

# **WINNING IN THE COLD**

**Leaders' guide to winter  
combat readiness**



MINIATURE IN THE WORLD

Leadership in the World

Annual Conference

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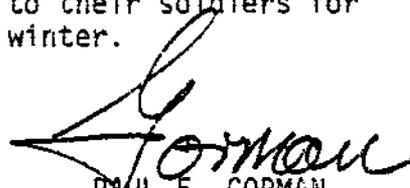


31 March 1979

War, if it comes to us, is unlikely to break out on a sunny day, amid flowers and singing birds. The attackers will more likely choose weather bad for U.S. air support, and that means they could strike in the dead of Germany's long, dark winter. And so we must be ready for combat in snow, ice, fog, and wet cold.

Cold is an enemy in many ways more formidable than the Warsaw Pact. Cold can kill or maim in peace as readily as war. Cold seeps into every nook and cranny of a Task Force, cutting the efficiency of every man and woman afield. Cold also induces injury among those seeking to get warm, by carbon monoxide poisoning, scalding, and burns.

Here is a booklet about Winning in the Cold. It is designed to remind leaders what they must know and teach to their soldiers for combat readiness in winter.

  
PAUL F. GORMAN  
Major General, USA  
Commanding

Effective 31 March 1979, the policies specified in Winning in the Cold are directive within the 8th Infantry Division. Overall proponent is the Chief of Staff. Comments and recommendations may be submitted directly to the Office of the Chief of Staff.

The words "he", "his", and "himself" are intended to include both the masculine and feminine genders and any exceptions to this are so noted.

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## CHAPTER 1

### WINNING IN THE COLD

Winter in Central Germany means long nights, bone-chilling cold, fog, freezing rain and snow, ice, mud -- bad going and poor visibility. It means sudden unpredicted changes in the weather. It means that any operations from November through April could face intense, protracted cold. And it means omni-present danger, for cold itself can kill, without any assistance from a human enemy. In many respects, winter weather is the more dangerous adversary, for each leader must first conquer the environment before his soldiers can fight in any other battle.

The severest tests of the U.S. Army have come in winters past -- Valley Forge, the Hurtgen Forest, the Battles of the Bulge, the Yalu, the Ch'ongch'on, and Chip'yong-ni. An Army combat historian, who knew the American soldier better than most, wrote that:

"Troops get high when the sun is bright and so do the leaders; their spirits sag under leaden skies, especially when there is mud underfoot. Decision comes easier when nature is kind; hesitation is the natural fruit of ugly weather." -- S.L.A. Marshall

Leaders in Seventh Army today cannot afford hesitation if the Warsaw Pact attacks, since we face unfavorable human and material odds. We cannot allow Germany's winter, no matter how ugly it gets, to weigh on the scales against us. Rather, we must learn how to fight in winter, so as to make an ally of the cold, for the misery of driven snow or the peril of iced roads is bound to afflict the foe, slow his attack, and plague his logistics. Our job requires that we master techniques for performing our mission despite environmental difficulty. But winter warfare techniques do not come easily or naturally for most American soldiers.

No training task is more urgent or more difficult than preparing to win in winter.

## The Environment: Winter in Germany

Each leader must first conquer the environment — know what you are up against.

The Fulda region lies at the latitude of lower Canada in North America. The Fulda River runs at about the 51st parallel, well north of the Ohio River (38°), the Yalu River (40°), and the Columbia River (47°). This northerly setting provides lengthy summer days — in June, more than 18 hours of daylight are available for operations. But in winter, Fulda nights are long — in December, daylight for operations shrinks to 9 hours:

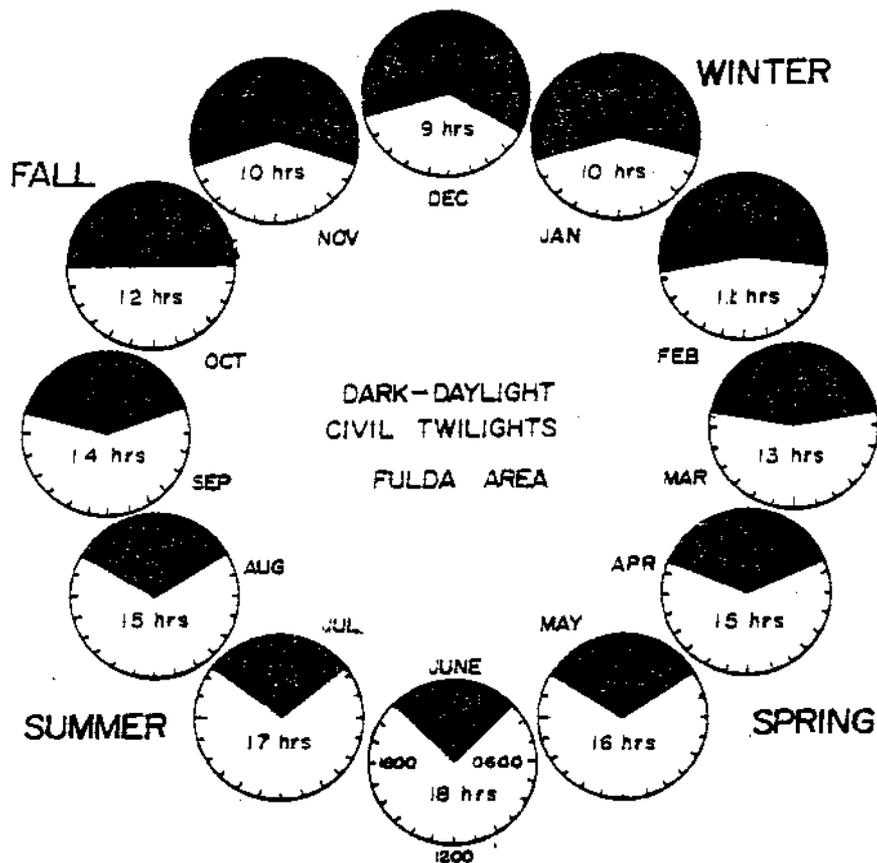


Figure 1. Annual Hours of Daylight, Fulda

Night sights and night observation devices are much more important in winter.

Visibility in the Fulda region, both day and night, is often limited by fog and haze. October brings the first cold, and dense fog sets in. November through February are the worst months for fog. Figure 2 plots average greatest distance for 90% assurance of seeing a tank, showing that fog is more persistent at higher elevations:

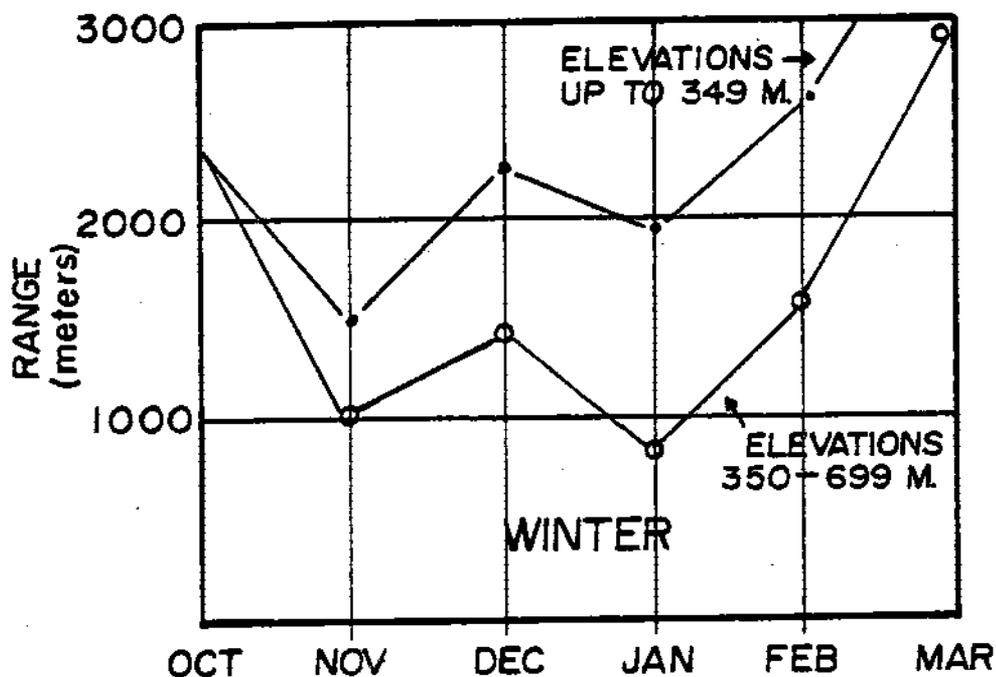


Figure 2. Average Visibility at Fulda as a Function of Elevation

Fog, haze, sleet, or snow cut visibility. Winter clouds are low-slung hill-clingers. The higher you are, the less you are likely to see.

In the area around the city of Fulda itself, which is typical, visibility is lower overall from November through February, and lowest in January.

The problem becomes even more complex when average winter visibilities are superimposed over the hours of daylight as shown in Figure 3 below.

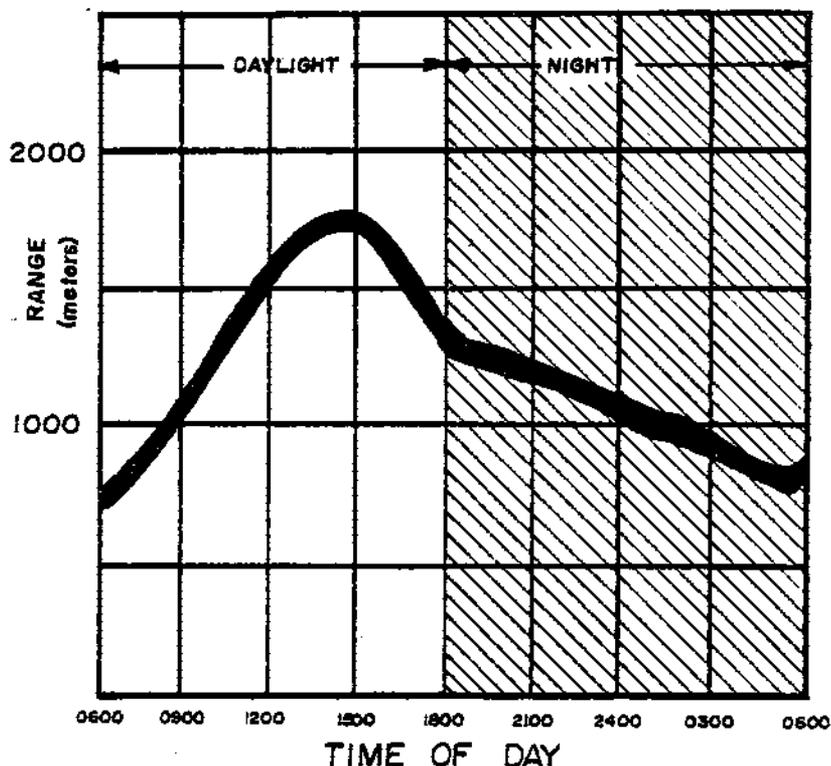


Figure 3. Average 90 Per Cent Observation Visibility Range Curve Versus Time of Day, Nov-Feb, Fulda.

The message is clear — an early morning attack in winter uses the weather to best advantage by minimizing the effectiveness of tank, TOW, and DRAGON systems not equipped with thermal sights. Moreover, the use of indirect, attack helicopter and close air support systems are difficult and require detailed prior planning.

In winter, ground surveillance radar, patrols, and observation posts must be used to offset reduced visibility.

And of course winter brings cold. Minimum daily temperatures usually occur in the early morning hours, maximum temperatures in the afternoon. January and February are the coldest months, as indicated by Figure 4.

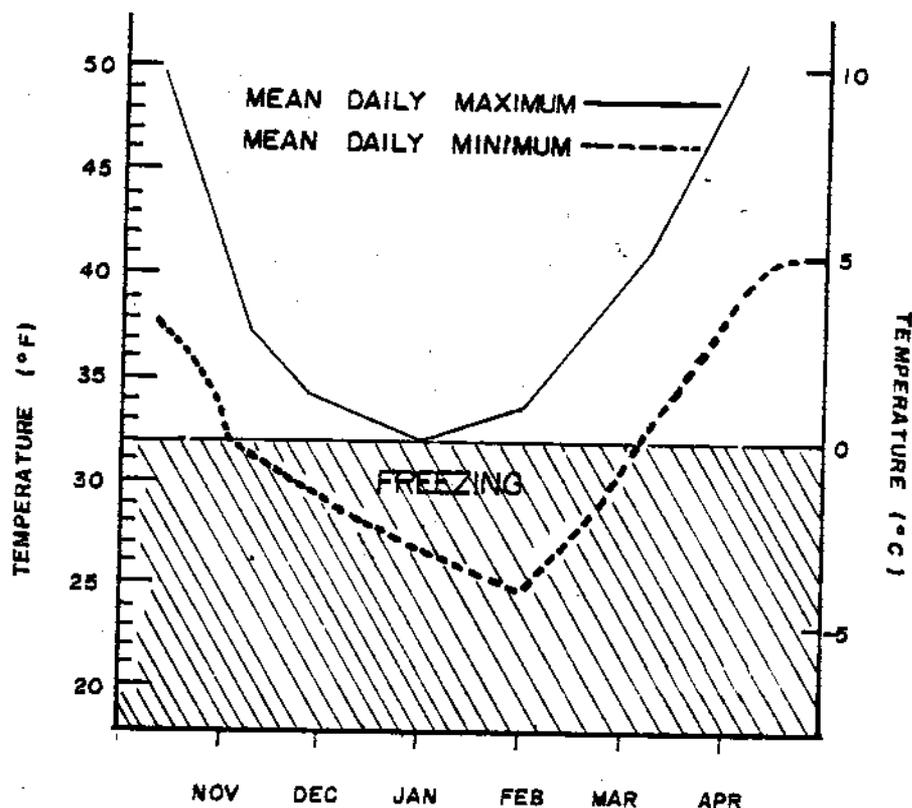


Figure 4. Average Daily Mean Maximum and Minimum Temperatures, Fulda

But freezing temperatures are not the main hazard from cold. Wind chill multiplies dramatically the danger of low temperatures.

Wind chills soldiers -- whether the wind is blowing, or the soldier is exposed in a moving vehicle or under helicopter rotor wash.

Generally, strong winds blow in the Fulda region more often during winter, and are more likely at higher elevations than low. October is blustery, but relatively warm. Winter brings both frequent high winds and freezing temperatures. Figure 5 reflects number of days per month with gale winds against mean minimum temperature, and shows the resultant wind chill when freezing temperatures combine with strong winds. As may be seen from November through March, wind chill often causes ARCTIC-COLD, SUB-ZERO TEMPERATURES — a fact too often overlooked by soldiers and leaders in Germany today.

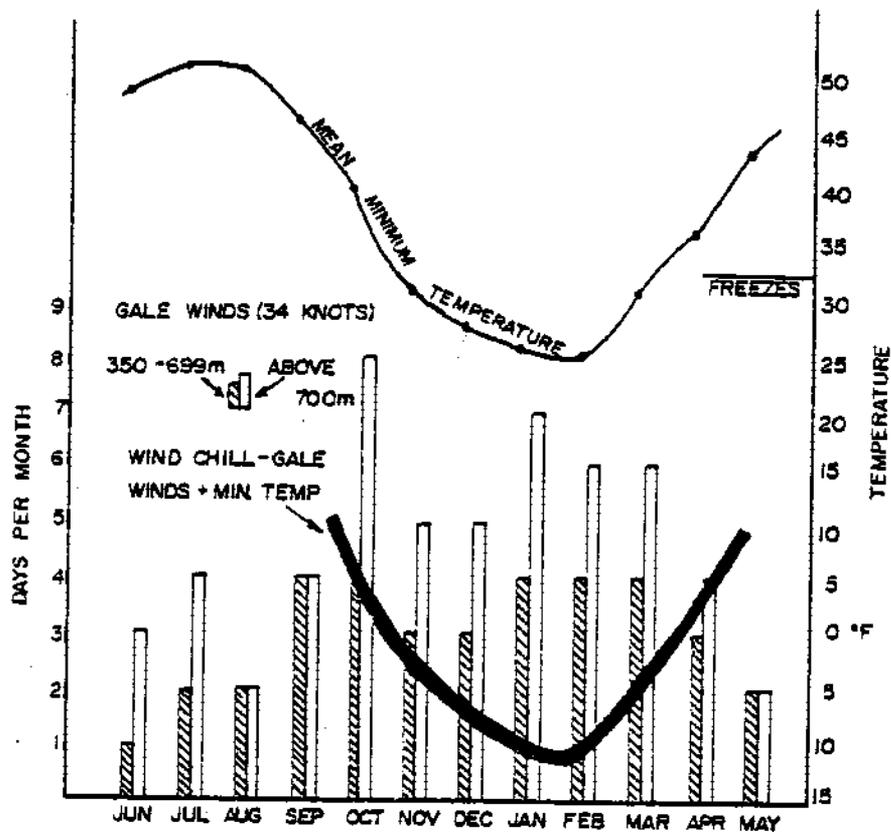


Figure 5. Wind Chill Effects as a Function of Gale Winds, Mean Minimum Temperatures, Fulda

Cold affects cross-country trafficability.

Figure 6 portrays the impact of winter on cross-country trafficability, showing that good going for armored vehicles (dry, or bare, frozen soil) is best in July, worst in January. From November through March, on more than two out of every three days, the ground will be either wet or covered with snow or ice, and cross-country going will be impeded. In the diagram, average days of "good-going" are shown above the line; poor going beneath:

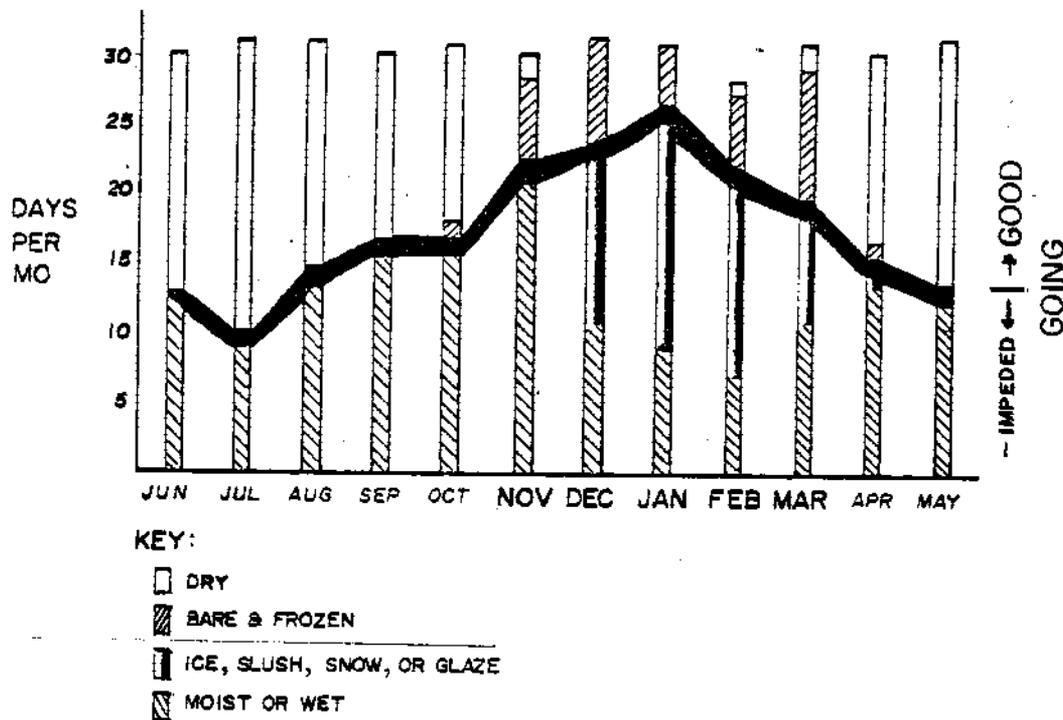


Figure 6. Cross-country Trafficability, 350-699 Meters Elevation, Fulda Region

Winter makes movement of armored or mechanized units sluggish -- mud and ice, both on and off roads. Winter slows movement times, increases vehicular accidents, and puts a premium on driver training and judgment. Moreover, with the temperature hovering around freezing, a field frozen hard during the night could turn to quagmire in the daytime.

A mud obstacle at noon could become an avenue of approach by midnight.

Snow accumulation is greatest in January and February, as shown in Figure 7. Higher elevations collect even more snow.

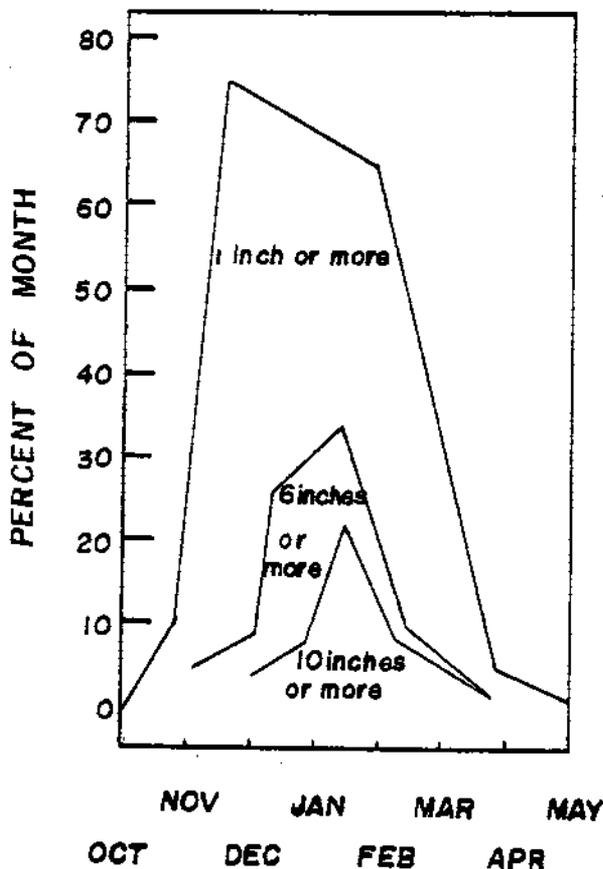


Figure 7. Snow Depth in Inches, Per Cent Coverage by Month, 350-699 Meters Elevation, Fulda Region

Chances are better than 50% that there will be snow on the ground from December through February. Snow can hide cross-country driving hazards -- tanks have driven over snow-covered ponds to crash through the ice, or plunged into snow-obscured ditches. Camouflage in snow is not just a matter of different coloration; tracks in snow can pinpoint even a well-camouflaged position. Snow makes movement on foot tiring, and sentinels standing in snow risk foot injury from frostbite.

Snow complicates all infantry work, hampers terrain reinforcement, muffles artillery and mortars, makes cross-country driving hazardous, and creates different camouflage needs throughout the force.

Leaders planning for operations in winter must estimate carefully the tactical implications of long periods of darkness, extended periods of reduced visibility both day and night, hampered mobility, and protracted cold, since all of these environmental characteristics will dictate changes in plans suitable for other seasons. Battle books and field training exercises must be prepared with these differences clearly in mind. No leader should plan without consulting the handbook prepared by the Staff Weather Officer in V Corps, dated April 1977, entitled CLIMATOLOGY HANDBOOK FOR V CORPS FORWARD AREAS; excerpts and related data are included as Appendix 1.

The winter environment changes dramatically from place to place depending on the terrain, elevation, month, and time of day. Each leader must assess each locale in which he expects to operate, and tailor his plans for that place.

#### The Threat: Soviet Doctrine for Winter

Soviet leaders anticipate fighting and winning in cold weather campaigns, and they train their troops accordingly.

For the Soviet Army, the last war was World War II -- what they call "the Great Patriotic War." Soviet generals experienced combat only in that war, and Soviet manuals today indicate that the lessons of 1941-1945 still govern their thinking about contemporary operations. To the degree that the Red Army's past is any guide for the future, we must expect Soviet forces to exploit winter weather for offensive operations. One noted German officer who fought against the Red Army in World War II wrote that:

"The Russians preferred to carry out their major offensives in winter because their troops were accustomed to that season and very well equipped and trained for it. The Russians were superior to all peoples of Central and Western Europe in enduring rigors of weather and climate. Casualties from the cold were an exception in the Red Army. Soldiers with frostbite were severely punished. Even in the harsh winter of 1941-42, from 6 December 1941 to 14 April 1942, the Soviets carried out their first major offensive in the area west of Moscow...Between 19 November 1942 and the middle of March 1943, they succeeded in creating a fluid situation along a 1000 mile stretch of the Eastern Front, and in penetrating up to 300 miles toward the west...The Russian general offensive, begun along the entire Eastern Front in mid-January of 1945, culminated in the occupation of Hungary, Poland, Silesia, East Prussia, and Pomerania. After short local halts, the Russians stood before Vienna and Berlin, and in cooperation with the armed forces of Western Powers, brought about the end of the war."<sup>1</sup>

<sup>1</sup> DA Pamphlet 20-230, November 1950, Russian Combat Methods in World War II, p. 39. The principal author, a German general, commanded in succession a panzer division, a corps, a panzer army, and an army group fighting the Soviets in Russia.

The Russians exploited wind, fog, and snow in their tactics as well as their strategy, as this German anecdote illustrates:

"During fog and blizzards, the Russians always developed lively reconnaissance activity and raided advanced security posts... In winter they exploited the cold eastern storms of the steppes for such assaults, especially in the southern sector. On these occasions the Russians often succeeded in entering the German trenches without firing a shot, and in taking many prisoners. Indeed, the Russians knew very well that the easterly gales drove such clouds of powdered snow ahead of them that the German soldiers were unable to observe and take aim against the wind. They were, therefore, practically defenseless. Only by a ruse were the German divisions fighting there able to regain mastery of the situation. Those from sectors particularly threatened during the eastern gales were simply evacuated and the forces quartered in the villages situated along the sides of the gaps. When the Russians rushed forward into, or over the empty trenches, the German forces wheeled against the rear of the Russians and attacked them from the east; the Russians were then just as defenseless as the Germans had previously been, and were often captured en masse..."<sup>2</sup>

The Soviet Army today places special emphasis on training for cold weather. The Soviet contend that large-scale operations are possible in Central Europe at any time of the year, even in extreme climatic conditions. In 1978, required to invite American military observers to watch Army training, Soviet leaders made a point of taking them to a winter field exercise, in which well-drilled troops and white-draped mechanized equipment moved with impressive precision over a snow-scape in intense cold.

Soviet winter training is done in the field just as in summer,<sup>3</sup> even when the temperatures reach minus 22<sup>o</sup> to minus 40<sup>o</sup>F<sup>3</sup>.

<sup>2</sup>Ibid, p. 86

<sup>3</sup>"Soviet Army Winter Operations," *Truppen Praxis, Military Review*, June 73, COL Sobik, p. 58.

In general, Soviet doctrine calls for tactical methods in cold weather not much different from those for other seasons. Soviet manuals recognize that cold weather warrants an increase in logistical support, hinders the construction of defenses, makes rivers and marsh areas passable because of freezing, and restricts air support. They anticipate difficulties in ascertaining the location of enemy, his strengths and flanks, direction of movement, and disposition and the location of his nuclear weapons, and so provide for increased reconnaissance.

Cold weather attacks are generally planned to be the same as in fair weather. During winter, assembly areas are located closer to the FEBA to lessen approach distances, and to limit soldier fatigue and danger of frostbite. Warming shelters are provided in these assembly areas. Approach marches take place both day and night; the attacking force is arrayed in columns, usually of divisional size, with each column divided into a first and second echelon to shorten commitment times. During movement, deep snow fields, gullies, and steep-banked streams are by-passed where possible, and march rates are generally slower. Regular motorized rifle and tank units will be used. Usually, no special winter equipment will be issued, as standard Soviet equipment and clothing is designed for all-weather use. In cold weather, commanders are told to hold back a larger reserve, even in the case of battalions and companies who normally do not have one. Attacks are launched at any hour, but commanders are taught to look for chances to hit during severe climatic conditions to attain surprise.

In especially tough going, a "route-reconnaissance and repair" detachment can be sent ahead of an attack force to assess route suitability. This task-organized detachment consists of engineer, sappers, reconnaissance, chemical, and motorized rifle elements, which are drawn from organic assets. Special equipment is issued, consisting of snow removal equipment; white camouflage outfits (jacket with hood, trousers, and gloves); white paint and white cloth for covering combat equipment; skis for soldiers and towed artillery; and, in deep snow, special over-the-snow equipment. Extensive provisions for helicopter support are made.

On defense, the forward edge of the battle area is established, if possible, behind a natural obstacle. In deep snow, use is made of ice-buttressed snowbanks in front of defenses, and for building above-ground trenches. In defense, the concept is a network of positions and obstacles to tire the attacker, slow his movement, and deny him shelter to extend his exposure to the cold; natural and man-made obstacles, including minefields, are covered by fire and linked to a system of strongpoints. In the latter, no more than a third of fighting personnel occupy firing positions at one time, so the others will be at peak combat readiness in the event of attack. Once an attacker is slowed or stopped, limited counterattacks are conducted. If a nuclear strike occurs, Soviet soldiers are taught to skim-off 20 to 30 centimeters of snow for immediate decontamination.

Overall, Soviet doctrine and training emphasizes operations in cold weather because experience conditions them to believe they can win in winter.

## CHAPTER 2

### PATHFINDER WINTER OPERATIONS

Chapter 3 of FM 100-5 sets forth principles for fighting to win in Germany. When rereading that Chapter with cold weather battle in mind, each Pathfinder leader must consider Germany's winter environment as part of his terrain:

The tactical leader visualizes what terrain can do for the enemy. He then positions or maneuvers his forces on the ground to outwit and outfight the enemy. Terrain, therefore, provides a tactical equalizer or multiplier. . . ."

As in other seasons, the winner in winter will be the side which trains troops to produce full effectiveness from their weapons; which concentrates its combat power at the critical place and time; which controls and directs its forces decisively; and which better uses cover, concealment, suppressions, and combined arms teamwork. But fighting in winter calls for special training.

#### Cover

In general, winter changes few of the imperatives for seeking and using cover on the modern battlefield. Frozen soil is more impervious to fire, and well-prepared defensive positions which exploit both frozen ground and a mantle of snow are particularly difficult to defeat. Both frozen ground and snow, however, complicate the construction of such positions. Snow itself, depending how densely packed it is, can stop bullets and smother artillery or mortar bursts. In deep snow, foxholes can be dug in the snow and provided an overhead cover of logs and packed snow. Water thrown over packed snow to form ice, or mixtures of water, snow and sand ("iccrete") can be used to harden fighting positions. Figure 8 shows minimum thickness of snow/ice cover for protection against small arms or shell fragments:

<u>MATERIAL</u>	<u>MINIMUM THICKNESS</u>	
	<u>FEET</u>	<u>METERS</u>
Newly fallen snow	13	4
Firmly frozen snow	8	2.5
Packed snow	6.5	2
Frozen snow and water	4	1.2
Ice	3	1
Icecrete	1	0.3

Figure 8. Snow/Ice Minimum Thickness Required for Protection Against Small Arms and Shell Fragments

## Concealment

Often concealed positions or routes reconnoitered when the leaves are on the trees are found to be exposed in winter. Cold increases possibility that vehicle "rooster tails" of exhaust smoke, or vapor clouds or heat waves from running engines, can pinpoint the location of a unit under cover. Cold also makes any type of thermal sensor more effective. "Near infra-red" detectors function more efficiently when heat-sources stand out against cool backgrounds -- an uncovered generator in a forest, for example. But the main threat to concealment is "far infra-red" detectors, especially weapon sights which use thermal imagery. By day or by night, any person or man-used object can readily be detected against winter terrain by such sights, which portray temperature differentials. Against a cold winter landscape, a heated tank or any other vehicle will stand out like a sore thumb. In experiments at Baumholder in 1978 and again in 1979, tanks were positioned side by side, one with a personnel heater, the other without. Shut down simultaneously, the heated tank glowed very plainly in a thermal sight 4 hours later, while the unheated tank cooled to invisibility within 30 minutes. Thermal radiation -- the heat "signature" -- can be detected by thermal sights through darkness, smoke, haze, fog, light snow and rain, and normal screen camouflage, at ranges up to 3000 meters.

Leaders must be aware that thermal signatures provide significant tactical advantages for the DEFENDER.

In cold weather, the attacker is more exposed than ever since his powerpack and suspension system will be easily detectable -- and killable -- by our weapons systems equipped with thermal sights.

The defender, on the other hand, may remain virtually undetectable since his system can be cooled to near ambient temperature and placed in ambush under a shed, or behind some other thermally opaque screen, such as a tarpaulin, a snowbank, sheet or blanket. Villages, throughout the GDP area offer excellent thermal concealment opportunities.

Thermal sights require a complete reappraisal of measures for concealment. Leaders must routinely operate at night as in daylight, discount visual obscuration, and use thermal screens.

In the long nights of winter, leaders must exploit their night vision equipment to the maximum. E.g., a sentinel equipped with an M16 mounting a zeroed Low Light Level Sighting System is three times more likely to hit when he shoots. Any of the several light-intensification sights available for individual or crew served weapons -- especially tank "passive" sights -- are similar combat multipliers, stripping the concealment of night away from the enemy, and rendering our weapons more deadly.

Light intensification sights make necessary at night the same measures for camouflage or concealment as for day.

Snow presents another challenge to concealment in winter: while snow on the ground does not completely invalidate brown/green/black camouflage screens or vehicular paint, snow makes them less universally useful. Any non-white camouflage net which is snow-covered hides superbly, but if the net has to be removed, for instance to fire a cannon, the snow-free net may give away the position. Generally, fighting positions which are in woodlines or in villages, where weapons can be concealed amid a clutter of naturally dark objects, are easier to camouflage than positions in the open. Tanks or other vehicles which must occupy snowy positions deprived of such concealment should be camouflaged with one or more of the following techniques:

- Splotch whitewash over darker camouflage paint tones
- Drape with bedsheets or white-painted tarps
- Apply wet white paper swatches, and allow to freeze
- Obtain and use a standard white camouflage net

Tracks in snow can destroy concealment. Overhead reconnaissance can readily detect even well-camouflaged positions unless leaders take pains to confine the movement of vehicles and personnel to the fewest tracks, preferably those shared with civilian traffic, and employ simple deceptive measures, such as looping tracks past positions and back onto roads.

Concealment in winter works by different rules. Soldiers pay a heavy price for leaders not knowing and following these.

### Suppression

No movement on the battlefield should take place without suppressive fire, fire aimed at destroying the enemy if feasible, but in any case at driving him to cover, and disrupting his own fire and movement. Generally, U.S. weapons function as well in cold weather as they do in warm. Extreme cold may alter established zero, and lead to inaccuracy with first rounds. Some increased obscuration from kicked-up snow or ice fog in front of guns may occur, mortar ranges may be reduced for some charges, and rockets and missiles may have increased hazard in their back-blast area from after burning propellant. Cold weather usually calls for use of different lubricating procedures, and keeping fire control instruments free of frost. Leaders must be aware that tracked vehicles must be moved periodically to preclude tracks from freezing fast as mud congeals. In addition, some care must be taken with mortar baseplates and machine gun tripods to also insure that they are properly seated, and that they can be freed of frozen soil when displacement is required. But, by and large, leaders and troops can use their weapons as they have been trained all year.

Artillery and mortar shells work better against exposed personnel on frozen ground, since frozen clods and chunks of ice become missiles additive to the fragments. But loose snow reduces the effective radius of burst. Delayed action fuzes will cause the round to penetrate the snow to attack the cover underneath, but fragmentation will be smothered. To attack personnel on snow in the open, fuze superquick, or VT are best.

Heavy machine guns -- the .50 caliber -- are especially effective winter weapons, in that they will punch through snow and ice more effectively, depriving the enemy of more cover, than the M60. All machine guns require care in siting, in that neither unprepared frozen ground or snow is likely to provide a stable gun platform.

Pinning the enemy down in snow or on frozen ground exposes him not only to indirect fire, but also to cold injury.

### Combined Arms Teamwork

Communication is the lifeblood of teamwork, and winter poses special hazards of iced antennas, or signals weakened by snow-covered evergreens. Even messengers are slower, and less reliable.

Terrain reinforcement is more difficult in winter. Frozen soil sometimes makes bulldozer work easier, in that the blade cuts more efficiently, but all shovel work is harder and slower. Most fighting positions will require machine assistance, at least to cut through the frost layer. Mine laying, either mechanically or manually, may be limited to placement on top of the frozen ground -- the mines must, in any event, rest atop a firm base, and then covered with snow if possible. A shallow snowfall on top of already prepared obstacles and fighting positions effectively conceals them, but an exceptionally heavy snow could negate the value of a minefield or even a tank ditch. On the other hand, such heavy snow would slow the enemy under the fires of the obstacle-covering weapons, and therefore the outcome may be little different.

Winter operations require that tactical leaders take every opportunity to exploit local opportunities. Because winter slows ground movement, commanders can put less emphasis on reinforcement from great distances, or on withholding forces for counterattack. Rather, commanders should push forces forward so that subordinates have enough combat power to deal with local situations, and otherwise simplify plans for concentrating force. While attack helicopters can fly in winter weather, and are especially effective against tanks slowed by ice or snow, winter's reduced visibility is bound to cut their contribution to the division's battle. All leaders, at every echelon, must understand that even simple tasks are harder in winter, and that units will respond slower. Troop leading procedures must allow for the extra time winter exacts for reconnaissance, assembly, maintenance, refueling, warming of troops and equipment, and other essential undertakings. Routine jobs like feeding which can be ignored or postponed in warm weather, become inflexibly vital in winter.

Everything is harder and slower in the cold, from wrench-turning to chow. Leaders must plan accordingly.

Winter makes concerned leadership more important than ever. Personal contact and communications by leaders is essential for keeping soldiers alert, informed on what is happening, and involved in what their unit is doing. Keeping soldiers informed in winter may be tantamount to saving their lives. It is crucial for teamwork.

The main obstacle to teamwork in winter is cold, and its effect on personnel. Soldiers naturally dislike cold, and many, when bundled up in winter gear, tend to withdraw; their parka hood, or their vehicle becomes a cocoon. Their hearing deadened, their vision limited, they become oblivious to their comrades, sluggish, and drowsy. Whole groups can hibernate in sleeping bags or tents, become withdrawn and somnolent. Such lethargy not only destroys teamwork and makes them easy prey for the enemy, it equally importantly makes soldiers candidates for cold injuries.

Leaders must keep soldiers ACTIVE except when they are told to sleep.

There is no denying that winter operations are more difficult. But whatever difficulties we face, our potential enemies must contend with most of the same problems. True, there are more of them than of us, and they may be willing to throw away human lives, but as in every other aspect of countering their numerical superiority, the answer for us is BETTER TRAINING.

## CHAPTER 3

### SOLDIER READINESS

American military history is not reassuring about the durability of the American soldier in winter warfare. Of the Continentals who began the winter of 1777-1778 at Valley Forge, only two-thirds remained in the ranks when spring came, and of these, half were unfit for duty. In the Civil War and World War I, winter quartering practices kept losses to cold injury down, but in World War II, the U.S. Army fought hard winter campaigns, and lost heavily to cold. Trenchfoot and frostbite seriously weakened the fighting strength of U.S. divisions; in the winter of 1944-1945 alone, U.S. forces fighting in Europe evacuated 71,000 cold weather casualties -- more soldiers than now man the entire V Corps. During the War in Korea, cold injury struck as decisively as the Chinese Army: one U.S. division, during the months of November and December 1950, fielded an average strength of 22,496, but lost fully one-third that number, 7,338, as non-battle casualties, chiefly from frostbite and trenchfoot.

In the Seventh Army today, every soldier assigned is essential for our success in the first battles of the next war. The Division cannot afford to allow cold injuries or winter accidents to sap its strength.

We need every Pathfinder for our wartime mission, especially in winter. Leaders must not squander human resources through ignorance, carelessness, or lack of training for cold weather operations.

Yet in recent winter exercises, some units experienced losses which, in wartime, could spell the difference between winning and losing. During a divisional exercise in the winter of 1978, nearly two percent of the force was lost in 10 days: hundreds of soldiers were medically evacuated with suspected frostbite, or with winter-related injuries -- falls on ice, burns from careless fires, vehicular collisions, or other accidents. One senior NCO was killed by a passing civilian car while checking a convoy at a halt. A jeep-load of soldiers were killed traveling with doors closed when struck by a train at a marked crossing. A VTR crew drank some wine, locked themselves inside their vehicle with the heater running, fell asleep and died from carbon monoxide poisoning. Post exercise investigation concluded that:

In virtually every case, a concerned leader could and should have prevented the loss, or a knowledgeable soldier could have avoided the danger.

### Cold Injury: The Scope of the Problem

Among the losses leaders can prevent most easily are those from frostbite — a form of cold injury. General Mannerheim, the Finn who defeated the Soviet Army in the Winter War of 1939-40, has stressed that:

"Losses among the troops because of frostbite weigh heavier on the commander's conscience than battle casualties, because in this case there always remains the disturbing feeling that losses due to cold might possibly have been avoided if greater precautions had been taken."

Of all units in Seventh Army, the infantry regiments of the 8th Division have historic bitter reasons for concern for cold injury. The 87th Infantry, in its fighting for Kiska, Alaska, in 1943 suffered heavily from cold casualties. The 13th and 28th Infantry lost heavily to cold injury in late 1944 and 1945 as shown in Figure 9.

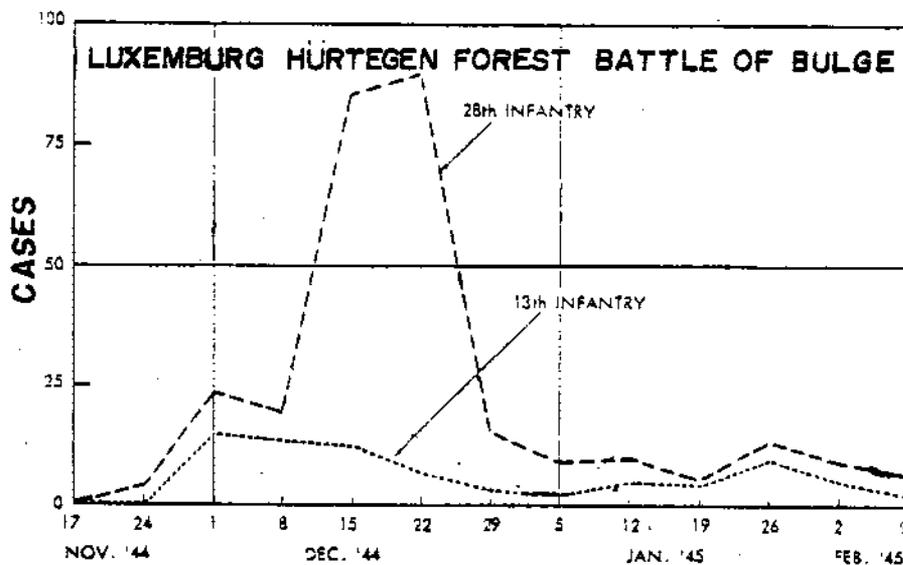


Figure 9. Cold Injury Experience by 8ID Infantry Units During Winter 1944-1945.

<sup>4</sup> DA Pamphlet 20-292, Warfare in the Far North, Oct 1951, p. 4.

The heaviest losses portrayed above were suffered by the 28th Infantry Black Lions while cut off in the Hurtgen Forest. Infantrymen of isolated forward companies, subjected for two weeks of continuous enemy fire while in wet, muddy foxholes, without hot food or drink were severely hit by cold injuries.

But the 8th Division's adverse experience extends right up to recent FTX's. Figure 10 shows the experience of three infantry battalions on a 1978 winter FTX which encountered snow, cold, and wind chill down to  $-51^{\circ}\text{F}$ . Battalions A and B were initially on the defense; Battalion C was initially attacking. The changeover of missions occurred on day 4 and 5.

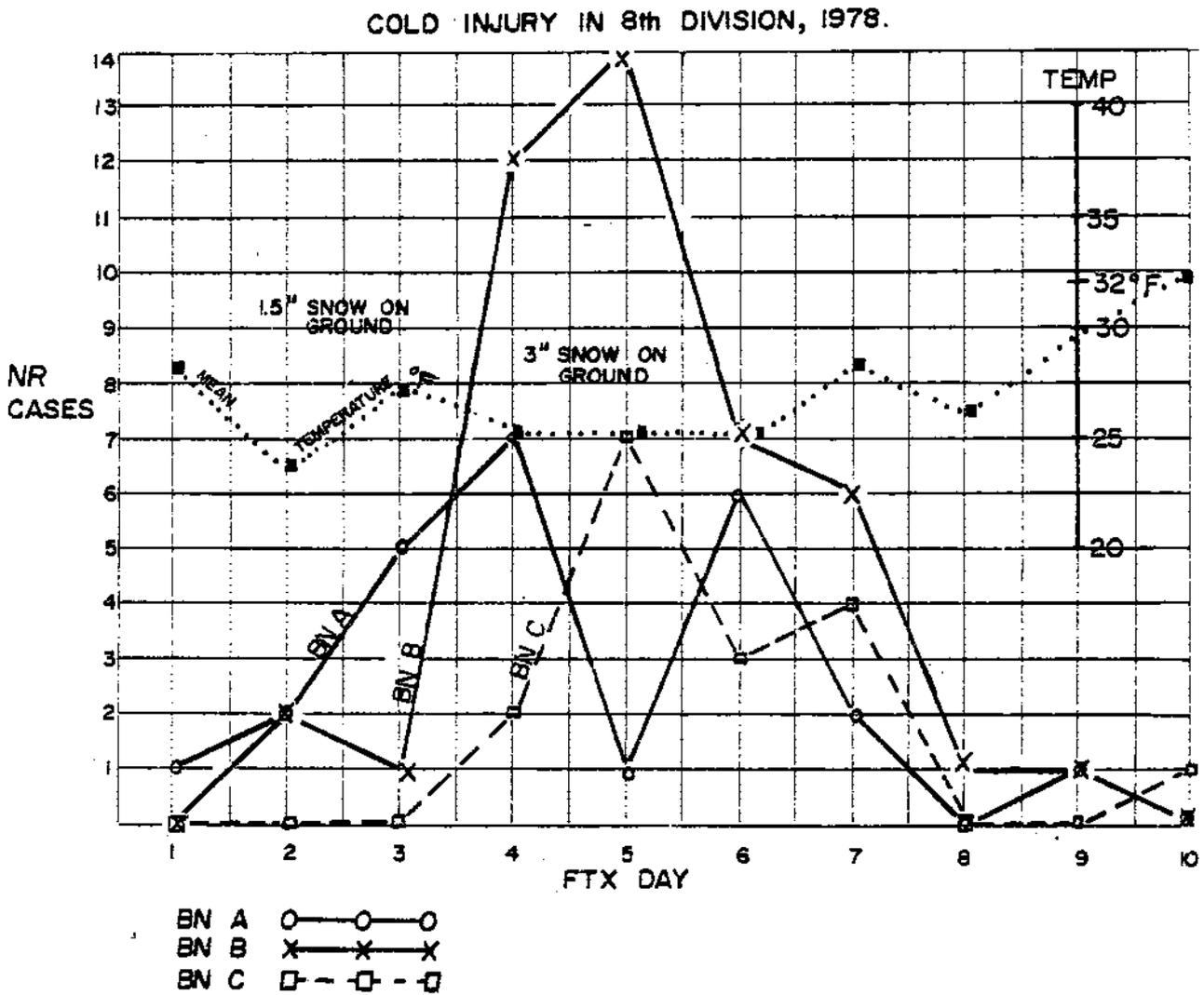


Figure 10. 1978 Cold Injury Experience of Three Battalions During a 10 Day Winter FTX in Germany.

The message is clear — troops who were on the move and in the attack had few cold weather injuries; however, troops in the defense, improperly led and supervised, became needless cold casualties.

No mechanized infantry division such as the 8th is today need accept such risk of wide-spread cold injury. It has armored fighting vehicles to bring forward and move supplies about the battlefield even under fire, direct to the fighters-on-foot, who need them the most -- including ample clothing, shelter, warming equipment, food and hot drink. That mobility also assures adequate rotation of individuals and units from exposed positions back to warming areas. No Pathfinder soldier need stand in a flooded foxhole -- an APC bilge pump can be rigged to pump the hole dry quickly and efficiently.

Our men and women are the division's most vital resource. Even if winter supplies -- personal bags, tents, stoves, camouflage -- require diversion of transport from ammunition basic load, frontline soldiers must get what they need to survive in order to fight.

Yet indications are that the very advantages of being mechanized cause carelessness in some leaders. On the 1978 field exercise, some infantry leaders never thought to take advantage of insulated boots, allowed some troops to go without warming or hot drink for periods of up to three days, and paid the inevitable price in cold injuries -- a completely unacceptable lapse in professionalism. Moreover, only 2 of 10 soldiers evacuated could remember having been instructed how to prevent cold injury -- a completely unacceptable lapse in training.

Cold injuries tend to occur more often among troops defending or delaying than attacking, because the attacker can use his initiative to keep his troops warmer and better rested, while the defender must spread his men over wide frontages where warming is hard, and keep them out in the cold, on the alert. But in recent exercises some units, no matter what their tactical posture, accomplished their mission with 0 cold injuries. The difference is plainly better leadership.

Too many leaders regard cold weather operations in Germany to be nothing more than business as usual -- they think cold can simply be gutted-out until ENDEX -- nothing could be further from the truth.

Each leader must understand who in his unit is vulnerable to cold injury, and devote special attention to those soldiers more likely than others to become a casualty. In the 1978 winter exercise referred to earlier, losses to cold injury were concentrated among young, junior soldiers, most of them in the field during winter weather for the very first time.

<sup>5</sup>AR 40-418, para 2-22, requires that the Surgeon General be notified telegraphically if a soldier is admitted to a hospital as a result of cold injury. Figures are based on those so reported.

Figure 11 shows the profile of the cold injuries from that exercise:

Male	100%
Age 18, 19 or 20	94%
Black	70%
From South	55%
Service less than 2 years	75%
Injured feet	100%

Figure 11. Profile of Cold Injuries Experienced by the 8th Infantry Division During a 10 day Winter FTX in 1978.

We do not have sufficient information concerning the performance of female soldiers in cold weather; however, we must assume that the lessons provided could and should pertain vis-a-vis women.

Based on hard learned and relearned experience, leaders must focus attention on:

<u>Southerners</u>	Most of the cold-injured came from the Carolinas southward and westward to Texas.
<u>Newbies</u>	For most, the FTX came during their first winter in Germany.
<u>Kids</u>	Lack of experience, lack of motivation to keep active -- both could have figured.
<u>Feet</u>	Almost all had duties requiring prolonged contact with snow-covered ground. While <u>all</u> had been issued insulated boots, and most had these boots in the field, three out of four were wearing leather boots when injured.
<u>Infantry</u>	Three out of four were in infantry units. Most of the rest were on guard, or manning an OP on a perimeter.
<u>Blacks</u>	It is statistical fact that blacks are especially prone to cold injury. <sup>6</sup> Young blacks require extra vigilance.

<sup>6</sup>DA, TB MED 81, Cold Injury, Sep 76, p. 3.

The NATO Handbook on Emergency War Surgery,<sup>7</sup> which is based on U.S. Army experience in Korea 1950-1953, defines "cold injury" as including the following types:

Chilblain, which usually affects the hands as well as the feet, may result from exposure to air temperatures from above freezing to as high as 60°F (16°C), and is often associated with high humidity, and repetitive exposures over periods of days or weeks.

Immersion foot implies an injury caused by exposure, usually in excess of 12 hours, to water at temperatures usually below 50°F (10°C).

Trenchfoot, which may also occur in the hands, results from prolonged exposure (48 to 72 hours) to cold at temperatures ranging from just above freezing to 50°F (10°C), often in damp environment, and usually in connection with immobilization of the extremities.

Frostbite implies the crystallization of tissue fluids in the skin or subcutaneous tissues after exposure to temperatures of 32°F (0°C) or lower. Depending on the ambient temperature or the wind chill, the exposure necessary to produce frostbite varies from a few minutes to several hours.

Carbon Monoxide (CO) Poisoning results from inhaling carbon monoxide which is a colorless, tasteless, and virtually odorless gas produced by the incomplete combustion of coal, oil, or other fuels used in such equipment as motor vehicles, field ranges, and lighting and heating devices. Carbon monoxide poisoning is usually the result of faulty equipment, improper use of equipment, or inadequate ventilation.

Cold injury occurs when an unprepared soldier meets winter. Weather, his clothing, the type of combat operations in which he is involved, and his own physical and mental make-up all influence whether he will be injured, and how much. The NATO Handbook cites these causative factors:

-- Weather. Temperature, humidity, precipitation, and wind modify loss of body heat. Low temperatures and low relative humidity -- dry cold -- favor the development of frostbite. Higher temperatures, together with moisture, favor the development of trenchfoot. Wind chill accelerates the loss of body heat, and aggravates either.

<sup>7</sup>U.S. Department of Defense, NATO Handbook, Emergency War Surgery, 1975, pp. 36-47

— Type of Action. Soldiers in combat support and combat service support units are injured far less frequently than those in combat units. A soldier is more likely to be injured if he is often in contact with the ground, if he is immobile for long periods -- such as riding in a crowded APC --, if he stands in water in a foxhole, if he is kept out in the cold for days without warming, or if he lacks opportunities to carry out his personal hygiene. His vulnerability goes up with fear, fatigue, dehydration, and lack of nutrition. Defense, delay, observation post and sentinel duties create these conditions more often than offensive action.

— Clothing. Most soldiers who suffer cold injury are improperly dressed. Leaders must require troops to dress as lightly as possible consistent with the weather to reduce the danger of excessive perspiration and subsequent chilling, since it is better for the body to be slightly cold and generating heat than excessively warm and sweltering toward dehydration. However, a large proportion of cold weather injuries results from too few clothes being available to individuals when the weather suddenly turns colder. In winter, all soldiers must have their complete cold weather gear available -- including sleeping bag, insulated boots, gloves, field jacket liner, etc. -- and know how to use same. Abuse of equipment, e.g., sleeping with boots on in a sleeping bag, often causes cold injury. Because of the difference in individual metabolism -- each soldier produces heat and loses it at his own rate -- leaders must not be arbitrary in specifying exactly what each man should wear. However, winter underwear, especially bottoms, should be required at all times. Other clothing should be worn loose and in layers, so that it can be vented at the neck. Clothing and footgear that are too tight restrict circulation and invite cold injury. Tight garments lessen the volume of trapped air layers, and thereby reduce the insulation and ventilation available to the body. Headgear is especially important, as heat loss is often greatest from the head. Heat may flow from a soldier's body at a rate equal to or greater than the rate at which it is produced. A man generates 100 watts when still, but up to 10 times as much when working. When heat loss exceeds production, the body uses up the heat stored in tissue, causing a rapid drop in body temperature, especially in the extremities. Excessive heat loss can result in shivering, a sort of emergency action in which the body uses energy to produce heat -- an important warning, ignored at hazard of cold injury, that clothing must be added, or that exercise, food, or warmth are needed.

— Branch and rank. Frostbite and trenchfoot are maladies occurring overwhelmingly among lower-ranking riflemen. In World War II, 90% of all cold injury casualties were riflemen;<sup>8</sup> the experience in Korea, and the division's 1978 experience were parallel. Since only 15% of the division now fights on foot, compared with 30% in World War II, heavy losses among our combat-critical minority of fighters-on-foot pose serious replacement problems.

<sup>8</sup>DA, Cold Injury, Ground Type, 1958, p. 378

-- Previous cold injury. Individuals with prior cold injury have a higher-than-normal risk of subsequent cold injury. Such individuals are unlikely to be injured in the same location on their body, but their overall individual susceptibility is surely higher.

-- Fatigue. Both mental and physical weariness contribute to apathy, which leads to inactivity, personal neglect and carelessness, reduced heat production, and thence to cold injury.

-- Other injuries. Wounds or sickness may lead to a soldier's being immobilized, affecting his blood circulation, which predisposes him to cold injury.

Injuries resulting in significant blood loss or shock reduce the blood flow to extremities and make the individual a prime candidate for cold injury as well.

Casualties and the sick need special measures to be kept warm.

-- Discipline, training and experience. Cold injury is preventable. Well-trained and disciplined men can be protected even in the most adverse circumstances if they and their leaders are knowledgeable concerning the hazards of cold exposure, and informed regarding the importance of personal hygiene, especially care of the feet, exercise, and use of protective clothing.

-- Psychological factors. Fear acts to reduce the body's ability to rewarm itself, and thus to increase the incidence of cold injury. Scared soldiers are vulnerable. Cold injury is also more likely in passive, negative, and hypochondriacal individuals. Such persons show less muscular activity in situations in which activity is unrestricted -- hence produce less body heat -- and are careless about precautionary measures -- especially warming activity - - when cold injury is a threat.

-- Race. In all studies concerning World War II and Korea, black soldiers had from four to six times the incidence of cold injury among caucasian counterparts, matched for geographic origin, training, and education. This is not to say, however, that blacks cannot be protected against injury, or that they cannot soldier in the cold. It means, rather, that both the black soldier and his leader must be especially careful in cold weather.

-- Sex. No known differences - Cold injuries occur in both sexes if proper preventive actions are not taken.

<sup>9</sup>TB, MED 81, p. 3.

-- Drugs and Medication. Any drug which modifies body system responses, alters sensation, or affects judgment or motivation -- and that certainly includes alcohol -- can have disastrous effects on individual performance and survival in the cold. Alcohol poses a special danger for cold injury because it both affects judgment and speeds heat loss from the body.

Drinking in the field in winter is frigid folly.

#### Cold Injury: First Aid

Leaders and soldiers must be made to understand that cold injury is very painful and possibly disabling for life. They must treat it most seriously.

Many soldiers suffer cold injury without knowing what is happening to them. They sense cold, and experience general discomfort, but they do not notice the injured part, because heat loss numbs it. Superficial cold injury usually can be detected by numbness, tingling, or stinging ("pins and needles") sensations, symptoms which often can be relieved simply by loosening boots or other clothing, and exercising to enhance circulation. But in more serious cases involving deep injury, the injured soldier often first becomes aware that his affected member feels "like a stump" or "like a block of wood."

Early exterior manifestations of cold injury include discoloration of the skin at the injury site: in lighter skinned individuals, reddening is followed by pale or waxy white; in darker skinned individuals, greyness is usually evident. An injured foot or hand feels cold to the touch. Evident swelling is an indication of deep injury. Soldiers working in pairs -- buddy teams -- should check each other for signs of such discoloration and other symptoms. Leaders checking or inspecting soldiers should be similarly alert.

Once cold injury is suspected, the problem in administering first aid within the unit is to estimate whether the injury is superficial or deep. Cases of superficial frostbite may be adequately treated by immediate warming of the affected part using body heat. For example, covering cheeks with hands, putting finger tips under armpits, placing feet under the clothing next to the belly of a buddy. Under no circumstances should the injured part be massaged, exposed to a fire or stove, rubbed with snow, slapped, chafed, or soaked in cold water. Pain will occur on rewarming. Walking on injured feet is to be avoided. If the estimate is deep injury, the injured soldier should be moved at once to an aid station where the affected part can be rewarmed under medical supervision. Intense pain, further discoloration, swelling and other symptoms develop after rewarming.

The Soldier's Manual of Common Tasks includes the following:<sup>10</sup>

1. Frostbite.

a. Signs/symptoms - skin is white, stiff and numb.

b. First Aid -

(1) Cover frostbitten part of face with warm hands until pain returns.

(2) Place frostbitten bare hands next to skin in opposite armpits.

2. Carbon Monoxide Poisoning.

a. Signs/symptoms - The symptoms of carbon monoxide poisoning come rapidly and in quick succession. Dizziness, headache, noises in the ears, and throbbing in the temples are quickly followed by a feeling of sleepiness and weakness. Vomiting and convulsions may occur, followed by unconsciousness and death. The skin and lips are often bright red.

b. First Aid -

(1) Move the soldier into fresh air immediately and administer artificial respiration. It is safe to you to administer mouth-to-mouth respiration to a carbon monoxide victim.

(2) Keep the soldier quiet and transport him to a medical treatment facility.

(3) If feet are frostbitten, seek sheltered area and place bare feet under clothing and against abdomen of another person.

(4) If deep frostbite is suspected protect part from additional injury and get to medical treatment facility by fastest means possible. DO NOT attempt to thaw deep frostbite. There is less danger of walking on feet while frozen than after thawed.

3. Immersion foot.

a. Signs/symptoms - Soles of feet are wrinkled. Standing or walking is extremely painful.

b. First Aid -

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible. (Continued on next page.)

<sup>10</sup>FM 21-2 (TEST), Soldier's Manual of Common Tasks, 31 Aug 77, pp 13-14

Soldier's Manual, continued.

4. Trenchfoot.

a. Signs/symptoms - Numbness. May be tingling or aching sensation, cramping pain, and swelling.

b. First Aid -

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

5. Snow Blindness.

a. Scratchy feeling in eyes.

b. First Aid -

(1) Cover eyes with dark cloth.

(2) Transport casualty to medical treatment facility at once.

Often suspected deep injury will turn out, fortunately, to be a false alarm, and the soldier, warmed and rested, is soon returned to duty. But no one familiar with how scarce our front line evacuation and medical holding resources truly are will underestimate the seriousness of having to evacuate the soldier in the first place. Prevention, not first aid, and certainly not evacuation, is preferred. In case of doubt, however, evacuate, since diagnosis, even by a doctor, is difficult when the patient is first seen. If injury has in fact occurred, it will be evident within hours of rewarming. Degree of injury is medically reported as follows:

First-degree:	Discolored skin, chapping, possible aches, and sensitivity to cold.
Second-degree:	Swelling, blisters, formation of blackened tissue, which falls off leaving vulnerable new skin; persistent throbbing, deep aching, and sensitivity to cold.
Third-degree:	Involvement of the whole skin with blistering; and ulceration; formation of hard, black dry chunks which fall off; burning, throbbing, and shooting pains.
Fourth-degree:	Gangrene; destruction of an entire part, bone and tissue; mummification; loss of damaged part.

N.B. duty time lost to cold injury averages 83 days per man.<sup>11</sup> Fourth-degree injury leads to medical reclassification or discharge.

### Cold Injury: Prevention

The NATO Handbook prescribes as follows for minimizing cold injuries among soldiers:

"The successful prevention and control of cold injury depend, first of all, upon vigorous command leadership, the provision of adequate clothing, and a number of individual and group measures. These measures include:

1. A thorough appreciation and comprehension by command, staff, technical personnel, and all combat components of the potential losses which may occur from cold injury, both in winter combat and in other circumstances in which cold injury has been known to occur.

2. Full command support, by echelon, of a comprehensive and practical cold injury prevention and control program. It should be emphasized again that this is a command, not a medical, responsibility. The DA technical bulletin of 1976 requires that each platoon and squad or comparable-sized unit will have a Cold Injury Control Officer or Noncommissioned Officer designated.<sup>12</sup>

3. Indoctrination of all personnel in the prevention of cold injury individually and by units.

4. The provision of adequate supplies of clothing and footgear and their correct utilization to avoid exposure to cold. The program of supply must provide adequate dry clothing for the daily needs of the soldier who is farthest forward in combat; it must also provide for the correct fitting of clothing and boots. All articles of clothing must be sized and fitted to avoid constriction of the extremities and tightness over the back, buttocks, and thighs. Clothing for cold weather, based on the layering principle, is now designed as an assembly for protection of the head, torso, and extremities. The clothing is worn in loose layers, with air spaces between the layers under an outer wind-resistant and water-resistant garment. Body heat is thus conserved. The garment is flexible, and inner layers can be removed for comfort and efficiency in higher ambient temperatures or during strenuous physical exertion. Prevention of lost body heat by proper protection of the body is equally as important as the efficient use of appropriate dry footgear and warm dry gloves. Finally, the most efficient clothing is of no value unless, through training, a high level of individual and unit foot and clothing discipline are maintained.

<sup>11</sup>Department of the Army, Cold Injury, Ground Type, 1958, p. 500

<sup>12</sup>TB, MED 81, p. 4

5. Special protection for racial and other groups who are especially susceptible to cold injury, together with the regular rotation of all troops. It should be remembered that patients with exposed wounds and injuries are particularly liable to cold injury because blood and discharge from their wounds will freeze from the clothing inward.

6. Effective policies of sorting in forward areas, with provision for early evacuation and treatment of casualties actually suffering from cold trauma.

7. The identification of factors responsible for cold injury in special situations, which is a command responsibility. Significant numbers of cases occur as a result of barehanded contact with cold metal or gasoline; as a result of rapid deployment of troops seated in unheated vehicles, without interruption for short, rewarming marches every few hours; as a result of air-drops of troops into cold areas without adequate protective equipment and training; or as a result of several hours' confinement of arctic-equipped airborne troops in heated aircraft, followed by a drop into a subzero environment after their insulating clothing has been saturated with perspiration. Only by the evaluation of these factors can specific measures necessary in particular units or groups be put into effect."

The NATO Handbook, the DA Technical Bulletin, reports from previous wars and 8ID recent experience all point to the need for a comprehensive command approach to meeting the cold weather challenge in Germany today.

## CHAPTER 4

### PATHFINDER SOLDIER POLICY FOR WINTER OPERATIONS

The 8th Division's plan for fighting in cold weather has 8 (eight) main points which are listed in capsulated form in Figure 12. Each point is further broken out as "officer's business" and "sergeant's business" in Figure 13. N.B. it will require the concerted effort of all leaders to make the plan a reality.

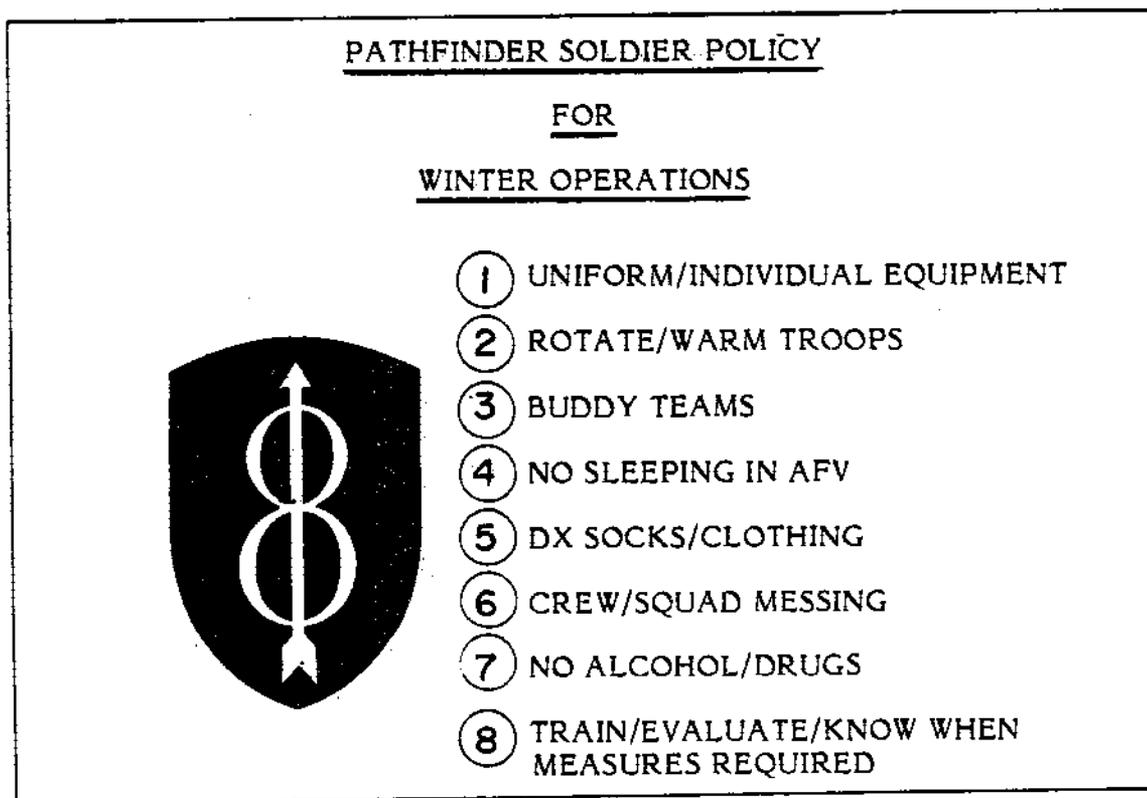


Figure 12. Pathfinder Soldier Policy for Winter Operations



SOLDIER READINESS IN WINTER

"OFFICER BUSINESS"



"SERGEANT BUSINESS"



<p>PROVIDE SOLDIERS ADEQUATE WINTER CLOTHING AND PERSONAL EQUIPMENT, AND INSURE AVAILABILITY OF SAME IN FORWARD ELEMENTS IN THE FIELD.</p>	<p>1 SUPERVISE ISSUE, ACCOUNTABILITY, PROPER FIT, STOWAGE, USE AND MAINTENANCE OF EACH SOLDIER'S CLOTHING AND EQUIPMENT.</p>
<p>CONSERVE FIGHTERS-ON-FOOT FOR TACTICAL USE AT NIGHT AND IN REDUCED VISIBILITY BY DIRECTED PERIODS OF EXERCISE, WARMING, NOURISHMENT AND/OR REST ALTERNATED WITH ALERT IN TACTICAL POSITIONS.</p>	<p>2 SET UP AND CHECK THE UNIT'S SYSTEM FOR: (1) ROTATION OF TROOPS WITHIN SQUADS, PLATOONS OR SECTIONS FROM FIGHTING POSITIONS, OP'S, OR GUARD POSTS TO WARMING OF SLEEPING SHELTERS, (2) EXERCISE AND FEEDING.</p>
<p>LIMIT RISK OF COLD INJURY BY (1) IDENTIFYING AMONG FIGHTERS-ON-FOOT; AND REASSIGNING TO LOWER EXPOSURE DUTIES, SOLDIERS WITH MEDICALLY RECORDED COLD INJURY, AND (2) PRESCRIBING A MINIMUM OF TWO SOLDIERS PER MISSION OR DUTY POST.</p>	<p>3 INSTALL, ENFORCE AND CHECK THE BUDDY-TEAM SYSTEM FOR EVERY FIGHTING POSITION, GUARD POST, VEHICLE ON THE ROAD, AND ANY OTHER JOB.</p>
<p>FORECLOSE SLEEPING IN, OR USE OF PERSONNEL HEATERS FOR ARMORED FIGHTING VEHICLES, BUT PROVIDE FOR AN ALTERNATIVE SLEEPING PLAN, SUPPORTED BY APPROPRIATE EQUIPMENT.</p>	<p>4 IMPLEMENT UNIT SLEEPING PLAN BY DESIGNATING SITES, AND SUPERVISING USE AND MAINTENANCE OF EQUIPMENT - ESPECIALLY TENTS, SLEEPING BAGS, AND HEATING GEAR.</p>
<p>FURNISH TO COMBAT UNITS DIRECT-EXCHANGE CLEAN SOCKS, UNDERWEAR, AND OTHER CLOTHING, AND ARRANGE FOR UNIT BATHS AT LEAST ONCE PER WEEK.</p>	<p>5 INSPECT TROOPS TO INSURE THAT EACH SOLDIER, AT A MINIMUM, WASHES AND SHAVES ONCE DAILY, AND CHANGES HIS SOCKS TWICE DAILY AND WHENEVER WET, MASSAGING AND DRYING HIS FEET EACH TIME HE DOES.</p>
<p>SUPPLY COMBAT UNITS WITH A CREW/ SQUAD MESSING CAPABILITY.</p>	<p>6 REQUIRE TROOPS TO CONSUME 3 MEALS PLUS 3 CUPS OF SOUP OR OTHER HOT DRINK BETWEEN MEALS, EACH 24 HOURS.</p>
<p>PROHIBIT CONSUMPTION OR POSSESSION OF: (1) ALCOHOL OR (2) ANY CONTROLLED SUBSTANCE.</p>	<p>7 ENFORCE RULES AGAINST HAVING OR USING (1) BEER, WINE OR OTHER LIQUOR, OR (2) ANY KIND OF ILLEGAL DRUG.</p>
<p>PLAN, MANAGE, AND CONDUCT TRAINING FOR COLD WEATHER OPERATIONS, REGARDING EVERY WINTER DAY - IN GARRISON, IN THE FIELD, AT PEACE OR WAR - A TRAINING DAY. KNOW WHEN COLD DEFENSIVE MEASURES ARE NECESSARY.</p>	<p>8 CONDUCT TRAINING ON COLD WEATHER OPERATIONS FOR, AND KEEP A JOB BOOK RECORD ON, EACH SOLDIER, EVALUATING THAT TRAINING BY INSPECTING DAILY FOR COMPLIANCE WITH INSTRUCTIONS, FOCUSING ON SOLDIERS VULNERABLE TO COLD INJURY - FIGHTERS-ON-FOOT, NEW ARRIVALS, YOUNG SOLDIERS, AND BLACK SOLDIERS.</p>

Figure 13. Leader's Guide for Soldier Readiness in Winter.

① Uniform and Equipment

OFFICER

NCO

PROVIDE SOLDIERS ADEQUATE WINTER CLOTHING AND PERSONAL EQUIPMENT, AND INSURE AVAILABILITY OF SAME IN FORWARD ELEMENTS IN THE FIELD.	SUPERVISE ISSUE, ACCOUNTABILITY, PROPER FIT, STOWAGE, USE AND MAINTENANCE OF EACH SOLDIER'S CLOTHING AND EQUIPMENT.
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Clothing plays a crucial role in preventing cold injury. The winter clothes issued each soldier are adequate, provided they fit, are worn right, and are available when he needs them. Check fit on the soldier. Fit of all clothing should be loose, and while it is better for troops to be overdressed and venting, than underdressed, leaders should understand that too much clothing hampers soldiers, causes them to sweat, and thus dehydrates and then chills them because of wet undergarments. Overwhite camouflage uniforms, since they are in limited supply, should be issued only to those fighters-on-foot likely to be in forward positions.

Leaders must check for the small items troops need in winter — face masks for drivers, TC's and air guards, scarfs, chapsticks, dark inserts for goggles or sunglasses, waterproof matches, heat tablets or candle ends, extra socks pinned to shirt, gloves and liners (with dry extras).

② Rotate/Warm troops

OFFICER

NCO

CONSERVE FIGHTERS-ON-FOOT FOR TACTICAL USE AT NIGHT AND IN REDUCED VISIBILITY BY DIRECTED PERIODS OF EXERCISE, WARMING, NOURISHMENT AND/OR REST ALTERNATED WITH ALERT IN TACTICAL POSITIONS.	SET UP AND CHECK THE UNIT'S SYSTEM FOR: (1) ROTATION OF TROOPS WITHIN SQUADS, PLATOONS, OR SECTIONS FROM FIGHTING POSITIONS, OP'S OR GUARD POSTS TO WARMING OR SLEEPING SHELTERS, (2) EXERCISE AND FEEDING.
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The feet perspire more and are generally less well ventilated than other parts of the body, regardless of the type boot being worn. The insulated boot, while better for troops in contact with the ground for prolonged periods, may be less desirable than leather boots and overshoes in situations where activity is so intense that the feet sweat heavily and the socks become wringing wet.

WHENEVER THERE IS DANGER OF COLD WEATHER AND PROLONGED EXPOSURE TO THE COLD, PERSONNEL MUST BE EQUIPPED WITH BOTH THE INSULATED BOOT AND OVERSHOES.

In the cold-wet winters of Central Europe, leather boots will never be worn without overshoes, and fighters-on-foot should wear the insulated boot. However, the insulated boot is not a panacea since cold injuries can still occur if proper foot and sock care are not observed. Such injuries usually result from inactivity and dependency on the foot, as occurs with prolonged sitting or standing without foot or leg movement. TB MED 81 indicates that particular attention is warranted after exercise because of increased sweating, retention of sweat, and the decreased insulating quality of wet socks.

TB MED 81 prescribes frequent changing of socks and massaging of feet to eliminate cold weather injuries to the feet.

The 8th Infantry Division policy is that feet be checked at least every four hours, and socks be changed and feet massaged at least twice daily.

Leaders must husband infantrymen, scouts, and others who fight on foot to meet security requirements during winter's reduced visibility. Long road marches and lengthy cross-country moves in cold weather often jam soldiers in cramped positions within APC's, and subject air guards to special hazards from wind chill; leaders must interrupt such moves at least once per hour to exercise troops vigorously — group calisthenics are a good solution. Track commanders, drivers, and air guards require extra protection against wind chill, and may have to be rotated or exercised even more frequently. Dug-in fighting positions can be equipped to warm troops — e.g., a stove under overhead cover, a candle in a poncho-covered foxhole — or a warming shelter — a tent or a building must be provided where troops can be sent at least every two hours for warming, rest, or refreshment.

③ Buddy Teams.

OFFICER

NCO

LIMIT RISK OF COLD INJURY BY (1) IDENTIFYING AMONG FIGHTERS-ON-FOOT, AND REASSIGNING TO LOWER EXPOSURE DUTIES, SOLDIERS WITH MEDICALLY RECORDED COLD INJURY, AND (2) PRESCRIBING A MINIMUM OF TWO SOLDIERS PER MISSION OR DUTY POST.

INSTALL, ENFORCE AND CHECK THE BUDDY-TEAM SYSTEM FOR EVERY FIGHTING POSITION GUARD POST, VEHICLE ON THE ROAD, AND ANY OTHER JOB.

Leaders should not assign any soldiers with a record of cold injury to a job which requires prolonged exposure on the ground. Rather, such a soldier should be used for tasks which assure close supervision, plenty of activity, and ready access to a warm area -- e.g. handling ammunition or supplies in field or combat trains, or tending stoves or generators in a command post.

No soldier anywhere will be assigned to any job alone.

Rather, buddy teams will be used. Each man should know that he is responsible for checking his buddy for signs of cold injury, and in a fighting position, for spelling-off his buddy while the latter warms up.

④ No sleeping in AFV.

OFFICER

- NCO

FORECLOSE SLEEPING IN, OR USE OF PERSONNEL HEATERS FOR ARMORED FIGHTING VEHICLES, BUT PROVIDE AN ALTERNATIVE SLEEPING PLAN, SUPPORTED BY APPROPRIATE EQUIPMENT.	IMPLEMENT UNIT SLEEPING PLAN BY DESIGNATING SITES, AND SUPERVISING USE AND MAINTENANCE OF EQUIPMENT -- ESPECIALLY TENTS, SLEEPING BAGS, AND HEATING GEAR.
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Personnel heaters in armored vehicles likely to be viewed through enemy thermal sights greatly complicate concealment, and are therefore ruled out. Personnel heater management by type vehicle is discussed in detail in Chapter 5, Pathfinder Equipment Policy for Winter Operations. Sleeping in armored vehicles of any type, whether heated or not, is a dangerous practice and is also forbidden -- aside from the hazards of carbon monoxide poisoning, an armored vehicle surrounds a sleeping soldier with hard cold surfaces which rapidly conduct heat away from the body. Therefore, each unit must have a sleeping place. For instance, each tank might carry two shelter halves with pins and poles, so that two men sleep while two are on watch in the tank; a rifle squad might carry a small hexagonal tent; or a nearby farm building might be designated as the sleeping site. Leaders must appreciate that cold injury strikes many soldiers while they are asleep -- a tired man drops off, his circulation slows, numbness sets in, and when he awakens his feet are dead weight. Never permit a soldier to crawl into his sleeping bag with his boots on -- sleeping with boots on restricts circulation and invites frostbite. Since clothing worn in the bag can bind and restrict circulation as the sleeper turns, soldiers should pull on their bag over the least possible clothing and never over wet clothing, especially wet socks. Soldiers should put as much insulation under the sleeping bag as feasible -- preferably the air mattress, but if not available, cardboard, newspaper or evergreen branches. Each soldier should be taught to exercise vigorously before he gets in the bag so that he heats the bag quickly. A small man or woman should be taught to fold a loose bag underneath the body inside the sleeping bag to reduce the amount of air needed to be warmed. Soldiers should take a piece of candy or another small edible into the bag, so that if they wake up cold, they can regenerate heat by eating the snack. Shelter for sleepers is necessary, but a stove or other heat source is not essential. If a stove is used, the leader must insure that it is safely positioned and tended. Sleeping shelters should be sited in covered and concealed positions, out of the wind and as close to vehicles or fighting positions as possible. It is a good idea to standardize the location of sleeping shelters relative to APC's or tanks as much as practicable, and to mark the trail from the vehicle to the shelter with white engineer tape or other means.

⑤ DX Socks/Clothing

OFFICER

NCO

FURNISH TO COMBAT UNITS DIRECT-EXCHANGE CLEAN SOCKS, UNDERWEAR, AND OTHER CLOTHING, AND ARRANGE FOR UNIT BATHS AT LEAST ONCE PER WEEK.

INSPECT TROOPS TO INSURE THAT EACH SOLDIER, AS A MINIMUM, WASHES AND SHAVES ONCE DAILY, AND CHANGES HIS SOCKS TWICE DAILY OR WHENEVER WET, MASSAGING AND DRYING HIS FEET EACH TIME HE DOES SO.

A soldier can wash his entire body with the equivalent of two canteen cups of water, using half for soaping and washing, and half for rinsing. Washing is important in promoting circulation and maintaining a health of the skin — and the skin is what is endangered by cold injury. Washing feet, hands, crotch and armpits is especially important. Access to a bath unit, or to showers in a building, should be arranged weekly, and these occasions should be used to inspect clothing and to replace by direct exchange soiled or damaged items. Clean socks should be provided in any event, but special attention should be directed to headgear and underwear as well. Clothes matted with dirt and grease lose much of their insulating properties; air pockets formed by the cloth fibers become clogged or crushed, and heat is readily transmitted. It is a good idea to wear summer underwear under winter underwear to help keep the latter cleaner of body oils. Wet socks or gloves can be dried by pinning them, unfolded, under the shirt where body heat will dry them. Every soldier should have at least two extra pairs of dry socks in his possession, so that he can change socks at least twice daily. Each time he does so, he should massage his feet — preferably washing them — and dry them thoroughly before replacing his boots. Beards should be shaved and the hair combed daily. A beard or long hair adds very little insulation value, and soils clothing and headgear with natural oils. More importantly, facial hair forms a base for buildup of ice on the face from breath moisture, and can hide frostbite symptoms. In any event, a beardless face is important for use of the protective mask against chemical attack, since an airtight seal is difficult to maintain even with stubble on the face.

⑥ Crew/Squad Messing

OFFICER

NCO

SUPPLY COMBAT UNITS WITH A CREW/SQUAD MESSING CAPABILITY.

REQUIRE TROOPS TO CONSUME 3 MEALS, PLUS 3 CUPS OF SOUP OR OTHER HOT DRINK BETWEEN MEALS, EACH 24 HOURS.

The body derives the energy to keep itself warm from food, and proper nutrition is therefore essential for warding off cold injury. Of course, commanders would like to provide soldiers three square hot meals per day, just like they can get in garrison. But in war that is a patent impossibility, and even in peacetime winter exercises, ice and snow conditions are frequently so bad that moving cooked food to forward elements is very dangerous if not altogether impossible. Moreover, dehydration can occur as often in winter as in summer — soldiers working hard while wearing winter clothing lose a lot of body water. If not replaced, fluids lost through perspiration plus elimination soon affect physical ability and mental attitude: a dehydrated soldier feels generally tired and weak, and in his torpor, he becomes especially vulnerable to cold injury.

When fighting under similar circumstances during WWII, British troops proved more resistant to cold injury than Americans largely because the British insisted on pausing during operations so that each tank crew or rifle section could "brew up" tea.

Hence, it is important that each small unit — each armored fighting vehicle, gun crew, communications team, etc., — be equipped and trained to warm their own rations and to prepare their own hot beverages.

Digesting a cold ration requires the body to expend as much food as the ration provides: THEREFORE, NO NET GAIN IN HEAT RESULTS.

Commanders must issue heat tablets, stoves, and appropriate rations -- besides the "C" ration, troops require dried concentrated foods and soups, coffee, and tea. Supplemental candy bars are especially useful to the frontline soldier, since they can be carried in the pocket and used for heat-generating snacks whenever the soldier feels chilled. Leaders of small units using squad/crew mess techniques must guard sanitation carefully and require troops to clean utensils scrupulously. Many troops profess to dislike field rations and to disdain soup, but they must be required to eat and to drink warm liquid between meals to keep their energy up and to avoid cold injury. Individual ration heating tablets are available as well as assigned single and double burner squad stoves. The individual squad activity has to be supplemented by a company distribution effort of vacuum jugs with hot fluids, such as coffee, cocoa, or soup to the platoon warming area. The ration distribution program in USAREUR now provides for supplemental issues for field exercises without units having to request it. The ration supply system provides dehydrated soup mix in No. 2 1/2 cans which lend themselves to individual or squad preparation at the designated "brew up" times.

Follow-up of the responsibility for providing hot food with an effective sanitation program must not be overlooked. Since immersion heaters will normally be located in the company trains area, the leader must provide for some hot wash capability. For this purpose he can also obtain and use food service disinfectant (NSN 6840-00-810-6396) to augment his sanitation program.

⑦ No Alcohol/Drugs

OFFICER

NCO

<p>PROHIBIT CONSUMPTION OR POSSESSION OF: (1) ALCOHOL OR (2) ANY CONTROLLED SUBSTANCE.</p>	<p>ENFORCE RULES AGAINST HAVING OR USING: (1) BEER, WINE OR OTHER LIQUOR, OR (2) ANY KIND OF ILLEGAL DRUG.</p>
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Alcohol is a depressant. Alcohol causes body temperature to drop, furthers dehydration, deadens pain which might otherwise signal cold injury, and renders soldiers drowsy and inactive. Most other drugs similarly invite cold injury. Moreover, drugs — alcohol included -- increase sharply the possibility of accident and injury or death from carbon monoxide asphyxiation, falls, and vehicular accidents. Bad news in any season, drugs spell death in winter.

⑧ Train/Evaluate

OFFICER

NCO

<p>PLAN, MANAGE, AND CONDUCT TRAINING FOR COLD WEATHER OPERATIONS, REGARDING EVERY WINTER DAY — IN GARRISON, IN THE FIELD, AT PEACE OR WAR — A TRAINING DAY. KNOW WHEN COLD DEFENSIVE MEASURES ARE NECESSARY.</p>	<p>CONDUCT TRAINING ON COLD WEATHER OPERATIONS FOR, AND KEEP A JOB BOOK RECORD ON EACH SOLDIER, EVALUATING THAT TRAINING BY INSPECTING DAILY FOR COMPLIANCE WITH INSTRUCTIONS, FOCUSING ON SOLDIERS VULNERABLE TO COLD INJURY — FIGHTERS-ON-FOOT, NEW ARRIVALS, YOUNG SOLDIERS, AND BLACK SOLDIERS.</p>
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The main problem in training to avoid cold injury is that many of those soldiers most likely to be injured are precisely those most likely to be absent from training when the all-too-often pro-forma unit "classes" are held -- the more junior troops away on detail and the new arrivals in-processing. Moreover, a single "class" in November is hardly likely to be remembered in February. Here is a problem in training management which calls for application of the principles set forth in DA Training Circular 21-5-7: planning and provision of resources by battalion, and training within the company by each first line supervisor, conforming to tasks, conditions and standards established by division. To that end, supplemental Training and Evaluation Outlines and appropriate job book insert are provided at appendices 3 and 4 respectively for use by all leaders. Pre-operation evaluations must be followed up in the field by daily inspections for compliance. In addition, attainment of standards will be checked during the AGI TPT as well as being required training tasks for specified monthly readiness tests.

In addition to the temperature, wind velocity and humidity must also be considered by commanders. The implementation of the Forward Area Limited Observing Program (FALOP), as prescribed in the 8th Inf Div Reg 381-2, provides each maneuver battalion and brigade commander with his own capability to determine temperature, wind velocity, and humidity in his area of operations.

In all training from October through March, dedicated attention must be paid to soldier readiness for winter warfare, and whether in garrison or elsewhere, trainers must seek opportunities to practice foot-care. Infantry and scout units should make a fetish out of tasks pertaining to care of feet. All divisional evaluations of individual or collective training from October through March, including the AGI TPT, will include the tasks set forth in Appendix 3. All evaluators, whether working at external or internal evaluations, should take particular interest in training of leaders. Selected tasks will also be specified for monthly readiness tests.

In the last analysis, it is far more important to train NCO's and junior officers to know what must be done in the field to meet the challenge of winter warfare than to try to train every single soldier in garrison.

In war and in field exercises, meeting winter warfare standards will depend crucially on the caliber of leadership provided within forward platoons and sections. These leaders must overcome both the environment and the enemy, and never allow energies directed into the former struggle to prevent success in the latter. Leaders must be thoroughly knowledgeable and in superior physical condition if they personally are to meet winter warfare on its own terms.

## CHAPTER 5

### PATHFINDER EQUIPMENT POLICY FOR WINTER OPERATIONS

The 8th Division's equipment plan for fighting in cold weather has 8 (eight) main points which are listed in capsulated form in Figure 14. Each point is further broken out as "officer business" and "sergeant's business" in Figure 15. N.B. Just as in the case of soldier winter readiness, it will require the concerted effort of all leaders to make the plan a reality.

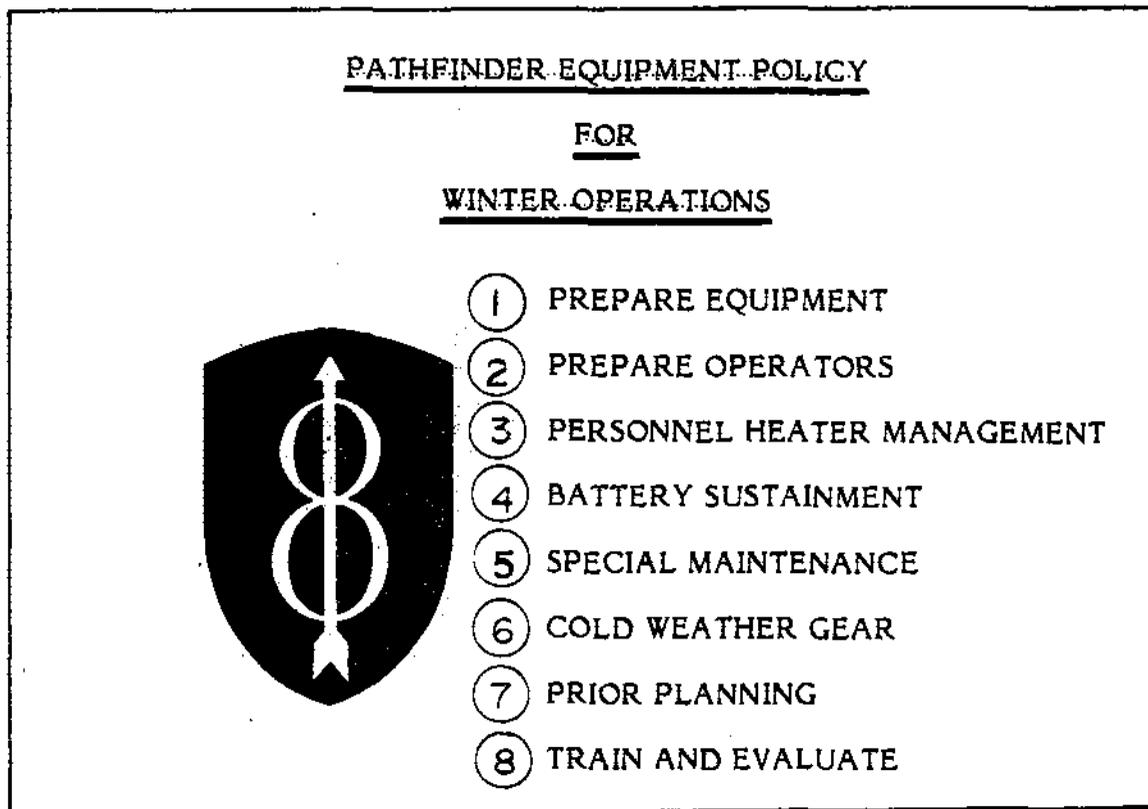


Figure 14. Pathfinder Equipment Policy for Winter Operations



EQUIPMENT READINESS IN WINTER

"OFFICER BUSINESS"



"SERGEANT BUSINESS"



<p>PLAN, MANAGE AND SUPERVISE COLD WEATHER EQUIPMENT USE.</p>	<p>1 INSPECT EQUIPMENT AND ENFORCE ADHERENCE TO PROPER VEHICLE AND EQUIPMENT COLD WEATHER OPERATING PROCEDURES.</p>
<p>PLAN, MANAGE AND CONDUCT TRAINING FOR COLD WEATHER VEHICLE AND EQUIPMENT OPERATIONS.</p>	<p>2 CONDUCT TRAINING ON EQUIPMENT COLD WEATHER OPERATIONS AND KEEP JOB BOOK RECORD ON EACH SOLDIER WHO IS AN EQUIPMENT OPERATOR.</p>
<p>DEVELOP A UNIT VEHICLE AND SPACE HEATER UTILIZATION PLAN THAT IS MUTUALLY SUPPORTIVE AND CONSERVES RESOURCES.</p>	<p>3 IMPLEMENT THE UNIT HEATER UTILIZATION PLAN; INSURE THAT SOLDIERS ARE NOT SLEEPING IN VEHICLES, HEATED OR OTHERWISE.</p>
<p>DEVELOP A BATTERY MAINTENANCE AND CHARGING PLAN TO INSURE BATTERIES DON'T FREEZE.</p>	<p>4 SUPERVISE THE EXECUTION OF THE COMMAND BATTERY SUSTAINMENT PROGRAM.</p>
<p>REDUCE THE EFFECTS OF COLD WEATHER OPERATIONS ON EQUIPMENT BY PROVIDING FOR THE PERFORMANCE OF DAILY PREVENTIVE MAINTENANCE PROCEDURES.</p>	<p>5 CHECK SOLDIERS TO MAKE SURE THE DAILY EQUIPMENT CHECKS AND SERVICES ARE PERFORMED, AND PERFORMED PROPERLY.</p>
<p>FURNISH TO UNITS THE COLD WEATHER EQUIPMENT AND CONSUMABLES NECESSARY.</p>	<p>6 INSPECT EQUIPMENT AND SOLDIERS TO INSURE THAT THEY HAVE THE NECESSARY ITEMS TO ACCOMPLISH THEIR MISSION SAFELY IN THE COLD.</p>
<p>PREPARE COLD WEATHER LOAD PLANS FOR THOSE CONTINGENCY ITEMS THE UNIT WILL NEED.</p>	<p>7 PACK COLD WEATHER CONTINGENCY EQUIPMENT AND SUPPLIES AND INSURE INVENTORIES AND SERVICEABILITY INSPECTIONS ARE CONDUCTED.</p>
<p>INTEGRATE COLD WEATHER TRAINING INTO THE UNIT PROGRAM FOR COLD WEATHER OPERATIONS INSURING EVERY WINTER DAY PREPARES THE UNIT TO WIN IN THE COLD.</p>	<p>8 CONDUCT TRAINING AND EVALUATE SOLDIERS FREQUENTLY. CHECK FOR COMPLIANCE WITH THE COLD WEATHER LOGISTICS INSTRUCTION EMPHASIZING EQUIPMENT COLD WEATHER POTENTIAL PROBLEMS, AND PROPER OPERATION OF GEAR IN THE COLD.</p>

Figure 15. Leader's Guide for Equipment Readiness in Winter.

① Prepare Equipment

OFFICER

NCO

PLAN, MANAGE AND SUPERVISE COLD WEATHER EQUIPMENT USE.	INSPECT EQUIPMENT AND ENFORCE ADHERENCE TO PROPER VEHICLE AND EQUIPMENT COLD WEATHER OPERATING PROCEDURES.
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Leaders must know the fourteen general effects of cold weather on all equipment.

1. LUBRICANTS become stiff and when lighter oil is substituted, it is consumed at a faster rate.
2. PLASTICS AND HARD RUBBER PARTS become brittle. A sharp knock or sharp bend may snap or break them. Seals and other synthetic parts are more subject to failure.
3. GAUGES AND DIALS stick and may give erroneous readings. A gentle tap usually frees them.
4. HAND BRAKES freeze to drums if left applied when wet.
5. FUEL TANKS, FILTERS AND LINES become blocked or freeze from condensation.
6. LINKAGES get stiff causing hard operation or delayed response.
7. PAINT becomes brittle and cracks easily.
8. CRANKCASES sludge up from condensation if engines are not warmed to operating temperature.
9. BATTERY efficiency is reduced. A discharged battery will freeze and crack.
10. ENGINES are hard to start and more vulnerable to hydrostatic lock.
11. MACHINED AND UNPAINTED SURFACES rust and corrode quickly.
12. DRAIN COCKS AND PLUGS freeze tight, discouraging daily or periodic draining.

13. POWER TRAIN BREATHERS AND VENTS clog from slush and can freeze, blocking the flow of air.

14. WINDSHIELDS crack easily when hit by a blast of hot air when being defrosted.

Remember, PERSONNEL EFFICIENCY drops. Anticipate that maintenance tasks will take twice as long -- plan accordingly.

Vehicle operating procedures for cold weather are, in a majority of cases, placarded and in every case found in the -10 operator's manual for the equipment. Extracted cold weather procedures for the M60 tank, M113 series vehicles, the M109 2 1/2 ton and 5 ton trucks are included in appendix 2.

The majority of our vehicles will operate in temperatures of -25°F without the application of special arctic kits.

Our equipment will operate effectively to -25°F but only if the special cold weather procedures in the -10 operator's manual are followed.

During a recent winter exercise, divisional use of major assemblies was unusually high. Ninety-six engines, transfers and transmissions were changed during the course of this ten day exercise, virtually exhausting on hand replacement stocks.

Improper idling of M113/M577 vehicles to power radio and lighting systems accounted for the failure of 28 engines of this series vehicle alone.

This large loss of assemblies represent a waste of materiel resources as well as the man-power to replace them. This preventable loss also represents an unacceptable lapse in training and supervision by leaders.

Maintenance resources will be required to return battle damaged equipment to service. We can ill afford to squander resources on DAMAGE caused by NEGLIGENCE.

In some cases, our equipment has design shortcomings which leaders must know how to overcome.

The 400 gallon water trailer is a case in point. Its use in cold weather, as some commanders are painfully aware, is complicated by the fact that it is made of fiberglass and precludes the use of an immersion heater as was possible in earlier models. The question then is: How to keep this unit's water supply from freezing? Here again knowledge, training, and supervision are the key. The operator's technical manual for the water trailer contains information which specifically addresses draining the distribution plumbing after each use. Trailers should only be filled three-quarters full to provide for expansion. The "T" handle should be closed and the complete delivery system drained to prevent the pipes from freezing and perhaps bursting. The time required to freeze the contents of the trailer generally exceed that time required for its use. In view of the fact that water is critical in cold weather for keeping warming beverages available to troops to provide nutrition and prevent dehydration, commanders and leaders should be closely monitoring water consumption.

② Prepare Operators

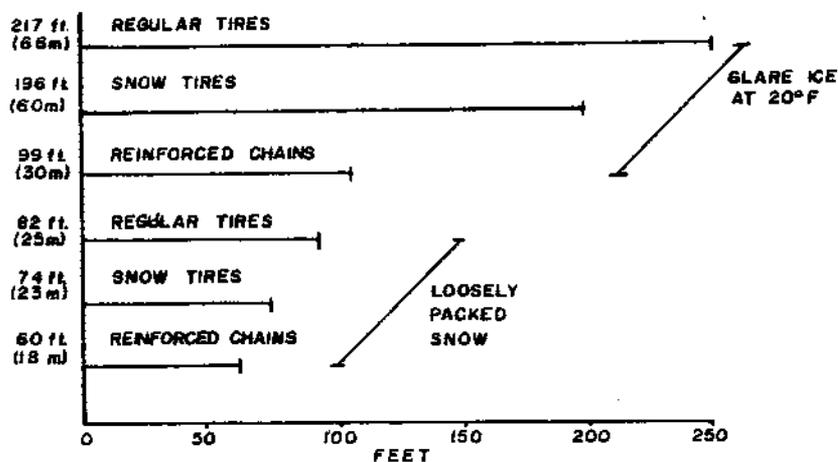
OFFICER	NCO
PLAN, MANAGE AND CONDUCT TRAINING FOR COLD WEATHER VEHICLE AND EQUIPMENT OPERATIONS.	CONDUCT TRAINING ON EQUIPMENT COLD WEATHER OPERATIONS AND KEEP JOB BOOK RECORD ON EACH SOLDIER WHO IS AN EQUIPMENT OPERATOR.

Driving over snow has some significant implications when operating track vehicles. The 1966 Rundschau study on Tanks in the Snow points out that soil or surface deformation depends on the thickness of the snow blanket. Vehicles will encounter no significant resistance when the snow blanket is thin. But as the snow blanket becomes thicker, tracks will begin to offer increased resistance as they sink in. This requires greater traction force over a surface that has degraded the vehicle's surface grip. The depth of the snow must also be considered. In general, a track vehicle is going to get stuck if the depth to which the track sinks exceeds the ground clearance of the vehicle.

Snowdrifts of more than one meter can become a barrier in that they will float the hull of a track vehicle.

Wheeled vehicle operations are also affected by snow and wet ground. Wheels however, operate effectively if the footing will prevent sinkage of more than one-third of their diameter.<sup>14</sup> Stopping distances are also increased over the surface conditions associated with winter operations as shown in Figure 16.

### TOTAL STOPPING DISTANCE



STOPPING DISTANCES ARE FROM 20 mph WITH ZERO REACTION TIME 3/4; SECOND AVERAGE REACTION TIME ADDS 22 FEET TO THE ABOVE STOPPING DISTANCES

Figure 16. Vehicle Stopping Distances as a Function of Winter Surface Conditions

<sup>14</sup> Operational Problems in Cold Regions, LTC Allen P. Richmond, 1964

A 1969 arctic test center evaluation of T142 track for the M60 series tank included operation with and without pads. This test determined that the self-cleaning action makes it unnecessary to remove the pads to obtain improved traction. There is no significant gain in traction and there is a 30% increase in stopping distance from 20 mph. Operations with alternate pads removed should only be considered as an emergency recovery procedure and then only for very short distances. Track operations over snow covered ground also introduces an undulating effect to the track because the concentration of weight is directly below the road wheel. This phenomenon then causes the upper part of the track to have greater tension, as shown in Figure 17.

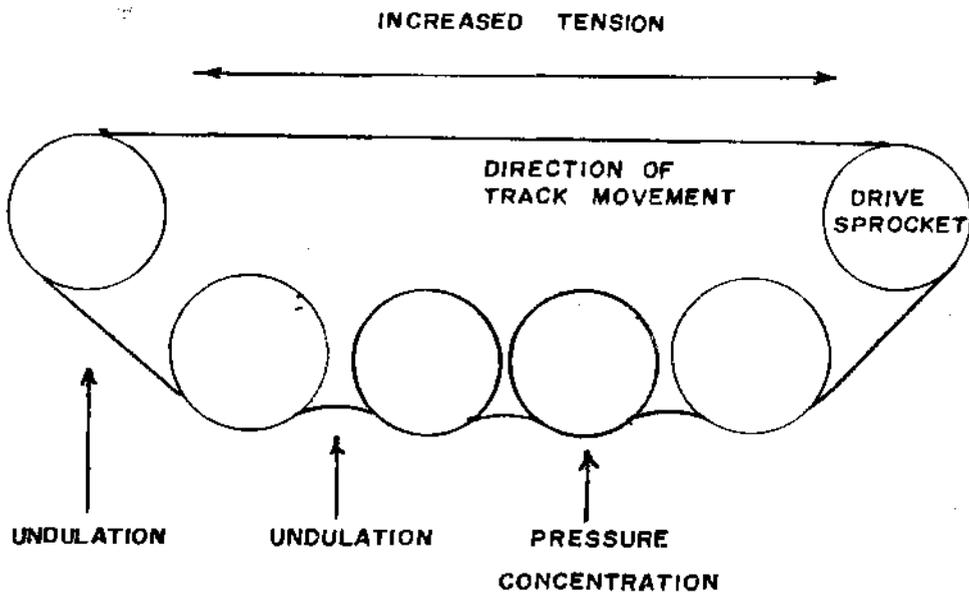


Figure 17. Undulating Effect on Track Resulting in a Loss of Traction

Since the stress is less evenly distributed on the track system, the susceptibility to breakage is greatly increased.

Abrupt steering and braking must be avoided.

Track and wheeled vehicle drive train systems also are subjected to unusual operating stresses due to the build up and packing of snow and mud which freezes to sprockets, control rods, road wheels and brakes. Little traction is gained by track pad removal and increased pin and end connector wear occurs when alternate pads are pulled.

Track pads will not be removed for winter operations.

Rubber and plastic items are made brittle by lower temperatures. This is evidenced by seals leaking more often, shock absorbers seizing and road wheel and track pads being more susceptible to cracking and chunking.

Seals and other synthetic parts will be made brittle -- more subject to failure -- by low temperatures.

Cold affects many other things on equipment due to the contracting effect it has on most substances. Small engines for generators and similar equipment will have difficulty operating due to carburetor icing. Signal and power distribution cables will be brittle and attempts to unroll a coiled reel which has been stored outside during cold weather is likely to damage it.

Training to operate our equipment for fighting in the cold is a task which leaders can't postpone until the onset of winter weather.

Training to operate equipment in the cold has to stress use of the equipment operator's manual.

The soldiers must be trained in the special considerations and precautions that he must take to prevent injury to himself and others. Rocket launchers and recoilless weapons backblast distance is doubled under severe cold weather; tracking devices and weapons' sight eyepieces can freeze on contact with a man's face, a grenade may kill the thrower and those around him if he has attempted to throw it, and it has frozen to his hand or wet glove.

Gun barrels, launcher tubes and bare metal can stick to the skin or wet garment in sub-freezing temperatures.

Vehicle driver training is an area which must receive continuous emphasis. The driver's manual TM 21-305 contains fundamental driving information which must be understood by leaders and soldiers alike.

Three factors acting on a vehicle in motion -- momentum, traction, and inertia -- become critical when operating over slippery or potentially slippery surfaces as shown by Figure 18.

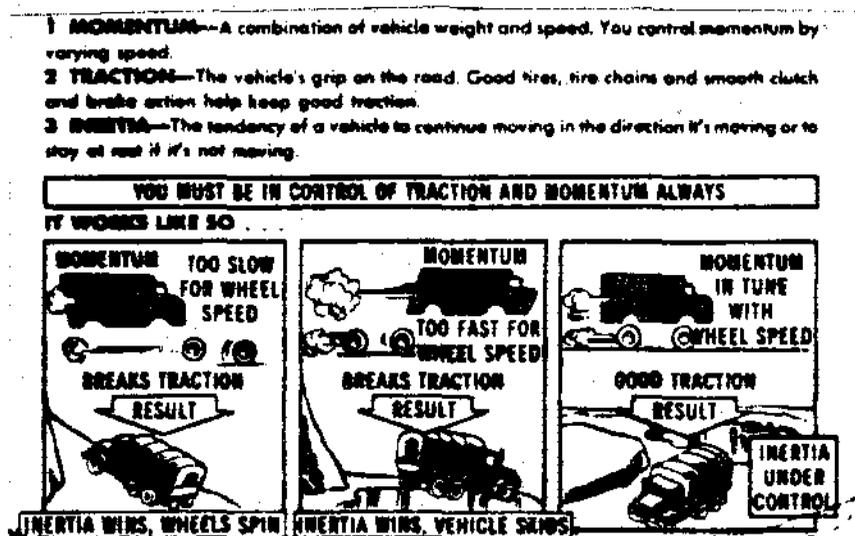


Figure 18. Relationship Between Momentum and Traction for Winter Driving

Operators must understand that a routine preventive measure can become critical under cold weather conditions. A frozen fuel system can result from the failure to drain a fuel filter daily. The same omission for the air distribution system can cause brakes to lock up, immobilizing the vehicle or causing loss of control if it was in motion.

Knowledge obtained by a leader's effective training program lowers the cost of operating equipment.

Saving a windshield by properly pre-heating the cab or saving an engine or transmission when correct idling procedures are used, means that scarce resources may be saved to support the battlefield. Cold weather vehicle operator training should routinely include the following general rules:

- Engines should be run below 1000 rpm until engine instruments read normal.

-- When moving out, the operator should use low range, check for dragging brakes and allow power train and gear boxes to warm up.

-- Do not idle diesel engines for prolonged periods of time after vehicle has completed its mission.

-- Vehicle drivers should be taught to properly load their vehicles for operating on snow and ice.

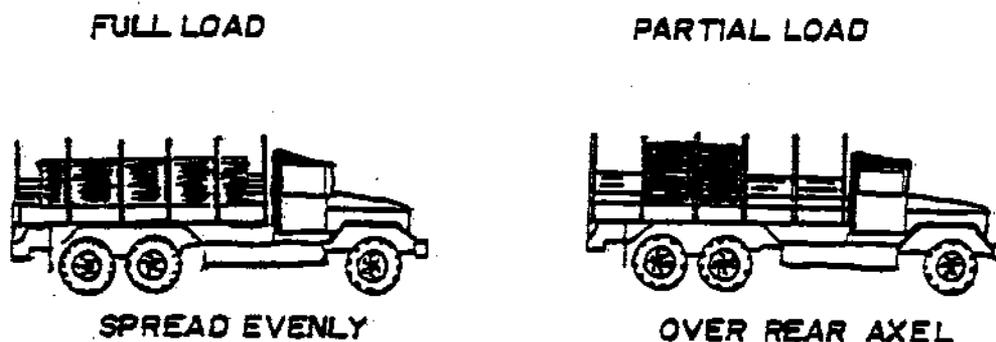


Figure 19. Cold Weather Vehicle Loading

③ Personnel Heater Management

OFFICER	NCO
DEVELOP A UNIT VEHICLE AND SPACE HEATER UTILIZATION PLAN THAT IS MUTUALLY SUPPORTIVE AND CONSERVES RESOURCES.	IMPLEMENT THE UNIT HEATER UTILIZATION PLAN CHECK TO INSURE THAT SOLDIERS ARE NOT SLEEPING IN VEHICLES, HEATED OR OTHERWISE.

**Heater Utilization.** As mentioned in the previous section, use of personnel heaters in combat vehicles represents a distinct tactical liability. 8ID ASICGRAM #003-79 clearly demonstrates operation of the crew heater in a tank produces a more highly visible thermal signature than a tank without heater. Commanders will develop a vehicle heater utilization plan which is integrated with their use of warming tents and buildings to warm and refresh their soldiers.

There are two key elements to be considered in the determination of whether a vehicle's heater is to be utilized or not. First is the observation threat to which the vehicle will be exposed; and second is the function the vehicle is to perform. Clearly, any frontline fighting vehicle using a heater increases its probability of being seen, even when camouflaged, by its radiation of thermal signature. Use of heaters in frontline vehicles increases the exposure of the leader and his force to the consequences of the axiom "If you can see it -- it can be hit -- if it can be hit -- you can kill it." Tankers, scouts and infantrymen exposed to direct fire weapons must dress for operations in unheated vehicles -- especially those who fight on foot. But some vehicles behind the FEBA should be heated, e.g., the manual dexterity of the personnel in an FDC track is important to their efficiency, and a heater there directly affects our fire support effectiveness. Likewise, use of heaters in armored ambulances and command posts is often necessary for mission accomplishment. It must be remembered, however, that after use of a heater, the heat signature is residual for many hours after the equipment has been used, so concealing a heated vehicle is harder.

The organization's heater maintenance program must dovetail into the utilization plan. Repair parts and repair effort should be discriminating, repairing only those heaters which the leader has designated to be operational and omitting those which will not be used. It follows naturally that a cannibalization policy should be formulated to address to what extent heaters or their parts, will be transferred to designated heated vehicles. The vehicles which require heat for personnel as part of their functional requirements such as FDC, armored ambulances and CP tracks will have their heaters turned off as a minimum of two hours prior to anticipated movement to positions which potentially may expose them to enemy detection.

The divisional policy for use of heaters is as follows:

<u>COMBAT</u>	<u>HEATER</u>
M60 tanks	No
M113 TOW	No
M113 FIST	No
M113 Squad Carriers	No
 <u>COMBAT SUPPORT</u>	
113 CP/FDC	Yes
577 CP	Yes
577 FDC	Yes
M109 How	No
M110 How	No
AVLB	No
CEV	No
 <u>SERVICE SUPPORT</u>	
113 Medic	Yes
577 Medic	Yes
M88	No
M578	No

Only those vehicles designated "Yes" on the previous page may OPERATE THEIR PERSONNEL HEATERS.

Leaders must not permit these heated vehicles to become warming or sleeping areas. Crew, squad or platoon warming tents should be provided for this purpose.

④ Battery Sustainment

OFFICER	NCO
DEVELOP A BATTERY MAINTENANCE AND CHARGING PLAN TO INSURE BATTERIES DON'T FREEZE.	SUPERVISE THE EXECUTION OF THE COMMAND BATTERY SUSTAINMENT PROGRAM.

Batteries, both vehicular and dry cell are critical in cold weather. They must be kept from freezing. For vehicle batteries, this is accomplished by periodic charging through the vehicle system. The vehicle charging cycle must be long enough so as to reduce the effects of equipment effect #8 (sludging lubricant). Dry batteries should be kept warm inside of clothing or stored where they will not become excessively cold. Never attempt to heat batteries on a stove or with any flame source — the batteries will explode. The only solution for a frozen battery is to let it thaw slowly indoors. Water should be added to a cold or discharged battery concurrently with charging to insure electrolyte mix and prevent layered freezing of the water.

Batteries need to be checked and serviced with the onset of cold weather. The Number One Common Automotive Tool Set authorized in every company sized unit, provides an optical tester for this purpose. Even a new battery can only muster 40% of its cranking ability at 0°F; and at 0°F it will freeze when the electrolyte declines to a specific gravity of 1.160.

<u>SPECIFIC GRAVITY READING</u>	<u>FREEZING POINT</u>
1.280	-90°F (-68°C)
1.250	-62°F (-52°C)
1.200	-16°F (-27°C)
1.150	+ 5°F (-15°C)
1.100	+19°F (-7°C)

Figure 20. Battery Reaction to Cold

Battery maintenance has been one of the division's weak points.

N.B. The average battery's life in the Division is less than half of its manufacturers stated life expectancy. This exceptionally high turnover trend is one that must be reversed. Ultimately, the lack of training and follow-up in this area will be paid for by denial of equipment for operation when faced with wartime supply constrictions.

To train operators in battery care, leaders should become familiar with TM 9-6140-200-14.



Slave starting should be accomplished following the procedures outlined in the equipment operator's manual. Slave receptacles are standard on some equipment, like tanks and personnel carriers. Other tactical vehicles get slave receptacles only as part of their winterization kits.

Slave cables are part of the Number One and Number Two Automotive Tool Sets. Newer equipment is being fielded with a NATO type single prong slave receptacle as an "interoperability" improvement. The new slave cable (NSN 2590-00-148-7961) is the one that units should order. This cable comes with an adapter which allows its use with older equipment which still has the two pronged receptacle. Clamp type cables (NSN 2920-00-027-0125) are authorized to units with M880 series vehicles.

The fabrication of a portable jump-starting outfit from a salvaged 2 1/2 ton truck battery box will aid motor pool and contact team starting hard starting vehicles.

Jump cables must be hooked up positive to positive and negative to negative on alternator charging systems, even a slight flash on a wrong post can burn out components.

While jump starting, you should keep the live vehicle running at 1200 rpm. Vehicles should be of similar battery configurations. For example, never try to slave a tank with four 6TN batteries from a 1/4 ton which has only two 2HN batteries. Slaving from a vehicle with a higher capacity electrical system is OK, but must be done with caution. A high capacity electrical system will cause the smaller batteries to explode if they are internally shorted or completely discharged.

All tactical and combat vehicles have a negative ground.

**BELIEVE IT!**

**⑤** Special Maintenance

OFFICER

NCO

REDUCE THE EFFECTS OF COLD WEATHER OPERATIONS ON EQUIPMENT BY PROVIDING FOR THE PERFORMANCE OF DAILY PREVENTIVE MAINTENANCE PROCEDURES.

CHECK SOLDIERS TO MAKE SURE THE DAILY EQUIPMENT CHECKS AND SERVICES ARE PERFORMED.

When it comes to equipment preparation for cold weather operations, the operator's and organizational maintenance manuals are the keys to success.

Antifreeze testing and servicing should be done in the fall to preclude damage when the first cold snap hits. But testing will only confirm the leader's knowledge that his equipment will be damaged if he had not previously forecasted and requested antifreeze requirements. The temperature protection desired is also a required planning consideration.

ETHYLENE GLYCOL PROTECTION GUIDE (ANTIFREEZE)	
<u>PROTECTION DESIRED</u>	<u>PINTS OF ANTIFREEZE NEEDED PER GALLON OF WATER</u>
+20°F (-7°C)	1 1/2
+10°F (-12°C)	2
0°F (-18°C)	2 3/4
-10°F (-23°C)	3 1/4
-20°F (-29°C)	3 1/2
-30°F (-34°C)	4
-40°F (-40°C)	4 1/4
-50°F (-46°C)	4 1/2
-55°F (-48°C)	4 3/4

Figure 21. Antifreeze Protection Guide

In mixing antifreeze, the adage "If some is good then more is better" will only hold true as charted above. The reason is that too much antifreeze in the mixture will cause the protection level to regress.

The lubrication order (LO) is also an important publication in preparing your equipment for cold weather operations. Here can be found the lubrication specifications for the equipment needed to operate in different temperature ranges. The LO, however, is not all-encompassing; for example, condensation and fuel dilution will turn oil to sludge at a much faster rate. Condensation will also affect differentials, transmissions, and transfers requiring periodic draining between regular lube services.

Leaders must train equipment operators in special procedures for cold weather operations -- READ THE TECHNICAL MANUAL.

Exhaust systems can be neglected in warm weather with little danger of personnel injury; not so when cold weather sets in and vehicles are operated with windows and hatches closed. A faulty exhaust system under the latter condition becomes a killer. There is no guarantee of a leak-free exhaust system. Therefore, leaders must insure that there is no sleeping in any vehicle.

Vehicle fuel burning heaters should have increased attention to tight exhaust couplings and be used only with an adequate ventilation source. Don't take chances, operate your vehicle with a window or hatch cracked open.

Additionally, maintenance of equipment for cold weather operations will be oriented towards preventive measures. Batteries have already been discussed, but there are other measures to be taken to prevent the fourteen effects of cold weather. Leaders must schedule specific equipment maintenance periods. These will be used to clear intakes, gear boxes, breathers and vents of snow and mud. Coolant checks are particularly critical in the M113 series vehicles since low levels will cause engine block cracking. Filters and air systems will be drained daily during this maintenance period and immediately after shutdowns.

Preventive maintenance in cold weather has to be applied during all operational phases. A specific case in point is the positioning of vehicles; tanks and trucks will not be parked in water or soft mud in freezing conditions. However, if no alternate position can satisfy the tactical requirements, then the surface must be prepared by laying down branches, brush, or other suitable bedding material to prevent track or tires from being frozen fast to the ground.

When maintaining equipment in the cold, leaders should be particularly careful to enforce Pathfinder Soldier Policy for Winter Operations Number Three -- Buddy Teams. A soldier intent on his work may be careless in checking himself for frostbite or other cold injury symptoms.

Recovery operations become much more difficult under cold weather conditions.

Vehicles used to extract other equipment become less effective as ground surface conditions worsen, and men operating in harsh conditions lose their efficiency. Draw bar pull, which is normally expressed as percentage of a vehicle's weight in pounds, is the force available for towing after subtracting resistance losses. Figure 22 shows the loss in capability caused by winter conditions.

Turf	35%
Gravel	53%
Packed Clay (best)	75%
Snow	25%-40%
Ice (worst)	35%-50%

Figure 22. Maximum Draw Bar Pull for Track and Wheeled Vehicles

It can be readily seen, then, that to extract a tank which weights 97,000 pounds, it could take as many as four other tanks or M88 recovery vehicles (112,000 pounds), assuming the worst case on snow or ice without applying some method of increasing the mechanical advantage of the vehicle being used for recovery.

Soldiers training to maintain in the cold must be made to prepare their work area. Neglecting to put down an insulating tarp or some sort of ground cover is an invitation to injury.

Leaders should place emphasis on the preventive aspects of maintenance in their training programs. Clean breathers and intakes of snow and slush; dry brakes after they are driven through water to prevent them from freezing. Check for fuel or water in the oil during normal pre-operational checks. All of these will prevent equipment break downs or damage. When attempting to start a cold vehicle, an operator can burn up a starter or a battery through continual cranking. Water in an antenna matching unit which freezes will burn out its electric motor. -- Burn, in cold weather? -- Yes, by fusing the internal parts.

Damage to equipment does not have to be only cold weather damage because the temperature is low -- heat damage due to lack of lubrication or overloading can be induced by these conditions.

Use of petroleum derivatives and alcohol based fluids present special hazards to maintenance personnel using them. These liquids have, on the whole, very low freezing points. The leader then should visualize the potential for injury of a POL handler who spills MOGAS on himself that has reached a temperature of say  $-5^{\circ}\text{F}$  or  $-10^{\circ}\text{F}$  -- result -- instant -- severe injury. The same applies to handling of antifreeze compounds for cooling and fuel systems.

Protective clothing for maintenance personnel -- gloves, goggles and coveralls -- are even more important in cold weather.

As mentioned previously, soldiers are our most valuable asset. You cannot trade them off for equipment -- they are your equipment availability.

⑥ Cold Weather Gear

OFFICER

NCO

FURNISH TO UNITS THE COLD WEATHER EQUIPMENT AND CONSUMABLES NECESSARY.

INSPECT EQUIPMENT AND SOLDIERS TO INSURE THAT THEY HAVE THE NECESSARY ITEMS TO ACCOMPLISH THEIR MISSION.

Food, clothing, fuel, antifreeze, and protective equipment must be provided to the soldier if we are to train and fight in the cold. The officer must plan to insure supplies will be there when needed. The NCO must check to see that his soldiers receive and use them. Both must insure that they aggressively replace them. Without this effort we will not have the staying power necessary to accomplish our mission. As pointed out in the foregoing section, satisfactory support in terms of food as well as ammunition, in terms of clothing as well as repair parts has to be balanced by the leader. A cold injured soldier is an ineffective weapon/equipment user. A neglected weapon is of little use to a comfortable soldier. The leader must provide for support of an integrated man/weapon system.

The onset of cold weather is no time to be scurrying around to see what is on hand in order to get by. The effective leader will have planned his needs.

Authorization for heaters (as modified by the divisional Personnel Heater policy), closure kits, and cold weather aids are outlined in SB 9-16.

Vehicle tire chains are listed in the respective parts manuals (-20 p TM). More importantly, the chains used last winter should be checked and repaired by fall. If they have not been, the result could be broken axles or damaged brakelines. Such is an accident hazard as well as exposing soldiers to cold injury.

#### CROSS CHAIN REPLACEMENTS

<u>TIRE SIZE</u>	<u>CHAIN NSN</u>	<u>CROSS CHAIN NSN</u>
7.00 x 16	2540-00-177-7235	2540-00-933-6916
9.00 x 16	2540-00-933-9026	2540-00-933-9616
9.00 x 20	2540-00-933-9024 (single)	2540-00-933-6916
	2540-00-933-9030 (dual)	2540-00-933-6916
11.00 x 18	2540-00-933-6933	2540-00-933-6915
11.00 x 20	2540-00-933-9022 (single)	2540-00-933-6915
	2540-00-933-9599 (dual)	2540-00-933-6915
12.00 x 20	2540-00-933-6922 (single)	2540-00-933-6915
	2540-00-933-6917 (dual)	2540-00-933-6915
14.00 x 20	2540-00-933-9033 (single)	2540-00-933-6992
	2540-00-933-6928 (dual)	2540-00-933-6992
14.00 x 24	2540-00-933-9023 (single)	2540-00-933-6992
	2540-00-933-6929 (dual)	2540-00-933-6992
16.00 x 20	2540-00-933-6937	2540-00-933-6914

The need to identify vehicles or other equipment which do not have slave receptacles is an important planning requirement, as discussed in Equipment Policy #4 -- Battery Sustainment. Only certain tactical equipment, such as tanks, have slave receptacles as standard equipment.

Repair parts for winter operation, in addition to tire chains, should be identified well in advance. Demand history for the previous winter is the best guide; especially for cold weather unique parts usage. The past twelve months demand history is readily available on the Demand History Printout provided quarterly by the DMMC to your PLL clerk.

The leader's requirement for DX stocks of clothing outlined in the previous section is another element to be considered in forecasting. Provisions to carry soldiers' additional clothing in the company support element or battalion trains should be planned.

When operating in the cold, leaders should anticipate increased POL requirements.

The various types of water, space and vehicle heaters available to units will consume increased amounts of fuel when operating under severe cold weather. The colder the environment, the more heating equipment will have to operate at higher settings or for longer periods to raise air or water temperatures to usable temperatures. Fuel consumption will also be raised by the increased power requirements of our AFV and tactical vehicles to propel themselves through snow, slush and mud. The deeper a vehicle sinks into a soft surface, the more power it will require to propel it.

Fuel consumption can rise by as much as 25% for vehicles operating in deep snow, slush, or mud -- S-4's and support platoon leaders take note!

Camouflage is the next area leaders should concern themselves with. With the advent of winter, the standard winter US and Europe -- verdant pattern will not provide white camouflage to blend into a snow background. While the Army does have a removable white camouflage paint, it is unsatisfactory because it freezes at 32°F which would require heated storage during cold weather operations. Available through the facility engineer is a suitable expedient whiting, chalk dry powder (whitewash) (NSN 8081-00-V52-6045). The whitewash can be obtained in 25 kg bags and the engineer warehouse at Giessen normally stocks sufficient quantities to meet any requirement that a divisional size unit could place on it.

Camouflage screens are starting to be produced in snow and arctic blend configuration. These, however, will be in limited supply for some time (5,000 Army-wide during FY 79). The only units that could present a strong case for them would be those which must occupy positions totally devoid of vegetation and other structures which would aid concealment.

The woodland screen can be adapted for the snow environment by garnishing it with white cloth obtained from salvage sheets of mattress covers. An additional consideration when determining camouflage screen requirements is discriminating between the need for radar transparent and radar scattering type screens. This, of course, will be driven by the type of equipment being covered. An emitter cannot be effectively camouflaged by a radar scattering screen since the antenna would have to be outside the net.

Ingenuity and expediency must be substituted for the lack of just the right item.

To improve individual positions, cold weather brings a useful material. Figure 8 indicates how snow material can provide protection from small arms and fragments. Sand and gravel aggregate mixed with water can be used to make iccrete blocks for overhead cover and improved fighting positions. The detailed procedures are outlined in FM 5-15.

⑦ Prior Planning

OFFICER	NCO
<p>PREPARE COLD WEATHER LOAD PLANS FOR THOSE CONTINGENCY ITEMS THE UNIT WILL NEED.</p>	<p>PACK COLD WEATHER CONTINGENCY EQUIPMENT AND SUPPLIES AND INSURE INVENTORIES AND SERVICEABILITY INSPECTIONS ARE CONCERNED.</p>

Leaders need to be prepared to deploy and fight in the cold. The identified cold weather unique items should be on hand and prepacked in a company cold weather pack. This prepack must be organized into platoon, squad, and section sub-packs which allow rapid and uncomplicated distribution. The unit should have 15 days of ration heat tablets, candies, dehydrated soup and quantities of over-white camouflage clothing, whitewash, sheet or mattress cover garnishing, food service disinfectant in their prepacks. These are to be considered minimum requirements. Items which are used all year round such as tentage, camouflage screens, and space heaters will remain part of the unit's overall loading scheme. The leader will review his own plan to see that it supports his compliance with the 8th Division's policies for winter operations.

Deployment to fight in the cold should be planned for. The items listed in Figure 23 are some recommended for prepack loads.

<u>PRESTOCK COLD WEATHER EQUIPMENT</u>
HEAT TABLETS
CANDLES
DEHYDRATED SOUP
CAMOUFLAGE OVERWHITES (AS REQUIRED)
WHITEWASH
WHITE CAMOUFLAGE MATERIAL
FOOD SERVICE DISINFECTANT
SPACE HEATER SPARE PARTS

Figure 23. Prestock Cold Weather Equipment List

Packaging in platoon, squad or section prepacks, depending on the unit's plan, will allow for rapid and less complicated distribution.

As mentioned in earlier sections, S-4's and support platoon leaders should review basic load requirements to insure added quantities of fuel, alcohol, antifreeze, and other items whose consumption can be expected to increase are forecasted. When assembling prepack and basic load supplies, the S-4's and unit supply personnel should insure inventory and shelf life review procedures are incorporated into SOP's.

Prepack configurations should be designed to conform to standard pallet dimensions and incorporated into loading plans to allow for rapid deployment upload from unit storage locations. If upload storage is opted for, commanders are enjoined to take security measures which will be adequate in terms of safeguarding their property.

⑧ Train and Evaluate

OFFICER

NCO

INTEGRATE COLD WEATHER TRAINING INTO THE UNIT'S PROGRAM FOR COLD WEATHER OPERATIONS INSURING EVERY WINTER DAY PREPARES THE UNIT TO WIN IN THE COLD.

CONDUCT TRAINING AND EVALUATE SOLDIERS FREQUENTLY. CHECK FOR COMPLIANCE WITH THE COLD WEATHER LOGISTICS INSTRUCTION EMPHASIZING EQUIPMENT COLD WEATHER POTENTIAL PROBLEMS, AND PROPER OPERATION OF GEAR IN THE COLD.

This policy is a duplicate of the one promulgated in Chapter 4. Of necessity it must be. Our failure to train in the logistics of winning in the cold is no less important. During garrison operations in winter, every opportunity to practice cold weather procedures should be taken. Scheduling of training should be concurrent with equipment preparation for winter operations. As in the operational areas, the NCO and the junior officer must know his equipment, his soldiers, his logistics requirements, and what must be done to support both of these. To meet the Division's training standard for winter operations during exercises, leaders must provide positive direction to their soldiers. Insuring that this is accomplished, and that he and his men are equal to the challenge of both the enemy and the elements, will test our leaders to the very limits of their mental and physical endurance.

APPENDIX I

Weather Reference Data

Tab A Humidity Data For Forward Area

Sample Charts from Climatology Handbook for V Corps Forward Areas

Tab B Visibility Chart for Any January

Tab C Gale Winds for Any Year

Tab D Ground Conditions for Any January

Tab E Snow Depth for Any Year

Tab F Mean Monthly Temperatures

HUMIDITY DATA - 8TH LD FORWARD AREA													
GROUND ELEVATION	AVERAGE PERCENT RELATIVE HUMIDITY												
	J	F	M	A	M	J	J	A	S	O	N	D	ANNUAL
ALL ELEVATIONS	88	86	79	75	75	76	76	77	82	85	88	89	81
UP TO 349 METERS	85	82	77	73	73	74	74	77	79	83	85	86	79
350-699 METERS	90	87	81	76	75	76	75	78	82	85	90	90	92
ABOVE 700 METERS	91	90	81	77	77	80	79	77	86	87	92	92	86

Provided by Det 12, 7th Wea Sq  
26 October 1978

AF FORM 3134  
SEP 77

GENERAL PURPOSE (104" X 3")

U.S. G.P.O. 26-7301/1379

VISIBILITY CHART FOR V CORPS FORWARD AREAS DURING JANUARY

HOURS OF THE DAY (LOCAL TIMES)	IF YOUR ELEVATION ABOVE SEA LEVEL IS IN ONE OF THE FOLLOWING THREE CATEGORIES YOU CAN EXPECT GROUND VISIBILITIES IN YOUR AREA TO BE AS SHOWN AT LEAST <u>90%</u> ( <u>80%</u> ) OF THE TIME*					
	UP TO 349 METERS		BETWEEN 350-699 METERS		ABOVE 700 METERS	
2300 - 0159	2200 (4700)	1100 (1800)	**	(**)	**	(**)
0200 - 0459	1800 (2200)	** (1100)	**	(**)	**	(**)
0500 - 0759	1100 (1800)	** (600)	**	(**)	**	(**)
0800 - 1059	1100 (1800)	600 (1100)	**	(**)	**	(**)
1100 - 1359	1800 (2200)	1100 (2200)	**	(**)	**	(**)
1400 - 1659	1800 (2200)	1100 (3700)	**	(**)	**	(**)
1700 - 1959	2200 (2200)	1100 (1800)	**	(**)	**	(**)
2000 - 2259	3700 (4700)	1100 (2200)	**	(**)	**	(**)

EXAMPLE: Your ground elevation is 600 METERS; LOCAL TIME IS BETWEEN 1000 AND 1359; YOUR GROUND VISIBILITY SHOULD BE 1100 METERS OR MORE AT LEAST 90% OF THE TIME, OR 2000 METERS OR MORE AT LEAST 80% OF THE TIME.

\* WEATHER FACTORS SUCH AS FOG AND HAZE DETERMINE GROUND VISIBILITIES. DURING THE DAY YOU CAN EXPECT TO SEE OUT TO THE DISTANCES INDICATED. AT NIGHT YOU MUST USE NIGHT VISION DEVICES TO SEE THAT FAR.

\*\* DATA TO OBTAIN EXACT DISTANCES IS NOT AVAILABLE. HOWEVER, THE DISTANCE TO WHICH YOU CAN EXPECT TO SEE EITHER 90% OR 80% OF THE TIME WILL BE LESS THAN 600 METERS.

TAB B

GALE WINDS IN V CORPS FORWARD AREAS DURING THE YEAR

MONTH	DETERMINE YOUR ELEVATION. THE FIGURES UNDER THAT COLUMN SHOW THE NUMBER OF DAYS THAT YOU CAN EXPECT GALE WINDS DURING THE MONTHS IN THE LEFT COLUMN.		
	UP TO 349 METERS	BETWEEN 350-699 METERS	ABOVE 700 METERS
JANUARY	1	4	7
FEBRUARY	1	4	5
MARCH	0	4	5
APRIL	0	3	4
MAY	0	2	2
JUNE	0	1	3
JULY	0	2	4
AUGUST	0	2	2
SEPTEMBER	0	4	4
OCTOBER	1	4	8
NOVEMBER	0	3	5
DECEMBER	0	3	5

EXAMPLE: YOUR ELEVATION IS 710 METERS, AND THE MONTH IS OCTOBER. YOU CAN EXPECT GALE WINDS TO OCCUR 8 TIMES DURING THE MONTH.

GALE WINDS ARE GENERALLY DESTRUCTIVE IN NATURE AND CAN SOMETIMES BLOW TREES OVER. THEY CAN BE EXPECTED ALSO TO BLOW TENTS, ANTENNAS, AND OTHER LIGHT CONSTRUCTION FACILITIES DOWN UNLESS THESE THINGS ARE EXCEPTIONALLY WELL SECURED. IN ADDITION, IT NORMALLY IS NOT POSSIBLE TO FLY HELICOPTERS/LIGHT AIRPLANES DURING GALE WINDS.

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TAB C

GROUND CONDITIONS FOR V CORPS FORWARD AREAS DURING THE MONTH OF JANUARY

	DETERMINE YOUR ELEVATION ABOVE SEA LEVEL. FIGURES UNDER THAT COLUMN SHOW THE NUMBER OF DAYS THE CONDITIONS IN THE LEFT COLUMN ARE EXPECTED TO EXIST DURING THE MONTH. THE FIRST FIGURE IS THE NUMBER OF DAYS THE CONDITION EXISTS AT 0600Z AND THE FIGURE IN PARENTHESIS IS THE NUMBER OF DAYS THE CONDITION EXISTS AT 1800Z.					
	UP TO 349 METERS		BETWEEN 350-699 METERS		ABOVE 700 METERS	
Dry	1	(2)	0	(1)	1	(0)
Moist or Wet	14	(17)	9	(11)	2	(3)
Bare and Frozen	7	(4)	4	(2)	1	(1)
Ice, Slush, Snow or Glaze	9	(8)	18	(17)	27	(27)

EXAMPLE: YOUR GROUND ELEVATION IS 400 METERS. YOU CAN EXPECT DRY CONDITIONS 0 DAYS OF THE MONTH AT 0600Z, AND 1 DAYS OF THE MONTH AT 1800Z. (CONTINUE DOWN THE COLUMN FOR THE REST OF THE CONDITIONS).

AS A RULE, DRY CONDITIONS NORMALLY INDICATE FAVORABLE CONDITIONS FOR BOTH TRACK AND WHEEL VEHICLES. MOIST OR WET GROUND USUALLY INDICATES UNFAVORABLE CONDITIONS, ESPECIALLY DURING FALL, WINTER, AND SPRING.

GROUND THAT IS FROZEN SEVERAL INCHES, AND GROUND THAT IS COVERED WITH AT LEAST SEVERAL INCHES OF SNOW ARE USUAL INDICATORS OF FAVORABLE CONDITIONS FOR TRACK VEHICLES AND WHEEL VEHICLES WITH CHAINS.

MEAN NUMBER OF DAYS WITH SPECIFIED SNOW DEPTHS ON THE GROUND IN  
V CORPS FORWARD AREAS

MONTH	SNOW DEPTHS		
	1.0 IN OR MORE	6.0 IN OR MORE	10.0 IN OR MORE
JAN	23	7	2
FEB	19	9	6
MAR	9	2	1
APR	1	0	0
MAY	0	0	0
JUN	0	0	0
JUL	0	0	0
AUG	0	0	0
SEP	0	0	0
OCT	0	0	0
NOV	4	0	0
DEC	11	1	0

NOTE: SNOW DEPTHS INDICATED ABOVE ARE MOST RELIABLE FOR INTERMEDIATE ELEVATIONS (350-699 METERS). FOR LOCATIONS WHERE THE ELEVATION IS LESS THAN 350 METERS AND TEMPERATURES ARE GENERALLY WARMER, ONE CAN EXPECT LESS SNOWFALL AND CONSEQUENTLY FEWER DAYS WITH SNOW ON THE GROUND. FOR LOCATIONS WHERE THE ELEVATION IS GREATER THAN 699 METERS AND TEMPERATURES ARE GENERALLY COOLER, ONE CAN EXPECT MORE SNOWFALL AND CONSEQUENTLY MORE DAYS WITH SNOW ON THE GROUND.

TAB E

MEAN MONTHLY TEMPERATURES FOR V CORPS FORWARD AREAS

MONTH	TEMPERATURES (°F)	
	MEAN DAILY MAXIMUM	MEAN DAILY MINIMUM
JAN	32	26
FEB	34	25
MAR	42	31
APR	50	36
MAY	59	43
JUN	65	49
JUL	68	51
AUG	67	51
SEP	60	46
OCT	53	40
NOV	39	31
DEC	34	28

NOTE: TEMPERATURES INDICATED ABOVE ARE MOST REPRESENTATIVE OF INTERMEDIATE ELEVATIONS (350 - 699 METERS). FOR LOCATIONS WHERE THE ELEVATION IS LESS THAN 350 METERS TEMPERATURES 3 - 5 DEGREES WARMER CAN BE EXPECTED. FOR LOCATIONS WHERE THE ELEVATION IS GREATER THAN 699 METERS TEMPERATURES 3 - 5 DEGREES COOLER CAN BE EXPECTED.

TAB F

## APPENDIX 2

### Cold Weather Procedures

Tab A	M60 Tank Family
Tab B	M113 Family
Tab C	M109 Howitzer
Tab D	Cargo Trucks

## TAB A

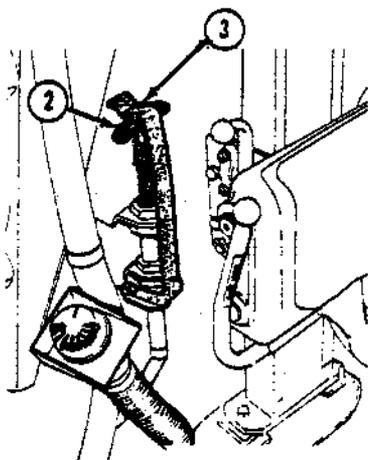
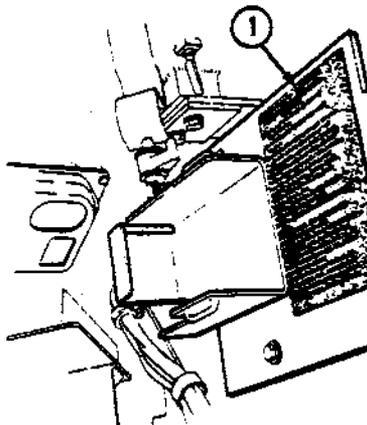
### Cold Weather Procedures

#### M60 Tank

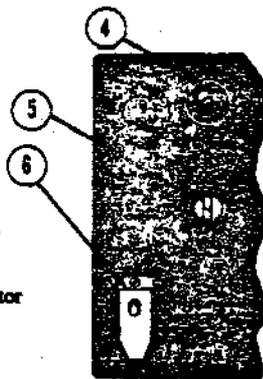
1. Listed below are the seventeen steps for starting the M60 tank — extracted from TM 9-2350-257-10.

#### STARTING THE ENGINE

1. Plate (1) is a list of warnings and instructions you must be aware of prior to starting the engine. Where necessary, more details are provided in the following instructions.
2. Apply parking brake.
3. Close crew and engine compartment drain valves.



4. Push MANUAL FUEL shutoff handle (2) down and lock with spring clip (3).

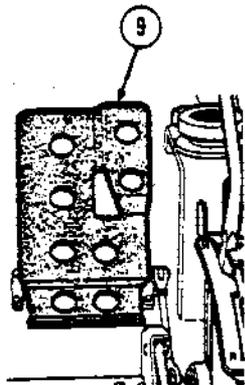
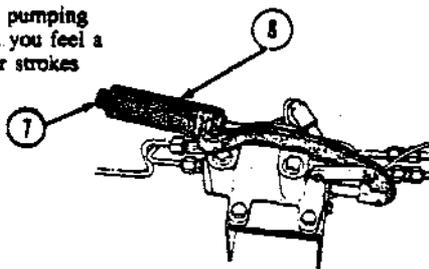


5. Turn OFF all electrical switches except FUEL PUMPS and HEATER MASTER.
6. Set MASTER BATTERY switch (5) to ON. Indicator (4) will light.
7. Set FUEL PUMPS switch (6) to ON, if it is off.

## STARTING THE ENGINE --- Continued

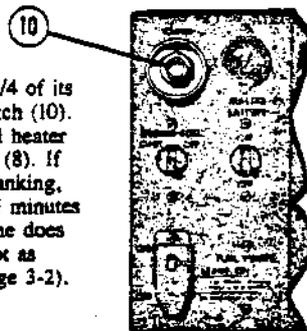
8. If engine has not been operated for a week or more, proceed with step 9. If engine has been operated within a week, skip step 9 and proceed with step 10. For cold weather starting, skip step 10.

9. Purge air from fuel lines by pumping purge pump handle (8) until you feel a back pressure. Three or four strokes should do it.



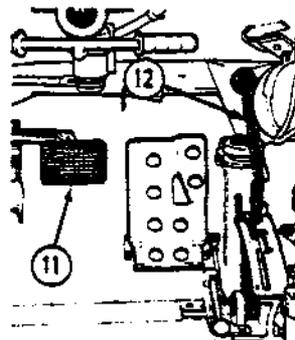
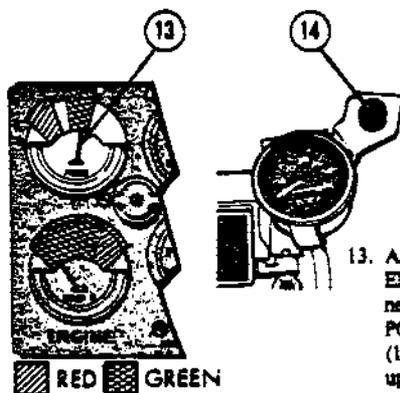
10. Press accelerator pedal (9) about 2/3 to 3/4 of its travel and press and hold STARTER switch (10). When engine starts, release STARTER switch and proceed to step 13. If engine does not start after 15 seconds cranking, release STARTER switch and wait 3 to 5 minutes before you attempt another start. If engine does not start after the second try, troubleshoot as specified in the troubleshooting table (page 3-2).

11. Press accelerator pedal (9) about 2/3 to 3/4 of its travel and press and hold STARTER switch (10). While engine is cranking, press manifold heater switch (7) and pump purge pump handle (8). If engine does not start after 15 seconds cranking, release STARTER switch and wait 3 to 5 minutes before you attempt another start. If engine does not start after the second try, troubleshoot as specified in the troubleshooting table (page 3-2).



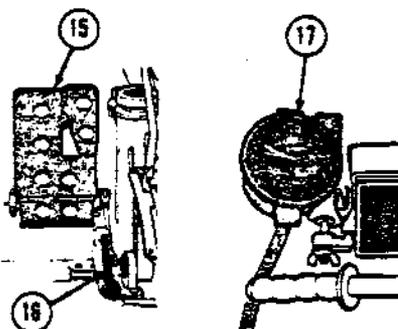
## STARTING THE ENGINE — Continued

12. If engine starts and runs on only one bank, hold brake (11) and load engine with transmission by shifting (12) to H to start the other bank.



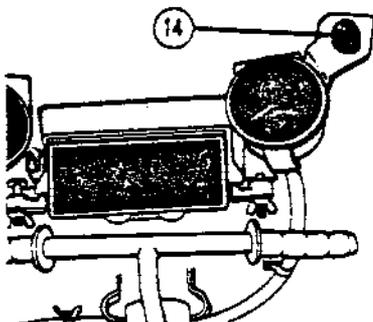
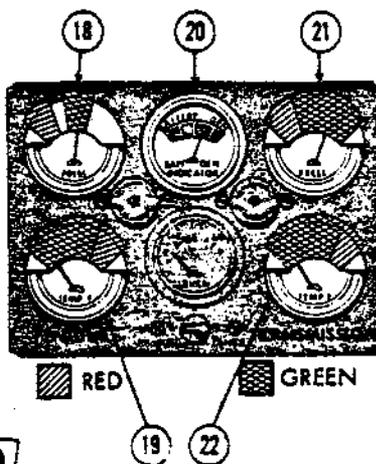
13. As soon as engine starts, check that ENGINE OIL PRESSURE indicator needle (13) is in the green area and POWER PLANT WARNING LAMP (14) is OFF. If oil pressure does not come up, shut off engine and troubleshoot (page 3-3).

14. Press accelerator pedal (15) until tachometer (17) indicates 1,000 to 1,200 rpm; then pull up lock lever (16) to lock accelerator. Let engine warm up for at least 3 minutes. Do not accelerate engine beyond warm up speeds. For cold weather starts, let engine warm up for 3 to 5 minutes at 1,200 to 1,800 rpm. If engine is to be idled for an extended period, a high idle (1,000 to 1,200 rpm) will be required to prevent smoking.



**STARTING THE ENGINE — Continued**

15. Check that indicators are as follows:
  - a. ENGINE OIL indicators (18) and (19): green area.
  - b. BATTERY-GENERATOR indicator (20): green area.
  - c. TRANSMISSION OIL indicators (21) and (22): green area.
  - d. POWER PLANT WARNING LAMP (14): Off.



16. If POWER PLANT WARNING LAMP (14) lights during vehicle operation, check engine and transmission indicators (18), (19), (21), and (22) to determine whether engine or transmission is at fault. Stop engine and troubleshoot (page 3-3).

17. If the BATTERY-GENERATOR indicator needle is in the yellow or left red area, the alternator is not charging. Stop engine and troubleshoot (page 3-4).



18. If the BATTERY-GENERATOR indicator is in the right red area, the alternator is overcharging. Notify organizational maintenance.

2. Operating Engine. Normal engine idle speed is not sufficient to support complete combustion in the cylinders. When an engine is allowed to idle for extended periods at low ambient temperatures, the engine becomes over-cooled. This results in erratic idling caused by one or more cylinders not firing. Thus, unburned fuel washes down the cylinder wall which impedes normal cylinder lubrication. Poor idling can be evidenced by excessive blue and white exhaust smoke and the presence of raw fuel on the rear access grill doors.

3. Vehicle Operation in Snow. It may be possible to ride heavily crusted snow with only occasional breakthroughs. To climb back onto the crust, reduce engine speed and move transmission shift lever for forward movement without slippage. Avoid steep grades. Drive tank as nearly straight up and down as possible to equalize track load. Avoid sharp turns, ruts and snow banks. For soft or fine snow, place transmission shift lever in L (low) to obtain best traction.

4. Vehicle Operation on Ice. Select proper transmission range and speed to move the tank slowly and steadily. If skidding occurs, decelerate engine and proceed with caution.

5. One Track Spinning. To move a tank that has one track on solid ground and the other spinning in mud or on ice, apply steering action to the spinning track. This will stop the differential action and cause power to be transmitted to both tracks. If one track is on solid ground, it will move the vehicle. As soon as the effect of steering is felt and the vehicle begins to turn, return the steering to straight ahead.

6. At Halt or Parking. In ambient temperatures of plus 45°F (7°C) to -25°F (-24°C), perform the following procedures:

a. Refuel as soon as possible to prevent condensation from accumulating in fuel tanks.

b. When halted for short shutdown periods, if possible, park the tank in a sheltered spot out of the wind. If no shelter is available, park so that the tank faces into the wind. For long shutdown periods, if high, dry ground is not available, prepare a footing of planks or brush for the tank. Chock tank in place if necessary.

c. When preparing a tank for a shutdown period, stop engine and place the transmission shift lever in P (Park) position so that, if the transmission shifting systems become stiff, the engine can be started.

d. Additional precautions include, but are not limited to:

(1) Cover inlet grill doors and exhaust doors during heavy snow or sleet. This will help retain heat and will help prevent water freezing in the engine compartment.

(2) Open driver's compartment and engine compartment drain valves to drain any melted snow or ice from the hull while engine heat is present.

(3) Clean mud, snow and ice from the track and suspension as soon as possible after halt.

(4) To prevent freezing of linkage, do not apply parking brake; use chocks.

8. Air Cleaner Intake Reversal. In the event of impending CBR attack or CBR operations, air should be drawn from the engine compartment.

9. Operating the 105mm Gun. Check the first few rounds fired through a cold gun for frost or ice, especially around the primer. This could prevent grounding of the firing circuit and cause a misfire. Condensation may also collect and freeze in the breech, in and around the firing pin and prevent a complete circuit. If condensation appears, be sure to dry the firing circuit.

10. Combination Gun Mount. Be particularly observant of the recoil mechanism during firing. If the 105mm gun hangs out of battery, do not operate the mechanism and immediately report it. Observe the replenisher indicator tape. Sometimes extreme cold will cause the replenisher piston to seize and present false readings.

M113 Series Vehicles

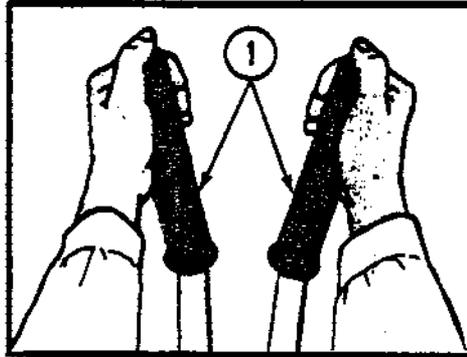
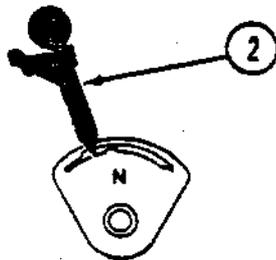
1. Listed below are the fourteen steps for starting the M113 series vehicles in temperatures below +40°F and the four steps for starting the M113 series vehicles in temperatures below -25°F — extracted from TM 9-2300-257-10.

**STARTING ENGINE (BELOW +40°F)**

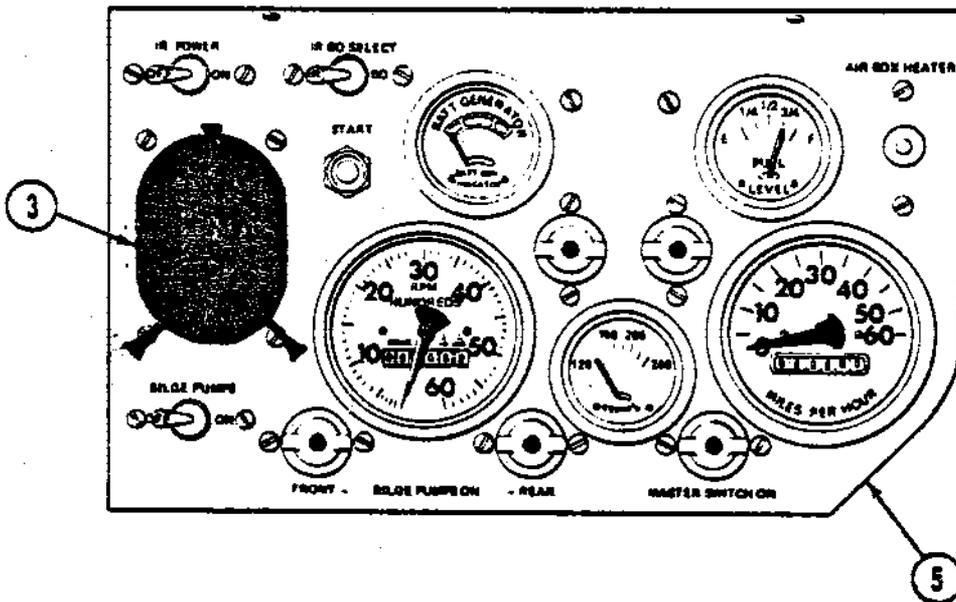
**NOTE**

If the temperature is below -25°F, you have to follow special procedures to get the engine ready before you start it. See page 2-88 for those special procedures. Then use this procedure to start the engine.

- 1 Do the B preventive-maintenance checks and services (pages 2-22 through 2-35).
- 2 Lock the brakes (1) and set the shift lever (2) in N range.



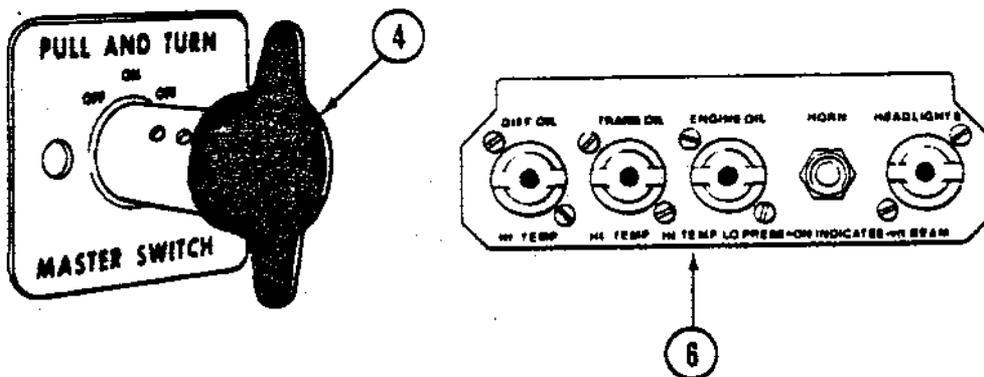
- 3 Make sure the driving lights switch (3) is OFF.



TM 9-2300-257-10

### STARTING ENGINE (BELOW +40°F)

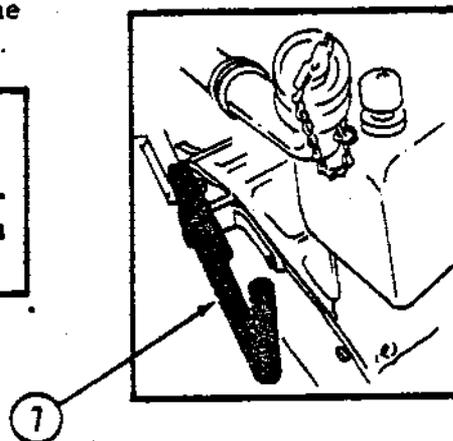
- 4 Turn the master switch (4) ON and check the instrument panel (5) and warning light panel (6). The panels should look like the pictures on page 2-81 and below.



- 5 Remove the engine access panel next to the driver's seat and disengage the engine disconnect (7). Lift the lock on the control handle and push the handle in as far as it will go. This disconnects the engine from the rest of the power plant, so the starter does not have to work so hard.

**CAUTION**

Never try to move the engine disconnect handle when the engine is running.

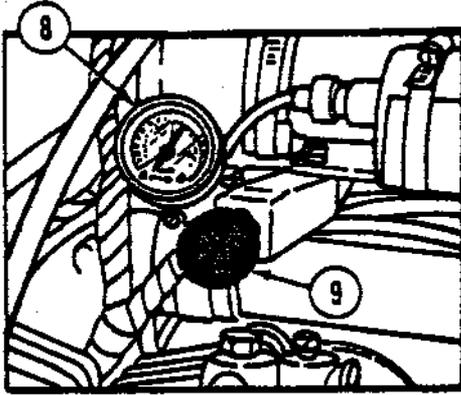


## STARTING ENGINE (BELOW + 40°F)

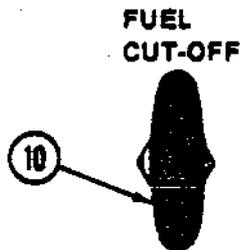
- 6 Use the airbox heater to preheat the air going into the engine while you start the engine:

If your carrier has an airbox heater accumulator with gage and manual pump, do this:

- A — Make sure the accumulator gage (8) reads in the yellow zone. Add pressure with the hand pump (9) if pressure is down. Don't raise the pressure too high: you could pop the accumulator diaphragm.



- B — Install the driver's access panel.  
C — Make sure the fuel cutoff (10) is pulled out.



If your carrier has an airbox heater with electric air pump, do this:

- A — Install the driver's access panel.

## STARTING ENGINE (BELOW +40°F)

Carrier with airbox heater accumulator, gage, and pump:

D — Hold the airbox heater switch (11) ON for a second or two, then let it go OFF again.

E — Press in the START switch (12) and hold it for about 5 seconds, then release it.

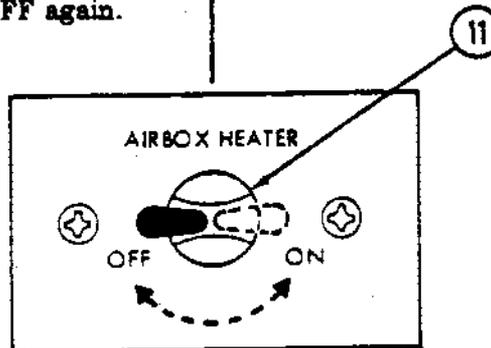
F — Push in the fuel cutoff (10).

G — Press and hold the START switch (12) while you turn the airbox heater switch (11) ON and OFF. Hold the airbox heater switch ON for about 1 second, then leave it OFF for about 2 seconds.

Carrier with airbox heater electric air pump:

B — Push in the fuel cutoff (10).

C — Press and hold the START switch (12) and hold the airbox heater switch (11) ON at the same time.



START



FUEL CUT-OFF



## STARTING ENGINE (BELOW +40°F)

Carrier with airbox heater accumulator, gage, and pump:



300 - 350 RPM

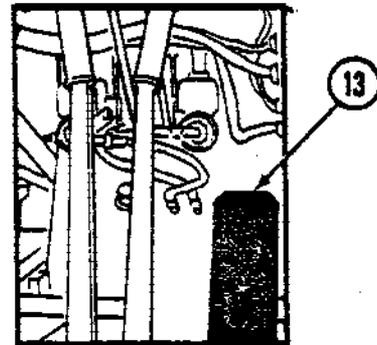


650 - 700 RPM

H - Hold the START switch (12) and work the airbox heater switch (11) until the engine is running at 300 - 350 rpm, then release the START switch. Keep working the airbox heater switch until the engine runs smoothly at 650 - 700 rpm without it.

Carrier with airbox heater electric air pump:

D - If the engine doesn't start within 45 seconds of cranking, release the airbox heater switch (11) and press the accelerator pedal (13) about halfway down. Keep on holding the START switch (12).



### NOTE

Cranking time before pressing the accelerator pedal changes with temperature. 45 seconds is for -25°F. Crank 5 seconds LESS for each 5 degrees ABOVE -25°F, down to a shortest time of 10 seconds. Crank 10 seconds at all temperatures from +10 to +40°F.

E - If the engine doesn't start when you press the accelerator pedal (13), release the pedal and hold the airbox heater switch (11) ON for 15-20 seconds, then OFF for 2-4 seconds. Keep on holding the START switch (12).

## STARTING ENGINE (BELOW +40°F)

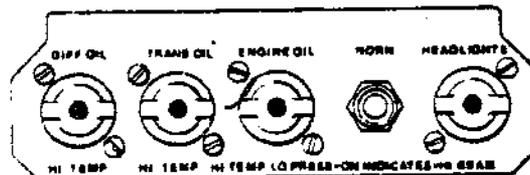
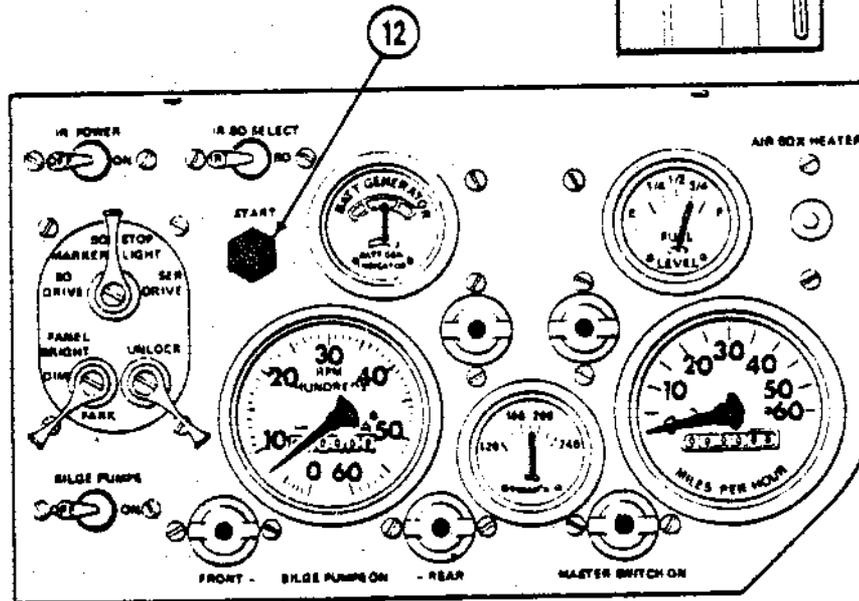
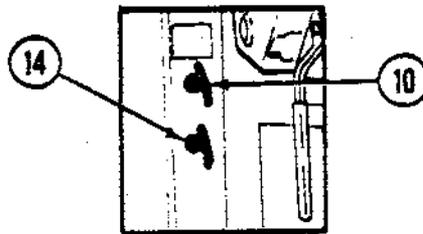
- 7 Run the engine for 3-5 minutes at 650-700 rpm. This gets the engine oil warmed up and pumping to all the bearings.

### NOTE

If the temperature is below -25°F and your carrier has an engine coolant heater kit, now is the time to turn off the coolant heater and close the coolant valves (page 2-102).

- 8 Set the hand throttle (14) to run the engine at 1,200 - 1,500 rpm for about 5 minutes. This is to warm up the engine to normal operating temperature (about 160°F).

- 9 Push in the hand throttle (14) and check the instrument panels. They should look about like the pictures below.



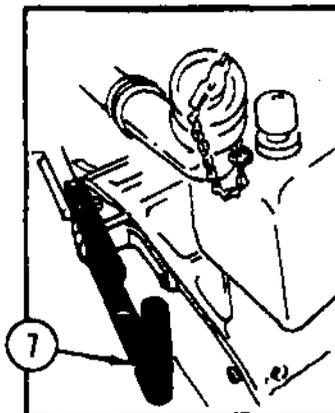
WARNING LIGHT PANEL

## STARTING ENGINE (BELOW + 40°F)

- 10 Pull out the fuel cutoff (10) to stop the engine.
- 11 A — Engage the engine disconnect (7). Pull out.

**CAUTION**

Never try to move the engine disconnect handle when the engine is running.



- B — Pull the engine disconnect (7) as far as it will go. If it's hard to move, press the START switch (12) for a moment to turn the engine a little.
- C — Close and secure the access panel.

 **WARNING**

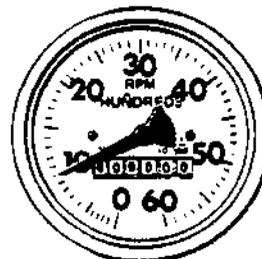
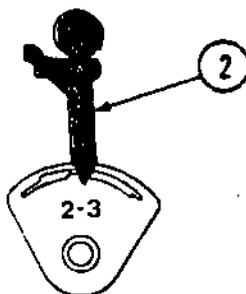
Carbon monoxide gas is deadly poison. Make sure the power plant access panels are closed tight before you restart.

- 12 Push in the fuel cutoff (10) and press the START switch (12) to restart the engine.

**CAUTION**

If the engine doesn't start after 30 seconds of cranking, release the START switch and let the starter cool for 30 seconds before you try again. If you can't restart the warm engine in five tries, troubleshoot it.

- 13 Put the shift lever (2) in 2-3 range and set the hand throttle (14) to run the engine at 800-1,000 rpm for about 10 minutes. This is to warm up the transmission.



800 - 1,000 RPM

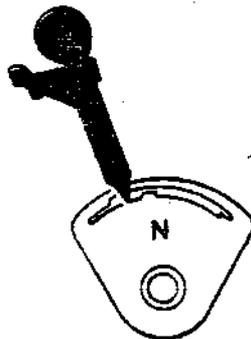
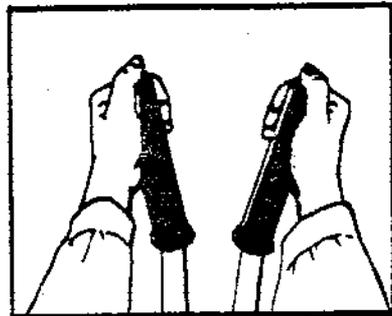
- 14 Push in the hand throttle (14), set the shift lever (2) in N range, and do the preventive-maintenance hot checks (pages 2-32 through 2-33).

## STARTING ENGINE IN EXTREME COLD (BELOW -25°F)

- 1 Do the B preventive-maintenance checks and services (pages 2-22 through 2-35).
- 2 If your carrier has the engine coolant heater kit and you used the heater while the carrier was parked (page 2-101), use the normal cold-weather starting procedures (pages 2-80 through 2-87). If your carrier doesn't have the engine coolant heater kit, or the heater stopped running and your carrier is COLD, report it to organizational maintenance.
- 3 After the engine starts turn OFF the engine coolant heater and close the coolant shutoff valve (page 2-102). Then do the D preventive-maintenance.

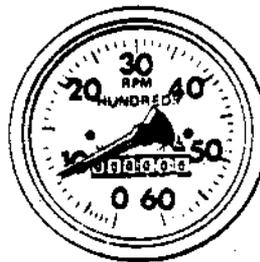
## STOPPING ENGINE

- 1 Pull back the steering and braking levers and press down the locking buttons to lock the differential brakes.



- 2 Place the shift lever in N position.

- 3 Set the engine to run at about 1,000 rpm for 2 minutes or so.



- 4 Set the engine back to idle (650-700 rpm) and check the instrument panel for normal readings.

2. Running the Engine. Run engine for 3 to 5 minutes at normal idle (550-600 rpm) then set throttle to 1200 to 1500 rpm and run for 5 minutes. Push in throttle and stop the engine. Perform normal start and place shift lever in the 2-3 range and run the engine at 800 to 1000 rpm for a maximum of 10 minutes to warm up the transmission.

3. Driving. Driver must be careful when placing carrier in motion. Track frozen to the ground must be considered. Place shift lever in range 1 and driver carrier for 100 yards to warm up lubricants in gear and tracks sufficient for normal operation. M113 series, as all other track vehicles, will be operated with track pads installed.

4. At a Halt or Parked. Place carrier out of the wind or facing away from wind direction. Prepare footing of planks or brush if ground is wet. Clean and clear off snow and ice and refuel immediately.

5. Auxilliary Equipment. Armament and mortars should be covered and kept dry and free of snow and ice. Do not breathe on optical sights and components as condensation will freeze to them.

#### CAUTION

Prolonged idling of the engine will force oil overboard causing permanent damage. Idling should NOT be used as a power source for electrical equipment or for keeping personnel warm.

6. Carbon Monoxide Danger. A frequent practice which invites tragedy to strike is heating the M113 by venting warm air from the exhaust duct into the vehicle. This is done by placing a poncho or shelter-half over the exhaust duct to funnel the warm exhaust through the TC hatch into the vehicle. This is an extremely dangerous practice due to leaks which may exist in the exhaust system and allow carbon monoxide gas to be vented into the vehicle.

## TAB C

### Cold Weather Procedures

#### Howtizer, Medium, SP. M109A1

1. Starting Engine. Turn flame heater ON, hold starter switch in the ON position and cycle flame heater until engine reaches 400 rpm. Depress accelerator halfway and release starter switch. If engine doesn't start in 10 seconds, stop starting procedures and notify organizational maintenance. If battery voltage drops below 12 volts during cranking, flame heater does not have enough fuel pressure for good operation. With brakes still locked, set the throttle to run at 1200 rpm and shift transmission to 4th gear position. Continue to cycle flame heater switch until engine coolant temperature gauge indicates 120°F to 140°F. Shift to neutral and idle the engine (if transmission temperature approaches 300°F during warm up, immediately shift to neutral until temperature approaches normal range), shift transmission to 1st gear position and drive vehicle slowly 100 yards being careful not to stall the engine. This will warm lubricants sufficiently for normal operation.

2. At Halt or Parking. In ambient temperatures of plus 45°F (7°C) to -25°F (-24°C), perform the following procedures:

a. Refuel as soon as possible to prevent condensation from accumulating in fuel tanks.

b. Clean mud, snow and ice from the track and suspension as soon as possible after halt.

## TAB D

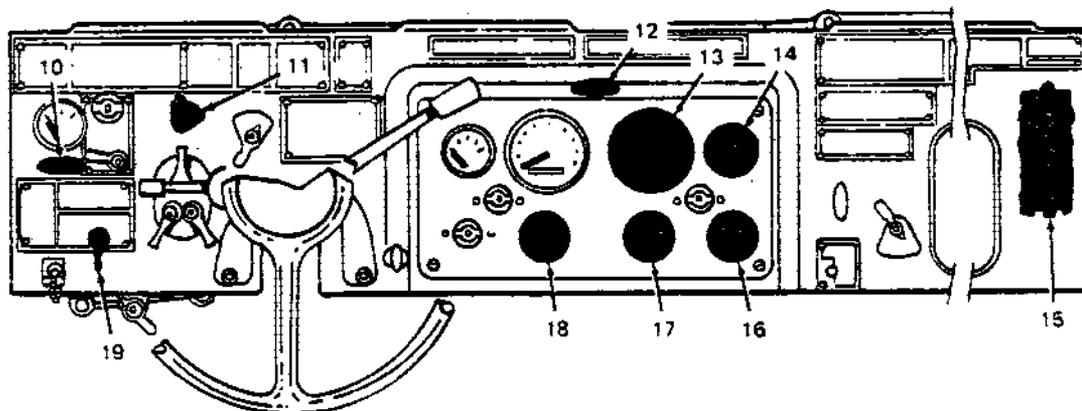
### Cold Weather Procedures

#### M813/M54 (5 ton) Cargo Trucks

1. Listed below are the 21 steps for starting the M813/M54 5 ton cargo trucks — extracted from TM 9-2320-260-10.

#### 2-7. Starting the Engine Above +32° F.

- a. Apply handbrake by pulling up handbrake lever (3). Turn knob on end of handle as required, to adjust brake cable tension.
- b. Place transmission selector lever (1) in "N" (neutral) position.
- c. On vehicles with a front winch, make sure winch control lever (4) is in "N" (neutral) position and that it is secured by hinged lock.
- d. On vehicles so equipped, make certain power takeoff control lever (2) is locked in "N" (neutral) position and that transfer power takeoff control lever (6) is disengaged (down).



- e. Make sure emergency engine stop control (12) is pushed in all the way.
- f. Check air cleaner filter indicator (15). If red appears, indicating air restriction, notify organizational maintenance.
- g. Place battery switch lever (11) in ON position.
- h. Depress clutch pedal (9) and accelerator pedal (7).

#### CAUTION

Do not operate starter continuously for more than 10 seconds at a time nor with headlights on (which will drain the batteries). Wait 10 to 15 seconds between periods of starter operation.

- i. Place ignition switch lever (19) in START position. Release lever after engine starts. Lever will return automatically to RUN position.

- j. Release clutch pedal (9).
- k. Adjust hand throttle control (10) until tachometer (13) or tachograph indicates 800 to 1,000 rpm.
- l. Allow engine to run until temperature gage (14) indicates 120°F. Unlock hand throttle (10) by turning it left or right, and push it in to allow engine speed to drop to idle.

m. Check your instruments!

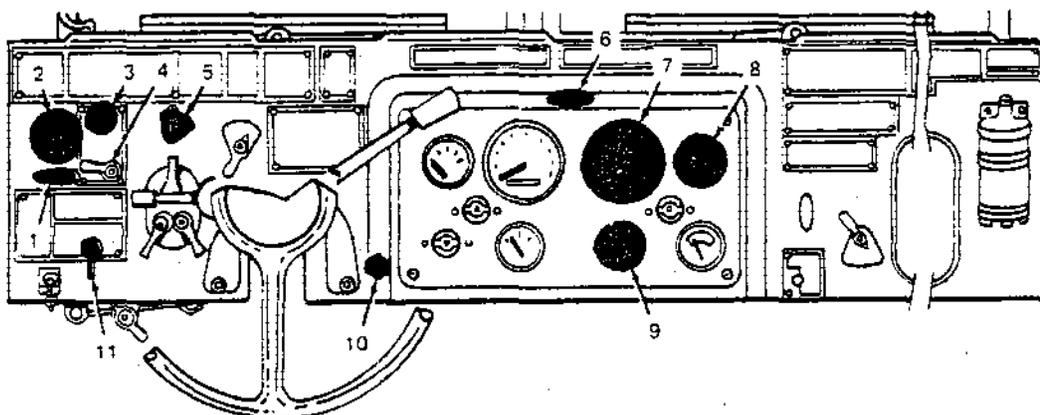
- (1) Oil pressure gage (18) should register about 15 psi after engine starts.
- (2) Air pressure gage (17) should rise from 0 to 60 psi before air pressure warning buzzer stops, indicating compressed air system is operating properly.

(3) Battery-generator indicator (16) should read in green area.

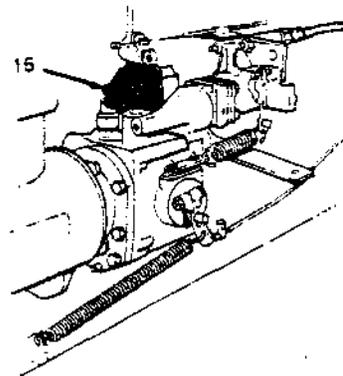
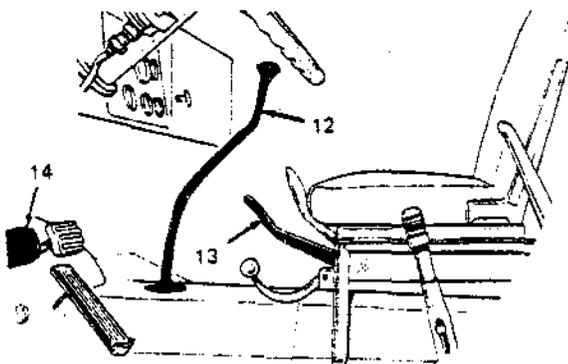
(4) Temperature gage (14) should read 175° to 185°F when engine has reached normal operating range. Stop engine by turning ignition switch lever (19) and battery switch lever (11) to OFF positions, and notify organizational maintenance if any instrument reading is not normal.

### 2-8. Cold Weather Starting (Below +32°F).

a. Perform steps a through h on preceding pages.



- b. Pull hand throttle control (1) out approximately one-third and lock in place.
- c. Place battery switch lever (5) in ON position.
- d. Depress clutch lever (14).



e. Place preheater switch (4) in ON position. Preheater indicator lamp (3) should glow. Wait 30 seconds and if lamp does not glow, notify organizational maintenance.

### CAUTION

Do not operate starter continuously for more than 10 seconds at a time nor with headlights on (which will drain the batteries). Wait 10 to 15 seconds between periods of starter operation.

f. Operate hand primer pump (10), and at same time turn ignition switch lever (11) to START position. Maintain fuel pressure between 80 and 120 psi, shown on the fuel pressure gage (2), while cranking engine.

g. Release ignition switch lever (11) after engine starts. Lever will return automatically to RUN position. Release clutch pedal (14).

h. Continue using hand primer pump (10) with fuel pressure of 60 to 80 psi, shown on fuel pressure gage (2), until all cylinders are firing, approximately 3 minutes.

i. Push hand primer pump (10) in and lock in position.

j. Place preheater switch (4) in OFF position.

k. Check your instruments! Refer to items m(1) through m(4) on page 2-37.

l. Adjust hand throttle control (1) until tachometer (7) or tachograph shows 800 to 1,000 rpm.

m. Allow engine to run until temperature gage (8) shows 120°F. Unlock hand throttle control (1), push it in, and allow engine speed to drop to normal idle.

n. Stop engine immediately by pulling out emergency stop control (6) if at any time one or more of the following conditions arise:

(1) Noisy engine and/or excessive engine vibration.

(2) Oil pressure does not register or suddenly drops to less than 15 psi.

(3) Sudden increase of coolant temperature.

(4) Engine continues to run after ignition switch lever (11) and battery switch lever (5) are turned off.

o. After emergency shutdown, have above conditions corrected by organizational maintenance before attempting to restart engine.

### NOTE

The emergency stop control (6) closes the engine fuel valve (15). After stop control has been used, it will be necessary to raise the hood, manually open fuel valve (15) and reposition control knob (6) before engine can be restarted.

APPENDIX 3

Cold Weather Training and Evaluation Outline

### APPENDIX 3

## SUPPLEMENTAL TRAINING AND EVALUATION OUTLINE TO ARTEP 71-2

### APPENDIX 16 TO CHAPTER 9 TRAINING AND EVALUATION OUTLINE UNIT: BATTALION TASK FORCE THROUGH SQUAD/SECTION\* MISSION: WIN IN THE COLD

#### 1. GENERAL CONDITIONS

The unit deploys in West Germany to meet an OPFOR threat during the winter (October through March). Upon deployment, the unit encounters wet, windy and cold weather conditions. At times, the temperature drops below 32°F. Once contact is made with the OPFOR forces, it continues for at least 48 hours. During this time, the activities of the unit varies from periods of intense physical activity to periods of immobility while troops are directly exposed to the weather.

#### 2. PRIMARY TRAINING/EVALUATION STANDARDS

To receive a satisfactory rating, the unit being evaluated must:

- a. Have prepared its personnel and equipment for cold weather operations prior to deployment.
- b. Take all appropriate steps to prevent cold weather injuries and cold weather induced equipment failure.
- c. Neutralize the effects of cold weather on its tactical operations.

#### 3. TRAINING/EVALUATION RESULTS

Check SAT or UNSAT on the following pages of this T&EO to indicate the unit's proficiency on each task for this mission. Trainers/evaluators will record detailed observations of training deficiencies which need training emphasis. This T&EO should be provided to the unit as a basis for future training. The overall proficiency rating for this mission is determined from the performance of the unit on each task, the primary training and evaluation standards, and the evaluator/trainer's subjective judgment as to whether the unit would have been successful on the modern battlefield had it performed as it did on this mission. Circle one of the following to indicate the overall combat proficiency of the unit on this mission:

OVERALL PROFICIENCY	SAT	UNSAT
---------------------	-----	-------

\*Also applies to all non-maneuver battalion and smaller size units which have personnel who are required to periodically perform duty while directly exposed to cold weather - artillery, military police, maintenance recovery sections, etc. Such units will make this T&EO a supplement to their ARTEP.

Insert after  
page 9-15

9-16-1

81D Suppl  
ARTEP 71-2  
2 March 1979

## TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC

MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S U
<p>9-16-A Prepare for cold weather operations.</p>	<p>Prior to each deployment of unit to the field for tactical operations during the period October through March.</p>	<ol style="list-style-type: none"> <li>1. Chain of command above squad level:               <ol style="list-style-type: none"> <li>a. Demonstrate necessary emphasis and supervision required to ensure squad leaders adequately prepare their soldiers for cold weather operations (Task 9-16-A-2).</li> <li>b. Demonstrate appropriate command action and follow-up required to ensure all soldiers obtain required clothing, equipment and supplies (Tasks 9-16-A-2a and 9-16-A-6).</li> <li>c. Identify soldiers with medically recorded cold injuries and assign them to low exposure duties.</li> <li>d. Publish heater utilization SOP which conforms with 8ID heater utilization plan (Tab B to Appendix 16 to Chapter 9).</li> </ol> </li> <li>2. Squad leaders conduct necessary inspections to ensure:               <ol style="list-style-type: none"> <li>a. Each soldier has minimum essential cold weather clothing and equipment (Tab C to Appendix 16 to Chapter 9).</li> <li>b. Each driver, TC and air guard who will be exposed has a face mask and goggles.</li> <li>c. Squad stove is present and in working order.</li> <li>d. Each soldier's job book verifies that he has demonstrated proficiency on following common tasks within previous 90 days (Tab D to Appendix 16 to Chapter 9).</li> </ol> </li> </ol> <p>(1) 081-831-1004 Perform mouth-to-mouth resuscitation and external cardiac massage (resuscitation only).</p> <p>(2) 081-831-1011 Apply first aid for wet or cold injuries.</p>	

## TRAINING AND EVALUATION OUTLINE

 UNIT: BN TF THROUGH SQD/SEC

 MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
9-16-B Prevent cold weather injuries.	When temperature falls below 50°F during wet or windy weather or when temperature falls below 32°F regardless of other factors.	3. All wheeled vehicles have at least one set of tire chains.  4. Specific gravity of vehicle batteries is at least 1.200.  5. Antifreeze level in radiators protects coolant systems to at least -20°F.  6. Fifteen day supply of hot drink mix is on hand at company level or below.  1. Chain of command above squad level: a. Demonstrate necessary emphasis and supervision required to ensure each squad/section leader exercises dynamic leadership in preventing cold weather injuries (Task 9-16-B-2).  b. Make provisions for serving three meals a day and a hot beverage between each meal.  c. Make provisions for each soldier to take a shower at least once a week.  d. Make provisions for clean DX clothing to be available.  2. Squad leader conducts systematic inspections and exercises thorough supervision to ensure that each soldier: a. Wears overshoes when temperature drops below 50°F during wet weather.  b. Wears insulated boots and four layers of clothing, except when marching, when temperature drops below 32°F.  c. Changes socks and massages feet daily or when wet.  d. Checks feet at four-hour intervals when awake.		

## TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC

MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
<p>9-16-C Prevent cold weather induced equipment failure or loss</p>	<p>When temperature may fall below 32°F within 24 hours and/or during periods of fog or snow.</p>	<ul style="list-style-type: none"> <li>e. Washes and shaves daily.</li> <li>f. Eats three meals a day and has a hot drink between each meal.</li> <li>g. Does not drink alcohol or use drugs.</li> <li>h. Wears clothing and boots loose.</li> <li>i. Empties water from foxhole.</li> <li>j. Removes boots and wet clothing when getting into sleeping bag.</li> <li>k. Does not sleep in a vehicle.</li> </ul> <p>3. Platoon leader:</p> <ul style="list-style-type: none"> <li>a. Establishes sleeping/warming plan which provides for maximum sleep in shelters and rotation to heated areas from exposed positions at two hour intervals.</li> <li>b. Employs soldiers in buddy teams at all times.</li> <li>c. Conducts vigorous exercise periods at hourly intervals for exposed personnel when temperature falls below -20°F. (Exercise should not be strenuous enough to cause perspiration).</li> </ul> <ul style="list-style-type: none"> <li>1. Vehicles are operated in accordance with proper cold weather operating procedures prescribed in operators manual (Tab E to Annex 16 to Chapter 9).</li> <li>2. Engines are shut down as soon as possible; no prolonged idling.</li> <li>3. Vehicles are topped off daily to minimize condensation accumulation in fuel tank.</li> <li>4. Filters and air systems are drained daily and immediately after operation.</li> </ul>		

## TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC

MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
<p>9-16-D Neutralize effect of cold weather on tactical operations</p>	<p>When temperature falls below 50° F and/or during periods of fog or snow.</p>	<p>5. Daily maintenance period is conducted to clear intakes, gear boxes, breathers, and vents of snow and mud.</p> <p>6. Chain of command directs and ensures that chains are put on all wheeled vehicles when roads are slippery.</p> <p>7. Track vehicles do not attempt to cross snow fields or drifts over one meter deep except in tactical emergencies.</p> <p>8. Water pick up plans ensure that fiber glass water trailers are emptied at a rate which does not permit water to freeze.</p> <p>9. Top half of door canvas on wheeled vehicles is folded down.</p> <p>1. Extensive use is made of OP's and GSR to compensate for limited visibility during periods of fog.</p> <p>2. Local security and number of personnel kept awake is increased during blizzards and heavy fog to counter threat doctrine to conduct extensive reconnaissance during such periods.</p> <p>3. When ground is covered with snow, movement in vicinity of defensive positions and fixed sites is restricted to woodlines and established roads in order to prevent visual detection of activity in area by threat air reconnaissance.</p> <p>4. Tracked vehicles are not exposed to the enemy from defensive positions until after heaters have been turned off for at least four hours. All warming vehicles with heaters running are positioned on rear slope and in built-up areas whenever possible.</p>		

## TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC

MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		<p>5. Vehicles and personnel operating in snow are camouflaged to blend in with snow or are positioned in adjacent to naturally dark backgrounds such as woods, rock formations, built-up areas, etc.</p> <p>6. Additional execution time is planned for movement on snowy or ice covered roads and for the accomplishment of routine physical tasks during periods of intense cold.</p> <p>7. Entire chain of command, and squad leaders in particular, increase supervision to keep bundled up soldiers alert and observing. Frequent exercise, change of pace, and pep talks are employed to prevent lethargy induced by cold weather.</p> <p>8. Place FALOP kit in operation and determine weather conditions.</p> <p>NOTE: All temperatures indicated above for tasks, 9-16-B and 9-16-D, reflect temperature after reading has been corrected for wind chill factor.</p>		

TAB A TO APPENDIX 16 TO CHAPTER 9  
SUGGESTED SUPPORT REQUIREMENTS  
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

1. Administration:

a. Begin evaluating this mission prior to deployment of unit to field (task 9-16-A).

b. Continue evaluation during entire period unit is in the field (Tasks 9-16-B through 9-16-D).

c. Continuous command emphasis and supervision and thorough preparation is essential for winning in the cold. Absence of these factors makes winning in the cold a matter of luck rather than combat professionalism. Accordingly, it is not possible to evaluate this mission by merely focusing on terminal performance. If the chain of command above squad level does not perform its tasks in a satisfactory manner, overall proficiency should be rated UNSAT even though all squads evaluated perform their tasks satisfactorily. Likewise, if the chain of command above squad level meets its support requirements through crisis management rather than systematic planning, the unit's overall proficiency should be rated UNSAT.

d. The absence of cold weather injuries or equipment failure due to cold weather does not in itself justify a SAT rating if the standards prescribed in this T&EO are not performed in a satisfactory manner.

e. Task 9-16-A should be used as a checklist during appropriate inspections and all readiness tests during the period October through March.

2. Minimum Evaluators: Same as for major mission.

3. Opposing Force: Same as for major mission.

4. Support Troops: None.

5. Vehicle/Communications: Same as for major mission.

6. Maneuver Area: Same as for major mission.

7. Firing Area: None.

8. Training Aids, Devices, and Special Equipment:

a. Optical battery specific gravity tester

b. Antifreeze tester

9. Ammunition: None

10. Key References: 8ID Pam, Winning in the Cold; FM 21-2 (TEST), Soldiers Manual of Common Tasks; FM 31-70, Basic Cold Weather Manual; TM 10-275, Cold Weather Clothing and Sleeping Equipment; applicable operator manuals for equipment involved.

11. Tips for Trainers/Evaluators:

a. Full field layouts of clothing by randomly selected squads and maintenance inspections of randomly selected equipment will be required to evaluate task 9-16-A. Sufficient time should be set aside for this prior to deployment of unit to the field.

b. Artificial weather conditions -- temperature, precipitation and wind -- may have to be injected into the general tactical situation in order to provide the necessary cues required to enable the unit to demonstrate its proficiency.

TAB B TO APPENDIX 16 TO CHAPTER 9  
8ID HEATER UTILIZATION POLICY  
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

HEATER USE

<u>VEHICLE</u>	<u>HEATER</u>
M60 Tanks	No
M113 TOW	No
M113 FIST	No
M113 Pers/Carr	No
M113 CP/FDC	Yes
577 CP/FDC	Yes
M109	No
M110	No
AVLB	No
CEV	No
M113 AMB	Yes
577 AMB	Yes
M88 MED/REC	No
578 Light/REC	No

TAB C TO APPENDIX 16 TO CHAPTER 9  
MINIMUM ESSENTIAL CLOTHING AND EQUIPMENT  
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

Minimum essential clothing and equipment to be carried or worn by 8ID soldiers on field exercises during period October through March:

- Undershirt (2)
- Winter Undershirt (2)
- Fatigue Shirt
- OG Shirt
- Wool Scarf
- Field Jacket
- Field Jacket Liner
- Undershorts (2)
- Winter Undershorts (2)
- Fatigue Trousers
- Field Trousers
- Wool Socks (3 pr)
- Parka
- Parka Liner
- Parka Hood
- Trigger Finger Mittens
- Trigger Finger Mitten Inserts (2)
- Gloves
- Glove Inserts (2)
- Wet Weather Jacket
- Wet Weather Trousers
- Overshoes
- Insulated Boots
- Waterproof Bag
- Shelter Half
- Poncho
- Winter Sleeping Bag
- Sleeping Bag Cover
- OD Blanket
- Air Mattress

TAB D TO APPENDIX 16 TO CHAPTER 9  
COLD WEATHER SOLDIER'S MANUAL TASKS  
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

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## PERFORM MOUTH-TO-MOUTH RESUSCITATION AND EXTERNAL CARDIAC MASSAGE

---

### CONDITIONS

Given an unconscious casualty who has stopped breathing and has no heart-beat.

### STANDARDS

Properly apply mouth-to-mouth resuscitation and external heart massage until the casualty resumes breathing or until you are relieved.

### TRAINING

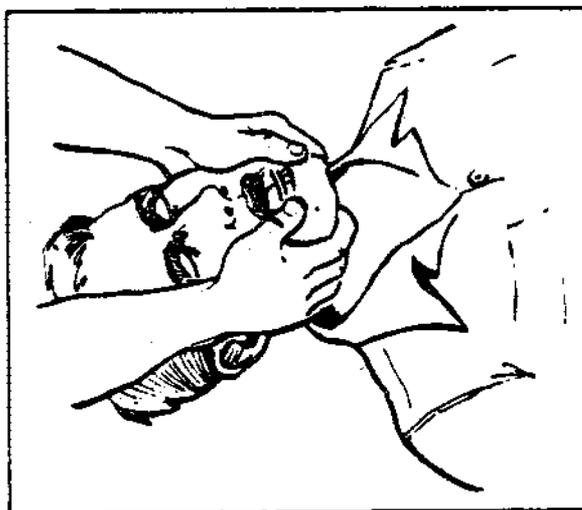
1. Restore breathing (artificial respiration).

**NOTE:** This method is used except when soldier has a crushed face or is in toxic environment.)

- a. With soldier lying on back, position yourself at side of his head.
- b. Place one hand behind his neck to keep his head in a face-up, tilted-back position. Pinch his nostrils with thumb and index finger of other hand and let same hand press on his forehead to keep head tilted backward.

**NOTE:** For adults: First 4 breaths - Full and quick; thereafter - 1 every 5 seconds.

For children: Puffs of air from cheeks.



c. Take deep breath and place mouth (in airtight seal) around soldier's mouth; then blow forcefully as you observe his chest. (If it is clear that the casualty's mouth is full of debris, remove the debris first.) If after blowing forcefully his chest does not rise, adjust his jaw and blow harder, making sure air is not leaking from his mouth or nose. If chest still does not rise, turn his head to one side, run your fingers down inside of lower cheeks, over base of tongue, and across back of throat to remove vomitus, mucus, or foreign bodies. If airway is still not clear, roll him onto his side; using heel of hand, deliver sharp blows between his shoulder blades to dislodge foreign body.

d. When soldier's chest rises, remove your mouth from his mouth and listen for return of air from his lungs. If returning air is noisy, lift his jaw.

e. After each exhalation of air, pinch his nose again and blow another deep breath. First 4 breaths should be full and quick (except for children); thereafter, the rate is once every 5 seconds. Insure adequate ventilation on each breath by observing his chest rise and fall and by hearing and feeling air from his lungs.

f. As soldier starts to breathe, adjust timing to assist him. (If abdomen bulges, apply gentle pressure on abdomen with hand at frequent intervals between inflations.)

**NOTE:** The mouth-to-nose method is performed in the same way except you blow into his nose while you pinch his lips closed with one hand.

## 2. Restore heartbeat (closed-chest heart massage).

**NOTE:** (To keep blood flowing to brain and other vital organs until heart begins beating normally again.)

a. Prepare soldier for artificial respiration. (Breathing stops before or soon after heart stops.) Place him on solid surface. Elevate his legs about 6 inches by placing his pack or other suitable object under his feet.

b. Position yourself close to his side. Place heel of one hand on lower half of breastbone with fingers spread and raised. Place other hand on top of first hand. (Use only one hand for child and only fingers for infant.)

c. Bring shoulders directly over breastbone: keep arms straight; press breastbone down only 1½ to 2 inches. (More than 2 inches may fracture breastbone. If child or infant, press only lightly.)

d. Release pressure immediately, keeping hands in place.

3. Restore breathing and heartbeat - keeping one rescuer (closed-chest heart massage with artificial respiration).

a. Give 4 quick inflations of the lungs (see paragraph 1).

b. Compressions (See paragraph 2) - 80 per minute. (This rate allows for time lost when giving the breaths to the casualty.)

c. Inflations - 2 (quick but full) after each 15 heart compressions (15:2 ratio).

d. Timing - Count aloud: 1 and 2 and 3 and 4 and 5 and, 1 and 2 and 3 and 4 and 10 and, 1 and 2 and 3 and 4 and 15.

e. Compress and say the numbers. Release and say "and". Blow after count of 15 two deep breaths into airway in rapid succession without allowing full return of air. Repeat count and continue resuscitation.

4. Restore breathing and heartbeat - two rescuers (closed-chest heart massage with artificial respiration).

a. One person positions himself at the casualty's side and performs closed-chest heart massage. The other person positions himself on the opposite side of the casualty at his head, keeps the casualty's head tilted back, and administers artificial respiration.

b. The person who is administering closed-chest heart massage should compress the heart once every second (60 compressions per minute) by counting, one thousand one, one thousand two, etc.

c. The person who is performing artificial respiration quickly blows into the casualty's lungs after each five compressions (5:1 ratio).

d. When one rescuer becomes fatigued, he can switch positions with the other rescuer without any significant interruption of the 5:1 rhythm.

#### References

- TEC Lesson 911-441-0026, 27, 28 and 29F Basic First Aid Measures  
FM 21-11, First Aid for Soldiers, 30 June 76 (Chap 3, pages 11-28).  
FM 21-2 (Test), Soldier's Manual of Common Tasks, 31 Aug 77, Skill Level  
1, pages 1-3, Task #081-831-1004.  
TC 21-11, Pocket Medic, 14 March 75. (Part 1, pages 12-13, 16-19)

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## APPLY FIRST AID FOR WET OR COLD INJURIES

---

### CONDITIONS

Given a casualty suffering from a cold injury, (frostbite, immersion foot, trench foot, snow blindness).

### STANDARDS

Casualty's signs and symptoms are identified in accordance with the training guidance and initial care is begun immediately to reduce severity of injury.

### TRAINING

Identify type of injury.

1. Frostbite.

a. Signs/symptoms - Skin is white, stiff, and numb.

b. First Aid -

(1) Cover frostbitten part of face with warm hands until pain returns.

(2) Place frostbitten bare hands next to skin in opposite armpits.

(3) If feet are frostbitten, seek sheltered area and place bare feet under clothing and against abdomen of another person.

(4) If deep frostbite is suspected, protect part from additional injury and get to medical treatment facility by fastest means possible. **DO NOT** attempt to thaw deep frostbite. There is less danger of walking on feet while frozen than after thawed.

2. Immersion foot.

a. Signs/symptoms - Soles of feet are wrinkled. Standing or walking is extremely painful.

b. First Aid -

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

3. Trench foot.

a. Signs/symptoms - Numbness. May be tingling or aching sensation, cramping pain, and swelling.

b. First Aid -

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

4. Snow Blindness.

a. Signs/symptoms - Scratchy feeling in eyes.

b. First Aid.

(1) Cover eyes with dark cloth.

(2) Transport casualty to medical treatment facility at once.

References

- TEC Lessons 911-441-0034 and 35F Environmental Injuries
- TC 21-11, Pocket Medic, 14 March 75, (Part 3, page 61)
- FM 21-11, First Aid for Soldiers, 30 June 76, (Chap 9, pages 90-91)
- FM 21-2 (Test), Soldier's Manual of Common Tasks, 31 Aug 77, Skill Level 1, pages 13-14, Task #081-031-1011

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MEASURE SPECIFIC GRAVITY OF VEHICLE BATTERIES

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CONDITIONS

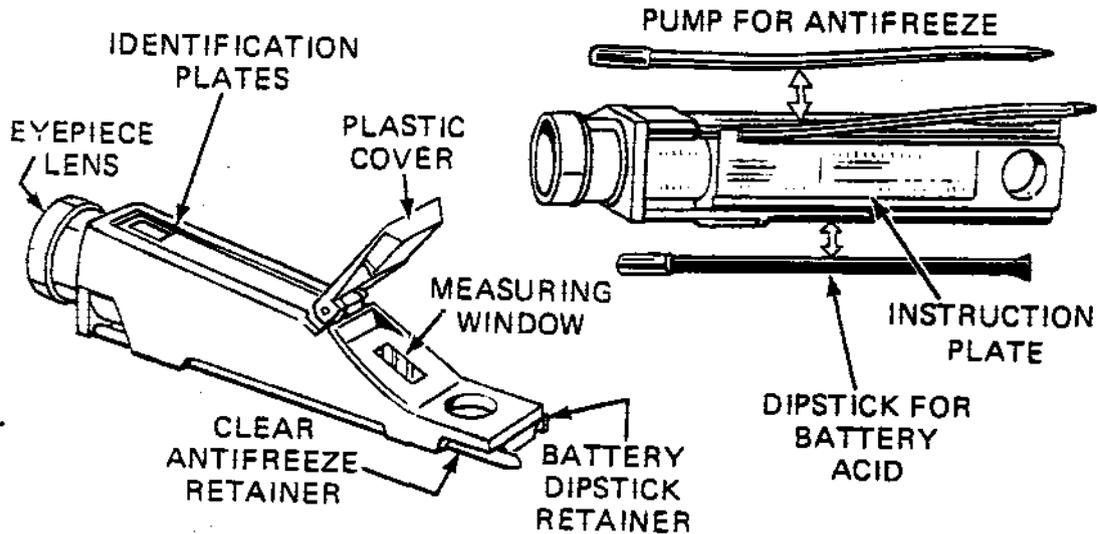
In a field or garrison environment, given a lead acid storage battery, and optical battery/antifreeze tester (NSN 6300-00-105-1418), or a built-type tester (hydrometer).

STANDARD

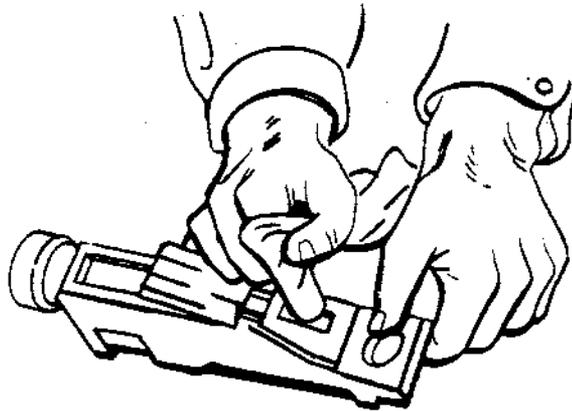
Within 10 minutes the soldier will accurately measure the specific gravity of the battery.

TRAINING

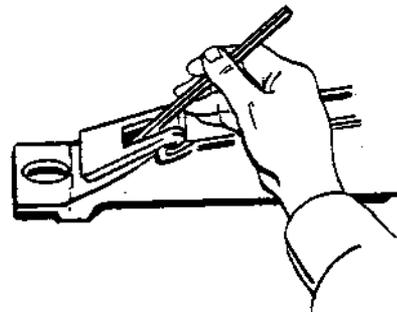
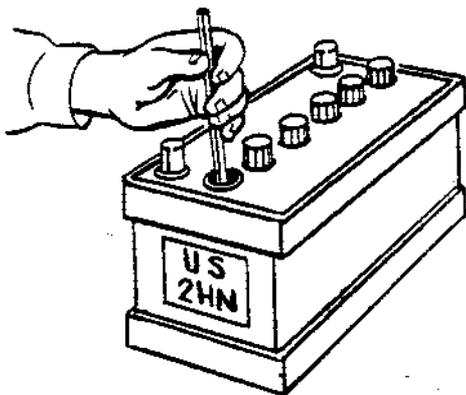
1. Optical Battery/Antifreeze Tester. This tester is quick, accurate, and reliable. There is no guesswork or arithmetic involved. The tester automatically adjusts for temperature.



- A. Both plastic cover and measuring window must be clean and dry. Wipe clean with a soft cloth. Clean the eyepiece lens. Use clean water, if needed, to clean dirty areas.



- B. Swing the plastic cover down until it rests against the measuring window.  
C. Test the battery before adding water.  
D. Make a separate test for each battery cell.

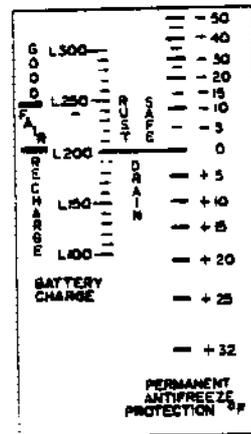


- E. Using the black dipstick, place a few drops of electrolyte onto the exposed portion of the measuring window.

**WARNING:** Be careful not to splash electrolyte onto you or the equipment.

- F. Point the tester toward a bright light source. When you look through the eyepiece lens you'll see a rectangle with two calibrated scales — battery charge readings on the left scale, antifreeze readings on the right.
- G. The electrolyte sample will divide the rectangle with an area of light and an area of shadow. You read the scale where they meet.

- A full charge is 1.225 specific gravity for tropical electrolyte and 1.280 specific gravity for temperate electrolyte.
- If below 1.180 specific gravity for tropical electrolyte and 1.225 specific gravity for temperate electrolyte, replace the battery with a fully charged one if you can't charge it in the field.
- Take a dry battery back to the shop for further servicing.



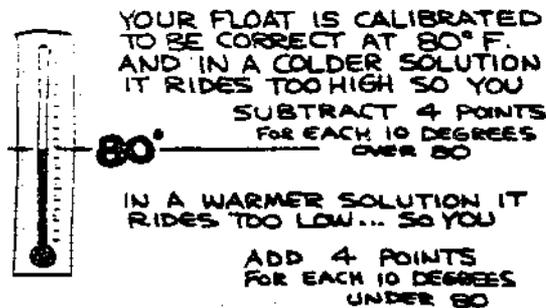
#### TIPS on using the optical tester:

- Clean and dry all parts after each use.
- Keep the plastic cover against the measuring window when testing. You could get a bad reading if any of your electrolyte sample begins to evaporate.
- If the line where the light and dark areas meet is not sharp or clear, the plastic cover and measuring window were not cleaned and dried enough. Wash, clean, and dry the tester, and take a new reading.

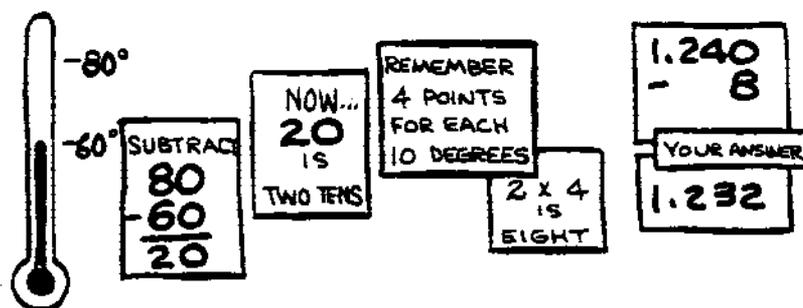
2. Bulb-Type Tester (Hydrometer). If you don't have the optical tester, you may need to use the old bulb-type hydrometer. The hydrometer (float) of this tester reads in specific gravity units. Its markings are correct, and are read directly from the float scale only when the electrolyte is at 80° F (27° C) temperature.

**WARNING:** While reading the hydrometer, do not drip electrolyte on yourself or on the equipment.

- A. Take off one of the battery caps, insert tip of the tester into the electrolyte, and draw electrolyte to float the glass hydrometer in the barrel of the tester. Return electrolyte to the same cell being tested.
- B. For accuracy, the liquid level of the battery cell should be at normal height when the hydrometer reading is taken. Any water added to the battery should be thoroughly mixed with the underlying electrolyte by charging before the hydrometer values are reliable. Therefore, if the battery in the vehicle is dry and you can't make a charge in the field, replace with a fully charged battery. Take the dead battery back to direct support for further servicing.
- C. To correct for temperature, you read the thermometer built into the tester. Then, for every 10° F (5.5° C) below 80° F (17° C) you subtract 4 gravity points from the specific gravity reading. Or, for every 10° F (5.59 C) above 80° F (17° C), you add 4 gravity points.



- D. To apply your correction, let's say your battery electrolyte is 60° F, and the float says it has a specific gravity of 1.240. Since 60° is two 10's below 80° F, you're going to subtract two 4's, or eight points, which leaves you with a corrected reading of 1.232.



- E. Perhaps you let the battery stand-out in the truck on a cold night, and wish to check it again the next morning. This time your electrolyte is down to 20° F, and the hydrometer says you have a specific gravity of 1.256. But when you subtract 20° from 80° you get six 10's, and six 4's (24), subtracted from 1.256 shows you still have a corrected gravity of 1.232.
- F. Now let's say the truck goes out on a long hard run on a sunny day, and that the use of the starter just about balances the charge from the generator. You might find when you checked your battery that the electrolyte was up to 100° F, and that it indicated a specific gravity of only 1.224. Now, your temperature is two 10's above 80° F, so you add two 4's to the float reading, and there you are again with a corrected gravity of 1.232.
- G. After using the hydrometer, flush it with clean water.

3. The minimum specific gravity for cold weather operation in the 8ID is 1.2; if less than this, battery requires charging, electrolyte replacement, or replacement of the battery. This task will normally be performed by a mechanic. Battery testers are found in the Number One Common Automotive Shop Equipment.

#### References

TM 9-6140-200-14, Operators' and Support Maintenance Manual for Lead-Acid Storage Batteries (Apr 78), Ch 3, pp 3-18 thru 3-21.

MEASURE THE DEGREE OF ANTI-FREEZE PROTECTION

CONDITIONS:

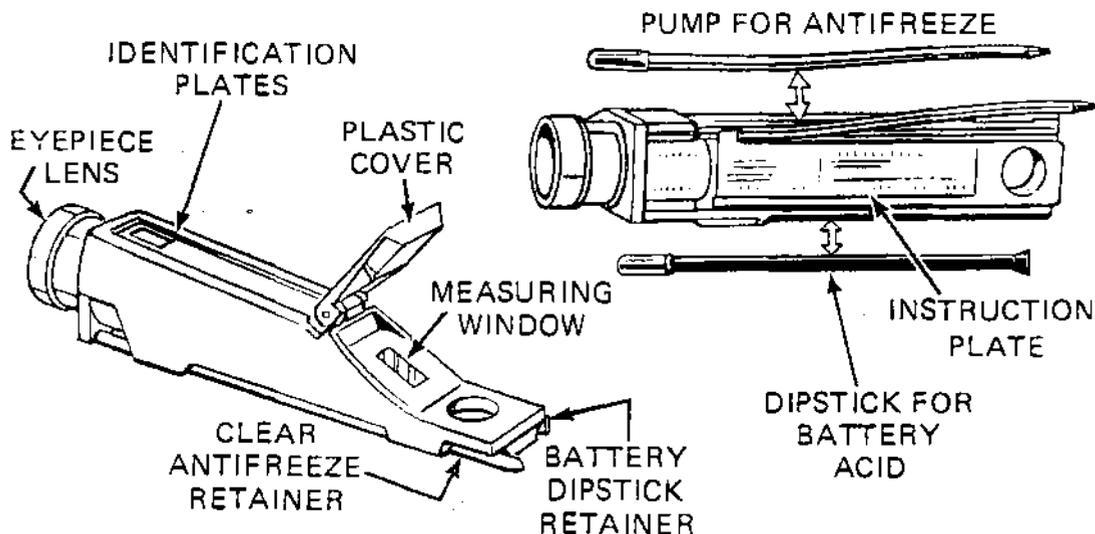
In a field or garrison environment, given an optical battery/antifreeze tester (NSN 6630-00-105-1418) and a vehicle radiator with coolant.

STANDARDS:

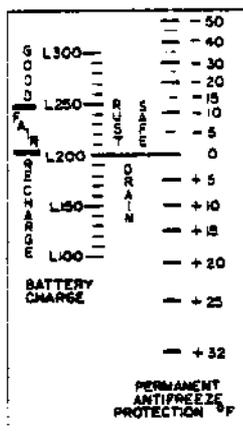
Within 10 minutes the soldier will accurately measure the degree of antifreeze protection in the cooling system.

TRAINING

1. Follow instructions printed on the optical battery/antifreeze tester.
2. Both plastic cover and measuring window must be clean and dry. Wipe clean with a soft cloth. Clean the eyepiece lens. Use clean water, if needed, to clean dirty areas.
3. Swing the plastic cover down until it rests against the measuring window.
4. Using the antifreeze pump, place engine coolant into antifreeze retainer.
5. Point the tester toward a bright light source. When you look through the eyepiece lens, you'll see a rectangle with two calibrated scales -- battery charge readings on the left scale, antifreeze readings on the right.
6. Read the degree of antifreeze protection on the antifreeze scale.



Optical Battery/Antifreeze Tester



### Calibrated Scales

7. Minus 20° fahrenheit is the desired degree of protection for cold weather operations in the 8ID; if the degree of protection is not at least -20° fahrenheit, add antifreeze as required. To achieve protection to -20° fahrenheit, 3 1/2 pints of ethyleneglycol are required per gallon of water. The operator's manual (-10) for each vehicle specifies the cooling system capacity.

#### Reference

TM 9-6140-200-14, Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Lead-Acid Storage Batteries, April 1978, Chapter 3, pages 3-18 and 3-19.

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SLAVE START A VEHICLE

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CONDITIONS

In a garrison or field environment, during daylight or darkness, given a vehicle with discharged battery, a vehicle with charged battery, appropriate slave or jumper cables, and the appropriate Operator's Manual for each vehicle.

STANDARD

The soldier will correctly slave start the vehicle with a discharged battery.

- (1) If using jumper cables, the following sequence must be observed.

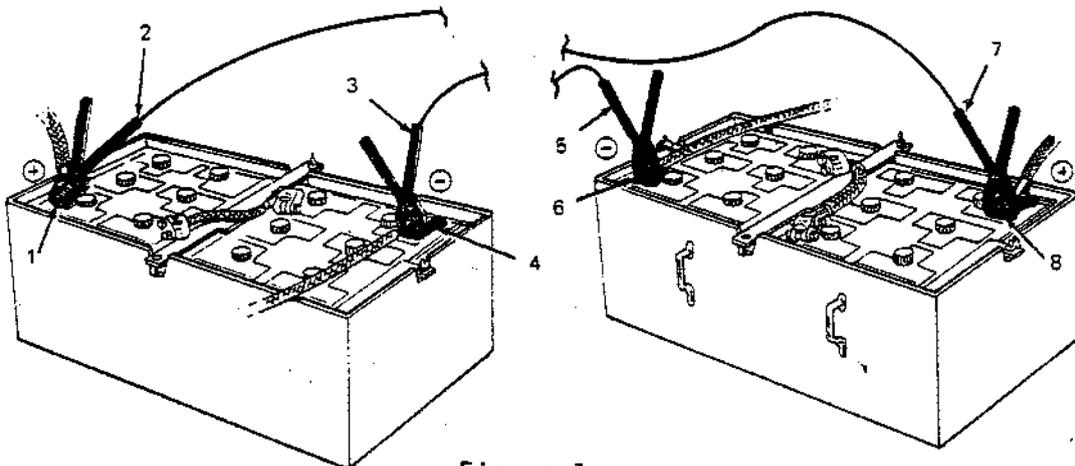


Figure 1

- a. Position the slave vehicle so that its batteries are positioned directly opposite those of the disabled vehicle, stop the engine, and insure switches on both vehicles are off.

- b. Open the battery compartment doors to expose the batteries.

## CAUTION

Be sure you do not connect the positive post of the disabled vehicle to the negative post of the slave vehicle and/or the negative post of the disabled vehicle to the positive post of the slave vehicle. Doing this may burn out the alternator.

c. Attach one end of the positive (red) jumper cabled (2) to the positive battery post (1) of the disabled vehicle. Then attach the other end (7) to the positive battery post (8) of the slave vehicle.

d. Attach one end of the negative (black) jumper cable (3) to the negative battery post (4) of the disabled vehicle and attach the other end (5) to the negative battery post of the (6) slave vehicle.

e. Start the engine of the slave vehicle. This will provide sufficient electrical power to crank the engine of the disabled vehicle.

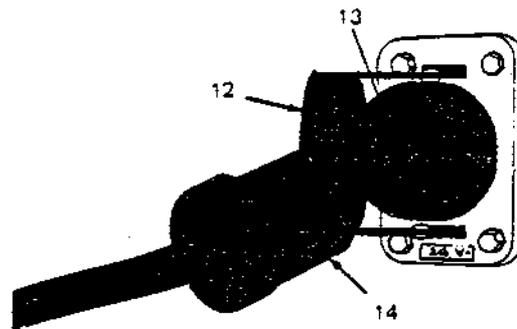
f. Start the disabled vehicle.

g. Remove the jumper cables and secure the battery compartment doors for travel.

## CAUTION

Completely remove one jumper cable at a time to prevent contact of the positive (red) end with the negative (black) end of the cables. Shorting the battery in such a manner can cause serious damage to the alternator.

(2) If using a slave cable (2-prong type, NSN 4910-00-474-9135), the following sequence must be observed.



a. Position slaving vehicle right side to right side of vehicle to be slaved, stop slaving vehicle engine, and insure all electrical switches in both vehicles are off.

- b. Unscrew cover (12) from slave receptacle and connect slave cable (14) to slave receptacle (13) on slaving vehicle. Repeat procedure on slaved vehicle.
- c. Start engine of the slave vehicle and set idle speed at 1,000-1,200 rpm.
- d. Start engine of disabled vehicle.
- e. After engine starts and is running smoothly, disconnect slave cable from slave receptacles (14) on both vehicles and stow cable.

(3) If using NATO type slave cable (NSN 2590-00-148-7961), the following sequence must be observed:

- a. With master switches on both vehicles off, attach slave cables securely in both vehicles.
- b. Start engine of slave vehicle and set idle speed at 1,000-1,200 rpm.
- c. Start engine of disabled vehicle.
- d. After engine starts and is running smoothly, disconnect slave cable from slave receptacles on both vehicles and stow cable.

#### TRAINING

1. Check batteries of dead vehicle for damage, electrolyte level, tight cable connections, and ground straps.
2. Make sure track vehicles are in P (Park) range and wheel vehicles are in neutral.
3. Make sure parking brakes are set, and all electrical switches and electronic equipment in both vehicles are off.
4. For tanks, if time permits, recharge batteries in the slaved vehicle for 15 minutes before you try to start it.
5. Only the NATO cable will work on the M60A1 (RISE) tank.
6. Position tanks side by side facing in the same direction.
7. Position artillery vehicles side by side facing in the opposite direction.

8. While jump starting, you should keep the live vehicle running at 1,200 rpm. Vehicles should be of similar battery configurations. For example, never try to slave a tank with four 6TN batteries from a 1/4 ton which has only two 2HN batteries. Slaving from a vehicle with a higher capacity electrical system is OK, but must be done with caution. A high capacity electrical system will cause the smaller batteries to explode if they are internally shorted or completely discharged.

9. To adapt the 2 prong slave cable to the 1 prong NATO slave cable, see below.

## NATO SLAVE CABLE NEWS



So now you've got the M60A1 (RISE) tank. How do you slave it?

No way you can do it without the new NATO slave cable NSN 2590-00-148-7961. This cable has a single prong at each end to fit the NATO slaving receptacle. It also comes with a 3-part 2-prong adapter at both ends to fit the standard 2-hole slaving receptacles.

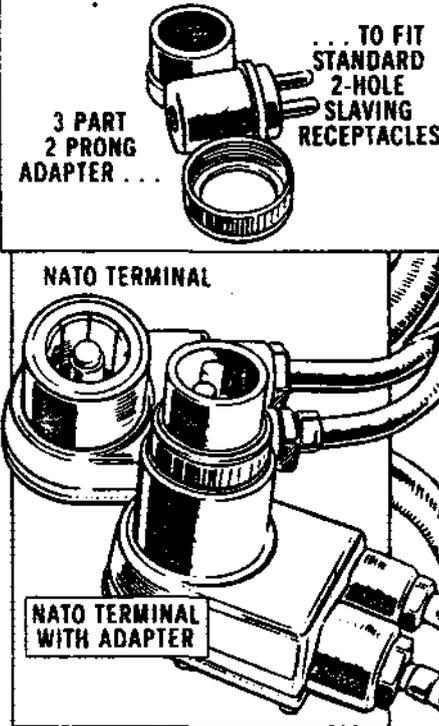
As you can see, the NATO cable can do it all ... slave 2 NATO vehicles, 1 NATO and 1 non-NATO or a pair of non-NATO vehicles.

It's so handy it'll replace the old 2-prong slave cable NSN 4910-00-474-9135 in the No. 1 and No. 2 common tool kits.

In time the 2-prong receptacles will be phased out and all new vehicles, both wheeled and track, will have NATO receptacles.

If the NATO adapters get lost, the AMDF lists them as NSN 5935-00-322-8959 per set.

**OLD 2-PRONG SLAVE CABLE**



**Figure 3**

References

TM 9-2320-209-10, Operator's Manual, Truck, 2 1/2 ton (October 1976), page 2-44.

TM 9-2320-260-10, Operator's Manual, Truck, 5 ton (November 1977), page 2-45.

PS Magazine, Issue 301 (December 1977), page 29-36.

PS Magazine, Cold Weather Europe Special (extracted from PS Magazine, Issue 300, November 1977, page 35.)

INSTALL TIRE CHAINS

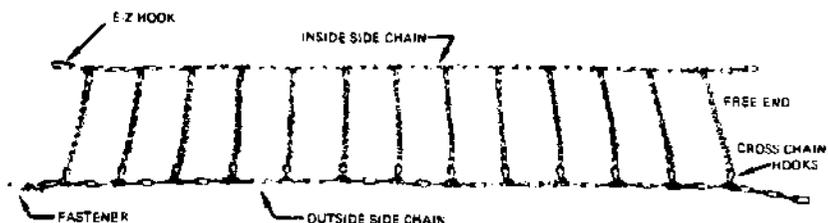
CONDITIONS

In a garrison or field environment, during daylight or darkness, given a set of tire chains, a wheeled vehicle, and slippery driving conditions (mud, snow, etc.)

STANDARD

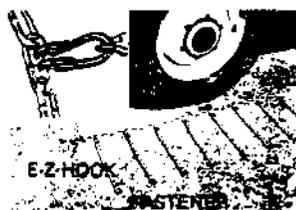
The soldier will correctly install tire chains as follows:

(1) For single wheel vehicles, the soldier will install a set of two tire chains in the following sequence within 20 minutes:



Tire Chain components

1



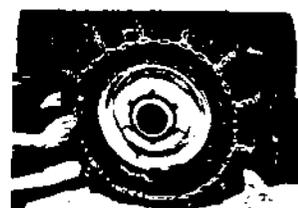
2

Lay chain flat and straight. Make sure cross chain hooks are facing up (See insert photo.) Remove any twists in cross or side chains. E-Z hook should be on inside of tire and fastener on outside of tire.



3

Place chain over top of tire, tucking cross chain against tire and road surface. Check that cross chain hooks are facing out and are not against the tire sidewall. Again, check for twists. Adjust cross chains to hang equal distance across tire tread.



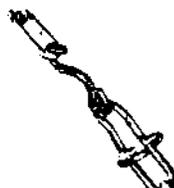
4

Move vehicle until fastener is almost axle high. Position chain so cross chains are equally spaced and are at right angles to tread. Lift both side chains to measure approximate link hook-up.



5

Fasten inside side chain in predetermined link.



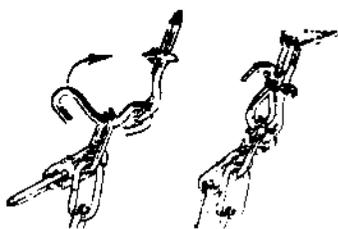
6

Engage hook-end of fastener lever in and side chain link.



7

Pull outward on the outside side chain to develop tension on chain. Maintaining tension, wiggle each cross chain. This action will assure snug fit of chains.



8

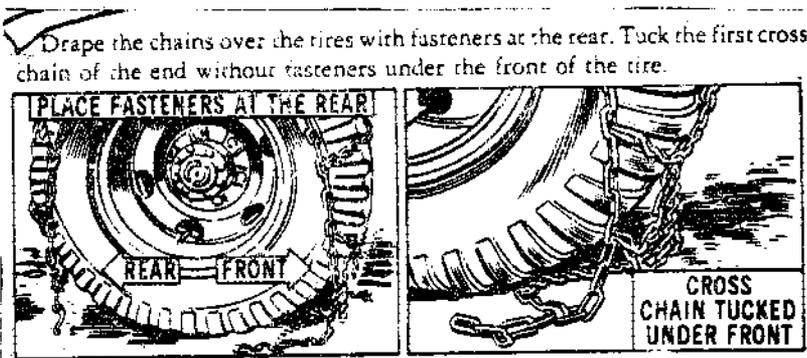
Secure fastener into predetermined link by hand, using no tools or tire deflation. Chains are to be maintained snug by hand effort only.



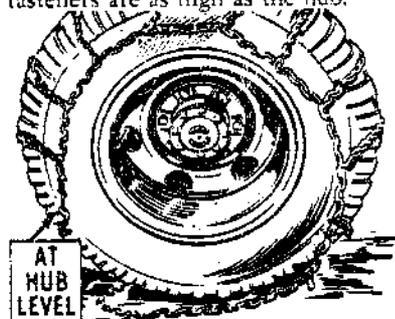
9

Properly installed chains should have cross chains at right angles to tire tread. Side chains should be evenly tightened and centered around tire sidewall. Extra side chain links must be secured to avoid vehicle damage.

(2) For dual or tandem wheel vehicles (i.e., 2 1/2 ton or 5 ton trucks) the soldier will install chains on 4 tires (2 on each side in either single or dual wheel configuration) in the following sequence within 45 minutes:

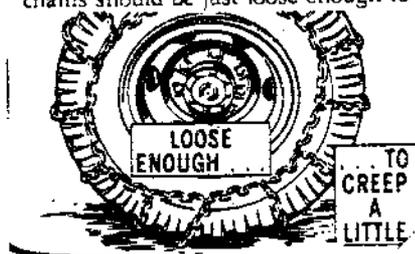


Move the vehicle forward until the fasteners are as high as the hub.



let them "creep" a little. This saves wear on both the chain and tire. Fasten the inner side chain first, then the outer. With dual-wheel chains, fasten the center chain first, then the inside, then the outside.

Bring the side chains up to see which link to use for fastening. The chains should be just loose enough to



### TRAINING

1. This task may be tested in other than slippery driving conditions.
2. Drivers will normally perform this task; however, all vehicle occupants should be able to perform or assist in the task.

3. Be sure to park in a safe place before installing or removing chains.
4. To remove tire chains, first unhook the outside fastener followed by the inside fastener. Allow chains to fall off of the tire to the ground. Drive off the chains.
5. For storage, hook the side chains together to avoid tangling.
6. Chains may be dipped in used crankcase oil to prevent rust.
7. To prevent damage, remove chains when not needed, especially when traveling on hard surface roads.
8. Because of tire size variations, be sure to try your chains for size. This assures you that when you need chains, they will fit properly. Snow tires may require a size larger chain than regular tires.
9. Do not deflate tires to install chains. When reinflated, chains may fit too tightly; causing unnecessary damage to the tires.
10. After installing chains, cut off or tie back all but one or two side chain links. This will avoid damage loose side chain ends can cause to undervehicle parts.
11. Tire chains should be snug. Cross chains at right angles to the tread. Side chains should be evenly tightened and centered on the circumference of the tire sidewall.
12. After driving 1/2 to 3/4 mile on chains, stop and retighten side chains to take up slack. Loose chains cause faster wear.
13. Faster cross chain wear will occur at speeds over 30 m.p.h.
14. Avoid running tire chains on bare pavement unless absolutely necessary.
15. Repair broken cross chains immediately. Use new cross chains or repair links. If none are available, remove broken cross link to avoid undercar damage.
16. When starting with chains, accelerate slowly to avoid spinning the wheels. When stopping, lightly pump the brakes to avoid locking the wheels.
17. Drive carefully...if the weather is bad enough for chains, it is bad enough to require extra caution when driving.
18. Tire chains should not be used for anything other than what they are intended.

References

PS Magazine, Cold Weather Europe Special. (Extracted from PS Magazine, Issue 300, November 1977), p. 27.

See installation instructions provided with tire chains.

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## CAMOUFLAGE/CONCEAL EQUIPMENT.

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### CONDITIONS:

During daylight hours, given any item of military equipment in a field location, natural camouflage materials (foliage, grass, mud, snow, etc.) appropriate to area, camouflage net(s), and basic-issue pioneer equipment.

### STANDARD:

Within 30 minutes, conceal shiny parts, cover remaining areas of the equipment in irregular patterns, and alter outlines to blend with the predominant terrain background pattern in the area.

### TRAINING

To camouflage and conceal equipment, follow these examples:

1. Use pattern paint, mud, whitewash, etc., to cover shiny areas of equipment in irregular patterns so the item will blend with the color of natural surroundings.

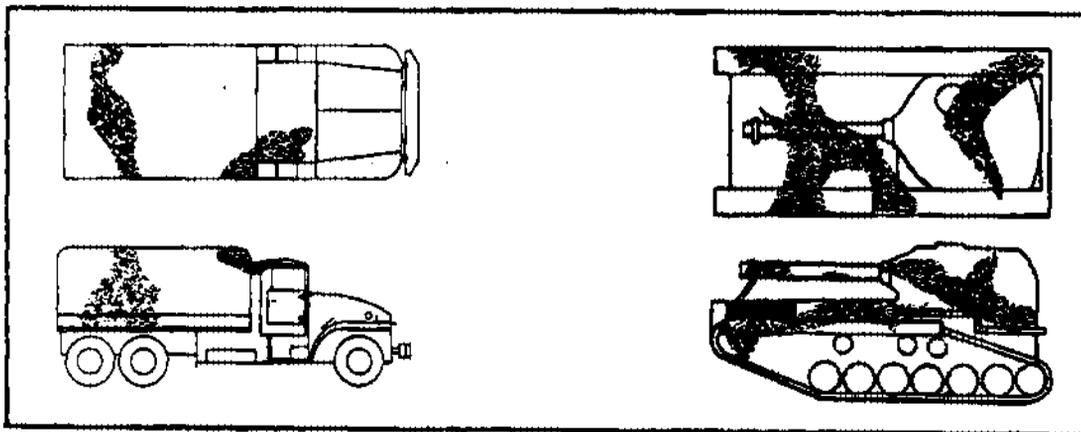


Figure 1.

2. Use natural materials (foliage, grass, mud, etc.) and manmade materials to alter the shape and size of the equipment.

3. US whitewash (NSN 8081-00-V52-6045).

French whitewash, Omya Eriquette Violette 3FD.85 216.8

Or other similar commercial military products should be utilized for camouflage when operating in snowy conditions.



*Figure 2.*

#### References

FM 5-20, Camouflage, 20 May 68. (Chap 3, pages 17-20; Chap 6, pages 35-43)

TEC Lesson 937-060-0032-F, Cover, Camouflage, and Concealment, Part 3  
FM 21-2 (Test), Soldier's Manual of Common Tasks, 31 Aug 77, Skill Level;  
pages 45-46, Task #051-191-1362.

TAB E TO APPENDIX 16 TO CHAPTER 9  
VEHICLE COLD WEATHER OPERATING PROCEDURES  
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

1. M35 (2 1/2 ton) and M813/M54 (5 ton) Cargo Trucks:

a. Starting Engine. Observe all normal starting procedures. Also, pull out the hand throttle to 1/2 its maximum travel. With the accelerator pedal depressed 2/3 of the way, the accessory power switch on, depress the start button. While engine is cranking, turn on the manifold heater.

b. Running the Engine. Set hand throttle to 800 rpm and allow engine coolant to reach 140°F. If engine runs rough, use the manifold heater intermittently.

c. Vehicle Operation. Move the vehicle in low range initially to warm up gear boxes and ensure brake shoes are not frozen to the drums. When accelerating or braking on winter roads, the watch word is "gradually". Sudden braking or accelerating will cause the driver to lose control of the vehicle. Decelerate before entering turns. Slowly gain speed prior to climbing a grade to use momentum to assist traction. Stop the vehicle at the crest and descend.

d. At a Halt or Parked. Pump brakes to dry them before halting or parking. Use tarpolins and park out of the wind to retain engine heat. If vehicle cannot be parked on dry ground, prepare a mat of brush or planks to prevent tires from being frozen to the ground.

2. M113 Series Vehicles:

a. Starting Engine. Ensure engine panels are installed. Check accumulator pressure and recharge to yellow zone (55-65 PSI). Press air box heater 1 to 2 seconds immediately prior to pressing start switch. Pull fuel cut off out, press starter 4 to 5 seconds, then push the fuel cut off in and continue cranking while cycling air box heater switch (on 1 second, off 1 1/2 second) until engine reaches 300 to 350 rpm. Release the starter switch but continue to cycle air box heater switch until the engine runs smoothly at 550 to 600 rpm.

b. Running the Engine. Run engine for 3 to 5 minutes at normal idle (550-600 rpm) then set throttle to 1200 to 1500 rpm and run for 5 minutes. Push in throttle and stop the engine. Perform normal start and place shift lever in the 2-3 range and run the engine at 800 to 1000 rpm for a maximum of 10 minutes to warm up the transmission.

c. Driving. Driver must be careful when placing carrier in motion. Track frozen to the ground must be considered. Place shift lever in range 1 and drive carrier for 100 yards to warm up lubricants in gear and tracks sufficient for normal operations.

d. At a Halt or Parked. Place carrier out of the wind or facing away from wind direction. Prepare footing of planks or brush if ground is wet. Clean and clear off snow and ice and refuel immediately.

e. Auxiliary Equipment. Armament and mortars should be covered and kept dry and free of snow and ice. Do not breathe on optical sights and components as condensation will freeze to them.

### 3. M60A1 Tank:

a. Starting Engine. Allow engine to warm up for several minutes at 1000 to 1200 rpms. Intermittent use of manifold heater will aid induction temperatures and minimize white smoke until engine runs smoothly. Then allow engine to warm up for several minutes at 1200 to 1800 rpm. If engine is to idle for an extended period, a high idle (1200 to 1600 rpm, depending on the temperature) will be required to prevent smoking. If a lower speed idle is necessary, intermittent use of the manifold heater will provide a sustained smoke-free idle.

b. Operating Engine. Normal engine idle speed is not sufficient to support complete combustion in the cylinders. When an engine is allowed to idle for extended periods at low ambient temperatures, the engine becomes over-cooled. This results in erratic idling caused by one or more cylinders not firing. Thus, unburned fuel washes down the cylinder wall which impedes normal cylinder lubrication. Poor idling can be evidenced by excessive blue and white exhaust smoke and the presence of raw fuel on the rear access grill doors.

c. Vehicle Operation in Snow. It may be possible to ride heavily crusted snow with only occasional breakthroughs. To climb back onto the crust, reduce engine speed and move transmission shift lever for forward movement without skippage. Avoid steep grades. Drive a tank as nearly straight up and down as possible to equalize track load. Avoid sharp turns, ruts and snow banks. For soft or fine snow, place transmission shift lever in L (low) to obtain best traction.

d. Vehicle Operation on Ice. Select proper transmission range and speed to move the tank slowly and steadily. If skidding occurs, decelerate engine and proceed with caution.

#### e. Operation Without Track Pads.

(1) Limited experience is available regarding operation of T-142 track without track pads. T-142 track, operating without pads, was tested by the Arctic Test Center (1967) and by USAARENBD (1969).

(2) T-142 track with all the pads removed demonstrated better traction, slopeclimbing ability, and braking. Drawbacks are that top speed is decreased slightly, stopping distances are increased, and operating T-142 track without pads and alternate pads removed is considerably harder on most hard road surfaces. Additional considerations are the time required to remove/install track pads and storage of pads when removed.

(3) As a general guide, track pads will not be removed within the 8ID.

f. One Track Spinning. To move a tank that has one track on solid ground and the other spinning in mud or on ice, apply steering action to the spinning track. This will stop the differential action and cause power to be transmitted to both tracks. If one track is on solid ground, it will move the vehicle. As soon as the effect of steering is felt and the vehicle begins to turn, return the steering to straight ahead.

g. At Halt or Parking. In ambient temperatures of plus 45°F (7°C) to -25°F (-24°C), perform the following procedures:

(1) Refuel as soon as possible to prevent condensation from accumulating in fuel tanks.

(2) When halted for short shutdown periods, if possible, park the tank in a sheltered spot out of the wind. If no shelter is available, park so that the tank faces into the wind. For long shutdown periods, if high, dry ground is not available, prepare a footing of planks or brush for the tank. Chock tank in place if necessary.

(3) When preparing a tank for a shutdown period, stop engine and place the transmission shift in P (park) position so that, if the transmission shifting system becomes stiff, the engine can be started.

(4) Additional precautions include, but are not limited to:

(a) Cover inlet grill doors and exhaust doors during heavy snow or sleet. This will help retain heat and will help prevent water freezing in the engine compartment.

(b) Open driver's compartment and engine compartment drain valves to drain any melted snow or ice from the hull while engine heat is present.

(c) Clean mud, snow and ice from the track and suspension as soon as possible after halt.

(d) To prevent freezing of linkage, do not apply parking brake, use chocks.

h. Air Cleaner Intake Reversal. In the event of impending CBR attack or CBR operations, air should be drawn from the engine compartment.

i. Operating the 105mm Gun. Check the first few rounds fired through a cold gun for frost or ice, especially around the primer. This could prevent grounding of the firing circuit and cause a misfire. Condensation may also collect and freeze in the breech, in and around the firing pin and prevent a complete circuit. If condensation appears, be sure to dry the firing circuit.

j. Combination Gun Mount. Be particularly observant of the recoil mechanism during firing. If the 105mm gun hangs out of battery, do not operate the mechanism and immediately report it. Observe the replenisher indicator tape. Sometimes extreme cold will cause the replenisher piston to seize and present false readings.

APPENDIX 4  
JOB BOOK INSERT

1. The following cold weather Soldier's Manual tasks are common to all MOS's of the Division and will therefore be added to all job books which do not now contain them.

TASK NO	DESCRIPTION	GO	NO GO	DATE
* 9-16-A-1C	Ascertain previous cold weather injury.			
* 9-16-A-2a	Inventory, inspect serviceability and determine proper fit of all winter clothing, particularly boots, overshoes and thermal boots.			
9-16-A-2d(1)	Perform mouth to mouth resuscitation and cardiac massage.			
9-16-A-2d(2)	Apply first aid for wet or cold injuries.			
* 9-16-B-1a	Determine susceptibility to cold injury.			
* 9-16-B-2d	Inspect feet at four hour intervals.			
* 9-16-B-2f	Brew hot beverage or soup.			
* 9-16-B-3b	Assign each soldier a cold weather buddy.			

2. The following cold weather Soldier's Manual tasks are not common to all MOS's in the Division. They should therefore be added to the job book of those soldiers who are now or will be expected to perform the tasks.

TASK NO	DESCRIPTION	GO	NO GO	DATE
* 9-16-A-2b	Wear face mask and goggles when assigned as driver, T.C. or air guard on a track or open wheel vehicle.			

TASK NO	DESCRIPTION	GO	NO GO	DATE
9-16-A-4	Measure specific gravity of vehicle batteries.			
9-16-A-5	Measure the degree of antifreeze protection.			
* 9-16-B-2i	Pump water from a foxhole.			
9-16-C-1	Slave start a vehicle.			
9-16-C-4A	(truck) Drain a 2-1/2 or 5 ton truck fuel filter system.			
9-16-C-4A	(tank) Drain an M60 tank fuel filter system.			
9-16-C-4B	Drain a 2-1/2 or 5 ton air brake system.			
9-16-C-6	Install tire chains.			
9-16-D-5	Camouflage/conceal equipment.			

\* These soldier's manual supplemental tasks are to be published. Units are encouraged to write supplemental cold weather soldier's manual tasks from the text of *Winning in the Cold* and add them to individual job books.

## APPENDIX 5

### Footnotes

1. DA Pam 20-230, Russian Combat Methods in WWII, Nov 1950, p. 39.
2. Ibid, p. 86.
3. "Soviet Army Winter Operations," Trupen Praxis, Military Review, June 1973, COL Sobik, p. 58.
4. Ibid.
5. Ibid.
6. "Soviet Army Winter Training," ASMZ, Military Review, Oct 1978, Erich Sobik, p. 77.
7. DA Pam 20-292, Warfare in the Far North, Oct 1951, p. 4.
8. AR 40-418, para 2-22, requires that the Surgeon General be notified telegraphically if a soldier is admitted to a hospital as a result of cold injury. Figures are based on those so reported.
9. DA, TB MED 81, Cold Injury, Sep 1976, p. 3.
10. DOD, NATO Handbook, Emergency War Surgery, 1975, pp. 36-47.
11. DA, Cold Injury, Ground Type, 1958, p. 378.
12. TB MED 81, p. 4.
13. Cold Injury, Ground Type, p. 500.
14. FM 21-2 (Test), Soldier's Manual of Common Tasks, Aug 1977, pp. 13-14.
15. TB MED 81, p. 4.
16. Ibid.
17. Operational Problems in Cold Regions, LTC Allen P. Richmond, 1964.
18. Ibid.

## APPENDIX 6

### Bibliography

#### 1. ARMY REGULATIONS:

- a. AR 40-5, Preventive Medicine
- b. AR 40-418, Medical Statistical Reporting
- c. AR 40-562, Immunization Requirements and Procedures
- d. AR 190-90, Suppression of Prostitution

#### 2. FIELD MANUALS:

- a. FM 21-2 (Test), Soldiers Manual of Common Tasks
- b. FM 21-6, How to Prepare and Conduct Training
- c. FM 21-10, Field Hygiene and Sanitation
- d. FM 21-11, First Aid for Soldiers
- e. FM 21-15, Care and Use of Individual Clothing
- f. FM 21-18, Foot Marches
- g. FM 21-35, Drivers' Manual
- h. FM 31-70, Basic Cold Weather Manual
- i. FM 31-71, Northern Operations
- j. FM 31-72, Mountain Operations
- k. FM 31-73, Skiing and Snowshoeing

#### 3. TECHNICAL BULLETIN: MED 81, Cold Injury

#### 4. TECHNICAL MANUALS:

- a. TM 5-297, Well Drilling Operations
- b. TM 5-632, Military Entomology Operational Handbook
- c. TM 5-700, Field Water Supply
- d. TM 8-250, Environmental Health Technician, 31 Jul 74
- e. TM 9-2350-215-10, Operator's Manual for Tank, Combat, FT, 105mm,  
M60A1
- f. TM 9-2300-257-10, Operator's Manual: Carrier, Personnel, FT, Armored,  
M113A1; Carrier, Mortar, 4.2 inch
- g. TM 9-2250-217-10, Operator's Manual for Howitzer, Medium, SP,  
M109A1
- h. TM 9-2320-209-10, Operator's Manual for Truck, Cargo, 2-1/2 ton,  
M35A2
- i. TM 9-2320-218-10, Operator's Manual for Truck, Util, 1/4 ton, M151A2
- j. TM 9-2320-222-10, Operator's Manual for Recovery Vehicle, FT,  
Medium, M88

- k. TM 9-2320-238-10, Operator's Manual for Recover Manual, FT, Light, Armored, M578
- l. TM 9-2320-209-10/1, Operator's Manual for Truck, Cargo, (6 x 6), 2-1/2 ton, M35
- m. TM 9-2320-260-10, Operator's Manual for Truck, Cargo, (6 x 6), 5 ton, M813
- n. TM 9-2320-00-10, Operator's Manual for Truck, Cargo, (6 x 6), 5 ton, M54
- o. TM 9-207, Operation and Maintenance in Extreme Cold Weather
- p. TM 9-6140-200-12, Lead Acid Batteries
- q. TM 9-6140-200-14, Lead Acid Storage Batteries
- r. TM 21-305, Drivers' Manual

5. DA PAMPHLETS:

- a. DA Pam 20-230, Russian Combat Methods in World War II
- b. DA Pam 20-292, Warfare in the Far North
- c. DA Pam 21-52, Cold Facts for Keeping Warm
- d. DA Pam 360-410, Northeast to the Arctic

6. OTHER:

- a. Climatology Handbook for V Corps Forward Areas, Apr 77
- b. US Department of the Army. The Surgeon General. Cold Injury, Ground Type. By COL T. F. Whayne, MC, USA (Ret) and M. E. DeBakey, M.D., Wash, D.C.: US Gov't Printing Office, 1958. 570 pp.
- c. US Department of Defense. Emergency War Surgery. First United States Revision of the War Surgery NATO Handbook. Wash, D.C.: US Gov't Printing Office, 1975. 397 pp.
- d. "Soviet Army Winter Operations," Truppen Praxis, Military Review, June 1973. COL Sobik, p. 58.
- e. "Soviet Army Winter Training," ASMZ, Military Review, October 1978, Erich Sobik, p. 77.
- f. PS Magazine, Cold Weather Europe Special, 1978, undated.
- g. Operational Problems in Cold Regions, 1964, LTC Allen P. Richmond.
- h. ASICGRAM #003-79, 8ID.
- i. 8ID TV Tape, Winning in the Cold.





