MCRP 3-35.1A

Small Unit Leader's Guide To Cold Weather Operations

U.S. Marine Corps

Coordinating Draft 22 February 2000

DEPARTMENT OF THE NAVY
Headquarters United States Marine Corps
Washington, DC 20380-0001

XX Feb 2000

FOREWORD

1. Purpose. Marine Corps Reference Publication (MCRP) 3-35.1A, *Small Unit Leader's Guide to Cold Weather Operations,* will address tactics, techniques, and procedures (TTP) for small unit operations in the cold weather environment.

2. Scope. The publication will address individual and collective skills necessary for small units to operate in the cold weather environment from company to fireteam level. It illustrates how small units can be organized, trained and equipped to conduct operations in the cold weather environment. This publication will also be a quick reference for those operational problems that are common to all military occupational specialties in the cold weather environment.

3. Supersession. FMFM 7-23, *Small Unit Leader Guide to Cold Weather Operations.*

4. Certification. Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

J. E. RHODES
Lieutenant General, U.S. Marine Corps
Commanding General
Marine Corps Combat Development Command
Quantico, Virginia

DISTRIBUTION: 000 000000 00

TABLE OF CONTENTS

Chapter 1	Marines Against the Cold	1
Chapter 2	Clothing and Personal Equipment	5
Chapter 3	Group Equipment	13
Chapter 4	Rations and Diet	19
Chapter 5	Health and Medical Care	21
Chapter 6	Living in the Cold	30
Chapter 7	Navigation and Route Selection	35
Chapter 8	Movement on Foot	40
Chapter 9	Movement by Vehicle	48
Chapter 10	Movement by Helicopter	51
Chapter 11	Weapons, Optics, and Communications Equipment	61
Chapter 12	Offensive Tactics	70
Chapter 13	Defensive Tactics	76
Chapter 14	NBC Defense	82
Appendix	Avalanche Avoidance, Search and Rescue	87

Chapter 1

Marines Against the Cold

1001. Objective

This reference publication serves to introduce small-unit leaders to unique tactics, techniques and procedures for shooting, moving and communicating in a cold weather environment (CWE). Through a combination of practical application, training, study and experience, the Marine leader can better prepare his unit for success on the cold weather battlefield. While primarily directed towards the infantry unit leader, the information contained herein is equally relevant to preparing leaders from combat support, combat service support and aviation combat element units.

1002. Types of Cold

Clauzewitz defines war as "Zweikampf," which literally translates to a "two-struggle"; he illustrates this concept by picturing two wrestlers locked in a fight, each attempting to impose their will on the other. [i] Operating in a CWE, however, is better represented by a "three-struggle": you, the enemy and the ENVIRONMENT. It is therefore imperative that leaders recognize the challenges imposed by cold weather. While the individual Marine is most interested in "wet cold" or "dry cold" conditions, logistical planners are more interested in "intense cold" and "extreme cold."

a. Wet Cold. Wet cold conditions occur where temperatures are near freezing and variations in the day and night temperatures cause alternate freezing and thawing. Wet snow and rain causing the ground to become mushy and muddy often accompany these conditions. With these conditions, Marines require clothing that consists of a waterproof or water repellent, wind resistant outer layer, and an inner layer with sufficient insulation to provide protection in moderately cold weather of 14 degrees F or above.

b. Dry Cold. Dry cold conditions occur when average temperatures are lower than 14 degrees F. The ground is usually frozen and the snow is dry. These low temperatures, plus wind, increase the need for protection of the entire body. For these conditions, Marines require clothing that will provide insulation for the body for a wind-chill factor of –80 degrees F. The inner layers of insulation must be protected by a water repellent, wind resistant outer layer.

c. Intense Cold. Intense cold air temperatures (-5 to –25 degrees F) are in the range where materials begin to change, adversely affecting operations. Fuels gel, back blast areas triple, artillery fires drop 100 per 1000 meters, water in containers freezes quickly. Appropriate protective clothing is required.

d. Extreme Cold. Extreme cold (below –25 degrees F) inhibits full-scale combat. Special fuels and lubricants are required, rubber becomes stiff and brittle, and close tolerances are affected. Operator personnel must have special protection from the elements.

1003. Wind Chill

When a high wind is blowing, Marines will feel much colder than when it is calm. Temperature alone does not, therefore, truly indicate the impact of the CWE. To effectively gauge it, some scale must be used; the most commonly used is the wind chill chart. Wind chill is a measure of the combined effects of wind and temperature. As shown in figure 1-2, the wind chill chart is a simple and practical guide showing when cold weather is dangerous and when exposed flesh is likely to freeze. The chart need not be memorized, but leaders must recognize that a temperature of 5 degrees F combined with a 20-mile-per-hour wind can be more dangerous than a calm day of –25 degrees F.

WIND SPEED		COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																				
KNOTS	MPH	TEMPERATURE (°F)																				
CALM	CALM	40	35	30	25	20	15	10	5	0	5	10	15	20	25	30	35	40	45	50	55	60
		EQUIVALENT CHILL TEMPERATURE																				
3–6	5	35	30	25	20	15	10	5	0	5	10	15	20	25	30	35	40	45	50	55	60	70
7–10	10	30	20	15	10	5	0	10	15	20	25	35	40	45	50	60	65	70	75	80	90	95
11–15	15	25	15	10	0	5	10	20	25	30	40	45	50	60	65	70	80	85	90	100	105	110
16–19	20	20	10	5	0	10	15	25	30	35	45	50	60	65	75	80	85	95	100	110	115	120
20–23	25	15	10	0	5	15	20	30	35	45	50	60	65	75	80	90	95	105	110	120	125	135
24–28	30	10	5	0	10	20	25	30	40	50	55	65	70	80	85	95	100	110	115	125	130	140
29–32	35	10	5	5	10	20	30	35	40	50	60	65	75	80	90	100	105	115	120	130	135	145
33–36	40	10	0	5	10	20	30	35	45	55	60	70	75	85	95	100	110	115	125	130	140	150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT		LITTLE DANGER					INCREASING DANGER (Flesh may freeze within 1 minute)						GREAT DANGER (Flesh may freeze within 30 seconds)									

1004. Preparing to Overcome the Cold

Operating in a CWE exposes the individual Marine to unfamiliar frictions, both physical and mental. While snow and frozen ground significantly impact combat operations, freezing temperatures will also sap the physical and moral strength of unprepared Marines. Prior individual and unit training is the key to maximizing unit efficiency and minimizing cold weather injuries. Erwin Rommel recognized this when he wrote:

"*War makes extremely heavy demands on the soldier's strength and nerves. For this reason make heavy demands on your men in peacetime exercises.*" [ii]

Using the information presented in this publication, a pre-environmental training regimen must focus on:

a. Cold Weather SOPs. In order to minimize the amount of time Marines are left out in the cold with nothing to do, units must design and rehearse SOPs. These "drills" will include everything from determining each Marine's team-equipment requirement, actions and routines during unit marches (especially during halts), and bivouac responsibilities. (Chapter 6, 12, 13)

b. Equipment. Marines will operate with unique equipment when working in a CWE. Examples include over-the-snow mobility assets (skis, snowshoes), bivouac equipment (stoves, tents) and clothing. Training must be conducted in order to familiarize Marines with their equipment such that they can use it with and confidence in the cold weather. (Chapter 2, 3, 8)

c. Physical Endurance. Operations in a CWE make increased demands on the Marine's stamina. Climactic conditions and cold weather equipment requires a unit to keep in shape, drink plenty of water and eat to keep fit (Chapter 4, 5)

1005. Core Values and Leadership Challenges

"One of the most important tenets of cold weather operations is that strong and consistent leadership is essential to survival and to minimize injuries"

-MCWP 3-35.1 "Cold Weather Operations"

The consequences of poor leadership in a temperate climate are significant; however, the consequences for poor leadership in a CWE will be multiplied as a result of extreme weather and terrain. Not only must pre-environmental training take place before a unit can be expected to succeed in a CWE, but positive leadership and the adherence to Core Values must be ever present in order to sustain the unit.

a. Environment. Most Marines, while varying in their proficiency, will at least learn to function adequately after a reasonable amount of exposure to cold weather (one to three weeks.) Training is not designed to teach Marines how to freeze; however, the mere conduct of field exercises under cold weather conditions will increase the Marine's confidence in his ability to survive.

b. Lead by Example. Initially, harsh and unfamiliar conditions tend to be frightening, and pose new challenges to Marine leaders. Junior Marines will automatically look to their leaders when conditions become harsh. If Marine leaders are visible and maintain a positive attitude, subordinates are more likely to follow their example.

c. Inspections. Personnel inspections must become routine within a unit. Incorrect or unserviceable equipment can have devastating effects; in the course of conducting inspections, the leadership not only gains confidence that his unit is properly outfitted, but demonstrates to the Marines that their leadership is concerned with their welfare.

d. Time. Everything in a CWE takes longer than in a temperate environment: waking up in the morning, preparing food, striking bivouac, movement. Leaders cannot set unrealistic time-standards for task accomplishment; a good tool to overcome this problem is to use "no earlier than" (NET) times. This minimizes the amount of time Marines are left in the cold waiting for others.

e. Psychological Defeat. The Marine leader can expect to encounter several cold weather unique situations that will require quick recognition and aggressive action in order to avoid.

(1) Cocoon-like Existence. Marines react to cold by bundling in layers of clothing and withdrawing from a unit. Typically, this is evident when a Marine dons his parka hood, becomes sluggish and limits contact with others.

(2) Hibernation. Individuals and groups, uncomfortable in the cold, withdraw to their tents and sleeping bags, or remain in heated vehicles. Security measures suffer.

The solution to these problems is to facilitate contact and communications among Marines. Keep the unit physically and mentally active. Review SOPs and maintain a sense of humor. Never accept cold weather as an excuse for not accomplishing the mission. Cold weather training will often resemble a camping trip unless dynamic leadership maintains the discipline to focus on the task at hand.

f. Core Values. As with the previously mentioned leadership challenges, a lack of honor, courage and commitment in a CWE will produce more catastrophic consequences than in a temperate environment. During the harsh winter breakout from Chosin Resevoir in 1950, Marines from Task Force Faith who were injured from battle injuries and the cold, were able not only to survive, but execute a successful operation by demonstrating *honor, courage and commitment*.[iii]

(1) Absent Honor: a unit cannot be confident that sentries are adequately performing their duties in harsh weather; unit cohesion breaks down.

(2) Absent Courage: Marines will allow their physical and mental misery to detract their focus away from the mission and the welfare of fellow Marines; cold weather injuries may result.

(3) Absent Commitment: leaders at all levels prioritize their own physical comfort ahead of assigned duties; unit readiness diminishes.

---

[i] Carl Von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984) p. 75.

[ii] Field Marsharl Erwin Rommel, *Attacks* (Provo, UT: Athena Press, Inc., 1979) p. 8.

[iii] Eric Hammel, *Chosin: Heroic Ordeal of the Korean War* (Novato, CA: Presidio Press, 1990) see Section Six "Breakout" for numerous examples.

Chapter 2

Clothing and Personal Equipment

2001. Cold Weather Clothing

a. Military cold weather clothing systems. Military cold weather clothing systems are designed to change with needs of the Marines. By varying the parts of the clothing system they are using, Marines can be comfortable when performing vigorous activities in the cold if proper "principles of wear" are adhered to. The basic principles for clothing worn can be remembered by using the acronym **C.O.L.D.**

(1) C- Keep clothing CLEAN. Clothing keeps you warm by trapping warm air against your body and in the pores of the clothing itself. If these pores become filled with dirt, sweat, or other grime, the clothing will not be able to do its job efficiently. Therefore, your clothes should be kept as clean as possible to keep you as warm as possible.

(2) O- Avoid OVERHEATING. Everyone naturally assumes that the more clothes you have on, the warmer you will be. This is true up to a point, and that point is when your body starts overheating and sweating. A Marine engaged in physical activity, such as digging a fighting position or snow shelter, will be warmer than one who is just standing guard. If both Marines are dressed the same, the one that is active will start to overheat. The key to surviving under this condition is not to be hot, but *comfortably cool*; not cold, but cool. If at any time you are sweating, you are too hot. Sweating is a sign that your body wants, and needs, to cool down. Let the environment cool you down, not sweat. This may be as simple as opening buttons or unzipping the underarms of the ECWC parka, instead of removing a whole layer of clothing. Once you stop your work, or feel yourself getting cold, bundle up again just enough to keep cool. Allowing just enough clothes and body activity to keep you cool, and the environment to cool you down, will keep your clothes from getting sweaty and dirty, and therefore improving their effectiveness. Overheating also contributes to several cold weather injuries such as dehydration, heat exhaustion, and hypothermia.

(3) L- Wear clothing LOOSE and LAYERED. Loose Clothing- Clothes should fit loosely for comfort. If clothing is too tight, it may act as a tourniquet, causing blood to pool in your extremities, (arms, legs, fingers, and toes.) This prevents blood from circulating into your body core and re-warming, thus causing that limb to get cold. Tight clothing will also prevent air from becoming trapped between your body and clothes. It is the warm air that keeps you warm, not the clothes. Layering- Compare this to your house, which has several layers, not just one, to keep you warm. It has shingles and a roof, a wood frame, siding, insulation, walls, foundation, and floor. A furnace heats the air inside the house to keep you warm. The layers are barriers holding this heated air around you. The first wall holds a warm cushion of air, perhaps allowing 25% of the warm air to escape. The second wall or insulation, however, will capture part of that, holding another warm layer of air, until only a fraction of warm air escapes to the outside. Even when a strong wind hits your house blowing away one layer of air, you still have several others. Your body works along the same principle, with your body being the furnace and your clothing layers being the walls. The more layers used, the more warm air will be trapped. Strangely enough, several thin layers working together will work better than one thick layer alone.

(4) D- Keep clothing DRY. Clothing must be kept dry from the outside, such as putting on rain gear during wet conditions, and from the inside, such as taking a layer off when you start to sweat. Once your clothes are wet, the water or sweat starts to evaporate, drawing warmth away from your body.

b. **Principles of Design.** The principles of the military cold weather clothing systems are: Vapor Transmission Layer, Insulating Layer, and the Protective Layer. They are best remembered by using the acronym V.I.P. Moisture accumulated in the undergarments will inhibit the cold weather clothing systems from functioning correctly. A good rule of thumb is to *start cool.* Then after ten to fifteen

minutes, make a rest stop, remove unnecessary layers and vent the neck, waist, and under the arms to avoid overheating.

(1) Vapor Transmission Layer: Better called a "sweat transfer layer," this layer soaks up your body moisture and draws it away from your body to keep it dry. Significant progress has been made with such synthetics as polypropylene, which draws water away from the body, and helps to keep the body dry.

(2) Insulating Layer: This is the layer that holds the warm air around your body. Preferably, it is made of polyester pile, but wool is adequate.

(3) Protective layer: This not only protects the insulating layer from getting dirty, but also from getting wet. It should be made of wind resistant/water repellent materials.

NOTE: These are the three main layers to consider in the military clothing system. There may be times when one or more layers are not used, or when the insulating layer may be several layers thick.

2002. ECWCS Clothing (NEW)

a. The Clothing Systems. There are three clothing systems currently in use in the Marine Corps: the new Extended Cold Weather Clothing System (ECWCS), the old M-1950 Cold Wet/Cold Dry seven layer system and the Specialty Clothing System developed to fit the specific needs of aviation and maintenance personnel (reference NAVAIR Manual 13-1-6.7 chapter 5.) This manual will only discuss the ECWS system since the old M-1950 seven-layer system is being phased out.

(1) Extended Cold Weather Clothing System (ECWCS). ECWCS was developed to provide a lighter weight, less bulky clothing system that was better suited for the modern cold weather battlefield. This system uses recently developed synthetic materials to provide warmth and handle moisture much better than the older standard clothing system. ECWCS is a layered insulating system adjustable to personal preference, metabolism, and prevailing weather conditions. It is designed to maintain adequate environmental protection between plus forty degrees Fahrenheit and negative twenty five degrees Fahrenheit, (four degrees Celsius and negative thirty one degrees Celsius). The Extreme Cold Weather Boots protect down to negative fifty degrees Fahrenheit, (negative forty-five degrees Celsius). This system uses the moisture management principle to pull perspiration away from the skin so that the user will remain warm and dry. In cold, wet, and arctic environments, it is recommended that Marines use only clothing items in the ECWCS. Marines should not combine ECWC garments with any items that are made with wool or wool blends, with the exception of the glove inserts and cold weather hood. It is easy to maintain in both field and garrison environments. The unique characteristics of this state of the art material require special use and care instructions that are followed. You can find these instructions on the items themselves.

(2) ECWCS Clothing Items

1. General. The Marine Corps has recently completed a new cold weather system.

2. **Long Underwear**. The cold weather system consists of the undershirt and drawers.

- Description of Undershirt. The polypropylene undershirt is a buff-colored turtleneck that has a center front zipper that extends to the middle of the chest area.
- Description of Drawers. The polypropylene drawers, also buff-colored, serve as a base layer to protects the lower extremities.
- Concept of Use. The underwear layer that is next to the skin acts as a vapor transmission or moisture wicking layer. This draws moisture away from the skin while transferring it to the outer layers of the clothing system. The wearing of issue cotton undergarments will negate the wicking action of the polypropylene. The cotton fibers will hold moisture next to the skin cotton equal death. DO NOT wear cotton undergarments when using this clothing.

3. **Cold Weather Fleece Shirt**. The cold weather fleece shirt is a new item. (Fleece Shirt/100% Polyester, 300 Weight)

- Description of Item. The shirt is black-colored, has reinforced shoulders, upper back, upper chest and elbow patches, a convertible turtleneck collar, front zipper, elastic shock-cord waist, Velcro fastened wrist straps, and two hand-warmer pockets with zippers.
- Concept of Use. The polyester fleece shirt serves as the primary insulating layer for the upper body.

4. **Cold Weather Fleece Bib Overall**. The cold weather fleece bib is a new item. (Fleece Bib/100%polyester, 300 Weight)

- Description of Item. The bib is black-colored, has adjustable elastic suspenders with quick release fastener buckles located in the front, front zipper, and full-length zippers at the outside seams.
- Concept of Use. The polyester fleece bib serves as the primary insulating layer for the lower body and legs. Recommended to be worn only when a Marine is stationary, i.e., standing sentry duty or in periods of intense cold.

5. **Trousers, Cold Weather, Field, (Nylon and Cotton).** The olive green or four-color camouflage printed cold weather field trousers, (Trousers, Cold Weather, Field, Nylon and Cotton), are standard items of cold weather issue and are also used in the ECWCS.

- Description of Item. Characteristics of the field trousers are the side-hanging pockets, hip pockets, cargo pockets, draw–cords at the trouser bottoms, and the adjustable waist straps.
- Concept of Use. The field trousers serve as a durable outer layer to be worn over the insulating layers when the outer extended cold weather trouser, (Gore-Tex), is not needed.

6. **ECWCS Parka Camouflaged**. (PARKA, extended Cold Weather, Camouflaged, Gore-Tex)

- Description of Item. The parka has an integral hood, (the new generation of parkas have a pocket in the collar for hood stowage), two inside breast pockets which can be accessible without unzipping the parka, two large cargo pockets, and a two-way front zipper to provide full face protection leaving only the eyes uncovered. There is an elastic draw cord at the hem, Velcro wrist tabs, underarm ventilation with zippers and a rank tab at center chest.
- Concept of Use. The parka serves as part of the windproof and water-resistant layer in the system. The polytetraflouroethylene (PTFE) laminate in the garment serves to repel water while allowing perspiration to be expelled.

7. **ECWCS Camouflage Trousers**. (Trousers, Extended Cold Weather, Camouflage, Gore-Tex)

- Description of Item. The trousers have seat and knee reinforcement patches, pass through pockets, and inserts in the seams of the leg openings to allow easy donning and removal without removing the boots.
- Concept of Use. The trousers serve as part of the windproof and waterproof layer in the system. The PTFE laminate in the garment has the property to repel water while allowing perspiration to be expelled.

8. **Snow Camouflage Parka and Trousers**. The snow camouflage parka and trousers (Parka, Snow Camouflage and Trousers) are standard carryover items from the M-1950 issue.

- Description of Item. The hooded white parka has drawstrings for adjustment at the waist draw cord, side pockets, a hip pocket, knee pleats and drawstrings at the ankles of the trousers. The parka and trousers, snow camouflage, are to be worn for whatever type of camouflage is required in snow covered terrain.
- Concept of Use. The over white parka trousers are used as a camouflage outer layer in snow covered terrain and is not a substitute for an outer garment. It is worn over the (ECWCS) parka and trousers.

9. **Hood C/W (Balaclava)**. The head wear in the ECWCS cold weather system.

•Description of Item. The hood consists of a wool, knitted cap, which covers the entire neck and face with holes for the eyes and nose and is a pullover ski mask style that comes in either green or black.
•Concept of Use. The cap is intended to provide protection in cold weather to the neck and face.

10. **Hand Wear**.
•General. The standard hand wear items are: Glove inserts, gloves, mitten inserts, mitten shells (cold weather and snow camouflage mitten set). These items are carryover items from the standard M-1950 cold weather issue. These items are considered part of the ECWCS issue. The gloves and glove inserts are unit supply items, while the mittens, mittens inserts and camouflage shells are Training Allowance Pool items.

2003. ECWCS Accessories (NEW)

a. The items in this section are considered part of the ECWCS issue. Some of these items are new to the Marine Corps while some are carry over items from the M-1950 issue.

(1) ECWCS Accessory Items

1. **Suspenders**. The suspenders (Suspenders, Trousers M-1950) are a carry over item used with the field trousers.
•Description of Item. The olive drab suspenders straps are scissor-back style (cross over in the back). The suspenders have two slide buckles and two hooks which attach to the trousers.
•Concept of Use. The suspenders are to be used with the trousers, extended cold weather, camouflage.

2. **Head-over Scarf**. The head-over scarf (Scarf, Head-over) is an item borrowed from NATO allies. This item enables Marines to regulate their body temperature.
•Description of Item. The head-over scarf is a circular knitted wool tube 2 feet long and 9 inches wide laid flat, open at both ends, with the face of the fabric lightly brushed.
•Concept of Use. The head-over scarf is to be wrapped around the neck, pulled over the head and ears, or pulled down over the neck and lower back.

2004. Care, Use, and Maintenance of ECWCS (NEW)

a. The individual Marine is responsible for keeping his ECWCS items in good serviceable condition. This is his uniform. It will not continue to effectively serve its intended purposes unless it is kept clean, maintained in good repair, and stored properly. The ECWCS will protect him only if he takes care of it and wears it properly. Check the label to see if the size is correct. This is extremely important in order to achieve maximum user satisfaction using the layering principle. ECWCS IS DIFFERENT. Pay particular attention to cleaning instruction for layers 1 and 4, polypropylene underwear and parka/trousers, extended cold weather, camouflage, as these items are made of state of the art materials and require added care.

b. **Donning and Doffing Procedures**. The ECWCS is an insulating system consisting of the following five primary layers (including the overwhites, when necessary) and accessories:

(1) Layer1-Polypropylene undershirt and drawers

(2) Layer2-Bib overall, cold weather shirt and trouser liner.

(3) Layer3-Coat liner and filed trousers.

(4) Layer4-Extended cold weather camouflage parka and trousers.

(5) Layer5-Snow camouflage parka and trousers (overwhite)

c. Layering. Layers 1 and 4 are always worn; add layers 2 and 3 as necessary to stay warm. The bib overalls in layer 2 are normally worn for temperatures below –25 F (-32C). Remove layers 2 and 3 as necessary to avoid overheating when on the move. The polypropylene underwear has the ability to draw moisture away from the skin and transfer it to the outer layers of the system. Beginning with layer 1, add layers 2 and 3 as the temperature drops. Layer 4 is the outer layer of the ECWCS when snow camouflage is not required. Layer 5 is the outer layer of the ECWCS when snow camouflage is required. Layer 5 is not a substitute outer garment, but is worn over layer 4 only as a camouflage. Adjust layers according to preference, metabolism, and weather conditions.

d. Inspection. Examine the ECWCS items regularly for tears, punctures, or damage to the material. Punctures of the outer layer will produce leaks and eventually ruin the material if not properly maintained. Repairs should be made as soon as possible.

e. Rank Insignia. Attach rank insignia on the parka to the rank tab, which is provided at the center of the chest. Either the pin-on or sewn-on rank insignia may be used. Be careful not to puncture or snag the outer layer of the material when attaching rank as punctures will produce leaks.

f. Cleaning. Clean ECWCS clothing items regularly when is use. Dirty clothes wear out quickly because dirt cuts textile fibers and retains moisture from perspiration. Prior to laundering and drying, make sure all the drawcords are tied together, all zippers are zipped and all snaps and hooks are fastened. Securing these items will result in a better laundered garment. When laundering, use delicate or gentle fabric wash cycle or by hand, using cold water (up to 85 F/29C) and cold water laundry detergent. Rinse in clean cold water. DO NOT USE BLEACH OR STARCH. Tumble dry at the lowest fabric cycle, delicate/gentle do not exceed 90F/32C. Remove immediately at the need of drying. AVOID OVER DRYING. To drip dry, remove water and place or a rustproof hanger. **DO NOT PRESS**.

g. Water Repellency. If the fourth layer (Parka/Trousers, Extended Cold Weather, Camouflage) of ECWCS leaks and inspection has revealed no rips or tears, wash garments in mild powdered detergent. Detergents used in cleaning affect water repellent qualities. DO NOT WASH GARMENTS IN LIQUID DETERGENT. When liquid detergents are used, they leave a chemical residue, which actually reduces the waterproof properties of the fabric. To restore the weather repellency of the parka/trousers, occasionally steam garments with an iron on steam setting being careful to hold the iron about ½ inch above the garment. **REMEMBER, DO NOT PRESS**.

2005. Footwear

USMC footwear consists of two types: the old Vapor Barrier system and the new ski march boot/sock system.

a. The Vapor Barrier (VB) boot system consists of three items: The cushion-sole wool socks, the black cold weather boot and the white extreme cold weather boot. The barrier (VB) boots use an inner and an outer boot made of rubber and filled with either wool fleece or closed cell foam (neoprene) insulation. The rubber acts to stop the movement of moisture from the feet. Heat is transferred quickly by the moisture in the air. By trapping the moisture, the boots trap heat. The boots also act to keep the moisture out. New Socks, Men's, Nylon, Cushion Sole Stretch type, OD-106 should be worn by Marines; also, carry dry socks and change socks at least 3 times a day when wearing VB boots. When possible, the VB boots should be removed for at least a few hours a day to allow the feet to breathe and dry out. There are two types of VB boots:

(1) Boots, Cold Weather (Type 1, Black). These boots are worn in the cold wet environment and will protect the feet down to –20F.

(2) Boots, Extreme Cold Weather (Type 2, White). These boots are worn in the cold dry environment and will protect the feet down to –50F.

b. Ski March Boot System. The system consists of several layers including vapor transmission socks, insulating socks, vapor barrier sacks, the boot itself, and several different overboot designs.

(1) Components of the Sock system: The sock system currently undergoing test in the Marine Corps is a three sock-layered system. The first layer is a lightweight single layer polypropylene sock. It should fit snugly. It is designed to wick moisture away from the foot and prevent blisters by reducing friction. The intermediate layer of the system is a vapor barrier sock. (This layer is only worn in extreme cold temperature. Working on the same principle as the Vapor Barrier (VB) boot it traps all of the heat created from the feet. The problem is that is also traps all of the moisture.) This sock should be worn between the vapor transmission and the insulating layers. This keeps the foot warm and protects the insulating layer from perspiration. Never wear the VB socks over the insulating socks, as it will cause the socks to become saturated and lose its heat retention properties. Remember the "D" in COLD. Also, be careful of using the VB sock when it is warm as it can cause blisters due to excessive sweating. The third layer is a hook stitch pile fiber made of 50% wool and 50% polypropylene. This combination provided the warmth needed for prolonged ski movements and still allows the moisture to pass through the sock. When looking at this sock you will see that there is a smooth side and a rough side. The smooth side is worn on the inside next to your foot.

(2) Use of the Sock System. Two pairs of the vapor transmission and insulating socks are issued. This enables the wearer to continually rotate the socks, allowing the other pair to be dried in whatever method is available. Body heat works well.

(3) Care of the Sock System. In the field, is important to keep the socks as dry and clean as possible to prevent them from losing their specific properties. Shake out your socks to keep them as free as possible from dirt and body oil which render them less effective. This is in keeping with the "C" in COLD. When in garrison, wash the polypropylene inner socks in the same manner as the polypropylene long underwear. The wool socks should be washed in cold water with mild detergent such as Woolite.

(4) Ski March Boot. The ski boot now undergoing final testing is the ALICO single ski boot. It has a box-toe and a grooved heel that is designed to work with our standard issue ski and the NATO 120 binding. The boot tongue is gusset in design and incorporates a collar with Thinsulate and Evapor insulation.

- **Felt Insoles -**The felt is designed to add insulation, absorb moisture that would otherwise be absorbed by the boot itself, and to form to the foot for a more comfortable fit. The boot is provided with two liners to allow a wear/dry rotation. Sleeping with one liner next to your body will both dry it and warm it prior to putting the boot on.
- **Sizing -**Proper sizing of the boot is critical. Done wrong, the Marine may suffer from blisters of frostbite. Sizing must be done with the felt liner in the boots and wearing all three socks of the previously discussed sock system. Normally, 1 to ½ sizes larger will be required for proper fit. The boot should fit snugly in the heel area to avoid blisters, but not so tight that it cuts off circulation. The toes should have some movement, but avoid side slippage which not only causes blisters but also reduces control while skiing.
- **Breaking In**. New boots must be broken in gradually. Wear for no more than four hours at a time for the first few days to prevent blisters as will as foot fatigue.
- **Waterproofing**. There are many commercially available products that effectively waterproof boots.

c. Care of the Ski March Boot. Caring for your ski march boot is much the same as any other leather boot. Dry your boot whenever possible, avoiding open flames or any method that will dry the boot too quickly. Strive to keep the boot dry to prevent freezing. Using foot powder to absorb excess moisture is okay as long as it is kept to minimum; otherwise, the fibrous parts of the boot can become clogged and reduce effectiveness.

d. **Gaiters**. Also known as "Super" gaiters, these are worn whenever the ski boots are. It is nylon Gore-Tex legging that is fully insulated. To place on the boot feed the toe of the boot through the front hole on the bottom of the gaiter. Slide the heel of the boot through the rear hole in the rubber seal is snug against the welt of the boot. If the rubber seal will not stay in place along the toe of the boot, a light coat of Purple Klister (ski wax) will help stick it in place.

e. **Overboots**. As their name implies, are worn over the entire ski march boot system. The overboots are fully insulated and have a hard sole for walking. They are not designed for skiing.

- **Care:** Caring for the Super gaiters and the Overboots are essentially the same. Keep as clean and dry as possible. Open the gaiter occasionally while wearing to allow condensation to evaporate. If the rubber parts start to dry out, coat them with a silicone spray.

2006. Specialty Uniforms

The Specialty Uniform System uses four cold weather clothing layers found in the supply system and is not stored or obtained from the Training Allowance Pool, (TAP).

2007. Cold Weather Personal Equipment

Cold Weather Personal Equipment is specially designed to provide protection and to be as lightweight as possible.

a. The sleeping system consists of a sleeping bag, an insulated sleeping mat, and a waterproof bag.

(1) There are two types of sleeping bags that, when used in conjunction with the camouflage Gore-Tex bivy-bag, will provide protection according to the following temperature scales:

- **Sleeping Bag, Type I, intermediate cold**, for temperatures down to +10F, uses polyester batting for insulation and weighs 7.5 lbs.

- **Sleeping Bag, Type II, extreme cold**, for temperatures down to –50f, uses waterfowl feathers, down, and polyester batting for insulation, weighs 9.5 lbs.

(2) Sleeping Mat. The sleeping mat replaced the old pneumatic mattress. It provides excellent insulation from ground cold and can be used for sitting, sentries, when consolidating following assaults, and in ambush positions when personnel must lie prone for long periods of time.

(3) Waterproofing Bag. This is used to protect the sleeping bag from getting wet. Sleeping bags are difficult to dry once wet and care should be taken to keep them as dry as possible.

b. **Load Bearing Equipment**. Marines are now issued the LCS-88 pack for use in cold weather/mountainous environments. This pack has an internal frame, fully adjustable suspension, a map flap, three external ski tunnel pockets, as internal divider for the zipper opened sleeping bag compartment, a radio pocket, numerous attachment points for ALICE equipment. Packing of this pack is discussed in Chapter 8, "Movement on Foot."

CHAPTER 3

GROUP EQUIPMENT

3001. Group Stores

The group stores are the items that are packed and hauled in the fire team sled. These stores consist of items that are required to operate for a prolonged period in a cold weather environment. The fire team sled should not be used to haul individual gear (that gear is to be carried in the individual pack.) Group stores consist of, but are not limited to:

a. One ECW (Extreme Cold Weather) tent complete (tent body, fly, poles, and repair kit).
b. Extra fuel for individual stoves.
c. One case extra of MREs/RCWs.
d. Two shovels and pioneer gear as required (hatchet, belay rope, etc.).
e. Two pair of climbing skins (if skiborne).
f. One whiskbroom – used for sweeping snow off clothing and tent floor.
g. One team cook set.
h. Candles or lantern.
i. Trash bags – used to collect snow for water production or track camouflage.

3002. Fire Team Sled

The fire team sled is designed to haul all of the necessary equipment required for a 4-man team to operate in a CWE. One man who may wear skis or snowshoes pulls it. In extremely rough terrain, it may be necessary for a second man to assist the primary puller, either by belaying the sled from the rear when going down hill or by hooking an extra line into the tow harness when going uphill. The weight capacity of the sled is 150-200 pounds. Exceeding this weight may cause damage to the sled. Also, overloading the sled makes it very difficult to transport.

a. Packing. There is one simple principle that should be adhered to: keep the center of gravity low, centered, and to the rear half of the sled. This principle will facilitate movement of the sled and help prevent it from tipping over or nose-diving into the snow when being pulled.

b. Sled Movement. There are 4 basic ways to transport your sled.

(1) Towed By Vehicle. If the assets (BV-206, snowmobile, etc.) are available this is a fairly efficient method of moving your sled.

(2) Carried On A Vehicle. This is the easiest method of transporting sleds over long distances. The roof of the passenger variant BV-206 can be used to transport sleds.

(3) Carried By Helicopter. The sleds will be the last things loaded onto the helicopter, and thus the first thing unloaded.

(4) Pulled By the Individual Marine. This is obviously the most difficult method of moving your sled. It is recommended that the man pulling the sled wear snowshoes, or skis. If the puller does wear skis, then he should also have climbing skins on to facilitate movement. Some general principles must be kept in mind when pulling the sled.

(a) Pulling the sled is extremely hard work. Rotate the personnel pulling the sled on a regular basis to prevent exhaustion.

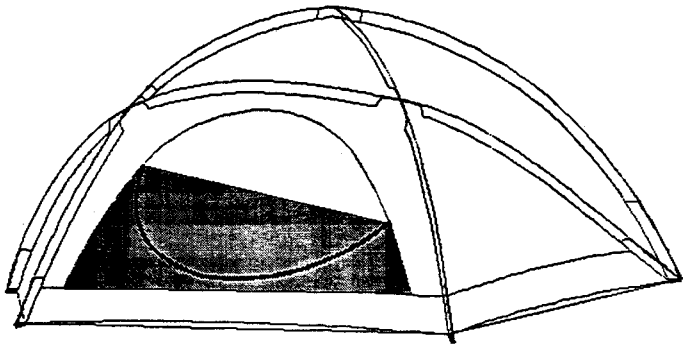
(b) One man from the team should always travel behind the sled to assist as necessary. He can attach a belay line to the sled to slow it down when going downhill, help push it uphill, and upright it if it tips over.

(c) When traversing up or down a slope, a route must be selected to prevent making kick turns. Use large, wide turns instead.

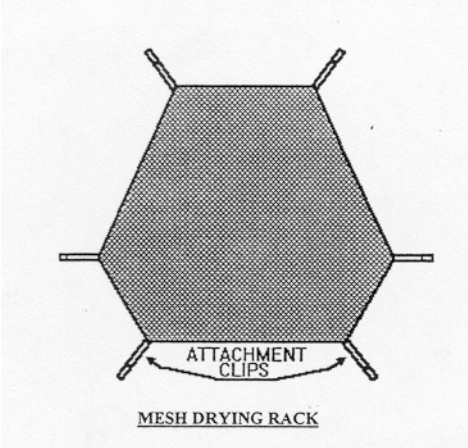
(d) The trail-breaking party should build a snow bridge to span any gaps.

3003. Extreme Cold Weather Tent

The extreme cold weather tent was developed to replace the ten-man tent, and the Norwegian tent sheets. It is lightweight and portable, weighing only 14 lbs. It is a self-standing, dome-shaped, four-season design capable of holding four Marines within its 84 square feet of floor space. The tent body is made of 3 ounce per yard urethane coated taffeta nylon. Inside the top of the tent is a mesh drying rack, and around the bottom are several mesh pockets for commonly used items. The entrance has a mesh panel designed to keep bugs out. Later versions will have two openings spaced around the tent body that facilitates joining tents together for CP's or BAS's. Another modification on later models is a stove hole by the front door that closes with a drawstring. This allows cooking to be done inside the tent during inclement weather without fear of food spills soiling the tent or fire igniting it in case the stove falls over. The tent comes with three different flysheets; a woodland camouflage cover, a desert camouflage cover, and a white cover. These sheets are also made of nylon with a heavier urethane coating. Later models will only come with two flysheets, the desert one having been deleted. The pole configuration used with this tent allows maximum use of floor space. The poles are comprised of nine sections of 7075 aluminum with an overall length of 18 ft. 2 ½ in. The poles are held together by shock cords which aid in connecting them when pitching the tent. Later models of the tent will have slightly shorter poles that are easier to put into the sleeves and reduce bending the poles by forcing them. Each tent comes with an accessory kit containing: 2 pole repair sleeves, 24 aluminum stakes, 12 nylon tie down cords, 12 line tightners, a black foam spacer, and woodland colored repair tape 3" x 36".



EXTERNAL VIEW



MESH DRYING RACK

a. Pitching the Tent.

(1) Clear an area and ensure that there is sufficient room for the tent (approximately 12-ft.) by spreading it out on the ground and pulling the floor section tight. Another method is to have one man stand in the center of where the tent is to be pitched and hold a ski pole for a second Marine. The second man will walk in a circle around the first man using the ski pole to measure the radius, thus ensuring that the tent will have enough room. Once the circle is marked, it should be dug down (4-6 ft.) in order to provide camouflage and protection. Depending on the tactical situation, if time is limited, the snow can be packed down to achieve some cover and concealment initially and then improve the position later by building up a surrounding snow wall.

(2) Insert poles into the sleeves of the tent, six poles for the tent and three poles kept aside for the fly. The poles that form the triangle at the top of the tent should go in first, followed by the poles around the side. There are several grommets in each strap to adjust the tension of the tent. If the tent is too loose, snow and rain can accumulate. When pitching or striking the tent, it is advisable to push rather than pull the poles so that the sections will remain engaged.

(3) Attach the foam spacer to the snap located on the rear of the tent. The foam spacer is used to prevent the flysheet from coming into contact with the tent, thus keeping water away from the tent.

(4) The fly is hooked onto the back of the tent and brought over the top, ensuring that the entrances on both are aligned. Insert the remaining poles into the sleeves of the fly and adjust for tension. Pull the front of the fly out away from the tent to attain maximum tension. Inside the fly are two straps that attach to the triangular buckles on each side of the entrance, use these to adjust tension and prevent the fly from blowing away. The fly is a very important part of the tent and tent performance is degraded without it, so it is imperative that the fly not be allowed to blow away.

(5) Use the tent stakes and guide lines provided to secure the tent. These tents, as with all tentage, are vulnerable to wind damage: therefore, it may be necessary to secure the corners prior to inserting the poles during pitching in high wind conditions. If you are pitching the tent in deep snow, it may be preferable to use 'deadmen' to hold the tent down (tied objects such as tree branches or stones that anchor to attaching points on the tent and are buried underneath snow.) Use all tie down points available depending on wind and tactical conditions. (Tying the tent down in ten different places may not be advisable if enemy attack is imminent.)

(6) The tent is designed with a light retention material, but is not lightproof. Also, it may be possible to build a snow wall that not only shields light emissions, but also camouflages and protects the tent from the snow as well. In deep snow it is best to dig down into the snow pack and keep a low silhouette. Camouflage with overwhites or netting.

b. Striking and Packing. In order to strike the tent; perform the pitching instructions in reverse order. Tent poles have a tendency to freeze and must be stroked at the joints in order to loosen. Also, it is recommended that the tent fly be folded length-ways into thirds for efficient storage. Before placing it in the stuff sacks, roll tightly around the folded tent pole sections, squeezing trapped air out in the process.

c. Maintenance. The ECW tent requires very little maintenance. After each use, shake out loose debris. Sponge clean all dust and track marks. If the fabric requires deeper cleaning, hand wash the tent in mild soap and warm water. Air-dry the tent out of direct sunlight. Make sure that the fabric is completely dry. Never store the tent damp, as it will cause mildew and damage to the tent fabric. For the tent poles, apply a thin layer of silicon lubricant to all parts of the poles. This is excellent protection against corrosion, prevents the poles from freezing together when they are very cold, and will make the joints work more smoothly in any weather. To complete waterproofing both the tent floor and flysheet, the seams must be thoroughly sealed. Lubricate the zippers with a silicon spray to keep them running smoothly and to prevent freezing.

d. Safety Considerations. A four-man tent team living together for extended periods of time will quickly produce a foul atmosphere within the tent if precautions are not taken. The only way to ventilate the original version of this tent was to open the door slightly; later versions have positive ventilation in the sidewalls. This also prevents condensation from forming inside the tent, as well as from humid air preventing the proper functioning of the drying rack. Great care should be taken when lighting a stove inside the tent because a flare up could be disastrous. The place for cooking or melting snow for water is outside; if weather conditions prohibit this then cooking will be accomplished inside the vestibule. Cooking inside the tent itself can lead to fires or nasty spills on gear and other Marines, potentially resulting in burns. A small stove will heat the inside of a tent very quickly, but it will also consume all of the air in a sealed tent, resulting in asphyxiation. There have been numerous deaths caused by asphyxiation. Also, you should never sleep in the tent while the stove is lit. If at all possible, do all cooking during the day as a light discipline technique.

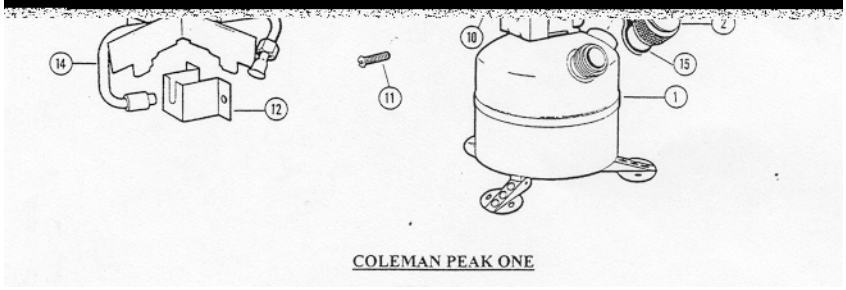
e. Carrying the ECW Tent. The Northface tent is designed to be used by a fire team and will be carried by the fire team to which it is assigned. There are a couple of ways this will be accomplished. The first way is to spread load the tent between all the members of the fire team. The second way is by use of the fire team sled. When using the sled the tent will be placed between the normal fire team stores and the pioneer gear, so that it is readily accessible when it needs to be used.

3004. Peak 1 Stove.

The Coleman Peak 1 is a multi-fuel stove. It can burn white gas or kerosene. To be certain on how to operate this stove it is important to be able to identify the different parts.

a. Nomenclature of the Peak 1 Stove

(1) The following diagram corresponds to the numbered list:



(a) Fount

(b) Filler cap

(c) Valve assembly

(d) Burner bowl

(e) Burner ring set

(f) Pump cup

(g) Pump plunger

(h) Air stem and check valve

(I) Clip for pump cap

(j) Burner box assembly

(k) Screw (six)

(l) Generator bracket

(m) Grate

(n) Generator assembly

(o) Lanyard

b. Serviceability Check

(1) Make sure the screw is tightened down on the burner assembly.

(2) Ensure the grate is not loose, bent or damaged.

(3) Make sure that the pump cup is not bent and seats well into the fuel tank. Lubrication may be necessary to provide efficient pressure.

(4) Check all the parts of the pump plunger for cracks.

(5) Ensure that the filler-cap has a gasket and a tight fit to the fuel tank.

(6) Ensure that the pump-cap clip is in place to hold the pump assembly stable while pressurizing the fuel tank.

(7) Check the generator assembly for kinks or fuel leaks.

(8) Ensure the threads of the valve assembly are not damaged and that they fit properly into the fuel tank.

(9) Check the fount for fuel leaks and that the proper, clean fuel is used in the fuel tank.

c. Maintenance. If proper maintenance is not performed periodically, the stove will begin to fall apart and fail to operate properly. Ensure that all parts of the stove are tight. Remove excess carbon buildup by taking a small toothbrush or AP brush and a small amount of fuel and scrub the following areas: burner head, outside area of the burner head, and the entire stove itself due to spilt food. If at all possible, keep the stove inside a pack or wrapped in clothing and out of the extreme cold until use to prevent possible cracking and damage to the plastic and rubber parts.

d. Lighting

(1) Ensure the fuel tank has sufficient fuel in it (no more than ¾ to allow for pressurization.)

(2) Place the stove on a level surface. **DO NOT TIP THE STOVE.**

(3) Be sure the control knob is in the "off" position.

(4) Open the pump knob one turn counterclockwise.

(5) With the thumb over the hole of the pump knob, pump air into the fuel tank, **DO NOT OVERPRESSURIZE THE FUEL TANK.** If little or no resistance is felt, lubricate or replace the pump cup.

(6) Close pump knob firmly to the right.

(7) Hold a lit match to the burner bowl.

(8) Turn the black control knob counterclockwise to the "HI" position. If a yellow flame or liquid fuel appears in the burner, turn the control knob "OFF" and allow the flame to burn out excess fuel or allow it to evaporate before relighting.

(9) It may be necessary to re-pump the stove occasionally during use for full heat output.

(10) To regulate the heat, turn the control knob between "HI" and "LOW".

(11) To turn the stove off, turn the control knob fully clockwise to the "OFF" position and the flame will slowly extinguish itself.

Chapter 4

Rations and Diet

4001. Effect of Cold Weather on Nourishment

a. Caloric Intake. In cold weather operations Marines must eat more than usual in order to function without suffering significant weight loss. The body burns a larger percentage of calories to maintain body temperature, leaving less energy to perform physical work. In a cold climate, at least 4,500 calories are needed to perform hard, physical work and sustain life. Without proper intake individuals will weaken physically in a short period of time.

b. Fluids. The body loses liquid at an exceptional rate in arctic conditions due to evaporation, exertion, and low humidity. However carefully you adjust clothing and ventilation, the heavy exertion of movement on foot and other field activities will exact a toll in sweat and loss of moisture in the breath. These problems are combined with decreased thirst in a cold environment, and potentially a lack or readily available water. To prevent serious dehydration fluids must be regularly replaced, preferably with hot drinks. If those drinks contain sugar they have the additional advantage of providing extra calories.

4002. Rations

Lethargy induced by the cold, combined with the difficulties and inconvenience of cooking, may sometimes tempt Marines to skimp or miss meals. The principles of sound leadership and discipline in cold weather require that meals are prepared and entire rations are eaten. Marines in cold weather operations may be fed with the following five different types of combat rations:

a. Rations, Cold Weather. Rations, cold weather, provide the 4,500 calories needed for the average Marine to function in a cold environment if all portions of both packages are eaten. They contain the correct proportion of carbohydrates, fat, and protein.

b. Meal-Ready to Eat. MREs may freeze in cold environments. Marines can prevent this by carrying the individual food packets in their shirt or trouser pockets. Each MRE contains 1,200 calories. Therefore four entire MREs must be eaten in order to provide the necessary calories.

c. Long-Range Patrol Ration. The long-range patrol ration (LRPR) is a lightweight, nourishing ration that may be easily prepared in hot water. Four LRPR's are required to provide the necessary calories for one day.

d. Tray Pack. The tray pack system is another useful ration system in the cold weather environment. Tray pack meals come in vacuum-sealed aluminum trays that can be stored without refrigeration. They are prepared in heat systems that utilize vehicle generators; diesel fired burners, or external electrical generators to heat a water bath. The tray packs are immersed in the hot water bath and heated to serving temperature. The meal is served on paper trays. Each storage tray contains plastic eating utensils and enough of an entrée, vegetable, or dessert to feed a squad-sized unit.

e. Food packet, Assault. The food packet, assault, is an excellent ration for cold weather operations. Marine commanders must ensure they receive the arctic supplement as well as two packets per day per person to gain the necessary 4,500-calorie intake.

4003. Fluids

Daily requirements for fluid vary from a minimum of 6 quarts up to 8 quarts per day during heavy exertion.

Leaders must insist that Marines take as much of the daily fluids as possible in the form of hot liquids. Marines should be cautioned to drink coffee, cocoa and other caffeine drinks in moderation due to their diuretic effects. Diuretics increase urine output, which will contribute to dehydration. Sugar flavored concentrates may be added to drinking water to improve taste and increase intake by the troops. The additives also have the benefit of increasing total caloric intake.

a. Sources of Water. Water is generally available from streams and lakes or by melting snow and ice. Fuel and time must be made available to melt snow or ice. The milky water of glacial streams should be allowed to stand until the coarser sediment settles. Holes cut in ice to obtain water should be protected to prevent refreezing. In very cold weather, the hole should be broken open frequently. If water is not available, melting ice provides more water in less time than snow. When melting snow, a small amount of water is initially put in the pot and melted. Additional snow is added to the resulting water.

b. Water Disinfecting. Water taken from streams or lakes should be disinfected to prevent potentially devae(s) Tc0.-10.8(w[(b.)-495.2(Water Disf)14(i)2.0.00240.00123176 TD/TT2 1 Tf10.9277 317 317 3ter DiTD0.0)6.5(i Tw|

help maintain an open airway.

- Do not massage the victim.
- Do not give alcohol to the victim; it may provide a temporary feeling of warmth, but will cause a further drop in core temperature.
- Get the victim to medical help as quickly as possible
- Victims with altered consciousness must be handled with care to prevent life threatening medical problems.

b. Frostbite. Frostbite is an injury in which tissues are frozen. It is almost always preventable. It seldom occurs in individuals who are not injured, dehydrated, malnourished, exhausted, or improperly clothed. The feet, hands and exposed facial areas such as eyes, ears and nose are the most vulnerable to frostbite, and should receive constant attention.

(1) Prevention

- Boots, socks, and gloves should not be tight.
- Personnel should be required to wear mittens instead of gloves in extreme cold.
- The buddy system should be used to check exposed areas, especially during wind.
- Require personnel to carry extra socks and mitten liners.
- Marines should not remain motionless for long periods of time.
- Use great caution when cold and wind are combined. (See fig. 1-1, Wind Chill chart)
- Check feet during halts on marches.
- Ensure Marines eat well and stay hydrated with hot drinks if possible.

(2) Symptoms

- The victim will have a painful feeling of coldness, followed by numbness.
- If an individual rewarms the part they will experience a burning, stinging or aching sensation.
- If the part is still cold it will usually be pale, whitish or bluish in color. If re-warmed, the part may be a variety of colors ranging from white, gray, blue, or red.
- The skin will be waxy in appearance and not glide freely over joints.
- Frostnip, which is an early, reversible precursor to frostbite may be similar in appearance to frostbite.

(3) Treatment

- For cases where frostbite is suspected, a fifteen-minute attempt at rewarming should be attempted. In cases of frostnip, the part returns to normal color and feeling and no further treatment is needed.
- The rewarming should be performed by placing the affected part against another person's stomach or underarms.
- If the affected part cannot be rewarmed within 15 minutes (i.e., capillary refill, feeling returns, toes and fingers move easily), the victim must be treated as a deep frostbite casualty.
- **The patient must be MEDEVACED immediately.**
- No further field rewarming should be attempted; rewarming using dry heat may cause greater damage.
- If a frostbitten part does thaw while in the field, extreme care must be taken to ensure it does not refreeze.

c. Dehydration. Those who become dehydrated in the cold are headed for trouble. Even mild dehydration makes Marines more susceptible to other problems: frostbite, hypothermia, altitude illness, headache and constipation.

(1) Prevention

- The minimum daily fluid requirement for persons doing arduous physical activities in the cold is six quarts per day.
- By the time a person feels thirsty, he is already dehydrated. **Require Marines to drink water whenever they have the chance,** particularly during foot movement rest halts. Ensure canteens are full before any type of movement where resupply will be difficult.
- Do not allow personnel to drink coffee when water is scarce. Coffee contains substances which increase urine output, and can contribute to dehydration. Water should be the drink of choice.
- Squad leaders should designate a place for each tent team to urinate. The squad leader should monitor the color of the urine spots in the snow. Dark yellow to brown urine indicates dehydration. Individual tent team leaders should be held accountable for dehydration of their tent-mates.

(2) Symptoms

- Dark yellow or brown urine. Red urine indicates a severe condition requiring immediate medical attention.
- **Headache.**
- Lack of appetite.
- Dry mouth, tongue, and throat.
- Upset stomach and vomiting.
- Constipation.

(3) Treatment

- Keep the victim warm.
- Give fluids by mouth if tolerated until the person has clear urine output.
- Refer to medical for IV fluids if the patient is unable to tolerate oral fluids.
- Rest.

d. Carbon Monoxide Poisoning. Carbon monoxide (CO) is a deadly odorless gas given off by the burning of fuel.

(1) Prevention

- Ensure stoves and lanterns are functioning properly.
- Vehicles should not have exhaust leaks under passenger compartments.
- Ensure stoves and lanterns are used only in well ventilated areas.
- The tent door must be open while stoves are in use inside the tent.
- Stoves should not be used in snow caves.
- Do not allow personnel to warm themselves by engine exhaust.

(2) Symptoms

- Early symptoms include headache, dizziness, confusion or odd behavior.
- As CO poisoning progresses, the person's lips and skin will take on a bright red color.
- The victim may become drowsy and collapse without warning.
- If personnel are found unconscious in an enclosed shelter, suspect CO poisoning.

(3) Treatment

- Move the victim to open air.

- Keep the victim still and warm.
- Administer mouth-to-mouth resuscitation if victim is not breathing.
- Administer CPR if patient is without a pulse.
- If patient has altered consciousness, MEDEVAC as soon as possible.

e. Snow Blindness. Snow blindness is sunburn of the eye by ultraviolet radiation. The risk of snow blindness is greater on a cloudy day than on a clear day because ultraviolet radiation penetrates the clouds and brightness is not apparent as a warning.

(1) Prevention.

- Require personnel to wear approved sunglasses. If they do not have sunglasses they can construct field expedient sunglasses from cardboard.

(2) Symptoms

- Eyes have a burning, gritty, or painful sensation.
- The person can not tolerate to look at bright light.
- Sight becomes blurred, tears flow from the eyes.
- Headaches.

(3) Treatment

- Rest in darkness.
- Antibiotic ointment designed for use in the eyes.
- Cool compresses.
- The injury should be referred for medical attention, but will usually heal in 2-4 days.

f. Sunburn. Sunburn occurs quickly in a snow covered, high altitude environment. People must deal with the sun's direct rays, as well as those reflected off the snow. At high altitude there is less of the earth's protective atmosphere to filter harmful ultraviolet radiation.

(1) Prevention

- Wear a cover when possible.
- Require personnel to wear sunscreen and chapstick with sunscreen protection.

(2) Symptoms

- Redness of skin.
- Prolonged exposure may cause pain, swelling and blistering.
- In severe cases, chills, fever, and headache may develop.

(3) Treatment

- Prevent further exposure of the affected skin to sunlight.
- Motrin or Ibuprofen 400mg twice a day will help reduce the inflammation
- Apply aloe vera cream 2-3 times daily to the affected skin if available
- Refer severe cases for further medical attention.

g. Tent Eye. Tent eye is caused by fumes from stoves or lanterns used in a poorly ventilated shelter. It is an irritation of the eye's cornea. It may be prevented by using properly functioning stoves and lanterns in only well ventilated shelters. The treatment is fresh air.

h. Trench/ Immersion Foot. Trench foot (also known as immersion foot) is an injury caused by prolonged exposure of the skin to wetness. Such conditions are common when vapor barrier boots are worn. This injury may be very painful and may adversely affect combat readiness.

(1) Prevention

- Ensure personnel have extra, dry socks available.
- Remove wet socks, dry feet, and put dry socks on at least twice each day.
- Pay special attention to feet while wearing vapor barrier boots.

(2) Symptoms

- Early symptoms include wrinkling of the skin, redness, and a numb or painful sensation.
- Symptoms may progress to include swelling, extreme pain, blisters, a mottled red and white appearance.

(3) Treatment

- In early stages; keep the feet clean, dry, elevated, and exposed to air.
- In later stages, MEDEVAC.

i. Constipation. At very cold temperatures, personnel tend to postpone bowel movements, leading to constipation. Dehydration will also contribute to constipation.

(1) Prevention

- Ensure that a head is designated in the bivouac area where it is accessible to all troops.
- The head should be sheltered from wind and snow.
- Ensure that Marines eat regularly and drink an adequate amount of water.
- Ensure men stay on their regular bowel movement schedule.

(2) Symptoms

- Lack of regular bowel movements.
- Stomach pain, cramping, or a bloated sensation.

(3) Treatment

- Prevention is the best medicine.
- Increase fiber and water intake.
- If symptoms persist, get medical help.

j. Heat injuries. Even in cold environment heat injuries may cause significant casualties, especially if personnel are not educated about the risk. Individuals unfamiliar with cold environments often overdress, especially during periods of physical activity.

(1) Prevention

- Personnel should be instructed to dress so as to remain “comfortably cool” and avoid sweating.
- Personnel should dress in layers, and be given breaks to remove extra clothing during periods of exertion.
- Ensure proper hydration of your men.

(2) Symptoms

- The individual's skin will be flushed and they may be perspiring.
- They may become dizzy, lightheaded, or nauseated.
- In later stages the individual may become confused, uncoordinated, and may even pass out.

(3) Treatment

- If they passed out, or became confused they need immediate medical attention.
- Rest, if they are feeling dizzy it may be helpful to lay them down with their legs elevated above head level.
- Hydration.
- Replace wet clothing with dry. A heat casualty may quickly become a hypothermia casualty in a cold environment.
- **Do not** rub snow on the person.

k. High Altitude Illness. There are several illnesses that may result from rapid exposure of individuals to high altitude that exists in many mountainous areas of operation. As a Marine moves to higher altitude there is less oxygen in each breath he inhales. The body must undergo a complex acclimatization process to prevent illnesses ranging from minor to life threatening. Altitude illness is rare below 7,000ft. Medical doctors and corpsman must be prepared for these contingencies; oftentimes, the best treatment is to descend.

(1) Prevention

- For personnel coming from low altitude begin operations at an altitude no higher than 7,000ft if the mission permits.
- Between elevations of 7,000ft and 14,000ft ascend at a rate not greater than 2,500ft per day.
- At elevations higher than 14,000ft ascend at a rate not greater than 1,000ft per day.
- There are medications (diamox) which may be useful in preventing altitude illness in the situation of a forced ascent.
- Avoid alcohol, it interferes with the acclimatization process
- Maintain proper water intake which assists in acclimatization.

(2) Symptoms (In the setting of high altitude)

- Early: headache, nausea, vomiting, difficult sleeping
- Later: Confusion, personality changes, stumbling gait, shortness of breath at rest, and cough productive of pink sputum. If one or more of these symptoms are present, it may signify a life threatening illness, which requires immediate medical attention.
- Serious high altitude illness is rare below 12,000ft.

(3) Treatment

- For mild symptoms: rest, hydration, restrict tobacco use, Tylenol for headache and refer to medical for evaluation of more serious conditions
- For later symptoms: descent of 2,500 ft may be life saving; victims also need immediate medical attention.

l. Battle Wounds. In cold weather, casualties should be given first aid treatment, protection from the cold and evacuation to an aid station without delay. Casualties should be insulated as best possible by placing them in a sleeping bag or other available insulating material. The patient should be monitored closely for shock and continued bleeding.
Wounds open to the weather may freeze quickly. Wounds that do become frostbitten heal poorly. The body loses heat in the area around the wound as blood soaks the skin and clothing. Blood loss

and immobility will increase the risk of hypothermia. Therefore, early first aid treatment becomes even more important at low temperatures.

m. Shock. Shock is caused by a reduction in the effective circulating blood volume. Shock is usually due to blood loss from wounds, but may also be a response to severe pain.

(1) Symptoms

- Rapid, faint pulse
- Apprehension
- Cool, clammy skin
- Pallor
- Lightheadedness
- Thirst

(2) Treatment

- Tourniquets should be used to lessen severe bleeding. Place the tourniquet as close to the wound as possible. Loosen the tourniquet every 5-10 minutes to see if the bleeding has subsided enough that a pressure bandage may be used instead.
- Pain can be greatly reduced with proper positioning, good bandaging, and splinting.
- Position the stretcher so that the casualty's head and chest are lower than his legs and abdomen. A six to twelve inch difference in height is best.
- Keep the casualty warm; his inactivity and blood loss will predispose the victim to hypothermia.
- Do not move the casualty any more than necessary. This does not mean movement over distance, but rather movement of the casualty from one stretcher to another, from one sleeping bag to another, unnecessary lifting or turning when bandaging or splinting.
- If the casualty is conscious and not experiencing abdominal trauma, give sips of warm soup, tea, cocoa, or other warm liquids except for alcohol.
- The casualty should receive medical attention as soon as possible.

5003. Medical Emergency Evacuation

Injuries in the cold have great consequences because the body often reacts by going into shock. This causes the blood to collect in the body core, making frostbite and hypothermia more likely. MEDEVAC procedures must be rehearsed ahead of time. Helicopters may not be available for casualty transport due to weather or tactical considerations. Even tracked vehicles may be unable to move over terrain that is not groomed. Movement of patients over snow by sled is very time consuming and labor intensive. Units must be prepared with predesignated litter teams and potential rewarming stations along the MEDEVAC route. If the patient is transported by sled ensure he is well insulated for the trip.

a. Training Situations. In a training situation, evacuate all but superficial frostbite cases. Helicopters are the most desirable means due to their speed. However, worsening of the casualty's condition must be weighed against risk to the helicopter crew, especially in bad weather. The next preferred method is evacuation ambulance or other vehicle. Such modes of transportation are often restricted by the snow pack. The least desirable method of evacuation is by sled. However, terrain and weather conditions may leave the sled team as the only choice. The decision then becomes whether to risk further harm to the casualty and possible injury of the sled team by movement on foot. A better choice may be to obtain medical advice by radio until an evacuation vehicle can get to you.

b. Combat situations. In combat, the decision to evacuate a casualty becomes even more complicated. You should consider the following:

- Will the enemy ground fire endanger the helicopter?

- Will the snow cloud created by the helicopter disclose your position?
- Can the unit afford to give up the combat power of a squad for each casualty moved by sled and continue to carry out the mission? Three to four people will be needed to pull the sled. Two men will be needed for security in the front, and one in the rear. Additional personnel will be required to rest the primary team or break trail in heavy snow.

Chapter 6

Living in the Cold

6001. Importance of Shelter

"Losses among the troops because of frost weigh heavier on the commander's conscience than battle casualties."

-Marshal Mannerheim, December 1941

The Finnish commander's comment is directed towards German generals of World War II who invaded Russia during the summer of 1941. As Operation Barbarosa lingered into the winter months, the German Army experienced an alarming number of losses due to cold weather injuries. The Germans were not prepared for the harsh Russian winter, and did not anticipate the importance of shelter. Their campaign relied largely on fighting from town to town with the intention of occupying Russian buildings at the end of the day's fight.

Selecting a bivouac and establishing its routine should be almost automatic for well-trained Marines. Under cold weather conditions, units must establish bivouacs during darkness or other periods of reduced visibility and avoid standing around getting cold. Special attention and detailed planning will help train Marines to move promptly. The unit SOPs should specify individual duty assignments and procedures that are discussed throughout this chapter. This chapter covers the selection of a suitable bivouac site, prioritization of bivouac tasks and responsibilities, and tips for living comfortably in the cold.

6002. Bivouac Criteria and Site Selection

The ECW 4-man tent is the Marine Corps's primary cold weather shelter. Focus on this tent should not detract the small unit leader's attention from the importance of survival shelters, either natural or manmade. The ability of a unit to live from the land in an emergency cannot be underestimated. Furthermore, proficiency and confidence in survival shelters may allow a unit to move under lighter loads for short periods of time. The survival shelter information in **MCRP 3-02F, "Survival"**, should be used in conjunction with this chapter to build a comprehensive training program for the small unit.

a. While the construction of a tactical bivouac should generally follow these established principles, a thorough estimate of the situation (METT-T) will guide in its exact design.

(1) Mission: how does the assigned mission impact the units flexibility to bivouac?

(2) Enemy: how close is the enemy; what are his capabilities?

(3) Terrain/Weather: how can the unit best camouflage; what weather must the unit be prepared to protect itself against?

(4) Troops/Fire Support: what is the physical condition of the unit; how large is the unit; how well trained is the unit in bivouac establishment?

(5) Time: how long can the unit expect to occupy the bivouac?

b. After the unit leaders have decided to what extent a bivouac should be established, all shelter must meet the following basic criteria.

(1) Protection from Elements: limit the effects of rain, snow, wind, sun, etc.

(2) Heat Retention: insulate to prevent the loss of heat.

(3) Ventilation: prevent the accumulation of carbon monoxide from burning fuel, and eliminate the chance of asphyxiation.

(4) Drying Facility: ability to dry wet clothes.

(5) Free from Natural Hazards: avoid rock fall, standing dead trees, high winds, avalanche.

(6) Stable: withstand the force exerted by severe weather.

c. Bivouacs should by sited according to eight criteria.

(1) Good Defensive Position: allows unit to accomplish mission from secure area.

(2) Suspected Avalanche Area: avalanche start and run-out zones can naturally damage a bivouac, or be used by the enemy to cause casualties.

(3) Large Enough for Whole Unit: units must provide for 360-degree security.

(4) Forested Area: provide for natural cover/concealment, protection from elements, firewood and construction materials, smoke dispersion.

(5) Depressions or Knolls: in the absence of forest, depressions afford similar benefits.

(6) Water supply: while snow may be naturally abundant, running water sources are more convenient to use for all purposes and require less fuel than melting snow.

(7) Leeward Side of Mountains: protection from wind-chill.

(8) Off Valley Floor: cold air settles during windless periods.

6003. Establishing the Bivouac

The order in which the bivouac is established is very important in order to save time. If possible, dispatch an advance party to reconnoiter and establish the bivouac.

a. Advance Party Responsibilities. Several variations of a basic technique can be employed to site the bivouac. An advance party composed of unit leaders and guides will conduct an initial reconnaissance of a potential bivouac. They will then meet the main body of troops to explain the layout of the bivouac and track plan. Afterward, the guides lead the main body to the position. Once in the position, the commander should take the following actions that usually confirm decisions made by the advance party.

(1) Break or mark the trails to be used in the bivouac area.

(2) Decide the types of field defenses to be constructed, and site them.

(3) Select exact tent and firing positions to maximize cover and concealment.

(4) Designate “specific use areas.” (discussed in 6004)

b. Security. Extended operations in a CWE will physically exhaust a unit; during these periods, the tendency may be to set up tents, rest and eat with no consideration for security or concealment. Security is essential prior to establishing, during construction and after occupation of the bivouac.

c. Track Plan. A good map study with a visual reconnaissance from afar will aid the leaders in knowing how they can set up their bivouac site to minimize confusion upon arrival. (See Fig. 6-1)

(1) Jump-off Point: The location where the trail to the bivouac site meets the approach trail. It must not be detected by the enemy and should be concealed by such natural obstacles as large trees, rivers, and rocks. The exit from the approach trail should be at a right angle, and must be covered by fire.

(2) Dummy Track: This is a deceptive trail that extends past the jump-off point on the main trail. Care must be used by troops making this trail in order to fool the enemy into thinking that the unit has continued on the main trail. The dummy track is extending past the jump-off point to an area that can simulate a dummy position. When returning on the dummy track, avoid any creating evidence pointing towards the actual bivouac. For example, ski without poles, reverse snowshoes, or loop the dummy track around to meet back into the main trail.

(3) Dummy Position: The end of the dummy track can be made to look lived in, further deceiving the enemy. This position should be sited within the fields of fire of the defensive positions such that it can be engaged should the enemy investigate it.

(4) Bivouac Tracks: Central tracks should interlock and must blend into natural surroundings. Tracks covered by trees are more difficult to detect from the air.

d. Defensive Positions. Should be outside the perimeter just beyond a point where bivouac noises reach a sentry so that he can listen to his front. Communication trenches should connect all positions (tents, fighting holes, and heads). (discussed in 13005)

e. Living Area. After determining the type of shelter to be used, decide how close to the defensive positions shelters should be located. Mark each shelter site and the communication trenches that connect shelters. They must be located in defilade and under trees or in thickets for cover and concealment. Within a shelter, there are specific areas for individuals and their equipment. Everything placed outside the shelter must be properly accounted for. Weapons must be stored and cared for as discussed in Chapter 11. Fuel, skis and snowshoes must be stored outside of tent according to a proscribed SOP for easy location. Also, the fire-team sled should be packed with non-essential equipment and stored upright in order to prevent large snow accumulation.

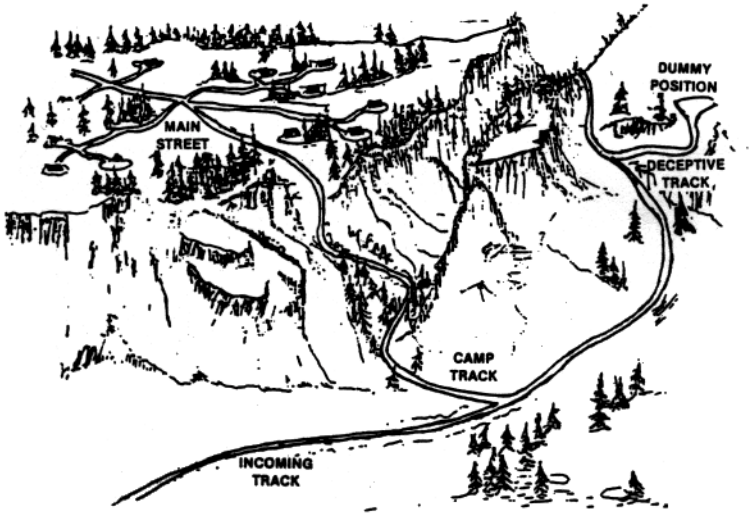


Figure Track Plan.

6004. Specific Use Areas

The final step in establishing the bivouac site is to designate and establish specific use areas.

a. Heads. Set up one central head if tents are not far apart within the bivouac; one head usually serves the needs of a unit to platoon size. It must be placed downwind of the site, but not so far from shelters as to encourage individuals to break sanitary discipline. A pit or cross-tree-type head is the usual type, wind-proofed by branches, snow blocks, ponchos, or any other available material, and properly camouflaged. Prefabricated cardboard-box heads with plastic liners may be used to enable the unit to remove its waste. Urinals are cut into the snow walls around tents or shelters or sited around a tree which will hide the discolored snow.

b. Water Point. If using a natural running water source, locate the water point at the furthest point upstream. If not available, locate a large, clean, sheltered snowbank upwind and uphill from the head, and mark it off. If the threat of NBC exists, test the whole snowbank before use.

c. Garbage Point. Should be disposed of in garbage pits designated one per tent group. The general rule is to burn or bury before departure.

d. Storage Points. Gear and equipment should be stored at designated areas within the vicinity of the bivouac (vehicles, rations, fuel, ammunition, and communications equipment). Precautions must be made to protect the equipment and ensure it is safely stored.

e. Firewood and Building Materials. Woodcutting should be spread throughout the bivouac site so as not to reveal your position by denuding one part of the forest. Cut during the daylight to take advantage of the natural noises that will help conceal your activity.

6005. Bivouac Routine

The maintenance of proper bivouac discipline and unit efficiency in a CWE is directly related to the quality of routines practiced. SOPs help delegate authority in this respect and ensure that each Marine understands what is expected of him.

a. Tent Team Leader. Responsible for supervising all tasks conducted by his teammates and maintaining overall control of the tent.

- Sleeping space is properly allocated.
- Equipment is organized outside the tent in convenient fashion. Areas should be designated immediately outside tent door for skis, snowshoes, weapons, fuel, shovels, and sled.
- Track and camouflage discipline is maintained.
- Housekeeping duties are performed according to a roster.
- Guards and sentries know where their reliefs are sleeping.
- Blackout is maintained.
- The tent is de-iced, and drifted snow is moved away from it.
- Fire precautions are observed.
- Stoves are filled outside.
- Stoves, weapons and equipment are regularly maintained.
- Snow is brushed off clothing and equipment before entering the shelter.
- Each Marine receives and eats the proper portion of rations.
- High standards of hygiene and sanitation are maintained.

b. Cook. The cook is responsible for the preparation of food, hot-wets and melting of snow for water. He must ensure the stove is properly maintained.

c. Tent Erection Team. The ECW 4-man tent and fly should be built by two men. While two Marines should occupy security positions, the other two men of a fire-team should be organized to prepare the site, to include stamping down the snow pack and rounding out the residual snow walls. The tent should be positioned such that the door is located down wind.

d. Trail and Defensive Position Maintenance. The tent team must rotate Marines during bivouac establishment in order to maintain and defend the trail. Fighting positions and communications trenches are built and maintained during periods of snowfall or high temperatures.

e. Sentries. In very cold conditions, sentries can remain alert for short periods only. They cannot look into the wind for long, and, despite frequent reliefs, can hear and see little. Leaders must use their judgment on how long an individual can be on duty outside; this time varies with the temperature, wind chill and visibility (but rarely falls outside of a 30-60 minute window.) All members of the tent team share sentry duties once the bivouac has been established. A fire watch and running stove may be necessary such that Marines can sleep comfortably in extreme cold; however, temperatures must be kept as low as possible in order to conserve fuel. These duties are rotated as part of the tent team sentry duties.

6006. Breaking Bivouac

A key to success for cold weather operations is the efficiency of the small unit in breaking bivouac. This routine must be rehearsed by every tent team in all weather conditions. The commander issues the order **PULL POLE**. At this designated time, all tent team preparations with the exception of striking the tent have been accomplished. All garbage and head sites are filled and covered; all personal equipment is packed and the team sled is ready to mount. The security of the bivouac must not be relaxed nor should the track, camouflage, light or noise discipline be forgotten. Pulling pole should be done as late as possible so that men are not required to stand about in the cold unnecessarily. Every leader should know how long those under his command need from the pull pole order until they are ready to move. This allows the commander to back-plan from the time he wishes to move.

Chapter 7

Navigation and Route Selection

7001. Cold Weather Navigation

Map reading and navigation in snow covered terrain follows the same principles as in temperate climates. In cold weather operations, however, navigation and route selection are complicated by:

- Snow covered terrain, which makes terrain look different and hinders orientation.
- Weather conditions can reduce visibility.
- Use of over-the-snow mobility devices such as snowshoes or skis with equipment loads (i.e., sleds) may determine route.
- Avalanche potential that constantly dictates the route. (see Appendix A)

7002. Navigation Challenges

Unlike any type of environment, a snow-covered environment provides many challenges to navigation and route selection. Deep snow will completely cover tracks, trails, streams and roads making map reading difficult. Other challenges unique in a CWE include:

a. Snowdrifts may hide small depressions and draws indicated on maps. They may even give the impression of small hills.

b. Lakes, ponds, marshes, and rivers are often covered with snow and/or ice, which make detection difficult. They may or may not be suitable to cross.

c. In Northern latitudes, increased periods of darkness during winter months will require more night operations.

d. Aerial photos taken during winter are difficult to read because of the monotony of detail, absence of relief, lack of contrast; and in more isolated areas, the absence of man-made works for reference points.

e. Handling maps, compasses, and other navigational equipment with cold weather clothing can be difficult.

7003. Navigational Techniques

The techniques of navigation are the same for snow covered terrain as under temperate conditions, although some additional considerations may be applied.

a. **Use of Compass.** The standard military, lensatic compass functions well in the cold. If you are using a liquid-filled compass, you will have to keep it warm, or it will become sluggish.

b. **Magnetic Force.** The lines of magnetic force run horizontal to the earth's surface near the equator but are nearly perpendicular close to the poles. Along the equator, a compass needle will lie horizontal. The further the compass is from the equator, either north or south, the more the needle will begin to pull toward magnetic vertical. In extreme latitudes, it is possible for the needle to dip enough to keep it from rotating freely.

c. **AN/PSN-11.** The AN/PSN-11 is a valuable navigational aid, but does have some cold weather considerations. To shorten warm-up time and conserve battery life in cold weather temperatures, wrap

the AN/PSN-11 in a parka, sleeping bag, or similar device during the warm-up period. The clothing acts as a thermal insulation. Keeping equipment heat from escaping to the ambient air results in a shortened warm-up period and extends battery life. The AN/PSN-11 will not operate at temperatures below –4 degrees.

d. Use of Altimeter. Many manufacturers now produce watches with altimeters. The altimeter is very useful for navigating in mountainous terrain and can be used as a second azimuth to obtain a resection from map. With known elevation, a navigator can trace his back-azimuth to the according map contour line as indicated with the altimeter. When moving parallel to the contour interval, the unit can maintain an elevation to within 5 to 10 meters. This technique can be used to maintain a certain elevation while traversing a slope. During periods of reduced visibility when landmarks are not available, the altimeter is a priceless tool for navigation. When lakes freeze and become covered with snow, they are indistinguishable for open fields. Use of a map, combined with an altimeter can help distinguish one from the other.

e. Determining Pace Count. Determining pace count in snow covered terrain is difficult on snowshoes and impossible if movement is on skis. This is because snow cover terrain will almost always dictate the route by long traverses and numerous kick-backs. Additionally, travel with sleds will require many turns through forested areas.

f. Compass March. In arctic regions without visible landmarks or in open terrain with reduced visibility, the compass march is a useful method to determine pace count. The team consists of a navigator with compass and two distance measuring men who have a 100 meter length of cord and nine trail markers.

(1) The lead man moves off dragging one end of the cord and carrying nine markers.

(2) The rear man jerks the cord when the lead man is at its end. This signals the lead man to drop his first marker.

(3) Both men move out dragging the extended cord between them.

(4) When the rear man reaches the first marker, he stops and jerks the cord. Then he picks up the first marker. When the lead man feels the jerk, he looks back to ensure the cord is not snagged and drops the second marker.

(5) Both men move out, and repeat the procedure until the rear man has all nine markers and the lead man is 1,000 meters out.

(6) The lead man stops. The rear man moves to the lead man's position. At this point, 1,000 meters have been covered. The navigator is responsible for directing the march.

g. Determining Location. Determining location can be difficult in snow covered terrain when using over-the-snow mobility device such as skis or snowshoes. While terrain will normally dictate routes, being able to dead reckon in a snow covered mountainous environment is almost impossible. Marines must rely more on terrain appreciation, but should not overlook vital navigational aids such as the AN/PNS-11 or altimeters.

7004. Route Planning Considerations

Before any movement, the following considerations should be used to determine your route.

a. Determine the Unit's Ability

- Are Marines on snowshoes or skis?
- How proficient are they on that equipment?
- What type of terrain can they handle?
- Will they be carrying heavy packs and pulling sleds?
- Are vehicles attached? What type of terrain can they handle?

b. Analyze the Terrain

- Is the route feasible with limited visibility?
- Does the route cross potential avalanche slopes as indicated by map reconnaissance and aerial photograph, if available?
- Does the route offer concealment from enemy direct observation?
- What obstacles can be anticipated? Example: a plowed road with high snow banks, farmland fences, and streams with steep sides are significant, especially if sleds are being pulled.
- Can the security element for the main body negotiate the terrain?
- How will snow condition impact movement (wet snow vs. ice)?

c. Analyze the Predicted Weather

- What allowance is made for weather?
- Are designated bivouac sites identified if weather turns bad?

d. Analyze the Tactical Situation/Mission

- How can tracks be camouflaged?
- Where can speed be accomplished without undermining total security?

e. **Plan the Route.** After all the route planning considerations are evaluated carefully, the route is planned and recorded on a map overlay or route card. The Time-Distance-Factor (TDF) is a guideline and should not be considered as the exact amount of time required for your movement. Furthermore, this formula is for use in ideal conditions.

- 3 kilometers per hour.
- Add 1 hour for every 300 meters ascent.
- Add 1 hour for every 800 meters descent.

7005. Route Selection

While the map overlay is constructed with the planned route, the detailed selection of route during movement is the responsibility of the unit leader. Some of the guidelines are as follows:

a. In open space terrain, break only one track. Follow the tree line or natural terrain feature.

b. Avoid dense forest, if possible. Stay at the edge of wooded areas or in less dense portions.

c. Use gentle traverses to ascend or descend mountainous terrain. Once altitude is gained, follow slope contours. Avoid avalanche-prone slopes.

d. Frozen streams can provide excellent routes. Check ice thickness before proceeding. (See Chapter 9) Move close to a shore or bank.

e. Bypass obstacles, if possible.

f. A route for night movement must follow the easiest possible terrain and should be well marked.

g. As you get close to the enemy, shift emphasis from ease of movement to concealment.

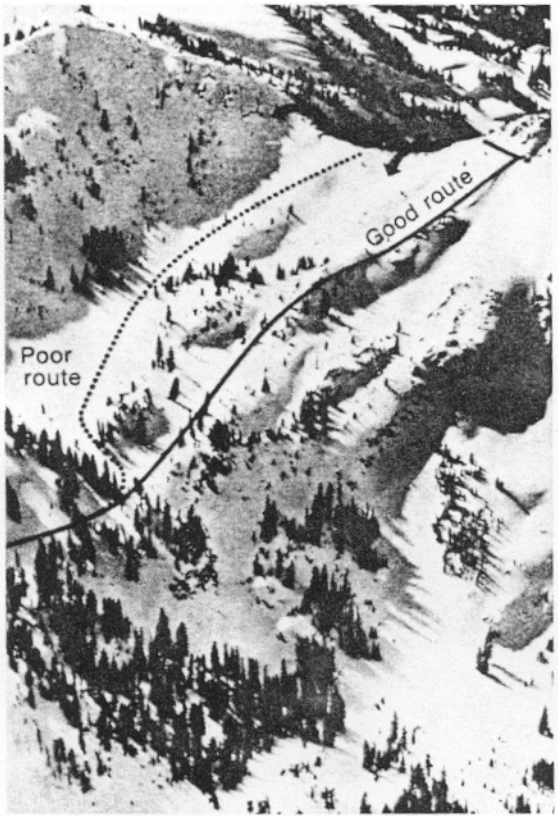


Figure 7-10A. Example of Route Selection in Area of Suspected Avalanche Hazard.

Figure 7-10B. Example of Route Selection in Area of Suspected Avalanche Hazard. – Continued

Chapter 8

Movement on Foot

8001. Effect of Cold on Mobility

a. Tactical Significance of Individual Load. The individual's load (weapon/ammunition and pack) is a great impediment to mobility. Commanders must make every effort to move nonessential equipment and to reduce each Marine's individual load to an absolute minimum. Minimal essential supplies and equipment must be carried. The individual fighting load must not inhibit the Marine's capability to fight once he arrives at the objective. See paragraphs 8002 and 8003.

b. Effects of Temperature. During the winter, low temperatures, snow, ice, and the difficulties of constructing roads and trails all hinder movement on the ground. During a thaw, ice on lakes and streams are weakened, and roads may become impassable. In summer, many areas become swampy because the underlying permafrost in arctic regions hinders drainage.

c. Effects of Snow. Besides restricting movement, snow blankets the country and obscures its features, making navigation difficult. Snow also hides natural obstacles, such as tree stumps, rocks, ditches, and small streams, as well as manmade obstacles, such as minefields and defenses. Snow also acts as an insulator. In the early stages of a thaw, it retards the thawing of underlying ground, preventing effective drainage and forming a deep and often almost un-negotiable slush.

d. Unaided Foot Movement. Men on foot cannot move easily through fresh or powder snow which is more than 8-inches deep. At depths of over 15 inches, unaided movement becomes laborious and very tiring. In such conditions, troops with no over-snow capability are road bound. Unable to maneuver effectively, they are at a great disadvantage relative to troops who can move freely over the snow.

e. Aided Foot Movement. In most conditions, using skis or snowshoes can enhance individual mobility, and equipment can be carried in team sleds. Troops can be trained to use snowshoes quite rapidly; however, their use is very tiring and restricted by steep terrain . Use of skis gives greater speed than snowshoes and opens up more terrain but requires more training. Ski troops pulled behind vehicles (skijoring) can achieve considerable speed. They arrive at their destination faster and more fit to fight than those who expended energy on laborious foot movement do. In any movement in cold weather, straggling cannot be tolerated for survival depends on staying with the unit.

8002. The Fighting Load

a. Commander's Considerations.

(1) The primary consideration is not how much a Marine can carry, but how much can be carried *without* impaired combat effectiveness-moral or physical. The combat strength of a unit is not counted simply in numbers of Marines, but in numbers of Marines physically able and eager to engage the enemy.

(2) It is generally better to risk temporary inconvenience from lack of health and comfort items than to exhaust Marines due to overloading.

(3) It is fundamental truth that men become physically exhausted more quickly when under the stress of combat. Marines must carry less into battle than they are conditioned to carry in training. Marines should be conditioned for carrying weight but should be equipped in combat for fleetness on foot.

(4) A common mistake is to base the fighting load on the gear and supplies necessary to meet every contingency. The commander cannot reasonably expect to carry enough gear for every possible eventuality. The items to be carried must be based on likely expectations.

(5) It is the commander's responsibility to produce transport to carry additional gear. As a rule of thumb, a rifle company or unit of similar size requires one 5-ton truck and trailer. In cold weather operations support assets such as helicopters, trucks, BV 202/206 (small-unit support vehicles [SUSV]), LAV, AAV, or sleds may be provided. Commanders must use them wisely to take the load off their Marines. These assets may have to be shared with others who have responsibilities (logistics, MEDEVAC, etc.).

(6) The commander must ensure that the supply system provides, on a dependable and timely basis, the balance of essential supplies and equipment not carried by the unit. Marines must feel confident that they will be supported with the necessary supplies and equipment.

(7) Commanders must design training that builds cohesion and pride among Marines operating under austere conditions. To effectively demonstrate this Spartan mentality, leaders must be visible and active. Train Marines in field craft, foraging techniques, and of caches and field expedients. Make maximum use of captured stores.

b. Equipment and Ordnance Load

(1) Specific loads that should be considered are:

ITEM	POUNDS
180 rounds of 5.56 mm	7.7
(4) M-67 fragmentation grenades	6.8
(1) SMAW	29.3
(1) M-720, 60 mm Mortar w/ multipurpose fuse	7

(2) Some Marines may be expected to carry accessory equipment into combat. Examples are:

ITEM	POUNDS
SINGARS w/ battery	21
Squad Automatic Weapon	18
240G machine gun	24.2
and/or	
U.S pistol, M-9	1.75

8003. Winter Warfighting Load Requirements

The winter warfighting load requirements have been developed as a guide for commanders when planning movements in the cold weather operating area. Commanders will decide, depending on the mission and terrain, which equipment load Marines will carry.

a. Basic Uniform Requirements. The following list of uniform items comprises the basic cold weather uniform. This list may vary depending upon the severity of the weather, the activity level of the Marine, and the individual metabolism of the Marine. However, the unit leader should dictate the outer camouflage layer.

Extreme Cold Weather Clothing System (ECWCS) Parka and Trousers
Cold Weather (C/W) Trousers w/ Suspend
C/W Hat or Balacalava
Polypropylene or Capilene long underwear

VB Boots or Ski March Boots w/ appropriate sock system and gaiters
Gloves with Inserts or Trigger-finger Mittens
Overwhites (parka, trouser, and over mittens)
Helmet w/ Camo cover (white)

As part of the basic cold weather uniform, each man should be required to have in his possession at all times some required pocket items. These seven items should be carried in the pockets of your ECWCS uniform:

Pocket knife
Whistle
Pressure Bandage
Chapstick and Sunscreen
Sunglasses
Survival Kit and rations (fire starting material, signaling material, food gathering material, water procuring material, sheltering material, 1st aid material)
Notebook w/ pen or pencil

NOTE: Some additional items that should be carried at all times are:

Contact gloves
Avalanche cord (10 meters)
Flashlight w/ tactical lens and spare batteries
Chemlights or route marking material

b. Assault Load. The Assault Load is equipment in addition to the basic cold weather uniform requirements, and is carried in the load bearing vest (LBV), butt pack and pack system. This is the equipment carried for short duration missions such as security patrols or during the final assault phase. It is carried at all times when you are away from your bivouac site.

An extra insulating layer (polypropylene, woolly pully, etc.)
Protective layer (ECWCS Parka and trousers if not worn)
Load Bearing Vest (LBV) with 2 quarts of water and first aid kit.
Rations for the time away from your bivouac site.
Extra socks and gloves.
Isopor mat (strapped to assault pack or carried on ski pole)
Over-the-snow mobility (skis, poles, wax kit and /or snowshoes)
Mission essential gear as required:
T/O weapon with accessories (sling, magazine, cleaning gear, bayonet/K-bar, and basic allowance of ammunition)
*Extra ammunition, demolitions, and pyrotechnics as the mission dictates.
*Optical gear (binoculars, night vision devices, etc.)
*Communication equipment (field phones, spare batteries, etc.)
*Navigational equipment (map, compass, GPS, etc.)

NOTE*:* Mission essential gear items indicated with an * are spread-loaded throughout the unit as the mission dictates. Also, it may be required for designated personnel (such as RTO's) to carry the assault load in the large Vector pack vice in the small assault pack.

c. **Combat Load.** The Combat Load is the equipment carried for longer duration missions such as movements to contact. It is carried in the large Vector pack and consists of essential gear required in the event of an unplanned bivouac and the gear required to conduct medevacs. The Following items are in addition to the items already being carried in the Assault Load.

Sleeping Bag
Snow shovel to dig expedient shelters, fighting positions, and avalanche victims)

Individual/squad stove (Whisperlite, Peak1, etc.)
Fuel bottle w/ fuel
Thermos
Poncho (for expedient shelters or medevac purposes)

NOTE*:* If the gear list dictates that each man carries the Assault Load, then 1 man per squad will also bring the Combat Load items. These items may be spread loaded throughout the squad to prevent over-burdening 1 man with extra weight. If all personnel are carrying the Combat Load, then items b,c,d,e, and f are 1 each per 2 men.

d. Existence Load. The existence load is any extra gear that is required that can be brought up to the forward combat elements once the situation allows. Ideally, each fire team packs their excess gear in one seabag, and it comes forward on the log train. It includes, but not limited to:

Extra insulating layers
Extra socks
Extra glove and mitten liners
Toiletries
Sewing Kit

e. Group Stores. Ideally, each fire team will have their own sled to haul their group stores. This sled may be pulled by the individual Marines during their movements, carried in the roof of the SUSV, or it may be brought up via the log train during the consolidation phase of combat. The group stores inside the fire team sled should consist of the following:

1 ECW tent complete(tent body, fly, and pole set)
Extra fuel for the stoves
1 case of extra MRE's/RCW's
2 shovels and pioneer gear as required (hatchet, belay rope, etc.)
2 pr. Climbing skins(if ski-borne)
1 Whisk broom
1 team cook set
candles
trash bags

NOTE: Proper packing of the group stores is discussed in Chapter 3 "Group Equipment."

8004. MILITARY SKIING

Skis are used by Marines to travel over the snow. Military skiing is not to be confused with downhill skiing in the traditional sense. Route selection is of the utmost importance. The goal is to move Marines units safely and efficiently to the objective.

a. Value of Trained Ski Troops. Trained ski troops can move as fast as men marching on hard ground can. Skis give mobility, encourage swift maneuvers to exploit surprise, and enable moves against flanks and rear areas over snow-covered terrain. Skis are normally used only on the approach march. In most cases, skis are staged before the final assault.

b. Specialized Units. Reconnaissance, surveillance and target acquisition units have the greatest need to become good skiers. Those in supporting units who might accompany reconnaissance units should acquire similar skills and be trained with the unit they are to support. This includes artillery forward observers, engineer reconnaissance teams, and forward air controllers.

c. Ski Training. Ski training is not easy. It takes about 4 weeks to achieve proficiency. Some Marines who take longer should be trained to snowshoe. Commander may have to task-organize their units according to skiing proficiency.

(1) Military skiing requires Marines to negotiate all types of terrain in many different weather and snow conditions. Marines must carry a weapon and heavy pack and often have to pull a team sled. They must master the techniques of moving uphill and downhill across difficult country with the minimum effort and at a pace to keep up with the rest of the patrol or unit. A military skier must become so proficient that skiing is second nature so that his whole concentration can be given to his mission.

(2) Certain basic skills must be learned by military skiers. A competent instructor is essential. While artificial slopes or dry land (grass) is useful for pre-environmental training, skiing techniques must be perfected on snow. Some preliminary ski training can usefully be done before setting out for theater where troops may have to ski.

Military ski instruction is described in more detail in the MCRP 3-35.1B, *Marine Ski Instruction Manual.*

8005. Skiing Speeds for Planning Purposes

Movement on skis is a combat multiplier that enables units to move over terrain unattainable without this advantage. However, skiing makes great physical demands, and ski troops must be very fit and capable of prolong feats of endurance. Do not contemplate moving on skis until Marines are fit and have mastered the basic skills.

a. Snow/weather conditions and unit ability influence the speeds of all skiers to such an extent that no accurate figures can be quoted for likely speeds. Each unit leader must know the abilities of his unit and evaluate its movement capabilities and rate in accordance with the abilities of his least experienced individual. Generally, movement rates can be calculated by adapting the following speeds to your situation.

(1) Skiers carrying rifles and packs can achieve between 3 to 5 kilometers per hour. When Marines pull team sleds speed falls to 2 to 3 kilometers per hour.

(2) Add one hour to estimated time for journey for every 300 meters ascended and for every 800 meters descended.

(3) On long marches out of contact with the enemy, skiers can be towed behind a vehicle in suitable country, saving time and energy. When skijoring, speeds of up to 15 kilometers per hour can be achieved dependant on the unit's level of training (see paragraph 8008.)

8006. Military Snowshoeing

a. Speed. Snowshoes enable a man to progress at about the same pace over the snow as he would achieve in boots on hard ground but the expense of considerable effort. Speed varies with the depth and consistency of the snow. Trained and conditioned men on snowshoes average 15 kilometers a day over flat or gently rolling terrain, and 20 kilometers a day on forced march.

b. Maintenance. Very little maintenance is needed as long as snowshoes are checked regularly and minor repairs are carried out promptly. Snowshoes are most likely to be damaged when negotiating tree stumps or rocky ground that may snag or fray the webbing. When such types of terrain are encountered, frequent inspections are desirable.

c. Comparison with Skis. Snowshoes are very useful when pulling and carrying heavy loads since the hands and arms remain free. On steep slopes, their use is limited because traction deteriorates. The snowshoes slide, causing loss of footing. Snowshoes will not glide over the snow like skis. Wet

snow may stick to snowshoes, adding weight and making walking more cumbersome. In summary, snowshoes have the following advantages and disadvantages when compared with skis:

(1) Advantages of Snowshoes

- Simple to use. Marines need little training on them.
- Can pull heavier loads then men on skis.
- Durable and require little maintenance.
- Light and reactively easy to pack and carry.
- Leaves the hands free.
- Rarely cause the user broken or strained lower limbs.

(2) Disadvantages of Snowshoes

- Tiring to use.
- Do not slide, nor make the best use of the characteristics of snow.
- Cannot move effectively on the hillside.
- Move poorly through brush.

8007. Trail-Breaking

The purpose of the trail breaking is to use a small body of troops to prepare a track so that the main body can move as easily and quickly as possible, either on foot or in vehicles, and arrive fresh at their destination. A trail-breaking party usually has four tasks:

- To reconnoiter and select the route. (See chapter 7.)
- To navigate. (See chapter 7.)
- To prepare the route (See par. 8007f.)
- To act as an advance guard and prevent the main body from running blindly into enemy opposition.

a. Planning. When existing tracks are not usable, trail breaking will be necessary. You must select a route and detail a party. The commander in charge of the operation selects the route direction and the number of routes. Since the exact route depends on the conditions underfoot, final selection must rest with the leader of the trail-breaking party. The initial selection is made from maps, air photographs, and reconnaissance reports. The factors which should be considered are the –

- Tactical situation.
- Type of equipment and method of movement of the main body.
- Type of terrain.
- Snow and weather conditions.

b. Size of Party. The size of the party depends on the anticipated difficulty in opening up the route and the likelihood of enemy interference. A covering party is often needed to protect the trailbreakers. The total number needed could be up to one-quarter of the main force. In the case of a battalion move, a rifle company might be given the task, and a platoon would form the actual trail-breaking party.

c. Timing. Trail breaking is a tiring and time-consuming task. The rate of progress depends on:

- Type of terrain, and whether it is wooded or open.
- Weather and snow conditions.
- Number of trails to be broken.
- Degree of improvement needed to the trails.

- Tactical situation.

d. Early Dispatch. The trail-breaking party should be dispatched well in advanced to provide local security at the destination before the arrival of the main body. Take into accountant the difficulty of the task and the capability of the trail-breaking party to determine how far ahead of the main body the party should move. The trail-breaking party should remain within range of fire support.

e. Communications. Make arrangements to keep the trail-breaking party in radio contact with the main body.

f. Organization and Tasks. The trail-breaking party should retain its tactical integrity if at all possible. If one platoon is breaking one trail, one squad leads the breaking. The other squad rotates as the leading squad tires. Adapt this principle to party of any size. The usual trail is two tracks wide. If units are pulling sleds, a three-track-wide trail is needed. The trail-breaking party is organized as follows:

(1) Party Leader. The leader selects the route, navigates if the navigation patrol is not used, and rotates the teams within the party.

(2) Breaker. This man is at the front of the party. He breaks the trail in the direction indicated by the party leader. He does not attempt to travel in a direct line to his objective but takes the easiest route.

(3) Straightener. The straightener cuts brush, straightens curves and improves the direction of the trail. He forms a team with the breaker and changes tasks frequently with him.

(4) Right Cutter. The right cutter cuts obstructions from the right side of the trail.

(5) Left Cutter. The left cutter cuts obstructions from the left side of the trail. The two cutters form another team. One makes a third track, if on skis, by skiing with only one ski in the pervious track.

(6) Trail Packers. The remaining member of the party is the packing team. They improve the trail by filling small depressions and ditches. On a cross slope, they flatten the trail and mark the route.

g. Equipment. The equipment required by the trail-breaking party is as follows:

- Party Leader: compass, map, and route card.
- Breaker and straightener: Machete and wire cutter each.
- Cutters: Axe or machete each.
- Packers: Shovel each, trail-marking material.

h. Trail Marking. It becomes necessary to mark a trail if it leads over existing trails of if it is to be used over a period of time. Any of the following methods can be used as long as the main body is informed.

- Break branches of trees and shrubs in a predetermined manner.
- Plant flags, sticks, or guiding arrows in the snow.
- Tie markers made of rags or colored paper to trees.
- Pile rocks or brush.

8008. Skijoring

Skijoring is the term for moving troops on skis by towing them with vehicles. (See fig. 8-1) It is faster and less tiring than skiing or snowshoeing. Oversnow tracked and wheeled vehicles can be used. The best routes for skijoring are snow-covered roads and trails, frozen lakes and rivers, and paths made by tracked vehicles.

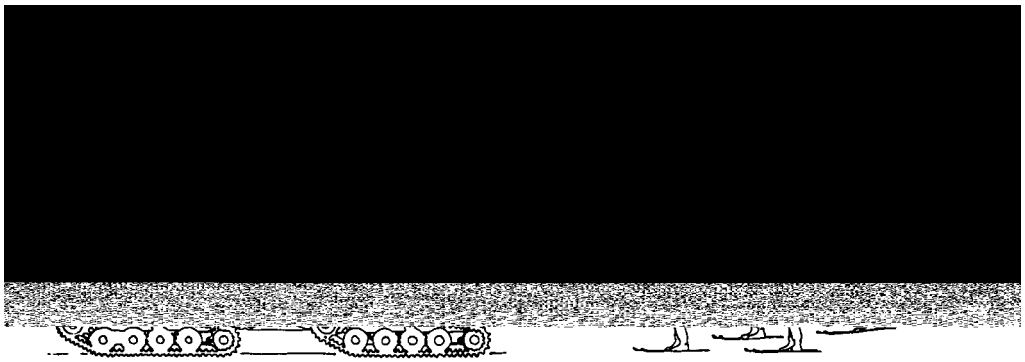


Figure 8-2. Skijoring.

On level ground, trained Marines, depending on weather, snow conditions, and the terrain can sustain a speed of 41 kilometers per hour. Normally, an over-snow vehicle can tow one squad across country or two squads along a road. Towing more than two squads with one vehicle is impractical because of the length of the column, difficulty in making turns, and the increased problems of negotiating steep or wooded country and of keeping up an even pace in inconsistent snow conditions.

a. Dangers. Skijoring is potentially dangerous. No skier should be secured to the rope in any way. A half hitch over a ski pole is secure method of attachment, which is easy to release. Skijoring can be extremely cold. Troops should wear adequate clothing and face protection. When covering long distances, you may need to halt periodically to restore circulation.

b. Observer. You must always station an observer in the rear of the vehicle to signal the driver immediately if a skier falls.

Load (tons)	*Required ice thickness (inches)*	*Distance between loads (feet)*
0.1	2	17
1	4	34
2	6	48
3	7	58
4	8	67
5.	9	75
10	13	106
20	18	149
30	22	183

MINIMUM ICE REQUIRED TO SUPPORT A LOAD

Chapter 10

Movement by Helicopter

10001. Effect of Cold on Mobility

The helicopter is the single best tactical mobility asset available to Marines during cold weather operations. It can move a unit farther and faster than any other means of transportation. The helicopter is not without its limitations, the greatest of which is the lack of dependability due to unpredictable weather and the extreme difficulty of performing maintenance in the cold. Additional maintenance personnel and maintenance shelters may be required. This means that the unit leader must always have an alternate movement plan to get to the destination in time to accomplish the mission. Use the helicopter whenever possible, but avoid of becoming totally dependent on it.

10002. Landing Zones

Helicopter operations in an ice or snow-covered landing zone (LZ) are slower. Loading, unloading, approaches and departures, seat belt hook-ups, crew-chief directions, and finally, passenger and aircrew coordination all take more time. Plan for these delays. The information below is intended not for helicopter support team personnel, but for small-unit leaders who must use a LZ in deep snow. The information provided assumes that the LZ is covered by deep snow.

a. **Selection**. You will probably never have the perfect LZ available when you need it. Listed below are some of the LZ selection factors you should consider in each case:

(1) Size. The minimum size for a CH-53, CH-46, or MV-22 is 150 by 150 meters. For a UH-1N or AH-1W, the minimum is 100 by 100 meters. When a LZ has multiple landing spots, 150 meters are required between landing spots.

(2) Approaches and Departures. The perimeter of the LZ should be clear of obstacles over 25 feet tall. Otherwise, the size of the landing zone should be doubled.

(3) Wind Direction. The wind direction is extremely important in the approach and departure direction of the helicopter. Helicopters, when possible, will take off and land into the wind.

(4) Ground Surface. The ground should be as smooth and flat as possible. Large rocks, tree stumps, and fallen tree branches can create possible hazards to personnel and helicopters.

(5) Ground Slope. The slope should be no more than 8 degrees. Helicopters may tip over while landing on slopes greater that 8 degrees.

(6) Cover and Concealment. The LZ is should be concealed from direct enemy fields of fire and observation.

(7) Obstacles. Look for obstacles that may be hidden under the snow; large rocks, tree stumps, fence posts, etc.

(8) Snow. Check the depth and consistency of the snow. It has a major impact on the difficulty of LZ operations. Soft snow may cause the helicopter to sink at unpredictable angles, contributing to the problem of ground slope.

b. **Preparation**. Whenever possible, you should walk through the LZ to determine the depth of the snow and appropriate location for the helicopter to touch down. The quickest way of packing a snow covered LZ is by driving a tracked vehicle over the area. Packing a LZ can also be accomplished by walking over the zone with snowshoes, skis, or by boot packing.

(1) Uniformly pack an area least 50 meters square.

(2) Probe the area for obstacles that could puncture the underside of the helicopter if it sinks into the snow.

(3) If more than one helicopter will be using the LZ simultaneously, pack and probe enough landing points at least 100 meters apart to avoid blowing snow.

(4) Frozen lakes and rivers make excellent LZ's since they are level and have little loose snow due to wind scouring. Ice thickness (see Chapter 9) must be checked: 8 inches is required for UH-1N and AH-1W's. CH-53, CH-46, and MV-22 require 15 inches of ice. Beware of a helicopter skipping on the ice during landing and takeoff, and wind gusts while it is on the ground.

c. Marking LZ and Landing Point. Marking the LZ and landing point is critical due to the local *whiteout effect* when the helicopter lands. It is very important to provide the pilot with a reference point in the LZ.

(1) The LZ can be marked using conventional panels and lights, by using rescue-survival dyes, dirt sprinkled in the snow, small green tree boughs, or any dark material.

(2) A smoke grenade is an excellent way in which to show the pilot wind direction at the LZ. Place the smoke grenade on an object to prevent it from sinking into the snow. Do no use white smoke as it will blend in with a winter environment.

(3) Use an ahkio huddle (see paragraph 10004) to mark the landing points. The huddle should contrast in color to the background in the LZ. Individuals should remove overwhites, wear a protective face mask, and be sure no bare skin is exposed to the rotor wash.

d. Landing Zone Brief. The pre-landing briefing to the helicopter from the LZ should include the following:

- Description of LZ
- Wind direction and strength in knots
- Depth of snow and whether it is packed or unpacked.
- Obstacles or suspected obstacles.
- Any special considerations that will delay embarkation significantly.
- Last known enemy location.

10003. Preparation for Embarkation

a. Planning. Helicopters will often have reduced payloads when operating at higher altitudes. In addition, high temperature, high humidity and high Density Altitude will degrade helicopter performance. Consequently, helicopter payloads may change significantly due to both the current and forecasted weather and LZ altitudes. Marines must have the flexibility to change their embarkation plans based on the varying conditions and helicopter support available. Prior detailed planning by unit commanders will greatly assist in quick helicopter operations.

HELICOPTER	SEA LEVEL	5,000 FT MSL	10,000 FT MSL
UH-1N	6 pax and gear	4 pax and gear	2 pax and gear
CH-46E	12 pax and gear	8 pax and gear	6 pax and gear
CH-53E	24 pax and gear	24 pax and gear	18 pax and gear
MV-22	12 pax and gear	10 pax and gear	6 pax and gear

- These numbers are estimates only. Actual lift capacity will vary depending on fuel consumption, ordnance on board, time of flight, weather, etc.
- The UH-60 should be treated similar to a CH-46 for planning purposes.
- The CH-47 should be treated similar to a CH-53 for planning purposes.

b. Personnel. A major hazard to personnel operating around helicopters in cold weather is the wind chill generated by the rotor wash. Exposed skin should be kept to a minimum. If a long wait is expected, warming tents should be erected. At the very least, provide some form of protection from the elements, even if it is only a windbreak.

c. Equipment

(1) The team sled should be staged as near the landing point as possible. To prevent the team sled from being moved by the rotor wash, the Marines embarking on the helicopter should lay on top of the sled.

(2) Weapons should be in a Condition 4 when embarking the aircraft. Muzzles should be pointed down on CH-46, CH-53, and MV-22. Muzzles should be pointed up or outward on UH-1N.

(3) No equipment (skis, radio antennas) should be allowed to protrude above the height of a man.

(4) Packs should not be worn abroad helicopters due to the restricted movement and the requirement to fasten seat belts before departure. Packs should be staged at the center of the aisle on assault aircraft.

10004. Ahkio Huddle Procedures

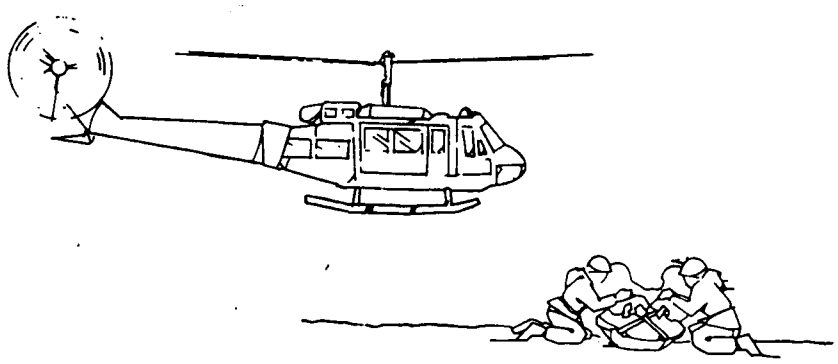
The embarkation and debarkation drills (ahkio huddle procedures) described below are designed to get your personnel on and off a helicopter as quickly as possible without severe injury due to rotor blade contact in addition to minimizing exposure to wind chill. These procedures must be practiced so that they can be performed during periods of extreme weather and reduced visibility.

a. Universal Method. The ahkio huddle has been developed as a universal method for loading and unloading all types of Marine Corps helicopters in a snow covered environment. (See fig. 10-1) Guides are not recommended or required; however, individuals to be lifted should remove overwhites when conducting ahkio huddles. This contrast in color will provide a recognizable reference for the pilot and aircrew. Having one standard procedure eliminates last minute changes that would be necessary when different models and types of helicopters show up at the LZ. This procedure will:

- Diminish the dangers of troops walking into the helicopter rotor and tail rotor blades.
- Reduces the problems of wind-chill.
- Reduces excessive fuel consumption by the helicopters.
- Decreases the duration of time that a visual and noise signature is presented by a helicopter landing in the snow covered LZ.
- Eliminates much of the delay involved in loading and unloading the helicopter.

It is important to remember that:

- The tent team(s) is the basic unit for development of the heliteam.
- All of tent group's equipment necessary for survival against the environment must be on the same aircraft as the personnel.



The helo is within a few feet of landing; the ahkio team is huddled about ahkio.

The helicopter lands with the ahkio huddle at the pilots (right seat) 2 o'clock position. (See fig. 10-2) Ahkio huddles(s) must be spaced away from any possible obstacle or far enough apart from the landing sites for other aircraft to allow for the possible drift of the helicopter around the ahkio huddle without conflicting with the obstacles or other helicopters. (see fig. 10-3) The helicopter lands next to the huddle of troops that are to be lifted (within the rotor arc). This ensures the best possible reference for the pilot and the greatest safety for the troops. Pilots will execute an immediate wave off if they lose sight of the ahkio huddle. To be performed efficiently even during periods of extreme weather and reduced visibility, these procedures must be practiced continuously.

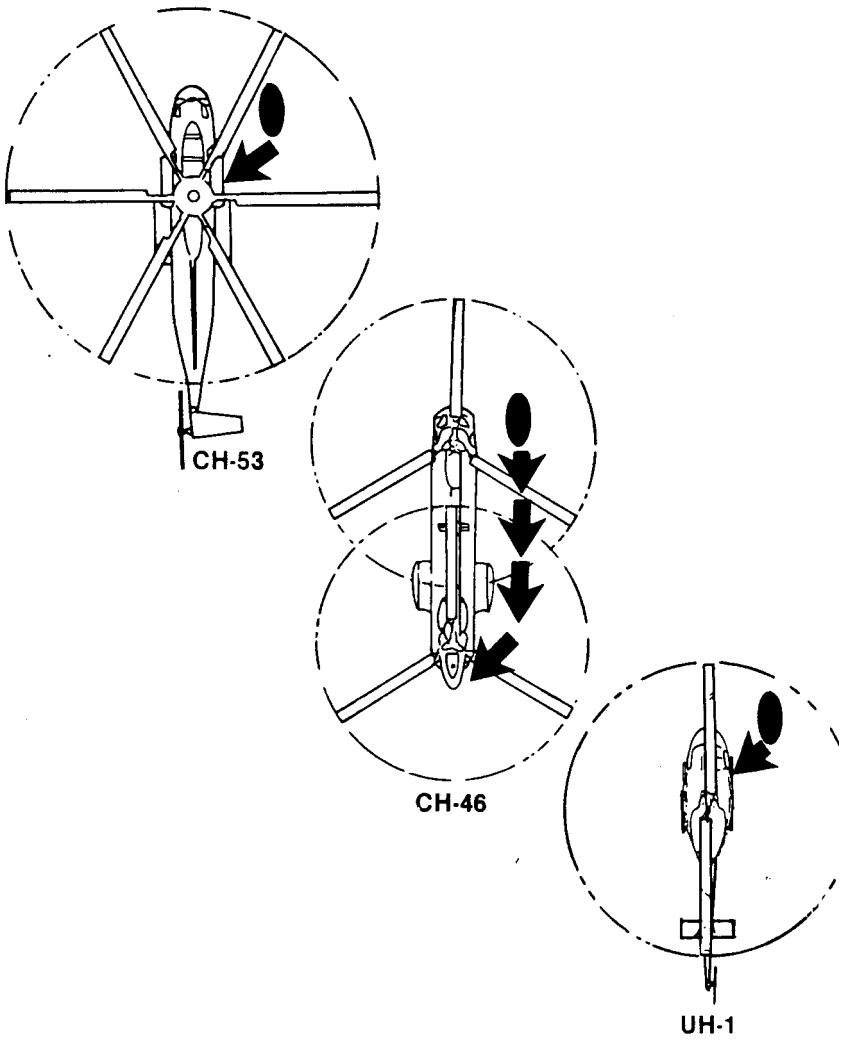


Figure 10-2. Positioning Ahkio Huddles for Loading Marine Helicopter

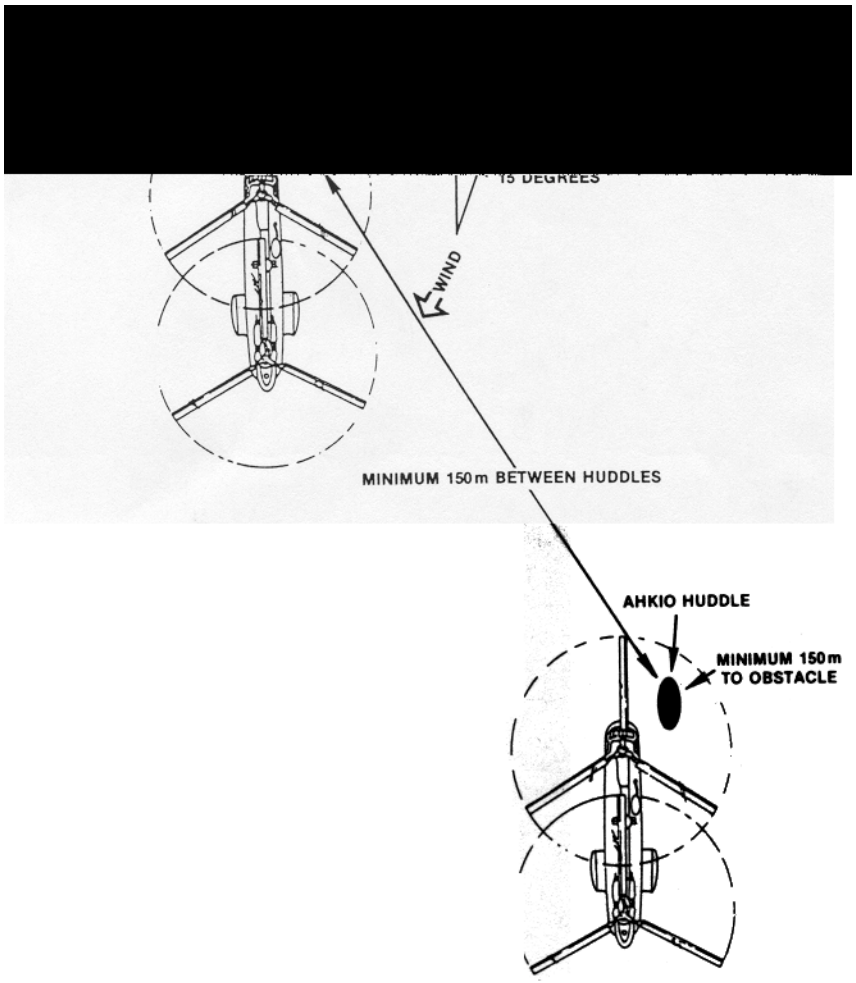


Figure 10-3. Minimum Safe Distance Within Landing Zone.

MV-22 Specific:

- Due to the unique flight characteristics of the MV-22, Marines must be aware of the extreme hazard of the engine exhaust from the nacels. The exhaust is over 550 F. (See fig. 10-4)
- Ahiko teams should position themselves at the pilots 12 o'clock position vice the 2 o'clock position. This will prevent the aircraft from over flying the ahkio team and ensuring engine exhaust does not create a hazard to the troops.

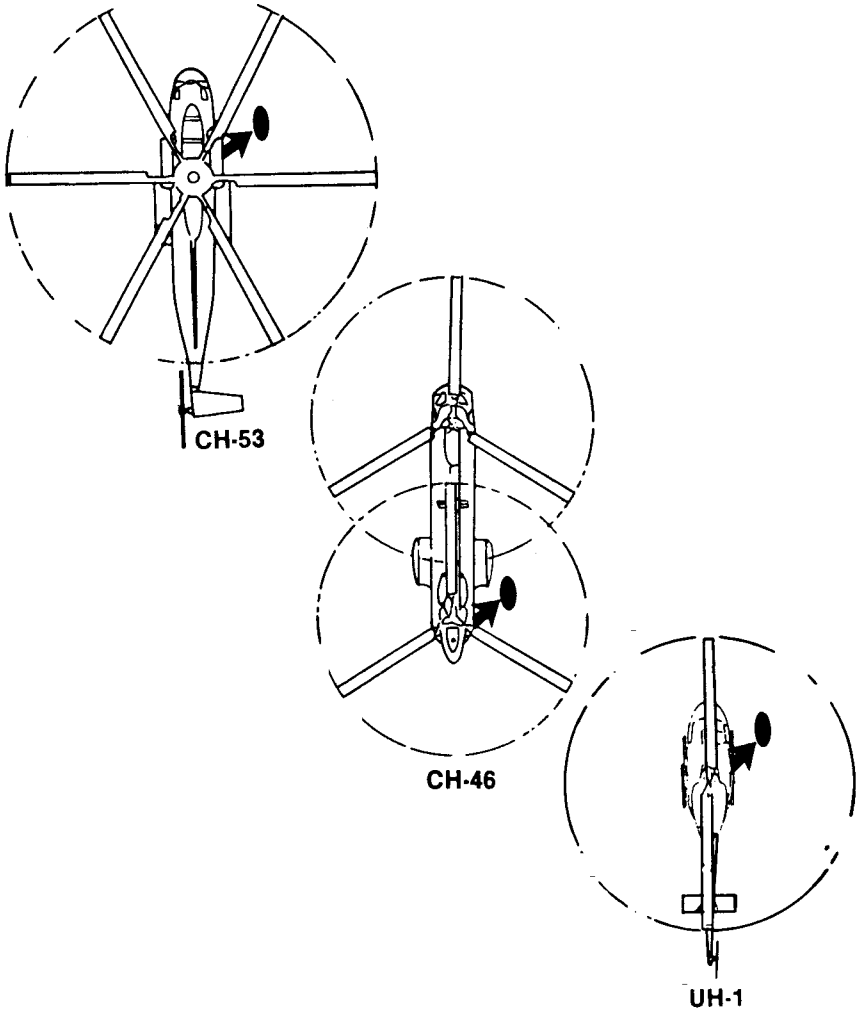


Figure 10-4. Debarkation Procedures for Marine Helicopters.

d. Immediate Action in the LZ. The "snowball" signature created by the helicopter when it lands can be seen from a considerable distance. Therefore, after the helicopter(s) leave the LZ, move away as quickly as possible.

e. Rotor Clearance. All Marines must realize that helicopters settle into the snow when operating in snow covered LZs. This lowers the distance between the snow surface and the helicopter blades. Using the universal method of helicopter loading (ahkio huddle) eliminates this problem. **Do not approach helicopters form outside the rotor arc. When unloading, do not leave the ahkio huddle before the helicopter debarks the LZ.** (See fig. 10-6, 10-7)

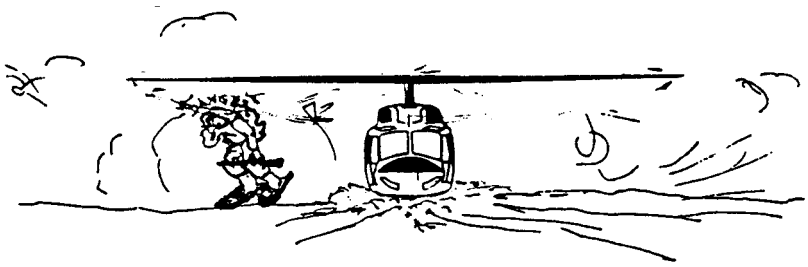


Figure 10-5. Beware of Rotor Clearance.

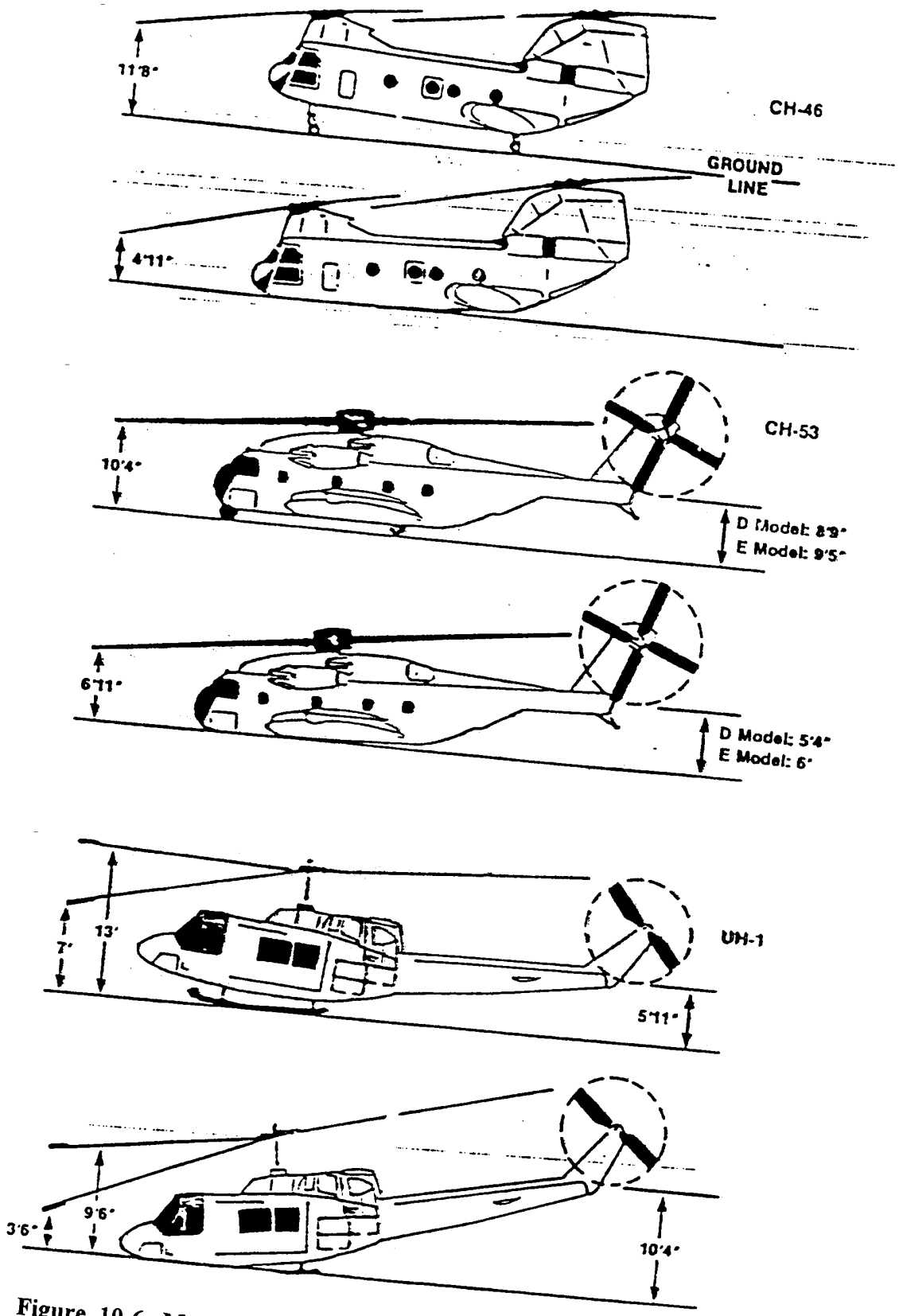


Figure. 10-6. Marine Helicopter Rotor Blade Clearances

Chapter 11

Weapons, Optics and Communications Equipment

11001. Importance of Care

The cold greatly affects the operation and employment of infantry weapons and causes equipment to malfunction. All Marines must be aware of these conditions to effectively employ and care for their weapons, ammunition, optics and communications equipment under winter conditions.

11002. Effects of Cold on Weapons

Problems with weapons in general in cold weather are summarized and discussed in the following paragraphs. For specific guidance, consult the appropriate technical manual.

a. Sluggishness. Snow and ice in the operating mechanism or improper lubrication cause sluggishness. Cleaning must be done more often in cold and snow. Use a light coat of CLP only. CLP freezes at –35 degrees F. LSAT freezes at 0 degrees F. LAW (Lubricant, Arctic, Weapon) is effective from –65 degrees F to 0 degrees F. Lubricants become gummy as their freezing point nears. If you do not have the right lubricant for the temperature, fire the weapon dry.

b. Breakage and Malfunction. Malfunctions occur from too much snow and ice in the weapon. Use gun covers, muzzle covers and improvised materials to cover every access point to the weapon. Ensure muzzle covers can be shot through for immediate action (i.e.- medical tape, plastic bag/cap, etc.). Keep magazines in magazine wells and rags in feed trays, etc. Breakage occurs in the first few rounds and at a higher rate in the cold. Fire slowly to allow the weapon to warm up (for automatic weapons: fire 3 single shots, then 3 short bursts, then normal bursts).

c. Condensation. Condensation forms on weapons when they are taken from the cold into any type of heated shelter. This is called "sweating." Weapons will continue to sweat for 1 hour. Weapons must be cleaned after an hour. If not, when the weapons are taken back out into the cold, the condensation freezes, forming a thin film of ice that can adversely affect the weapon's operation. To prevent this problem, leave weapons outside and protected from falling/blowing snow but readily accessible. The vestibule of the ECW (Extreme Cold Weather) tent is ideal for this purpose. If the weapon is taken into a heated shelter, it can be wrapped in a jacket, etc. and placed near the floor to minimize sweating. These considerations apply to ammunition also.

d. Visibility. Visibility is often reduced from falling or blowing snow, whiteouts, gray-outs, etc. Nights are longer in winter and also at higher latitudes. Ice fog can occur when weapons are fired at –35 degrees F and with 3mph wind or less. Ice fog is a thin cloud of ice crystals like a jet plane's contrail that forms from the muzzle of the weapon to the point of impact with each round fired. It obscures the gun-target line and pinpoints your firing position. Prepare additional alternate/secondary positions to shift between and displace frequently. Aim at the origination point of the enemy's ice fog line.

e. Emplacement. In order to avoid sinking, sliding, bouncing or breaking, special techniques are used during the emplacement of crew-served weapons on snow, ice or frozen ground requires special techniques. These procedures are discussed under each weapon in paragraph 11003 "Problems and Solutions for Specific Weapons."

f. Reduced Velocity and Range of Projectiles. As a result of slower burning propellants in the cold, chamber pressure and muzzle velocity are reduced, thus decreasing the projectile's range. Cold air is denser which increases the drag on projectiles during flight (which reduces range further). Test fire and BZO weapons frequently in the cold to maintain accuracy.

g. Ammunition. Cold weather can materially affect the accuracy of weapons and the performance of ammunition. Ammunition should be kept at the same temperature as the weapon; this can effectively be accomplished outside to prevent condensation. Ammunition should be stored 4" off the deck and remain sealed as long as possible in its original containers. Protect magazines, belts, etc. from snow and ice. Clean magazines of oil/lubricants and check frequently. Ammunition should not be lubricated. One foot of snow can absorb up to 80% of fragmentation. Deep, soft snow also increases the dud rate of point detonating fuses. For this reason, variable time/airburst is a preferred fuse in snow. Rocky or ice-covered terrain will increase the fragmentation effect.

h. Backblast. The cold increases the backblast effect of all recoilless-type weapons by a factor of three. Since backblast areas are tripled, all personnel must be instructed to plan for this hazard when fighting or training in the cold with recoilless-type weapons.

i. Cold Weather Hand Wear. When Marines wear mittens or heavy gloves, the speed of handling/firing weapons is reduced. However, this is not an excuse for not wearing hand protection. Under extreme cold, bare flesh freezes instantly to super-cooled metals. Thin contact gloves work best for dexterity in weapons handling. For extended operations in extreme cold, armorers should remove the trigger guards.

j. Limited Technical Inspection (LTIs). Ordnance mechanics and unit armorers will conduct LTIs on all weapons. Critical areas of inspection are:

- Make sure the trigger pull is heavy enough so that weapons will not accidentally discharge when handling with arctic mittens/gloves.
- Replace loose fitting parts resulting from different rates of expansion/contraction.
- Replace cracked or broken hand guards/stocks. Stress from the cold will rapidly make these parts unserviceable.
- Check cracked/pitted artillery tubes. Cracks are unacceptable, pits acceptable.
- Check the seals on all optical equipment; replace if cracked or torn to prevent fogging. Check nitrogen levels on all sights.
- Check brake lines on all towed artillery pieces.
- Check hoses on all sights to make sure there are no leaks.

k. Cleaning. Weapons exposed to extreme cold will malfunction if cleaned improperly.

(1) Check small arms for excess oil/lubrication in the:

- Chamber (causes rounds to stick and/or not fully chamber).
- Gas system (causes sluggish operation and short recoil/runaway gun).
- Bolt (freezes the firing pin solid)
- Buffer (thickens and/or freezes, causing violent recoil or runaway gun).

(2) Guided missile systems require minimal care on ammunition, but check the trackers for:

- Dirt/corrosion on the electrical connections (causes a bad connection and leads to a misfire).
- Bent/loose mountings. Repair or replace. They are hard to connect and more difficult to work with in the cold when wearing mittens/gloves.

(3) Check mortars for oil/lubrication:

- In the bore (thickens and causes feeding difficulties, even causing a round to lodge in the bore).
- In the base plate socket (thickens and causes difficulty attaching the tube to the base plate).

- On the threads of the T&E (thickens and freezes, making the T&E inoperable).

(2) Check artillery weapons for:

- Dirt and excess grease in the racing teeth (causes difficulty in traverse and elevation).
- Excess oil/lubricants in breach blocks (freezes, causing operational difficulty/in-operability).
- Oil/grease in air tank bleed valves (clogs, makes brakes lock).
- Dirt/oil in firing locks (freezes the lock).

11003. Problems and Solutions for Specific Weapons

a. U.S. Pistol M9. It is very difficult to handle with gloves/mittens, use contact gloves only. The magazine can freeze in the magazine well. The slide can freeze and cause a malfunction. Breakage of the firing pin and extractor/ejector can occur in extreme cold, carry spares.

b. M16A2/M-4 Carbine. The M16A2 has a very close tolerance on its moving parts. It is vital that the M16A2 be cleaned of all oil and grease and then lubricated with a light coat of CLP/LAW. CLP is recommended for cleaning. But remember that it freezes at -35 degrees F (keep CLP next to body to keep it fluid and quickly wipe dry or clean and dry M16A2 in a heated shelter). LAW is recommended for lubrication (0 degrees to –65 degrees F) only. Ammunition should not be lubricated. The M16A2 performs well under extreme temperature conditions provided the magazines are free of firing residue. Be sure to clean the tops of magazines between firing. Care must be taken not to accidentally fire the weapon when inserting gloved fingers into the trigger guard area. Marines should always attempt to keep the weapon dry. Use muzzle covers and keep a magazine in the magazine well. Under combat conditions, it is necessary to cycle the weapon every 30 minutes to prevent freezing of functional parts. Additionally, to insure proper functioning, keep the insides of magazines and ammunition wiped dry; leave weapon outside when entering a heated shelter to prevent condensation. Additional measures necessary for reliable functioning are:

(1) Tape the butt plate to prevent the vent hole in the upper butt plate screw from becoming plugged with snow/ice and to provide a non-slip surface for firing.

(2) Tape the stock with white medical tape to provide camouflage and prohibit the stock from falling apart if cracked/broken.

(3) Tape underneath the ejection port cover to eliminate the metallic sound of its opening.

(4) Tape the handguards to prevent snow from packing in around the barrel, to camouflage the weapon and to prevent it from pinching/falling apart if cracked/broken.

(5) Place white cloth medical tape, prophylactic, muzzle cap, etc. over the muzzle of the weapon to prevent snow/ice from plugging the bore. NOTE: Anything placed over the muzzle must be able to be fired through.

(6) Tape the pistol grip with the folding trigger guard in the lowered position to prevent it from closing, provide a non-slip grip and allow firing while wearing mittens/gloves.

c. M203 40mm Grenade Launcher. The M203 is not susceptible to breakage in the cold. However, 12” of snow can reduce fragmentation effect up to 80% and increase the dud rate. Aim into trees for an airburst, if possible. Noticeable range reduction in cold weather occurs. Use a prophylactic, etc. for a muzzle cover. Protect sights from snow.

d. M249 SAW. Use muzzle cover and protect feed tray with rag to keep snow out. Do not move with an ammunition belt in/exposed unless enemy contact is imminent. Keeping snow out of belted

ammunition is difficult. Attach ski pole baskets or an assault snowshoe to the bipod legs for flotation on snow or use a pack for expedient firing support.

e. **AT-4.** Breakage can occur to the sights, cocking handle and rubber end caps. Snow/ice can get into the cocking handle, and must constantly be cleared. Backblast area is tripled. It is possible in extreme cold for the launch motor propellants to still be burning as it leaves the muzzle, because of the slower burn rate of propellants. Therefore, skin must be protected from exposure before firing (protect face, hands and eyes).

f. **M153 SMAW.** Backblast area is tripled. Protect all exposed skin. Use gun covers. Protect spotting rifle from snow/ice. Below 32 degrees F, set the range selector switch to blue on the range drum (general range compensation only).

g. **Grenades.** The casualty radius of fragmentation grenades is reduced in snow. Attach a stick or other device for flotation, but do NOT milk the fuse for an airburst. Wear dry contact gloves (wet ones can freeze to the grenade causing it to drop short). Do not wear thick mittens/gloves as it is easy to mishandle and drop the grenade. Make a platform for smoke grenades or set upside down in packed snow to prevent sinking and smoke absorption in snow (do not throw).

h. **Mines.** Pressure activated mines can be neutralized by 6" of snow. Grease the fusewell and place in a plastic bag on platform (box, sticks, etc.). One night's snowfall can render a minefield ineffective. Wind can expose a minefield. Mines laid in the summer can be rendered ineffective by frozen ground in winter and reactivated by spring thaw. Burying in frozen ground can be impossible. Tilt-rod activated mines must be braced in snow and raised after fresh snowfall. Trip-wire activated mines must be raised after fresh snowfall. FASCAM will have many duds due to tilting/miss-orientation in snow.

i. **Demolitions.** Military explosives and demolitions retain their effectiveness in the cold, but some of their handling properties change at low temperatures. C-4 can not be molded unless warmed. Both time fuse and det cord become stiff and can break. Time fuse and non-electric blasting caps are susceptible to condensation. Non-electric systems are preferred due to an increased amount of static electricity in cold, dry air. Misfire/hangfire times are doubled in cold. Demolitions are quite useful for breaking through frozen ground to dig fighting positions and to breach ice.

j. **M240G Medium Machinegun.** There is a higher rate of breakage in all automatic weapons. Fire 3 rounds single shot, then 3 short bursts and then sustained rate to warm up and reduce breakage. Do not set a hot barrel on snow/ice as it will sink out of sight and ruin the temper of the barrel (or warp or crack it). Do not set on clothing, instead, use wood or metal buffing. Use gun covers and keep ammo in cans during movement and store outside. Firing platforms can be made from snow-filled sand bags, buffing a sled, using a-gunner's pack, attaching ski pole baskets or assault snowshoe to bipod legs, using MRE boxes or attaching 1 foot square plywood cut outs to tripod legs (imagination is the limit). Do not pull a sled with the machinegun mounted on top as it may cause the sled to roll over during movement. If ice fog conditions exist, dig 2 or 3 alternate positions. When engaging in ice fog, fire downwind to upwind, one side of traversing bar to next, FPL, from 6 o'clock to 12 o'clock on moving targets. Thoroughly dry T&E threads of all grease to prevent freezing and tape handwheels for improved grip.

k. **M2 50cal Heavy Machinegun.** The M2 has little breakage; carry an extra firing pin and an extractor/ejector. Use all gun covers and sled cover when transporting. Use the gun cover on HMMWV during snowstorms. Do not transport at the ready-position in a sled. Do not fire from one sled. Two buffed sleds, sand bags filled with snow, thick plywood cut-outs, snow shoes (1 on each tripod foot), etc. can be used for tripod support. Use increased alternate positions in ice fog and engage as described above. Do not set hot barrel in snow; use full-length pad for barrel change. Use single shot/short burst/full burst warm-up technique. Keep ammo in cans until ready to engage. When away from the HMMWV, consider using a BV-206, or snowmobile pulling a gun sled as alternate methods. As a last resort, skiing/snowshoeing and pulling a sled can be done. However,

consider taking less guns and more ammunition in sleds unless the gun teams are augmented with additional people (Marines can only carry so much; guns that run out of ammo after just a few minutes are useless).

l. Mk 19 MOD 3 40mm Heavy Machinegun. Same emplacement considerations as M2 above. LSAT freezes at 0 degrees F, so change to LAW or graphite at 0 degrees F. Increased dud rate in snow. Fragmentation is significantly reduced in snow, up to 80% in 12". It is easy for snow to get into the large openings, extra care and cleaning is necessary. Always have a gun cover on when not firing.

m. M3 Tripod Mount. Clean the mount and lightly lubricate all external surfaces. Take particular care that the pintle bushing is clean and lightly lubed and that the pintle lock release cam is free from grit. The sleeve lock indexing levers and telescopic legs should be clean and lubed regularly. The pads can be reinforced with 1ft-square plywood pads or snowshoes wired on for flotation.

n. M-63 Antiaircraft Mount. A drop of CLP is sufficient on joints of firing grips, trigger control linkage, slides of trigger control mechanism, side plate trigger, side plate trigger cam, and pintle pivot bolts. Lightly oil the pintle. The traversing bearing should be lubed sparingly (monthly) using grease (automotive and artillery), injected by grease gun.

o. M242 25mm Machinegun Gun. Heavy grease must be used on the bolt to prevent dry bolt seizure.

p. Mortars. Breakage occurs in the base plate, yoke and firing pin. Aiming stakes will shift in snow from the sun warming the metal and melting the snow around it. Use the freeze (pour water around it) or chock (rocks, snow-filled sandbags, etc.) method with aiming stakes. Do not breathe on sights as this can cause fogging. Wear contact gloves and tape handwheels for improved grip. The fluid in the leveling vials can become sluggish in cold, increasing the time required to level bubbles. Airburst is preferred in snow; however, on frozen ground, ice or rocky terrain, fragmentation is increased. Use delay fuse for avalanche initiation. Store ammo outside 4-6" off the deck. Save increments for later use in the thawing of frozen ground (see emplacement below). Mobility: one sled per 60mm Mortar; HMMWV remains the 81mm prime mover (there is an 81mm mortar variant of the BV-206). Man-packing the 81mm mortar requires a lot of personnel in snow; consider the transport of less tubes and more ammo as a solution.
Emplacing the Mortar:

- Dig to ground.
- If ground is frozen, thaw, blast or buff. Thaw the ground with unused increments, blast through with demolitions or buff the base plate to prevent breakage, bouncing or sliding with snow-filled sandbags, tires, ration boxes or layers of pine bough and snow.
- If unable to dig down (snow too deep), make a platform for support as above.
- Imagination and experience are required to give accurate mortar fire in snow.

q. Forward Observer. Initially, increased ammo expenditure is the rule for adjustment in compartmented terrain (due to increased number of lost rounds and depth perception problems.) Communications relay sites will be needed. Sheaves open up on slopes (the steeper the slope, the more dispersed the sheaf). These conditions combine to suggest the need for more suppression and less destruction missions. Interdiction of MSRs is effective due to limited road networks and an abundance of natural choke points. Include altitude of target in call for fire. The FDC computers utilized in the U.S. make many corrections automatically that many potential enemies do not make or make by hand, which results in relatively slower or more inaccurate fire. These include temperature, humidity, barometric pressure, altitude of gun line and target, winds and slope angle.

r. M47 Dragon. The tracker (day or night) should not be taken abruptly from a cold to a warm area. Condensation induced by this action may cause clouding of optics and rusting of internal parts. Wearing the wool scarf over the nose and mouth may reduce fogging of sights. As with all recoilless weapons, backblast is tripled. Gunners must wear face, eye and hand protection. Snow glare through magnification is increased; wear sunglasses. Control wires become brittle and can break, causing

increased erratic-missile flight. There is an increased amount of large wet surfaces, which can cause increased erratic-missile flight. The Dragon is rated down to –25 degrees F (battery power may not be sufficient below –25F). Select a firing position with minimal snow to reduce launch signature (snow can be packed down or wetted to reduce signature). Emplacement/mobility of the Dragon is unchanged in snow. When firing in ice fog, fire offset to the downwind side of the target and count 1 second per 100m bringing it back to the target just before impact (the gun-target line will become too obscured to maintain a track if not fired offset with tamping of snow in front of- and behind the gun). For moving targets in ice fog, fire behind the vehicle's direction of movement and steadily bring to target as above (if fired in front of the vehicle, the track can be lost as the vehicle is eventually screened by the ice fog).

s. TOW II. The TOW is rated down to –25 degrees F (there may not be sufficient battery power below –25F). Range is reduced to 3400m vice 3750m. The capstan can blowout at 10 degrees F. The TOW can be mounted on a BV-206, but is not recommended for sled transport. Protect face, eyes and hands while firing. Wear sunglasses for snow glare. Backblast area is tripled. Ice fog considerations are the same as for Dragon. The thermal sight works better in cold due to a larger contrast between background and target.

t. Predator. Still under development at this time.

u. Javelin. Range remains 2,000m. Can be fired down to –25 degrees F (design requirements, battery power may not be sufficient below –25F). Can be stored down to –50 degrees F. There is no bipod/tripod, so emplacement is not a problem. There is a "soft-launch" feature which will reduce target signature. However, still select a firing position with little snow or tamp snow to eliminate signature. The round is fire-and-forget, so there is no ice fog tracking problems. However, alternate firing positions will be needed. There is a slight initial drop on launch (until the flight motor kicks in) in cold, so do not fire from reverse slope/partial defilade positions in cold weather. Wear face, eye and hand protection. Backblast area is tripled.

11004. Effects of Cold on Optics

a. Lasers. Laser capabilities are degraded by ice fog and blowing/falling snow as a result of refraction off snow and ice particles (the human eye sees farther in these conditions.) When clear, cold and dry – it is accurate to within 1m at 10,000m. There is an increased eye hazard from refraction off snow/ice, wear protection. False signals are possible with laser target designators due to refraction, or bouncing, of laser off snow/ice covered target (this can cause the guided bomb to impact 1,000's of meters from the target.)

b. AN-PVS 7. Use the cold weather battery adapter and keep spare batteries next to the body. Use the de-misting shield. Plastic parts become brittle; use caution in handling. Keep in a case, protected from snow when not in use. Light amplification devices are more effective in snow cover due to increased ambient light reflection.

c. AN-PVS 4. Use daylight cover on the move to protect from snow. Keep extra batteries next to the body. Light amplification devices are more effective in snow covered terrain.

d. Thermal Sights. These sights work better in cold because of increased contrast between target and background. Heavy snow cover provides a uniform, clutter-free background. The human eye sees farther in falling/blowing snow than thermal. Snow and reflective insulation (like a space blanket) can be used for thermal camouflage. One foot of snow on a poncho provides overhead thermal cover for a position. Skiing or walking through snow will leave a thermal trail (duration can be minutes to hours depending on conditions and number of personnel).

e. Fogging. Use care not to unnecessarily breathe on lenses and sights to avoid fogging of the glass. Gunners may wear facemasks to limit this occurrence.

11005. Effects of Cold on Ammunition

Weapons fired at temperatures below –35 degrees F with 3mph wind or less create ice fog contrails that pinpoint weapon locations and obscure vision on the gun-target line. Prepare and stock multiple weapons positions with ammunition. Use spotters to call corrections on the T/I phone for tanks in defensive positions.

a. Small Arms Ammunition. The effect of cold on small arms ammunition is minimal. Velocity is lowered slightly which causes rounds to drop slightly. To overcome this:

- Battle sight zero all weapons when they arrive in the cold weather operating area.
- Range estimation will improve with experience. Use tracers if the tactical situation permits. Tracers provide the best method.
- When firing uphill or downhill, estimate the horizontal distance for sight setting – not line of sight range. Effective field expedient methods are using map distance or to aim at 6 o'clock and adjust. CAUTION: laser range finders give line-of-sight. Trajectory is only affected by gravity over the horizontal distance (aiming points/data for uphill and downhill are the same.)
- Increase ammunition allocation. Due to the effects of cold weather clothing, differences in range estimation, and the effect of cold on the human body, marksmanship will be reduced. Consequently, ammunition allocations must be increased.

b. Mortar Ammunition. The fragmentation-absorbing effect of snow will decrease ammunition's effectiveness. To combat this:

- Use variable time fuse for airburst over snow covered terrain.
- Use delay fuse for avalanche initiation.
- Use quick fuse on rocky or ice covered terrain.
- Increase ammunition allocation. Dud rates will be much greater and must be planned for. The snow will also absorb up to 80% of fragmentation.

c. Artillery Ammunition. Artillery ammunition will be affected by the cold with a result of 100m short for every 1,000m of range. While illumination rounds may malfunction and fail to open, those that are functional will be more effective because of reflection off the snowpack. Deep snow will absorb the bursting radius. When firing on frozen ground, rocks or ice, the effects of artillery ammunition will be enhanced.

d. Guided/Unguided Antitank Missiles. All antitank missiles are designed to operate down to –25 degrees F. However, at lower temperatures their accuracy will decrease due to:

- Effects of cold on the human's ability to function. The firing hand will feel numb due to the cold and heavy mittens/gloves. Practice while wearing gloves/mittens will help but not eliminate the problem.
- Optical sights fog immediately if breathed on. Gunners should wear masks when firing (ECW mask, scarf, surgical mask, etc.).
- Ice fog requires gunners to prepare multiple firing positions if temperatures drop below –25 degrees F. These positions should be 100m apart and pre-stocked with ammunition.
- Runaway missiles can be caused by the wire guidance system shorting out, wet snow contacting the control wire or a broken wire from extreme cold.
- Battery failure (causes misfires).

11006. Ammunition Storage

Ammunition storage areas should be sited to provide for all types of ammunition.

a. Protection from the Elements. To protect ammunition from direct exposure to snow, leave it in shipping containers until it reaches its intended weapon systems. Dumps should include cover over ammunition and keep stored ammunition 4-6" off the deck.

b. Gunline Storage Sites. The mishandling of ammunition or improper storage at the weapons site causes most misfires. Store ammunition at the same temperature as the gun and protect from the weather.

c. Freeze/Thaw Periods. Awareness of the effects of probable freeze/thaw periods is essential for proper storage procedures. Keep ammunition out of low-lying areas. As a result of thawing and freezing, the area could flood during the day and freeze solid at night.

11007. Effects of Cold on Communications Equipment

Extreme cold affects communications equipment by reducing the efficiency of certain components and by making operating conditions particularly difficult. The need for regular and careful maintenance must therefore be combined with intelligent siting and a particularly high standard of operating. The most significant impact of cold on siting is the tendency to establish the antenna farm nearer to or within the battalion command post (Bn CP). At company level, radios are in the CP anyway so this is not a consideration. Locating the antenna farms near or within the Bn CP area reduces wire and cable problems, but will render the CP more vulnerable to direction finding. In addition, the CP site may not be a good position from which to communicate.

a. Condensation. Condensation becomes a problem when temperatures fluctuate above and below freezing. Radio equipment is susceptible to the same dangers from condensation (sweating and freezing) as weapons, with the added problem of internal condensation (caused by battery heat). Internal condensation may take a long time to dry and may cause short circuits and damage. Anticipate that you will need additional radio equipment and additional time/labor to dry out equipment. Moisture from the breath freezes onto handsets and quickly coats them in ice; the button or switch may also become ice covered. Protect handsets by a cover which can be improvised from plastic battery bags and tape. Do not cover handsets with cloth that absorbs moisture and makes the problem worse. Do not place radios operated outside directly on ice or snow.

b. Radios. Cold affects radios and their component parts in other ways. All flexible cables and some metal parts become brittle at low temperatures. Rough handling easily breaks power connections and cables. If a radio is dropped or jarred when very cold, it is far more likely to become damaged. All moving parts become stiff or may jam because of the varying contraction rates of different metallic parts and because of frozen condensation. Handle all cables carefully. Warm cables so they can be easily manipulated before you connect them, particularly between a vehicle and a dug in command post or between 2 vehicles.

c. Batteries. All batteries give less power at low temperatures. The conventional dry cell battery loses efficiency very rapidly as the temperature drops. Store dry batteries at a temperature above 10 degrees F and gently warm them before use. Do not expose them to extreme cold until needed, and during use keep them as warm as possible. If an operator is going into a shelter for a short time to eat or rest, if possible, take the batteries with him and leave the radio outside to avoid unnecessary condensation. Take portable sets into shelters overnight. Avoid overheating lithium batteries; check with the communications officer on disposal of lithium batteries.

d. Vehicle-Mounted Radios. Power for operating the vehicle-mounted sets is derived from the vehicle's battery/generating system. Place vehicles with radios in as warm a place as possible. Both the radios and the batteries should be well insulated on those sides that are against the cold metal of the vehicle body. To conserve battery life in the cold, it is necessary to operate the vehicle when operating the radio. Battery maintenance is important. Lead acid batteries should never be allowed to drop below 2/3 of full charge. They should not be charged at temperatures below 15 degrees F.

Check the specific gravity of batteries at least once a week using a view-type battery/antifreeze tester. Batteries with a specific gravity of less than 1.250 should be recharged.

e. Antennas. Antennas may be difficult to erect in deep, soft snow and on frozen ground. They are also likely to become iced up. Antennas and particularly the wire supports should be jarred frequently to dislodge ice. Erect wire antennas so that wire is attached to one post by a weaker or thinner string that will break under built-up ice before the antenna breaks. Antennas can be anchored by trees, bushes, or a dead-man (buried log or rock). In an area where there are saplings, you can bend over one of the saplings, attach the antenna, and then release the sapling to give the antenna additional height.

f. Precipitation Static. Precipitation static occurs when metal-antenna, high-powered radios and sensitive receivers are exposed to rain or wet snow. Highly charged pellets of snow striking and discharging on antennas cause this interference. Covering the antenna with polystyrene masking tape reduces this effect if there are no other adjacent metal surfaces (sides of a vehicle, etc.) against which the discharge can take place. Precipitation static is not apt to be a problem at battalion and below.

g. Grounding. The amount of static electricity present makes grounding of radio equipment vital. Frozen ground is not a good conductor, and it is very difficult to drive in a grounding spike. The best ground is obtained by driving a spike through ice into water. The ground spike should be treated with salt, Epsom salt, or saltpeter.

h. Weatherproofing/Waterproofing. By performing weatherproofing/waterproofing on communications equipment, reliability and dependability are enhanced. Conventional material for weatherproofing includes; multipurpose waterproofing covers and waterproofing tape. Field expedient materials include; poncho, raincoat, tarpaper, ammo cans, plastic bags, sheets of pliofilm, flexible plastics, etc. Any protection is better than no protection.

i. Operator Maintenance. Because the polar regions are subject to disturbances that affect radio reception, it is very important to get the very best performance from radio sets. Operators must be experienced with their sets. In addition, they should:

(1) Keep radio equipment clean, dry, and warm (if possible).

(2) Handle the set and its ancillary equipment carefully, as most materials become fragile at low temperatures.

(3) Maintain the set and batteries regularly and meticulously and report any defects as soon as they become noticeable. The main points are:

- Plugs and jacks are clean
- Antenna connections are tight.
- Insulators are dry and clean.
- Snow and ice are removed.
- Cable or internal connections are tight.
- Motors and fans are turning freely.
- Knobs and controls operate easily.
- Dry batteries are fresh and kept warm.
- Operating spares are on hand.
- Breath shields are used on all handsets.

Chapter 12

Offensive Tactics

12001. Tactics in Cold Weather

The science and art of tactical operations in a CWE differs little from other environments. Still, historical lessons of winter warfare reveal that cold weather combat is oftentimes decided more by environmental factors than actual combat with enemy forces. Victory is still achieved by defeating the enemy; however, the cold weather introduces unique opportunities for attacking the enemy "system." Advantage is gained by avoiding the enemy's strengths and attacking his vulnerabilities. The example below is derived from the "Winter War" between Soviet and Finnish forces at the outset of World War II, and details how Finnish small-units applied maneuver tactics in a CWE:

Finnish tactics aim to separate the enemy's strong points from each other and to encircle them. In this manner, the famous "mottis", or an encircled enemy center of resistance, was formed. The fighting of the "mottis" clearly represented an attempt to starve the enemy into surrender.[i]

This Finnish tactic demonstrates that victory is not always accomplished by destruction of all enemy units, rather, by topping his will to fight. Following are considerations which small-unit leaders must take prior to projecting offensive combat power.

a. Terrain. Terrain is analyzed from the perspective of making it an advantage to friendly units and a disadvantage to enemy. Generally speaking, mountainous country where there are high ridges and plateaus cut by deep valleys is best suited to mobile, small-unit operations. Larger units and vehicle convoys will be channelized in this terrain and become more vulnerable targets. Flexibility in snow-covered terrain is increased if Marines are ski and snowshoe trained. Helicopters help to overcome the mobility problem and provide rapid deployment of troops when road routes are dominated by enemy.

b. Main Supply Routes (MSRs). Existing lines of communication must be controlled to assure success in winter operations. Breaches in enemy lines of communication should be made near dominating terrain if retention of the area is required. Severe winter weather hastens enemy destruction after supply lines are cut.

c. Weather. Use weather conditions to increase opportunities for surprise attacks. Exploit falling snow, blizzards, fogs, low cloud cover and natural night illumination. Imaginative use of weather obstacles may turn them into major advantages. Conducting offensive operations during severe weather conditions, however, restricts aviation support and increases control and reconnaissance problems. Furthermore, harsh weather requires that Marines train in a similar environment in order to gain confidence in their ability to operate equipment and employ weapons.

d. Surprise. Reduced visibility in a CWE increases the ability to attack with surprise. The combination of terrain, MSRs and weather may lead an enemy in a defensive posture to consider a particular route "no-go" and weakly secure it. However, this allows the Marine small-unit leader, with proper mobility, marksmanship and communications training, to strike into the enemy's weak point.

12002. Battle Drills

Battle drills should be established at company and platoon levels since the difficulties in command and control and the uncertainties of cold weather operations require initiative at all levels. Battle drills for each unit will encompass routines for march discipline as well as actions on contact with the enemy.

a. Actions During March/Halts. Proper march discipline increases the unit's survivability in many aspects. Schedule frequent but short rest halts, thus preventing sweat-drenched Marines from freezing. During halts, minimize the amount of movement outside of the march tracks; packs will typically be dropped to the rear of each Marine, facilitating the ability to sit on an insulated item. Security measures are enforced, alternating inboard and outboard fields of fire. Ensure the buddy system is employed to conduct frostbite checks during halts.

b. Actions on Contact. Preparing for counter-ambush begins with drills that rehearse transitioning from traveling to assault mode (this may involve dismounting skis, snowshoes, BVs skijoring, etc).

c. Actions at Assault Position. While many offensive operations may require an "assault position", the preparations which follow do not always apply. Drills should be considered for: establishing security; erecting warming tents; staging gear and transitioning to assault over-the-snow mode. Fire and movement is still executed in the assault, however, with deep snow packs, shorter movement distances are required.

12003. Orders

The process of issuing warning orders, fragmentary orders and detailed operations orders does not change in a CWE. The unique aspects of cold weather, however, require that more time be allowed to accomplish small unit preparations. Everything takes longer in the cold. In order to ensure that Marines are responsive to orders, proper and timely use of warning orders provides the solution to this problem.

12004. Uniform and Equipment

a. Uniform. Detailed in the commander's orders, the uniform should be as light as possible, consistent with the weather. A good rule of thumb is to ensure Marines dress "comfortably cool." Experienced men should decide the amount of underclothing to be worn; the unit commander for purposes of identification, camouflage and uniformity, however, selects the outer camouflaged layer. Wearing camouflage must be preplanned and detailed, and adjustments may be made during the march (to respond to changing terrain and weather.)

b. Equipment. The equipment carried varies with mission, weather and duration of operation. At a minimum each Marine must be equipped for three functions: surviving the cold, accomplishing the primary mission and being prepared for on-order missions. (see 8003.)

12005. Track Intelligence

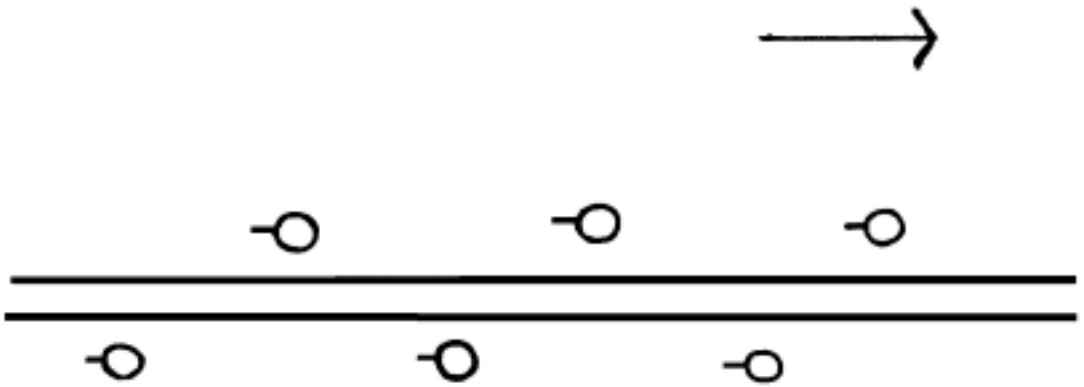
Units on the tactical march must immediately analyze ski and snowshoe tracks for their intelligence value.

a. Unit Size Estimation. Although there is no exact method to determine actual unit size, ski pole basket marks provide the best indicator. Be aware that skiborne troops moving downhill plant their poles less frequently than on flat-ground, and increase their pole plants while moving uphill.

- Up to Squad – it is possible to distinguish and count individual basket marks. The track is generally clean and straight. It is possible to identify multiple ski/snowshoe tracks.
- Up to Platoon – if on skis, basket marks are difficult to distinguish from each other and may look like a small ditch. The track is somewhat clean and straight, but may be a half-a-width wider than normal (i.e., 3 ski tracks or 3 snowshoe tracks wide.)
- Platoon to Company – track is sloppy and wide, possibly 2-3 times wider than normal. The edges of the track are destroyed at bends and curves.

b. Unit Direction. Once again, the ski pole basket mark reveals the general direction traveled by the unit being tracked. As the ski pole is planted and the ski moves forward, the basket will angle

forward, causing the basket to dig into the snow, and leaving an indent on the forward edge (thus indicating direction.) Also, the point of the pole will contact the snow before the pole is planted, making a line pointing away from the direction of travel.



• Disturbance – whether skiborne or snowshoe mobile, snow disturbance provides evidence to help the tracker determine unit direction. All forward movement will displace snow forward. Snowshoes and skis will throw snow up and outwards in the direction of travel.

12006. Camouflage and Concealment

In snow-covered terrain the stark contrast between light and dark emphasizes any item which does not blend naturally with its surroundings. Furthermore, every movement by vehicles or dismounted troops leaves readily identifiable tracks in the snow which can provide detailed intelligence to an enemy. Also, backgrounds are not necessarily all white. Rocks, brush, trees and shadows make sharp contrast with the snow It is essential that individual Marines understand these basic concepts in order to effectively camouflage themselves, their equipment and their vehicles.

a. Individual Concealment. A thorough reconnaissance and terrain analysis is required in order for the small-unit leader to proscribe proper camouflage patterns. By using a combination of green woodland and overwhite articles of clothing, four different color schemes can be used depending on terrain.

(1) Thickly Wooded. These areas consist mainly of secondary growth coniferous or deciduous trees with thick underbrush. An all green clothing combination is normally best.

(2) Low Brush/Light Scrub These areas are often found at and above the treeline or in hilly areas with poor soil. In most cases and open snow background predominates and a combination of with over green is usually suitable.

(3) Forest. These areas are covered with primary growth, coniferous and deciduous, of varying density, with little underbrush. The normal clothing combination here is green over white.

(4) Above Treeline. Even above the tree line, terrain is not solely white. Exposed rock and shadows change the view. Commanders should carefully observe the area. All-white camouflage is usually best. In areas of exposed rock, deep shadows or exposed brush, however, it may be best to roll up a leg or arm of the overwhites to provide for some contrast

b. Weapons and Equipment. Equipment is relatively easy to camouflage with good results being achieved by the use of matte white paint or white tape. Plastic, adhesive tape works best but should be applied in a warm environment, and when applied to weapons, should not interfere with the operating groups. Group equipment, such as sleds and tents, should be white, but will be camouflaged additionally based on background terrain. In wooded terrain, the area around the bivouac site can be improved by thickening it with branches; small trees or branches can also be suspended above the tents to break up the silhouette. In predominately snow covered terrain, tents and other large equipment must be dug in, then concealed by draping white camouflage netting over.

c. Vehicles. Vehicles should be prepared with matte paint in irregular patterns. Stationary vehicles should be dug into the snow, parked in a depression, or surrounded with a snow wall. When possible, vehicles should be parked so that their shadow falls on brush or another shadow, thus interrupting the straight lines of its own shadow. Exhaust plumes can be seen from miles away, the noise of an idling engine carries for great distances, and the infrared signature of a warm engine against the cold background is very great. In the absence of thermal blankets which minimize heat signatures, snow provides an excellent thermal barrier.

12007. Movement

a. Scout Skiers. Rifle companies and similarly sized support detachments should task organize their units with a dedicated element that represents its most mobile and highly trained Marines. These elements, referred to as scout skiers, may encompass from two to six fire-teams, and serve as a unit leader's personal reconnaissance element. Traditional tasks include:

- To scout terrain to a main body's front and flanks prior to movement, and to provide security throughout the movement's execution. (This information is delivered to the commander and often determines contact status and deployment formation.)
- To provide reconnaissance as directed by commander's intent (for example, to locate suitable assembly areas, attack positions, probably line of deployment, release points, ice thickness, avalanche hazards, etc.)

b. Far Flank Security (referred to as "mountain picketing")**.** Combat reports from the 1979-1989 conflict between the Soviet Union and Afghanistan *mujahideen* rebels reveal several lessons regarding military operations in mountainous terrain. Offensive operations in Afghanistan oftentimes required the units to command adjacent ridgelines prior to "sweeping" a corridor of interest. Without forces on the dominating terrain, it was difficult to effectively observe or engage enemy units in the corridor.

Such mountainous terrain as was encountered by the Soviets in Afghanistan may prevent local flank security elements from providing the necessary protection. Mountain picketing is an expanded concept of the techniques of flank and all-around security. The mission of the mountain picket force is to prevent the enemy from bringing effective flanking fire or observation onto bear on the main body. Deploy mountain picket forces on high ground to protect the main body by domination of the high ground, by additional flank security and by linking units or subunits by observation and support fire when units are channeled into corridors by the nature of the terrain. Local flank security is fundamental to our tactics and familiar to all Marines; however, mountain pickets have distinct, additional advantages and disadvantages.

- **Advantages:** Mountain pickets overlooking the route provide the main element with increased security and constant coverage by supporting teams. While traveling along dominating ridgelines, these pickets are also more likely to maintain communication with fire support agencies, and are thus in the best position to direct fire support.
- **Disadvantages:** Mountain pickets will likely move through more arduous terrain than the main body, thus slowing the main body's rate of movement. Concealment is paramount as pickets

typically deploy above the treeline. Control and communication is difficult between main body and pickets due to physical separation and frequent lack of visual contact.

Pickets are particularly effective during "clearing" missions or other tasks that require a main body to physically travel a corridor. The pickets can travel slightly ahead of the main body and provide reconnaissance information to the main body. In defending the main body against ambush, frontal or flank attack, mountain pickets will have the best observation for directing fire support. Hence, attaching forward observers and FACs to the mountain picket could maximize fire support flexibility for the commander.

In order to effectively coordinate their movement, the main body must design a solid movement scheme of maneuver that uses checkpoints and phase lines. These coordinating measures assist not only in reporting procedures, but also for the commander to ensure that the movement of separate units is synchronized and controlled. Elements dispersed from the main body, such as far flank security, must have established priority of fires and conduct of fire nets in order to effectively coordinate fire support.

c. Track Discipline. Movement in a snow-covered environment can be the Marine's worst enemy if his unit does not understand track discipline. Tracks left in snow are quite visible to both ground and air assets for great distances.

- Routes of advance should be concealed from air and ground observation, and can best take advantage of natural shadows by following the terrain contours.
- Use of existing tracks is encouraged, minding the likelihood of ambush. Traveling in a previous unit's tracks minimizes evidence of recent activity, and can work to help improve deception.

12008. ATTACK

Individual and small unit tactics will remain generally unchanged; the phases of an assault are the same, though the CWE requires specific considerations and unique techniques.

a. Assault Position. If this control measure is used, it is usually the time at which the main body rejoins forces with scout skiers and the advance guard. Prior to the assault, warming tents may need to be established in order to dry clothing, prepare hot wets and care for casualties. Marines will typically drop unneeded equipment here; the assault load should be light, but must include survival equipment, shovels, sleeping mats, etc. Finally, units will transition to their assault mode of travel (ski, snowshoe, and foot.)

b. Assault. In order to maximize surprise and speed, the assault should be timed to coincide with darkness, snowstorms, fog, etc. Indirect and direct fire support should be planned closer to the objective to compensate for the dampening effects afforded by snow and ice fortifications. Sleds, snowmobiles or other mobility assets must be planned for displacing firing assets closer to the enemy as the assault progresses. Similarly, reserve units must be kept closer to the main body as mobility in a CWE is drastically reduced. Ideally, the assault is conducted from high ground to low ground. Do not rely on aircraft for either assault support or close air support, as unpredictable weather severely limits their capabilities and dependability.

c. Consolidation. Assaulting troops will be fatigued and must now be protected from becoming cold weather casualties. Priority is placed on establishing limited bivouac, either by erecting warming tents or temporarily using the enemy's accommodations. This may require a tasked unit to return to the assault position for the purpose of bringing forward essential equipment (stoves, tents, etc.) Temporary occupation of the enemy's positions is acceptable; however, counterattacks should be anticipated, as the enemy will likely fight to recover vital equipment he has abandoned during the fight./

[i] German Report Series, *Warfare in the Far North,* (Washington, D.C.: Center of Military History, U.S. Army, 1982) p. 19.

Chapter 13

Defensive Tactics

13001. Weighing the Defense

As with offensive scenarios, situations that may require a unit to assume the defense in a CWE differ little than in a temperate environment. Winter combat between Allied and Soviet forces in Northern Russia during 1918-19 demonstrates that the defense was typically superior to the offense because the attacker:[i]

- Was exposed to frost and wind chill
- Became exhausted after moving through deep snow
- Was afforded little concealment

Other historical sources, however, indicate that a defense centered on prepared positions is strategically a postponement of defeat.[ii] So…what historical lessons are to be followed in the consideration of small unit defensive tactics in a CWE? This chapter presents defensive techniques and procedures that are uniquely affected by cold weather or snow. Still, warfighting philosophy of MCDP 1 "Warfighting" is quite relevant in a CWE, especially when applied in a defensive scenario: whether the defense is of a temporary bivouac or for a prolonged period of time, it must incorporate an offensive character (security patrols, ambushes, planned counterattack elements, etc.)

13002. Common Camouflage Problems

a. Ice Fog. Ice fog is caused by condensation of supercooled fine droplets of water. Weapons firing, vehicle exhaust and human breath can cause ice fog. The formation of ice fog can reveal weapons' positions, vehicles parks and bivouac sites. Ice fog emitted from the rockets of anti-tank missiles can cause the gunner to lose observation of the missile. Deliberately caused ice fog can be used as a deception measure or to conceal movement.

b. Sound. Sound carries for very long distances in cold, dry air. Marines must be made especially aware of the need for good sound discipline. Marines must be trained to be quiet, particularly when in their shelters where they feel protected and where noise levels and need to talk seem to rise. The sound of skis, snowshoes and ice-crust breaking can warn the enemy of a unit's approach from long distances.

c. Light. Maintain good light discipline both when on the move and when in bivouac. Artificial light is particularly noticeable in the sparsely settled areas where cold weather operations are likely to take place. In addition, artificial light can be seen from great distances due to snow reflection and excellent visibility in clear, cold air.

d. Thermal Signature. Detection by infrared devices is very likely because of the contrast between the heat radiated by vehicle engines, cook stoves, fires, human bodies and even candles, and the cold background temperatures of snow-covered or frozen ground. All possible methods to lessen this detection must be used (snow is an excellent thermal-barrier and can minimize heat signatures if used to conceal tents, vehicles, etc.)

13003. Camouflage Measures

a. Principles. Snow, natural vegetation and white camouflage nets can be used to conceal defensive positions from ground and aerial observation. Ensure bivouacs and defensive positions blend into the surroundings by rounding accumulations of snow and ice into natural contours (avoid sharp corners that may cast an unnatural shadow.) In the absence of freshly fallen snow, dirt or dirty snow must be covered by existing snow.

b. Track Plan. Tracks made in snow-covered terrain will lead the enemy directly to defensive positions unless a track plan or deception plan is strictly enforced. The track plan must be determined and the information disseminated before the position is occupied. Small-unit leaders must strictly enforce the track plan and mention of the plan should be make in all subsequent patrol orders. The use of deception is a necessity. Tracks should be continued well beyond the entrance to the bivouac/defensive position. If possible, the entrance track should lead into the rear of the position and be covered by an automatic weapon. Dummy positions and dummy tracks can be used to lead an enemy force into the killing zone (see paragraph 6006).

c. Track Discipline. Some inevitable tracks will be visible to enemy ground troops and aircraft. Take care to minimize the enemy's ability to find them. Where possible, tracks should not cross an open area. Move in forests and along treelines; use dips and hollows in the ground or small watercourses to hide tracks. Move in old tracks, when possible, and disguise ski pole marks to prevent the enemy from determining your unit size.

d. Light Discipline. The ECW 4-man tent with fly is constructed with light retention material, and is literally light proof when all hatches are zipped. When entering and exiting tents and shelters, ensure lights being used inside are extinguished prior to opening the hatch. When emplacing a bivouac, orient all tent openings away from the main track and construct a snow wall to screen the opening.

13004. Considerations for the Defense

General unit procedures for establishing a defensive position (whether temporary of a bivouac, or prolonged of a sector) do not change in a CWE. Maximizing terrain advantages and natural obstacles, maintaining sound security measures and building a defense in depth remain paramount to a solid defense.

- Siting a defense on high ground is optimal for observation and firing purposes. Most over-the-snow vehicles (BV-206) have difficulty climbing ungroomed slopes that are icy. Further, freshly fallen or deep snow makes fire and movement difficult. Use these conditions to your advantage to dissuade an enemy force from attacking you.
- Design bivouacs and track plans in accordance with paragraph 6006. Fighting positions should be relatively close to shelters. Sentry rotation will be more frequent than in temperate weather for the purpose of minimizing the potential for cold weather injuries. Marines will typically sleep in full gear in order to expedite this rotation.
- Communications wire or 550 cord is a good method of linking fighting positions to tents. If the sentry detects enemy movement, he can easily alert the sleeping Marines with a pull on the wire.
- Obstacles can be built to channelize the enemy into areas of deep snow. Detailed information relating to snow fieldworks and camouflage is found in MCWP 3-35.1.
- Fighting positions should be dug into the ground snowpack, though demolitions may need to be used if the ground is frozen. If engineer support is unlikely, train Marines in the employment of basic demolitions.

13005. Defensive Positions

Fighting positions and shelters made from snow can provide protection from both the elements and hostile fire. As indicated by the chart contained within this charter, small arms fire penetration varies from four meters in newly fallen snow to 0.3 meters in icecrete (frozen water and soil.) Examples of possible field fortifications that follow are simply guides to methods and materials that can be used; imagination is the limiting factor in the use of snow and other natural resources for the purpose of protecting Marines.

TYPE OF SNOW MIX	YARDS	METERS
Newly Fallen Snow (no wind)	3.6	4
Packed Snow	1.98	2.2
Ice	0.9	1
Icecrete	0.27	0.3
Frozen Snow/Water mix (snowcrete)	1.125	1.25

This table gives the minimum thickness necessary to stop small arms fire.

a. Tree-Supported Wall. Logs are laid on top of one another and lashed to trees. Snow is then piled against them.

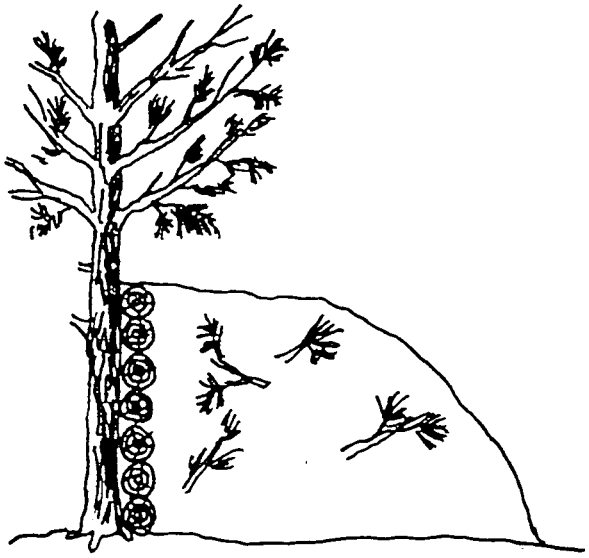


Figure 13-4. Tree-Supported Wall (Side View).

b. Tripod-Supported Wall. Construct tripods as shown to add a limited degree of overhead protection.

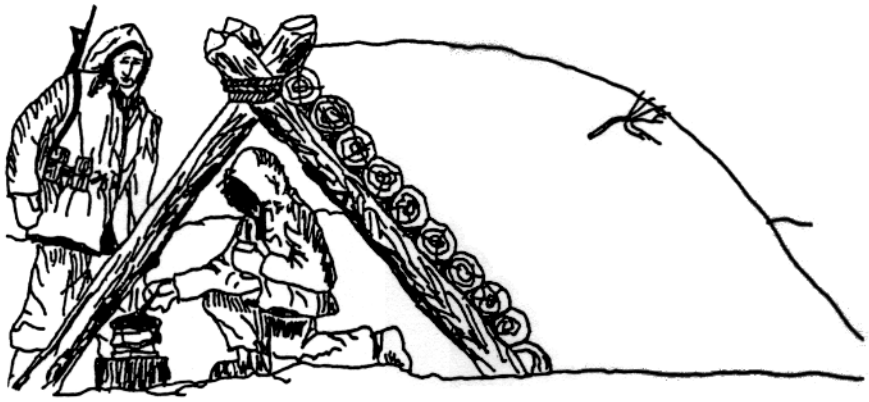


Figure 13-6. Tripod-Supported Wall (Side View).

Figure 13-7. Tripod-Supported Wall (Rear View).

c. Anchor-Supported Wall. This wall requires two short logs for uprights, one long log for anchor, two lengths of rope or communication wire, and as many logs as need for height. Before securing lines, adjust uprights to lean slightly toward anchor, then bank snow to hold logs in place.

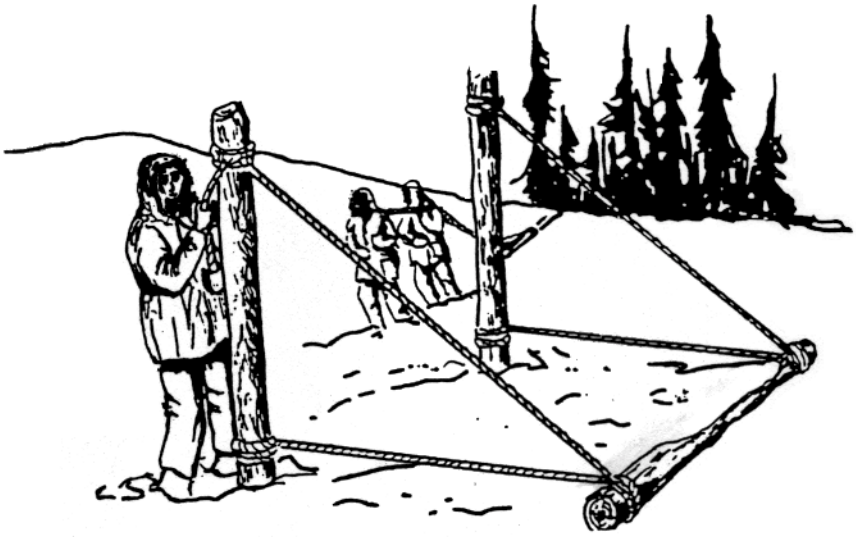


Figure 13-8. Anchor-Supported Wall (Oblique View).

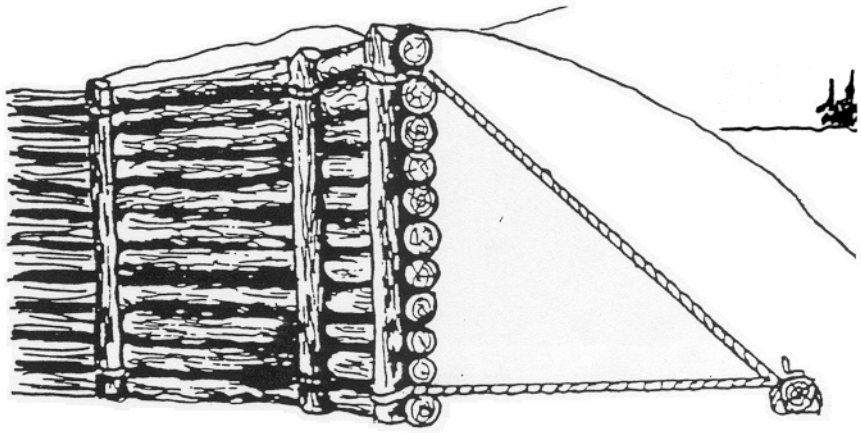


Figure 13-9. Anchor-Supported Wall (Side View).

d. Defenses Using Ice. Icecrete is made by mixing gravel, sand, pebbles or dirt with snow and water. When well mixed, the icecrete is shoveled into any of the following containers or forms":

- **Ration Cases:** Use any type of cardboard box. When stacking, wet the top of each layer so the next layer you place on it will freeze to it. If water is scarce, use short stakes and peg the layers together.
- **Ammunition Boxes:** Use only wooden boxes. Metal boxes increase ricochet danger. Build a wall as with ration cases. Use stakes to peg layers together.
- **Sandbags:** Fill bags with icecrete. Wet bags so they will freeze together.

[i] Dr Allen F. Chew, *Leavenworth Papers No.5 Fighting the Russians in Winter: Three Case Studies* (Fort Leavenworth, Kansas: Combat Studies Institute, 1981) p. 15.

[ii] George K. Swinzow, *CRREL Special Report 93-12 On Winter Warfare* (Hanover, New Hampshire: U.S. Army CRREL, 1993) p. 62.

Chapter 14

Nuclear, Biological, and Chemical Defense

14001. Cold Weather Operations.

Cold weather environments create unique and diverse conditions with which to overcome and accomplish an assigned mission when coupled with NBC events. Doctrine governing nuclear, biological and chemical defense remains in tact during cold weather operations. This chapter discusses only those aspects of NBC Defense that require modifications during cold weather operations/conditions within the context of the small unit leader. Each area-specific paragraph (Nuclear, Biological, and Chemical) provides a brief overview with unique measures for Individual, Monitor/Survey and Decontamination Operations.

14002. Nuclear Defense

The winter environment influences the effects of a nuclear detonation with regard to blast, thermal effect, and radiation effects.

a. Blast Effects. At subzero temperatures, the radius of damage to material targets can increase as much as 20 percent. Tundra, irregular terrain features, and broken ice caps will break up the pressure wave and thereby reduce its effects. Blast waves can drastically interfere with troop movement, by breaking up cover and causing thaws, with possible avalanches in mountainous areas.

b. Thermal Effects. Ice and snow have a high reflectivity. This reflectivity may increase the number of personnel whose vision is affected by the brilliant flash, or light dazzle, especially at night. Cold temperatures reduce thermal effects on materials, by reducing possible heat signature. Snow, ice, and even frost coverings on combustible materials greatly reduce the tendency of materials to catch fire; however, this thermal effect will dry out exposed tundra areas and may cause grass fires.

c. Radiation Effects. The number of passable roadways is limited already by weather conditions, and radiological contamination on roadways may further restrict resupply and troop movement. Seasonal high winds in the arctic may present a problem in the prediction of radiological contamination predictions and for crossing contaminated areas.

d. Individual Protective Measures. The following conditions must be considered:

(1) At low temperatures, Marines operating in the field are particularly vulnerable to all of the effects produced by a nuclear detonation because of the difficulty in digging fighting holes and underground fortifications for protection. Shelters and fortifications constructed from snow and ice provide some protection. Wherever possible, they should be constructed to take maximum advantage of the additional protection provided by natural terrain features.

(2) Snow and ice, although not as effective as earth in reducing radiation hazards, is readily available and can be used to provide shielding against radiation effects. Loose snow falling on a contaminated area will have a half-thickness of about 60 centimeters (24 inches). 30 centimeters (12 inches) of hard-packed snow will reduce the value to ½ of its original value. Half-thickness is the thickness of material required to reduce the original radiation level (reading) to half its value. Example; original radiation reading equates to 120 cGy, add required thickness of material and new value is 60 cGy.

(3) Cold weather clothing (Outer shell, overwhites) provides an advantage of low absorption properties and thereby reduces the thermal effects.

e. Monitor/Survey Operations/Equipment. The following conditions must be considered:

(1) High winds will extend contamination zones, creating additional challenges for monitor/survey operations. Aerial survey is the most practical method in extreme cold weather areas dependent on operating altitude and environmental conditions.

(2) Hot spots or areas of concentrated accumulation of radiological contamination may occur in areas of heavy snow and snow drifts. These areas need special attention during survey operations.

(3) Radiac instruments (used to detect, survey and monitor radiological hazards) should be kept warm until use to ensure maximum efficiency. Refer to TM 11-6665-251-10 (Operator's manual for Radiac set AN/VDR-2) for operating within cold weather environment.

f. Decontamination Operations/Equipment. The following conditions must be considered:

(1) Decontaminate radioactive fallout on vehicles via brushing using brooms, or even tree branches, due to the freezing point of water (32 Deg F). Radioactive effects (Fallout) are being removed from the contaminated item, NOT neutralized, which equates to transferring of contamination.

(2) Refer to TM 3-4230-228-10, for operating Lightweight Decontamination System, M17 Sanator under cold weather conditions.

14003. Biological Defense

Biological warfare can be waged effectively in the arctic with few exceptions. Most vectors (infected insects) will not survive the extreme environmental conditions and it is more difficult to aerosolize live biological agents in freezing temperatures. Toxins, on the other hand, are less susceptible to the cold. It has been found that the survival of microorganisms increases significantly at temperatures below freezing. At these temperatures spore-forming bacteria and certain viruses will survive and will remain dormant within the cold. Upon warming (warming tent, sleeping bag, heated vehicle, etc) they become an active hazard to personnel. Temperature inversions that exist over snowfields tend to prolong the integrity of an aerosolized biological cloud. Accordingly, it will disperse more slowly and remain a threat for a longer period of time.

a. Individual Protective Measures. Personnel are more susceptible to live biological agents in arctic environments, due to:

(1) Rapid rate diseases will spread in the crowded warming areas (tens, vehicles, etc).

(2) Difficult to maintain required food intake due to extreme physical demand (water, rest, and cleanliness may also be in short supply.)

14004. Chemical Defense

In arctic conditions, chemical agents act differently according to type. Table 14-1 is provided as an analysis tool with regard to effectiveness of chemical agents under cold temperature conditions.

a. Blister Agents. Some forms of blister agents are ineffective casualty-producers in a CWE because the temperature is well below their normal freezing points. This is not true for all blister agents, which may still be effective as harassing or casualty producing agents.

b. Nerve Agents. Significant contamination of areas at low temperatures and wind speeds may persist for several days. In severely cold conditions, nerve agents will remain liquid, which can be absorbed through normal cold weather clothing.

c. Blood and Choking Agents. Blood and choking agents remain extremely hazardous and nonpersistent throughout the low temperature range.

Freezing points of selected chemical agents
Table 14-1

Agent	Symbol	Contact Hazard	Vapor Hazard	Freezing Point
Nerve				
Tabun	GA	Extreme	Low-Moderate	-58 F (-50 C)
Sarin	GB	Extreme	Extreme	-69 F (-57 C)

Soman	GD	Extreme	Probable	-44 F (-43 C)
	VX	Extreme	Negligible	Below 60 F (16 C)
	VR-55	Extreme	Probable	Unknown
	TGD	Extreme	Probable	Depends on Thickness
Blister				
Distilled Mustard	HD	Extreme	Negligible	+58 F (15 C)
Mustard Lewisite	HL	Extreme	Low	-13 F to –25 F (-25 C to –40 C) Depending on purity
Nitrogen Mustard	HN-1	Extreme	Low	-29 F (-34 C)
Nitrogen Mustard	HN-2	Extreme	Low	-76 F (-60 C)
Lewisite	L	Extreme	Negligible	0 F (-18 C)
Nitrogen Mustard	HN-3	Extreme	Low	+25 F (-4 C)
Phosgene Oxime	CX	Extreme	Low	-1 F (-18 C)
Blood				
Hydrogen Cyanide	AC	Low	Extreme	+8 F (-13 C)
Cyanogen Chloride	CK	Low	Extreme	+20 F (-7 C)
Arsine	SA	Low	Extreme	-176 F (-80 C)
Choking				
Phosgene	CG	Slight	Extreme	-198 F (-127 C)

d. Individual Protective Measures. The addition of Chemical Protective clothing to EWCS increases the risk of heat casualties and degrades unit performance. Leaders will need to capitalize on MOPP analysis, risk assessment, and METT-T in order to derive the best available force protection requirements with minimum readiness degradation.

(1) M40 or M40A1. Refer to TM 3-4240-339-10 (Operator's manual M40 & M40A1 mask) for operating within cold weather environments. The following are quick tips for leaders:

- Always use mask assembly with outserts installed when operating in cold climate to help prevent fogging.
- DO NOT warm up mask near heater or open flame. Mask could be damaged.
- Do not clear mask by exhaling a large amount of air into it (as done in warm weather); doing so may frost inside cold eye lenses. Instead, exhale steadily and slowly.
- The outlet value may stick to the seat. If this occurs, lift the outlet value cover and rotate the disk with a finger while exhaling only. After freeing the valve, reseat the valve cover.
- To don the protective mask in arctic conditions, Marines should take the following actions:
- Stop breathing.
- Remove mask from under parka (clod weather clothing).
- Remove gloves or mittens as needed to properly don the mask.
- Lower parka hood.
- Don and clear mask per TM.

NOTE: Perspiration collects around the facepiece. Take care when removing the mask to prevent perspiration from freezing on your face and causing frostbite. Use small towel or cloth to wipe your face and inside or mask. To prevent ice formation, wipe your mask thoroughly before storing it. When possible, further dry the mask by placing it in a warm, heated environment, but avoid placing it near direct heat.

(2) Chemical Protective Clothing.

- Cold temperatures will not adversely affect the current Marine Corps chemical protective suit (Saratoga).
- Based on METT-T and risk assessment, leaders will need to establish whether chemical protective clothing is worn as outer layer (over ECWCS) or as undergarment (under ECWCS).
- ECWCS will provide only marginal protection in a chemical environment

(3) Chemical Protective Overboots. Current bootcovers are worn seasonally, hence to do fit over cold weather vapor barrier (VB) boots. During cold weather operations the VB boots provide adequate protection when worn in conjunction with chemical protective clothing (page A-2, FMFM 11-9). The VB boots are double layered, natural rubber an air pocket in between.

(4) Chemical Protective Gloves. Follow normal procedures when donning the protective gloves. During winter operations in a chemical environment, use the wool glove liners (part of black leather glove set) under the butyl rubber gloves to absorb and wick away perspiration from hand surfaces. Proper glove fit is required to preclude restricting blood circulation and contributing to a cold weather injury. In extreme cold environment, the arctic mittens should be worn over the rubber gloves to provide warmth. Decontamination of cold weather mittens (if contaminated) maybe impractical and may be discarded as a combat loss.

(5) Nerve Agent Antidote Kit (NAAK). NAAKs are subject to freezing at about the same temperature as water. At temperatures at or below 40 F (5 C), remove kit (NAAKs) from mask carrier and store in shirt pocket, in order to maintain warmth through body heat. This precludes the danger of severe muscle spasms and/or shock from injecting an extremely cold liquid into muscle. During transit, storage and resupply operations, NAAKs must be protected from freezing and then thawing in order to minimize the threat of rendering kits unserviceable.

(6) M291 Skin Decontamination Kit. This kit can operate in different climatic conditions, and is effective in a CWE to temperatures of –50 F.

e. Monitor/Survey Operations/Equipment.

(1) Operations. Toxic chemicals react differently at extremely low temperatures. Some chemicals freeze at cold temperatures, thereby reducing the vapors which current detectors collect to ascertain identification. Table 14-1 provides chemical freezing points. Refer to FMFM 11-9 (NBC Protection) for cold weather Monitor/Survey considerations and guidance.

(2) Equipment.

(a) M256 Chemical Agent Detector Kit. The kit may give inaccurate indications when the temperature drops below –15 degs F (-21 degs C). Solutions in the capsules freeze (even if thawed they may not work), and heater tabs used to heat enzyme windows to reaction temperature, will have difficulty reaching proper temperature. Refer to TM 3-6665-307-10 (Operator's manual for Detector Kit, Chemical Agent M256 and M256A1) for operating within cold weather environment.

(b) Chemical Agent Monitor (CAM). At lower temperatures, most agents become more persistent or even freeze, and the CAM will have difficulty in detecting any agent as organic solvents, thereby giving potentially false readings. Cold weather will shorten battery life. Refer to TM 3-6665-327-13&P (Operator's Unit, and Immediate Direct Support Maintenance Manual, Chemical Agent Detector) for operating in cold weather environment.

(c) M8/M9 Detection Paper. The use of M8 or M9 detection is not specifically limited in the cold, but is only capable of detecting liquids. If the specific substance is thickened or solidified, collect a sample with a stick or scraper and wipe onto a sheet of M8 paper. Place the sample onto running vehicle hood to stimulate thawing of suspected agent, then wait for reaction on paper.

f. Decontamination Operations/Equipment. Refer to MCWP 3-37.7 (NBC Decontamination) for decontamination considerations and guidance with regard to cold weather environments.

(1) Equipment Decontamination. The use of water as a decontaminate will be limited during cold weather operations due impart to its freezing point (32 degs F). An alternative low-temperature decontaminate can provide a solution. STB or HTH can be used as a dry mix (two parts STB to three parts earth or snow). This method may require several applications at low temperatures. Application can be accomplished via shoveling it onto contaminated surfaces or filling sandbags and dusting it onto surfaces. After decontaminating, remove residual elements of the dry mix by brushing, scraping

or using uncontaminated earth or snow to "wash" it off. These decontaminates are corrosive to metals and personnel must wear rubber gloves and protective masks to avoid injury.

(2) Personnel Decontamination. Increase time allowances when planning MOPP exchange or detailed personnel decontamination in a CWE, placing emphasis on training with ECWCS garments.

REFERENCE PUBLICATIONS

MCWP 3-37.7	NBC Decontamination
FMFM 11-9	NBC Protection
FMFM 11-20	NBC Reconnaissance
FMFM 7-11-H	Field Behavior of NBC Agents
TM 3-4240-329-10	Operator's manual, Chemical-Biological Mask M40 and M40A1
TM 3-6665-307-10	Operator's manual, Detector Kit, Chemical Agent M256 and M256A1
TM 3-4230-229-10	Operator's manual for Decontamination Kit Skin: M291
TM 3-6665-311-10	Operator's manual for Paper, Chemical Agent Detector: M9
TM 3-6665-327-13&P	Operator, Unit, and Immediate Direct Support Maintenance Manual Chemical Agent Monitor (CAM)
TM 11-6665-251-10	Operator's manual for Radiac Set AN/VDR-2

Appendix

Avalanche Avoidance, Search, and Rescue

1. Occurrence

Natural avalanches occur during or shortly after storms. Avalanches triggered by man or his equipment may occur at any time when travelling on or near avalanche an prone slope.

2. Protection

- Seek advice of local experts.
- Learn recent weather history.
- Determine start zones of probable avalanche prone slopes and cross as high as possible, preferably above natural anchors.
- Travel on high points and ridges, especially the windward sides.
- Stay to the sides of the start zone and track when ascending/descending an avalanche prone slope.
- Avoid wind-loaded, lee slopes.
- Favor terrain with anchors, i.e. tree-covered area, over open slopes.
- Pick areas with flat, open runouts so that debris burial depth is decreased. Avoid areas that feed into crevasses and/or cliffs.
- Travel in U-shaped valleys, avoid V-shaped valleys where an avalanche can continue up the opposite side.

3. Signs

a. Instability

- Recent avalanche activity on similar slopes and small avalanches under foot.
- Booming, the audible collapse of snow layers.
- Visible cracks shooting out from under foot.
- Sloughing debris, which is evidence of avalanche activity occurring.
- Sunballing or snow-rollers, which is caused by rapid rewarming.
- Excessive snowfall, over 1” per hour for 24 hours or more.
- Heavy rains that warms and destroys the snowpack.
- Significant wind-loading causing leeward slopes to become overloaded.
- Long, clear, cold, calm period followed by precipitation or wind-loading.
- Rapid temperature rises to near or above freezing after a long, cold period.
- Prolonged periods (more than 24 hours) of above freezing temperatures.
- Snow temperatures remaining at or below 25 degrees F, which slows down the settlement process.
- Flag trees (branches only on the downhill side, trunks bent downhill) or new growth in a mature forest.

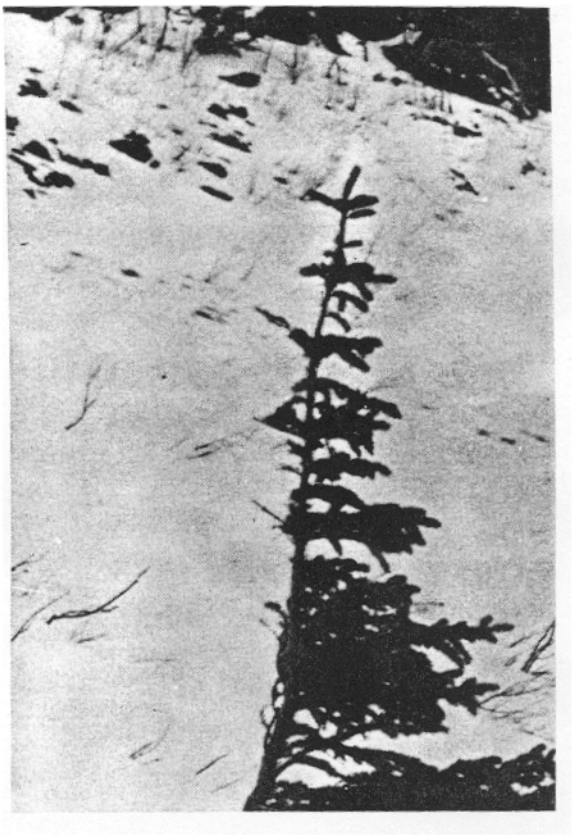


Figure 7-9. Evidence of Past Avalanche Activity. Branch Damage on Uphill Side of a Tree.

b. Stability

- Settlement cones around trees and other objects.
- Creep and glide, which can be seen by a ripple effect at the base of a slope.
- Absence of wind during storms, which can be seen by snow accumulation in trees.
- Snowpack temperatures remaining between 25 and 32 degrees F, which promotes settlement.

4. Requirements for Crossing an Avalanche Prone Slope

- Post an observer.
- Loosen ski bindings, remove hands from ski pole straps.
- Loosen pack straps, undo waistbelt, leave downhill strap on shoulder.
- Secure ECWCS hood tightly covering face, trail an avalanche cord, if available.
- Go straight downhill on foot rather than ski and look for possible escape routes.
- Go straight down, do not traverse.
- Cross as high as possible on concave slopes.
- Cross one at a time. Belay each Marine across, if possible.

5. Actions if caught in an Avalanche

- Jettison all gear (pack, ski poles, and skis).
- Assess best line of escape.
- Keep mouth shut, many victims die from a snow plug in the mouth/throat.

- Delay your departure, let as much of the avalanche go by as possible.
- Try and work to the side. There is less force at the edge of the flow.
- Try to swim out using a double backstroke movement or try to roll away at a 45-degree angle.
- A supreme effort should be made to get to the surface as the avalanche settles.
- Make an airspace to breathe.
- Move to position near the surface, if possible.
- Establish orientation (try spitting).
- Don't panic, it wastes oxygen.

6. Search and Rescue

Marines must know how to conduct avalanche searches. They must be conducted quickly and efficiently. Help is needed immediately. The buried victim must be recovered as soon as possible. There is a 20% chance of survival after 30 minutes, and only a 50% chance after 60 minutes. Some victims have survived for days. Only 19% of avalanche victims survive. Actions taken by survivors are paramount to the success of search and rescue. If victims survive, certain first-aid procedures must be given immediately. Survivors should conduct one or more types of searches; hasty, course probe and fine probe.

a. Immediate Action of Survivors. Action in the first few minutes is critical. Someone must take charge and decide immediately if outside help is needed. An overlook should be stationed off to the side and above the slide in a safe area to observe search and rescue procedures. He can provide early warning to the search party of any danger.

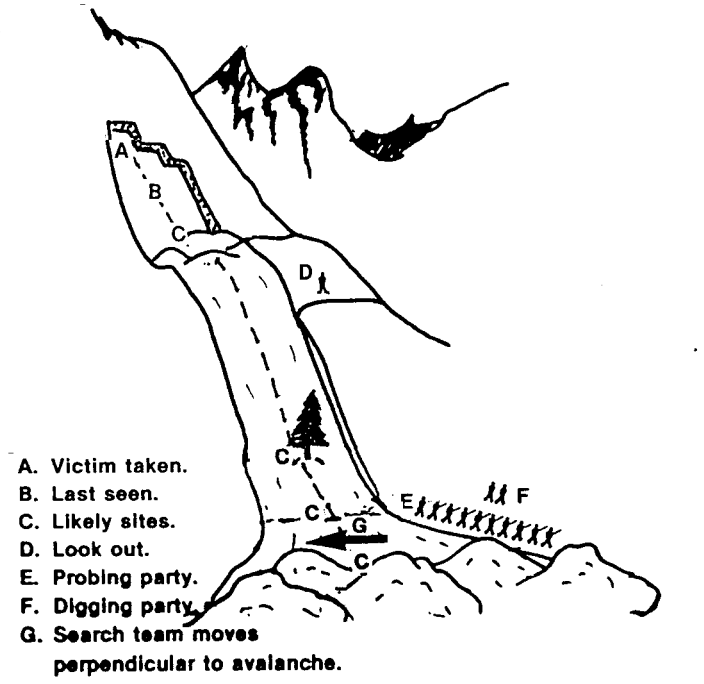


Figure B-1. Avalanche Search.

b. Hasty Search. A hasty search is conducted to determine the most likely place where victims may be located. When conducting the hasty search, speed is vital. Chances of survival decrease rapidly as time passes. Conduct the hasty search as follows:

- Mark the place where the victim was last seen.
- Make a quick search using avalanche probe poles, ski poles, skis, etc.

- Check down the fall line from the last known location to the runout zone.
- Look for some of the victim's equipment. Redirect search accordingly, if found (gear found on the surface means the victim is probably uphill since surface snow slides faster).
- Check above obstacles or anchor points.
- Check the outside of bends.
- Probe only at the most likely spots.
- Have other survivors not involved in the hasty search prepare for a course probe.
- Send for help, if necessary.

c. Course Probe. If the hasty search does not work, conduct the course probe. On the average, 20 searchers can cover a 100m x 100m area in 4 hours. There is a 70% chance of finding victims (dead or alive). Conduct the course probe as follows:

- Establish a probe line at the base of the line checked by the hasty search.
- Line up all probe line searchers at close interval (with 1 Marine in charge of the line).
- Make a single insertion with the probe between the feet of each searcher at the command of the senior man. No other will be talking.
- On command, the probe is removed and the line takes a 30" step forward. Repeat this procedure.
- Mark the line probed on the ends with ski poles, sticks, etc. An avalanche cord can be trailed behind the line so that the same area is not searched twice and the search line is kept straight.
- The probe itself should be no deeper than 3m.

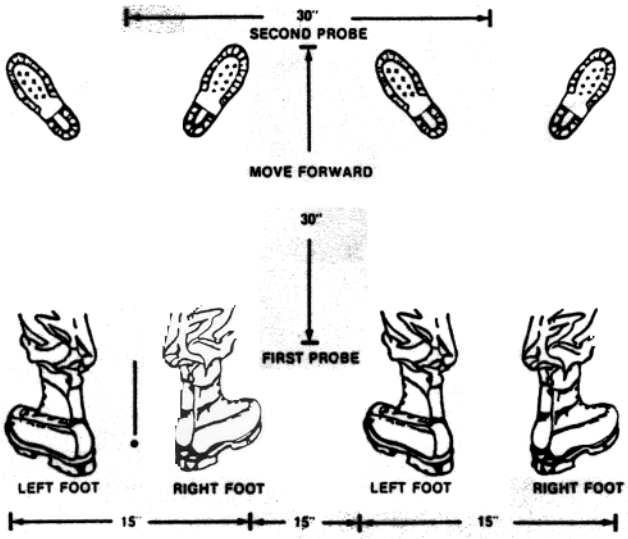


Figure B-2. Course Probe.

d. Fine Probe. At this stage, there is little hope for survival. The attempt is now made simply to recover the body. Discipline must be rigid. The chances of finding the bodies are nearly 100% (dead or alive). It usually takes 4 times as long to conduct the a probe than a course probe. Conduct the fine probe as follows:

- Use the same line procedures as in the course probe.
- Each Marine probes in front of his right foot, then between the feet, then in front of his left foot.
- The search line advances at a 15" step and repeats the procedure.

e. First Aid. Once the victim is found, if there is to be any chance of survival, digging must be conducted quickly and carefully. First Aid must be started immediately using the following procedures:

- Clear the victim's mouth and nose of any ingested snow and attempt to restart breathing, if necessary.
- Treat the victim for hypothermia, fractures, or bleeding.
- Medevac immediately, if possible.