a good fire starter, being resinous it burns fiercely and readily, even when green. Never burn off an area of spinnifex, as it may quickly turn into an uncontrollable grass fire.

Be cautious when bushfires are prevelent in your work area. Don't go into forested or scrubby areas by vehicle or on foot while fires are in the vicinity

L.P. GAS

In most areas of Australia firewood is not a problem, but other areas are almost devoid of firewood. The Nullabor Plain, the black soil plains of far west Queensland, and the Gibber Plains of South Australia, are gas stove country. Most of the small islands off the coast have proved to be treeless with unreliable supplies of driftwood. Gas stoves are essential in these conditions.

L.P. Gas equipment and fittings should be treated carefully. Damage to hoses and couplings can cause a potentially explosive situation. See that hoses are properly packed for travelling and check that they are not damaged before use. Check that all couplings are tight before using the equipment.

SMOKERS

Care should be taken with cigarette butts when travelling by vehicle. They should be completely extinguished and deposited in an ashtray. In the bush deliberately extinguish the butt and dispose of it safely. Smokers should take care not to smoke when refuelling operations are in progress with vehicles or aircraft.

RUBBISH DISPOSAL

A deep hole near the fireplace has been the traditional means of rubbish disposal in Nat Map camps, using the old adage, "Burn, Bash and Bury".

All flamable waste is burned in the fire, don't leave litter, it advertises your ignorance to whoever follows.

Throw tins in the fire when empty, this burns off the remaining food which would attract ants and flies. The tin will rust quicker and break up sooner.

Bash the tins flat, then bury or cover with rocks.

Don't smash bottles or jars; glass doesn't decompose and will remain there forever. If broken it is a menace to stock, game and man for a considerably long time.

Wash your plates and utensils immediately after meals, they are easier to clean and require less water.

Dirty cooking utensils left by the fire at night may encourage foxes or dogs to scavenge in the camp. Once they are there they will carry off billies, pans, boots, or other leather articles, or forage in your food boxes. Don't attract them.

SANITATION

As field parties are not usually camped at one location for very long periods it has been the practice to use what is called "Cat Sanitation". In other words take the shovel for a good long walk to ensure privacy, and bury the result so that the flies cannot commute from your waste to your food.

Personal Hygiene is very important when operating in remote areas. It is the first line of defence against disease and infection, when access to medical treatment may be days away from you. In these conditions water is generally scarce and therefore rationed, but don't begrudge water to wash hands before handling food and after attending calls of nature.

WATER

The main factor determining the length of time a party can be self-sufficient in the field is the amount of water carried and the time it can be made to last.

Restrict the use of water to drinking, cooking and essential washing, i.e. the water used to heat tins can be used to wash plates or utensils after the meal, that water can then be used again to heat tins.

The habits of city life must be changed in the interests of conserving water, i.e. don't wash hands or brush teeth under a running tap, pour off enough water to do the job into a container, then wash. You will find it takes less water than you thought to do these tasks just as efficiently.

Always fill tanks and containers when leaving a town or homestead, enquire about water from locals, e.g. dams, waterholes, for availability and suitability for drinking. If in doubt, utilise local water for washing and use the vehicle tank for drinking. If it is necessary to use local water, i.e. tanks, waterholes, always boil it first.

Keep account of the water in the tank, a dipstick is easily made from bush timber. Arrange to be resupplied with water or set off for water before your tank or jerry cans are completely exhausted.

DIET

When purchasing food for a field trip try to balance the diet to include as much fresh food as can be carried, with tinned or dried food. Make the selection as varied as possible, buying in bulk, by the carton can be cheaper but not if it turns out that you don't like the particular line of food.

Buy smaller tins of vegetable lines to assist in mixing foods at mealtime. Don't leave food in opened tins; if you wish to save part of a tin for future use store it in a glass container.

Be especially wary of food tins which have rust spots or are damaged, they may be punctured. If the contents look different to normal or smell a bit "off", dispose of the whole tin. Ptomaine poisoning or at least violent vomiting can be the result of eating food from holed tins. Don't take chances.

Carry fresh potatoes and onions in a coarse weave bag. They can last for some months if properly ventilated bags are used. Never store in plastic bags, even with punch holes.

Eggs will keep for some time if kept cool, if they survive travelling they are a welcome change of diet; they are worth the trouble to carry.

Fresh food to supplement a diet of tinned food will go some way towards preventing vitamin deficiency. Multi-vitamin tablets are essential. Cuts and scratches which turn septic and are slow to heal indicate vitamin deficiency. If it goes unchecked it can lead to ulcers and skin eruptions called "Barcoo Rot".

BUYING YOUR FOOD

To gauge the quantity of food you will need, get an idea of the range and variety of food available. Work out a menu for a period of a week or fortnight, make it as varied as you oan. Use this as a guide depending on the number of weeks you expect to be camping and buy accordingly.

Don't forget such items as condiments (most important), beverages, detergent, scouring pad, clothes pegs. Buy a small selection of the more exotic foods to jolt the palate when the common lines become less appealing.

LOSS OF EQUIPMENT

One aspect of a mobile team which is packing and unpacking every other day is the high risk of losing items of equipment. Condition yourself to replacing things immediately after you have used them. Load the equipment back into the vehicle in the same place each time you load.

Use containers of some kind to keep small items together, i.e. a tucker box for plates, cutlery, mugs, etc. A carton for billies, lids, pots and pans, etc. A web pack for compass, binoculars, tape, plumbobs, etc. The tool box or canvas rolls for all tools.

Some high loss risk areas are :

Items left on the flat mudguards of Landrovers.
Clothes lines left tied between trees near the camp.
Items left hanging in trees, e.g. shaving mirrors, toilet articles, etc.
Items placed under the vehicle for shade or just put "out of the way" are easily overlooked.

LEAVING CAMP

When leaving a camping site you should see that all litter and waste is burned and properly buried.

Be certain that the fire is extinguished and covered with soil or rocks.

Check that aerials and ropes are not left tied to trees. See that the vehicle is securely closed at all doors or flaps. Circle the vehicle checking the outsid underneath, and the surrounding camp area.

ENTRY ON TO PRIVATE PROPERTY

National Mapping field parties have no right to enter, camp or work on private property without the permission of the owner or manager.

Parties must always see, or contact the owner and ask permission to enter and work on their property. It is usually found that owners have no objection to survey parties and are generally helpful with valuable local information.

Property owners are always favourably impressed if no demands are made on their resources, parties should try to be fully provisioned as regards food and petrol. A request to top up water tanks, if required, is seldom refused. Be moderate with any requests unless unlimited water is available.

There are a few basic rules to be observed when you are working on private property.

Always close boundary gates after you, if found open close them. Don't leave a boundary gate open in anticipation of a following vehicle closing it for you.

Leave other gates as you find them. To close an internal gate found open may cut off stock from food or water.

Travel slowly when approaching cattle, horses, or sheep etc. Always be prepared for them to run in front of the vehicle. The slightest bump to a cow in calf or a sheep in lamb almost invariably means loss of both. If an animal is in anyway injured, make your peace (or compensation) with the owner. Stock represent income to the man on the land, you must be careful when driving in their vicinity.

Drive slowly in the vicinity of station buildings to reduce dust.

The offer to carry messages and parcels that do not take you far from your intended route is again appreciated. It pays to be a good listener, don't pass opinions on local problems or personalities. Off-hand comments get around quickly in the outback.

Tracks on private property are private roads and are maintained at the owner's expense. Our vehicles are heavily loaded and can do a lot of damage to a bush track after rain. Give tracks time to dry out before travelling on them. Use detours around depressions where they exist, avoid cutting deep wheel ruts along station tracks. If you become bogged, make an effort to repair any deep holes after you have extracted the vehicle.

Many of the problems can be avoided by talking with the owner beforehand. He may be able to propose a route which will avoid the worst conditions, mark the location of gates etc.

Report any signs of damage to tracks, windmills etc, seen on the property i.e. cattle standing at dry troughs or the like.

If it is necessary to cut timber near control stations or bench marks, permission must be obtained before cutting can begin. This can be obtained from the owner, but in many cases the timber may be controlled by another authority, i.e. Forests Commission, State Lands Department etc.

Trees growing by the roadside in closely settled districts are controlled by shires, any extensive cutting must be justified to shire officials.

In very wet conditions keep abreast of information regarding roads which may be closed to traffic. Shires are empowered to impose heavy fines on vehicles breaking restrictions. We are not excempt. Warnings are broadcast on local radio stations and displayed at roadside signs. If in doubt enquire at shire offices or police station. When leaving a property under these conditions the owner will either know the situation or telephone for you, it is in his interests to help you.

In general use common sense and consideration for the people who live in the outback after all, you are only passing through.

It is the responsibility of all drivers to be familiar with the road traffic laws of each state. Drivers of Commonwealth vehicles are bound by all state and local traffic laws, as are other drivers. There are also Departmental regulations covering vehicles, these are distributed as a booklet "Rules Governing the Use of Motor Vehicles".

FREE WHEEL HUBS

Some of the Division's 4 wheel drive vehicles are fitted with free wheel front hubs. These hubs are used to disengage the hub from the stub axle, allowing the front wheels to turn freely in 2 wheel drive without driving the differential and drive shaft back to the transfer case.

The principal advantage of disengaging the hubs is the reduction of wear to the front wheel drive assembly and front tyres. There is, also, a significant fuel saving on a long journey.

Four wheel drive should only be selected when the front hubs are in the lock (engaged) position otherwise the hub engagement mechanism may be damaged. If low range is selected, an excessive torque load may be placed on the rear drive line resulting in a broken rear axle or more serious drive line damage.

Front hubs and 4 wheel drive should be selected as surface conditions dictate, and it is best to do so before conditions deteriorate to an extent where a vehicle may become "stuck" if left in 2 wheel drive. Obviously such situations are more likely off the road, on little used tracks and in wet conditions, than on a highway or well used roads.

OUTBACK ROADS

Driving on roads in outback areas requires as high a degree of awareness on the part of the driver, as driving on main highways in more heavily populated areas.

When driving on sealed roads the driver may presume that the road surface is smooth and regular, if not, there will be signs to warn him. There are white lines, reflector posts, recommended speeds at corners and many other aids to warn him of conditions ahead.

In remote areas, and on gravel roads, the conditions can change so quickly that permanent signs could not be used. The driver must be aware of the warnings which nature provides and always be alert for the unexpected.

Improvised warnings are often left at bad spots by drivers to warn other vehicles of a hazard. The obstacle may be a deep wheel rut from a bogged vehicle, an erosion gully encroaching on the road surface or extra large pot hole or anything of this nature. The warning may be something like a bush tripod, an old tyre propped up on a pole beside the obstacle, or in the road to make other drivers stop or slow to go around.

In outback areas of some states temporary signs are sometimes used. A red triangle on a post, or a square panel with black and white diagonal stripes, similarly mounted, are warning of a road hazard ahead.

NATURAL WARNINGS

The presence of lush green grass beside the road at the bottom of depressions indicates at least soft edges and possible water damage to the road surface.

A change in colour of the road surface will tell you that the road surface is composed of a different material; sand to gravel, soil to rock etc. This will tell the observant driver that the road surface may change, for better or worse.

A sudden change in vegetation may also indicate different soil and perhaps different road surface conditions.

DIPS

Dips in the road are common in the outback and on main roads are often indicated by a road sign. This will not, however, tell you the condition of the road in the dip. This may vary from a smooth graded surface to a small water course with a gully washed out across the road. Always reduce speed and anticipate the likelihood of having to stop or use low gear.

GRIDS

A grid is used in outback areas as an alternative to a gate. Known as a cattle grid or ramp in different parts of Australia, it consists of a concrete lined trench 0.1 m deep and 2.0 m wide across a road where a fence line intersects the road.

The top of the trench, at road level is made of spaced rails or pipe to allow wheeled traffic to cross easily, but cattle will not cross.

Grids are another variable, depending on the nature of the terrain and degree of road maintenance. They can be a smooth crossing but in soft, sandy ground can have an appreciably step at the edge of the grid. Always reduce speed when approaching grids.

WATER COURSES

Water courses should be approached with caution due to the reduced visibility caused by the steep banks. The road will usually bend to cross at right angles, then dip to go down to the river bed. The road surface at the approaches is often poor, and in the river bed is usually rough. Be especially cautious if there is flowing water across the road, no matter how shallow. Where a causeway has not been constructed, rocks are often built up on the river bed to give a solid, though usually rough base on which to cross.

In most parts of Australia the water courses can be spotted by the line of denser vegatation and larger trees which grow along the banks, always reduce speed well before the banks are reached.

DUST

Dust is always encountered on outback roads and depending on the degree of intensity can be a nuisance or a hazard.

When driving into the dust cloud created by an oncoming vehicle, move to the left as far as possible, slow down and turn on your head lights. The incidence of head-on collisions with a vehicle overtaking through a dust-cloud is high enough to warrant caution each time you are in this situation.

When overtaking another vehicle on a dusty road, be patient. If the dust is so thick that you cannot see the road ahead, drop back, switch on your headlights and follow until conditions improve. Generally drivers of slow vehicles will make the effort to allow other vehicles to overtake, if they know they are there.

Never overtake through a dense dust cloud. Wait until you can see the road ahead for some distance. Look for oncoming cars, or a dust cloud, a vehicle can be hidden in a dip momentarily, see that the road does not narrow for a culvert or creek crossing, check for grids, bridges. There are a lot more aspects to check on outback roads.

Driving on dusty roads becomes a very dirty business but this can be reduced to some extent if the following techniques are adopted. Most of the vehicles have forward facing vents, if you drive with these vents open, and the windows closed the cabin will build up a higher pressure than outside. This will cause air to leak out of cracks and joins, which will prevent dust seeping in through the same openings. This method depends on the construction and the condition of the cab for efficiency, but usually improves the situation.

A sweep out of the cab each day will prevent dust already in the cab from being raised again.

In vehicles with a separate canvas canopy, open the large vent in the front of the canopy, and the same effect will help to reduce the dust building up amongst the load.

"BULLDUST"

This is a driving hazard found on outback roads and should be handled with the usual caution. Bulldust is an area of road which has been broken up to the consistancy of talcum powder and is so fine that it will flow almost like water. The dust will fill a pot hole but will not support a wheel. So a wheel will simply push through and the dust will flow back in after the vehicle has passed.

The trap is that the dust will conceal quite large pot holes while doing nothing to cushion a wheel which goes into the hole. Apart from the huge cloud of dust that is raised, there is the possibility of serious damage to the vehicle's suspension.

Bulldust pans are often found in depressions on ground that has previously been covered by water. It may also be found in rocky ground where a patch of rotten crumbly rock has been broken up by constant traffic.

Bulldust can usually be spotted at a distance by a change in colour from the surrounding terrain and the mantle of dust covering the surrounding vegetation.

STOCK

Most outback roads pass through pastoral properties, and grazing stock are common beside the road. Always drive carefully and remain alert, particularly at evening when stock are on the move to drink.

A young animal is inclined to make for the safety of the herd or its mother when startled, and will dart in front of an approaching vehicle to achieve this.

Hitting an animal, i.e. a sheep, steer, or kangaroo etc, at any speed has major consequences. If the beast is not killed, but is badly injured, the unpleasant task of destroying it must be faced. The driver may also be liable to compensate the owner of the stock for any loss suffered. The vehicle can be put out of commission with radiator or steering damage. A more serious accident may occur if by hasty evasive action, the driver loses control of the vehicle.

SANDY ROADS

When driving on roads or tracks in sandridge country it is best to deflate the tyres by a few pounds to handle the softer conditions more easily. This will mean a lesser speed especially on stretches of hard ground and at corners. The softer tyre pressures will mean that the vehicle will behave differently: it will under-steer markedly on corners and will tend to follow in the tracks or ruts already in the track.

When the road crosses sandridges a compromise must be reached between a speed required for momentum and high revs for power to take the vehicle over. At the softer section of the sandridge, near the top, the surface may be very rough from previous traffic, high speeds are not recommended.

You should change down for sandridges in almost every case, do this before the sand becomes too steep and soft enough to cause the vehicle to stop while the gear change is being executed.

Only experience can teach a driver what to expect and how to react to the different problems which exist at every sandridge.

STATION TRACKS

Roads and tracks on properties are generally narrow and twisty. The width, when in timbered country is governed by the size of the vehicles operating from the station. Some of the Division's vehicles, particularly Internationals, are higher and wider than the vehicles which commonly use these tracks.

Remove side mounted driving mirrors and mounting brackets before they are broken. Be prepared to detour around, places which are too narrow, or overhanging trees which are too low for the vehicle to pass under.

Station tracks get little maintenance and seldom have warning signs posted at hazards.

ROAD TRAINS

Road trains are transports with two or three trailers and are frequently encountered on outback roads. These vehicles use a lot of road and because of their size are reluctant to move toward edges which may be soft. They generate a lot of dust so observe precautions when passing and particularly if you must overtake. Never exercise your "right of way" with a road train they cannot manoeuvre quickly or easily.

CONVOYS

When driving in company with other Nat Map vehicles leave enough space for other faster motorists to overtake the vehicles one at a time. If other road users have to overtake two or three vehicles at once it increases the risk of an accident. This risk will involve your vehicle. Take every opportunity to allow other motorists to overtake safely by allowing at least a few hundred metres between each convoy vehicle when travelling outside built up areas.

CROSS COUNTRY DRIVING

Some of the Division's field work such as Trig inspection, spot photo marking, traversing, etc., requires teams to operate away from roads or tracks. This may involve excursions off a track to a hill top or a task in an area where no roads or tracks exist.

Under these conditions vehicles must be handled properly both for the successful completion of the task and the safety of the individuals. There is no substitute for experience in this kind of work as there are no hard and fast rules to follow, the conditions vary in every instance. A knowledge of the factors which effect the vehicle and the options open to the driver should assist you in assessing the capability of the vehicle when driving across country or negotiating drive-on hills.

VEHICLE CAPABILITY

Factors

Driver's experience.
New track or defined wheel tracks.
Vehicle fully loaded or light.
Surface; wet or dry.
Surface; soil, sand or rock.
Timber density.

Options

Is it necessary?
Is it possible?
Would it be easier by walking?
Correct tyre pressure.
Correct engine speed.
Engage appropriate gear.

GENERAL HINTS

Use information from maps, photos or land advice, and avoid any difficult localised area unless you must work in it.

Keep the speed low and do not operate the vehicle harder than necessary. When the going is firm and fairly flat use two wheel drive.

Remove outside driving mirrors. and mounting brackets before they are broken.

Stop and inspect unknown obstacles on foot before proceeding. Be sure you can drive out of a situation before you drive into it.

Keep your thumbs outside the rim of the steering wheel when driving across country.

When crossing washaways, angle the vehicle across so that both sets of wheels don't drop into the gully at the same time. When crossing deeper, steeper, gullies the overhanging parts of the vehicle may hit or be "hung-up" on the banks. Look for a suitable place to cross or be prepared to dig the banks away to allow a crossing.

Do not hit rough patches, pot holes, gullies or stumps at speed with the brakes applied. More damaged is caused by hitting such obstacles with the brakes on than with the wheels rolling freely. Make every effort to reduce speed, but, release the brakes just before impact.

When following wheel tracks of unknown origin, don't be influenced by the fact that the previous vehicle has succeeded in getting through. It may have had more clearance or effective power than the vehicle you are driving. You must assess each situation as it arises being aware of your vehicle's clearance, load and performance.

If the vehicle becomes so bogged in mud or sand that the initial effort to get out is unsuccessful, you will have to lighten the vehicle. If this is necessary, empty the vehicle of all equipment but don't drain fuel or water unless it can be stored in containers. The lightened vehicle will respond with more power and better clearance.

The vehicle maintenance procedure, described later, should be carried out meticulously in cross country conditions. In addition a daily inspection of the suspension, body and engine mounts, drive shaft universals gearbox and transfer case mounting bolts should be made.

Clear any accummulation of grass collected under the vehicle to avoid fire risk.

This check should also include the tyres. Inspect and remove small stakes before they work their way through the tyre to cause a punoture. An awl or gimlet with a fine sharp point can be pushed in alongside the stake then lever it out with the point. If you use pliers or a screw driver the wood splinters and breaks up, whereas a spike takes the wood out cleanly.

Periodically inspect the radiator core and hoses for damage. At low speeds the engine runs hotter than normal. The core can become blocked with seeds, grass etc. and needs to be cleaned at regular intervals. Hoses deteriorate quicker and require periodic checking.

DESERT DRIVING

A large part of Inland Australia, and some coastal areas, are arid semi-deserts strung with parallel ridges of sand up to 30 metres high. These areas have vegetation varying from dense stands of wattle, mulga and mallee gums to the open areas of spinnifex with the occasional desert oak and ghost gums.

Low speed is of prime importance when driving cross country in desert areas. Rocks, stumps, anthills and "washaways" can be hidden by long grass or spinnifex especially when this latter is in seed. As you can easily be caught off-guard, low speed is essential. Spinnifex always hold the sand around their roots, while the surrounding sand is blown away, they generally provide a lumpy surface that prohibits fast driving.

On soft sand it is necessary to deflate the tyres to about half the pressure used for highway driving. This allows the vehicle to roll over sand without digging its way through as it would with narrower, harder tyres. The lower the tyre pressure the easier the vehicle will handle sand, but this is compromised by other factors.

The vehicle's handling characteristics are markedly changed by low tyre pressures. Tyres are more susceptible to punctures, as they are easily "staked" by fallen branches or dead stumps of the hard wooded trees which grow in these regions. In the occasional area of hard ground encountered, damage to the rim or side walls of the tyre can occur.

When travelling extensively in desert areas, you should strike a balance between tyre pressures low enought to travel across the terrain efficiently and pressures high enough to minimise tyre damage. Tyre damage will be further reduced by:

Carefully picking a track to avoid stakes.
Driving slowly on hard ground.
Frequently checking and altering tyre pressures to suit the terrain.

SANDRIDGES

Cross sandridges at the lowest point or a place where the gradient is moderate. It often entails a detour in order to locate the best crossing point.

Approach the ridge at right angles so that you have a straight run at the ridge from level ground to the slope.

Sandridges generally have one side steeper than the other due to wind effect. If this is pronounced in the area, an inspection on foot is wise so that you know what to expect on the other side. It may also affect your choice of crossing, to enable you to drive back over at the same place on your return.

Crossing sandridges requires some speed and momentum to take the vehicle over. The speed is governed by the surface, but not at the cost of damage to the vehicle or safety considerations. The sides of sandridges are dotted with clumps of spennifex which hold the sand in a rough uneven surface prohibiting high speeds.

If the vehicle is not going to cross at the first attempt don't push it until the vehicle bogs. Let the vehicle stop without "digging in" then roll back, taking care to stay in the wheel tracks. This will flatten out some of the bumps and allow you to safely take another run a little faster. This may be necessary for a couple of runs but if you anticipate stopping before the wheels dig up the sand, you will get further up the ridge each time. This will give you the opportunity to judge which gear is going to get you over. You will not be able to change gear during the crossing so you will have to be in that gear at the foot of the slope. This will most likely be first or second gear, low range 4 wheel drive depending on the vehicle, load and sand conditions.

The top of the sandridge is windblown, soft sand, don't stop here until you are right over and ready to go down. Once stopped in the soft sand you may have to dig to get moving again.

When stopped in soft sand, don't try to move off with the front wheels turned to a lock position. Keep the front wheels pointing straight ahead and only turn when the vehicle is in motion. Don't make full lock turns when driving in sand as this places excessive strain on the transmission.

SCRUB AND TIMBER

Driving through heavy scrub or timber is hard on the vehicle, particularly the tyres, bodywork and canvas canopy. Preparation of a track is, again, necessary to protect the vehicle.

Avoid trees larger than about 8 cm diameter, a track should be cut if trees are closely spaced or larger than this size. Move the cut trees or fallen logs to the edge and lay them lengthways to help define the track.

Do not use the vehicle to push trees over as this invariably leads to damaged body panels and even transmission damage.

Given reasonable surface conditions a vehicle can push through the lighter scrub with relative ease, however, beware of obstacles that can be obscured by the scrub..

When returning along wheel tracks that have been pushed through scrubby areas damage may be caused to radiator, wiring, brake hoses etc, by the scrub between the wheel tracks, that is now facing toward the vehicle at a difficult

angle. It may be necessary to stop and clear these more dangerous obstructions before continuing on the return journey.

Tyres are more likely to be staked when following another vehicle or returning on newly made tracks. Trees or stumps pushed over or disturbed may expose roots which were below ground, when the first vehicle passed.

MUD

Mud is the most difficult of the various driving conditions encountered during field operations. Being bogged in mud creates hard physical work during vehicle recovery, greater wear and tear on the vehicle, and damage to the road or track surface.

Where possible avoid the lower lying ground and other areas that are likely to be boggy. When possible leave areas that are likely to become boggy or covered in water when heavy rain is expected. Where practicable try to reach high ground or a sealed road before heavy rain sets in.

It is usual for local authorities, (shire councils, property owners) to close roads to vehicular traffic when rainfall has been sufficient for vehicles to damage roads or tracks. Penalties are provided for driving on roads that have been closed, it is sometimes necessary to wait for conditions to dry out before preceeding after heavy rain.

Look for, and use, detours around low lying, muddy areas and sheets of water. Often there are quite extensive detours to by-pass such areas on well used roads and tracks, but as the detours are little used in dry weather they are often hard to recognise. Sometimes a road or track, even though it is covered by water, is harder than the surrounding country because the soil on the track is packed hard, but the edges can be very soft.

Conditions have to be judged "on the spot" there are no set rules, only experience. If in doubt walk over the route to be taken and test the surface for softness with a crowbar or similar implement.

When travelling on slippery but otherwise firm surfaces, it is best to use the highest gear possible in four wheel drive high range, with the least engine speed possible, in order to maintain a slow vehicle speed. If the going is heavier, over softer, muddy surfaces it is necessary to balance engine speed and vehicle speed in order to have enough momentum to carry the vehicle through without losing control. Don't travel at excessive speed through water as spray and splashes will cause a water-logged ignition system.

In the event of becoming bogged it is necessary to reduce the weight in the vehicle as much as possible, usually by completely unloading it. Then jack the vehicle up, place a firm footing beneath each of the wheels and along the route to be taken out of the bog. The materials used to establish a firm footing depend on availability and include, logs, branches, foliage, rocks, stones, sheets of corrugated iron etc. It is best to do a thorough job at the first attempt rather than make repeated attempts, due to not making enough initial preparation. The recovery may be made easier if another vehicle is available to assist with "a tow" but care should be taken to ensure this does not result in another bogged vehicle.

Vehicles should travel far enough apart to ensure that two don't get stuck in the same bog. Wait until the previous vehicle is through before attempting to cross a boggy patch. Always check that the following vehicle is through the bog before proceeding.

When operating in muddy conditions, load the vehicle as lightly as possible. Where sealing plugs for the clutch housing are provided make sure the clutch housing is sealed.

Once out of the muddy conditions, check over the vehicle as you would after cross country driving. Clean away accumulated mud from underneath the vehicle. Hose it clean if possible. Check oil levels, particularly transmission oils, for water contamination. After severe mud conditions it may be necessary to clean brake linings and inside the brake drums. Heavy caked mud on the wheels can affect the wheel balance and often causes wheel "wobble".

CLAYPANS

Claypans on Salt lakes are frequently encountered in the outback. Where well used tracks cross them the surface can usually be trusted if conditions have been dry, but there is usually an alternative route for wet weather.

As a general rule, claypans cannot be trusted as a driving surface. The apparently hard smooth surface of a claypan is a crust, the condition of the ground beneath the crust will vary but can be mushy, with no hard bottom. After many miles of cross country driving on rough surfaces the flat expanse of a claypan is irresistibly tempting. RESIST.

There are no half measures when a vehicle is on a claypan, it is either a smooth crossing or the vehicle breaks through and sinks to the tray. In the latter case all the devices for extracting a bogged vehicle must be employed with the possible exception of towing. Towing will put the other vehicle at risk if its spinning wheels break through the crust.

You will need to empty the vehicle, deflate the tyres to about half the normal pressure, and use a great deal of timber, foliage, rocks etc, to make a corduroy track to hard ground. Jacking may be difficult under these conditions, even the normal jacking plate may not provide a solid base on which to jack. An alternative is a bush timber pole as a lever under the axle to lift and block the vehicle in stages until logs can be placed under each wheel.

If a vehicle is very bogged you will need everything going for you, in that case do all the preparation you can, then camp. The time to try to drive out is at dawn, before the sun has had time to draw moisture toward the surface.

RETURNING TO THE ROAD

After any cross country excursion you should check the vehicle before setting off at the higher speeds possible on a good road. The vehicle has been working harder than usual and may have developed problems not noticed at low speed. Inspect the vehicle thoroughly for damage, in particular check underneath for:

* Wiring that may have been torn out by scrub, look for broken ends trailing down. Secure and insulate any bared wires.
* Inspect springs, shackles, "U" bolts, shock obsorbers, engine and body mounts.
* Check brake hoses for fractures or leaks.
* Look for leaking fuel or water tanks.
* Inspect tyres for cracked sidewalls, remove any "stakes" before travelling on hard surfaces.
* Inflate tyres to normal pressures as required.
* Replace driving mirrors.
* Disengage 4 wheel drive.

Travel at a more moderate pace at first and listen for any new noises or any unusual response from the vehicle. Investigate anything out of the ordinary before travelling faster.

MAINTENANCE AND REPAIRS

Proper maintenance procedure and sympathetic driving practices are the greatest factors in ensuring a safe and reliable vehicle life.

Proper vehicle maintenance depends upon careful, daily, driver inspection and adherance to the manufacturer's recommended service schedule.

Our vehicles usually operate in what is accepted as extreme conditions. The manufacturer's service schedules are the maximum for good, sealed road driving. Therefore drivers should carry out servicing every 3,000 km or monthly. To do this efficiently, drivers should be familiar with the maintenance procedures set out in the operator's and service manuals for their vehicles. When operating in remote areas, the vehicle should carry basic spares, a supply of the correct grades of oils and grease, and sufficient tools to carry out minor repairs and proper servicing.

Although situations may arise where some service or maintenance tasks are too complex to be carried out under field conditions, drivers should carry out all possible routine servicing and minor repairs themselves.

DAILY DRIVER MAINTENANCE

Daily maintenance is largely a matter of applying commonsense and a responsible attitude toward the safety and operation of the vehicle, and can be done quite quickly when a systematic routine is adopted. Before operating the vehicle each day, drivers should attend to the following points :

1. Clean windscreen, side windows, mirrors, lights and turn signals. Sweep out cabin floor.

2. Check operation of lights, gauges, indicators, horn, windscreen wipers and washer, foot and hand brakes.

3. Check (and top up if necessary) level of engine oil and radiator coolant.

4. Visual inspection for excessive oil leaks from engine, transmission, axles, hubs, fuel and water tanks, radiator and hoses, and fan belt tension.

5. Check tyre condition and pressures.

6. Check security of vehicle load. Load should be as balanced as possible, heavy items lowest, doors or flaps closed.

7. When driving, listen for any unusual sounds, knocks or rattles, check gauges and warning lights regularly; investigate and rectify causes of such as necessary.

WEEKLY CHECK

1. Check (and top up if necessary) level of brake and clutch fluid reservoirs.

2. Check (and top up if necessary) level of battery electrolyte, ensure battery case, mounting frame and terminals are clean and cables are firmly fastened.

3. Top up windscreen washer water level.

4. Check axle drive flange retaining nuts (or bolts).

5. Service air filter and crankcase breather when operating in dusty conditions.

6. When water supplies are available wash under body and exterior of vehicle, especially when operating in muddy or salt water conditions.

7. Check that the radiator core and airways are clear of the build up of insects, grass seeds, etc.

8. Inspect and check the mountings of the engine, transmission, suspension and body components. In particular, wheel nuts, chasis spring 'U' bolts, shackle pins, shock absorbers, steering box, steering arms and rods, exhaust system, spare wheel and sump/transmission/steering rod protection plates.

9. Attend to any nut, bolt or fitting that may have worked loose. Do not overtighten when loose nuts are found or when checking tensions. This will strain and break fatigued bolts and cause worse trouble than you are trying to prevent.

10. Occasionally check adjustment of wheel bearings.

11. While attending to paras. 8 and 9, remove all sticks, leaves and grass wedged underneath the vehicle. This accumulates rapidly and is the most frequent cause of vehicle fires. The protective trays under the engine and transmission seem particularly prone and with oil spills or leakage soaked into the wood - grass, they present a major fire hazard. Regular cleaning of the tray and the body work, i.e. cross members near the exhause pipe are essential.

If the driver pays attention to the preceeding points as a routine exercise, and carries out regular servicing as outlined in the operator's manual, the vehicle should return a safe and reliable operational life.

FAULT FINDING

Provided the vehicle is maintained in good order and condition by periodic cleaning and servicing and is inspected daily before use for any signs of components working loose or breaking, it usually remains both serviceable and reliable throughout its working life with the Division.

Occasional engine malfunctions or failures can usually be traced to either lack of engine fuel or no electrical spark at the spark plugs to ignite it. The two most common causes of an engine "mysteriously" stopping are failure of petrol supply to the carburetter or an electrical connection coming undone or "breaking down".

Usually failure of the fuel supply will cause a running engine to run roughly before stopping. An electrical failure usually stops the engine in the same

VEHICLE SPARE PARTS

Vehicles which operate in more closely settled areas need carry only mimimal spare parts. In the event of a breakdown, access to parts should hot be difficult. The mimimum essential parts would be a fan belt and radiator hose for that vehicle.

When operating in remote areas the vehicle should carry the following spare parts:

Points and condenser
Spark plugs
Distributor cap and rotor button
Carburetter overhaul kit
Fuel pump overhaul kit
Radiator hoses and fan belt
"U" bolts and centre bolts for both front and rear springs

Any other parts which that vehicle model has shown to be prone to breakdown.
Vulcanising patches, tyre sleeves and sleeve adhesive
Spare inner tube, valve cores and caps
Fuses
Oil filter elements
Oils and grease
Gasket glue

In addition to spare parts, carry a selection of nuts, bolts, flat and spring washers and various sized split pins, to cover the range of sizes used in the construction of the vehicle. Keep nuts, bolts and replaced parts, don't throw them away, they may be used for an improvised repair.

LOADING VEHICLES

A loaded vehicle is rather like an army kitbag, the item you want always seems to be on the bottom. This is impossible to overcome completely, but a flexible approach and a few hints should minimise this annoying tendancy.

The vehicle should firstly be loaded from the point of view of weight distribution and balance. The petrol and water tanks are heavy when full, and in most of our vehicles are fitted in the forward area of the tray. Heavy boxes and items of equipment are then loaded at floor level with the heaviest items forward. The equipment should then be loaded with lighter, more sensitive items; the very light or soft bags on top.

To be more specific, the items to go in first should be bulk supplies of food, and equipment or materials not required till later in the season. The next layer is usually technical or working materials, camping gear and vehicle spares. Then, next to the tail gate, should be the tool box, jack and plate, camping gear and tucker box. The soft bags of personal gear and swags go on top.

If this layout is followed a party should be able to arrange the load so that the gear required for an overnight camp is right at the back or on top. If you arrive at a work site you'll probably camp there anyway, so the camping gear is out and the next layer is the equipment you'll need to work with. This is the time to get at bulk food to stock a "ready" tuckerbox kept near the tail gate.

If the work is based in a town, you then arrange the load so that suitcases and work material are more accessible than the camping gear. The tool box and tyre changing gear should always be within easy reach.

Such items as first aid kit, tool roll, torches, log book and order books, cake of soap and hand towel can be carried in the cabin. The cabin tends to become very crowded with "essential" items; the people involved generally work out how much can be fitted in with comfort and efficiency.

CAUTION

When loading a vehicle there are some items of equipment carried which require special care. The obvious ones are precision instruments which are always

provided with a carry box of padded or shock mounted construction. These need to be placed on a flat surface and packed to prevent movement.

The things that usually catch people out are cans of oil, tins of paint and the like. A loose tin of something like this is certain to be punctured or crushed. The easiest way to carry this type of material is a cardboard carton with extra cardboard placed on the bottom to support the bottom of the tins. Glass jars or bottles need special care. If issued with dry charged batteries pour in the electrolyte and destroy or puncture the plastic container. The battery will travel safely in its wooden box and the danger of a plastic bottle of electrolyte leaking into the load is removed.

FIRE EXTINGUISHERS

All of the Division's vehicles are equipped with fire extinguishers. Before setting off on a trip, check the location of the extinguishers and that they are charged. Learn how the quick release clamp and the extinguisher operates, don't wait until a fire starts. If an extinguisher is used, see that it is recharged at the earliest opportunity.

Most vehicle fires can be extinguished quickly with minimum damage if prompt and effective action is taken by the team in the first half minute. At the first whiff of burning, or signs of smoke, switch off ignition and stop; grab the extinguisher and immediately seek the "seat" of the fire. When it is extinguished, investigate the cause of the fire and correct the defect.

FIRE HAZARDS

Petrol caps not replaced or incorrectly fitted, allowing spillage.

Leaking tanks, jerrycans, lines, etc.

Grass caught up in protective sump trays or packed in body, chassis crevices near or beside the exhaust pipe.

Faulty or holed exhaust pipe or muffler.

Electrical short circuits from broken wires, caused when driving through scrub.

12 volt batteries loaded without a protective box or cover over the terminals. If metal objects short across terminal posts a fire may start.

FIRE PREVENTION

Don't overfill tanks in vehicles or portable generators, leave an airspace for expansion.

Don't smoke near vehicles during refuelling. When refuelling from drums in field locations, site the fuelling point well away from camp fires, etc.

When refuelling portable generators, disconnect battery leads, stop the engine, avoid spilling fuel or overflowing the tank. If petrol spills into the generator allow ample time for the spillage to evaporate before connecting leads and starting the engine.

Don't smoke or use naked flames near a charging battery. Hydrogen gas is given off by batteries when charging, and to a lesser degree when discharging.

BATTERIES

A frequent occurrence, when camped for a lengthy period is to find the vehicle battery too flat to start the engine. Most of the Division's field work entails the use of electronic equipment which requires electric power and so extra batteries or a generator will usually be carried. However, if you are camping at the one spot for an extended period without a generator, start the vehicle and run the engine for a short time each day. If you are able to crank start, 15 minutes at a fast idle should be sufficient to keep the battery in good condition. If you start the vehicle off the battery run the motor for a half hour.

In these conditions, regulate the camp routine to save power, limit the use of camp lights wherever possible.

If the battery becomes too flat to start the vehicle, ensure terminals are clean and cables are tightly clamped before hand cranking the engine. These days some vehicles are produced without a hand cranking facility and in such a case you will have to resort to an improvised method of starting.

A proven method of starting the vehicle is to jack up a back wheel, and with the vehicle in gear, third gear, turn the raised rear wheel to start the engine. This has been done with the wheel turned by hand, it's hard work and requires perseverance. An easier way is to wind rope around the tyre and pull. Both methods require a determined effort, but they do work.

JACKING

Never work under a vehicle raised on a jack without having the vehicle supported by boxes, logs or something strong enough to take the weight of the vehicle if the jack should fall. If you are able to work without removing the wheel, leave it on.

Stability is very important, scoop a small hole behind each wheel and let the vehicle roll into the holes and come to rest, then place chocks of rocks or logs against the wheels. If the work requires turning the raised wheel, be certain that the vehicle is stable without the hand brake or gearbox engaged.

Remove everything required for the job before jacking; avoid disturbing the vehicle once it is raised on the jack.

Never jack on sand or soft ground without a jacking plate to provide a firm wide base. A jacking plate should be at least 7 m.m. thick for light vehicles and 10 m.m. for heavy support vehicles. The area of the plate can be roughly 15 c.m. by 30 c.m. for the light vehicles and slightly larger for heavy vehicles.

WARNINGS

While jacking the vehicle, listen for the sounds made by the body and chassis twisting. Once the vehicle is raised, these sounds are a warning that the

vehicle is moving. When you are under a vehicle listen carefully for these sounds.

Don't be distracted by idle conversation or radios.

Don't be under the vehicle any longer than you have to.

Pay attention to the job and do it as quickly as possible.

When you are under the vehicle listen for the "squeaks and creaks" that will tell you that the vehicle is moving. If you hear them, get out fast, then sort out what needs to be done.

TOWROPES

The towrope carried by each vehicle is of polypropelene film, a light but very strong synthetic. It is ideal for towing as the elasticity of this rope minimises the jolts usually associated with towing.

When attaching the rope to a vehicle for towing, utilize the spliced eyes and 'D' shackles. Almost any knot tied in synthetic rope will "lock in", making it nearly impossible to untie, once the strain of towing is applied.

Avoid passing the rope around a bumper bar or chassis member as the strands are easily cut. If it cannot be avoided, pack material around the sharp corners to round it out and prevent cutting, or rig a sling around the bar or member and then couple it to the towrope with a "D" shackle.

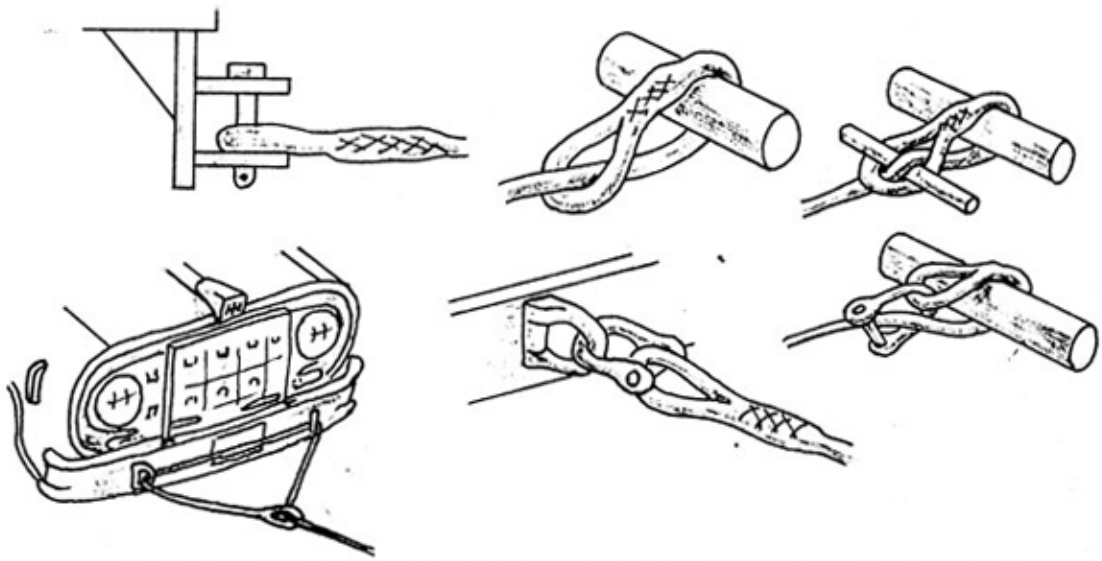


Diagram. Some applications of spliced eye and 'D' shackles.

Synthetic rope will not rot or mildew when stored wet, but needs to be protected from damage by heavy, sharp objects, which may cut or damage the strands. Store the rope away from excessive, direct heat.

BUSHCRAFT

Every year, in outback Australia one or two people perish of thirst or exposure in the bush, in most cases as a result of walking away from a stranded vehicle or becoming separated from a group of people. The first rule in outback driving is to stay with your vehicle in the event of a breakdown. But there are probably many compelling reasons why someone in this position would try to walk to what they think is an easily achieved objective.

The Division's teams will find more compelling reasons to stay at their vehicles, where there should be sufficient water, food, and shelter for sometime, and radio communications. In fact, a vehicle breakdown should be regarded as a nuisance rather than an emergency.

Emergencies aside, field staff have many reasons for leaving a vehicle or camp and proceeding into the bush on foot. At climb-on hills, investigating vehicle access in rough terrain, general reconnaissance or recreation. At these times you are vulnerable to the same hazards which apply to the stranded motorist who decides to walk. This is when you will need the fundamental bushcraft skills.

There are many tales of navigation by primitive people, or by experienced bushmen, which have generated a belief in a "sixth sense" or "sense of direction". On examination these stories reveal that these people have normal faculties which they have trained to use properly in an environment which is familiar to them. Bushcraft skills are not concerned with a "sixth sense" but the proper application of the normal senses, observation, deduction, common sense and practice.

Most people in an urban environment practice similar methods when making their way through the suburban spread of our major cities. In many respects they don't have to work as hard at it, roads are named and plainly defined, but recognition of landmarks on familiar ground is exactly the same as the bushman's methods when travelling in familiar country.

To towns-people, one gum tree looks pretty much the same as the next, to the experienced bushman, its shape and position in relation to other features distinguish it as a landmark. The bushman would probably find most suburban road intersections fairly similar in appearance, but they are landmarks to the townsman by virtue of their familiarity.

LOCAL KNOWLEDGE

Familiarity with the area is an advantage, but our field parties are on the move constantly and seldom acquire the extensive local knowledge which makes navigating easier.

A study of available maps, photos or information from "locals" is a necessary preparation when working in a new area. This should be supplemented by a strip map or vehicle log, made as you proceed showing directions and speedo readings at bores, track intersections or any prominent feature. This will assist you to plan movements, increase your local knowledge and enable you to direct others to your locality in detail if you need to.

FINDING DIRECTION

The Prismatic Compass

A prismatic compass is carried by teams, this is a sensitive instrument and should be treated with care. Its performance and reliability is effected by its treatment.

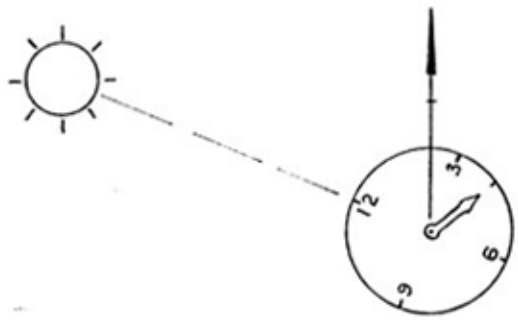
Check the accuracy of the compass periodically, at a control station airfield runway or other such features where a bearing is known, and, after allowing for magnetic variation, note compass error.

Take care when you are using the compass it is influenced by metallic objects and can give an incorrect direction if affected. Stand well clear of vehicles, wire fences, steel posts etc. Also be sure that no objects about your person will affect the reading, steel belt buckle, knife, tobacco tin or a torch at night.

THE SUN

A reliable North - South direction can be obtained by determining the direction of the shortest shadow cast by the sun.

The watch method may be used to find a north direction, Hold the watch flat, with the 12 hour pointed to the sun, north will be halfway between the 12 and the hour hand. (See diagram).



The same method may be used on cloudy days the only difference is the technique used to find the sun. If you point the blade of a knife or a leaf, or any thin flat object on to a flat surface, a shadow will be seen at the point of contact. Turn the blade until the shadow is thinnest, the blade will then be pointing to the sun.

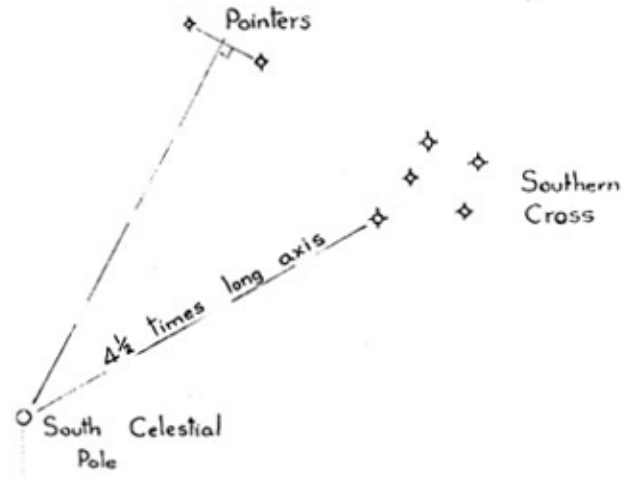
NOTE: When using the watch method note the following points which effect the accuracy of this method.

* In midsummer, north of the Tropic of Capricorn (23.4°S), the sun will throw a (short) shadow to the north.
* The sun's direction at sunrise and sunset will depend on its declination at the time, and the observer's latitude, and may be north or south of the east-west direction.
* The observer's position in relation to the standard time meridian i.e. when close to the W.A.-S.A. border, can effect the accuracy.
* Daylight Saving Time should be accounted for, if applicable.

THE STARS

The Southern Cross is the most commonly used constellation for direction finding in southern skies. The long axis of the cross points directly to the South Celestial Pole, which is 4½ times the length of the long axis from the base of the cross.

Another method is to extend the long axis of the Southern Cross then extend a line at right angles from a point midway between the Pointers, Alpha and Beta Centuri. The two lines will intersect at the South Celestial Pole.



These are the easiest methods, using other constellations requires either precise instruments and information or complete familiarity with the heavens. The latter amy be attained to some degree if the opportunity to study the stars each night is taken. Camping out on an extended field trip is the best opportunity you have to observe and become familiar with the major stars and constellations.

WINDS

Prevailing winds provide a reliable indication of direction in most open semi desert ares of the Inland. The effect of these winds is also apparent, and more permanent. Solitary trees will develop a pronounced lean and dense vegetation, on the leeward side.

SANDRIDGES

Generally in sandridge country the ridges are parallel and follow a consistant direction. There are exceptions in small localised areas of jumbled, braided ridges. But where the ridges are spaced and parallel they provide an indication of direction.

ORIENTATION

It is easy to become disoriented when following an access, particularly at night when you are concentrating on tracking rather than maintaining direction. In the case where an access starts south of a control station, but the terrain forces the access to finally approach the hill from, say the east, this can create a preconceived orientation which can be dramatically wrong. Always check your orientation, by any method, on arrival at a work site or camp. Never trust a "sense of direction" which is not arrived at logically.

PREPAREDNESS

When working in the bush in vehicles, or especially on foot, be properly clothed and equipped at all times. Wear boots which are comfortable and suited to the task. Long trousers will keep you cleaner and provide protection from cuts or scratches when walking over rocks or through timber. This is a significant factor if water is limited.

Consider a knife as one of the tools of your profession and never be without one. Sheath knives are useful, but can be an encumberance when driving or sitting down, as well as inviting disproval when worn in more civilised areas. The primary value of a knife is its availability when you need it. The advantage of a folding knife is that it can be carried on your belt in a pouch or just in your pocket.

A length of cord or a bootlace takes up no room and is invariably useful on occasions.

A box of matches should always be carried, the easiest way of starting a fire is still by striking a match. Don't offer your matches to smokers, they must provide for themselves.

Whenever you leave camp for any excursion into the bush, whether for work or recreation be properly clothed and prepared for the likelihood of your absence being longer than planned.

As well as the equipment required for the task, be sure to take a canteen or other container of water, some readily eaten food, biscuits, raisins etc, your waterproof jacket, and a torch. The work may extend into the evening, and a torch is a great asset when descending a hill in the dark.

TRAVELLING ON FOOT

As mentioned previously, there are many occasions when you will leave camp, or the vehicle, and proceed into the bush on foot. This involves walking to an objective and returning to the vehicle, of which, the latter is the most critical.

In timbered country a vehicle is difficult to see at 100 metres. Even in low scrub at 200 metres a vehicle can be lost to view. If the terrain is broken or undulating the vehicle can be out of sight in a relatively short distance.

In contrast the objective of the walk may be a distinctive feature visible from a great distance. such as, a control station on a climb-on hill or a defile through sandridges or hilly country which can be easily followed.

These factors can influence the newcomer into confidently walking a considerable distance, but on turning to go back, finds there is no similarly distinctive feature to guide his return to the vehicle.

To overcome this, seek out a distinctive feature at which to stop the vehicle, or park on top of a hillock or dome, to make it visible above the surrounding terrain. If you cannot stop at a landmark, carefully note the position in relation to whatever landmarks you can see.

As often or not there are no convenient prominent features so you must make your own. A signal of some kind, towel, streamers etc, tied to

the radio aerial, or tossed into the upper branches of a tree, may help to place your vehicle from a distance or from the flank of a hill.

You should not rely on a single landmark to get back to your vehicle, unless it is completely unmistakable. A combination of signals and landmarks is more helpful.

PRECAUTIONS WHEN LEAVING THE VEHICLE

Know the general direction you will be taking when you leave.

If there is more than one person, walk in single file to better define the tracks. In sand or soft soil, scuff your feet, to plainly mark the ground. If you drag a stick as you walk you will have a distinctive mark to follow back.

In rocky ground, deliberately dislodge or overturn stones to display the different coloured underside.

In scrub, break branches and let them hang, or lean fallen sticks against standing timber.

Make every effort to lay a plain track to your objective then "back-track" to the vehicle when you return. The marks should be distinctive, as you may have to return in the dark.

As you proceed, look back frequently to familiarize yourself with the appearance of the terrain to assist your return. Check that the trail you are leaving is within your tracking capability.

Note the time you have spent walking out, if you lose the track back you may have to deduce a bearing and strike out for the vehicle. You must then use time as an indication of how far to walk to reach the general area of the vehicle or camp.

At climb-on hills the above techniques should be applied, here you are most likely to be returning to camp in the dark. The two most important points are leaving the top of the hill in the right direction, the first 50 metres is critical, and having the camp sited or marked for easy location.

TRACKING

Tracking is largely a test of your powers of observation.

The bush has a natural settled appearance and any person or vehicle passing through will disturb the orderly appearance to varying degrees. The skill is in seeing and recognising things which are different or disturbed. Broken branches, scraped bark, crushed grass overturned or freshly tilted rocks. The whole affect is a general "line of disturbance" and is sometimes all that can be seen.

In desert country everything that moves leaves a track on the sand. You should take every opportunity to practice tracking. Each time you leave camp, even for a call of nature, make a habit of tracking yourself back, particularly at night. A favourite prank, years ago, was to turn off the camp light and douse the fire, when someone took the shovel for a walk late at night. His return to camp was watched with interest and amusement.

This could happen accidently sometimes, so it becomes necessary to check direction, landmarks, or backtrack as a matter of habit.

You can do a great deal to become proficient at tracking early in a field trip. Begin by becoming familiar with the appearance of your own vehicle tracks on any soft or dusty ground. Try to distinguish your vehicles tracks from other team's vehicles, assess vehicle track width, tyre width, and tread patterns if possible.

The tread pattern won't always be impressed unless the vehicle stops, but you will be able to distinguish road treads from bar treads. Often you won't be able to tell any more than whether a track was made by one of our vehicles or another very different type of vehicle, but at times just knowing this can be important.

In sandy areas, following fresh wheel tracks is easy and good practice. Sand is a good medium for wheel impressions and freshly crushed grass, or spinnifex leaves a plain track to follow.

Wheel tracks remain evident for many years particularly if a number of vehicles have been over them. The impression in the sand remains hard packed no matter how smoothed the edges become, and although the grass grows again it is slightly stunted, growing in the harder packed sand of the old wheel tracks. The grass which has been crushed always grows a slightly darker colour than the surrounding grass. Often, in long grass, old wheel tracks can be followed when the impressions are obscured by grass, but the track can be "seen" on the lower, darker, tops of the grass.

In rocky country the stones sit on top of the soil or sand which is eroded from around them. A vehicle's weight presses them into the soil and they remain embedded for a great many years. In addition the tyres rub the tops and some rocks produce a visible shine.

The newly exposed surface of a broken piece of rock is very distinctive against the weathered appearance of older rock. Fresh scratches are similarly obvious, and overturned rocks show a different colour. All are indicators to you when tracking vehicles on hard ground.

Light conditions are an important aspect of tracking, particularly vehicles. In early morning and late afternoon with the sun low enough to throw a good shadow into the wheel impressions, tracks will be plainer than at noon, with no shadows.

Artificial light i.e. headlights, can sometime make tracks easier to follow, particularly through vegetation. In open country, block off the driver's side headlight, this will allow the passenger side headlight to throw a shadow into the wheeltrack in front of the driver.

If tracks are very faint you may check with a torch held very low, the enfiladed light across the ground will throw a shadow in very faint tracks.

The most difficult part of tracking is finding the tracks initially. Faint tracks are only seen when you look along them, the indicators are so faint that taken individually are of no significance. Only when seen in line with the other faint indicators does the continuous impression of the wheel track "stand out"

from the surroundings. A knowledge of where the tracks begin, and their general direction is of great importance.

Finding wheel tracks when you are approaching them at right angles is a great deal harder than it sounds, even when looking for fresh tracks. The tracks cannot be seen until you are on them and unless you are looking along them at that instant you will go past. Finding the track will only be done moving slowly and looking carefully.

When leaving a road, to drive across country, make the beginning as clear as you can. Markers and a speedo reading from a known point will assist other teams which may have to follow you.

Make the first section of track as straight as possible to enable following vehicles to easily find the start of the track.

LAYING TRACKS

Locating control stations established by helicopter and reconnaissance for traversing will sometimes involve driving on a bearing from a known point. The ideal of course, is having protracted a bearing you simply drive on it to reach the area of the control station. It is seldom as easy as it appears and requires constant concentration on the part of the navigator as well as the driver.

When confronted by an obstacle, and therefore a choice of direction, most people will consistently turn to the right. The obstacle need not be of significant proportions, so long as it provides a choice. When driving on a bearing you need to deliberately match changes in direction to left and right.

Take a bearing and carefully select a number of landmarks along the direction. It is helpful to sketch these features and select some intermediate points to keep you on track. In undulating country you will lose sight of some, the more features you have noted the less you will be effected by losing distant landmarks. Use landmarks to the rear with reverse bearings, don't ignore them once they are behind you.

Sketching the landmarks is a great help, for as you proceed, you may find that your distant landmark was two distinct and separate features superimposed. Staying on track, and reference to sketches, will help you to identify such things. Trying to identify them, from a different angle, may be impossible, be aware of this likelihood.

It is also helpful to fix a shadow stick to the bonnet, mark where the shadow falls with the vehicle facing your direction of travel. Use the shadow to bring the vehicle back on line after a change of direction for an obstacle, and as a general guide to your direction. As your direction should be checked by compass regularly when picking landmarks you can account for the sun's changed position at these times.

If other vehicles are to follow your tracks you must make them easy to find. The most important consideration is to keep the tracks as straight as you can, plan the route to allow wide turns at obstacles. Sharp turns are hard to see and will cause delays as well as leaving confusing tracks as the following vehicles overrun the turn and "back-track" to it. If sharp turns are unavoidable indicate the direction of the turn to allow following vehicles to see it in time.

If two or more vehicles are travelling together they should stay strictly in single file. The following vehicles have an important role in consolidating the track. Don't cut corners, you must make the turns plainer. By paying strict attention to following a vehicle which is in sight and staying on the track you can gain valuable experience at tracking.

HEAT EXHAUSTION

In many areas of operations, especially during the late months of the year, you may need to conserve water, this is to say, don't waste water and limit the water you do use. But do not restrict water for drinking in a very hot climate.

The body will absorb heat from the air and increase the body temperature if the air temperature is above 33°C(92°F). You can also absorb heat from the ground by contact, the ground can be a great deal hotter than the air temperature.

The body gets rid of excess heat and attempts to keep the temperature normal by perspiring, but when you perspire the body loses water and dehydration results.

Symptoms

The first sign of heat exhaustion is usually cramps in the legs or stomach muscles, then fatigue, headaches and dizziness.

Treatment

Reduce strenuous activity in the open. Seek shade and rest, don't sit or lie on the ground.

For cramp, straighten the leg and stretch the cramped muscle. Drink water, in moderation, with a salt solution of ½ teaspoon of salt to a large mug of water.

For more severe heat exhaustion, lie the patient on a stretcher in the shade, loosen tight clothing, cool the patient by bathing him with a wet towel and fanning.

Prevention

Thirst is not an indication of the amount of water you need. If you drink only enough to satisfy your thirst you can still dehydrate. Drink plenty of water especially at mealtime and during the cooler hours of morning and evening. Take salt tablets, start with 3 tablets a day and vary with your activities.

Wear light cotton clothing and a hat, don't "sun bathe".

EXPOSURE

The dangers of exposure are seldom encountered by National Mapping field parties. Much of our work is done in inland Australia where conditions, even when cold, are mainly dry. Another reason is that bad weather usually prevents work being undertaken so teams stay in camp and don't get any wetter than they have to.

Nevertheless, conditions may conspire against a team and then, knowledge of the dangers of exposure, its prevention and treatment will be valuable.

Exposure, or hypothermia, is an illness seldom encountered in an urban environment, but it is a very real danger to people living and working outdoors. It is associated with a lowering of the body core temperature. The immediate cause is prolonged heat loss. This is due to inadequate clothing in cold, wet, windy conditions, associated with hunger, physical exhaustion, and possibly anxiety.

At 10°C a wind of 40 km/hr (25 m.p.h.) produces the same heat loss from unprotected skin as would be lost in windless conditions at -30°C. Wet skin loses heat much faster than dry. Damp windy conditions with temperatures around 5°C are the most dangerous.

Symptoms

The symptoms, any or all of which may appear are, strange behaviour, mental lethergy, apparent partial deafness or failure of sight, stumbling and falling, sudden shivering fits. Heat loss through wind and rain is more likely to produce this effect than intense dry cold.

In normal conditions the inner core (trunk and brain) temperature of the body remains constant at 37°C (98.4°F). The outer shell (extremities and surface areas) temperature is generally below this. It is vital for the proper functioning of the body that the inner core temperature is maintained at the correct level. A progressive drop in this leads directly to mental deterioration, loss of muscular co-ordination and eventually to unconsiousness heart and respiration failure and death. Therefore in any condition where body heat is being lost more quickly than it can be replaced, exposure will develop.

The body itself acts to maintain core circulation and temperature by restricting the flow of blood to the exposed periphery so that core blood is not cooled at the surface. In any treatment, therefore, the importance must be realised of not increasing peripheral circulation unless there is minimal loss of heat at the skin surface. Further heat loss from the core must at all costs be avoided. Sudden warming of parts of the body surface, therefore, is wrong.

When the symptoms are suspected or observed, any further exertion, such as forcing the victim to go on walking, even downhill, must be avoided. The party must stop and proceed with treatment. It is impossible to overstress the importance of this.

Methods of Treatment

Immediate treatment in the field.

As already indicated, the risk of precipitating a sudden surge of blood to the surface, such as may be produced by hot water bottles, rubbing, or alcohol intake, must be avoided.

The essential and immediate treatment is to prevent further heat loss by seeking shelter from the wind and insulating the victim's body.

Methods will vary according to conditions and the equipment immediately available. An outline of the correct treatment for exposure victims is:

(i) Get the victim into a sleeping bag, provide insulation between the ground and the victim's body.

(ii) Put a fitter companion into the sleeping bag with him, to give him bodily warmth, or two people in sleeping bags, lying either side of him to help provide conditions in which he can re-warm himself slowly and naturally by his own heat production.

(iii) There should be a windproof and waterproof wrapping around the bag and the patient.

(iv) If the patient can take food, sugar in an easily digested form or condensed milk or a warm, sweet, drink (not hot) may be given.

(v) All people in the party should take shelter and warm food at this stage as all may be suffering, to some degree, from shock, exhaustion or exposure.

It is obvious that prevention is better than a cure for exposure. A two man team would be vulnerable if conditions were condusive to exposure, and would be badly placed to assist each other. The real danger lies in the lack of recognition of the condition by either the victim or his companion since both are more or less affected.

PREVENTION

The conditions for exposure would usually prevent work being carried out so in most cases the team would not be out in the weather.

If the climate of the work area is prone to these conditions then the teams should see that they are properly clothed for the conditions. Long trousers, woollen shirts or pullover, warm hat, waterproof clothing should be worn or carried on a climb-on hill.

A good meal at the start and frequent snacks of readily digested food should be taken during the day. Glucose, barley sugar, honey, biscuits, dried fruit, have high energy value, hot sweet drinks are also of great benefit.

MAP READING, INCLUDING ELEMENTARY AERIAL NAVIGATION

Object of Map Reading

This is to render possible the clear and accurate visualization of the ground, so that this knowledge can be used for whatever task comes to hand. To reach this standard the student must understand the following :-

* The information shown in the margin of the map.
* The names by which features are known, and technical terms used in mapping.
* Scales, protracting bearings.
* Map symbols.
* How to visualize relief from contours.
* The difference between true, magnetic and grid north.
* Australian map grids.
* The use and reading of Grid (or Map) References).

It must be remembered that few, if any, maps can be perfectly accurate owing to the time lag between the original aerial photography and the first printing. Although the terrain has been mapped accurately from the photography constant alterations and additions to the man-made detail in well populated areas soon renders the best work out of date.

Understanding maps

(a) Marginal information. This varies with the scale of the map, and its purpose. It also varies slightly with the publishing authority. The information on the margins of the two scales of maps at present generally used in the field is as follows :-

(i) ICAO 1:1,000,000.
Name and number of the area.
Scale
Elevation unit (ft), and elevation conversion scale (metres)
Projection.
Hypsometric (Elevation) Tint code.
Topographic base reliability diagram.
Scales, Nautical miles, Statute miles, Kilometres.
Edition number, compiled by, drawn by, and printed by,
Date of Aeronautical, Topographical, and Isogonic (Mag. Dec) Inf.

In addition, much information is printed on the back of the ICAO. This includes symbols for the type of aerodromes, air navigation lights and beacons, marine lights and code, also miscellaneous information such as, Isogonic lines, radio masts heights, prohibited or restricted areas, etc. These are printed in dark blue on the face of the map. Hydrographic symbols (pale blue on the map), relief contours or hatchuring (brown on map) and mapping symbols (black on map), are also shown.

(ii) The 1:250,000 map series will probably be the one most used for field work in Australia for some years. The following information will be found in the margin :-

Map name, number, series and edition.
Scales in stutute miles, nautical miles and kilometres.
Method elevations shown, and datum.
Projection and horizontal datum.
Details of TM grid, zone and spheroid.
Method of giving a map reference.
Magnetic declination information.
Map reliability diagram, and map sheet location diagram.
Map symbol legend.
Date of aerial photography and compilation.
Authority responsible for compilation and printer.

Two important factors to notice about the 1:250,000 map series; firstly that some map areas have been compiled by different authorities making for some slight differences in layout and style, and secondly, on these maps the Australian National Grid, in yards and using the Clarke 1858 Spheroid, is still in use. As the new 1:100,000 series is compiled, so also will be the new 1:250,000 series based on the metric Australian Map Grid and the Australain Geodetic Datum. The Universal Transverse Mercator Projection is used.

(iii) Marginal information on the 1:100,000 map series is similar to the 1:250,000 series, but enlarges on it along the following lines :-

Road classification shown.
True, Magnetic and Grid North shown in diagramatic form.
Information about contour intervals.
Conversion table, metres to feet, (to convert metric heights to ft).
More specific information about accuracy of horizontal control.

(b) Names by which features are known and technical mapping terms.

Basin A small area of level ground surrounded or nearly surrounded by hills. Or a district drained by a river and its tributaries.

Saddle A neck or ridge of land connecting two mountains or hills. It is lower than the points it connects and higher than the surrounding plains and valleys.

Crest The general line formed by joining the summits of the main ridge of a chain of mountains. Or the top of a mountain, or hill.

Dune A hill or ridge of sand formed by the wind.

Estuary The tidal mouth of a river.

Escarpment An extended line of cliffs or bluffs.

Foreshore That portion of the shore between high and low water at maximum spring tides.

Gorge A rugged and deep ravine.

Knoll A low detached hill.

Main Feature — Those important features such as ridges, drainage systems, etc., which determine the shape of the terrain.

Pass — Narrow passage through mountains or hills.

Plateau — An elevated plain.

Re-entrant (or Gully) — These occur where the hillside is curved inwards towards the main feature. They are always found between two spurs.

Spur — A projection from the side of a hill or mountain, generally with a decreasing gradient.

Undulationg ground — Ground which alternatively rises and falls gently.

Watercourse — The line defining the lowest part of a valley, whether occupied by a stream or not.

Watershed — A ridge of land separating drainage systems; the summit of land from which water divides and flows.

This list does not profess to be exhaustive. There are many common words such as hill, mountain, river plain, island cliff or ravine, etc., which it is not necessary to define.

Technical mapping terms :-

Bearing — True bearing is the clockwise angle from the true north line to the point observed.
Magnetic bearing is the clockwise angle from the magnetic north line to the point observed.
Grid bearing is the clockwise angle from the grid north line to the point observed.

Contour — This is an imaginary line on the surface of the ground at the same height above sea level throughout its length.

Contour Interval — The difference in level between two adjacent contours.

Datum Level — The level to which altitudes are referred.

Detail — All minor natural or artificial features.

Fixed Point — A point which has been joined to one or more of the main control points by traverse intersection resection, etc.

Form Line — An approximate contour; a sketch contour.

Grid — A system of East-West, and North-South parallel lines which represent progressive distances east and north of a fixed point of origin.

Grid North — The Central Meridian of a Map Zone points both true north and grid north. Within that Map Zone any line drawn parallel to the Central Meridian points grid north. The greater the distance east or west of the Central Meridian, the larger the convervence fron the true bearing. This is known as Grid Convergence.

Hachuring — A Method of representing hill features by shading in short disconnected lines drawn directly down the slopes in the direction of the flow of water from the slopes.

Horizontal Datum — The datum to which the horizontal control is related.

Latitude — The Latitude of a place is expressed in degrees, minutes and seconds, east or west from the Meridian of Greenwich, as the case may be.

Magnetic declination — The amount Magnetic North declines from True North, at any place. It is called East or West declination according to whether magnetic north is East or West of true north from that place.

Orienting a map — When a map, sketch, air photo or plan is placed so that its true north line points true north, the map is said to be "oriented".

Plotting — The process of recording on a map or plan, the field observations and measurements.

Resection — A method of fixing the position of the observer by drawing lines to or observing bearings to at least two previously fixed points.

True North — This is the direction of the North Pole from the observer.

Vertical Interval — This is the vertical distance between two contours.

(c) Scales

The word "scale" means the proportion which the length between two points on a map bears to the horizontal distance between the same two points on the ground; thus if the distance between two houses on the map is one inch and the horizontal distance on the ground is one mile, the scale of the map is one inch to one mile. This can also be expressed as a Representative Fraction. This expresses the denominator of the fraction in the same unit as the numerator; thus the R.F. for one inch to one mile is expressed 1:63,360, there being 63,360 inches per mile, As the metric system comes more into use, more scales will be expressed as a Representative Fraction.

(d) Protracting bearings from a map

Where approximate bearings are required from a map, i.e. the 1/250,000 series, the grid lines, rather than the faint Latitude and Longitude graticules, are the most convenient, from which to protract the bearings. This does introduce a small error, if the map sheet happens to be close to the Map Zone boundary. However, taking into account the general accuracy of

the compass, it would only in rare cases be worth while to rule true meridians from the Longitude graticules, from which to protract bearings.

To obtain the magnetic bearing of a line, from the map, the true bearing is protracted, then the magnetic declination added or subtracted from that true bearing, to give the magnetic bearings.

When declination is East :- Subtract from true bearing.
When declination is West :- Add to true bearing.

Example :-	True bearing	265°
	Declination East	- 5°
	Magnetic Bearing	260°

To obtain the true bearing from the magnetic bearing, the rule is reversed:-

When declination is East :- Add to magnetic bearing.
When declination is West :- Subtract from magnetic bearing.

Probably the best way of obtaining magnetic bearing from a map is to set the protractor so that it is oriented with 0° along the line to Magetic North. Proceed as follows :-

Set centre mark of the protractor over the point from which bearings are to be read. Orient to true north by keeping parallel to the grid lines.

Then mark with pencil the angle of declination as shown on the map margin, i.e. declination 5° East, mark 5° to the east of North.

Turn north point of protractor to co-incide with the 5° mark.

Magnetic bearings can now be read directly from the map.

(e) Map Symbols (Conventional Signs)

For ease of recognition, these are suggestive of the object represented. Thus the sign for a windmill could scarcely be taken for anything else as also a cross for a church and an aeroplane for an airstrip. The scale of the map governs the space available, therefore a set of map symbols is designed for each map scale. However, little trouble is experienced in understanding the variations encountered.

(f) How to visualize relief from contours

Relief is mostly shown on the 1:250,000 maps by hill-shading owing to the lack of vertical control in most areas. However maps of the more developed areas are contoured at 250 ft intervals with layer tinting as an adjunct.

Form lines are approximate contours and are used when insufficient vertical control is available for contouring. They show the elevation in the same manner but are not reliable for exact information.

With the increased vertical control becoming available, the new 1:100,000 maps will be contoured in metres. Some have already been published, the contour interval being 40 metres with 20 metre auxillary contours in selected areas.

The contour lines have their height printed at various places along the actual line and these contour lines, with the actual drainage pattern give the map reader the picture of relief, As can be imagined, un-numbered contours of a knoll without any drainage pattern could also be interpreted as a depression. It should also be noted that the closer the contour interval, the better the picture of relief.

Figure 1 below, shows a contour plan of a knoll and section through the same. As previously mentioned, unless some other information such as heights against each contour, drainage pattern, spot heights, etc., is provided, this plan could just as easily be that of a depression. Turn the page upside down and see.

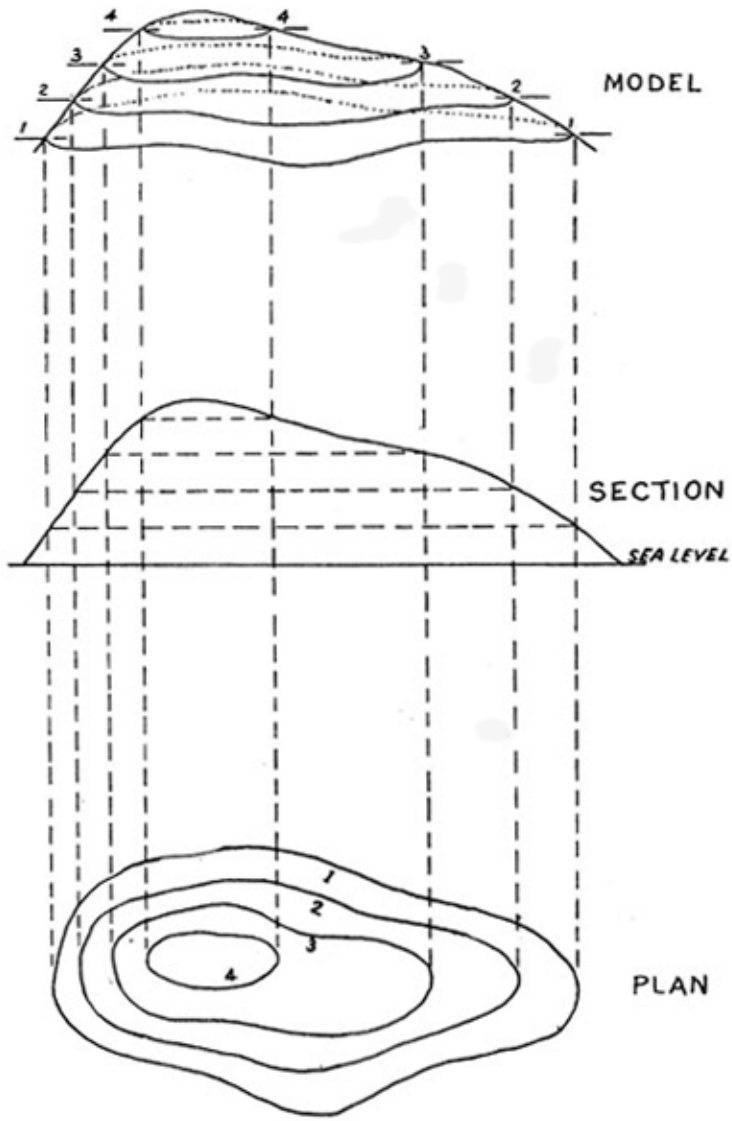


Figure 1

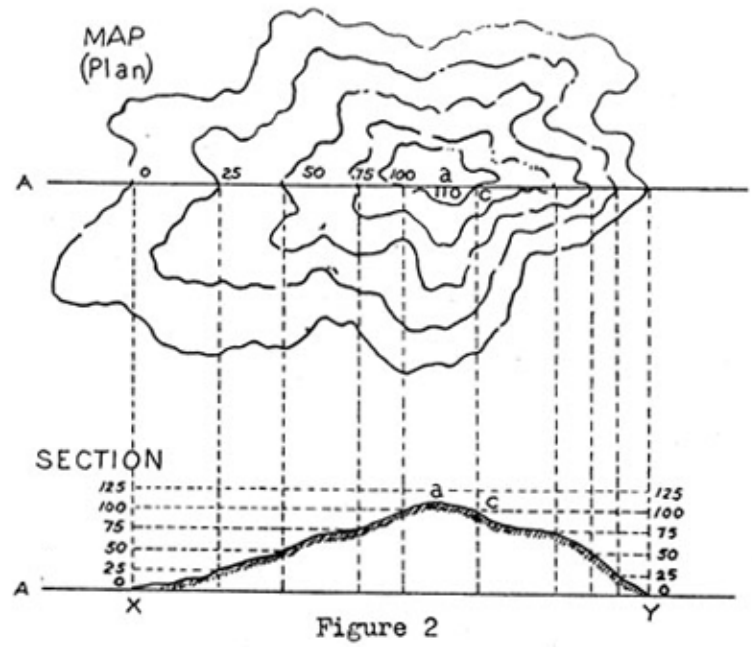


Figure 2

The contours of a definite knoll with a section through the same

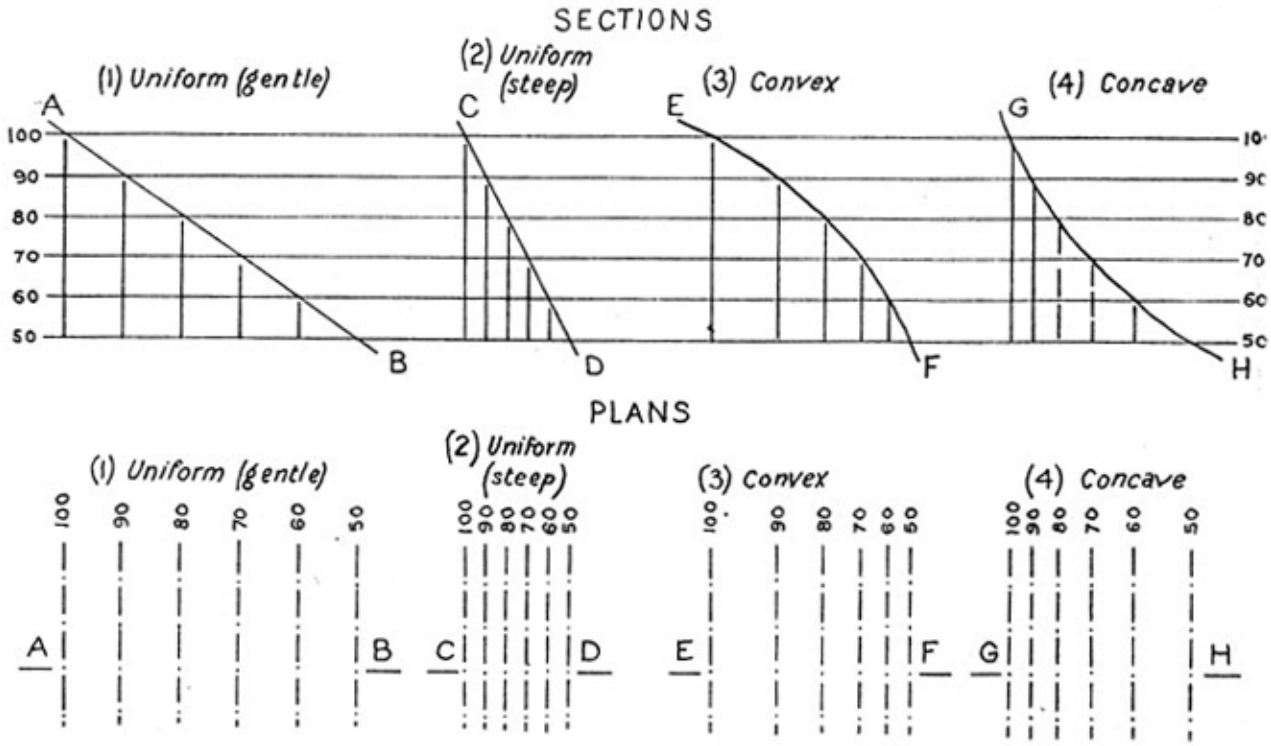


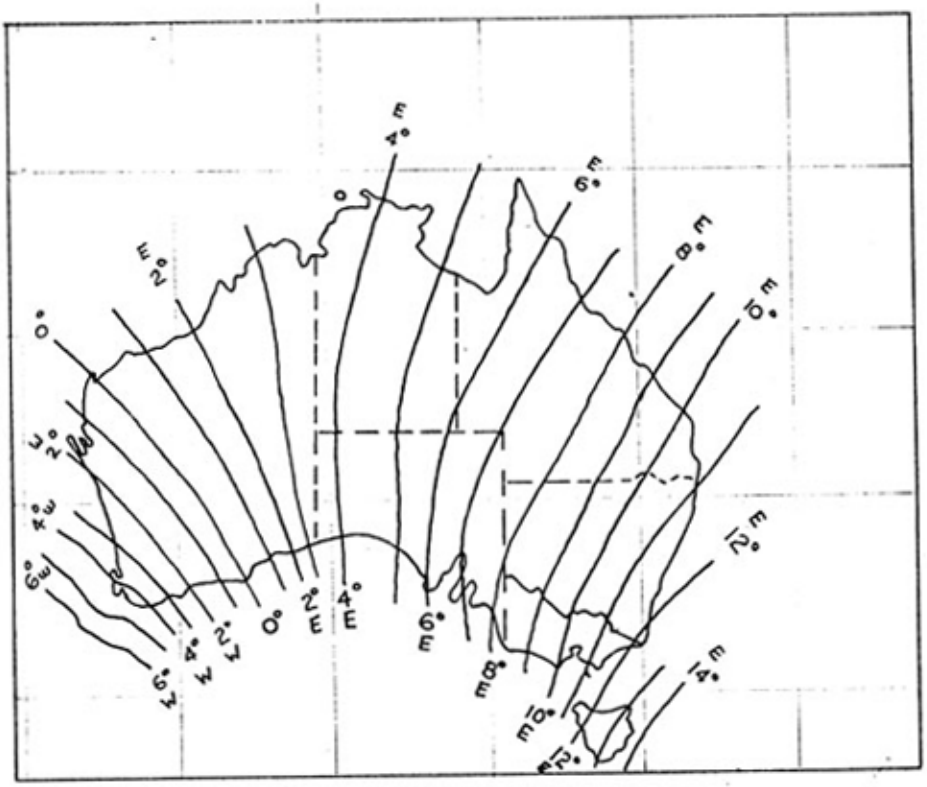
Figure 3

Sections drawn from contours to show slopes. The drawing of such sections taken from various maps, is good practise for the visualising of terrain from contours.

(g) The difference between true, magnetic and grid north

True north means the direction of the north pole from the observer, and the direction of true north from the observers position is called the True Meridian. As the earth is spherical in shape, it follows that the meridian of any point, East or West of the observers position will meet the true meridian of the observers position at the north pole.

Magnetic north is the direction of the magnetic pole from the observers position. The difference between the magnetic and true meridians is known as the Magnetic Declination of that position. Magnetic Declination varies from place to place throughout the world. Figure 4 shows the general pattern of magnetic declination over the Australian continent. Lines joining places of equal magnetic declination are known as Isogonic Lines. Owing to the slight annual movement of the magnetic pole the magnetic declination of a place varies slightly from year to year.



Isogonic Chart of Australia
Figure 4

Grid north Map grids will be explained in the next section. For a definition of grid north it is sufficient to say that grids are rectangular and only one grid line coincides with a true meridian therefore it is only along this meridian (called the Central Meridian) that the grid points to true north. All other vertical grid lines are drawn parallel to this Central Meridian and do not point to true north, but in each case point to an imaginary point called "Grid North". The angle between True and Grid north is called Grid Convergence and increases as the distance from the Central Meridian increases.

(h) Australian Map Grids In the early 1930's the Australian National Grid on the Transverse Mercator Projection, and in yards, was adopted for Australian maps and maps produced until the completion of the provisional and 1st Edition of the 1:250,000 maps about 1966 use this grid. Any revising to these 1:250,000 map will be only overprints in magenta to show changes of road and track patterns. built up areas, development , etc. This grid is based on Clarkes 1858 Figure of the Earth, and the Astonomical Co-ordinates of the Sydney Observatory were used as the origin. Eight zones, each 5° wide plus $\frac{1}{2}^{\circ}$ common overlap were laid out to cover from Longitude 111°E to 154°E.

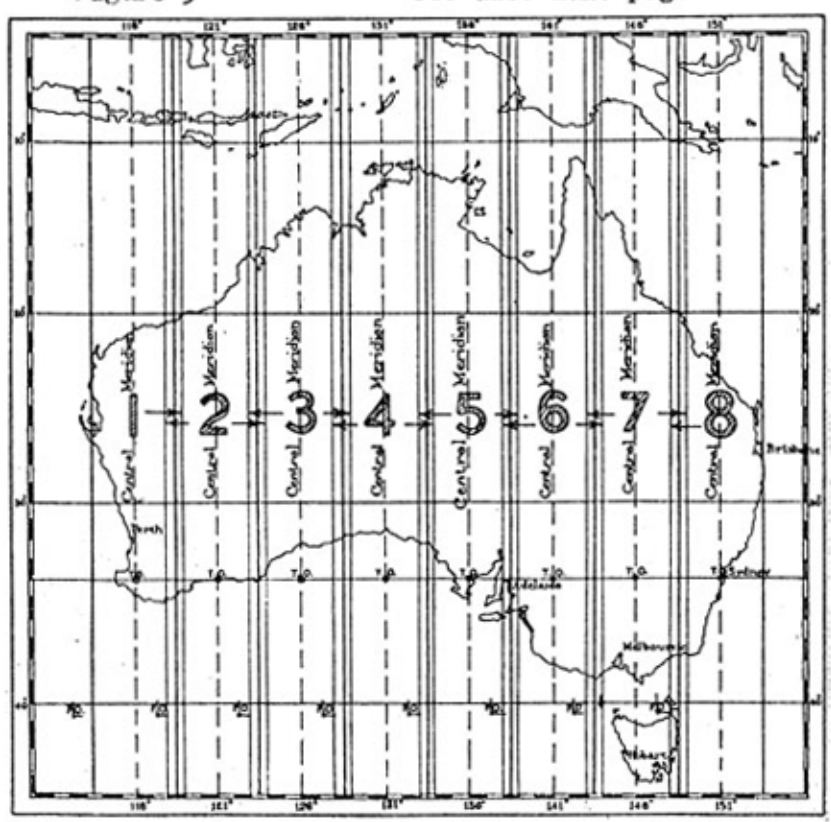
The True Origin of the co-ordinates of each zone in the grid isthe junction of Latitude 34 S and the Central Meridian of the zone. The False Origin for each zone, with zero co-ordinates is 400,000 yards west and 800,000 yards south of True Origin. This is to ensure that co-ordinates for all points within the zone will be positive.

In 1965, the Australian National Mapping Council adopted a new grid, the Australian Map Grid. It is a metric grid based on the Universal Transverse Mercator Projection and the Australian Geodetic Datum. Twelve zones 6° wide plus $\frac{1}{2}^{\circ}$ common overlay are used to cover the Australian continent and Territories under its control.

True Origins re the junction of the Central Meridian of each zone with the Equator. False Origins are 500,000 metres west and 10,000,000 metres south of the True Origin.

Figure 5 shows the layout of the map zones under both the Australian National Grid and the Australian Map Grid.

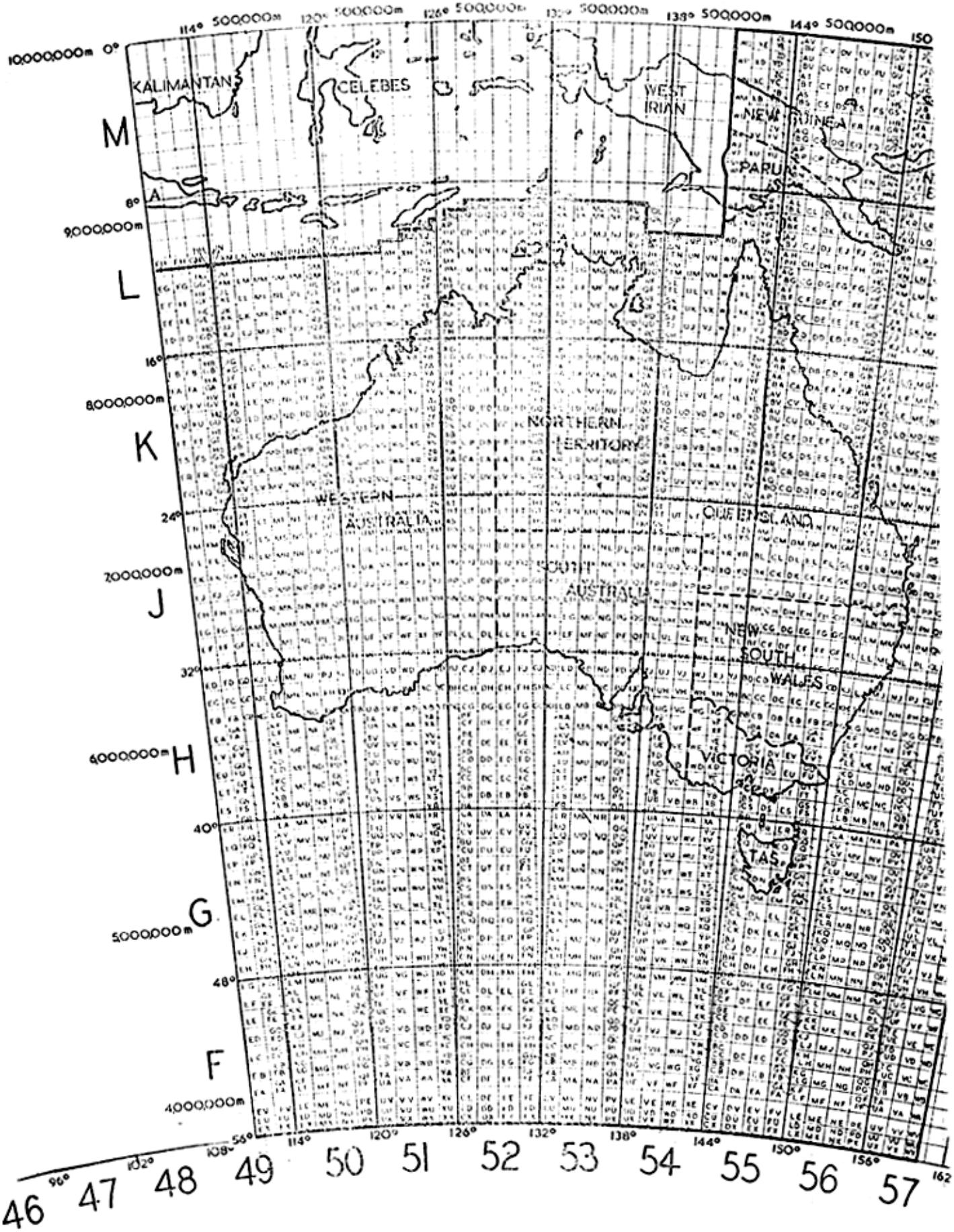
TRANSVERSE MERCATOR ZONES
Australian National Grid
Figure 5 see also next page



T.O. True Origin
F.O. False Origin 400 000 yds W, 800 000 yds S. of True Origin

Zones overlap $\frac{1}{2}^{\circ}$ on each side

100,000 METRE SQUARE IDENTIFICATION OF THE AUSTRALIAN MAP GRID AREA



(i) The use and reading of Grid (or Map) References

(i) The 1:250,000 Australian National Grid (yards) It will be some years before this series will be republished on the Australian Map Grid (metric), and as these maps are the basic map for current field work any grid references used will still be in yards. However, this is no problem as all maps incorporate a panel in the margin giving an explanation and an example. The black numbered grid lines indicate 10,000 yard intervals, and the Grid Reference of a point is given to the nearest tenth of this interval i.e. 1,000 yards. Each grid line is numbered with two figures, the 100,000 and the 10,000. Thus the three figures for the Easting reference come from the two printed figures on the nearest line west of the station with the third figure representing the number of tenths the point is estimated to be east of that line.

It follows that the three figures for the Northing reference come from the two printed figures on the first grid line immediately south of the point, with the third figure representing the number of tenths the point is estimated to be north of this line.

(ii) The 1:100,000 Australian Map Grid (metric). As these maps will gradually become available an explanation of the giving of Grid References on these maps, is warranted. The black numbered grid lines indicate 1,000 metre intervals. By estimating the tenths of these intervals in the same manner as in (i) above, a Grid Reference to the nearest 100 metres is obtained.

From the margin and the Grid information panel ascertain within which 100,000 metre square the point lies, and prefix the six figure reference with the two letters nominating that 100,000 metre square.

Hints on Map Reading

Once a good knowledge of the amount and variety of information obtainable from the map has been assimulated, map reading itself is mainly a matter of having plenty of practise at following maps under field conditions. The following hints have been found useful :-

(a) Always check the date of the air photography, map compilation and latest amendments. These will give an idea of the reliance to be placed on that particular map.

(b) Always have a prismatic compass, protractor, and scale handy. If no scale is available make one along the edge of a piece of blank paper.

(c) Always keep the map orientated.

(d) Always use a soft lead pencil (not a ball-point) to draw in bearings or make notes of directions and mileages. It is a great help to be able to quickly plot one's position, particularly when on reconnaissance. When this is done in pencil the map can be cleaned up later and the required data only, plotted permanently in ink. Also always have a notebook handy for more elaborate notes.

SEARCH AND RESCUE

GROUND SIGNALS

When forming signals :-

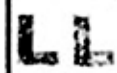
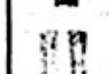
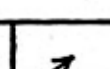
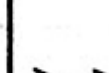
A. Use strips of fabric, pieces of wood, stones or other available materials

B. Make symbols at least 2.5 m (8 ft) long.

C. Lay out symbols exactly as depicted to avoid confusion.

D. Provide maximum colour contrast.

E. Endeavour to attract attention by other means, such as radio, flares or smoke.

SIGNALS BY SURVIVORS			
REQUIRE DOCTOR SERIOUS INJURY		WILL ATTEMPT TAKE-OFF	
REQUIRE MEDICAL SUPPLIES		AIRCRAFT SERIOUSLY DAMAGED	
UNABLE TO PROCEED		PROBABLY SAFE TO LAND	
REQUIRE FOOD AND WATER		REQUIRE FUEL AND OIL	
REQUIRE FIREARMS AND AMMUNITION		ALL WELL	
REQUIRE MAP AND COMPASS		NO	
REQUIRE SIGNAL LAMP WITH BATTERY AND RADIO		YES	
INDICATE DIRECTION TO PROCEED		NOT UNDERSTOOD	
AM PROCEEDING IN THIS DIRECTION		REQUIRE ENGINEER	
SIGNALS BY GROUND SEARCH PARTIES			
OPERATION COMPLETED		HAVE DIVIDED INTO TWO GROUPS EACH PROCEEDING IN DIRECTION INDICATED	
(a) WE HAVE FOUND ALL PERSONNEL			
(b) WE HAVE FOUND ONLY SOME PERSONNEL		INFORMATION RECEIVED THAT AIRCRAFT IS IN THIS DIRECTION	
WE ARE NOT ABLE TO CONTINUE RETURNING TO BASE		NOTHING FOUND WILL CONTINUE SEARCH	

BITES AND STINGS

SNAKES

The reaction of most people to snakes is usually a fear quite out of proportion to any danger the snake may pose. Their villianous role has been promoted in folk lore and fairy tale until a rational respect for snakes, based on fact, has to be acquired by effort.

There are a number of books available written by naturalists who know, and even love, these creatures, which will provide you with factual information on identification and habits.

Much of the following information is based on a publication by Eric Worrell called "Things That Sting". It is an easily read book containing a great deal of common sense information about a number of Australian animals, insects and plants which are capable of inflicting a bite or sting. It is recommended reading.

In Australia there are about 140 kinds of snake on land and 25 species of sea snakes in the surrounding waters. Although most Australian snakes are venemous to varying degrees, only about a dozen species can be considered dangerous.

ANTIVENENES

Antivenenes are available for all of the more common deadly species and a polyvalent (multi-purpose) antevenene, now available, makes it unnecessary to positively identify the snake. However identification is a great advantage as the antivenene, being made from horse serum, can cause allergic reaction, thus making it desirable to give the smallest dose possible to neutralise the venom. The polyvalent antivenene requires larger doses thus increasing the risk of side effects. Do not try to seek out the snake and kill it, this increases the risk of being bitten, a description of the locality and the terrain can allow experts to determine the species of snake from this information.

FIRST AID FOR ANY SNAKE BITE

If the bite is on a limb, tie a tourniquet, or constrictive bandage, above the knee or elbow (the single boned portion of the limb) and above the bite. Apply the tourniquet <u>at once</u>, it must be tight enough to prevent a pulse being felt in the limb below it.

The tourniquet or constrictive bandage can consist of a handkerchief, belt, strip of clothing or rope. If the tourniquet is narrow, use padding to prevent the material cutting into the flesh and causing damage to the limb.

To make a tourniquet, tie the material loosely around the limb, place a stick or pen under the material at the knot, and turn it so that the material is twisted up at the stick causing the remainder of the material to constrict around the limb.

It is <u>essential</u> to loosen the tourniquet after twenty minutes, for thirty seconds, then re-apply it. Do not cover the tourniquet or conceal it, note the time at which it was applied. The tourniquet may be discarded after two hours if medical treatment has not been reached.

- Make the patient lie down and keep still to reduce the rate of circulation.

- Wash the area of the bite with any available liquid to remove traces of venom remaining on the surface. Wipe carefully away from the wound.

- Keep the patient rested and treat for shock. This is most important, if the patient is sufficiently frightened of snakes the effects of shock can be fatal before the poison has had time to work on the system. He must be convincingly reassured that he is not in danger.

- Give the patient hot sweet drinks, but definitely not alcohol.

- Seek medical treatment as quickly as possible.

- Do not cut or cauterize the wound.

- Do not suck the wound as the venom may enter the bloodstream through open sores in the mouth (ulcers) or decayed teeth.

PREVENTING SNAKE BITE

Snakes are normally timid creatures and will retreat from larger, noisier animals, such as people, if they can. Snakes prey on small creatures which they swallow whole, as they are unable to chew, anything too large to swallow whole is unsuitable as food. For this reason snakes will not attack a man with the intention of eating him, but will only attempt to bite in self defence.

It is not necessary to kill every snake encountered in the bush, most victims of snake bite were trying to kill the snake when it bit them. In most Australian states, all reptiles, including venomous snakes are protected by law. Only when your life or property is endangered is it lawful for you to kill a snake.

When confronted by a snake the wisest course of action is to obey your first reaction, which would be to retreat and go another way.

To avoid accidently provoking a snake, be careful in places where snakes, or their prey, may be found, i.e. among fallen or dead timber when collecting firewood, creek banks or dams, deserted and ruined buildings.

Don't step over fallen timber, learn to step onto it, look, then step down. Many snakes will bask or sleep partly under fallen timber where they are difficult to see and may be accidently stepped on.

When two or more people are walking in single file through the bush, the second and third men in line should be particularly alert. Very often the first man will disturb a snake without necessarily seeing it, and then be past it, leaving the aroused snake to confront the following walkers.

As most bites are around the feet and legs, sturdy boots, sox and long trousers can protect you from, or minimise the effect of most snake bites.

Don't attempt to handle snakes or investigate hollow logs or burrows with bare hands.

LIZARDS

There are no venomous lizards in Australia, however, if bitten don't ignore it. A bite from a lizard should be bathed and dressed with antiseptic. A serious bite by a larger lizard may require anti-tetanus injections or booster shot.

SPIDERS

Of the many species of spiders in Australia only two are known to cause death. These are the Sydney funnel web and redback spiders. As all spiders are technically venomous, treat all spiders with caution and if bitten by a spider which you suspect as being dangerous, treat as for snake bite.

FUNNEL WEB SPIDER

There are several species of funnel webs. The deadliest species is the Sydney funnel web, so called because it is only known to have been found within a radius of 80 km of Sydney.

The large tree funnel web, found from the central to northern coast of New South Wales may also be dangerous. There are about five other species of funnel webs found in various parts of Eastern Australia and Tasmania. None of these are known to be dangerous but all funnel webs should be treated with caution.

Funnel webs are heavily built spiders and are black to purplish black whereas other spiders are brownish. The female is four to five centimeters in length and has a big body with thick legs. The male is smaller, with longer legs and a much smaller abdomen. The venom from the male is about six times more deadly than the female.

REDBACK SPIDERS

Redback spiders are found throughout Australia. Only the female redback is dangerous. It has a round black body which is about the size of a pea and usually a distinct red stripe or patch on the rear of the abdomen. It has slender black legs. The male redback is so small he would usually be overlooked in a web.

Redbacks are generally found in dark, dry, quiet places, in sheds, garages or empty buildings, around undisturbed rubbish and sheltered vegetation.

Many other common spiders are capable of inflicting a bite if handled or accidently caught up against exposed skin. These bites will have various effects from itching to painful swelling.

FIRST AID

Pain and itching caused by bites from non-dangerous spiders can be relieved by applying hot cloths and antihistamine cream.

Wash the wound carefully to avoid infection.

Contact a doctor if symptoms get worse.

CENTIPEDES AND SCORPIONS

Despite their fearsome appearance and reputation Australian centipedes and scorpions are relatively harmless. Their venom is designed to subdue their

insect or spider prey and is not strong enough to seriously affect humans.

FIRST AID

At worst the bite might be about as painful as a wasp sting. Pain can be relieved by hot cloths applied to the bite.

ANTS

Most small ants only cause irritation when they nip, but some of the larger ants sting from their rear ends using a very painful acid.

Most ants live in colonies and make their homes in underground tunnels with a mound at the surface forming an entrance. If disturbed they rise angrily to the surface, stinging again and again. Smaller ants may utilize fallen timber for a nest and again react angrily when disturbed.

FIRST AID

Pain can be relieved by hot cloths, ammonia or antihistamine cream.

In the case of multiple stings, continuing pain or other symptoms, consult a doctor.

AVOIDING BITES FROM SPIDERS, CENTIPEDES, ETC.

Spiders, centipedes, scorpions, etc. will generally only sting or bite when they feel threatened.

It is wise to avoid poking your fingers into crevices or under rocks or bark where these creatures live.

Take care when collecting firewood, a couple of kicks at the wood, before picking it up in your arms may cause spiders and other creatures to abandon the timber before you handle it. This technique also reveals whether or not the firewood is inhabited by ants, something that is best discovered while the wood is on the ground.

When handling rocks, turn them over with a stick or your foot before picking them up. Rock cairns which have been standing for many years provide the ideal conditions for spiders, centipedes, scorpions and many other small creatures and insects to thrive. When these cairns have to be dismantled to find the ground mark be very watchful and wear strong leather gloves.

Spiders are able to survive underwater for a considerable time. Specimens removed from a pool may appear dead but can be very much alive. Avoid handling these or other biting creatures.

Check your boots or shoes each morning before donning them by knocking and shaking them.

Keep your swag made and covered, or rolled up when it is not occupied.

Don't leave clothing or open bags lying on the ground.

Wherever possible avoid sleeping or sitting on the ground.

SANDFLIES AND MOSQUITOES

In many areas of Northern and Inland Australia conditions are made difficult by the presence of sandflies and mosquitoes; the bites from these insects cause extreme itching. Although the bites are not serious, unless a person is allergic to them, the risk of infection is high if the bites are scratched to the point where the skin is broken.

Both sandflies and mosquitoes need water in which to lay their eggs. Therefore you can expect to find one or both of these insects at such places as rivers, creeks, dams, pools, areas which are inundated, and beaches, particularly where a large tidal movement exists.

The hours of sunset and sunrise are when these insects are most active, but they will attack at almost any time of the day or night.

PREVENTING BITES

The benefit of chemical repellents seem to vary with individuals, the best you can expect is a useful twenty minutes of relief, after that the repellents appear to lose their effectiveness.

Clothing provides protection if you are unable or unwilling to use repellents. A net is essential for a good nights sleep in these conditions, take care of the net, if torn it is worse than useless.

Don't camp close to a river, estury, creek or waterhole if you wish to avoid mosquitoes and sandflies. If the terrain permits, an exposed, windy site at least fifteen metres above the water will often prove a pest free site while still close to the water.

FIRST AID

The first point in treating bites is probably the hardest. DON'T SCRATCH.

Irritation from bites can be relieved by bathing in hot water; apply calomine lotion or antihistamine cream.

TICKS

Ticks are most prevalent in the coastal areas of Australia but can be encountered in the scrub by cattle country of outback Queensland and the Kimberly district of Western Australia.

Ticks are small parasites which attach themselves to a host and feed on blood. With the bite they inject a poisonous saliva to prevent the blood clotting while they feed. The bite does not cause sharp pain but rather a gradual irritation.

The adult female tick can be dangerous, sometimes causing temporary paralysis in humans. In some cases they have caused the death of very young or elderly people who have less resistance to the venom. When it attaches itself, it is flat bodied and no larger than a match head, after feeding for a few days, it can swell to about the size of a pea.

CHECKING FOR TICKS

A tick bite will cause itching or irritation, enabling the victim to discover

and remove the tick before much poison is injected. Ticks prefer to attach themselves to a warm, soft place, often where there is hair. The ears, scalp and groin are such places and irritation in these areas should be investigated promptly. If ticks are prevalent check frequently, particularly at constrictions around the body or limbs such as the waistband, sock tops, elasticised waist or leg band on briefs, and even the watch band.

FIRST AID

Once a tick is found it should be removed immediately, it can be dabbed with petrol, kerosine or insect repellent to cause it to disengage itself. Alternative it can be nipped out with tweezers, but take care not to squeeze more venom into the wound, or worse, tear the body off leaving the head of the tick still imbedded.

- The area should then be swabbed with strong antiseptic.
- If pain becomes intense or headache, dizziness or vomiting occur, seek medical attention.
- A tick antitoxin is available at hospitals and veterinary surgeons.

SCRUB ITCH

In forested areas of Northern Australia during the dry season, a tick called a Red Mite is found living in dead wood. The tick can be conveyed to people brushing against, or sitting on, dead wood.

The result is a large itching area, usually around the groin. Scratching may cause infection without relieving the itch.

TREATMENT

Sluice the body with a strong solution of Dettol and water then allow the body to dry in the air without towelling.

STONEFISH

Stonefish present a menace when wading in shallow water or over reefs. They are particularly well camouflaged, the best description of a stonefish is "a weed covered rock with eyes", being so well disguised they are easily stepped on. The stonefish is equipped with a dorsal spine which can inflict a most painful and dangerous sting. The spine will penetrate light sandshoes so fairly strong footwear should be worn if you are working on reefs or beaches in Northern Australia.

TREATMENT

The treatment is the same as for snake bite, apply a tourniquet, treat the patient for shock and seek medical aid immediately. A serum is available for stonefish venom. It is important that the serum is given as soon as possible. Continually bathe the wound with cloths soaked in hot water to relieve the intense pain.

STINGRAYS

Stingrays can be encountered in shallow water, they are inquisitive rather than

aggressive and will approach to investigate a person wading, they are easily frightened off by splashing. The stingray has a sharp barbed spine at the base of its tail. A person would only be stung if he were to step on or try to handle a stingray.

TREATMENT

- The wound should be encouraged to bleed.
- Bathe the wound with cloths soaked in hot water to relieve the pain.
- If the pain continues or other symptoms develop seek medical attention.

SEA WASPS

Sea wasps are a species of jellyfish. In the far north of Australia sea wasps are blown toward the coast by seasonal winds in the summer months. In these areas people do not swim in the sea during the danger period from November to March. Sea wasps can be difficult to see, especially if the water is disturbed or cloudy. The sea wasp has probably the most dangerous and difficult sting to treat of all animals.

APPEARANCE

Also called the Box Jellyfish, the sea wasp can be recognised from other, less dangerous, jellyfish by its box shaped body, with long venomous tentacles suspended from the four corners. The tentacles may be up to several metres long and contain microscopic barbs of extremely virulent venom, which have been known to cause death within a few minutes.

FIRST AID

- If it can be done quickly, apply strong alcohol, mixed with vinegar if available, to the sting. This should be gently dabbed on, causing the jelly like tentacles to shrink and come away from the skin. It is very important not to rub the wound as this can cause the tiny poisonous barbs to be pushed further into the skin. Do not suck the wound.
- If the sting is on a limb apply a tourniquet above the wound and above the knee or elbow.
- Contact the nearest hospital and go there quickly.
- If the patient collapses apply mouth to mouth resuscitation until medical help can be given.
- Release the tourniquet every twenty minutes for thirty seconds until medical help is given.
- The Commonwealth Serum Laboratories have prepared a serum, but the venom acts quickly, speed is essential.

SEA SNAKES

Sea snakes are not aggressive and will only bite after considerable provocation, such as being handled.

First aid treatment is the same as for other venomous snakes.

CONE SHELLFISH

Cone Shellfish are another group of deadly sea creatures found in tropical waters. As their name suggests, they are cone shaped, but most have a flattish face on the broad end. The largest are only several centimetres long. They have a venomous tooth-tipped tongue which may dart out from the narrow end to a length greater than the shell.

All Cone Shellfish are venomous although only four species are definitely known to be deadly to men. About ten other species are known to cause intense pain and it is likely that others may be dangerously venomous.

Most injuries occur when a prettily marked shell is handled, when the animal is disturbed in this way it is likely to probe with its little harpoon and inject its venom. All cone shells should be treated with caution and not handled.

First aid treatment, as for snake bite.

CORAL

Cuts or wounds caused by coral can cause local poisoning which may turn septic if not attended to. Wounds suffered by other means can be poisoned by some kinds of live corals, even without direct contact, and recovery may be slow.

TREATMENT

Coral cuts or scratches should be liberally disinfected with some preparation containing ammonia.

PREVENTION

Suitable footwear, as mentioned previously, should at least cover and protect the ankles. Avoid wading or swimming near coral if you have open wounds or sores.

OTHER DANGEROUS ANIMALS

Almost any animal is capable of inflicting an injury of some kind if it feels threatened or needs to protect its young. Avoid provoking animals unnecessarily or encounters which press the animal to defensive action.

CATTLE

On many of the large cattle stations in outback Australia the stock will seldom see men unless they are mounted or in vehicles. Sometimes their only experience of men on foot is in the branding yard, consequently they are not always kindly disposed toward us.

Be cautious when on foot in cattle country, particularly when aerial mustering is under way in the area. Cattle which have evaded the muster can be so enraged after the aerial harrassment that they will charge anything that moves.

CROCODILES

Crocodiles, although once nearly hunted to extinction in Northern Australia, are now protected and are increasing in numbers in the remote Northern coastal areas. Avoid camping on beaches, near mangroves or river estuaries. The Saltwater Crocodile is a dangerous and unpredictable predator.

SHARKS

Sharks of many species are common in the waters surrounding Australia. When in remote coastal areas restrict your swimming to a quick, watchful, dip. A long swim any distance from shore is inviting danger.