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REPORT NO T 27/76

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**A STUDY OF INITIAL TREATMENT AND EVACUATION OF  
SIMULATED CASUALTIES IN A COLD WEATHER ENVIRONMENT**

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**U S ARMY RESEARCH INSTITUTE  
OF  
ENVIRONMENTAL MEDICINE  
Natick, Massachusetts**

**FEBRUARY 1976**

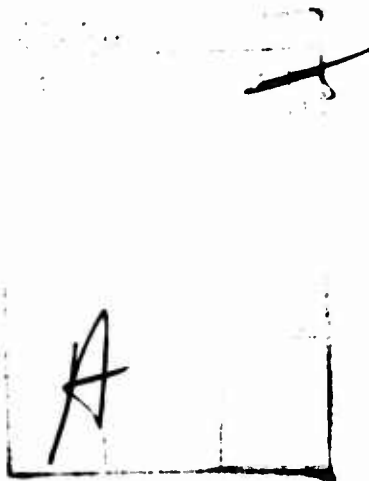
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**UNITED STATES ARMY  
MEDICAL RESEARCH & DEVELOPMENT COMMAND**

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20. Abstract Continued

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**TECHNICAL REPORT**

**NO. T 27/76**

**A STUDY OF INITIAL TREATMENT AND EVACUATION OF SIMULATED  
CASUALTIES IN A COLD WEATHER ENVIRONMENT**

by

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**US Army Research Institute of Environmental Medicine**

**Natick, Massachusetts**

## **ABSTRACT**

A scenario was designed to test present medical doctrine, training, force structure and equipment for initial treatment and evacuation of wounded personnel in cold weather regions.

A platoon size unit, experienced in cold weather operations, was deployed on a combat mission in Alaska without prior knowledge of the scenario. An observation team from the United States Army Research Institute of Environmental Medicine intercepted this unit and tasked them with treatment and evacuation of five simulated casualties. It was assumed that adverse weather conditions and enemy hand-held SAMS precluded air evacuation. Thirty-six inches of snow cover prevented mechanized transportation until an access road was attained three kilometers away.

Observations from this exercise led to the conclusion that present medical doctrine, training, force structure and equipment are totally inadequate for initial treatment and evacuation of wounded in cold weather regions. Application of the present approach would result in disaster in a wartime situation. It is recommended that appropriate agencies reconsider all medical aspects of cold weather operations.

## INTRODUCTION

Historically, cold injury has had a major impact on military operations:

1. Total allied casualties in World War I, World War II, and Korea exceeded one million cases (1,2).
2. In World War II, U.S. forces alone lost seven and one-half million man days due to cold injury (1).
3. In Korea, U.S. forces lost 850,000 man-days with 6,000 cases evacuated due to cold injury (2).
4. Cold injuries in Korea accounted for 10% of all casualties, a figure similar to that caused by malaria in Vietnam (3).
5. The USSR reports that 16-25% of all injuries in wartime have been due to frostbite (4).

Personal communication with such cold weather experts as LTC William Doolittle, MC (Retired), Admiral William Mills, MC (Retired), COL LeeRoy G. Jones, MC, LTC Wayne O. Evans, MSC, and CPT Murray Hamlet, VC, verify that cold weather will continue to have a devastating impact on medical operations. According to them, unless new means are devised to overcome existing deficiencies related to the exacerbating effects of cold on trauma, shock, medical treatment and evacuation, the lessons of history will continue to go unheeded.

Evidence that medical treatment and evacuation are deficient are substantiated by the following facts:

1. Present training of AMEDD personnel in cold weather problems is a negligible percent of their total training time\* (5).
2. The only doctrinal modifications for evacuation of the wounded are totally without an appreciation of the problem if aircraft cannot be used due to the presence of SAMS or to the common occurrence of bad weather.
3. Air evacuation is not possible due to adverse weather conditions approximately 25% of the time. (Appendix 10).
4. There is no wheeled field ambulance that can negotiate more than 12" snow cover (6).

\*91B10 medical training currently has only a 2-hour block of instructions on the treatment of cold injuries.

5. There is no tracked vehicle that can negotiate more than 29" of snow cover (6).

6. The only special medical equipment for cold weather are the Litter Kit Ski Sled and the evacuation bag. The problems of maintaining and administering liquid medication and IV solution have not been fully addressed (7).

7. No force structure modifications have been proposed for cold weather in face of the requirement of 4-5 men needed to evacuate one casualty by achiio.



## METHOD

### A. Assumptions of the exercise:

1. Employment of experienced cold weather troops in order to obtain a fair assessment of existing problems.
2. Area of operation would include terrain features typical of northern operations.
3. Involved troops would have no advanced warning of the nature of the exercise.
4. Full TOE for actual combat mission would be employed by participating personnel.
5. An impartial seasoned infantry officer would be a member of the observation team in order to document the realistic nature of the exercise.
6. Foul weather and enemy hand-held SAMS would preclude air evacuation.
7. Thirty-six inch snow cover would prevent mechanized ground transportation until an access road is attained.

### B. Plan of Operation:

To deploy a medical observation team from USARIEM on 11 January 1976 to Alaska to evaluate medical procedures surrounding the treatment and evacuation of wounded soldiers in one platoon with its medical complement. The above platoon will be deployed to a predesignated point 2-3 kilometers from the nearest access road. Their objective will be a routine reconnaissance of an area with known enemy concentrations. Without the platoon's prior knowledge, the USARIEM observation team will make physical contact with them via helicopter. Prepared casualty cards will be assigned to each of five simulated casualties. The type of casualties will be those expected due to one mortar round. The medical aidman will be instructed to initiate emergency treatment and then to proceed with evacuation to their battalion aid station. The only forewarning the aid station will have is through radio communications from the platoon. Once the casualties reach an access road, transportation to the battalion aid station may be by field ambulance. Termination of the exercise will occur when casualties have received additional treatment at the aid station prior to further evacuation. It is assumed that adverse weather and enemy hand-held SAMS preclude air evacuation. Also, thirty-six inches of snow precluded surface evacuation via motorized vehicles until the access road has been reached.

## RESULTS

The temperature on the morning of 16 January 1976 was -15°F. In the course of the day it rose to 7°F at 1300 hours and fell to 0°F by 1400 hours. Under broken cloud cover the sun appeared over the top of the Alaska range at 1000 hours and set at 1400 hours. Wind varied from virtually non-existent in the dense forest to 5 mph with gusts to 15 mph on the wind swept tundra ponds. Snow depths ranged from 0-2 inches on the frozen lakes to 12 inches in the tree line, to 2-21 inches on the tundra flats. Snow crust varied from 1/4-2 inches. (These relatively moderate weather conditions are characteristic of those prevalent in northern Europe or Korea). At 0830 hours, a mortar platoon of experienced arctic soldiers from the 172nd Infantry Brigade at Ft. Richardson, Alaska, departed simulated pump station #8 located approximately ten minutes flying time by UH-1 from Ft. Greely, Alaska for a pre-designated LZ three kilometers from the nearest access road. They were air lifted via CH-47 Army aircraft with a complement of 25 men, together with their life support equipment which included three 10-man arctic tents, stoves, fuel, rations, personal gear, snowshoes, individual weapons, 81 mm mortars and three achkios.

They arrived at their LZ at 0845 hours and were in the process of erecting an arctic tent when the members of the observation team landed at 0910 hours. Accompanying the team was a seasoned arctic infantry platoon leader, 1st lieutenant, from the 172nd Infantry Brigade. The mortar platoon leader was immediately briefed as to the nature of the scenario prior to the members of the observation team randomly assigning their respective simulated casualties. (Appendix 1).

With the commencement of the exercise at 0915 hours, the wounded fell to the snow covered ground. During the course of the next hour the platoon's medic moved from patient to patient rendering what immediate first aid he could from the supplies available in his M-3A medical kit. (Appendix 9). There existed no IV capability or analgesic stronger than aspirin. It was necessary for the medic to remove his arctic handwear in the process of caring for the injured. Consequently, he periodically had to stop to rewarm his hands. By 1015 hours all five casualties had received their initial treatment and were in the arctic tent with the Yukon stove operational. (Appendixes 2-6).

During this time it took the mortar platoon leader 45 minutes to establish communications with his battalion CP via PRC-77 radio. According to him this was due to the "dead" areas scattered throughout the arctic. Upon receiving word that air evacuation was not possible, he elected to evacuate his five wounded by achko with 16 of his 20 healthy troops leaving 4 men behind. When he learned that three of the five casualties were now litter cases (Appendix 4), he elected to leave behind all of their life-support equipment except for their individual weapons, canteen and LCE minus butt pack and E tool, in order to accommodate the litter patients on his available achkios. The platoon sergeant decided to transport the wounded without the use of their snowshoes because of the apparent minimal snow cover in the local area.

At 1030 hours, the evacuation party departed with two men pulling and a third guiding each achkio from behind. Litter patients were transported in double arctic sleeping bags since no evacuation bags were available. It took the platoon ten minutes to cross a frozen lake adjacent to their LZ before progress was drastically slowed due to a dense scrub spruce forest. Once in the woods, it required an ax-swinging soldier to clear a trail through 12 inches of snow. It was self-evident at this point that neither cross-country skis nor snowshoes would have been feasible for movement through the thick brush even with someone clearing a trail.

At 1045 hours the soldier with the right shoulder wound became the fourth litter patient. (Appendix 5). The decision was made to continue the evacuation by stacking the latest litter case on top of the patient with the fractured mandible. After thirty minutes it was apparent that it would be impossible to continue in this fashion. The patient on the bottom could no longer tolerate the additional weight above him; the injured soldier on top kept falling off, besides being unable to tolerate the cold; and the three litter bearers maneuvering the achko were rapidly becoming exhausted. At 1115 hours the chest patient was declared dead which made it possible to place the shoulder wound patient on the now vacated achkio. (Appendix 3).

By 1200 hours the platoon, still located in the forest, required a ten minute rest. During this time it was necessary to exchange one of the litter patients with a litter bearer because his feet were too cold despite the fact that he was positioned inside of a standard double arctic sleeping bag with his VB boots. Another litter patient needed to urinate. This was only solved by his being completely extracted from his sleeping bag.

Thirst was visibly apparent in the men around 1115 hours, but because all of their arctic canteens contained frozen water they resorted to eating snow. By the time the platoon exited the woods at 1220 hours, the litter bearers were literally soaking wet despite frequent changes in personnel. With perspiration running off their faces, several of the men fell to their knees and covered their faces with snow in an effort to cool off. At this point, another rest period was granted.

After proceeding across a second lake, a third rest period was taken at 1235 hours. Rapidly progressive exhaustion necessitated a fourth stop at 1300 hours. During these stops the aidman was observed moving among his troops passing out salt tablets.

From 1230 until 1320 hours the platoon spent their time crawling and stumbling through the tundra, falling off stumps into knee deep snow. By 1320 hours, with the platoon physically expended, hungry and thirsty, a fifth rest was ordered. Because of the rapidly deteriorating situation and ever growing darkness, permission had been granted to radio for a tracked vehicle evacuation approximately one hour earlier. After spending twenty minutes unthawing the carburetor, the M-116 tracked vehicle was able to negotiate the tundra flats without bottoming out, only because of the unusual scanty amount of snow and arrived at the platoon's location at 1330 hours. Prior to it's arrival, a second simulated casualty requested

he be allowed to get up and walk around because of cold feet. It was also at this time that the patient with the fractured leg was declared dead. (Appendix 2). The wounded troops were placed into the back of the M-116 and the remaining 16 men dragged themselves to the access road, after having covered only 2½ kilometers in the course of their planned evacuation.

The casualties were transported approximately 8.5 kilometers to the battalion aid station arriving at 1350 hours. The aid station consisted of two GP small tents positioned together. Present were the Medical Platoon Leader (3506), physician's assistant (911A), medical platoon sergeant (91B4) and a clinical specialist (91C). Equipment of note were sufficient dressings and bandages and a functioning resuscitation apparatus (ambu bag). No IV solutions were present (due to the freezing problem) and no form of traction splint was available.

**B. Summary of Time and Events:**

**1. Times**

- a. Entire exercise - 4 hours 35 minutes
- b. Initial treatment prior to evacuation - 1 hour 15 minutes
- c. Achkio evacuation - 3 hours
- d. Mechanized evacuation - 20 minutes

**2. Distances**

- a. Entire exercise - 11.0 kilometers
- b. Achkio evacuation - 2.5 kilometers
- c. Mechanized evacuation - 8.5 kilometers

**3. Terrain**

- 650 meters - 6° uphill, smooth incline, dense scrub spruce
- 650 meters - 6° downhill, smooth incline, dense scrub spruce
- 700 meters - Level ice
- 500 meters - Tundra

**4. Casualties**

- a. Chest wound - died at 1115 hours

(1) Cause - untreated shock and progressive hypothermia compounded by the prolonged time for evacuation.

**b. Fractured femur - died at 1320 hours**

(1) Cause - untreated shock and progressive hypothermia compounded by the prolonged time for evacuation.

**c. Fractured mandible (jaw)**

(1) Litter patient

Cause - respiratory compromise

(2) Frostbite of feet

Cause - inadequate evacuation bag and prolonged evacuation time.

**d. Shoulder injury**

(1) Litter patient

Cause - simulated morphine administration

(2) Frostbite of feet and shoulder wound

Cause - no other available evacuation bag and prolonged evacuation time.

**e. Face wound**

(1) Ambulatory (if morphine had been available, he would have been converted to litter status).

(2) Dehydrated

Cause - no available fluids

The obvious deductions to be drawn from these five simulated injuries are that under conditions of cold weather and with prolonged evacuation procedures, walking wounded are rapidly reduced to litter patients. In addition to inadequate first aid, litter patients are susceptible to death from hypothermia and frostbite; therefore, the evacuation procedure as described here is responsible for increased injury.

With more severe conditions of weather, terrain, enemy activity or with less experienced troops, it is not medically unreasonable to speculate that all five casualties may well have succumbed.

## CONCLUSIONS

Under existing conditions, in time of war, adequate initial treatment and ground evacuation of wounded personnel in cold regions is next to impossible without compromise of the primary mission and further deterioration of the injured. This statement is based on existing deficiencies in doctrine, training, force structure, initial treatment and evacuation. In no way does the above reflect on the performance of the unit involved in this exercise. In fact, they were better prepared than most units which could be tasked with a similar mission.

At present, most casualties in cold weather operations will die due to the inability of the medical support units to render initial treatment and to evacuate rapidly in a life sustaining environment. Further, the presence of casualties will require troop commanders to either leave their wounded to die or abort their mission. Only a massive reconsideration of the problems of cold weather medical operations can prevent a disaster in time of war.

## RECOMMENDATIONS

It is obvious that many of the subtle and some not so subtle deficiencies apparent during this exercise upon which these recommendations are based, would have been tremendously magnified had the temperature been in the minus 20 - 40°F range or had the weather and terrain been more adverse.

### a. Training

At present we have a negligible amount of training directed toward medical personnel who will be or who are now serving in cold weather areas. Present training programs for Cold Weather Operations should be expanded in the Basic and Advanced Training of medical personnel. This block of instructions should be presented to:

- (1) EM - MOS's 91B - 91C - 91D - 91Z - 91P
- (2) MSC - Basic and Career Course; this should also encompass operational problems of northern warfare.
- (3) MC - Individuals should be familiarized with all elements of the various types of cold injuries and their exacerbation of trauma.
- (4) ORT's for medical units operating in cold regions should be performed by experienced observers (not part of the exercise) without the unit's prior knowledge. The observers should report not only to the unit's commander, but also directly to The Surgeon General through technical reporting channels.

b. Doctrine

It is apparent at present, one of the important factors of medical effectiveness is the strategic location of the Battalion Aid Station and Division Clearing Stations. These medical facilities, when aircraft evacuation is not feasible, must be located near the FEBA to enhance timely evacuation of patients. Collection points should be immediately behind combat units. Collection points should provide a warmed environment in which initial treatment could be provided.

It might be presumed that rear to front evacuation would be advantageous when units operating under cold weather conditions have no other means of evacuation except by achkio/sled. Forward units should not be required to evacuate for distances in excess of 300m to 500m.

c. Force Structure

For a unit to continue its primary mission in cold weather regions without abandoning its wounded, it will be necessary to restructure the number of medical support personnel so that evacuation procedures may be performed without compromising the unit's mission or its wounded. Patients who are evacuated by achkio require a minimum of 3-4 persons to transport each wounded soldier. Consideration should be given to increase the number of support personnel for such purpose.

d. Equipment Recommendations

The following represent a few of the needed specialized items of equipment:

(1) Dedicated Field Ambulance

An environmentally controled, armored, tracked vehicle reliably capable of negotiating snow depths characteristic of cold weather regions would allow for ground evacuation of wounded personnel in a life sustaining environment. In any situation in which air evacuation is not possible such a life-sustaining armored, tracked ambulance would appear to be a necessity. The Yom Kippur War proved the need for such a vehicle in desert warfare.

(2) Insulated Medical Bag

Such a container would prevent cold soaking of life saving equipment and medication.

(3) Medical Vest

A vest worn under the parka, warmed by body heat, would allow the medic to carry and preserve vital liquid medications.

(4) Intravenous Administration Set

A cold resistant container to include tubing and needles which would permit administration of volume expanders without the aid of gravity would afford wounded necessary fluid replacement inside an evacuation bag.

(5) Treatment Evacuation Module

A lightweight unit which could be almost immediately available to extract the wounded from the cold environment and allow initial treatment would prevent the freezing of blood soaked garments and decrease the likelihood of shock and super-imposed cold injury.

(6) Heated Handwear

Manual dexterity is of utmost importance in rendering immediate first aid to the wounded without severe risk of cold injury to medical personnel.

(7) Heated Medical Chest

An easily hand transportable, continuous temperature controlled container would allow for storage of liquid medications.

(8) Portable Circulating Heated Water Bath

Such a system would allow for rapid rewarming of a frozen extremity prior to arrival at a definitive treatment facility, which in cold regions may be days.

(9) Low Reading Thermometer

It is important to be able to detect and monitor core temperature in the diagnosis and treatment of hypothermia.

(10) Splint Set

A cold resistant device fashioned from non-conducting material would eliminate risk of additional cold injury.

(11) Tape

A tape which does not become brittle or lose its adhesive properties when cold soaked would permit application of medical dressings.

(12) X-Ray Film

Film which does not sacrifice quality after being cold soaked would improve radiographic diagnosis.

(13) Analgesic

A non-sedating, non-depressing, non-hypothermogenic, potent analgesic would permit walking wounded to be relieved of pain without rendering them litter cases in a cold environment.



APPENDIX 1

SIMULATED CASUALTIES

1. Shrapnel wound to right thigh - medical aspect

Initial Problem

- (a) Fractured femur - simple
- (b) Lacerated femoral artery
- (c) Moderate blood loss
- (d) Litter patient

2. Shrapnel wound to left thorax

Initial Problem

- (a) Unconscious
- (b) Sucking chest wound
- (c) Progressive shock
- (d) Litter patient

3. Shrapnel wound to left cheek

Initial Problem

- (a) Fractured mandible (jaw)
- (b) Progressive swelling of tongue
- (c) Ambulatory (initially)

4. Shrapnel wound to right shoulder

Initial Problem

- (a) Unable to use arm
- (b) Mild blood loss
- (c) Ambulatory - initially

5. Shrapnel wound to face and eyes

Initial Problem

- (a) Loss of vision
- (b) Ambulatory

## APPENDIX 2

### EVACUATION OF SHRAPNEL WOUND TO RIGHT THIGH

- (a) Fractured femur - simple
- (b) Lacerated femoral artery
- (c) Moderate blood loss
- (d) Litter patient

January 16 - Simulated injury was inflicted on a member of the mortar platoon at 0915 hours. Injury was conceptualized as a fragment wound resulting in a simple femur fracture, femoral artery laceration and moderate bleeding.

Initial evaluation was made by medic at 0917 hours. Medic delegated responsibility for a splint and pressure bandage to a member of the mortar team and proceeded on to evaluate other wounded. By 0930 hours splints fashioned from spruce drift had been applied and bleeding staunched with the application of a pressure bandage. Material for bandages was obtained from individual aid pack (1 pressure bandage, 2 bandaids, 1 pack sulfa powder) and by sacrificing components of cold weather clothing. No analgesics or IV fluids were available. Considerable difficulty was encountered in wound assessment, balancing the need for direct visual wound inspection, and the need for minimizing cold exposure. The application of a pressure bandage to some extent compromises circulation, increasing the risk of cold injury to damaged limb.

By 1015 hours a tent was erected, Yukon stove lit, pine boughs placed on snow for insulation and patients moved inside where they were reevaluated by medic. Achkios were readied and patients placed on achkios within double mummy sleeping bags and evacuation began by 1030 hours.

Sixteen men of 25 member platoon were required to maneuver the three achkios of wounded. The trip was extremely exhausting for litter bearers: (a) In the pine brush, because the achkio continuously needed to be lifted and maneuvered around and over pine trees; (b) In the tundra the achkio slid nicely but the bearers were constantly tripping and falling knee deep into holes hidden in the snow.

The patient was considered to have died in shock at 1320 hours from blood and fluid loss, hypothermia and continuous trauma inherent in achkio transfer. The clinical status was aggravated by lack of IV or means to administer IVs; incapacity to reevaluate and repack wound once in the bags and on achkio; no means of replacing blood; soaked, frozen shredded clothing; no analgesics; prolonged transit time. Under these conditions, with good weather, good terrain, a short distance to cover (3.0 kilometers), and excellent navigation (and therefore no lost time in wandering), the patient in my judgment still would have died from a treatable wound due to evacuation time and the problems mentioned above.

#### OBSERVER

Military M.D. stationed at  
US Army Research Institute of Environmental  
Medicine, Natick, MA - 3 years  
Wintered over in Antarctica

### APPENDIX 3

#### EVACUATION OF SHRAPNEL WOUND TO LEFT THORAX

- (a) Unconscious
- (b) Sucking chest wound
- (c) Shock
- (d) Litter

Casualty was imposed at 0915 hours, 16 January 1976. Medic first saw patient at 0925 hours. Only medical supplies available were in the medic's M-3A bag. As the medic removed clothing from the patient, he complained of being cold. Also, medic had to stop to warm his hands. Only ½-inch paper tape was available to secure 4x4 wound area. The tape was brittle and it's container cold. It was difficult for medic to handle. After the bandage was placed, the patient was left in the snow. At 0945 hours, two men placed the patient in a sleeping bag and then onto an achkio and covered with the canvas. At 0945 the achkio was placed into the arctic tent. The patient remained warm with no complaints of being cold. During assessment, the clothing was not completely removed to adequately expose the wound. If clothing had been removed and blood on the skin exposed to air, the individual would have had an increased risk to frostbite. With no IV fluids available and with blood loss, this individual would have been more susceptible to hypothermia.

The achkios were adequate for traversing the terrain and the wounded were adequately secured to the achkio with rope. The outstanding feature of the evacuation was the fatigue and overheating of the individuals pulling the achkios. Interestingly, the medic passed out salt tablets to the bearers - and, of course, the water had frozen in their canteens. Therefore, although becoming dehydrated, they received a salt increase with no water. The sucking chest wound was determined dead at 1115 hours due to untreated shock and progressive hypothermia compounded by the prolonged evacuation time.

M-116 vehicle intercepted the patrol approximately 800m from objective OP30. Time of intercept was 1330 hours. From intercept to Battalion Aid Station 20 minutes arrival 1350 hours. However, M-116 was stopped at check point approximately 75m downhill from Battalion Aid Station. Patient had to be removed from M-116 and transported to Battalion Aid Station. Vehicle should have immediate access to Battalion Aid Station.

#### OBSERVER

Military M.D.; Flight Surgeon

Stationed at USA Research Institute

of Environmental Medicine, Natick, MA - 4 yrs

First-hand experience in winter operations  
in arctic

#### APPENDIX 4

##### EVACUATION OF SHRAPNEL WOUND TO LEFT CHEEK

- (a) Fractured mandible (jaw)
- (b) Progressive swelling of tongue
- (c) Ambulatory (initially)

0915 - Casualty inflicted.

0917 - Treatment applied by radio telephone operator while waiting for platoon medic. Sulfur powder, followed by field dressing, was applied to the entrance wound. These items were carried in his standard first aid pack.

0920 - First aid initiated by medic. Ability to breathe checked. Field dressing repositioned to immobilize broken jaw. There was no apparent difficulty in handling or positioning the bandage. However, within approximately an hour the bandage had loosened to the point where immobilization was ineffective. The medic stated that he had no morphine in his pack, only robaxin and aspirin for pain.

While the medic was attending to the other casualties and getting them moved into the tent, the other platoon members regularly checked on the patient's condition.

0935 - Patient began to have difficulty breathing and indicated this to others who called for the aidman. The aidman's medical pack contained an airway, but it was cold soaked. He was able to rapidly warm it in his hand so that it was placed by 0940 hours. The patient was able to breathe easily through the airway until 1155 hours when he had to get up and walk due to cold feet. There was a slight condensation but there was no problem with maintaining it's patency.

1000 - By this time one tent was erected and Yukon stove was in the process of being ignited. The casualties were moved into the tent. There was much confusion and congestion in the tent due to platoon members coming and going in order to warm up. These men were bumping and disturbing the casualties and interfering with the medic's performance. He stated that in a real exercise of this nature, another tent would have been erected for troops to warm up. Once all casualties were into the tent, the condition of the cheek wound patient was monitored regularly by the medic.

1010 - Patient was inserted into the achkio wrapped in canvas only, ready to be evacuated. Patient stated that he was slightly cold on his back where contact was made with the bare base of the achkio.

1015 - Patient was unwrapped, placed in a double sleeping bag and rewrapped in the canvas cover.

1045 - The shoulder wound casualty was no longer able to walk and was placed on top of the patient with the fractured mandible, but without any available means of keeping warm. Within a half an hour he had to get up and walk in order to keep warm. This situation would have probably been a severe hypothermia case in a real situation. In addition the added weight made it difficult for the man on the bottom to breathe. This would have severely compromised an individual with an artificial airway and already weakened by the wound.

1200 - The patient had to be replaced by another man due to cold feet, even though he was inside a double sleeping bag with vapor barrier boots still on. The platoon had no evacuation bags. The medic stated that the platoon had never had any.

1205 - The two litter bearers were changed due to exhaustion. The bearers suffered from dehydration because the water in all of their canteens had been frozen by approximately 0900 hours that morning. The medic passed out salt tablets to the litter bearers.

1330 - Casualties were picked up by M-116 carrier.

My casualty was debilitated and likely to have suffered from frostbite and hypothermia as a result of the lengthy evacuation time. The evacuation team members were exhausted, dehydrated, perspiration soaked, and without sleeping bags, tents, food or fresh water.

**OBSERVER**

**Military Research Veterinarian  
2 years experience at the Arctic Medical  
Research Lab, Ft. Wainwright, AK  
Presently stationed at the Naval Arctic  
Research Lab, Point Barrow, AK**

## APPENDIX 5

### EVACUATION OF SHRAPNEL WOUND TO RIGHT SHOULDER

- (a) Unable to use arm
- (b) Mild blood loss
- (c) Ambulatory - initially

At approximately 0910 hours the observation team landed near the mortar platoon on the edge of a lake. My casualty had a shrapnel wound to the right shoulder which caused mild blood loss and disabled his arm. He was initially ambulatory.

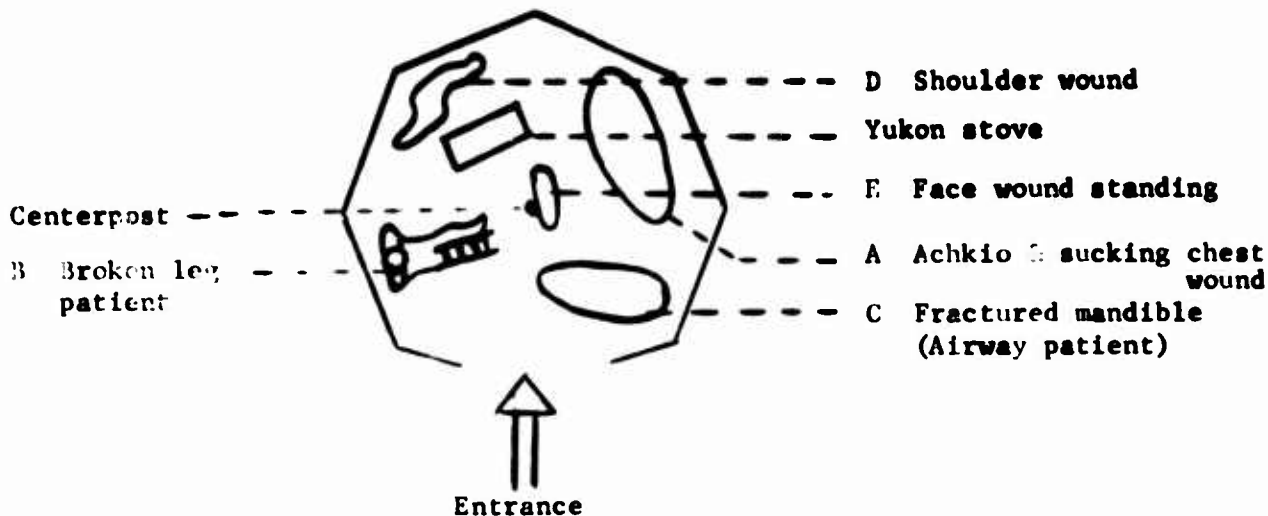
At 0915 hours, the injured man's buddy called for the medic and assisted by applying pressure over the wound until the medic was available. The casualty was layed on his left side with injured shoulder up.

At 0930, casualty was walked twenty meters to warm-up tent site (tent was being set up). The medic immobilized the arm and shoulder with an ace bandage sling. The wounded soldier was not allowed to use his right arm for entire duration of evacuation procedure. The medical supplies the medic had available for his use were the contents of only one M-3A bag (Appendix 9). Noticeably absent were the following:

1. Morphine
2. Splinting material
3. Adequate gauze sponges for even minor bleeding injuries
4. Adhesive tape 1" or 2" which work when cold soaked

At 1000 hours, shoulder casualty was moved into warm-up tent. He was very cold when moved into the tent. Failure to brush him off before entering the heated tent rendered his outer overwhites wet within a few minutes.

All five casualties were moved into warm-up tent (the "sucking-chest wound" casualty was in a double mummy sleeping bag on an achkio). They were distributed around tent as follows:



The tent was crowded with all five patients inside. It was also being used by "cold-soaked" troops to warm up. One soldier walked into the tent and stumbled on the splinted (wood tree-limb splint) leg of fractured femur casualty and fell onto the center post.

The sucking chest wound patient appeared comfortable and acknowledged that he was warm. The medic had pine boughs cut and brought into the tent to be placed under the fractured leg and shoulder wound casualties. Canvas was placed under the fractured mandible casualty. The face and eye injury casualty would either stand or squat against the center post.

The tent was very congested

Troops brought the two remaining achkios to the entrance of the tent. They were not going to dump the snow and pine boughs out of the achkios before using. I suggested that they do so. Initially, the troops loaded the fractured leg patient and fractured mandible patient into achkios without placing them in double mummy bags (did not have arctic evacuation bags in which to place casualties). After discovering that these two patients were not in sleeping bags, the achkios were then unloaded and the litter patients subsequently placed in double mummy sleeping bags and replaced on achkios.

The platoon leader (sergeant first class) organized pull teams. The teams then hooked up to the achkios. All sled patients were warm prior to evacuation. The platoon moved out at approximately 1030 hours. At this time, all arctic canteens were frozen. An advance team led the way and broke trail with an ax while moving through the timber. In the forest there was room for only a two-man pull team in advance of sled. Even though three men could pull the achkio much easier, they would stumble over each other on the narrow trail. All sled patients were warm early into cross-country trek. At 1045, the fractured shoulder patient was overcome by the effects of morphine and could no longer walk. There was no available sleeping bag for this litter patient. He was subsequently layed on top of the fractured mandible patient (airway patient) and the two-man pull team was changed to a three-man team with a fourth steering man on back rope of achkio.

The team proceeded with difficulty and the shoulder patient was dumped from sled three times. He rapidly became very cold and was allowed to stand up and move around from 1100-1110 hours. The pull teams all appeared to be overheating. All were working very hard. The chest wound patient died at 1115 and the shoulder wound patient was subsequently placed in his achkio. At approximately 1200 hours, the litter patient with fractured mandible began to complain of cold feet (had VB boots on in double mummy sleeping bag). He was removed and a new man placed in the achkio. After crossing the peak of the timbered hill, the downhill pull was relatively easy. We exited the timber onto a large lake which was crossed very easily by the pull teams.

We then crossed a very small spanse of timber and came to another lake. We crossed this lake onto open tundra. It was interesting to note that by now all of the troops were overheating on the cross-country trek but only two men made a conscious effort to unbutton and remove clothing to ventilate and prevent sweat buildup in their inner garments.

The achkios slid easily across the tundra but the troops had great difficulty walking on this terrain. Subsequently, troop movement was very slow. The lieutenant who accompanied us decided to contact headquarters for a track vehicle, M-116, to make field contact and pick up litter patients.

Delivery of a track vehicle from headquarters was delayed because the carburetor on the vehicle had "froze up". The M-116 made field contact at 1330 and loaded patients and observers. After a very rough ride (precludes insertion of IV needles and catheters and fluid administration), we arrived at battalion aid station at 1350 hours.

We had moved approximately 2.5 kilometers cross-country on foot. We moved 8.5 kilometers via M-116 from our field position to battalion aid station.

Patients in achkios complained of severe jarring of upper trunk (which were positioned on front end of achkio).

At the end of the trip, the troops began to show signs of chilling. They probably became cold-soaked very rapidly because of their failure to ventilate properly. The troops were also very thirsty; had no water and all were eating snow. The cross-country navigation was excellent.

In addition to his shoulder injury, my patient's condition certainly deteriorated as a result of repeatedly falling off the achkio and no other available sleeping bag. It is likely that he would have sustained frostbite to his feet and further severely compromised his wound as a result of loss of any existing insulation due to the blood soaked, frozen bandages.



In a true combat situation, the knowledge that seriously injured could not be evacuated cross country in sufficient time to save their lives would definitely reduce troop morale.

**OBSERVER**

**Military Research Veterinarian**

**Four years experience in cold injury  
models at USA Research Institute of  
Environmental Medicine, Natick, MA**

## APPENDIX 6

### EVACUATION OF SHRAPNEL WOUND TO FACE AND EYES

- (a) Loss of vision
- (b) Ambulatory

At 0915 hours on the morning of 16 January 1976, my patient fell to the ground, covering his eyes with his hands, calling MEDIC! Patient had just been wounded by shrapnel fragments to the face and eyes.

My patient was the least serious of five casualties. At 0930 hours, 15 minutes after being "hit", he was treated by the medic attached to the platoon. In all, his bleeding was considered minimal and his face and eyes were covered with a 4"x7" dressing and his head wrapped with a cravat bandage. Being in a position of leadership and aided by another of his platoon, he continued to assist the platoon leader in directing the operation. The uninjured members of the platoon erected an arctic tent and started one of the platoon's Yukon stoves in an effort to keep the casualties warm and allow the medic closer access to the more seriously wounded since the temperature was at -15°F.

The route originally selected was basically a straight line but as the overland movement became slow, it was decided by the platoon leader that a series of doglegs to nearby lakes along the route would be fastest and less tedious as the overlake movement was relatively effortless.

In illustration of the effort required for this mode of evacuation, the majority of the men pulling the achkios had broken into a sweat by 1115 hours. This caused numerous halts to adjust clothing and to run snow over both face and neck in an effort to cool more rapidly. In addition, all members' canteens were frozen causing the men to consume copious amounts of caked snow as they became thirsty.

My patient was guided by a rotating member of the lead achkio team that was required to not only break through the initial snow cover and deadfall, but to also cut down small trees in the path of the party in order that the achkios could be maneuvered properly.

As the unit progressed, rest breaks became increasingly more frequent, especially on even the slightest of uphill grades. At 1300 hours and having covered approximately 2 kilometers, the element encountered snow covered tundra. The travel over this sort of terrain was so slow that after only 250 meters, the platoon leader requested that the casualties be picked up where they had stopped. By 1330 hours, an M-116 tracked vehicle arrived and the patients were loaded and moved about 8.5 kilometers to the battalion aid station (0.5 kilometers overland/ 8 kilometers on access road).

Although my patient remained ambulatory, it is doubtful that he could have continued in such a fashion had morphine been available, because of its depressive and sedating effects compounding his already weakened condition secondary to his injury.

Observations:

1. The ride on an achkio was very uncomfortable and continuously jolting. Transportation with an IV, if available, would be tenuous at best.

2. Salt tablets were distributed by aidmen. As if this were not enough, there was no water to take with them.

3. Navigation in the arctic is difficult, but if necessary, all available lakes should be used, tactical situation allowing. A route with a number of doglegs from lake to lake may be much quicker than a straight-line route. Unfortunately, navigating this far north results in a large GM angle with a declination in the double digits allowing for disastrous errors in plotting azimuth if one is not experienced. The navigation by this platoon was flawless, but could cause problems for units not familiar with the sort of situation common to the northern climates.

4. Finally, the unit's mission had to be abandoned which would probably not have been the case if this unit were not operating in a cold weather region. With the number of casualties sustained, they should have been able to keep at least two of the guns operational provided the FDC had not also been hit.

OBSERVER  
Medical Service Corps  
1st Lieutenant Airborne Infantry  
Medical Platoon Leader  
Presently stationed at USA Research  
Institute of Environmental Medicine,  
Natick, MA

## APPENDIX 7

### OBSERVATIONS OF THE 1st LIEUTENANCE INFANTRY PLATOON LEADER:

1. Strategic problems which would have been encountered in an exercise of this nature in an actual combat environment would have met with disastrous results.
2. Problems inherent in leaving behind the majority of a platoon's life support equipment, especially considering how suddenly weather can change, would have rapidly compromised the entire unit.
3. Without air support, with present medical equipment and doctrine, it would be impossible for a unit this size to evacuate wounded without aborting their mission.

**APPENDIX 8**

**OBSERVER CHECKLIST**

<u>PATIENT - CASUALTY</u>	<u>YES</u>	<u>NO</u>	<u>EQUIPMENT</u>	<u>YES</u>	<u>NO</u>
1. time in snow	___	___	A. BANDAGES		
2. prob w/insert in bag	___	___	1. accessible	___	___
3. comfortable	___	___	2. manipulable	___	___
4. prob w/exposure wound	___	___	3. cold soaked	___	___
5. risk of frostbite	___	___	B. SPLINTS-SLINGS		
6. risk of hypothermia	___	___	1. accessible	___	___
7. time for evacuation	___	___	2. manipulable	___	___
			3. cold soaked	___	___
<u>EVAC. BAG</u>			4. appropriate	___	___
1. availability	___	___	C. ORAL AIRWAY		
2. warm enough	___	___	1. accessibility	___	___
3. access to wound	___	___	2. cold soaked	___	___
<u>LITTER BEARER</u>			D. AMBU BAG		
1. fatigue	___	___	1. accessibility	___	___
2. # of bearers	___	___	2. manipulable	___	___
3. freq of change	___	___	3. cold soaked	___	___
4. dehydration	___	___	E. I.V. BOTTLE		
<u>MEDICS</u>			1. accessible	___	___
1. prob w/dexterity	___	___	2. manipulable	___	___
2. risk frostbite-hands	___	___	3. cold soaked	___	___
<u>ACHKIO - SLED</u>			F. I.V. LINE		
1. availability	___	___	1. accessibility	___	___
2. practicality	___	___	2. manipulable	___	___
<u>MEDICATIONS</u>			3. cold soaked	___	___
A. INJECTABLES			G. I.V. NEEDLE		
1. accessible	___	___	1. cold soaked	___	___
2. manipulable	___	___	<u>AMBULANCE</u>		
3. cold soaked	___	___	1. availability	___	___
B. OINTMENTS			2. temperature	___	___
1. accessible	___	___	<u>RADIO COMMO</u>		
2. manipulable	___	___	1. adequate	___	___
3. cold soaked	___	___			

SNOW DEPTH

AMBIENT TEMP

WIND

DAYLIGHT HOURS

TIME OF EVAC

1. to access road
2. road to battalion aid
3. time to battalion aid

COMMENTS

APPENDIX 9

**M-3A BAG - CONTENTS**

**Airway - Cold Soaked**

**Kaolin**

**Tetracaine Ointment - Felt Frozen**

**Neomycin, Polymixin, Bacitracin Ointment**

**Gamophen<sup>®</sup> Surgical Soap**

**Monavitamins**

**Eugenol<sup>®</sup>**

**"Cold Caps" - ? ? (tape label)**

**Drinatab<sup>®</sup> - Decongestant**

**Aspirin**

**Robaxin - Not frozen**

**Tripriolidine Pseudnephidrine HCL - Actified<sup>®</sup>**

**Bensedrix<sup>®</sup> Inhaler**

**Mylanta<sup>®</sup> - tablets**

**Chloreseptic Lozenges**

**Preptic<sup>®</sup> Swab - 4**

**Robitussin<sup>®</sup>**

**Muslin Bandages - approx 5 bandages**

**Adaptic Bandages**

**4x4 Gauze Bandages**

**3x3 Adaptic Bandages**

**Ace Bandages - 2**

**1 Eye Kit Bandage**

**1/2" Paper Tape**

APPENDIX 10



DEPARTMENT OF THE ARMY  
U S ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE  
NATICK, MASSACHUSETTS 01760

SGRD-UE-CR

12 February 1976

CW04 Clarence N. Gatewood  
222 Aviation Battalion  
ATTN: AFZT-AV-SO  
Ft. Wainwright, AK 99703

Dear Mr. Gatewood:

Request the following information be furnished this Institute:

- a. Percentage of time helicopters cannot fly due to weather conditions for a one year period.
- b. Percentage of missions aborted due to weather over a one year period.
- c. Percentage of missions aborted due to mechanical problems over a one year period.

Thank you very much for your assistance:

Sincerely,

DONALD O. WHITE  
SFC  
Cold Research Division





DEPARTMENT OF THE ARMY  
222D AVIATION BATTALION  
APO SEATTLE 98731

AFZT-AV-SO

SUBJECT: Helicopter Percentages

SFC Donald O. White  
USARLTA  
Natick, Mass 01760  
ATTN: Cold Division

Listed below are the approximate percentages per your letter, dated 12 February 1976.

- a. Percentage of time helicopters cannot fly due to weather - 25%
- b. Percentage of missions aborted due to weather - 15%
- c. Percentage of missions aborted due to mechanical problems - 35%

CLARENCE W. GATEWOOD  
CWL, AV  
Safety Officer



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