ARMY GROUND RISK-MANAGEMENT PUBLICATION

COUNTERMEASURE

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POV FATALITIES
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THRU AUG FY00 100

Don't Lose Your Cool... Heat!

Be prepared for cold weather, know the hazards and plan accordingly!

PLUS: Hot Tips for Tent Heaters!

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OCTOBER 2000 VOLUME 21 NO 10

The Official Safety Magazine for Army Ground Risk-Management

Cold Weather - Are You Prepared?

Plan for the cold. Cold weather injuries are preventable through planning and training.

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Investigators' Forum

Soldier killed, another injured while changing tire.

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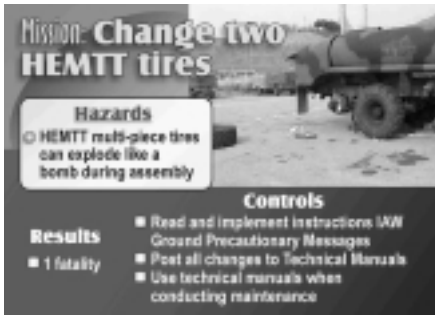

Into the Flames

With the car and the woman on fire, the Captain took a deep breath and thrust his hands and arms into the flames and pulled her out!

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Survival of the Fittest

Everyone is aware of dehydration in hot weather, but it doesn't get a lot of attention on cool days. Read what happened to one runner.

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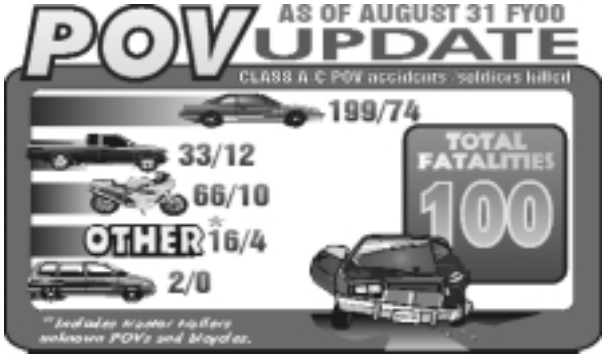
Survival of the Fittest



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Gene M. LaCoste
Brigadier General, U.S. Army
Commanding Officer

Cold Weather—Are You Prepared?

The good news is that all the satellite and weather balloon measurements of temperature agree that the surface temperature measurements are all lower than the models and that global warming isn't really happening. The bad news is this means winter will be cold as usual. Cold weather brings cold injuries, at least for those who are not prepared. This has been true from Hannibal crossing the Alps, to the soldier wearing jungle boots on guard duty in Bosnia in January.

How do you prepare? The first thing in any battle is to know the threat.

■ **Dehydration:** In the cold, dehydration is a problem because it is unexpected. Most of us think that dehydration is only found with heat injuries—this isn't true. In the heat, you sweat, and it's easy to think of drinking water to replace the sweat. Working in the cold, you still sweat; but because you are not hot, you might not think you need fluids. Symptoms of dehydration include dizziness, weakness, headaches, and nausea. A good rule of thumb is that if your urine is dark yellow, you're not drinking enough water. (Note: Diarrhea and vomiting can also promote dehydration or make it worse.)

+ First Aid: DRINK WATER! Have the soldier replace lost fluids. Water is best; however, sports drinks are also acceptable if available. Fluids should be sipped, not gulped. Sodas, coffee, tea, or other caffeine drinks won't help. If the soldier isn't improving quickly with fluids and rest (preferably in a warm location), seek medical help.

■ **Immersion Foot:** This is also called trench foot after the first descriptions of the condition when it occurred in World War I soldiers. The cause is continued exposure to wet, cold conditions. The surprising factor is that it doesn't have to be freezing cold, trench foot can occur at temperatures up to 60 degrees Fahrenheit if the exposure is around 12 hours. Of course, if the temperature is lower, it can occur sooner. Symptoms include cold, numb feet that may have shooting pains, as well as redness, swelling, and bleeding particularly involving the toes.

+ First Aid: The most important step is to re-warm and dry the feet. Expose the feet to warm air and/or gently wrap in dry blankets or towels. Do NOT massage, rub, or use salves or ointments on the feet. Do not expose the feet to extreme heat; if the feet are numb, the victim may get burned and not realize it. If you suspect trench

foot, get medical help immediately.

■ **Chilblain:** This is a condition caused by exposure of bare skin to continued temperatures ranging from 20-60 degrees, depending on an individual's acclimatization. Symptoms of chilblain include tender, hot-feeling, red and itching skin, mainly on exposed areas like the cheeks, ears, and fingers. Feet, however, may be affected also.

+ First Aid: Warm the soldier's affected body part with direct body heat, or move the soldier to a warm area. Do NOT massage the area, rub with snow or ice, or apply salves or ointments. Do NOT expose the area to any intense heat. If the soldier does not improve, seek medical help.

■ **Frostbite:** This is a very common and potentially dangerous injury. The body is mainly water and water freezes at 32 degrees. Frostbite occurs when the body cannot maintain sufficient internal heat in certain parts, and the water in cells freezes. Areas that are most often affected are those areas exposed, or where blood flow can be decreased, such as fingers, toes, ears, and other facial parts. Exposure to bare skin on metal, extremely cool petroleum, oils, and lubricants (POL), wind chill, and tight clothing, particularly boots, can make the problem worse. Symptoms include numbness or tingling in the affected part; blisters, swelling, or tenderness; body parts that feel dull or wooden; and pale, yellowish or waxy looking skin—gray in dark-skinned soldiers..

+ First Aid: Frostbite is a medical emergency; the victim should be evacuated as soon as possible. If not treated properly, frostbite can lead to gangrene and amputation. Prior to evacuation, the soldier should be moved to a warm area and warm the part affected with direct body heat or warm air. Do NOT warm with hot water, expose the part to any intense heat, rub or massage the area, rub with snow or ice, or use salves and ointments. Do not allow the part to thaw and then refreeze.

■ **Hypothermia: This is a serious medical emergency.** Hypothermia is caused by severe body heat loss due to prolonged cold exposure. Immersion in water can make hypothermia worse or come on more quickly because the water increases heat loss. Symptoms include lack of shivering and what has been described as "the Umbles"—stumbles, mumbles, fumbles, and grumbles—all of which are signs of mental slowing and lack of coordination. Hypothermia can progress to unconsciousness, irregular breathing and heartbeat, and eventually death.

+ First Aid: If you find a soldier in the earlier stages of hypothermia—still conscious—start to warm the soldier immediately. If the clothes are wet, remove them. Loosen any restrictive clothes. Wrap the victim in dry blankets or a sleeping bag. Another person can get into the sleeping bag as an additional heat source. Get medical help immediately.

If the soldier is unconscious, cold to the touch, and appears to have no pulse or breathing, DO NOT assume that the soldier is dead! Normal body temperature is 98.6 degrees. When it gets down to 90 degrees, the body tries to save energy and heat by trying to "hibernate." Blood flow to the arms and legs is decreased, and pulse and breathing become shallow. A soldier may appear dead, but his heart rate and breathing might be so low that untrained personnel miss it. People with temperatures as low as 82 degrees have been resuscitated. Get the soldier to a medical facility as soon as possible!

Cold injury prevention

The most important thing is to plan for the cold. Make sure you have accurate weather information for the area and time of the mission (wet conditions and windchill greatly increase chance of injury); ensure soldiers have appropriate cold weather clothing; if the tactical situation permits, use covered vehicles for troop transport, have warming tents, and if possible, warm food and drinks.

The most important individual preventive measure is wearing the proper cold weather clothing. The Gore-Tex™ parka is designed to keep

you dry, but it is not intended to be the main overgarment in extreme cold. Wearing every article of cold weather clothing issued can be bad, because it may cause overheating or restricted circulation. All cold weather clothing should be worn loose and in layers. This allows air circulation between the layers.

Socks should be changed frequently and boots rotated. Proper wear of boots is important. If you have intermediate cold weather boots (Gore-Tex™ lined, like Matterhorn™ boots), you might think you are safe from trench foot—not so. Many soldiers wear them both indoors and out, some year round. The problem is the Gore-Tex™ lining is designed to keep water out, but it can also keep dampness in.

If a soldier's feet are wet from sweat from being indoors all day, and then he goes out into a cool environment, he has set himself up for the conditions that can lead to trench foot. Also, if the boots are off at night and not allowed to dry by a heat source, the sweat can freeze. The next morning, the soldier puts his feet into the iced boots (frozen sweat)—a perfect recipe for a cold injury. (And remember that jungle boots are not appropriate for cold, wet conditions.)

It is important to keep clothing clean and dry. Dirt, oil, or water can increase the rate of heat loss by reducing the insulation ability of the clothes. It is also important to keep the clothing repaired—a broken zipper cannot keep the cold out. Headgear is extremely important; the body can lose large amounts of heat through the head. It is important to protect the hands and fingers by wearing proper gloves. Many soldiers like to wear Nomex® aviator gloves because they are light and flexible. These gloves are designed to protect aviators from fires; they are not designed for extreme cold, and will do little to protect your hands when they are wet. Unless specifically authorized, they should not be worn.

Other factors influencing cold injuries:

■ **Previous cold injuries.** Soldiers with previous cold injuries are more susceptible to having another. It is extremely important to identify these soldiers, and for first-line supervisors to monitor them closely.

■ **Tobacco.** Nicotine, regardless if it comes from a cigarette, snuff, pipe, cigar, or patch causes blood vessels to constrict. This is particularly dangerous in the hands and feet, and can lead to, or worsen a cold injury.

■ **Alcohol & caffeine.** These can lead to increased urination and dehydration.

■ **Meals.** If you skip meals, the first thing the body does is to slow the metabolism. Slower metabolism means less heat production and more chance of cold injury.

■ **Activity.** Huddling up and not moving is the wrong thing to do. The more you move, the more heat you produce. Decreased activity decreases the time it takes to get an injury.

■ **Buddy system.** The buddy system is a great way to help prevent injuries if soldiers are trained to know what to look for.

■ **Self-checks.** A simple self-check is to pinch the fingernails and watch how fast they return to red. The slower the return, the higher the potential for an injury to the fingers or toes.

More information on cold injuries can be found in FM 21-10 and FM 21-11, GTA 5-8-12 (this is a good pocket guide for soldiers), and Technical Note No. 92-2, *Sustaining Health and Performance in the Cold: Environmental Medicine Guidance for Cold-Weather Operations*, published by the U.S. Army Research Institute of Environmental Medicine.

All cold weather injuries are preventable! Battling the cold is like battling any other enemy—mission success happens only through planning and training.

Conclusion

All cold weather injuries are preventable! Prevention is the responsibility of leaders at all levels, as well as the individual soldier. Battling the cold is like battling any other enemy—mission success happens only through planning and training.

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The Cold Hard Facts of Freezing to Death

Call it luck. Call it fate. Call it a miracle. Rod Chandler's vehicle slid off a deserted snowy mountain road and slammed into a snowbank. His badly frostbitten feet ached as he trudged through the bitter cold to find help. After only a couple of hours in the freezing snow, his strength was gone, and he believed death was near.

It was Christmas Eve and I was headed home to Georgia to be with family and friends on my winter break from the University of Tennessee. Driving out of town, my defroster roaring, I could barely see the bank thermometer on the town square. Did it say 18 degrees Fahrenheit?!? The radio weather report had warned of a possible snowstorm. I stopped at the local gas station to fill the tank. The gas attendant shook his head and said that he wouldn't be going anywhere tonight if he were me. I just smiled. A little snow never hurt anybody. Besides, I have my trusty 4-wheel drive jeep, some tunes, and plenty of munchies and hot coffee. There was nothing to worry about.

That's what I thought until I got about 150 miles out of town on the 2-lane curvy road. The weather had worsened and I couldn't see the lines on the road. I tried to keep an eye on other terrain features to stay oriented. My head hurt I was concentrating so hard on my driving on the slippery roadway. Suddenly, my peripheral vision picked up a blur at my 3 o'clock position. A brown mass jumped right at me causing me to brake and jerk the steering wheel to the right. My jeep suddenly started spinning out of control off the mountain road and skidded into a snowbank.

Luckily, I wasn't hurt, but my jeep was stuck in an avalanche of snow. After jamming the gearshift into low, I tried to muscle my way out of the drift. No such luck. Frustrated, I shoved the gear into park and forced my door open with my shoulder. Brrrrr! Cold slapped my naked face and made my eyes tear.

My first thought was that I just dented my bumper. My second was that I failed to bring a shovel. My third was that I'd be late for dinner. My family was expecting me at the house around eight for a Christmas Eve dinner. Nothing could keep me from that.

I looked around the area for lights from a car or house. Nothing! I checked my map for the nearest town—at least 5 miles. I said aloud, "I can punch that out in no time!" My breath rolled from my mouth in short frosted puffs. I didn't worry about the cold at that time.

My jeep was cocked sideways in the snowbank right beside the deer that had suddenly darted into the roadway and became an unwelcome passenger.

I donned my fleece jacket, gloves and cap, grabbed my flashlight and map, and started my walk. Within a few minutes, I noticed my fingers were getting tingly, and then my toes got numb. After about 10 minutes of hard climbing, my body temperature increased and blood started seeping back into my fingers. Sweat trickled down my sternum and spine.

Treading slowly through deep, soft snow, I felt the 18-degree air bite at my face. I wish I had borrowed my friend's cell phone. Man, it's cold!

After an hour, there was still no sign of anyone. I double-checked the map. I flicked on the flashlight, and its cold-weakened batteries threw a yellowish circle in the snow. "It has to be right around here somewhere," I thought to myself, as the frigid air was pressing against my tired body and sweat-soaked clothes. The exertion that warmed me on the way uphill was now

working against me.

My body temperature began to plummet. Within 17 minutes, it reached the normal 98.6 degrees, and then it slipped below. At 97 degrees, my neck and shoulder muscles tightened (what's known as pre-shivering muscle tone). My hands and feet ached with cold. Ignoring the pain, I trudged through the snow for another 10 minutes.

Nearly 45 minutes later, my body temperature was 94 degrees and I entered the zone of moderate hypothermia. I was trembling uncontrollably, a natural response to generate additional body heat.

All I thought about was that the gas attendant was right—it was a mistake to come out on a night like this. Had I come too far to turn back? I fumbled for the map in my jacket. Would I be able to guide myself back to the warm jeep? I was too cold to even think about eating Christmas dinner. I could only think of the warm jeep that waited for me somewhere at the bottom of the hill.

I managed to turn myself around and walk back toward the jeep. I saw the jeep's shell as I came over the crest. The wind was picking up and I heard a sudden whistle of wind in my ears as I gained speed. I yelled, "I see the jeep! I see the jeep!" But, unfortunately, I didn't see the buried log and tripped over it. I lay very still. There was dead silence, except for my heart thumping in my chest. My ankle was throbbing with pain and I had gouged my head on a tree branch. I also felt a draft on my head...I lost my cap!

The snow that got packed down my shirt had started to melt and trickle down my chest and stomach. Realizing that this was not a good situation to be in, I scrambled to rise, but collapsed in pain, my ankle crumpling beneath me.

I sank back into the snow, shaken, my heat drained away at an alarming rate—my head alone accounting for 50 percent of the loss. The pain of the cold soon pierced my ears so sharply that I rooted about in the snow until I found my cap and mashed it back onto my head.

Time passed by, I checked my watch: 1152. Surely, someone would come looking for me soon. My head dropped back onto the snow. I heard it softly crunch in my ear. In this 18-degree air, my core temperature would fall about one degree every 30 to 40 minutes—apathy at 90 degrees, stupor at 86.

I had crossed the boundary into profound hypothermia. By the time my core temperature had fallen to 86 degrees, my body abandoned the urge to warm itself by shivering. My blood thickened like crankcase oil in a cold engine. My oxygen consumption fell by more than a quarter. My kidneys, however, worked overtime to process the fluid overload. I felt a powerful urge to urinate, the only thing I felt at all.

At 86 degrees, I lost the ability to recognize a familiar face, should one suddenly appear. My heartbeat became erratic. It now pumped less than two-thirds the normal amount of blood. The lack of oxygen and slowing metabolism of my brain, meanwhile, began to trigger visual and auditory hallucinations. Was I then unconscious?

Suddenly, I heard bells. Jingle bells? I tried to lift my face from my snow pillow, but realized my neck muscles felt rusted shut, unused for years. I acknowledged with a surge of gladness that they were not sleigh bells; they were the sound of welcoming bells hanging from the door of my parents' house. I was home! I knew someone would find me.

RISK MANAGEMENT POINTER

Plan to stay home during bad weather. If you have to drive and get stuck, stay with your car. Don't try to walk in a storm.

The Layered Look

The best defense against cold air is layers of...air? That's right. Your extreme cold-weather protective clothing is designed to trap warm, dry air against your body. The idea is to keep you from losing body heat—to prevent cold injury—without making you too warm.

You'll stay snug if you remember a few pointers:

■ **Wear several layers of clothing.** That way, if you get too warm, you can take off the extra layers. If the clothes next to your skin get wet from perspiration, they can't trap air. You'll chill in a hurry, especially if the wind's blowing.

■ **Shake off any snow, ice, or water droplets that get on your outer clothing.** Even though the gear is water-repellent, brush off snow and ice before you enter a warm shelter.

■ **Keep the clothing clean.** Dirt and grease, like water, cut out air space and reduce insulation. Brushing your clothing while you wear it helps keep it clean.

■ **Make sure your clothing fits loosely.** It's designed so you can leave some parts open—such as the neck and cuffs—to let cold air in if you get too warm.

Read up on your protective clothing in Section II of Chapter 2 of FM 31-70, *Basic Cold Weather Manual.* Care and repair instructions for some of the gear, including the extreme cold-weather hood and parka and the cold-weather coat, are in TM 10-8400-201-23, *General Repair Procedures for Clothing* and TM 10-8400-203-23, *General Repair Procedures for Individual Equipment.*

—Courtesy of PS Magazine

Tent Heaters Aren't the Problem, Operators Are

In cold weather, a propane space heater can make the difference between misery and relative comfort. Used incorrectly, though, it can cause a lot of misery by itself. Fire can engulf a tent in less than 10 seconds and destroy it in 60. That gives soldiers very little time to react to save themselves or fellow soldiers.

Recently there have been inquires to the Safety Center in regards to propane space heaters. Fire safety is a major concern. More than 80 percent of tent fires are caused by human errors. The most common error is leaving a heater unattended. In general, propane heaters do not have tip-over or shut-off protection, and will continue to burn until manually shut off. Canvas tents coated with water repellant chemicals are extremely hazardous and can produce toxic fumes when ignited. Plastic coated canvas can produce the same results.

Contact burns are also a risk. Many of the garments that are issued today keep us warm through the technology of synthetics. However, these synthetic materials burn rapidly and can melt to your skin in an instant. For example, visualize wrapping your arm in plastic food wrap and putting it over an open flame. Get the picture?

Common sense (not to mention risk management) dictates that fuel should

Risk Management Pointer

Procedures are established to take the guesswork out of portable-heater operation. To prevent the human errors that cause 8 out of 10 tent fires, proper operating procedures must be followed every time; there is no room for omissions or shortcuts.

not be taken inside a tent warmed by fire. Common sense should also keep soldiers from dropping cigarettes around combustible materials or going to sleep with a lantern or candle burning.

Despite proper planning, coordination, risk assessment, and controls, if a tent fire does happen, soldiers must know and practice safe firefighting procedures. The first and most important task is to evacuate the tent. The heater must not be opened while it is still hot, even after a flame-up has subsided. Doing so allows fresh air to feed the fire, and it will reignite. In addition, soldiers should not attempt to remove hot heaters from tents. Hot surfaces can come into contact with tent flaps and set them aflame. Above all, in fighting tent fires, soldiers must know that seconds count. The first response should be to save soldiers' lives.

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Hot Tips

■ Operators must be trained and licensed on each particular heater in accordance with AR 600-55, section 7.1, subsection 10, and possess a DA Form 5984-E.

■ Heaters should be inspected, setup, operated, and maintained in accordance with applicable TMs.

■ Fuel cans must be marked in the following manner: "DF" for diesel fuel (3/4-inch letters) or paint the upper 1/3 part of the can YELLOW; "MOGAS" for gasoline (3/4-inch letters) or paint the upper 1/3 part of the can RED; Do not paint fuel cans containing turbine fuel, but rather label them JP4, JP5, or JP8 (3/4-inch letters). A new type of gravity feed adapter with a quick disconnect can be ordered with NSN 4520-01-466-0415.

■ Do not allow bare skin to come in contact with fuel in subzero temperatures. Fuel becomes super cooled when stored in subzero temperatures and can freeze skin instantly upon contact.

■ Mount fuel cans securely outside at least 8 feet from the tent using a tripod (NSNs 4520-01-465-4430 or 7240-01-318-5222) and at least 3 feet higher than the top of the stove. Fuel lines will be equipped with drip interceptors or loops. Heating stoves with a fuel supply larger than 5 gallons will have a quick shut-off valve.

■ Store fuel a minimum of 50 feet from tent, structures, or vehicles.

■ Position the Yukon stove (or similar heater used in a 10-man tent) facing the opening of the tent.

■ If heater is on anything other than bare earth or a concrete floor, a sheet metal sandbox should be used as a heat shield. This can be constructed by using large aluminum cake pans that extend approximately 8 inches beyond the front, 6 inches from the sides and back of the heater (these dimensions are for a Yukon stove and can be adjusted for any heater).

■ Locate a serviceable fire extinguisher at the center pole, or at a location known to all in the tent.

■ Conduct fire drills.

■ Post fireguards whenever heater is on.

Many soldiers are not aware of the new generation of heaters that have been specifically designed and tested for use with our equipment and field environments. These heaters can be viewed at **http://www.sbccom.army.mil**. Remember, commercial heaters have not been manufactured for military use. Be smart and use only military approved heat sources.

Charge It!

Electricity is an integral part of our everyday work operations. Often, we take it for granted. What you may not know is that 1 in 7 reported electrical shocks kill!

■ A soldier was installing an aerial cable link on a utility pole that also held a high-voltage transformer. The conditions were wet and rainy and the soldier slipped and contacted the energized transformer conductors. He was severely shocked and burned as a result of this inadvertent contact.

■ The unit was occupying a position when a soldier was given the task to jump the generator off the M577 to supply internal power. Due to bad weather and faulty equipment, the soldier was injured from electrical shock.

Electricity can be dangerous. Severe injury or death can result when any part of the human body comes in contact with live electrical circuits. Because electricity and electrical equipment of all types are so common, the risk of electrical injury is usually underestimated. The severity of injury with electrical shock depends on the amount of current, the frequency of the current measured in Hertz (Hz), the type of current (AC or DC), the duration of the current, and the path through the body that the current travels.

What is interesting is that the amount of electricity needed to cause an injury can be quite small. As little as 1 milliamp (mA) will be felt, 9 mA can cause pain, 23 mA can cause painful muscle contractions, and 30 mA in children and 60-100 mA in adults can cause ventricular fibrillation—a condition where the large chambers of the heart beat rapidly and with insufficient synchronization with the atria (small chambers of the heart) to pump blood effectively. Unless fibrillation is reversed, this can cause death quite quickly.

By way of showing how small these amperages are, a 100-watt light bulb can draw about 900 mA, a computer monitor 1500 mA, and a 15-amp circuit breaker will trip at 15,000 mA. Another interesting observation is that common current in the U.S. is 60 Hz, in most of the rest of the world, 50 Hz. These also happen to be the frequencies at which the nerves in the body operate; therefore, electricity at these frequencies is more dangerous than much higher frequencies. In fact, some surgical instruments operate at up to 100,000 Hz, and this electricity passes harmlessly through the body. AC current is more dangerous than DC, and the longer a current is applied, the more likely there is to be an injury.

The path that the current takes is very important. Current that travels through the chest or nerve centers that control breathing can stop the normal breathing cycle and result in suffocation. As has been mentioned, current through the chest or heart can lead to ventricular fibrillation. Current that has passed through the head can lead to visual problems, and any current anywhere can cause severe burns to the skin as well as underlying tissue such as muscle. Something not always considered is that even mild, non-lethal shocks can lead to potentially lethal secondary accidents such as falling from a ladder.

Major causes of electrical shock

■ Contact with a bare wire carrying current.

■ Working with faulty electrical equipment.

■ Electrical equipment that has not been properly grounded.

■ Working with electrical equipment on damp surfaces.

■ Static electricity discharge.

■ Using metal ladders to work on electrical equipment. A metal ladder can provide a direct line from the power source to the ground.

■ Working on electrical equipment without shutting off the power.

■ Lightning strikes – static charges from clouds following the path of least resistance to the earth, involving very high voltage and current.

Reducing electrical hazards

Grounding of electrical equipment is the primary method of reducing electrical hazards. The purpose of grounding is to protect people from electrical shocks, reduce the probability of a fire, and protect the equipment from damage.

Grounding ensures a path to the earth for the flow of excess current.

Grounding also eliminates the possibility of a person being shocked by contact with a charged capacitor. Equipment such as communication receivers and transmitters, portable electric tools, electric equipment in damp locations, television antenna towers, electric equipment in flammable storage areas, and electric equipment operated with over 150 volts must be grounded.

Bonding, connecting two pieces of equipment by a conductor, equalizes any potential for static or sparking. Bonding also allows for a low resistance path to the ground. On the other hand, grounding provides a conducting path between the equipment and the earth. Bonding and grounding together are used for electrical systems.

Points to remember... Your life may be at stake!

■ Field Manual 10-67-1, Concepts and Equipment of Petroleum Operations, requires bonding and grounding during aircraft refueling. The field manual also outlines the requirements for POL storage and handling procedures. POL vehicles must be bonded and grounded at field locations.

■ Technical Bulletin 385-4, Safety Requirements for Maintenance of Electrical and Electronic Equipment, reminds us that all facilities that are used for charging of batteries must be well-ventilated and equipped with an emergency eye wash and shower that is readily accessible. Furthermore, maintenance areas that have exposed voltages exceeding 500 volts will be posted with red, white and black DANGER signs.

■ When working with live electrical circuits, make sure that at least two people are in the area at all times. Before starting work on live circuits, remove all exposed metal objects from your body; i.e., bracelets, rings, watches, dog tags, etc. Also be alert to the position of your hands, feet and body when working on energized circuit boards, power cables, transmitter output terminals, transmission lines, antennas, or any other kind of live circuit. Many electrical shock accidents during maintenance occur when one of the technician's hands contacts a live (hot) circuit while the other hand is touching a grounded conductor, such as chassis.

■ Never put your hand on or near a capacitor or capacitor bank or any wire attached to a capacitor unless all capacitors are grounded and a shorting bar or grounding stick is in place.

■ When working with live antennas and other sources of energy, avoid contact with surrounding metal objects, such as railings, inactive antennas, equipment shelter walls, vehicles, aircraft, etc. If possible, ground all such objects that have not been grounded.

■ Only trained personnel should install electrical wiring and equipment. Circuit breakers and fuses will not be bypassed or replaced with circuit breakers and fuses having higher amperage. The current should be turned off until trained personnel correct faults in electrical wiring [for example, blown fuses, exposed conductors, overheating, repeated tripping of the circuit breaker, short circuits].

■ Use tools for their intended purpose. Do not use power tools with frayed electrical cords or without proper grounding.

■ Electrical generators and equipment must be grounded and positioned away from sleeping areas and tents. The Surface Wire Grounding System [Grounding Kit, MK-2551A/U, NSN 5820-01-263-1760] is an alternative grounding system designed for use with systems requiring high mobility and quick installation and teardown operational scenarios.

If you are working with or around electrical equipment, ensure that you have received first-aid and CPR training. Someone's life may depend on you!

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Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

Investigators' Forum

Do It By The Book

We usually do our maintenance by the book, but what happens when the book isn't current? We have the best technicians in the world, but if we make repairs using outdated manuals that are missing changes, the results can be as bad as doing incorrect maintenance. So, who bears responsibility? Read on!

A unit had recently received a heavy expanded mobility tactical truck (HEMTT) from a rebuild program. The squad leader, after a quick inspection, decided two tires needed to be replaced. Unit maintenance personnel agreed with the decision and the squad leader made plans to change the tires the next day.

The squad members reported to the motor pool and began changing the tires. The rear left tire was disassembled and taken to the tire cage and inflated. The crew then returned the tire to the vehicle and completed the remounting procedure.

While completing the installation of the left tire, members of the squad began the removal and disassemble of the right rear tire. The crew used the old tube, boot and slip ring, but replaced the locking ring because it was warped. After the reassembly of the tire, the squad leader noticed that the lock ring gap was not 180 degrees from the valve stem and directed the lock ring be repositioned. The crew did this, rolled the tire to the cage, inflated the tire, and rolled it back to the vehicle. They lifted the tire about five inches on the first attempt to mount the tire, but the holes would not align with the lugs on the hub. During the second attempt, the tire exploded, propelling the tire away from the chassis of the vehicle, and fatally injuring one soldier.

What went wrong?

The unit did not have Change 5 to TM 9-2320-279-10-1 and had not made the pen and ink changes as directed by TACOM Ground Precautionary Message (GPM) Control Number 00-002, dated R211626Z

Oct 99, subject: Tire Inflation / Deflation Procedures, Wheel Assembly Inspection Procedures, Serviceability Criteria, and New Pressures for the HEMTT Wheel Assembly. This GPM detailed specific procedures for operators and directed that maintenance personnel conduct the required training for operators.

Additionally, the unit did not receive TACOM GPM Control Number 00-003, dated R211645Z Oct 99, subject: Mechanics Inflation / Deflation Procedures, Wheel Assembly Inspection Procedures, Serviceability Criteria for the HEMTT Wheel Assembly. This message directed that mechanics be trained on the latest procedures noted in the GPM and make pen and ink changes to the -20.

The crew did not have the required technical manuals available while they changed the tires. Incidentally, the TM states that the mechanics are to disassemble and reassemble split rim tires, not the operators.

Bottom Line

Changing any type of multi-piece rim is dangerous business. Leaders must ensure that soldiers have the most current technical manuals and changes on hand; that means they are on site, open, and soldiers are conducting the mission step-by-step. Leaders must also read all message traffic thoroughly and implement changes as soon as possible. If leaders had taken the prudent steps to ensure manuals were up to date, on hand, and the right people assembled the tire properly, this accident would not have happened. The Army goes to great lengths to ensure maintenance procedures are updated and current technical manuals are available for soldiers to use while performing day-to-day preventive maintenance checks and services (PMCS) and organizational-level maintenance. Let's do it by the book!

If leaders had taken the prudent steps to ensure manuals were up to date, on hand, and the right people assembled the tire properly, this accident would not have happened.

USASC Ground Systems and Accident Investigation Division, DSN 558-3562 (334-255-3562)

Into the Flames

With the car and the woman on fire, the captain took a deep breath and thrust his hands and arms into the flames and pulled her out!

Ever wonder how well your fire-retardant gloves and flight suit would hold up in flames? One aircrew member recently found out firsthand.

Heroic actions by two Fairchild Air Force Base, WA, airmen helped save the life of a woman trapped in a burning car in Airway Heights recently, and one officer's uniform helped save him from injury.

CPT Steven Clark, a flight surgeon with the 92nd Aerial Refueling Squadron, and SSG Robert Jones, a 92nd Security Forces Squadron member on Individual Mobilization Augmentee duty, both came to the aid of a woman whose car was in flames after being rear-ended by a pickup truck. The force of the impact sent her car crashing into a school bus carrying students home. The bus driver and students were all uninjured.

"As I was leaving the base, I saw a car on fire next to a school bus in the westbound lane," Clark said. He stopped his car and asked kids exiting the bus if anyone else was inside. Although the kids said no, he climbed inside and checked to make sure. A passerby told him that there was a lady trapped in the car that had crashed into the bus. "I saw the fire, so I went over to the car," Clark said. "Sometime during all this I was putting my flight gloves on. I always keep my Nomex

gloves in my flight suit. I looked in the car. The driver was lying down with her head on the passenger side of the seat. She wasn't moving."

The windows were rolled up and the car was almost completely engulfed in flames coming from the trunk forward. I tried to open the door, but it wouldn't budge. Because he could see that her clothing was on fire, he kicked and shattered the window to reach her. He was given several fire extinguishers to try to put out the blaze.

Meanwhile SSG Jones had left the base and was driving back toward Airway Heights when he saw the scene of the accident.

"The car was completely in flames and I noticed one person there frantically working around the vehicle," Jones said. "So I pulled over, grabbed the first-aid kit that I keep in the car, and ran over to CPT Clark, who was spraying the fire extinguisher. He told me there was someone inside the vehicle, and we got another fire extinguisher, but it didn't do any good. The flames were too strong."

Jones took the empty fire extinguisher and used it to break the windshield just as the driver regained consciousness. Jones and Clark told her to move toward the windshield.

"I was yelling, 'Come on, come toward the window!'" Clark said. "She began lifting her head up toward the window. At that time, I grabbed her clothes and started pulling her out of the window."

Jones added that they were able to get a good enough hold on her to pull her out and over the hood, and then onto the ground near the car.

The victim's legs were still on fire when they got her out of the car. Jones put out the flames while Clark checked her airway, breathing, and circulation. The rescuers got blankets from other people at the scene and set to work reassuring the woman until the ambulance arrived.

Local media outlets later reported the woman sustained burns over 90 percent of her body. Recalling the accident scene, Clark said that the first thing he thought of was a head-on collision with the school bus by the orientation of the vehicles. That's why he instinctively jumped on the bus first and looked to see if there were any kids hurt.

Clark proudly showed his fire-retardant Nomex gloves. He had no burns on his hands, but there were burn marks on the gloves. "I put my hands into the flames and pulled her out. There's just no humanly way to get in there and pull her out without these gloves."

Clark said that he had seen results of wearing the gloves in certain types of aircraft accidents, but he was amazed that they did what they did. He also credited having a long-sleeved flight suit, which overlapped the gloves, when he reached into the flames.

The doctor suffered some smoke inhalation from the rescue, and Jones said his new "high and tight" haircut was the result of getting his hair singed from the extreme heat.

Clark said that he doesn't feel his actions were heroic, and that he did what needed to be done. "You see a car on fire, you see a person lying on the front seat and you don't really think, except, 'My God, there's somebody in there!'"

The only thing that Clark thought about was that he had his Nomex flight suit and gloves, and nobody else was getting near the car. Clark said, "I knew those would protect me to some extent."

Courtesy of Torch Magazine and the author CPT Lisa Neidinger of the 92nd Air Refueling Wing Public Affairs Office, Fairchild Air Force Base, WA

Survival of the Fittest

Running on Empty

This is the fourth article in a 5-part series of articles on physical training and their accident causes. This issue is dedicated to dehydration. The next issue will cover sports-related injuries.

As I lay on a cot with an IV-tube sticking in my arm, I racked my brain to remember if I had trained enough. I had, hadn't I? I had put in the weekly miles and the long, lonely runs necessary to successfully complete the 26-mile marathon. So, what went wrong?

I clearly remember my excitement and anticipation at the start of the race. The gun fired, the crowd cheered, the race was on! The weather conditions were mixed; the temperature was a welcome 49 degrees, but the wind was brutal—a 25-knot headwind for 13 of the first 20 miles. These conditions proved to be my downfall.

Water stations were placed every 2 to 3 miles. Trying to save time, I skipped the first water station, and then took a sip at every other one. The strong winds evaporated my perspiration almost immediately. (Late in the race, you could see the white salt caking the black T-shirts worn by other runners.) The wind and the cool temperatures fooled me into thinking I didn't need much water.

I was wrong! I was becoming dehydrated, but didn't know it. By mile 12, it was too late. I had drank about 8 ounces of water and was still running my target pace, but it was only a matter of time. I wasn't replacing the water as fast as I was losing it. By mile 15, I was working too hard to maintain my pace. I thought it was the head wind, but my body was already suffering the effects from lack of fluids. Mile 21 arrived, and I was ready to walk. All the water in the world wasn't going to help me finish the race at this point. My legs felt like telephone poles, my breathing was labored, and other runners were passing me left and right. This is not the feeling you want in a race (especially a marathon) where the expected fatigue takes on monumental proportions, even when you do everything right.

The few seconds I had saved by skipping water stops turned into precious minutes lost because I was walking instead of running. I was fortunate to finish the race. However, instead of watching the later runners finish, congratulating my training partners, and drinking free beverages, I had to spend an hour in the medical tent. I also incurred the wrath of my wife—who had been patiently waiting at the finish line with an increasingly fussy baby for 4 hours—all because I didn't drink enough water.

I learned a lot about the necessity of having water during this race. Everyone is aware of dehydration in hot weather, but it doesn't get a lot of attention on cool days. Since I didn't feel hot, sweaty, or thirsty, I let conditions overrule good judgment. I knew in my mind that I needed water, but my body said I didn't. The effects of dehydration can lead to a serious medical problem, such as heat exhaustion or stroke. If you wait until you're thirsty, it's too late.

This article was written by Bryan Davis, a computer systems analyst at the Naval Safety Center. Although it might seem from this story that he is a novice runner, he says he isn't. This was his fourth marathon, and he runs approximately 40 miles per week for most of the year. Reprinted with permission from Ashore.

Don't Use JP-8+100

Here's the latest word on JP-8+100 from the Army—don't use it. The Tank-Automotive Command Research, Development and Engineering Center (TARDEC), Aviation and Missile Command (AMCOM), and the U.S. Army Petroleum Center have completed an evaluation of the Air Force aviation fuel additive +100. The Department of the Army has issued a message maintaining a No Use Policy for the additive.

TARDEC has determined that the use of this additive in ground equipment can lead to a failure of filter/coalesce elements. Moreover, no practical test exists to determine the concentration level of +100 in JP-8. Consequently, all Army activities must protect their fuel from accidental +100 contamination.

While the use of the +100 additive is not detrimental to the performance, reliability or safety of aircraft, the negative consequences of its use in ground equipment necessitates continued adherence to a no-use policy. Many Army activities use JP-8 for both aviation and mobility purposes, and it is nearly impossible to detect the presence of the additive.

In the event of inadvertent JP-8+100 refueling, document and register the incident with the Petroleum Center with quantity of JP-8+100 received. This will allow them to identify and fix systemic problems.

An aircraft can operate with this additive without restriction and will be considered free of the additive after three refuelings with JP-8. If circumstances call for aircraft defueling, transfer the JP-8+100 into another aircraft. If this is not possible, the JP-8+100 must be disposed of in accordance with hazardous waste policies.

For ground equipment, defuel the JP-8+100 and treat it as hazardous waste. After defueling, consume one tank full of JP-8, then immediately replace filter/coalesce elements.

POC: Del Reese, U.S. Army Petroleum Center, DSN 977-8580 (717-770-8580), dleese@usapc-emh1.army.mil

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