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S E A R C H & R E S C U E M A G A Z I N E

Winter 1982/Spring 1983

Dennis Kelley, Publisher Kim Plummer, Editor

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HIKING ACCIDENT by Keith Cullom

On Tuesday, May 11, 1976 at 1533 hours the Santa Barbara County Fire Dept. executed a four rescue operation off Highway 101, approximately 15 miles north of Goleta, California and about two miles inland from the Pacific Ocean. Santa Barbara County Engine Co. 31 from the community of Buellton and Paramedic Rescue 11 from Goleta were dispatched to a report of an unconscious female trapped on a cliff. (E-31 had 2 men assigned, R-11 has 3 men; 2 are paramedics).

First on the scene

Upon arrival at the scene, Rescue 11 met with companion hikers and the accident location was determined to be two miles up into the Coastal Mountain Range in Canada De Guillermo, which is about 2 miles south of Gaviota. The crew from Rescue 11 pulled off rescue equipment from their vehicle and began the long 2 mile hike up to the scene of the accident. (Tools included; Strokes litter, life lines, pomier life belts, drug box, trauma box, and communications gear). Shortly after the Rescue crew began their hike in, Engine 31 arrived at the scene. One of the two men assigned to the Engine Company stayed with the vehicles to handle communications from the scene and the second man began to hike into the canyon. There was no defined trail leading up the canyon and the firefighters cut their way through thick brush and poison oak as well as work in the high temperature encountered in the canyon. The County Firefighters were joined by two ambulance company paramedics during the rescue operation.

Fatal fall

When the firefighters reached the scene of the accident it was determined that the fall had been fatal to the 17 year old victim who was hiking with two companions. Due to the distance from the highway and the high canyon walls, radio communications from the accident scene to the vehicles parked on the highway was impossible. Because of the length of time that the operation had taken up to this point and the knowledge of the area involved, the Engineer who remained back with the vehicles requested that the Fire Dispatch Center send an additional Engine Company to the scene. Engine Co. 14 (3 men) was dispatched from Goleta to the rescue scene for manpower at 1704 hours.

Upon arrival at the scene, the three men from Engine 14 and the Engineer from Engine 31 began to hike into the scene. At this point the Battalion Chief at the scene remained at the mouth of the canyon and handled radio communications. The additional manpower joined the original seven rescuers as they were about 1/2 of the way out of the canyon carrying the victim of the fall in a stokes litter. The rescue operation was completed at 1933 hours. Engine 14 and Rescue 11 firefighters were treated at Goleta Valley hospital for minor injuries

including contact with poison oak, wood-ticks, and cuts and scratches. All of the firefighters taking part in the rescue operation received these injuries to one degree or another.

Santa Barbara County Fire Fighters Involved In The Rescue Operation:

Captains	Paramedics & Engineers	Companies
Dan Gaither	Art Franson	Rescue 11
Stan Spring	Dan Hamilton (Eng.)	Engine Co. 31
Ralph DeVane	Mike Buck (Eng.)	Engine Co. 14

Jim Petersen (F.F.)

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CLOTHING AGAINST HAZARDS by Robin Burton

During the last few years there has been much greater awareness of the need for suitable clothing to provide not only protection against cold but also against equally dangerous hazards such as fire or exposure to chemicals. Furthermore, many buyers are realizing that there are now various materials on the market which will do several jobs at once and have a lot of research effort devoted to their remarkable performances.

Wool is unique

Wool is one of these materials. It has unique natural properties which have long made it a useful material in mines for example, and fishermen have traditionally worn heavy woollen sweaters in areas where cold is a constant problem such as off Norway and in North Sea. It has also been used as protection against heat in iron foundries because of its insulation properties and it is the ability to absorb moisture, resist fire and insulate that has been the subject of intensive research at the research center run by the International Wool Secretariat.

Much industrial clothing does not have to be of specially high performance or outstandingly durable but there are several situations such as aboard an oil rig in winter or rescue attempts where comfort, durability, warmth and even fire safety are of paramount importance and this is where wool now has much more to offer.

Improve wool shrinkage

As a result of the IWS research the natural flame resistance of wool has now been much enhanced. It is now possible to make wool garments highly resistant to staining and soiling and they can be shrink proofed so that they can be washed commercially.

Furthermore, and most important, it has been made possible to add and electricity conducting capacity to wool yarn which not only enhances natural resistance to the build-up of static electricity to the point that garments can be almost totally anti-static but also enables clothing to be made which will protect the wearer when he is working on high voltage power lines.

There are now five main types of wool protective cloth on the international

market or developed to the point where they could be commercially exploited. They are a flame-resistant wool gaberdine for general work conditions. A wool-glass blend for protection against flame. A very heavy felted wool for prolonged exposure to intense heat. Wool-steel blends where high static control and possibly and electricity conducting capacity is needed, and a single-jersey pile fabric for gloves and inner garments in clothing systems designed to combat cold.

In almost all cases the cloths, and garments made from them, can be made fully machine-washable and dirt-resistant. This resistance also makes the cloth showerproof.

Protection when it counts

Some idea of the effectiveness of these cloths can be gained from the fact that in one case a worker wearing a wool gaberdine suit who was splashed with eight pounds of molten copper received only minor burns. It is not however only in high-risk situations that the wool gaberdine has its uses for it is now sold at a price comparable with that of flame-resistant cotton.

The wool-glass blend is already widely used by racing drivers and consists of 85% flame-treated pure wool and 15% fiberglass. It will only char under really intense heat such as that from a flaming petrol bath and is normally used as an outer layer with pure wool beneath for extra insulation. It is so effective that a blowtorch can be played directly onto a glove for more than half a minute without the hand inside getting more than warm. It would obviously be a most useful material for use in rescues from blazing aircraft or installations where fire spreads rapidly.

Quite recently the International Wool Secretariat developed a variation of the glass-blend fabric with an aluminum backing to reflect heat and give extra protection to the wearer. This material is still under trial and while it is thought to be as effective as aluminized asbestos it is known to be more comfortable.

Two wool-steel garments have been developed and one of these, a blend of 75% wool and 25% stainless steel is being considered for use as a Faraday cage garment to protect men working with high voltage electricity lines. The other version, containing only 1% stainless steel, is highly antistatic and this has fairly obvious implications in situations where men may have to work on oil tanks for example.

The biggest and most obvious use for wool of course is to keep people warm and oil rig workers, seamen, divers and survivors need warm, light and comfortable clothing to protect them from sometimes exceedingly hostile environments.

Wool fur

Wool technologists have developed pile fabrics of wool 'fur' for use as linings to underwater suits giving warmer and more moisture absorbent characteristics than synthetic alternatives. It is even thought that one company will produce a wool-steel blend for use under an electric heating element to ensure a diver's safety if the heater element was damaged.

The use of wool pile in gloves is also being looked into and it seems fair to say that wool is going to come into its own within the next few years. Especially as statistics show that increasing price competitiveness has boosted its share of total world fiber production to a considerable extent over the last

few years.

It seems then that the versatility of wool has been greatly improved but this does not mean that the ordinary woollen sweater has gone overboard in favor of newer and more expensive materials. This particular garment sometimes has one weakness though- it is not particularly resistant to wind if not tightly woven- and this can be got over by wearing a loose fitting outer garment of cotton or synthetic. If this is done then there is increasing truth in the old advertising jingle.

When Jonah, deep inside the whale,
Seemed healthy, hearty, even hale,
The Whale said, visibly annoyed,
'But aren't you cold, in that damp void?'
Quoth Jonah, with a careless shrug,
'My woolly coat keeps me quite snug'
This only goes to prove the rule,
There is no substitute for wool!

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INHALATION REWARMING FOR THE HYPOTHERMIA VICTIM by Robert D. Chaney

In the mountainous region of the Pacific Northwest, a lost child, and over-due hiker, or a man over-board is an all too frequent occurrence. A lightly-clad individual exposed to the cold, wet, weather or immersed in the 42 degrees F. water is a prime candidate for hypothermia, more commonly referred to as "exposure". Realizing the potentially fatal outcome of this condition, two U.S. Navy physicians at NRMC, Bremerton, Washington, have joined forces with a Port Angeles, Washington, U.S. Coast Guard flight surgeon to develop a method of rewarming that could be administered at the scene of the rescue as well as during evacuation to the hospital.

As a result of this joint U.S. Navy-Coast Guard endeavor, a new device has been developed and has been shown to be of real practical value in rewarming the victim of hypothermia. This device supplies heat to the body "core" by presenting warm, humidified oxygen to the patient for inhalation. The result is the transfer of heat across the large airways to the circulation for delivery to the heart and brain of the hypothermia victim. Since hypothermia has been shown to cause death by ventricular fibrillation in man, this technique should be of significant value in preventing this fatal arrythmia in the cold, slowly beating heart, by supplying heat and oxygen to the myocardium at a time when the heart is most susceptible to ectopic foci, is a fact, limited to this vital area. Recent work has demonstrated that the "hot-spot" in the vascular system is at the point of entry of the azygos vein into the superior vena cava. This suggests that the heat is not being transferred through the pulmonary circulation as might be supposed, but in fact, returns to the heart through the bronchial circulation.

After-drop can get you

One salient feature of external rewarming has to do with the phenomenon of "after-drop". After-drop is the continued downward progression of the core temperature after the victim has been removed from the cold stress. This

actually is the result of vaso-dilation in the cold "shell" followed by continued flow of colder blood from the shell back to the heart. After-drop is greatest following rapid cooling. It would follow then, that if heat were applied to the surface, such as in a warm water bath, vasodilation in the shell could result in large volumes of surface blood gaining heat from the surface, only to be cooled again as it passes through colder, deeper vessels enroute to the heart. This in turn could result in an increased amount of cold blood arriving at the cold-sensitive heart producing a relative overload. This superimposes the threat of cardiac decompensation upon a heart already in jeopardy of cold-induced ventricular fibrillation. A further hazard to the heart, particularly severe un the result of intense peripheral vasodilation releasing previously sequestered blood and acid metabolites, predisposing to "rewarming shock". Secondly, acidosis is known to precipitate ventricular fibrillation. Since core rewarming does not cause peripheral vasodilation, these complications of surface rewarming are not seen.

Inhalation rewarming is not new

The principle of inhalation rewarming is not a new concept. The first such apparatus was developed by a Scots physician named Lloyd. His device consisted of a soda-lima cannister previously charged with CO2, through which was passed a stream of oxygen. This resulted in heating the oxygen which was subsequently inhaled by the patient. This relied on the reaction of CO2 in soda-lime to produce heat and humidity. This was successfully employed several times and a unit similar to the original model is available commercially. However, the humidity and temperature is impossible to regulate. Further modification of the current NRMC, Bremerton device is planned to include a rechargeable battery pack. Either device could be easily used with either oxygen or compressed air. The only requirement is a flow meter to regulate liters per minute through the device. This is necessary because the inhalation requirement varies with various stages of hypothermia.

Some authorities have classified the victim's degree of hypothermia according to his level of consciousness and his ability to ventilate. As hypothermia deepens, respirations become more labored and acidosis is increased which may also precipitate ventricular fibrillation. The inhalation rewarming device described here has the built-in feature of assisted respiration, should this become necessary. It is important to note that most research regarding hypothermia has and experimental animals. Hence, a well-ventilated laboratory animal cannot necessarily be compared to a poorly ventilated, exhausted, struggling, cold water immersion victim as to rate and depth of respirations, carbon dioxide elimination and oxygen requirements.

Stagnant anoxia

A great deal of work has been done to determine the capacity of the coronary vessels to extract sufficient oxygen from the decreased coronary flow coincident with decreasing temperatures. Some experimenters state that in dogs, despite the decreased coronary flow, the heart is still able to sustain an ample blood supply due to the proportionally greater decrease in cardiac work. Again this depends on many factors which may not be similar in a fatigued, struggling, near-drowning human. It is also important to note that in anesthetized man, that prolonged hypothermia may produce stagnant anoxia. Due to the fact that the coronary A-V oxygen difference remains constant to a temperature of 20 degrees C., it has been stated that the body does not suffer an oxygen debt. However, Brooks points out that it is still possible that the oxygen requirements at the cellular level may exceed the reduced uptake of oxygen. It is further postulated that although the body as a whole may not suffer and

oxygen debt, specific organs may well become hypoxic. Recently, due to the increased utilization of oxygen by the tissues during rewarming, some investigators have encouraged the use of oxygen during rewarming. For these reasons, oxygen was used in this study.

The heart rate increases

Hypothermia's effect on the heart has been widely studied. In an excellent review article, Little make the following observations: initially, and increase in pulse and blood pressure are seen. As hypothermia deepens, a progressive bradycardia occurs. This reaches 40 beats per minute in the dog at 25 degrees C. and 15-30 beats per minute at 18-21 degrees C. This bradycardia is the result of the direct effect of the cold on the sinus pacemaker and is not affected by atropine or vagotomy. What is even more important than the change in heart rate is the disturbance in heart rhythm which occurs with hypothermia. These changes consist of prolongation of the P-R interval, lengthening of the ORS complex, and increase in duration of the O-T interval. These delays in intra-ventricular conduction times are almost always directly related to the temperature, and produce marked lengthening of both electrical and mechanical systole. In addition, the S-T segment may become elevated or depressed. The T-wave may become diphasic, then deeply and bizarrely inverted as the temperature approaches 20 degrees C. These latter changes have been compared with ECG changes seen in myocardial anoxia.

Horvath has suggested that not only is there a difference in temperatures in the various areas of the my ocardium, but that the right ventricular mural temperature falls more rapidly than the left. Since this is the anatomic location of the subendocardial conduction system, he believes this may be the triggering mechanism for ventricular fibrillation. This fall in temperature on the right side of the heart is the direct result of cold systemic blood returning to this chamber. The principle of inhalation rewarming has been shown to return warmed blood to the right side of the heart through the bronchial circulation thereby preventing this intra-ventricular thermal imbalance. Hence, this is the mechanism of action expected with inhalation rewarming in preventing ventricular fibrillation.

In summary, the inhalation rewarming apparatus offers a portable first aid treatment to the victim of accidental hypothermia which can be used at the scene as well as during evacuation to prevent further heat loss and aid in rewarming.

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LET IT BE SAID by Dennis Kelley, Publisher

In October 1982 I had to put Search & Rescue Magazine on hold because of sever funding and attitude problems. Not only was money an issue but I personally lost interest in SAR. At that time I tried unsuccessfully to sell Search & Rescue Magazine in the then dramatically down economy.

Now, 5 months later facing the reality of economic recovery, I am again putting Search & Rescue Magazine in your hands. Until financial support comes forth, I sincerely hope you all will be patient with this struggle. Wish me well!