

CLOTHING SYSTEMS

-- A COMBINATION OF NATURAL AND/OR SYNTHETIC FIBER MATERIALS AND CLOTHING DESIGNS WORKING TOGETHER TO PROTECT THE SAR RESPONDER FROM THE NEGATIVE EFFECTS OF THE ENVIRONMENT.

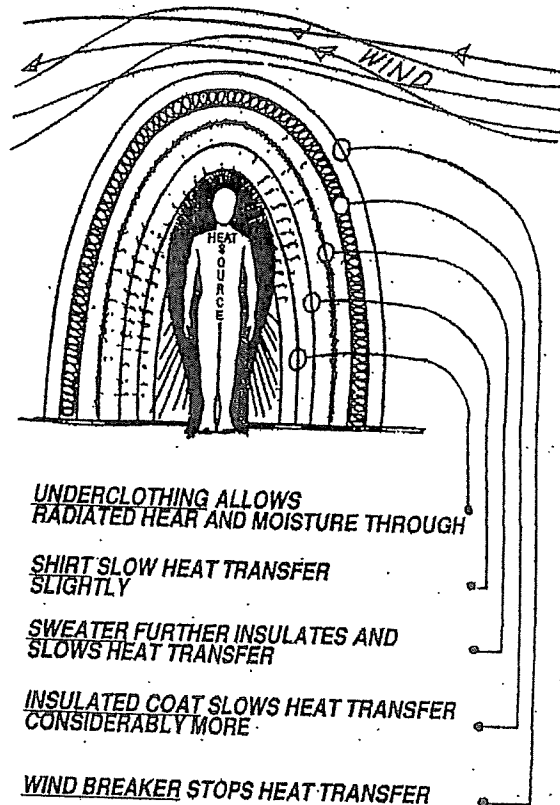
-- ASSISTS BODY THERMAL REGULATION BY:

- 1) BLOCKING EFFECTS OF WIND, PRECIPITATION, AND SUN.
- 2) PROVIDING THERMAL INSULATION.
- 3) ALLOWING MOVEMENT OF INVISIBLE MOISTURE AND PERSPIRATION AWAY FROM THE BODY.

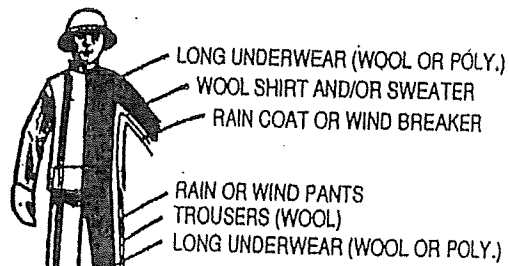
-- PROTECTS SEARCHERS FROM PLANT SPINES, ETC.

Fiber	Thermal Conductivity (air = 1)
Polypropylene	6.0
Polyvinylchloride	6.4
Polyester	7.0
Wool	7.3
Acrylic	8.0
Cellulose Acetate	8.6
Viscose	11.0
Polyethylene	13.0
Cotton	17.5

Lower thermal conductivity is a better insulator



Characteristic	Nylon	Cotton	Wool	Polypro
Water Repellency	Must be coated	Good if tight woven	Moderate	Good
Chemical Resistance	Good	Poor	Poor	Good
Wear Resist.	Good	Moderate	Poor	Good
Weight	Lightest	Moderate	Heavy	Light
Bulk	Least	Moderate	Bulkiest	Moderate
Insulating Quality - DRY	Poor	Moderate	Excellent	Good
Insulating Quality - WET	Poor	Poor	Good	Good
Burning Qualities	Melts easily	Moderate burning	Slow burning	Melts easily



Al's Tips for Clothing in Cold Environments

- Clothing is the *first line of defense* against harsh winter weather and possible death from hypothermia.
- Three important functions of clothing are: to keep a warm layer of air close to the body; to allow vapor (invisible moisture) to pass through; to provide protection from the wind (heat loss by convection) and precipitation.
- Once a survival situation presents itself, if the survivor is *not* properly clothed, he or she may not even survive long enough to erect a shelter or start a fire, let alone be rescued.
- You must clothe yourself according to *your* personal requirements. For example, persons of lower metabolism and thin persons will require more clothing than the average person. There is no standard. You set your own standard.
- Too much clothing? You can remove a layer or two. Not enough clothing, *you may have made a grave mistake*, and to live, you might have to mitigate this error, e.g., by finding shelter or starting a warming fire.
- Many layers of thin loose material have *greater insulation value* than one or two layers of thicker material. This principal allows one to better regulate the amount of heat being retained inside clothing by alleviating overheating and any related sweating, which can lower the effectiveness of the insulation.
- Insure that the *head and neck* are properly covered. At 50 degrees F., the exposed head and neck can lose 50% of total body heat, and at 5 degrees F., this heat loss can increase to 75%.
- After the head and neck, pay close attention to the hands, feet, armpits and groin, as they represent additional areas of higher heat loss than the rest of the body.
- Don't overlook the natural environment if extra insulation is required. Cattail down, dry grasses and mosses, deciduous leaves and tree barks such as juniper or cedar, are examples of natural materials that can provide excellent dead-air space insulation, especially when placed between two layers of clothing material.
- Do keep clothing *dry, clean and repaired*. Wear clothing *loose* and in *layers* and avoid *overheating*. Remember, trapped air is an outstanding insulator.

EMERGENCY SHELTERS

(By Al Cornell, Verde Search and Rescue)

The important word here is EMERGENCY. If you know you are going to stay the night in nature, then you must insure that you take the proper items such as a sleeping bag, a ground pad and a bivey sack or tent. The shelters presented below (carry one in your "day pack") are for that unplanned, unexpected emergency and by their very nature, as lightweight minimum protection, they are not going to be as comfortable as the planned camping experience. Most of Arizona lacks sufficient natural materials to build an effective emergency shelter. Therefore, if you are smart, you will carry your emergency shelter needs with you.

Proper clothing, shelter and fire are your three lines of defense or protection from nature's elements during the winter months. These three defenses are much more important than water or food, as a person can die within three hours from hypothermia.

Remember, what you prepare to do for yourself and your search team, you must also be prepared to do for the search subjects. You must carry protection for them (as well as food and water), as that is reason we are out there.

Emergency Shelter Considerations:

- 1) Reason(s) for the shelter, (i.e., protection from sun's radiation, hot winds, cold winds, precipitation, or insects; to enhance a fire or body heat for a hypothermic person; to survive a cold night).
- 2) Time available to erect the shelter, (i.e., how much daylight is left, or how much time before the storm hits).
- 3) Current/forecasted weather and other considerations, (i.e., wind, precipitation, temperature, insects).
- 4) Shelter items/tools in your pack and available in nature, (i.e., knife, cordage, tarp, ground stakes, leaf bags, leaves, pine needles, trees for vertical support).
- 5) Number of persons – searchers and subjects -- who must be sheltered.

Emergency Shelter Characteristics:

- 1) Lightweight (so it won't be left at home, but rather that it will always be with you).
- 2) Simple, fast and minimum energy to erect.
- 3) Effective in dealing with the reason(s) for the shelter's existence.
 - a) Cold/Wet/Windy Conditions: Protection from the top, the sides, the back, the bottom and be able to enhance a heat source.
 - b) Hot/Windy Conditions: Protection from the sun's rays and the hot ground; block hot winds.

(Winter Comments: Wind is a big factor in body heat loss in the winter. Therefore, a major function of a winter emergency shelter is to block the wind. Keeping dry during rains is critical, thus the importance of your shelter's overhead protection. A leaf bag filled with plant material – leaves, pine needles, juniper greenery – will provide protection from contact with the cold ground, and a fire at the shelter entrance backed by a reflector of rocks, or heat from a small tin can-like stove, and sometimes even a candle will increase the temperature within the shelter.)

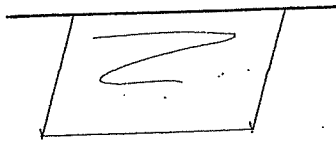
Emergency Shelter Site Selection:

- 1) We want: near fire wood; near water (fat chance in AZ); near trees and boulders that might block winds; trees for upright supports; a flat piece of higher ground to shed water (a small hillock).
- 2) We don't want: tall trees or rocks that might draw lightening; overhanging dead branches; low ground that might catch water or might flood; ant hills.

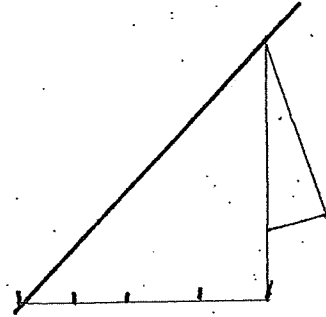
Emergency Shelter Tips:

- 1) A tarp with silver on one side will be more efficient, winter or summer.
- 2) Carry six ground stakes – saves much time/energy and takes up very little weight or space.
- 3) The shallower the depth (width) of the shelter, the more heat efficient it will be in winter.
- 4) For lying down in your shelter in the cold, it is more efficient to be in a position horizontal to the shelter's opening with your fire arranged in an oblong shape parallel to your body.
- 5) A common mistake in the winter is to make a shelter too large.
- 6) Your leaf bag(s) filled with leaves and debris for ground protection in the winter should be at least four fingers thick when compressed.
- 7) A shelter for the cold should be placed parallel to light winds; the back of the shelter into heavier winds, and facing the rising sun in a no wind situation.
- 8) Two small shelters (2 persons each) arranged on opposite sides of a fire during winter are more efficient than one larger shelter for four persons with a fire in front.

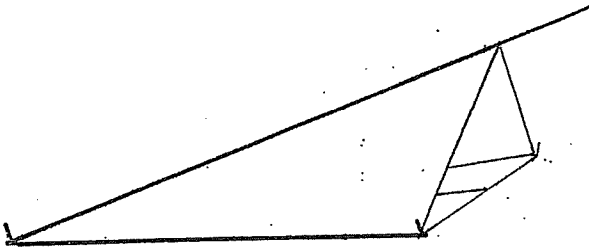
Six Simple Emergency Shelters:



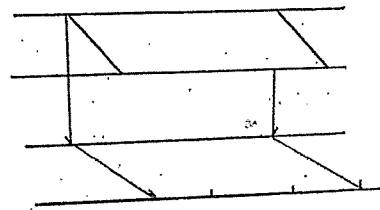
BASIC LEAN-TO



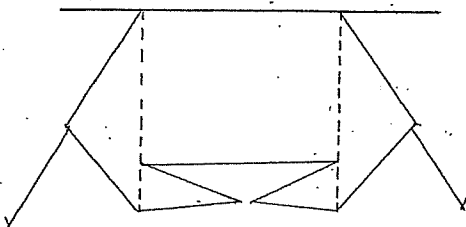
DIAMOND FLY



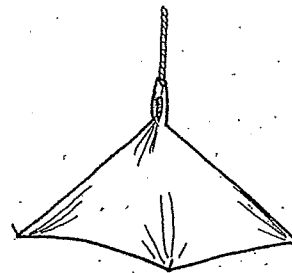
**DIAMOND FLY
(WITH FLOOR)**



"C" FLY



WIND SHED



PONCHO FLY

EMERGENCY FIRE STARTING TIPS

(By Al Cornell, Verde Search and Rescue)

First and foremost, no one should venture into the woods, no matter how short the venture, without carrying the means to start a fire. Furthermore, at least one method being carried should be valid during wet weather situations, for example, waterproof matches and/or the metal match. A lighter and waterproof matches are the best methods as they are quick, usually reliable and result in an immediate flame. I will also make mention below of four other methods which could be used in an emergency situation.

General Tips:

- 1) Start your fire earlier rather than later. This is especially important during cold weather as the onset of hypothermia may hamper your physical motor skills.
- 2) Collect much more wood than you might think you need for the night.
- 3) Take wood from upright dead sources; use gloves. (Ground woods contain moisture.)
- 4) Fire wood immediately adjacent to your site should not be collected, but considered as a last resort source of fuel in case you become injured/debilitated.
- 5) The process of starting a fire should be practiced in wet, windy and cold weather. Starting a fire in a good rain will require overhead protection until it is well established.
- 6) Keep at least one fire starting method in your pocket, separate from your pack.
- 7) Carry a square sheet of aluminum foil in your pack for placing on wet ground upon which to start a fire quickly. Also, a candle can be most helpful for "wet" fire starting.
- 8) Include tinder in your fire kit (cotton with petroleum jelly, super fine steel wool, etc.).
- 9) Don't overlook flammable items in your gear (i.e., toilet paper, insect repellent, etc.).
- 10) Be patient when establishing the fire. Too much fuel too fast might put the fire out.
- 11) Put up a heat reflector of rocks in the winter whenever possible. (Avoid river rock)

Tips specific to fire starting methods:

- 1) Matches: Use "Strike Anywhere" matches and waterproof them with fingernail polish or "Skin Shield," a medical superglue for closing cuts. (Skin Shield dries very fast.) Also, carry a striking surface, as natural striking surfaces such as rocks are of no value when wet. Protect your matches in a "match safe."
- 2) Lighters: Use lighters that are transparent so that you can see the fluid level. The less complicated the lighting mechanism the better, especially when the hands are cold.
- 3) Metal Match: Other methods may not function due to various conditions, i.e., no sun light. Lighters can fail. However, the metal match always works. A good wet weather method, especially when used with some natural cotton (not synthetic) infused with petroleum jelly, carried in a small 35mm film canister.
- 4) Magnifier: Obtain a plastic fresnel lens – credit card size -- as they take up almost no room or weight in the pack. Developed for reading small print on maps, they are great fire starters, especially with natural tinder. However, you must have clear sunlight.
- 5) Parabola: The parabola from a standard "D" cell flashlight can be used to focus the sun's light on tinder such as shredded juniper bark protruding through the hole for the light bulb. Again, clear sunlight is required.
- 6) Battery and Steel Wool: Carry a small 35mm film canister with "0000" (super fine) steel wool. Two batteries – must be two -- from your GPS or flashlight will ignite the steel wool. This steel wool can also serve as tinder for all of the other ignition methods.

PROTECTION: WINTER

(Al Cornell, 2351, VSAR)

THE THREE LINES of DEFENSE AGAINST DEATH

1. CLOTHING

- Limit Heat Loss: (Radiation; Convection; Conduction; Evaporation)
 - Trap Air Inside Clothing
 - Retain Body Heat
 - Limit Negative Effects of Outside Air
 - Present a Barrier to Direct Contact with Cold Objects
- How:
 - Appropriate (Correct) Clothing Materials (i.e., No Cotton)
 - Sufficient Clothing (Whole Body Approach)
 - Efficient Clothing: (Wool; Smart Wool; Polyester; Polypropylene)
 - Layers (Efficient Use)
 - Outside Shell

2. SHELTER

- Limit Heat Loss: (Convection; Conduction)
 - Protect Against Wind, Rain, Hail and Snow *
 - Barrier to Cold Ground*
 - * (Must Protect from the Back, Above, the Sides and the Ground)
- Enhance Heat Source: (Direct Heat; Indirect Heat)
 - Trap Heat from Fire (Flames and Re-emitted Heat from Hot Rocks)
 - Reflect Heat from Fire
- How:
 - Reflective Tarp (Best Option)
 - Emergency Mylar Blanket or Bivi-Sack
 - Natural Materials (Lean-to; Debris Hut)

3. FIRE

- Produce Heat
- How:
 - Direct and Indirect Heat from Flames (Create Microclimate)
 - Heat Liquids (Drinking; Warming; i.e., inside sleeping bag)
 - Heat Rocks (i.e., Put inside tent or shelter)

Other Heat Sources: Thermogenesis (Food; Exercise); Chemical Warmers;
Heat Donor; Direct Sun; Candle (i.e., inside poncho fly)

What can go wrong?

- Wrong turn or wrong trail
- Hike too far + lose daylight.
- Person separated from group
- Lost due to inattention
- Unexpected weather.
- Injury or illness.
- Mechanical failure of vehicle.

ATV or Motorcycle or aircraft.

Survival Mentality

SURVIVAL: To continue to live in spite of having to face difficult environmental circumstances.

We are all potential prey to a survival occurrence.

Will you be prepared?

- Emotionally
- Mentally
- Physically.

Once the threatening situation is recognized a new + most insidious threat appears.

Psychological reaction.

Anxiety → freeze / immobile.

Fear → erratic behavior.

Panic → bad decisions.

Why? The person(s) in trouble realize they are facing an unfamiliar ecosystem without the required skills or maternal support to survive.

They have NO options to deal with the situation.

Lost behavior can depend on if the individual or group has options!

Lost person behavior: speed up (maybe run)

"Bend" the map to fit where you think you are.

Realize the map does not agree with the terrain.

Realize you're lost

Anxiety level increases dramatically.

Decision making can be problematic depending on how well you have prepared.

The Solution: Being prepared.

Lack of preparedness caused by:

Ignorance
Arrogance
Complacency
Comfort.

The 4 Deadly Sins

- ① Ignorance of the weather
- ② Fail to inform others
- ③ Overestimate capabilities
- ④ Lack of survival items

Preparedness — 1st is Mental.

Develop survival mentality by:

Gain knowledge
Obtain experience
Practice skills
Practice with survival gear.

Always anticipate that the unexpected can happen.

- Results in self reliance.
- Expands comfort zone in wilderness.
- Wilderness becomes more enjoyable and educational.

- Early recognition that you're approaching trouble.
- Improved decisions + actions
(Good judgment).

Preparedness: Physical + Emotional.

2nd is physical:

- Good physical condition + readiness.
- Recognize capabilities + limitations.
- Carry survival gear + extra clothing
- Dress in clothing appropriate for situation.

3rd is emotional:

Mental + physical preparations result in positive mental attitude.

You will still experience anxiety BUT with your preparedness you will quickly focus on what needs to be done.

What should I carry into the wilderness?

Based upon:

- Environment (physical)
- Season and weather
- Personal needs / requirements.

- Mission requirements ie. SAR.
- Anticipate short fall of others
ie. clothing, food, water for lost
subjects

Preparedness: key to Survival.

- Mental: Skills / Experience.
- Physical: proper materials
- Emotional: can do attitude.

With preparedness you have survival options

The 4 Stays: Stay put.
Stay calm
Stay focused
Stay positive.

How should I dress for the wilderness?

- Cold wet: in layers.

Inner layer - thermal retention and moisture wicking

Middle layer (s) - thermal isolation and wicking

Outer layer - thermal isolation
(keep heat inside)

Insulation from wind/rain (keep outside).

Most important - protect head + neck, feet, armpits, and groin.

Hot/dry: Completely covered with base, light-colored, evaporating layer and large brim hat.

Which survival items to take?

- Do they mitigate shortcomings?
- Do they save energy?
- Are they simple to use?
- Are they reliable in bad conditions?
- Is there redundancy with most important items?

The most important survival items in the "Day Pack" are those that offer protection from the elements and ability to signal.

The 24-hr ready pack.

- Items must be worth their weight.
- Items should serve more than one purpose.
- Items must be neither too heavy, too bulky, nor too small as to be non-functional.

◦ Carry spare or redundant items for critical tasks (ie. fire, batteries).

◦ Pack characteristics

- lightweight
- durable
- water resistant
- personalized
- comfortable.

24 hr Ready Pack

◦ Carry items for each SAR related category

Survival - shelter, fire, tools, extra clothing.

First aid kit - triangular bandage.

Sam splint (if trained)

Signal - whistle, mirror

Safety + PPE - helmet, gloves, goggles, earplugs

Navigation - map, compass, GPS

Communication - Radio, cell phone.

Light - headlamp, hand lights, batteries

SAR equipment - flagging tape, webbing cord, pen/paper.

Hydration / food - water purification
Subject support - food, water, clothing,
light, gloves.

24 hour ready pack.

Organize pack into functional areas

• Protection:

Extra clothing

Trash bags

Space blanket

Aluminum foil

Duct tape. (take 2).

Starting / Tinder

Insect repellent

Tarp

Cord

Knife / Saw

Gloves

Fire

Sunscreen.

Very important pack items are those which contribute to the regulation of body core temperature.

24 hr ready pack.

Organize into functional areas.

• Health:

1st aid kit w/ Book

Water purification

• Signal:

Mirror

Flashlight.

Cell phone

Pen.

Whistle

Extra batteries

Flagging tape

Paper.

• Navigation:

Map

GPS

Compass

Extra batteries

• Sustenance:

Water

Extra water

metal cup.

Food.

Rubber tube.

• Special needs

Eyeglasses

Medication

Forced landing / Crash actions

- Move away quickly

- No fire - let engine (s) cool

- Expect high anxiety level, even shock.

- Treat injuries

- Select "Protection" site.

- Damaged aircraft "safe"?

If so, use aircraft.

If not, select site: close to aircraft
as safely possible.
(for searchers).

Consider: Wind

Wood

Water

Widow makers (falling tree limbs)

Wiggies (creepy crawlers)

- Shelter

Natural protection
Man made (tarp)

- fire

Warmth
Morale.
Signal.

- water acquisition

Airplane Survival Items

Organize "Bug-out" vest for emergencies

- Signal mirror
- Metal match
- Aluminium foil
- Tarp (shelter)
- Bivi sack (one-time use).
- Water purifying tablets
- Compass.
- Leather gloves
- water proof matches (UCO).
- Vaseline cotton balls.
- first aid kit
- Paracord.
- Knife (leatherman)

- Balaklava.
- Small saw
- Flashlight
- Duct tape.

Nice to have items: VHF Radio
PLB
Laser flare for signaling

Summary: preparation is key to survival

- Technology alone cannot replace mental, physical, or emotional preparedness.
- Be prepared for the worst case scenario
- Be innovative, most items in the "day pack" have more than one use.

If you fail to prepare you are preparing to fail
And your gene pool could end with you!
Natural selection at work

Steps in a survival event

- Recognition - Situation
Priorities
- Inventory - your items
Others items
- Local Resources.
- Threats + Aids
- Protection - Shelter
Fire.
- Signal - fire
mirror
flashlight
whistle.
- Water + food.
- Keep occupied

Critical Survival Skills

1st: Shelter building

2nd: fire.

3rd: signaling

After 1-3 are taken care of:

- 1st aid

- water (management, acquisition
purification)

- Land navigation

Critical Survival Skills

1st is Emergency Shelter

- an extension of clothing requirements
- type depends on:
 - Purpose - survival, subject protection
 - Area - terrain, trees, boulders, cave, alcove
 - Weather situation - rain, wind, cold
 - Materials available - tarp vs local materials.
- Visible, out of the wind
- away from dangers
 - Ground insects
 - Dead trees/limbs
 - Areas of flooding
 - Slide or avalanche possibility
 - Lightning targets
- close to natural materials
 - fire fuels
 - water.
- Summer shelter
 - Reflect away heat
 - Block hot winds
 - Off ground if possible.
 - If not, over ground.

- Winter shelter

Overhead protection

Protection in back + sides

Protection from cold ground

Enhance heat source.

Best cold weather emergency shelter
is a combination with fire.

More complete warmth for
less fuel

When building a shelter, conserving
energy is important.

Critical Survival skills

2nd is fire

fire is the great mitigator

- Purpose.

warmth.

enhance shelter

Signal

cook

repel insects

keep warm / dry

heat bed

day or night.

boil water.

The Lattice of fuel

- Loose enough to pass air
- Tight enough to pass heat
- from one piece to another

Ignition Methods

Matches - storm proof / water proof

Lighter - see through

Metal match - FAVORITE

Focus sun's rays - magnifier parabola

Electric - battery

Chemical

Flint + Steel

Firearm

primitive fire methods.

What will ignite wet! (Cotton ball with vaseline)

What will burn wet! (Resin, rubber).

Which woods are best?

- Soft (low density).

Burns fast - high heat + light.

Yucca

Sot ol

Roots of cottonwood

-medium

Moderate heat + light

Alder

Cottonwood etc.

-hard.

Low heat + light

Long lasting

Oaks

Junipers.

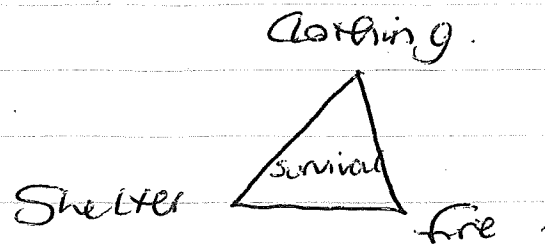
Mesquite

Manzanita

Fire Tips

- Protect tinder + wood from precipitation
- Use absorption / retransmission of heat when possible (ie. rock gotto behind fire)
- Bank coals
- Practice fire making often + under adverse conditions
- Consene fires next to camp for emergency use only

Survival Preparation Starts Before Leaving Home.



The Triad for staying alive in cold, harsh environment.

Other warming options

- Heat liquids

hot water bottles (place around you)
hot liquid intake

- Heat rocks

inside tent or shelter
inside vehicle

- Chemical warmers

- Candle or small heat can

- Thermogenesis

Intake of high-fat foods
Exercise.

Critical Survival Skills

3rd is Signaling

- Audible - whistle
firearm
voice.
- Visible - mirror
Smoke
Flashlight
fire
Colored panels
Body signals
Ground symbols.
- Electronic - Radio
Cell phone
GPS locator beacon.

Different signals in day vs Night
Signals can be passive or active.

How to signal.

Whistle : 3 blasts or SOS

... - - - ...

firearm : 3 shots.

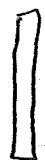
mirror : sweep horizon
with aircraft, 3 flashes
or SOS.


Flashlight : 3 flashes or SOS
Fire : 3 in a triangle
Smoke : must contrast.

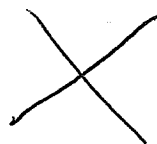
Body signals:

One arm up — all is well.
Two arms up — Need help.
Lie down prone — Need medical help.
Up/down arms
w/cloth. — Yes.
Sideways arms
w/cloth. — No

Ground symbols (4 feet x 40 feet)

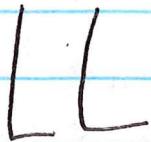
 injuries, need doctor.

 need medical supplies

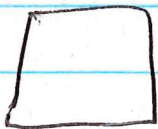
 unable to proceed.



proceeding in that direction



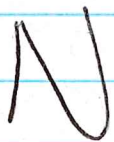
all is well.



need map + compass.



need food + water.



no.



yes.

The Desert.

- Environmental hazards

Intense heat - direct.

reflective

Conduction

Convection.

Low rainfall.

Sparse vegetation (no shade).

wide range of temps (midday to midnight)

high mineral content in water sources.

animals + plants.

Others - slopes

loose rocks

holes

mines.

2 heat sources

outside - environment.

inside - metabolic.

Physiological impact of desert environment.

Dehydration

Heat exhaustion

Hyponatremia

Heat Stroke

Heat Cramps

Sunburn.

Hypothermia

Protection from desert environment,

Hydrate

Carry water (+).

Acclimate.

Salty snacks

Clothing

Head cover

Rest stops

Sunscreen.

Dampen head.

Wet-shirts

Carry clothing for night.

Mitigation of Desert heat (Short on H_2O)

continue to drink

get off ground

No alcohol or caffeine

No food (including liquid foods).

Stop exertion (ration sweat).

Stay in shade.

Get out of hot winds

Breathe through nose.

Do Not

drink urine.

take salt tabs

drink cactus juice.

dig water still

rely on maps for water sources.

You must create your conditions
for access.