HAWK MOUNTAIN

RANGER SCHOOL

7 – 15 July 2012

"...these things we do – that others may live"

Wilderness Search Fundamentals

Revision 2, 6/13/12

Table of Contents

Hawk Mountain Ranger School History

In response to the need for ground support for air search missions, the concept of the Ranger Team was born under the leadership of Col. Phillip Neuweiler, PAWG Commander from the late 1940's to 1970. In 1953 USAF Pararescue and survival instructors trained PAWG SAR teams at Westover AFB, Massachusetts. Due to the dedication, motivation, and intensity displayed by the students, the instructors called them Rangers. In 1956 the school was moved to Col. Neuweiler's property at Hawk Mountain, and was staffed by USAF and CAP members. In the early 1960's training for Ranger Staff Cadets was implemented, and the Hawk Mountain Ranger School gained national prominence.

In the 1960's five different Ranger Proficiency grades were established to recognize skill and experience, devised in a similar way to awards for the Boy Scouts of America. In that time, several Ranger Teams had individuals that parachuted into aircraft crash areas. There was an Airborne Ranger shoulder insignia worn in place of the PAWG shoulder insignia.

In 1974 Brigadier General Leslie Westberg, the National Commander, attended the Hawk Mtn. Ranger School. He completed requirements for, and was awarded Ranger First Class. General Westberg tasked National Headquarters staff to document emergency services training and to recognize and link together various related schools across the United States. Through the 1970's there were National Ranger Schools held at Hawk Mountain, the Everglades in Florida, and Black River Mississippi. Col. Bartolo Ortiz developed Ranger Schools in Puerto Rico. Officially designated National Emergency Assistance Training (NEAT) schools, attendees of these schools wore a pocket NEAT insignia. Washington Wing Challenger School was also NEAT, and several of their staff trained at Hawk Mountain Ranger School.

In the early 1980's the Airborne Ranger shoulder insignia was replaced with a Search and Rescue insignia. Search effectiveness was compromised by CAP adoption of the Battle Dress Uniform. The traditional orange hat and colorful Ranger insignia became even more practical. Brigadier General Richard Anderson, CAP National Commander, visited the Hawk Mountain Ranger School in July 1996 and recognized the lasting contributions naming it "the Harvard School of Search and Rescue".

The National Search and Rescue Committee (NSARC) is a federal level committee formed to coordinate civil search and rescue (SAR) matters of interagency interest within the United States. This Wilderness Search Fundamentals textbook has been provided for the NSARC library. NSARC has provided it for the Air Force Rescue Coordination Center (AFRCC) Inland SAR Course instructors.
The Hawk Mountain Ranger School and the Pennsylvania Wing Ranger Program has been the model for many of the search and rescue programs throughout the country. It continues to be the single longest running school of search and rescue.

On September 11, 2004 the Hawk Mountain Ranger School training area was dedicated as the "Colonel Phillip Neuweiler Ranger Training Facility" and now includes eight newly constructed offices, a Medic training building, a student shower facility and a waste water collection system.

In July 2006 Major General Tony Pineda, the National Commander, attended the 50th anniversary Hawk Mountain Ranger School, and consequently challenged all the CAP wing commanders to attend the 2007 school. Many did, along with Brigadier General Amy Courter, the National Commander at the time.

The Hawk Mountain Ranger School facility is the property of Civil Air Patrol and belongs to its members. Ranger Staff are the individuals responsible for the maintenance.

Introduction

This reference material was developed to be used by students attending the initial and intermediate training at Civil Air Patrol's Hawk Mountain summer Ranger School.

The information is basic and is designed to supplement prerequisite training, experience and formal instruction at the school.

Additional training material and performance evaluation check sheets will be provided based on the student's course of study.

Students are expected to complete the following basic training requirements before learning Wilderness Search Fundamentals:

- Basic First Aid
- Basic CPR
- NIMS 100, (Introduction to ICS) and 700 (NIMS, An Introduction)
- General Emergency Services Training

Students will be assigned sections to read prior to the "classroom" portion of training. The instructors will answer questions and give additional information and practical exercises.

Additional copies of this manual are available by contacting:
DeEtte Riley
PA Wing HQ
driley@awandsons.com
www.pawg.cap.gov/hawk

Alerting Procedures

A communication process for alerting members must be in place and tested monthly. There are many methods available for an alerting system including phone calls, group texts, e-mails and programs like "I am responding". Whatever system is used, it must:

- Work at all times
- Be able to quickly and accurately give information and receive feedback
- Be able to be initiated from anywhere

A phone chain is where the team leader calls two members and each of those members would call two more members. If someone does not answer, the member calling would be responsible to call the two members that the non-answering member was supposed to call.

All members must be contacted quickly. Additional information should be sent in writing to eliminate confusion and provide details to the member's family. Include the alert information, the day, time, and call back information when leaving a message.

A method to contact other people in the member's homes should also be in place to communicate status of the members. As an example, notification can be made to have rides home for members while the team is traveling back to area where members will be dropped off. Someone not on the mission usually does this type of communication.

The members and their contact information must be kept current on the alert roster. When making a call to alert a team member:

- Identify yourself and the organization
- State who you are calling
- State the type of incident
- State the type of assistance needed
- State when and where the team will meet
- State the expected duration
- Ask if the member is available to respond.

If the member is available to respond, additional information will be given either immediately or often during another phone call following the alerting of the rest of the team. The additional information should include:

- The expected base of operations
- Additional details on the assistance requested
- Phone numbers for someone where the team will meet and the mission base
- Any special equipment that is needed
- The agency providing the initial incident command (IC)
- Details on the weather and how to cancel the response.

Individual Equipment

Most team members opt to carry two sets of equipment called day gear and extended gear. Both sets of gear may have to be carried at the same time.

The purpose of day gear is to support a person for up to 24 hours while functioning as part of a team. A list will be provided with typical items to be included in the day gear. There are many options for day gear and some of the most popular are described below.

Load Carrying Equipment (webbed gear) is usually cheap, long lasting and easy to adapt. The main drawback is that items are hung off the person causing increased fatigue. Hanging items are easily caught in heavy brush.

Load Bearing Vests are an improvement to the military webbed gear by cutting down on the amount of items on the waist. The majority of the weight (canteens, butt packs, etc.) is still hung from a web belt.

Air Force Survival Vests are constructed from nylon mesh and many different sized pockets. There is no place to attach canteens or other items.

Fanny packs are similar to the military butt pack except they normally have their own built in PADDED waist belt. This type of pack is normally not large enough.

Daypacks are small commercial backpacks with several compartments.

Extended gear is used when a team must be self sufficient for an unknown or extended period of time. A list will be provided with typical items to be included in extended gear.

Backpacks

An ALICE (All Purpose Lightweight Individual Carrying Equipment) pack is the most common form of military pack. It comes in medium and large. Both packs have a large inner compartment, three main exterior pockets, a "hidden" compartment in the top flap, and various attachment points for equipment on the outside of the pack. The large pack also has additional three smaller outer pockets for items such as socks, foot powder and snacks. ALICE frames are available as an accessory with these packs.

Commercial backpacks range in size from overnight use to ones large enough to sustain an experienced woodsman for many days. Many packs lack exterior pockets for equipment storage.

Commercial backpacks come with either internal or external frames. External frame refers to the fact that the frame is outside of the pack. This type of pack is generally best suited for longer duration excursions but is not available in as many sizes as other types of packs.

The internal frame pack has two aluminum bars make up the rigid support for the pack. These bars are bent to conform to the wearer's back and allow for a greater degree of comfort. The internal frame pack does sit against the wearers back allowing the jacket or shirt to become soaked with sweat. The pack must be properly adjusted.

Extended Gear

Pack a backpack with the heavy items highest. A team member's extended gear should include the following:

- Backpack
- Sleeping bag
- Ground cloth
- Foam sleeping pad
- Jacket or sweater
- Spare socks & underwear
- Food heating equipment
- Eating equipment
- Soap and towel
- Toothbrush and toothpaste
- Shelter
- Food for 3 days & 2 quarts of water
- Flashlight & spare batteries

Day Gear

A team member's day gear should include the following:

- Orange vest
- Watch
- Pocket knife
- Small plastic magnetic compass with lanyard
- Coins for phone and phone contact list
- Whistle
- Lighter
- Spoon
- Wallet with identification, cards, cash, calling card
- Notebook, pencils and pens
- Eye protection
- Hard Hat
- Leather gloves
- Medical exam gloves (2 sets)
- Two quarts of water
- Canteen cup or equivalent
- 24 hrs of snacks and food that do not require cooking
- Plastic surveyor tape - two colors
- A roll of toilet paper in plastic bag
- Duct tape
- 25 feet 550 lb. cord (Para cord)
- Locking carabineer and 15 feet 1" nylon webbing
- Rain gear
- Spare socks
- Flashlight w/spare batteries and bulb
- Headlamp
- Three large trash bags
- Waterproof matches
- Signal mirror - metal recommended
- Individual medication that the team leader knows about
- Sun screen

Many items should be kept in zip-lock bags or waterproofed as needed. The team member's name should be on each piece of equipment so it can be returned if found.

Some equipment options to add comfort include:

- Sunglasses
- Cough drops
- Chap stick
- Insect repellant

Batteries and Lights

Recharging in the field is usually not an option. Extra batteries are a must. Make an effort to use AA powered headlamps and flashlights so everyone has the same battery requirements.

Night search effectiveness and safety is dependant on good light. In some cases when working with good natural light the team may be more effective without lights. A night operation works best with either everyone using or everyone not using lights. Sporadic introduction of light degrades night vision instantly and then takes about 20 minutes to get effective night vision without lights.

Nutrition

Preparation for emergency service also extends to what you put into your body. A diet, high in carbohydrates and protein is preferred. A mission is not the time to be experimenting with foods you've never had before. Stomach upset and diarrhea will really slow you down.

Military rations such as Meal Ready to Eat (MRE) or canned foods, pastas, stews, meats, potatoes, sweet potatoes, vegetables, and fruits are ideal for missions. A balanced diet can easily be achieved. Make sure a can opener is part of your equipment if carrying canned foods.

Freeze-dried foods are popular among many backpackers. Access to water is crucial since they need to be re-hydrated before eaten. Avoid eating freeze-dried foods dry because they can cause dehydration. Freeze-dried foods are more expensive than a MRE or canned food.

Fresh food generally does not hold up to the rigors of even a short trek, although oranges are usually a good choice.

Glass containers should not be used for any of your equipment.

Snacks of granola bars, GORP, and dried fruit are better than toaster pastries. The pastries are rather dry and can cause constipation and add to dehydration. Fruit trail mix is a good option.

Clothing

Layering of clothing is done in preparation for extended periods in the outdoors. Layering allows a person to modify the amount of clothing worn as the activity level or environment changes.

The layering system consists of four parts:

- Underwear
- Insulation
- Clothing
- Shell.

The underwear layer is the closest to the skin. This layer should be supportive but not constrictive. A thin polypropylene or silk garment under wool or fleece insulation will move perspiration away from the skin. Keeping the skin dry is the key to keeping warm. Garments that interweave the "polypro" with the cotton or wool are not as effective since there is no separation.

The value of the insulation layer is determined by the type of material, thickness and physical construction. Fluffy down is excellent, but only if it stays dry. Wool and polyester fleece have the best combination of properties including cost. Cotton literally sucks the heat out of you as it accumulates moisture. Cotton does not dry until removed.

Synthetic socks are much better than cotton. Wear wool socks as a second layer even in hot weather. Many people will find a hiking boot far more comfortable than most military type boots. Cold weather will probably require different footwear.

The shell or outer clothing layer needs to be able to tolerate extreme wear. The shell serves to repel water and reduce heat loss from wind.

Gore-Tex or generic equivalents are ideal for team activities but are expensive. The lightweight Gore-Tex material allows for perspiration to escape while it prevents water and wind from entering. Laundering Gore-Tex will significantly reduce its water repellency.

It pays to do research before investing money in equipment for use in search and rescue. Cost is quite often the biggest factor in choice. Read books, talk to people, try various forms of the same types of gear on and determine what works best for you as an individual.

Water

Water is critical to survival. Even in cold areas, you need a minimum of two quarts of water each day. One of the first goals of survival is to obtain an adequate water supply.

Water sources include:

- Melted snow or ice
- Collected rain water
- Natural spring
- Ground water
- Water from rocks and fissures (cracks)
- Water from plants in a transpiration bag
- Condensation - solar still

Purifying Water

A team should try to locate water to disinfect for drinking while in the woods whenever the known re-supply time will be lengthy.

Rainwater and water from a still is generally safe for drinking without purification. Water collected from other sources should be purified. Methods of purification include:

- Water purification tablets
- Boil water for at least 10 minutes
- Five drops of 2% tincture of iodine into a canteen (let stand for 30 minutes).

Whatever method is used it is best to follow the directions on the container.

Boiling water remains the surest way to destroy microorganisms but it takes a lot of time and does not remove pesticides and herbicides.

Chlorine and iodine are not quickly effective against all microorganisms and do not remove toxic compounds. Hand-held microbiological water filters are used as certified water purifiers.

The PUR brand "Voyager" is one of several models of purifiers that are effective. The Voyager filter also contains an iodized resin to help kill small bacteria and viruses.

Purifiers range in price from about $30 to over $1000. The certified "survival straw purifier" is good for personal use, but a team should have a high volume purifier.

Identify Hazards

Animals

Keeping a clean campsite and avoiding animals will minimize most animal hazards.

Do not attempt to make a stand against an animal in the woods. Surrender as much ground as necessary. Retreat as a team if the team encounters an animal.

Never corner any animal. Even timid animals like rabbits and squirrels will fight if trapped. Never approach young animals, especially curious bear cubs or deer fawns. Their mothers are always near and will attack you.

If a black bear is entering your team's camp, make sure the bear sees and hears you, back out slowly but do not run.

Box turtles eat poison mushrooms. The toxins can build up in their bodies and are not eliminated by cooking. So don't eat box turtles.

Insects

Using repellent and wearing proper clothing are the best ways to prevent insect bites.

Ticks are a common carrier of Lyme disease and Rocky Mountain spotted fever.

You may not even feel when you are bitten by a tick. Ticks are usually discovered by one of the many "tick checks" that you should conduct on yourself while you are in the field. A tick check is simply looking at, and running your hand over, as much of your body as possible. You should ask for help from your teammates.

To remove the tick, begin by gently grabbing the tick at the base of its head, closest to your skin with a pair of tweezers. Unscrew the tick out of you skin in a counter-clockwise direction.

There are also several commercially available tick removers that commonly consist of a thin piece of metal with a slit in the middle. The metal is moved along the skin until the entire body of the tick is on one side and the slit is at the tick's "neck." By gently applying pressure to the tick it will withdraw from your skin.

Scratching any wounds could increase the risk of infection. Keep your skin as clean as possible using soap and hot water. Apply ice or cold water to a bite.

Snakes

There are many varieties of snakes and only a few are poisonous. Non-poisonous snakebites still hurt and can be a source of infection. Most poisonous snakes have a triangular head and their bite is distinguished by the prominent fang punctures.

Poisonous snakes can bite without introducing venom. Poisonous snakebites are rarely fatal but can cause a great deal of tissue damage that could lead to amputation of the affected limb.

The following poisonous snakes are in the American outdoors:

- Rattlesnake
- Copperhead
- Bushmaster
- Coral snake
- Cotton mouth
- Fer-de-lance

Methods for preventing problems with snakes include:

- Step on rocks rather than between them
- Do not tease snakes
- Wear sturdy boots that cover the ankle
- Check bedding and shelter before going inside
- Check clothing and packs before putting them on
- Don't reach into holes
- If you see a snake, stop and move slowly out of the area
- Use caution in areas that snakes can sun themselves

Any snake bite that has two small holes where fangs punctured skin and/or redness, swelling, and pain in the bite area should be treated as a poisonous snake bite.

The treatment for a snake bite includes:

- Keeping the patient calm
- Attempt to identify the snake
- Minimize movement
- Placing a constricting bandage between the bite and the heart. Make sure there is a pulse present on the affected limb after bandage has been applied
- Seek medical help for all snake bites as soon as possible
- Don't try to suck out the venom
- Keep the bite below the level of the heart
- Apply cold water and ice to the bite area

Plants

Avoid poisonous plants simply by not eating any berries or wild plants. There are "irritant" plants that can affect team members who touch them. Poison ivy, poison oak, and poison sumac can cause an irritating rash within a few days.

Poison ivy is an irritant vine that grows close to the ground and along the trunks of trees. The vine has green almond shaped leaves in sets of three.

Poison Oak is a three leaved vine. The leaves are broader and flatter than poison ivy.

Poison sumac has leaves in sets of nine or more with small red berries.

Traps

Traps used for hunting are often placed and left unattended for periods of time. Occasionally a careless trapper can lose one or not retrieve it after the season ends. It is to your advantage to understand that traps are placed along game trails and near watering areas.

Since narcotics growers don't usually stay around to tend and protect their crops, they often set traps to keep people out or cause injury. A team can find itself in a hostile area during a mission. At the first sign of anti-personnel traps, the team should contact command and leave in the same footsteps they created.

Cliffs and Steep Terrain

Operating in area containing cliffs and steep terrain is very hazardous especially at night. Search these areas parallel to the slope, rather than climbing or descending the cliffs. The team member closest to the hazard must monitor the hazard and should not be searching.

Lightning

Lightning poses an immediate threat to personnel. Never set up camp near a possible strike area such as a rock outcropping or metal tower. Move to lower ground when the thunder is approaching. Move into a building or vehicle when lighting is likely.

When strikes are happening around you, and the flash and the bang are less than one second apart, drop your pack and as much metal from your person as you can. Crouch low with your feet together. Never lean or sit against a tree while waiting for the storm to pass. Most storm cells pass in a matter of minutes. Heavy rain will continue but the team can resume its tasks.

Water Safety

Crossing bodies of water should be avoided because of the many risks with usually very little benefit.

In a low risk, high benefit situation, the following guidelines can be used:

- Look for the most shallow and narrowest part to cross. Crossing with gear is extremely dangerous
- Use Personal Floatation Devices (PFD's)
- Enter slowly with your feet first
- Cross one person at a time
- Use a walking stick on your upstream side to break the current
- Have at least one person with life saving skills ready to assist in a rescue. Throwing or reaching with something from shore is the safest way to attempt a rescue

Firearms

There are many thousands of hunters carrying firearms on opening day of hunting season. Some of them will become lost or need assistance. When the team encounters a firearm you should know how to make it safe. Courses in hunter safety and gun safety are offered by the state game commission, as well as sports clubs. These courses are highly recommended. The following is an overview:

- Avoid handling any weapon in an area that would be considered a crime scene
- Consider all firearms to be loaded
- Never point a firearm in the direction of anyone. If someone else points a firearm in your direction, take evasive action as if you are about to be fired upon
- Good communication with everyone present must happen before anyone handles a firearm.

It is best to secure the area without touching the firearm until law enforcement arrives.

Operational Safety

Safety Briefing

A safety briefing should be conducted at the beginning of every operational period and again whenever anything changes. The four minimum requirements in a safety briefing are:

- Explain the task
- Identify hazards
- Take steps to minimize or eliminate hazards
- Identify required personal protective equipment

When time permits, various individual members should take turns giving the safety briefing with oversight from the team leader. This ensures that everyone is involved with safety.

Report any injuries immediately to your team leader.

Personal Protective Equipment (PPE)

Orange hard hats and vests should be worn in field operations. Many environments mandate that hard hat remains in place. There are several methods of securing a hard hat on your head but the chin strap is the most fool proof.

Hand protection must be worn in a vertical operation for all tasks except inspecting rope. Leather groves must be worn in the preparation of rope systems and while tying knots.

Safety glasses protect the eyes from physical damage. Travel in wooded areas without safety glasses can cause eye injury. Safety sunglasses may be okay during the day, but substitution with clear glasses in limited light is required.

Wearing latex gloves and safety glasses will increase a team member's safety when there is the potential to contact someone else's blood or body fluid through Body Substance Isolation (BSI).

Keeping a Team Log

Log books are a legal record of all the teams' activities. The log book must be easy to read, complete and unaltered. It should be written in black or blue ink and kept waterproof. If a mistake must be corrected, draw one line though the mistake and initial the mistake. Someone must be responsible for log book entries at all times.

The roster of members should be listed first and include an accountability system, medications and allergies. The initial briefing information must be included in the log book. The log book will also include the time that all significant activities occurred. If nothing significant happens, no log book entries are made. Some examples of typical log book entries are:

> 1430 Team left van and entered woods following 135 degrees magnetic walking to the fire tower
>
> 1432 Smith contacts command with team location and intent
>
> 1503 Team stops for water break, Jones and Washington went to bathroom
>
> 1505 Jones and Washington return, all team members present. Team continues to fire tower
>
> 1530 Two male hikers encountered, did not talk to them

If a team splits in two, a second log book must be started and then attached to the first log book when teams combine back into one team.

Most team operations will require the person acting as the team medic to keep a medical log.

The log is started at the very beginning of the activity and maintained until personnel have called the commander reporting that they are safely at home.

The log book is signed indicating it is closed and passed up through command at the completion of the operation.

Radio Communication

Monitor the frequency before beginning to communicate. Hold the radio vertical when transmitting. Speak directly into the microphone keeping it a few inches from your lips. Speak deliberately and emphasize the syllables to be clearly understood. Speak in a normal tone and be brief. Clearly pronounce all words.

Identify the station you wish to communicate with, followed by "this is" and then identify yourself.

Radio Frequencies

Ground teams use a number of VHF-FM frequencies to communicate. Frequency assignments are usually assigned based on the following:

- VHF-AM (Air band) SAR Frequencies are dedicated for training and actual missions
- Simplex Frequencies (VHF-FM) are for short range communications. These radios operate on the same transmit and receive frequency
- Duplex Frequencies are for longer range communications and use of a repeater. All repeaters are accessed by transmitting a sub audible tone through the radio. In emergencies the 100.0 Hz tone will activate any CAP repeater to request the proper tone frequency for the repeater in use. Other tones are programmed into the radio as required.

"MAYDAY" is an emergency signal and takes priority over all other radio traffic.

"Say Again" is used when repeating or requesting for someone to repeat.

Zulu (Greenwich mean or Coordinated Universal) time is often used as an international standard time to eliminate confusion when teams are working in multiple time zones.

Most search and rescue teams use plain English.

The phonetic alphabet is used to clearly communicate letters.

A Alpha	G Golf	M Mike	S Sierra	Y Yankee
B Bravo	H Hotel	N November	T Tango	Z Zulu
C Charlie	I India	O Oscar	U Uniform	
D Delta	J Juliet	P Papa	V Victor	
E Echo	K Kilo	Q Quebec	W Whiskey	
F Foxtrot	L Lima	R Romeo	X X-ray	

In order to distinguish between numerals and words which are pronounced similarly, the proword "FIGURE(S)" precedes numerals. Transmit numerals digit by digit.

Numeral	Spoken As	Numeral	Spoken As
0	Zero	13	Wun Thu Ree
1	Wun	19	Wun Niner
2	Too	44	FoWer FoWer
3	Thu Ree	90	Niner Zero
4	FoWer	136	Wun ThuRee Six
5	Fife	500	Fife HunDred
6	Six	1478	Wun FoWer Seven Ate
7	Seven	2100	Too Wun Hun Dred
8	Ate	16000	Wun Six Thow Zand
9	Niner	81268	Ate Wun Too Six Ate

Cutting Tools

The knife can be used for a variety of tasks including preparing food and making field repairs.

The parts of a knife include:

- The bit which is the actual cutting edge
- The blade which is the metal part of a knife that contains the bit
- The handle or the part that you hold

To care for a knife:

- Keep it away from water and keep it oiled
- Clean the knife after each use
- Never stick it in the ground
- Keep it sharp
- Keep it out of fire. The heat from a fire will cause the metal to become brittle and break

Knife safety:

- Always cut away from you
- Keep people away when using a knife
- Make sure a folding knife locks open because the locks sometimes fail

When handing a knife to another person, fold the knife or put the knife in the sheath. If the knife must be passed with the blade exposed, hold it by blade (bit facing away from hand). The other person grasps the handle and says "Thank you, I've got it" upon exchange.

Machete

The machete is used for clearing paths through thickets, tall weeds and plant obstacles. The parts are the same as a knife. To prepare the machete for use, the handle should be rounded, the bit razor sharp, and eight inches of the blade from the handle toward the tip dulled. A wrist strap should be added so is the user looses their grip, the machete won't fly and injure someone else.

The machete is used by swinging it down on an angle with a snap of the wrist just before contact with the branch. Always cut away from yourself. If machete is in your right hand, cut to the right and vice versa. No one should be standing within 10 feet of you.

When 2 people are using machetes, the second person with a machete follows 10 or more feet behind and slightly to the side so they are well out of range of the first's swing.

Knife Sharpening

Always read the instructions that come with your knife to learn how the manufacturer recommends that you sharpen the knife. Knifes are generally sharpened by replacing the manufactured bit angle. This is done by rubbing the bit along an abrasive surface. A file may have to be used to begin sharpening if the bit is extremely dull. Normal sharpening requires the use of one or more sharpening stones. Oil is placed on the porous sharpening surface to float the very small pieces of blade metal from out of the holes.

Listed below are general guidelines for sharpening.

- Draw the knife over the stone using single strokes going from back of stone to front of stone.
- Start where the blade is closest to the handle and at back of stone then draw the blade over the stone while moving to the front of stone and the point of the blade.
- The blade should be held at the same angle that the manufacturer used, usually an angle between 15 to 30 degrees from the stone. The smaller angle makes the bit sharper but also more apt to break when used roughly.
- Sharpen on one side of the blade for about 10 strokes. Turn blade over and repeat the process on the other side for 10 strokes. Repeat this until you feel you have a good workable edge on bit.
- Keep the stone oiled during this process. When the blade seems to easily move over the stone, a finer stone can then be used. When done, clean all excess oil from the knife and stone.

To test sharpness, hold the bit up to light source, a glare off the bit indicates dullness. The blade is sharp if there is no glare. Another way to test for sharpness in by drawing the bit across a piece of paper and if sharp it will cut through very easily. Never cut hairs on arm as a test.

Axe and Hatchet

The axe and hatchet are sharpened in same manner as the knife but the bit angle is different. The axe should not be "knife sharp" but rather a clean consistent angle.

To sharpen an axe, cradle the axe in your lap. Use a file only if blade is really dull or to get out nicks. File from your body towards your foot with single brush strokes one inch at a time. File this way from the head of axe to the top of the axe head with the handle down (until bit is bright). You will feel a little rough edge on opposite side. You can draw the bit across a piece of wood to remove this or use a file. Turn axe over and repeat process, filing from the top of the blade with the handle down.

You can even get a better edge on the axe or hatchet with a honing stone and oil. Use a circular motion from middle of blade to each edge.

Keep axe dry, clean and oiled. Never use it as a hammer and never stick an axe in a tree for storage. It should be stored in its sheath. Make sure head is not loose before and after each use. Carry the axe with grip at neck of handle to control the head.

Felling a Tree

Felling a tree is what cutting down a tree is called. For safety and conserving energy avoid felling trees if possible. The team member will need a sharp axe, hard hat, eye protection and a spotter. Know which way you want the tree to fall. Felling a tree in the direction it is leaning is usually the easiest way. To determine the lean of a tree, hold the axe with the bit away from you by the bottom of the handle with one hand and line it up with the tree.

Make sure the area is clear by at least one axe-plus-arm length on the top, sides, front, and back. People should stand more than 1.5 times the height of the tree away. Shake dead limbs and branches loose from tree before cutting with the axe.

The placement of first cut will be on the side that you want the tree to fall. The height of the first cut is determined by diameter of the tree and what is comfortable for chopping. The fist cut is the lower of the two cuts (one on each side of the tree).

Cut straight in and then down at a 45 degree angle, about halfway through tree. Chop rhythmically and do not over-power your swings, this is going to take a while. Make second cut on opposite side of tree using the same angle. Cut about half trunk diameter higher than the first cut. Keep cutting until you hear the tree starting to crack and start falling. Back out of the way and yell "TIMBER."

When it is necessary to cut off branches, cut the way the branch is leaning so axe doesn't get pinched.

Knots and Hitches

The overhand knot is the simplest knot. Two opposing overhand knots are used to join 1 inch tubular webbing. When used in webbing these two opposing overhand knots form a water knot. One inch tubular nylon webbing is used for anchors and securing patients into litters and rescue baskets.

Half hitches can be used to secure a rope to a small object or to secure the loose ends of other knots.

A taut line hitch (two half-hitches with an extra turn) is used to tighten a line, and is ideal for clothes lines, tents and adjusting slack

Square knots are used to join two ropes of the same diameter. The square knot is not used for life safety but is very useful to tie off boot laces and bandages.

The clove hitch can be tied in the center or end of a rope to grip a round object such as a shovel handle or to secure the end of a rope around an object in shelter construction.

A bowline knot is tied to provide a non slipping loop. The tail of the bowline requires either an overhand or half hitch as a safety.

The figure eight family of knots is normally used for any application where a secure loop is needed. A figure eight ring is not a knot; it is a metallic tool that can be used as a descent control device.

A Prusik hitch is used as a rope grab device and can capture progress in a patient raise operation.

Using Rope

Nylon Static Kernmantle rope is the primary rope used for rescue. The color black is a standard indication that equipment can NOT be used for life safety. Typically the ends of the rope will be colored black and the rope is considered a utility rope.

The mobility concept of three points of contact is used when moving in a near vertical environment. Controlled and deliberate placing of each foot and hand one at a time is best to prevent a fall. Adequate space between individual team members is critical where footing is uncertain.

A belay is the process of securing and safeguarding someone by using a rope to hold the person's weight if they fall. A belay is required anytime a life load is being raised or lowered.

Rope systems intended for life carrying loads are only constructed under supervision of certified instructors. Sufficient padding and edge protection equipment is vital for life safety lines. A stationary rescue rope should never contact a moving rescue rope.

Large diameter healthy trees and very large rocks are primary considerations for anchoring the start of a rope rescue system. Team members should avoid using a vehicle as an anchor.

Avoid being under a suspended load.

A mechanical advantage system that has pulleys and 3 ropes supporting the load would have a 3:1 mechanical advantage.

Fires

Fires can provide warmth, light, a cooking source and be used for signaling in an emergency. The three things needed for fire are fuel, heat, and oxygen.

Generally dead, dry hard woods found low in trees are the best fuel for starting fires. There are three categories of fuel based on size:

- Tinder is used to start the fire and includes bark, wood shavings, small twigs, pine needles, wood shavings, dry grass and some dried leaves
- Kindling or "medium" sized wood is then added to support the flame
- Fuel (large logs) is then added to support the fire long term.

Have plenty of sticks and twigs in various sizes ready to place onto the fire as it starts. Remember small dry sticks burn quickly so make sure you have more than enough on hand. Do not use gasoline.

The firewood should be stored at least 20 feet from fire pit in such a way that it can be easily pulled into the fire. The wood must be positioned so that it can not accidentally roll into the fire. If camping in wet weather, it is important to cover the wood pile with a tarp. Dry out fuel next to fire before placing logs on the fire to burn.

The fire pit should be about 60 feet from tents. Construct a fire pit in an area clear of overhead hanging branches. Before lighting a fire, always clear the ground of combustibles. Always have an extinguishing agent nearby.

One way to construct a fire is by pushing a stick upright into the ground to make a support for the small twigs and tinder. Around the base of the stick, place plenty of easily ignitable material. Wood can also be arranged in a log cabin style, a teepee style, or lean too style. The heat needed to light the fire can come from many sources including:

- Matches or a lighter
- Flint and steel
- Magnifying glass
- Battery and steel wool
- A road flare

The air in most outdoor places contains more than enough oxygen to allow fire to burn once lit. Fire consumes a lot of air so providing more air will speed the process of lighting the fire. Place wood as not to obstruct air flow into the center of your fire. Light the fire with the wind at your back. Putting your lips almost together and blowing at the base of the fire will greatly speed fire growth.

Slowly add small pieces of wood, then larger pieces as flame grows. Use plenty of tinder, but do not smother the flame.

Campsite Selection

When considering where to set up your shelter keep the following in mind.

- Camp on level ground or only a slight grade
- Remove as many roots or rocks as possible
- Access to water
- Availability of firewood
- Presence of gullies, slopes, cliffs, or swamps
- No dead overhead trees or branches
- Is the campsite high enough that a severe rain won't wash it out?

Get permission from private property owners if your operation involves camping on or crossing their property. An emergency is no excuse for trespassing. Respect shrubbery and crops. Leave the area better than you found it. Clean up after yourself.

Shelters

Clear the entire area around the shelter to the bare ground. Remove anything that would cause discomfort. Check for snakes or insects that might already be there.

The simplest type of shelter can be made by pulling the poncho or tarp over your sleeping bag. For additional comfort, various types of shelters can be made.

To build a one-man shelter from one poncho, spread the poncho on the ground, hood side up. The hood opening must be tightly closed by adjusting and tying the drawstrings. The poncho is raised with string in the middle of its short dimension to form a ridge. The sides are then pulled out and secured out. Snow, sod, or branches can be used to seal the side and one end of the shelter to provide additional protection from the wind and to retain heat.
A two-man shelter can be made from two ponchos. Spread the ponchos on the ground with the hood side up and the long sides together so that the snap fastener studs of one poncho may be snapped into those of the other poncho. The ponchos are raised where they are joined to form a ridge. The seam should be slightly off center. The shelter is then pulled out and secured out at the sides and corners. A third poncho may be snapped into the other ponchos to form a ground cloth. Buttoning (cover a small stone with the fabric and secure with a clove hitch) can be used to tie off to fabric when constructing shelters.

The lean-to shelter is made of trees and tree limbs. Branches should be laid like overlapping shingles on the tree limbs forming the shelter. To save time and energy, fasten a branch as a ridge pole or crosspiece between two trees. Two forked poles or two A-frames can be used to hold the cross piece.

The occupants of tents should be identified in some way outside of the tent. This is so only the correct team members are awakened when necessary.

Keeping from Getting Lost

Brief the team members on the route, destination and emergency procedures before going into the field. The briefing will keep a team from becoming unintentionally separated. Write down and memorize the details. Use a Personnel Accountability Report (PAR) system often. Accountability is the process used to know the whereabouts of everyone at all times.

One technique for insuring that all team members are alert and present is the "count-off." The count-off is used about every 20 minutes or when the team hits any milestone such as the end of a search sweep or a rest break. A team leader can check search interval from behind by listening to the count-off if the team was placed by their assigned count-off number.

If separated from your team. Stop. Call out and whistle immediately. Start to think. If all is quiet and there are no sounds to guide you back either go back to the last known position or stop and wait, depending on your briefing.

Admit you are lost and don't panic. A positive mental outlook, reinforced by knowledge and skills can help supply the confidence needed to combat panic.

Stop. Sit down, or find a safe place to make an assessment.

Think. Consider what you know and what you have. What can you do to get found?

Observe. Is there anyone else nearby? What can benefit you?

Plan. What are your immediate needs? Develop a plan of action. It is generally better to stay where you are unless the location is hazardous.

One person must take charge if lost in a group. Survival depends on clear thinking and resourcefulness. The main things to remember are to keep calm, think, try to help each other, keep together, and keep warm.

Survival priorities include:

- Medical Care
- Shelter & Fire
- Signaling and Communication
- Water and food
- Determine where you are located
- Focus your energy on living

Signals

Hand signals or whistle signals can be used in addition to voice communication or by themselves. In noisy areas or areas where team members are far apart, standard hand signals work well for directing or controlling a team. Whistle signals have the added advantage of working well in the darkness.

Common whistle signals include:

- 1 long = assemble
- 1 short = go
- 2 short = stop
- 3 short = alert or distress

Evenly spaced sets of 3 signals indicate distress. Some examples include: 3 fires, 3 gunshots or tapping in sets on 3 on a pipe inside a collapsed building.

Gaining attention can be done in many ways including:

- Lights
- Sounds
- Fire of smoke
- Bright or contrasting colors
- Unnatural disturbance of the landscape

A signal mirror is the best way to attract attention of an aircraft during the day. Stop signaling once the pilot acknowledges or you could make it hard for the pilot to see.

Use a Signal Mirror

In daylight, using a signal mirror is a way to attract a pilot's attention, or let him know where you are. Mirror signals can be seen over 70 miles under normal conditions. A signal mirror can be a high-tech glass mirror or just a highly polished piece of metal. Mirror signals work well even on hazy or overcast days. To use a signal mirror:

1. Outstretch one hand in the direction of the airplane, leaving the palm facing you.
2. With the mirror in your other hand, reflect sunlight into the palm your outstretched hand.
3. Move your outstretched hand out of the way. Slowly bring the mirror up to eye-level and look through the sighting hole. You will see a bright spot of light. This is the aim indicator.
4. Hold the mirror near your eye and slowly turn and move it so that the bright spot is on the target aircraft. If having a tough time lining up on the airplane, try sighting the mirror between two fingers on the outstretched hand.

Team Member Care

The information in this section summarizes some of the first aid training that the member should have already learned; this is not a substitute for competency based first aid training.

Hygiene

Cleanliness in the field, particularly in the cold, is important. Your face and hands should be washed often especially after a bowel movement. The rest of your body will need washing if you are operating for more then a day. If water is not available, take a "bath" using foot powder, cornstarch, or rub your body briskly with a dry towel. The powder removes excess oil and perspiration from skin and hair.

Shaving just before sleeping will allow the face maximum recovery time before going out into the cold, reducing the possibility of superficial frostbite.

Your teeth should be cleaned daily. If a toothbrush is not available, a clean piece of cloth wrapped around a finger or a chewed twig may be used as a substitute.

The bladder and hose assembly of a hydration system should be cleaned before re-supply and following each activity.

The "bathroom" area of a wilderness camp should be set up downhill and just in sight. After having a bowel movement in the woods you should bury the waste.

Completely cook food. When cooking in the can, remove the label and open the can lid before a can of food it is heated in a fire.

Clean all eating and cooking utensils after each use.

Burn the trash after everyone is done cooking and away from the fire. Remove and crush what is left of the burnt trash after the fire is extinguished. All trash should be carried out of the field. In the rare occasion that the burnt is not carried out, it must be crushed and buried.

Prevent and Treat Fatigue

Search and rescue operations conducted in adverse weather and terrain conditions accelerate fatigue. Team member fatigue results in reduced search effectiveness due to a lack of concentration. The chances of field injuries are also greatly increased.

Fatigue symptoms should be recognized by all team members so that you know when you have to stop and rest. Some symptoms are:

- Inability to concentrate.
- Slurring words, incomplete sentences and speech patterns.
- 'Bloodshot' eyes and haggard expressions
- Inability to walk properly.
- Drooping eyelids.
- False energy or "slap happiness"

Individuals showing these signs are ineffective as searchers and represent dangers to themselves and others.

To help prevent or relieve fatigue:

- Sleep for as long as possible during the night or when off duty
- Take frequent breaks or catnaps when not on duty
- Eat light snacks through the day
- Eat complete meals and ensure adequate water intake.

Dehydration

Dehydration can lead to poor decisions and cause serious physical problems. To prevent dehydration, keep water easily accessible and drink water often. Fill your water container whenever possible. The more work you do the more water you need. By the time you feel thirsty you are already dehydrated.

Some signs of dehydration include:

- Dark yellow urine
- Lack of appetite
- Dry mouth, tongue, and throat
- Cramps
- Headache
- Muscle weakness
- Disorientation

Pre-hydration

The goal of pre-hydrating is to start the activity properly hydrated and with normal electrolyte levels. Pre-hydrating should begin several hours before the activity by slowly drinking one ounce of water for every ten pounds of body weight. You will produce clear urine if properly hydrated.

Do not substitute beverages containing alcohol or caffeine for water. Caffeine and alcohol can intensify dehydration.

Maintaining Hydration

Team members should drink water slowly and continuously during the activity. Electrolyte replacement beverages may be beneficial in the most extreme conditions, but the primary goal should be volume replacement, which is best accomplished with water.

Team members should continue fluid replacement even if they do not feel thirsty. Dehydration results in decreased performance and increased health and safety risks.

Eating snacks with sodium will help maintain hydration by stimulating thirst and fluid retention. Eating low-processed carbohydrates help you store water in addition to giving you energy.

Treatment for Dehydration

Maintain body temperature; give plenty of liquids, and getting the required rest.

Heat Ailments

The three most common heat aliments are:

- Heat Cramps
- Heat Exhaustion
- Heat Stroke

Heat cramps occur when muscles spasm because there is not enough salt in the body. Heat cramps could occur in the arms, legs, and stomach. To lessen the chances of heat ailments, team members should drink plenty of non-carbonated, caffeine free fluids.

Heat exhaustion is caused by not enough hydration, loss of body salt from physical activity or exposure in a hot environment. It is possible to experience heat exhaustion in a cold-weather environment when undergoing extreme physical exertion. People with heat exhaustion have a slightly elevated body temperature and a lot of perspiration. To prevent heat exhaustion, avoid strenuous activity in hot weather, drink plenty of fluids and eat salty foods.

Heat exhaustion can be recognized by cool and clammy skin that may look pale or ashen. The person may feel dizzy or nauseous and may faint. Treatment of heat exhaustion includes:

- Move the patient into shaded or cool area
- Have person rest, and stop physical activity
- Cool the person slowly
- Loosen all tight-fitting clothes
- If the patient is complaining of cramps, give one canteen of water with one stirred-in packet of salt. Drink the salt solution over a 30-minute period. Do not administer salt if the patient has an upset stomach
- If unable to drink water due to an upset stomach or if the symptoms have not improved within 20 minutes, evacuate to the nearest medical treatment facility

Heat stroke can occur if the person is not treated for heat exhaustion. Heat stroke is a life threatening condition and can be recognized by hot dry red skin. The treatment for heat stroke includes cooling the person immediately with a cold bath or in a stream if available. Then follow the same treatments used for heat exhaustion and seek medical attention immediately.

Hypothermia

Hypothermia is a lowering of the temperature of the body's inner core. This happens when the body looses heat faster than the body can produce heat. To prevent hypothermia, keep active, eat often and properly. Drink plenty of liquids, be ready for changes in weather and get enough sleep. Hypothermia can be recognized by:

- Shivering at the onset
- Shallow breathing
- Weak pulse
- Loss of feeling
- Impaired speech
- Poor coordination
- Trouble walking
- Confusion
- An uncaring attitude
- Glassy stare

The treatment of hypothermia includes:

- Preventing any further heat loss
- Get the patient out of the wind and cold
- Replacing any wet clothing
- Place the patient in a sleeping bag
- Add heat to the patient's neck, legs, and torso. This can be done with a hot water bottle, stove, campfire, or your own body heat
- Provide something warm to drink if patient is conscious
- Do not massage the patient
- Do not give alcohol to the patient
- Evacuate to a medical facility as soon as possible

The combination of wind and low temperatures creates a condition known as wind chill. For example, with the wind calm and a temperature of -20 F there is little danger of wind chill. If the temperature is -20 F and there is a wind of 20 knots, the equivalent chill temperature is -75 F.

Frostbite

Frostbite results when tissues freeze from exposure to temperatures below 32 degrees Fahrenheit (F). The degree of injury depends upon the wind-chill factor, length of exposure and the amount of protection.

Persons with a history of cold injury are prone to frostbite. There may be a tingling/aching sensation or cramping pain. The skin first turns red and then becomes pale gray or waxy white.

Frostbite is preventable and seldom occurs in people who are maintaining enough body heat. It is most commonly associated with a combination of overall body heat loss resulting from poor equipment, reduced food intake, dehydration, overtiring, or injury.

The feet, hands, ears, and exposed areas of the face are most easily hurt by frostbite. Methods of preventing frostbite include:

- Do not wear tight boots and socks
- Use the "buddy system" to check exposed areas and feet often
- Do not stay still for long periods of time
- Use caution when cold and wind are combined
- Eat well and have hot drinks as often as possible.

Frostbite can be recognized by:

- Redness followed by powdery flaking of the skin
- Skin may appear dull and grayish
- Blister formation may occur 24 to 30 hours after exposure
- Later stages of frostbite can include:
  - Loss of feeling
  - Pale yellow, waxy skin that could turn black
  - Pain when thawing
  - Skin may feel solid to the touch
  - Discoloration (red-violet) appears 1 to 5 days after the injury.

Treating Frostbite

The proper treatment of a patient with frostbite includes:

- Move the patient to a warm and sheltered area
- Do not rub the area
- Warm the face, nose, or ears by placing your hands on the frozen area
- Re-warm frostbitten hands by placing them under clothing and against the body
- Warm the feet by removing socks and placing the patient's bare feet under the clothing of a teammate. Once the feet are warmed, put on dry socks and boots
- Improve circulation with exercise
- Do not allow alcohol or tobacco use
- Protect frozen tissue from further cold or trauma
- Evacuate to a medical facility

Only warm the frostbitten area if refreezing is not possible.

If possible, do not allow the patient to walk if feet are affected. Thawing of deep frostbite in the field increases pain and invites infection and greater damage.

Exercise Universal Precautions

The term universal precaution refers to the practice of avoiding contact with another person's blood or body fluids.

Bloodborne pathogens are transmitted through direct contact with the blood or body fluids.

Inspect and wear Personal Protective Equipment (PPE) whenever there is a possibility of contact with someone else's blood or body fluid. Use a barrier rescue breather if giving ventilations.

Instructions for the removal of PPE are listed below:

- Medical exam gloves – remove one glove by pinching the glove at your wrist, and then slide your clean finger under the remaining glove and pull off inside-out while holding the first glove. Gloves must be changed between patients and when dirty.
- Eye protection - pull the eye protection away from your face and over your head while looking down.
- Mask – place your fingers under the strap and pull the mask away from your face and over your head while looking down

Dispose of PPE in Red bag. Wash hands with soap and water or use an alcohol-based hand cleaner after PPE removal is complete.

If you help another person and you are exposed to blood or body fluids, you may be given a medical evaluation.

Patient Assessment

Introduce yourself and ask for permission to help. Make sure the patient does not have any life threatening conditions by assessing (looking at) the patient's (ABC's):

- Airway
- Breathing
- Circulation

A team member can determine the responsiveness of a patient by tapping and shaking the patient, and yelling in both of the patient's ears. If the patient is talking it's a sure sign that the patient is breathing and has circulation. A patient with a pulse but is not breathing would be the one that should receive your attention first because it is most likely that you can save that life.

Take extreme care not to cause further injury when moving the patient. Have someone help to roll patient as a single unit, protecting the head and neck from twisting.

Do a head-to-toe examination and ask the SAMPLE questions. SAMPLE is an acronym to remember to ask the patient questions that are needed by medical professionals. SAMPLE stands for:

- **S**igns and Symptoms
- **A**llergies
- **M**edications
- **P**ast medical history
- **L**ast food intake
- **E**vents prior

Bleeding Emergencies

Bleeding should be controlled with:

- Direct pressure
- Elevation
- Pressure Point
  1. Place Sterile dressing
  2. Wrap roller gauze around wound site and tie knot directly over wound
  3. Check for circulation below the bandage.

Internal bleeding signs and symptoms:

- Blood loss from mouth, rectum, vagina, or blood in urine
- Bruise or contusion
- Rapid pulse rate
- Cool and/or moist skin
- Nausea and vomiting
- Painful, tender or hard spot on abdomen or chest

First aid care for internal bleeding:

- Care for shock
- Watch for vomiting
- Apply ice pack over a cloth to the injured area
- Call 911

Burns

Team members can get burns from several sources including heat, chemical or electrical. Burns are generally categorized as first, second, and third degree with first degree being the least severe. Infection is always a potential hazard with all burns.

First degree burns are recognizable by redness and swelling to the area. Sunburn and burns without blistering are first degree burns. Treat a first degree burn by cooling it with water. Do not treat burns with butter, oil or gels.

Second degree burns are recognized by skin blisters, swelling, and pain. Do not pop the blisters. After the burn area was cooled with water, wrap the area in a dry, sterile bandage to prevent infection. Seek medical care if blistering occurs on face, hands or groin area. Medical attention is also needed if the blister is larger than the size of a quarter.

Third degree burns are recognized by charred black or white skin. Third degree burns include damage to the nerves meaning a third degree burn by itself might not be as painful as a second degree burn. Third degree burns are life threatening. Loosely cover a third degree burn with a dry sterile dressing. Do not attempt to remove or pick clothing from the burned area. Treat for shock by maintaining body temperature, and elevating legs if appropriate. Do not submerge area in cool water. Seek medical attention immediately.

Chemical burns can occur if the skin is exposed to chemicals such as battery acid or liquid vehicle maintenance produces. Remove clothing and brush dry chemicals off of the skin then rinse with water. To treat a chemical burn, rinse affected area with a lot of water for at least fifteen minutes. Contact the poison control center and check the treatment recommended on the Material Safety Data Sheets (MSDS) if they are available. Wrap the burned area in dry, sterile dressing and seek medical help.

Strains and Sprains

Team members should handle strains and sprains using the RICE acronym:

- Rest – discontinue activity
- Ice – apply a cold pack; do not place directly on the skin
- Compress – use an elastic wrap to hold the ice in place
- Elevate – injured area should be elevated about heart level

Shock

The medical term shock is used when the organs and tissues are not receiving enough blood resulting in lowered levels of oxygen and a buildup of waste products that can cause damage to the organs. Death can result if shock is not treated immediately.

The signs and symptoms of shock include:

- Anxiety, restlessness, or irritability
- Altered consciousness
- Rapid pulse rate
- Rapid breathing
- Pale, cool, moist skin
- Lack luster eyes, dazed look
- Weak, helpless feeling
- Thirst
- Nausea

First Aid Care for shock includes:

- Keep the patient lying down, if possible
- Speak in a comforting and reassuring tones
- Control any external bleeding, if necessary
- Elevate legs 10-12 inches, if broken bones are not suspected
- Maintain body temperature
- Do not give patient anything to eat or drink
- If patient is nauseous, or begins to vomit, place the patient on his/her left side
- If EMS as not been called, call EMS.

Foot Problems

To prevent blisters wear well broken-in boots that fit properly. Keep feet dry and pad areas that become red and irritated. Moleskin or one-inch adhesive strips are commonly used for padding.

To treat blisters:

- Cover the blister to cushion the blister
- Do not put adhesive mole skin directly on blister
- Keep area clean, change any dressings as necessary
- Infection is a series concern.

Trench foot and immersion foot are injuries caused by the prolonged exposure of the skin to cold or wet conditions. To prevent trench foot:

- Change socks at least twice daily
- Dry and massage your feet regularly with foot powder
- If leather boots are wet, dry them whenever possible

In early stages, the feet and toes are cold, numb and walking becomes challenging. Feet swell and become painful. The feet look shriveled and the skin may peel.

In early stages, trench foot can be treated by keeping the feet dry, clean and exposed to the air. In later stages, evacuate the patient to a medical facility.

At night, air shoes out, do not stuff dirty socks into them.

Patient Packaging

Packaging the patient can be thought of as putting handles on the patient. There are many ways to put handles on the patient but this section will describe how to properly secure a mildly hurt patient into a Stokes basket.

Prepare the Stokes basket by laying a vapor barrier such as a tarp in the basket favoring one side. The vapor barrier is used to protect the patient from the weather as well as maintain the patient's body temperature. Next, using two wool blankets, lay one blanket parallel to the basket side in the bottom two-thirds of the basket and lay in the other blanket with the corner over the head of the top of the basket in the top half of the basket.

Once the patient is medically stable, place the patient into the basket; be sure that the team uses proper body mechanics to avoid physical strain or injury to themselves.

Place pieces of padding under the patient to fill areas where the patient's body does not come in contact with the basket. These areas include under the neck, lower back, and knees. When using baskets that have the leg section partitioned, be sure to include padding in the groin area.

Begin to secure the patient by covering the patient with the blankets. The blanket at the head area should be rolled in to form a horseshoe shape that will aid with stability of the patient's head. Next, fold in the vapor barrier beginning with the narrower side. The wider side should lie completely over the patient and be tucked in. To limit leakage the seam is placed on the side of the patient. Roll the blanket and vapor barrier at the bottom of the basket under itself, then tuck excess in at the foot area.

Three pieces of different colored webbing will be used to tie the patient into the basket. A twenty-foot length is used to tie in the area below the knees to and including the feet. A twenty-foot length is used to tie in the area above the knees to and including the waist. Finally, a twenty-foot piece is used to tie in the waist to and including the shoulders. The webbing should not have twists, be run around the top rail supports of the basket and never go directly over the patient's knees. Use three half hitches to secure the webbing ends to the basket and tuck in the ends of webbing.

Place safety glasses and a hard hat with the suspension removed onto the patient. Secure the head by duct-taping an "X" over the hard hat and connect the duct tape to the sides of the Stokes basket. Use a marker to write the patient's name and vital information about the medical condition of the patient on the duct tape.

Straps on a plastic stokes basket may loosen when the basket is picked up. Placing padding under those straps is proper to restore tension. The straps should not be tightened or they will be too tight when the basket is set back down.

Patient Movement

Six people are positioned around the basket, three on each side. The team member on the patient's right and located at the head of the basket is in charge and gives commands. The commands used include "Prepare to lift, lift, any movement command, clear, prepare to lower and lower."

To raise the patient, the team kneels on their right knee facing the basket and places both hands on the basket. The rescuer in charge says "prepare to lift, lift." Upon hearing the lift command each team member rocks backwards onto both of their feet causing the basket to lift off the ground without using their lower back muscles. The team then uses their legs to stand, face the front of the basket and drop what will be their outside hand from the basket. Any movement commands are now given.

The command, "prepare to lower", is used to signal to the team members to look under the basket for objects such as roots or rocks that may cause injury to the patient. Once all basket team members say "clear", the command "lower" is given. All team members lower to their right knee and then place basket on ground.

Objects can fall from areas above the team and patient. The command "rock" is used by anyone who sees anything fall. The basket team's responsibility is to lean their upper body over the patient to protect the patient. The packaged patient is completely helpless; the team needs to do everything for the patient.

When moving with the patient, the team may encounter unstable ground or an obstacle. In this situation other team members are positioned in two columns over the hazard or obstacle to pass the patient without the team having to move their feet. This technique minimizes the possibility of falling while walking.

A narrow area may be encountered when walking with the packaged patient. One or two of the team members would crawl under the basket on their hands and knees to accept the weight of the basket on their back. Two other team members are positioned at the head and at the foot to guide the basket. When the basket clears the narrow area, the six-team members are repositioned and the member(s) under the basket can get out.

In an area with low overhead clearance a lap pass is used. The team sits facing each other with their legs extended in front of them. Team member legs should be together and placed alternately. The patient is slid on the rescuers laps.

Navigation

Topographic Maps

Team members must to be able to understand topographic maps in order to move effectively in the field.

A map is a graphic representation of a portion of the earth's surface drawn to scale, as seen from above. It uses colors, symbols, and labels to represent features found on the ground. Prominent features are shown but not always in their true shape.

Features such as churches and bridges must be represented by standard signs and symbols. To be legible, many of these must be exaggerated in size, often far beyond the actual ground limits of the feature represented.

A map provides information on the location of, and the distance between ground features, such as populated places and routes of travel. It also indicates variations in terrain, heights of natural features, and the extent of vegetation cover.

Maps are documents printed on paper and require protection from water, mud, and tearing. A map should be carried in a waterproof container such as a zip lock bag.

Use a pencil with light lines that can be erased when making marks on the map.

Map Scale

A map scale is the mathematical "downsize" that was used to show a large area on a small map. You must know this to determine ground distances between objects on the map, the size of the area covered, and how the scale may affect the amount of detail being shown.

The scale is the ratio or fraction between the distance on a map and the corresponding distance on the surface of the earth.

$$\text{scale} = \frac{\text{map distance}}{\text{ground distance}}$$

As the ground distance gets larger and the ratio gets smaller, so the scale of the map decreases. A larger scale means more land area and less map detail.

Examples:

If 6 inches on a topographic map equals one mile, 1.5 inches on the map will be 1/4 mile on the earth surface.
5 millimeters measured on a topographic map with a scale of 1:24000 will be 120 meters on the earth's surface.

Marginal Information

All maps are not the same, so it becomes necessary every time a different map is used to examine the marginal information carefully. The marginal information is located all around the outside of the map. Some common marginal information is listed below:

The Sheet Name is generally named for a town or the largest feature on the map.

The Scale gives the ratio of a map distance to the corresponding distance on the earth's surface. For example, the scale note 1:24,000 indicates that one unit of measure on the map equals 24,000 units of the same measure on the ground.

The Declination Diagram indicates the angular relationships of true north, grid north, and magnetic north.

The Bar Scales are rulers used to convert map distance to ground distance.

The Contour Interval states the vertical distance between contour lines of the map.

The Legend on the United States Geological Survey (USGS) map identifies the symbols used on the map.

The adjoining maps are identified in the map corners and the center of the each edge of the map.

The Vertical Datum Note designates the basis for all vertical control stations, contours, and elevations appearing on the map. The Global Positioning System (GPS) uses a datum called the WGS 84 or NAD 83. For all practical purposes there is no difference between them. Most USGS topographic maps are based on an earlier datum called the NAD 27. In the Continental United States the difference between WGS 84 and NAD 27 can be as much as 200 meters. Always set your GPS unit's datum to match the datum of the map you are using.

Directions are expressed as units of angular measure. The most common unit of measure is the degree (°) with its subdivisions of minutes (') and seconds (").

1 degree = 60 minutes. 1 minute = 60 seconds.

59° 42' 137" in the proper format would be: 59° 44' 17"

Map Colors

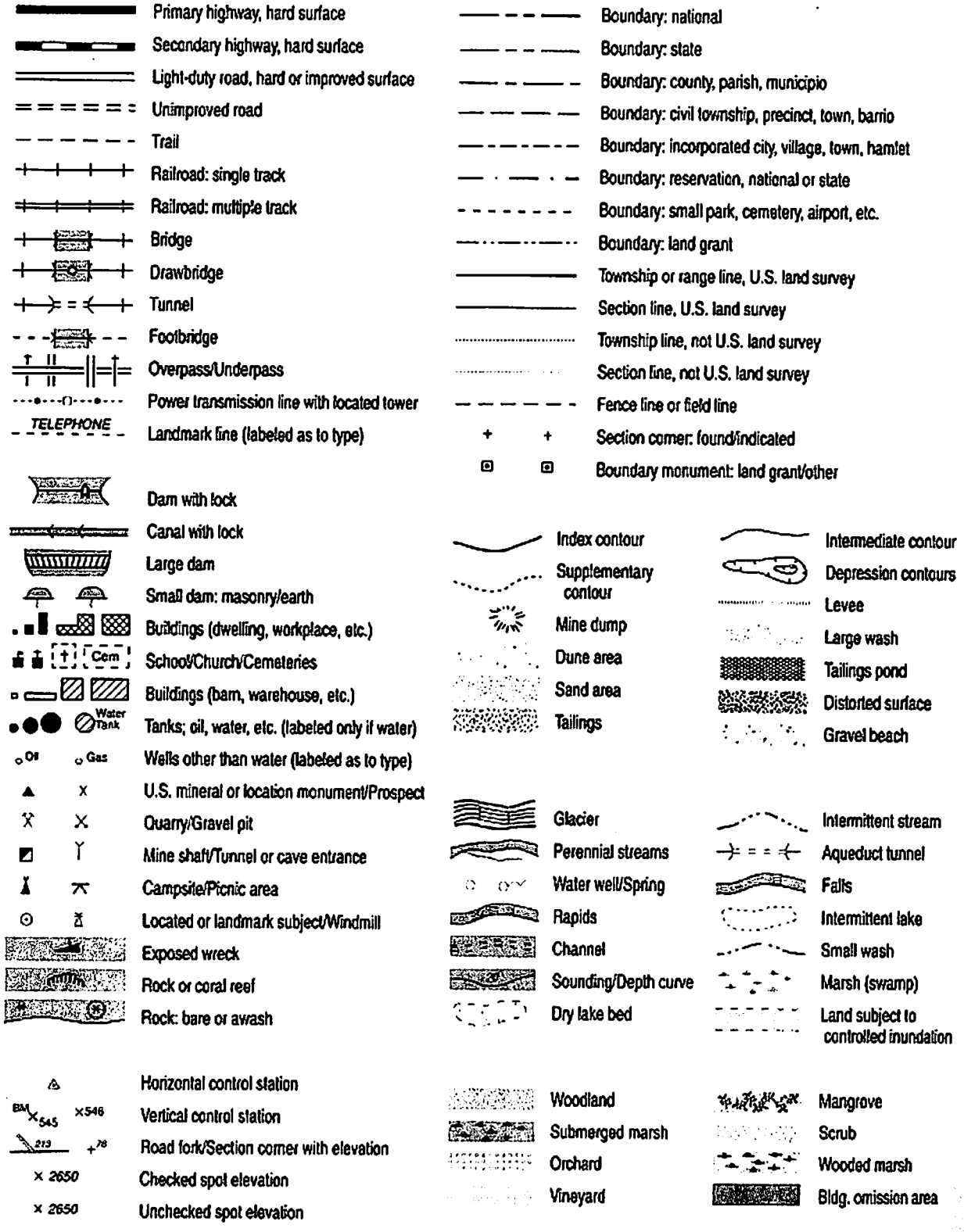
The Colors used on a Map identify features and information on a map.

- Black indicates man-made features such as buildings and roads
- Blue identifies water, such as lakes, swamps, rivers, and drainage
- Green identifies vegetation, such as woods, orchards, and vineyards
- Brown identifies all relief features and elevation, such as contours
- Red classifies main roads, and boundaries
- Pink classifies populated areas
- Purple indicates that the map was photo revised

Map Symbols

The Topographic Map Symbols permit the reader to visualize an area of the earth's surface with the major features properly positioned. Symbols are used to represent the natural and man-made features of the earth's surface. These symbols resemble, as closely as possible, the actual features themselves as viewed from above.

On the next page are listed the common USGS symbols.


Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Trail
Railroad: single track
Railroad: multiple track
Bridge
Drawbridge
Tunnel
Footbridge
Overpass/Underpass
Power transmission line with located tower
TELEPHONE
Landmark line (labeled as to type)
Dam with lock
Canal with lock
Large dam
Small dam: masonry/earth
Buildings (dwelling, workplace, etc.)
Cem
School/Church/Cemeteries
Buildings (barn, warehouse, etc.)
Water Tank
Tanks; oil, water, etc. (labeled only if water)
Oil
Gas
Wells other than water (labeled as to type)
U.S. mineral or location monument/Prospect
Quarry/Gravel pit
Mine shaft/Tunnel or cave entrance
Campsite/Picnic area
Located or landmark subject/Windmill
Exposed wreck
Rock or coral reef
Rock: bare or awash
Horizontal control station
BM
545
×546
Vertical control station
213
78
Road fork/Section corner with elevation
× 2650
Checked spot elevation
× 2650
Unchecked spot elevation
Boundary: national
Boundary: state
Boundary: county, parish, municipio
Boundary: civil township, precinct, town, barrio
Boundary: incorporated city, village, town, hamlet
Boundary: reservation, national or state
Boundary: small park, cemetery, airport, etc.
Boundary: land grant
Township or range line, U.S. land survey
Section line, U.S. land survey
Township line, not U.S. land survey
Section line, not U.S. land survey
Fence line or field line
Section corner: found/indicated
Boundary monument: land grant/other
Index contour
Supplementary contour
Mine dump
Dune area
Sand area
Tailings
Intermediate contour
Depression contours
Levee
Large wash
Tailings pond
Distorted surface
Gravel beach
Glacier
Perennial streams
Water well/Spring
Rapids
Channel
Sounding/Depth curve
Dry lake bed
Intermittent stream
Aqueduct tunnel
Falls
Intermittent lake
Small wash
Marsh (swamp)
Land subject to controlled inundation
Woodland
Submerged marsh
Orchard
Vineyard
Mangrove
Scrub
Wooded marsh
Bldg. omission area

Using a Compass

Lensatic compass-to determine an azimuth, look through the rear sight notch and align the front sighting wire with the object in the distance that you are trying to determine the azimuth. Look down through the lens on rear sight and read the number under the black reference line. This is the azimuth of the direction you are sighting.

To follow an azimuth, rotate your body until the desired azimuth falls under the black reference line. Turn the bezel ring until the luminous line is aligned with the north-seeking arrow. Once you obtain alignment, the compass is preset. Look through the sight notch and wire and pick out a terrain feature. To follow an azimuth, keep the north arrow aligned with the luminous line.

To use an orienteering compass similar to the ones made by Silva, rotate the compass dial until the "N" is at the red needle while pointing at the object with the arrow. Then read the dial number aligned with the "read bearing here" line. This is the azimuth of the direction the arrow is pointing.

For an orienteering compass to follow an azimuth, turn the compass dial until the desired azimuth is aligned with "Read Bearing Here" line. Rotate your body until north arrow is aligned with the "N" on the compass dial. Pick out a terrain feature along the azimuth and walk toward it. Occasionally recheck the compass to ensure the north arrow is still aligned with the "N" on the compass dial.

Setting a compass at night is best using a red or blue lens to set the azimuth and avoid night blindness. Charge the luminous marks by cupping your hand around a white light flashlight and the compass dial, ensuring the compass gets the light without blinding any team members.

Pace Counting

Pace counting is used to measure distance traveled on foot. A pace is equal to the distance covered every time either your left foot or in some system each foot touches the ground. To measure distance, count the number of paces in a given course, and convert to the map unit. Keeping track of the number of paces (in sets of one hundred) can be done in many ways including:

- Making notes in a record book
- Counting individual fingers
- Placing small objects such as pebbles into an empty pocket
- Tying knots in a string
- Using a mechanical hand counter.

Distances measured this way are only approximate, but with practice can become very accurate. It is important that each person establish the length of an average pace. This is done by pacing a measured course many times and averaging the results.

If you know you have 60 paces for 100 meters and you have to travel 325 meters:

60 paces (100 meters)
60 paces (100 meters)
60 paces (100 meters)
15 paces (25 meters is 1/4 of 100 meters, so 1/4 of your pace count is about 15
195 paces (325 meters)

An average pace must often be adjusted because of the following conditions:

- Slopes. The pace lengthens on a downgrade and shortens on an upgrade
- Winds. A headwind shortens the pace while a tailwind increases it
- Sand, gravel, mud and similar surface materials tend to shorten the pace
- Snow, rain, or ice reduces the length of the pace
- Reduced visibility will shorten the length of your pace
- Clothing. Excess weight of clothing shortens the pace while the type of shoes affects traction and therefore the pace length

A team navigation line is a 25 meter long piece of strong nylon that is used for exact measurement. If your pace is 15 per mark and you took 1500 paces, you would have traveled 100 marks or another way of looking at it would be 2500 meters.

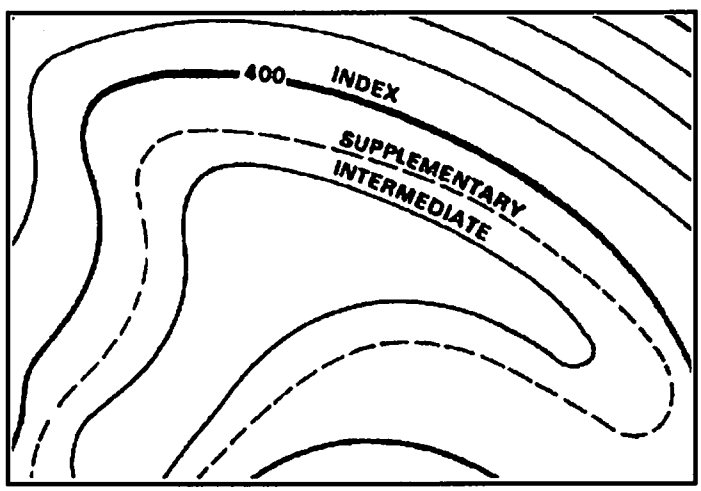
A log should be used for navigation to record all of the distances and azimuths while traveling. Often, relatively short stretches of travel cannot be traversed in a straight course because of some natural features such as a river, or a steep, rugged slope. This break in normal navigation is shown on the log to ensure proper plotting.

Elevation and Relief

The reference or start point for vertical measurement of elevation on a standard map is the datum plane or sea level. Elevation of a point on the earth's surface is the vertical distance it is above or below sea level.

Relief is the representation (as depicted by the mapmaker) of the shapes of hills, valleys, streams, or terrain features on the earth's surface.

Contour lines are the most common method of showing relief and elevation on a standard topographic map. A contour line represents an imaginary line on the ground. All points on the contour line are at the same elevation. The elevation represented by contour lines is the vertical distance above or below sea level. The three types of contour lines used on a standard topographic map are as follows:



Contour lines

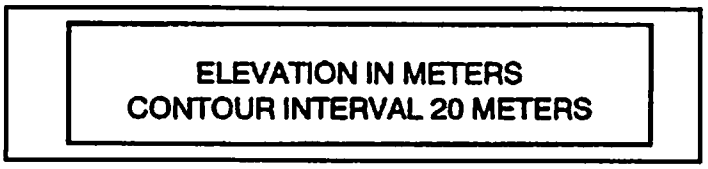
- An index is a heavier line on every fifth contour line. Normally, each index contour line is numbered with the elevation of that line.

- An intermediate contour lines falls between the index contour lines. These lines are finer and do not have their elevations given. There are normally four intermediate contour lines between index contour lines.

- Supplementary contour lines resemble dashes. They are not used on all topographic maps but represent an elevation of at least one-half the contour interval. These lines are normally found where there is very little change in elevation, such as on fairly level terrain.

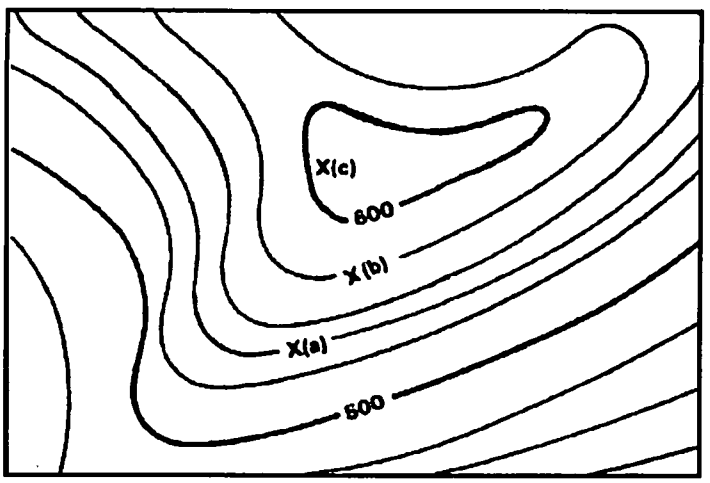
To find the elevation of a point on a topographic map:

1. Determine the contour interval and the unit of measure used, for example, feet, meters, or yards.



Contour interval note.

2. Find the numbered index contour line nearest the point of which you are trying to determine the elevation.



Points on contour lines

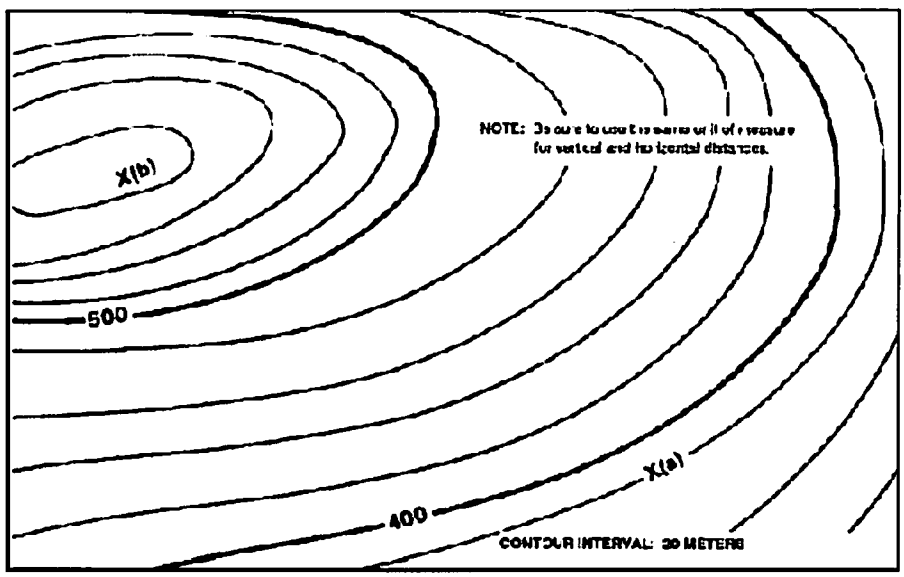
3. Determine if you are going from lower elevation to higher, or vice versa. In the figure above, point (a) is between the index contour lines. The lower index contour line is numbered 500, which means any point on that line is at an elevation of 500 meters above sea level. The upper index contour line is numbered 600, or 600 meters. Going from the lower to the upper index contour line shows an increase in elevation.

4. To determine the exact elevation of point (a), start at the index contour line numbered 500 and count the number of intermediate contour lines to point (a). Locate point (a) on the second intermediate contour line above the 500-meter index contour line. The contour interval is 20 meters meaning each one of the intermediate contour lines crossed to get to point (a) adds 20 meters to the 500-meter index contour line. The elevation of point (a) is 540 meters.

In addition to the contour lines, bench marks and spot elevations are used to indicate points of known elevations on the map. Bench marks are more accurate and are symbolized by a black X, such as X BM 214. The 214 indicates that the center of the X is at an elevation of 214 units of measure (feet, meters, or yards) above sea level.

Spot elevations are shown by a brown X or dot and are usually located at road junctions and on hilltops and other prominent terrain features. If the elevation is shown in black numerals, it has been checked for accuracy; if it is in brown, it has been estimated.

The steepness of a hill can be determined by studying the contour lines. A steep slope with have close contour lines.

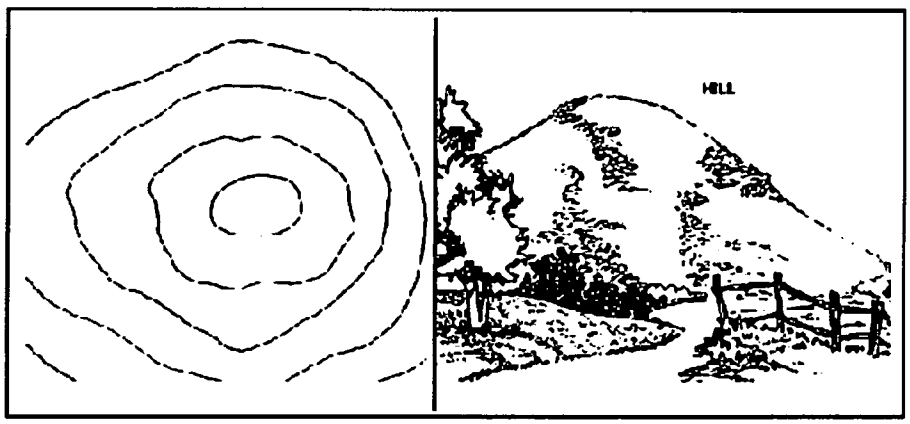


Contour line around a slope

Determine the vertical distance between the two points by subtracting the elevation of one point from the other point.

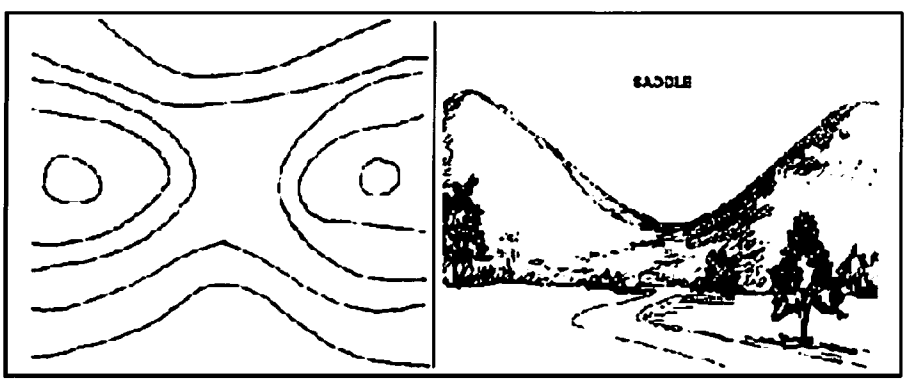
Major Terrain Features

A hill is an area of high ground. From a hilltop, the ground slopes down in all directions. A hill is shown on a map by contour lines forming concentric circles. The inside of the smallest closed circle is the hilltop.



Hill

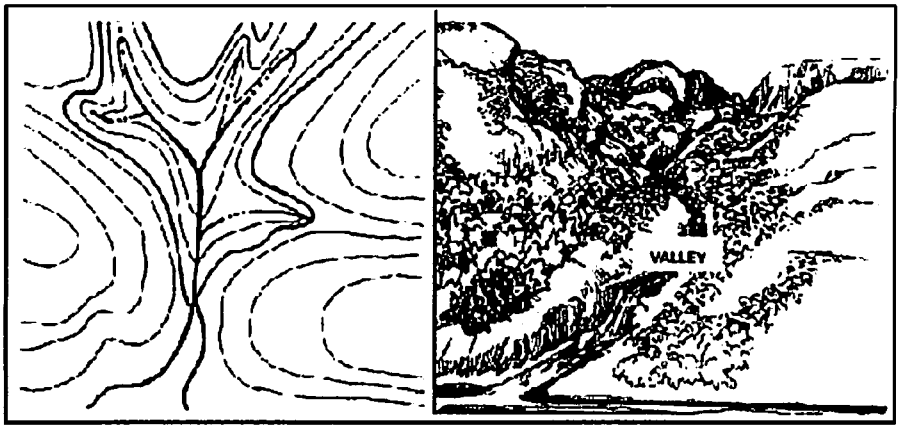
A saddle is a dip or low point between two areas of higher ground. A saddle may be a dip or break along a level ridge. If you are in a saddle, there is high ground in two opposite directions and lower ground in the other two directions. A saddle is normally represented as an hourglass.



Saddle

A valley is a stretched-out groove in the land, usually formed by streams or rivers. A valley begins with high ground on three sides, and usually has running water through it. If standing in a valley, three directions offer high ground, while the fourth direction offers low ground. Depending on its size and where a person is standing, it may not be obvious that there is high ground in the third direction, but water flows from higher to lower ground. Contour lines forming a valley are either U-shaped or V-shaped.

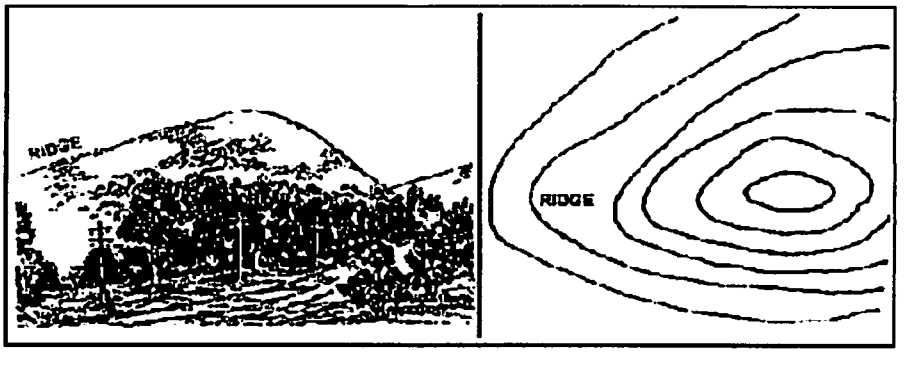
To determine the direction water is flowing, look at the contour lines. The closed end of the contour line (U or V) always points upstream or toward high ground. This is because the elevation of the stream bed is lower than the stream banks and a contour line would not remain straight when it crosses a stream.



Valley

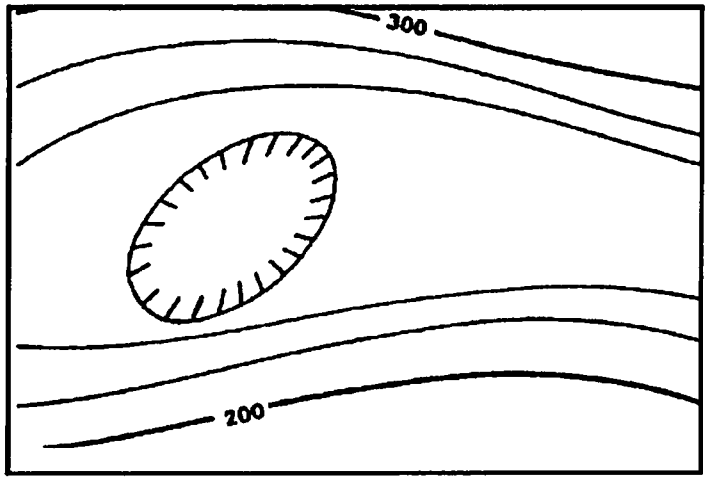
A ridge is a sloping line of high ground. If you are standing on the centerline of a ridge, you will normally have low ground in three directions and high ground in one direction with varying degrees of slope. If you cross a ridge at right angles, you will climb steeply to the crest and then descend steeply to the base.

Contour lines forming a ridge tend to be U-shaped or V-shaped. The closed end of the contour line points away from high ground.



Ridge

A depression is a low point in the ground or a sinkhole. It could be described as an area of low ground surrounded by higher ground in all directions, or simply a hole in the ground. Usually only depressions that are equal to or greater than the contour interval will be shown. On maps, depressions are represented by closed contour lines that have tick marks pointing toward low ground.



Depression

Orient a Map using Terrain Features

Look around your location and at the map for two or more terrain features common to both. Hills, saddles, valleys, ridges, buildings or radio towers can be used. Rotate the map until the terrain features are aligned with the map. The map is oriented when the terrain features on the map are aligned with the same terrain features you can see from your location. The map looks the way the area of earth actually looks.

Orient a Map using a Compass

Orienting the map with a compass is more accurate than using terrain association, and can be done when there are no visible prominent terrain features. To orient the map using a compass:

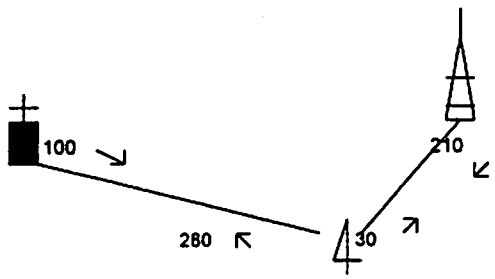
- Hold the map horizontally or place on a flat surface. Don't use the hood of a vehicle or metal surface
- Align the N-S edge of map with compass edge. Keeping the compass aligned, turn the map and compass until the difference between the magnetic north needle of the compass and the true north grid matches the magnetic declination on the maps lower margin
- Duplicate the illustrated MN and North Star arrows on the map, with the relationship between the compass needle and any N-S grid line on the map.

The Compass should look like the magnetic declination picture on the map.

Triangulation

Triangulation is a way of finding your position by taking compass headings using visual reference points and resolving the headings to a single position by:

1. Taking three compass headings to prominent features
2. Convert Magnetic Heading to True Heading
3. Convert to Back Azimuth (180 degrees in the opposite direction)
4. Find your selected prominent features on map
5. Plot Back Azimuths on map (referenced true north)
6. Lines should cross at your position like an X or Y



Azimuths

An Azimuth is the horizontal angle measured clockwise from either True North or Magnetic North. A compass heading is an azimuth.

A Back Azimuth is the opposite direction of an azimuth. To obtain a back azimuth from an azimuth, add or subtract 180 degrees. For example:

- The back azimuth of 90 degrees is 270 degrees
- The back azimuth of 0 degrees is 180 degrees
- The back azimuth of 30 degrees is 210 degrees
- The back azimuth of 235 degrees is 55 degrees

A Magnetic Azimuth is determined by using a magnetic compass.

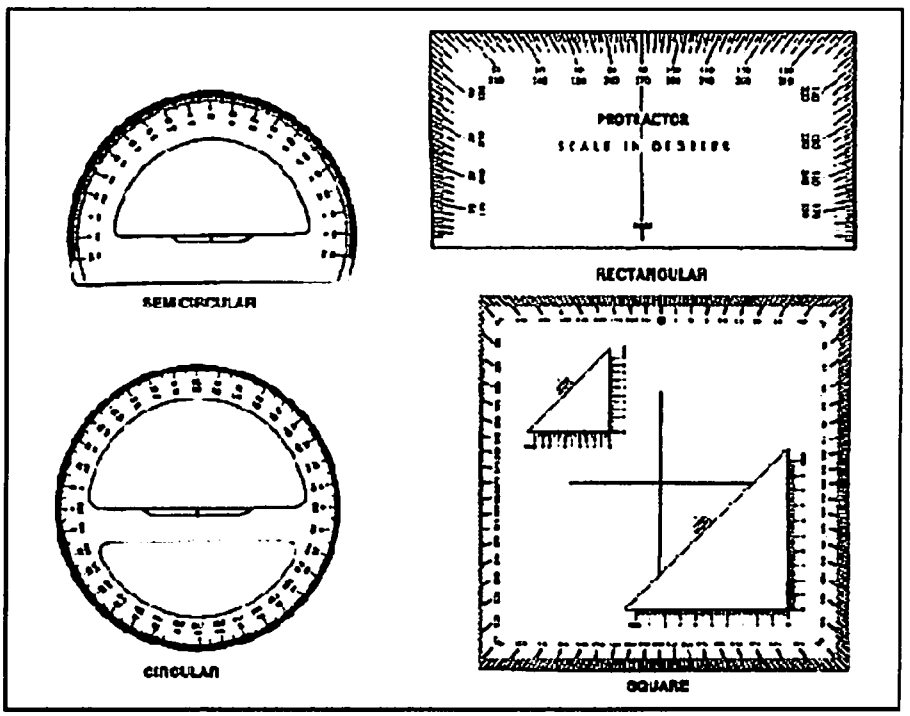
A bezel ring is the outside round part of a Lensatic compass face. Its purpose is to move the azimuth marks on the compass glass. The bezel ring is turned by hand and clicks as it turns. Each click represents moving the azimuth mark three degrees.

If a team is following a compass azimuth of 40 degrees magnetic and turns to the right by an additional 135 degrees they would be traveling 175 degrees magnetic.

If two people on your team have compasses that get two different readings, a reading with a third compass should be taken. Stop using the compass that reads differently.

Determining the Azimuth between Two Points on a Map

There are several types of protractors that divide the circle into units of angular measure, and each has a scale around the outer edge and an index mark. The index mark is the center of the protractor circle from which all directions are measured.



To plot a course:

1. Orient the map
2. Find out where you are and where you are going
3. Draw a true North-South (N-S) line through starting point
4. Draw a track line from start through finish and though the N-S line
5. Guess at the heading
6. Align your protractor with the N-S line with zero at the top
7. Read true north where your track line goes under the protractor
8. Apply magnetic declination.

A magnetic compass can be used to measure azimuths when the more accurate protractor is not available.

Using an orienteering compass:

Put the compass on the map with the base plate side edge on the line drawn.
Turn the compass dial until the "N" points to true north on the map. Read the number on the compass dial that is in line with "Read Bearing Here" arrow. This is map azimuth.

Turn the compass dial until the azimuth you want to plot is in line with the "Read Bearing
Here" line on the base plate. Mark the location to plot the azimuth from on the map. Without rotating the compass dial, put the center of the compass over that point, with 0 degree on the compass dial oriented with true north. Mark the map at the end of the "Read Bearing Here" line.
With a straightedge, connect the two marks.

Using a Lensatic compass:

Orientate the map. Place the compass on the map so the straightedge of the compass is on the line drawn. Use sighting wire if there isn't a straightedge. Read the number on the compass dial under the black index line on the glass. This is the magnetic azimuth.

Orientate the map. Mark the location to plot the magnetic azimuth from on the map. Place one end of the compass straightedge on the mark. Turn the compass until the index mark lines up with the magnetic azimuth to plot. Draw a line along the compass straight edge. Use the sighting wire if there is no straightedge.

Coordinates

Coordinates are quantities that give position with respect to two reference lines. Coordinates are read at intersections of vertical and horizontal lines. For example if you tell someone that you will meet them at the intersection of Main Street and 4th Avenue, they will know where you are. The street intersection is the coordinate location of your town.

The geographic coordinate system is a network of imaginary lines that circle the Earth. They are used to express a position on Earth. The earth is divided into grids of latitude and longitude.

There are north-south lines called meridians of longitude and east-west lines named parallels of latitude. The location of any point on the Earth can be expressed in terms of the intersection of the line of latitude and the line of longitude passing through the point.

Circles are customarily divided into 360° (Degrees) per circle. 60' (minutes) per degree, and 60" (seconds) per minute.

When writing geographic coordinates, write latitude first, followed by longitude. Use a single upper case letter to indicate direction from the Equator and Prime Meridian. For example: 38°28'00"N 104°08'00"W

The meridian of longitude passing through Greenwich, England is zero degrees (0°). This meridian is also called the prime meridian. The other half of the great circle on which the prime meridian is located is designated the 180th meridian. Portions of this meridian are also called the international dateline.

From the prime meridian east of the international dateline, meridians are assigned values of 0° through 180° east. Similarly, from the prime meridian west to the international dateline, meridians are assigned values of 0° through 180° west. The 0° meridian together with the 180° meridian forms a great circle which divides the Earth into east and west longitude (or hemispheres). There are 180° of east longitude plus 180° of west longitude for 360° of longitude.

Parallels of Latitude are the circles running in an east-west direction and of varying diameters (sizes). Only the circle designated "Equator" is a great circle. All others are small circles. Note that all circles are parallel to the Equator and run laterally around the Earth. Hence, each circle is called a parallel of latitude.

Unlike meridians, which extend only halfway around the Earth, a parallel of latitude extends all the way around the Earth. The Equator is a parallel of latitude that is assigned 0° latitude. Parallels between the Equator and North Pole carry values between 0° and 90° north; parallels between the Equator and the South Pole are assigned values between 0° and 90° south.

Universal Transverse Mercator (UTM) Coordinates

The UTM coordinate system is similar to latitude and longitude but is based on metric measurement. Teams can use either system. The popularity of the portable GPS provides an easy capability of reading or converting either system.

Military and USGS topographic maps are marked along the border with evenly spaced blue ticks (short lines) representing 1000 meter (1 kilometer) grids. Some maps actually connect the ticks making a ready to use grid on the map.

Each tick is usually represented by 4 numerals: 2 in lower case and 2 in upper case. The lower case numerals represent the 1,000,000 and 100,000 meter grids. The upper case numerals represent the 10,000 and 1,000 meter grids.

An example of a UTM point is: 245847

"245"means 24.5 and is located by finding the blue tick marked with an upper case "24" (ignore the lower case numbers for now) on the bottom or top of the map and measuring 5/10ths of the way to the next tick.

"847" means 84.7 and is located by finding the blue tick marked with an upper case "84" (ignore the lower case numbers for now) on the right or left of the map and measuring 7/10ths of the way to the next tick.

Measurements in the UTM system are always made from the left margin to the point (right, then up). This six digit system can describe a point within 100 meters accuracy.

Global Positioning System

The Global Positioning System (GPS) is space-based on a continuously available radio positioning navigation system. It is capable of determining latitude, longitude, and altitude of the individual user.

The GPS receiver can accept checkpoints entered in any coordinate system by the user and convert them to the desired coordinate system. The user then calls up the desired checkpoint and the receiver will display direction and distance to the checkpoint.

The GPS also has the potential to give the incident commander the following information:

- Performance feedback
- Knowledge of routes taken by the team
- Comparison of planned versus executed routes

Base Lines

Base Lines are used as a starting point or zero measurement. To express direction as a unit of angular measure, there must be a starting point or zero measure and a point of reference. There are three base lines:

- True North is a line from any point on the earth's surface to the North Pole. True north is usually represented by a star. The earth rotates on this True North Pole
- Magnetic North is the direction to the north magnetic pole as indicated by the North-seeking needle of a magnetic compass. The magnetic north is usually symbolized by a line ending with half of an arrowhead
- Grid North (GN) is not commonly used for team navigation. Do not use Grid North with compass navigation. This North does coincide with the North for UTM (Universal Transverse Mercator) grids.

The angular difference between the Grid North and Magnetic North Base Lines is commonly referred to as Grid Magnetic Angle, or G-M angle. Similarly, the angular difference between the True North and Magnetic North Base Lines is commonly referred to as Declination. The G-M angle and Declination are both important to the map reader because azimuths translated from grid, magnetic and true formats will be in error by the size of the respective angle if not adjusted properly. When converting azimuths, exercise extreme care when adding and subtracting the G-M angle and Declination. A simple mistake of 1° could be significant in the field.

A common phrase that should be memorized is "East is Least, West is Best." This phrase is a simple way of remembering that one should ADD Western declination or SUBTRACT Eastern declinations when going from True Headings to Magnetic (or Compass) Headings.

The opposite is true when converting from Magnetic Headings to True Headings. To convert from Magnetic Headings to True Headings, one needs to SUBTRACT Western Declination or ADD Eastern Declination from the given heading.

Converting a magnetic azimuth to a true azimuth

To convert from Magnetic Azimuth (MA) to True Azimuth (TA), you must note the declination in the Marginal Information of the map. For the given declination, the conversion from MA to TA is as follows:

MA – Western Declination = TA
MA + Eastern Declination = TA

In the case of a MA of 345° and a declination of 11° W, our TA is:

345° - 11°W = 334° TA

In the case of a MA of 274° and a declination of 10° E, our TA is:

274° + 10°E = 284° TA

Converting a true azimuth to a magnetic azimuth

To convert from True Azimuth (TA) to a Magnetic Azimuth (MA), you must note the declination in the Marginal Information of the map. For the given declination, the conversion from TA to MA is as follows:

TA + Western Declination = MA
TA - Eastern Declination = MA

In the case of a TA of 195° and a declination of 11° W, our MA is:

195° + 11°W = 206° MA

In the case of a TA of 65° and a declination of 8° E, our MA is:

65° - 8°E = 57° MA

Converting a magnetic azimuth to a grid azimuth

To convert from Magnetic Azimuth (MA) to a Grid Azimuth (GA), you must note the Grid-Magnetic Angle in the Marginal Information of the map. For the given Grid-Magnetic Angle, the conversion from MA to GA is as follows:

MA - Western G-M Angle = GA
MA + Eastern G-M Angle = GA

In the case of a MA of 102° and a G-M Angle of 11° W, our GA is:

102° - 11°W = 91° MA

In the case of a MA of 95° and a G-M Angle of 11° E, our GA is:

95° + 11°E = 106° MA

Converting a grid azimuth to a magnetic azimuth

To convert from Grid Azimuth (GA) to a Magnetic Azimuth (MA), you must note the Grid-Magnetic Angle in the Marginal Information of the map. For the given Grid-Magnetic Angle, the conversion from GA to MA is as follows:

GA + Western G-M Angle = MA
GA - Eastern G-M Angle = MA

In the case of a TA of 195° and a declination of 11° W, our MA is:

195° + 11°W = 206° MA

In the case of a TA of 65° and a declination of 8° E, our MA is:

65° - 8°E = 57° MA

Measure Distance on a Map

Distance for travel in a vehicle should be determined in miles. Distance for walking should be determined in meters, so you can use your pace count. There are 0.62 miles in a kilometer and 1600 meters in a mile.

Topographic maps are drawn to scale. 1:24,000 USGS quadrangle means that a one millimeter of map distance equals 24,000 millimeters (24 meters) ground distance.

You can use a ruler to measure the distance between two map points and multiply that by the scale factor. A simpler way is to use the bar scales located at the bottom of the map. These scales are usually printed in meters, yards, and miles. By taking the ruler or the edge of a piece of paper and mark on it the straight-line distance between the two map points. Then put the ruler or piece of paper under the appropriate bar scale and read the ground distance in the appropriate units.

To find the road distance between two points on a map, place a tick mark on edge of the piece of paper and then place the tick mark at the first point. Align the paper with the road edge until you come to a curve; mark the paper and the map at the curve. Pivot the paper so that it continues to follow the road edge to the next curve. Repeat the process until you get to the second point, where you make the final tick mark on the paper. At this point you can take the paper to the appropriate bar scales and determine the ground distance between the first and last tick marks. This will be the road distance between the two points on the map.

Navigating Past an Obstacle

If the obstruction is identified during planning on the map, a course can be plotted to avoid the obstacle using circumnavigation. Rather than navigating from point A to point B, you go through an intermediate point C to avoid an obstacle.

This procedure can be used If the obstruction is identified while hiking and you want to maintain your pace count and get back on the proper heading after going around the obstacle:

1. Record pace count and decide if it is easier to go right or left around the obstacle.
2. Using the compass, turn 90 degrees to your chosen direction
3. Walk that direction, starting a new pace count from zero
4. Continue walking until you have moved far enough to get around the obstacle
5. Stop and record how far you've walked in this direction
6. Turn back to your original azimuth and walk adding to your original the pace count
7. When you are clear of the obstacle stop and record your total traveling pace count.
8. Using the compass, turn 90 degrees toward your original path
9. Walk the number of paces recorded to begin going around the obstacle
10. You should now be on the direct opposite side of the obstacle from where you started
11. Turn back to your original azimuth
12. Walk the original azimuth, adding to both pace counts while following the original azimuth.

Locate a Distress Beacon

Many CAP search missions are electronic searches for Emergency Locator Transmitters (ELT). Using Direction Finding (DF) equipment like the L-tronics LH-16 is critical to these searches.

To locate an ELT, assemble the LH-16 on the antenna mast and hold vertically so that you can see the receiver controls. Turn the unit on, turn the volume and sensitivity full up, set the MODE knob to REC. Set the FREQUENCY knob to 121.775 for ELT practice and to 121.5 and 243 for active ELT searches. Listen for the signal. Once you have the signal, swing the antenna slowly through a full circle to determine where the needle deflects farthest to the right. That is where the signal strength is greatest. The antenna mast is marked to indicate which side of the antenna is being used in the REC mode.

Reflections or interference from power lines may cause several variations of signal strength. Switch to the DF mode and determine where the signal needle centers. The strongest signal direction should be in the same directions that the needle centered in the DF mode.

In DF mode you want to follow the needle. Keep turning until the needle centers. The needle will center when looking directly at the ELT and also when looking directly away from the ELT transmitter. If you are facing the direction of the transmitter and your rotate right the needle should go left.

The sensitivity setting will affect agreement of both modes. As you get closer to the signal, decrease the sensitivity to aid performance.

Any portable aircraft band receiver can also be used to receive the ELT signal

Determine Distress Beacon Bearing

Once the person operating the L-tronics LH-16 is facing the direction of the ELT, another team member will go about 25 feet the right of the located operator and take a bearing on the two lined up antennas. To determine actual bearing, 90 degrees must be added to the bearing of the lined-up antennas.

USAR

The acronym USAR stands for Urban Search and Rescue. There are a network of USAR teams in the United States that respond to major events such as destruction from terrorism and natural disasters. You may have seen an orange X painted with numbers and letters on buildings in disaster areas. The orange X is a USAR Structural search marking.

Interstate Highway Travel

All of the team members must be familiar with reading state road maps and also a road atlas. Some general facts that could help a team member understand highway maps include:

- Most of these maps are about 2 foot by 3 foot contain a legend and most navigable roads through the state. On the back you'll usually find more detailed maps of the larger cities and an alphabetical list of the towns marked on the map.

- You can get the basic road map at most any state welcome center or order them online from many of the state's Department of Transportation. The top of your map always points north.

- First locate your current position and your destination on the grid index. Next to the town names you'll see an alphanumeric coordinate such as "F-6", "U-9" that correspond to a set of vertical and horizontal lines running across the face of the map. The grid is indexed by a series of numbers listed across two opposite borders of your map.

Selecting your route

- Interstate highways are four to eight lane roads that link up the United States. These are normally identified by a blue and red shield containing the route number and a boldly marked line. Interstate with even numbers normally run east-west and odd numbered interstate run north-south. There are exceptions to this rule.

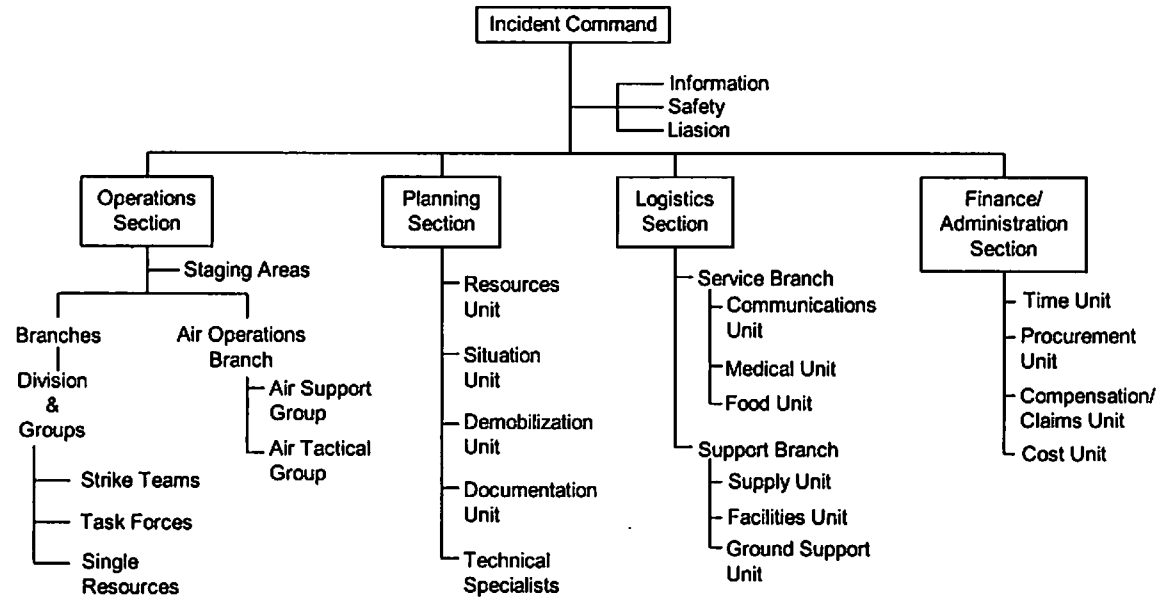
- U.S. Routes are normally smaller than Interstates, and are identified on your map by a plain white shield.

Once you've found a route, look at the symbols and colors along the way. Compare the symbols with the legend.

The marginal information and legend must be understood. The legend will also indicate other lines found on your map that are not roads. These lines could be boundary lines, state, county, or other boarders. Railroad lines can be confused with highways.

Mile markers are signs placed at least each mile along an interstate as reference points. They generally start at the state line or origin of the Interstate and increase from east to west. At any location along an interstate the mile marker will have the same value in both directions. The exit numbers are often the same as the nearest mile marker.

The Incident Command System



Members that would like to move into a leadership position should continue to take NIMS training as outlined on the NIMS website: http://training.fema.gov/EMIWeb/IS/crslist.asp

The Incident Command System (ICS) is a modular system that allows for the orderly expansion of the incident which respects the span of control. Some examples of how the incident command structure works are listed below.

A team leader tasked with cutting a person out of a crash should report to the operations chief when the patient is free from the wreckage.

If someone outside your team asked if the person in the stretcher that was just carried out is alive you should refer them politely to the information officer or your team leader. The information officer works with command to provide details to the news media that might result in calls or visits by others about the operation objective(s).

Assigning positions and responsibilities ahead of time will make the team more effective. A task assignment given by operations is one part of the overall operation strategy. When the team's task is complete the team will debrief with operations staff. A team member may be asked to verbally summarize observations during the teams debriefing process. Teams will report to rehabilitation following an operational period.

At the same time the team leader will ensure the team is preparing for reassignment and re-deployment. This may include eating, sleeping, equipment inspection, and vehicle servicing.

Search

An acronym is used to help remember priorities during a rescue. The parts of the acronym LAST are explained below:

- Locate means you need to find the patient
- Access means that you can get to and then be able to remove the patient
- Stabilize means that the appropriate level of care is given before and during transportation
- Transport means that you get the patient to a place where they can be turned over to someone equally or more qualified in patient care.

The terms patient, subject or object are used to describe what you are looking for during the search. It is a good practice to assume the search is criminal in nature so you keep a questioning attitude. It may be important to detail your exact actions at a later time.

Search Types

The type of search and the number of available searchers determines the number of searchers that are placed in a search area. It is never okay to search alone. The smallest team is two.

A Bastard Search refers to quickly looking in all the obvious places that the person might be assuming they were not lost. It can be very effective when family or friend report someone missing after a short period of time passes. The search subject is often found in his favorite bar or at home not realizing anyone was looking for him. It is possible that the subject did not want to be found by the person that reported him missing.

A route search is used to search a specific path or route of travel.

A contour search follows terrain features. On the contour search, the team members on the downhill side must travel more distance so they will require more time.

Type 1, 2 and 3 Search

A type I (Hasty) search is the rapid response to high probability areas by immediately available resources. A type I search requires 3 to 4 trained personnel because clue consciousness is critical. A fast moving small team would check areas and trails. First checked are the Point Last Scene (PLS) and/or the Last Known Position (LKP) and the suspected route of travel. This team should be made up of a ground team leader, a communicator and a medic. Some examples of where hasty search could be used include:

- Trails and fire roads
- Streams, rivers, drainages, lake edges and other runoff points
- Known visited places by the missing
- Common aircraft accident locations

A type II (Efficient) search is a relatively fast, systematic open grid search in a high probability area, often where a clue was found.

A type III (Thorough) search is a slow, highly systematic search using thorough techniques to achieve the highest Probability of Detection (POD) possible.

Type I, II, and III searches can all flag and search at the same time. No search operation should be performed alone.

Search Tactics

Search tactics are the techniques used to find clues, and the subject of the search.

An Active Search is the term used for physically looking for clues or subject.

A passive search is a combination of techniques used while not actively looking for clues or looking for the subject. The three main components of a passive search are Attraction, Confinement and Investigation.

Attraction is trying to get the subject to move to a desired location or let them know you are in the area. This assumes that a person is able to travel. Attempt to attract the person by using sound, lights, and objects. Sirens, yelling, public address (PA) systems and having the entire team blow their whistles at the same time for 15 seconds have all been used. Periodically, be quite and LISTEN. Methods of visual attraction include lights, beacons, strobes, flares, fires, smoke, light sticks, hanging signs and aircraft.

Confinement (containment) is an initial tactic used to limit the search area. It is very important to make boundaries for the search area before the subject has a chance to pass beyond the rapidly established perimeter. Road blocks, trail blocks and signs should be used on all routes leading into and out of the confinement perimeter. Look-outs placed at high points and camp-ins at natural travel routes identify and help preserve perimeter boundaries.

Track traps are established on dirt roads or bare areas by dragging or brushing them off. Footprints are looked for afterwards.

Large search areas can be subdivided into smaller, more manageable areas. String lines are tied from tree to tree in long boundaries at waist level, and then paper arrows attached that show the way to road or trail.

Investigation or fact finding is collecting any information that can help focus the search. The Lost Person Questionnaire (LPQ) is used as a guide to assemble and record information to develop strategy and tactics.

The Lost Person Questionnaire is a large list of predetermined questions that are asked of friends and family as the searchers are initially responding. It is usually best to have a trained investigator record the answers to the questions on the LPQ.

If your team gets search interview information that does not seem right, the information should be reported as you would any other information.

Search Dog Support

Search dog teams often need the support of searchers not using dogs. Your team or a member of it can provide skills such as communication, first aid, navigation, and other skills to the dog handlers in the field. The main types of search dogs include:

- **Air Scent Dogs**

  The air scent dog is the type most frequently used on searches to sniff traces of any human scent that are drifting in the air. An air scenting dog would most likely be used to determine if a person was in a general area.

- **Cadaver Dogs**

  A cadaver dog reacts to the scent of a dead human.

- **Trailing Dogs**

  The trailing dog can find a specific person by following a scent article from the missing person. A bloodhound working with its nose to the ground is the best dog to use if there is an uncontaminated scent article and a recent known location of the missing person. Trailing dogs normally work on leashes.

- **Tracking Dogs**

  A tracking dog is trained to follow the path of a certain person. A tracking dog is very similar to a trailing dog but it can work from a recent known location without a scent article. Tracking dogs normally work on leashes.

It is best if only the dog handler touches the scent article. Everyone else that touched it must be present when the dog first smells the scent article. Keep vehicles and people away from the Point Last Seen.

Search Lines

The search line (Grid Search) is the most often used search configuration. The line of searchers is moving at right angles to the line. Search lines are often used on missing person searches with either a small area or a lot of searchers. They are also often used in a bordered area to locate clues.

The search interval is the distance between searchers. The team leader determines the interval based on both the size of what the team is looking for, and how far each searcher can effectively see. Each searcher must know exactly what they are looking for. If the search objective is small, areas of dense brush must be completely searched.

Maintaining interval can be challenging for untrained or undisciplined searchers. Darkness and dense terrain will also make maintaining interval difficult. Move in as straight a line as possible.

The search line normally guides off of the team member following the boundary marker, flagging or other border. Each searcher must also keep aligned with the team members on either side. Variations in terrain and underbrush may slow the progress of some team members, forcing others to adjust their speed.

The search line should move no faster than its slowest member. While searching, scan in front, above and behind. It takes self-discipline to scan the search area properly, while maintaining interval and moving safety. Do not become so concerned with alignment that your Probability of Detection (POD) suffers.

Team members must watch where they are walking but not so much that they can not effectively search. Slow down in difficult terrain. Be quiet and listen unless otherwise directed. Coordinated calling might be effective in missing person searches.

Using breaks after each sweep is a good idea because it gives the team leader a chance to assess the team and their efforts as well as to boost morale.

Search Line Communication

The primary means of communication within a search line is verbal. Since a team is spread out to cover a large search area, not everyone can hear everyone else. To solve this problem, team members relay the leader's commands and member reports to other members of the team who are further away from the speaker. To relay a command or a report:

- Immediately obey the command. (If you hear "HALT THE LINE" then halt immediately before relaying the command.)
- Determine from which direction the command came.
- Repeat the message exactly, shouting it in the direction of team members farther from the speaker than yourself.

Mark a Route or Search Boundary

Blazing or flagging are terms used to describe placing a visible boundary with surveyor tape or toilet paper. Toilet paper boundaries do not work well in the wind or wet.

Flagging would be placed as a visible boundary by the team member on the right if the person on the left of the search line is using a road as a boundary. When the team turns to make the next search sweep, the flagging will be the new boundary on one side while the other side places new blazing.

The flagging-mark should be positioned so that the person following the blaze on the return sweep will have no trouble in sighting the marker. This can be accomplished by attaching each marker to the back side of the tree, relative to the direction of travel or in a place that is visible from all directions.

Flagging is often used after the search objective is located to make the best access for transportation.

Employ Search Techniques while on foot

Night Searches

Night searches should only be considered when the payoff is high and the risk to the team is low or moderate. Proceed slowly and with caution using good lighting.

When there is a moderate or low payoff, the team should rest and be ready to begin the search at first light.

Scanning for a clue at night is similar to day scanning. What a person sees off to the side of what they are looking at (peripheral vision) is more effective at night. You can prove this the next time you are trying to see the detail of something in the dark. Look directly to the side of what you are trying to see and the detail will be apparent.

White light will destroy your night vision. Avoid white light for 30 minutes prior to trying to see in the dark. Only use white light when conducting a full light search. Turn off the overhead dome light in the vehicle that is transporting you to the search site

During night searches remain alert to movement and noise. When stopped also look behind you from your position.

If you and another team member are walking in the woods and closing in on another group of searchers walking toward you using flashlights, your group should listen to your team leader's instructions and avoid shining lights into other people's eyes.

Clues

Clue preservation of the **L**ast **K**nown **P**osition (LKP) and **P**oint **L**ast **S**een (PLS) is essential in the case of the lost person search.

The LKP is the last point the subject is known to have been visual or not.
The PLS is literally the last point anyone actually saw the subject.

The is the last point the subject is known to have been visual or not.
Search Dogs that function from the LKP will have a better scent trail with fewer people contaminating the LKP. A room or a vehicle as LKP should be kept closed and preserved.

The search subject is a clue generator. Searchers are clue seekers. There are more clues than subjects. Clues can include:

- Physical - footprints, trash, broken brush, human feces
- Recorded - trail register, travel plan, flight plan
- People - family, friends, eyewitnesses
- Events – campfire or lights
- Scavengers - birds or animals
- Where the subjects cell phone has been in the cell network or an ELT signal. A team leader would be likely to see NTAP (National Tracking Analysis Program) information on a missing aircraft search.

Sign Cutting

Sign cutting or perimeter cutting is a method used to detect clues. Sign cutters travel ahead of a track or route looking for discoverable clues. Lack of sign means that the subject went a different way, or finding something by knowing where it is not.

Actions on Locating a Clue

Actions that an individual team member would take are the same no matter what the source of the clue:

- Halt in place and yell "Find" to halt the line
- Alert team leader of a possible clue find and position in the line
- From the find position survey the area and look for any safety hazards
- Do not disturb the clue
- Brief team leader with any safety hazards
- The team leader sends the medical team, briefs mission base and makes a log entry
- The clue should be surrounded by tape, cord, or some very visible indication, and kept under observation.

Identify Missing Person Search Clues

Searching for a missing person is an exercise in locating clues that will lead you to the location of the individual or group. These clues are found by conducting ground searches, air search, and witness interviews. Ground team members on searches should look for the following:

- Pieces of clothing, equipment or personal effects
- Smoke, by sight or smell
- Food wrappers or trash, cigarette butts
- Broken or disturbed trees and underbrush
- Presence of scavengers like vultures
- Signs of human passage or occupation
- Decomposition odors
- Trail registers or sign-in logs
- Signals (mirrors etc)
- Unusual noises, voices, creaking metal

Missing people are considered to be clue generators. Rarely can any person travel through or be in the woods without leaving signs of their passage. Teams must be clue-conscious. Look for the clues that lead you to the mission person.

Identify Aircraft Search Clues

In addition to the missing person clues, ground team members on searches should look for the following:

- Landslides
- Blackened or discolored areas
- Fuel, oil, or brake fluid
- Pieces of wreckage (twisted metal, seats, etc.)
- Fuel, oil, or brake fluid.
- Footprints

Downed aircraft do not usually come down intact and do not usually even look like aircraft on the ground. You are not looking for an airplane - you are looking for signs of an airplane crash.

Perform an Airfield Search

Ramp Check

One of the first priorities during a missing aircraft search is to investigate airfields in the area surrounding the take off, route and landing. This is to determine if the missing aircraft may have landed, refueled, or stopped due to the weather.

Your team may be tasked to search one or more airfields. Missing planes can be found at the wrong airport because the pilot landed their not realizing that people are looking for that aircraft.

Ramp checks are started by contacting the airfield owner or fixed base operator (FBO) to get permission to access a controlled airfield. They may also be helpful in obtaining landing/take-off records, fuel purchase logs, unlocking hangers and doing a preliminary search. If no FBO is present, proceed to search the airfield within the limits of safety.

Team members should know the tail number and what the missing aircraft looks like. Report aircraft that are very similar to the one you are searching for in the event there was an error in the information received.

Walk the flight line checking the tail numbers on all aircraft on the airfield. Look into hangars and check numbers. If on a controlled airport, notify ground control before entering operational areas like the ramps and hangars.

Interviews

Aircraft sometimes crash near an airport while trying to land or take off. Be aware of clues that a plane might have crashed near the airport such as people reporting hearing or seeing something strange.

Keep a written record of interviews all potential witnesses. Airport workers, maintenance personnel, pilots and people near the airfield may have helpful information on the missing aircraft. Leave the mission base contact information with everyone you interviewed.

Ground Teams Working with Aircraft

Teams can often see aircraft but the aircrew needs the team help in locating the team. Some ways of assisting the aircrew in locating the team include:

- Giving their location relative to some easy-to-spot landmarks
- Telling the aircrew the magnetic heading to adjust to fly over the team
- The team can make itself more visible with:
  - Signal mirror.
  - Bright colors
  - Unusual activity.

The aircrew takes over giving the team directions on how they should proceed once visual contact with an aircraft is made. The most common procedure for this is to assume that the team is in the center of a clock. The present direction of travel of the team is always called twelve o'clock. The aircrew will give clock face directions to the team.

The Air Force Rescue Coordination Center

The National SAR (Search and Rescue) Plan establishes the Air Force Rescue Coordination Center (AFRCC) as the inland coordinating agency. The US Coast Guard is responsible for SAR on the navigable waters of the United States, including major rivers and lakes.

In many states the responsibility and authority for SAR is placed in the local community. If the local community needs help, they can ask the Emergency Management Agency (EMA). The local EMA can request resources from the state EMA or Federal EMA (FEMA). Efforts can be coordinated by the AFRCC.

For missing aircraft or Emergency Locator Transmitter (ELT) search, the AFRCC calls upon Civil Air Patrol (CAP) as the primary resource.

Demobilization and Refit

When an operational period ends, the team will help the team leader prepare to be debriefed. During the search debriefing the team leader should be prepared to answer:

- What you actually did
- Where you actually searched and how thorough to help for calculation of POD
- What clues were found
- Any search difficulties, gaps in coverage and hazards
- Any communications problems

When the team is preparing to return home, a procedure to maintain accountability of personnel must be used. Typically the team must report to command and check-out documenting the time that individuals depart the operating area. If a team member is not returning home, the member's intentions must be communicated.

After command releases the team, the team leader will ensure the following occurs:

- The team is transported to a predetermined meeting area
- The equipment is made ready for reuse
- Incident command is informed that the team has dispersed
- The log book is signed as closed, copied and sent to the incident commander.

When each team member reaches their intended destination, they will communicate though the command system that they have arrived safely. This de-mobilization check-in is to make sure everyone returned home safety.

Team members should prepare for the next mission as soon as they arrive home because you may be alerted for another mission.

The team member must then:

- Replenish-Ensure you still have all required equipment. If not, inform your team leader. Replenish anything you used
- Repair-Inspect all your equipment. Repair or replace rips in clothing, patching holes in ponchos or tents. Clean and polish your boots to maintain water resistance. Make should all your equipment is clean and dry before repacking. Set up your tent and air out your sleeping bag
- Repack-Repack your gear so you can leave at a moment's notice.
- Rest- Get rest at least 12 hours rest after you have prepared your gear. Teams should be rotating 12 hours working and 12 hours resting.

Security

Security is defined as; "The state of being safe and free from danger or risk."

Scene preservation means doing as little damage as possible during the rescue, this can be done by sealing-off the area with security line or tape and only allowing essential personnel to enter. Note everything that was moved in the logbook and make a map of the original position.

Clue preservation requires not contacting potential clues so the clue is not contaminated.

A perimeter can be established to preserve a scene or a clue. Security personnel are stationed outside the perimeter. There could be several perimeters, one around immediate scene (hot zone), and another for much larger area (warm/cold zones).

When on security the team member investigates their area of responsibility using their senses. The team member should report any discovery to the person that was designated during the briefing. The designated person will make sure it was recorded in the log.

If you see a questionable activity, challenge by saying "who goes there?" and check their identification (ID) by either having them hold it for you to see or have them removing it from their wallet and hand only the identification to you.

Be professional, brief, and use good grammar. Aggressive actions can be construed as force. Holding objects in your hands (sticks, rocks, a knife or flashlight) can be considered force.

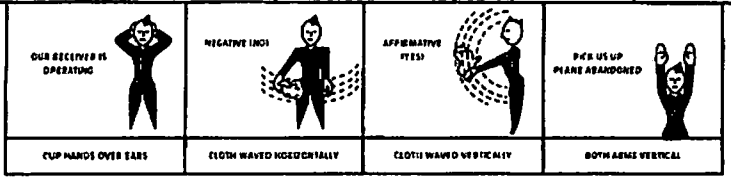
Teams cannot deny entry to a scene but should attempt to discourage entry. If violators are observed, note details and report to law enforcement. A photograph will not only help to discourage intruders but will make law enforcement's job easier.

The Federal Aviation Administration (FAA) investigates aircraft crashes. The FAA might request aircraft crash security from a wilderness emergency services team. Security is preventing disturbance to a crash site.

The National Transportation Safety Board (NTSB) may respond to an aircraft crash with a fatality or extensive damage. They would investigate with the FAA.

Ground - to - Air Signals

Body Signals



Not easily interpreted from aircraft. Stand in an open area, be sure clothing is in contrast to the background.

Go through the motions slowly, continue until the pilot understands.

1. REQUIRE ASSISTANCE	V
2. REQUIRE MEDICAL ASSISTANCE	X
3. NO or NEGATIVE	N
4. YES or AFFIRMATIVE	Y
5. PROCEEDING IN THIS DIRECTION	↑

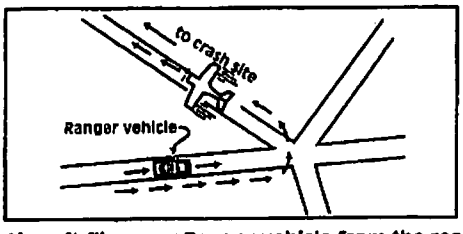
Panel Signals

From standard international SAR signals. Make as large as possible, at least 2 feet wide and 10 feet long, using contrasting color. Use other signals: flares, fires, mirrors, to attract attention. Drag, shovel, or trample snow. Fill with dark material also.

Look for pilot to acknowledge by rocking wings.

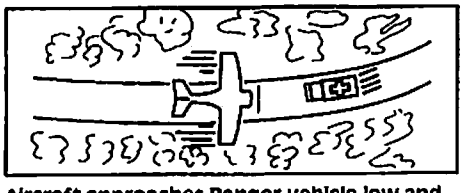
AIR - GROUND COORDINATION

INDICATING A TURN



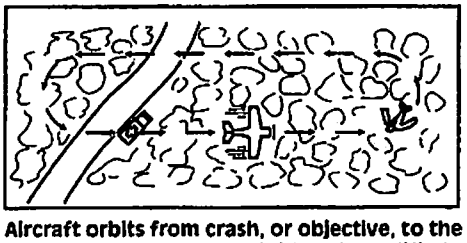
Aircraft flies over Ranger vehicle from the rear, then turns sharply to indicate direction.

HALTING A VEHICLE



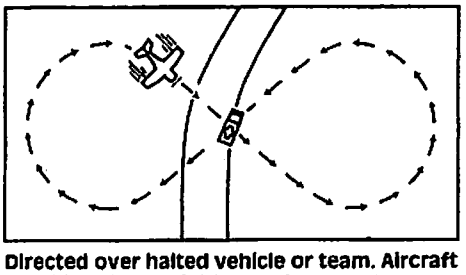
Aircraft approaches Ranger vehicle low and head-on. Team stops, looks for next instruction.

FROM JUMP-OFF TO OBJECTIVE



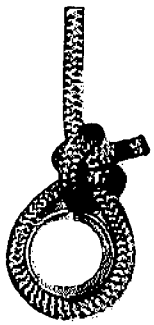
Aircraft orbits from crash, or objective, to the Ranger Team and back. Flight path modified as team progresses.

RETURN TO BASE OR COMMAND POST

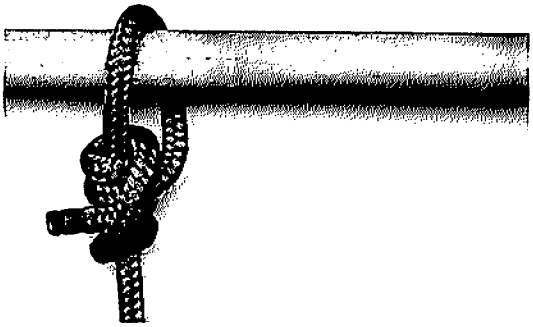


Directed over halted vehicle or team. Aircraft flies high figure-eight, crossing over team 3 times. Immediate return to base.

SQUARE KNOT



TWO HALF HITCHES



TAUTLINE HITCH

BOWLINE

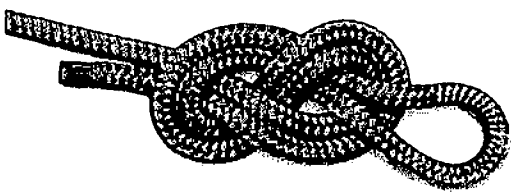
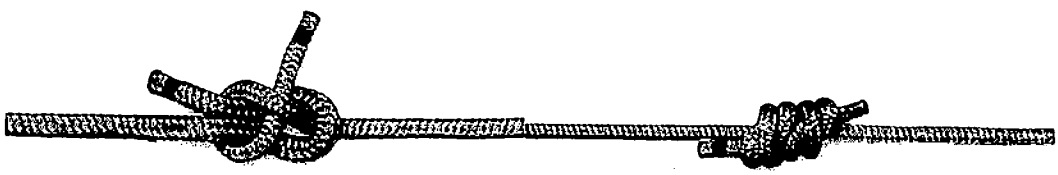
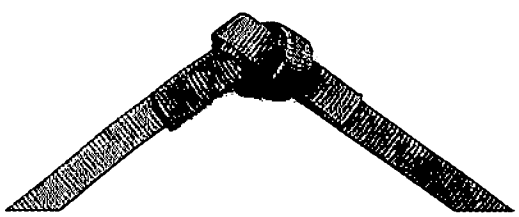


FIGURE EIGHT LOOP



SHEET BEND



DOUBLE FISHERMAN'S BEND

WATER KNOT