

# FM 31-71

DEPARTMENT OF THE ARMY FIELD MANUAL

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## NORTHERN OPERATIONS



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HEADQUARTERS, DEPARTMENT OF THE ARMY

## NORTHERN OPERATIONS

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\*This manual supersedes FM 31-71, 10 January 1963, including all changes.

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## FOREWORD

This revision provides commanders and staff officers with basic doctrine for northern operations. The doctrine contained herein is generally applicable to operations below division level. The manual provides guidance on the effect of the environment on personnel, equipment, organization and operations. This revision contains the latest doctrinal information available applicable to military operations in any cold weather area of the world.

## CHAPTER 1

### GENERAL

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#### Section I. INTRODUCTION

##### 1-1. Purpose and Scope

*a.* This manual provides doctrinal guidance to commanders and staffs for operation and administration of combat, combat support, and combat service support units in the northern regions of the world. The material contained in this manual is directed primarily toward operations below division level. Operations at division level and above will be essentially the same as those in other areas of the world. It is the forward elements of divisions or task forces that must overcome the many summer and winter problems inherent in northern operations. Commanders and staff officers at all levels must understand and appreciate the effects of the northern environment on the operations of these forward units and carefully consider them when planning each operation. The reader should refer to FM 31-70 and FM 31-72 and to other manuals of the arms and services for further information concerning northern operations (app A). The contents of this manual are applicable to—

(1) General war, to include a consideration of the employment and protection from nuclear munitions and chemical, biological, and radiological agents; and operations in nuclear, chemical, or biological environments.

(2) Limited war.

(3) Cold war, to include stability operations assistance in internal defense and internal development operations.

*b.* The provisions of Standardization of Operations and Logistics (SOLOG) Agreement 23R, Arctic Doctrine are implemented in this manual.

*c.* Users of this manual are encouraged to submit recommendations to improve its clarity or accuracy. Comments should be keyed to the specific page, paragraph, and line of text in which the change is recommended. Reasons should be provided for each comment to insure understand-

ing and complete evaluation. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to the Commanding General, United States Army, Alaska, APO Seattle 98749. Originators of proposed changes which would constitute a significant modification of approved Army doctrine may send an information copy, through command channels, to the Commanding General, United States Army Combat Developments Command, Fort Belvoir, Virginia 22060, to facilitate review and followup.

##### 1-2. Area of Northern Operations

*a.* The area of northern operations (fig 1-1), for purposes of this manual, is defined as those northern areas of the Northern Hemisphere which lies north of the temperate zone where environmental conditions require the application of special techniques and equipment that normally are not required for operations in a more temperate climate. Included in both summer and winter operations are the considerations of mountain operations and inadequate land lines of communications. Although the area of northern operations is graphically described, the doctrine and techniques put forth in this manual may be applicable in any area of the world that has snow and cold weather.

*b.* The term northern operations, as applied to this manual, includes both the Arctic and subarctic. About 45 percent of the North American continent and 65 percent of the Eurasian land mass lie in these regions.

*c.* For purposes of this manual, the terms, cold weather operations, operations in the subarctic, arctic operations, operations in the far north, operations in northern latitudes, polar operations, and operations on polar ice, will be considered synonymous and will be combined under the all encompassing term, "northern operations." This term embraces operations in both summer and



*Figure 1-1. Area of northern operations.*

winter and is applicable to North America and Eurasia.

### 1-3. Basic Considerations

*a.* The northern environment is a dynamic force. He who recognizes and understands this force can use it; he who disregards or underestimates this force is threatened with failure or destruction. Because of the demanding requirements on the individual soldier, leadership must be of the highest caliber. Leaders at all levels down to the squad, must make decisions far surpassing the scope of their usual responsibilities. In the north the human element is all-important. The effectiveness of equipment is greatly reduced. Specialized training and experience are essential. The climate does not allow a margin of error for the individual or the organization.

*b.* The ground mobility of all units is restricted. Movements must be carefully planned and executed with the knowledge that distance can be as difficult to overcome as the enemy. Momentum is difficult to achieve and quickly lost. All available means of transportation must be considered and used to maximum advantage.

*c.* Because of the stresses imposed by the northern environment, maintenance of equipment is difficult and of great importance.

### 1-4. Organization

With modifications, the current Army divisions, and other combat, combat support, and combat service support units are suited for operations in the north. The MTOE changes in personnel structure and equipment authorizations are the result of added emphasis on mobility, maintenance, communications, and additional logistical support. Certain items of equipment are eliminated or added based on their suitability to the terrain, the environment, and the concept of operations.

### 1-5. Command Leadership

Because of severe environmental conditions leadership in the north is highly demanding. Emphasis is on small unit operations. Command is decentralized to insure maximum flexibility for leaders at all levels. Resourcefulness and initiative are requisites for unit commanders. Forceful and personal leadership is the key to success in the north. Commanders at all echelons must plan and prepare their operations in great detail, actively supervise, keep themselves and their subordinates

informed, and maintain close coordination with adjacent and supporting units.

### 1-6. Tactics

*a.* Tactical principles for operations in the north are the same as those employed in other areas. However, because of the environment, emphasis may be placed on principles which are less important in areas of milder climate.

*b.* Mobility is a cardinal principle of operations in the north. Mobility can only be obtained through proper integration and use of all appropriate transportation, including aircraft, wheeled and tracked vehicles, water craft, and individual means. The fundamental principles and techniques of airmobile and riverine operations, prescribed in FM 57-35 and FM 31-75, with special considerations discussed in this manual, are applicable to combat in northern areas.

*c.* Operational planning emphasizes the use of envelopments to exploit the principle of surprise. The attack may be conducted as an envelopment to seize objectives from which the enemy position may be dominated by fire or from where he may be attacked from the rear. With the proper use of airmobility most operations will be in the form of reconnaissance and security missions with the objective of finding the enemy and destroying him in place with all available means of firepower.

*d.* Where predominantly ground forces are employed, movement to contact is conducted under cover of a highly mobile force. The force should contain aviation, combat support and combat service support elements, and sufficient fire power to eliminate minor opposition.

*e.* In winter operations during the long periods of darkness, night movement and night operations should become the rule rather than the exception. An attack has a better chance of succeeding during the night because during daylight columns of troops and equipment are easily located and are extremely vulnerable.

*f.* Lines of communications are the life blood of forces in the north. Enemy forces may be defeated by severing his air and ground lines of communication since the terrain and climate may deny the availability or use of alternate routes.

*g.* Lack of adequate ground lines of communications requires more emphasis on the use of aircraft and low ground pressure cross-country vehicles for supply, resupply, and troop movement.

*h.* Deception is vital in all operations because of vulnerability of forces in the north brought on by problems of concealment, slow movement of troops, and limited land lines of communications.

*i.* In winter, denial of adequate shelter to a force can cause casualties as surely as the delivery of fire power. This fact can work for or against the field unit.

### 1-7. Logistics

*a.* The unusual weather and terrain conditions that are found in northern areas make problems of supply, evacuation, transportation, and services more difficult and more time consuming. Time and space factors vary with the terrain, the climate, and the season. More time must be allowed for movement of supplies and troops because of the environment. Distance is measured in time rather than space.

*b.* Commanders must issue their orders early to

allow adequate time for subordinates to move supplies and equipment. Logistical support planning is required in great detail, even for small unit operations. Adequate support must be provided to troops to insure survival and comfort as well as combat resupply. Plans should include considerations for food, fuel, clothing, sleeping gear, tentage, mountain gear, winter equipment, repair parts, and ammunition or nuclear weapons, as appropriate. All means of transportation, to include aircraft, boats, wheeled and tracked vehicles, and individual means, must be considered in movement of supplies and equipment.

*c.* The capacity of the combat service support units to provide adequate logistical support may be the determining factor in evaluating the feasibility of a planned operation. The commander must be ready to alter the plan when environmental stresses make it impossible for the combat service support units to provide necessary support.

## Section II. EFFECTS OF ENVIRONMENT ON MILITARY OPERATIONS

### 1-8. General

In northern areas, the conduct of military operations is greatly affected by considerations foreign to more temperate regions. These considerations include the long hours of daylight (fig 1-2) and dust of summer, the long nights and the extreme cold of winter, and the mud and morass of the transition periods of spring and autumn. The disrupting effects of natural phenomena, the scarcity of roads and railroads, the vast distances and isolation (fig 1-3), and occasionally the lack of current maps combine to affect adversely but not totally restrict mobility, fire power, and communications. In spite of these conditions, operations are feasible through employment of aggressive leadership, a high state of training, and adequate logistical support.

### 1-9. Operating Conditions

*a.* The most suitable time for ground operations is from midwinter to early spring before the breakup period. The snow is "settled," giving well-trained and supported troops an excellent opportunity for oversnow mobility. During this period, operations are possible even in a roadless wilderness. Early winter, after the formation of ice, is also favorable; however, it does not afford well-trained troops the same oversnow and cross-

country mobility as midwinter. The winter cold requires the use of special cold weather clothing and equipment and places a premium on fuel for warmth. Tracks in the snow, and fog created by a heat source, complicate the camouflage of positions. The blending of terrain features, lack of navigational aids, fog and blowing snow all combine to make land navigation exceedingly difficult. High winds and the phenomenon of whiteout can interfere with aviation operations. High winds also combine with the cold to make moderately cold weather extremely uncomfortable. In midwinter, the environmental factors—extreme cold and snow—may be used to advantage by leaders with initiative and ingenuity.

*b.* Limited objective operations are feasible in spring if timed for the period when daytime thaw and nighttime freeze leave only a thin layer of mud on deeply frozen ground, and lake and stream ice is still firm. However, these operations may be interrupted by sudden breakup periods, causing them either to slow down or stop entirely.

*c.* From the end of the breakup season through autumn, operations can be resumed only after the ground has dried sufficiently to allow cross-country movement. Men and vehicles, to some degree, regain mobility. When operating in the low areas, the numerous streams and swamps will require



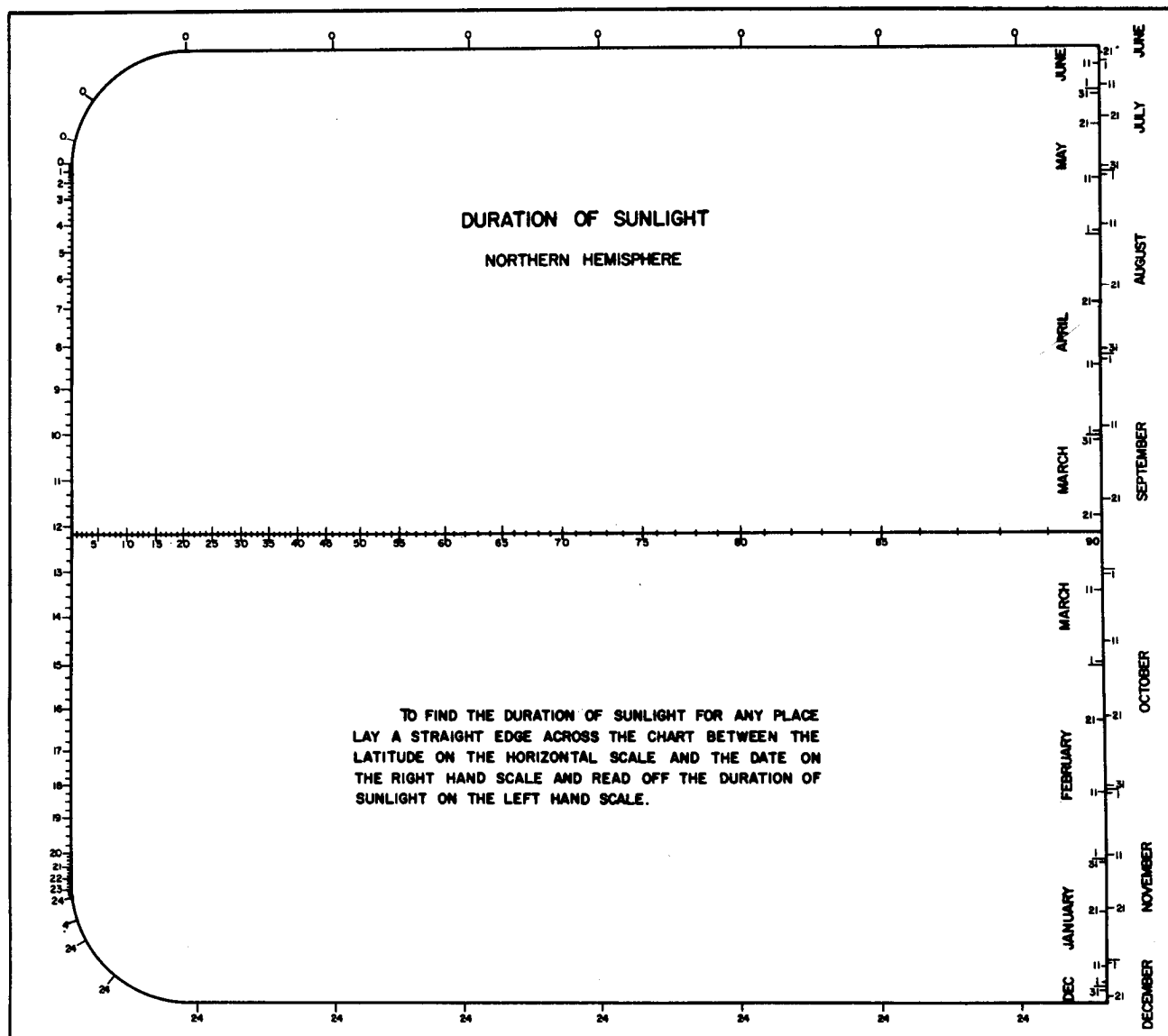


Figure 1-2. Hours of daylight in northern regions.

greatly increased engineer effort and the use of special equipment. The many rivers and streams can sometimes be used for the movement of troops and supplies.

d. Poor drainage may cause low lying country to become isolated from the surrounding terrain. Roads may become flooded. Poorly constructed roads disintegrate. Often, the only means of transportation is by aircraft and low ground pressure vehicles or watercraft. Attempts to maintain normal ground mobility are very exhausting to troops and hard on equipment. In brief, other than during the period from midwinter until early spring, offensive operations which require long-range mobility will be dependent for the most part on air movement.

### 1-10. Weather Phenomena

a. *Whiteout.* A milky atmospheric phenomena in which the observer appears to be engulfed in a uniformly white glow. Neither shadows, horizon, nor clouds are discernible. Sense of depth and orientation is lost. Only very dark nearby objects can be seen. Whiteouts occur over an unbroken snow cover and beneath a uniformly overcast sky. With the aid of the snow blink effect, the light from the sky is about equal to that of the snow surface. Blowing snow can cause the same effect. The whiteout phenomena are experienced in the air as well as on the ground.

b. *Greyout.* Greyout is a phenomenon which occurs over a snow covered surface during twi-



*Figure 1-3. Typical northern area terrain.*

light conditions or when the sun is close to the horizon. There is an overall greyness to the surroundings, and when the sky is overcast with dense cloud there is an absence of shadows, resulting in a loss of "depth perception" which increases the hazard in landing an aircraft, driving a vehicle along a road, skiing or even when walking, with the effect greatest when a person is fatigued. Under certain greyout conditions, it has been found almost impossible when driving to distinguish the road from the ditch or from the snowbanks along the roadside. The phenomenon is similar to whiteout except that the horizon is dis-

tinguishable under greyout conditions and not distinguishable during a whiteout.

*c. Ice Fog.* The phenomenon of ice-particle fogs is a very common occurrence around inhabited areas during cold winter weather. They are found most of the time when temperatures drop below  $-35^{\circ}\text{F}$ . Their origin, in marked contrast to that of ordinary super-cooled fogs, lies in the copious local production of water vapor by human activities, coupled with an inability of the stagnant air at such low temperature to hold the water vapor. Such sources of water vapor may include the exhaust from vehicles and aircraft, the vents of

steam from permanent type heating systems, the air ventilated from humid rooms, and the stove pipe from space heaters. In the field, such a fog may appear over a body of troops, bivouac areas, motor parks, airfields, convoys, and gun positions

when firing. Ice fog obscures the gunner's vision along the line of fire and may disclose the location of weapons, vehicles, and troops. During darkness ice fog limits or negates the effectiveness of night vision devices.

### Section III. MOBILITY

#### 1-11. General

*a.* Ground mobility is affected by inadequate transportation nets. During the winter, low temperatures, snow and ice, and the difficulties of constructing roads and trails hinder movement. During the breakup season, ice is weakened on lakes and streams, and existing roads may become almost impassable. Extensive overland movement is difficult during the summer because the underlying permafrost prevents effective drainage and extensive swampy areas result.

*b.* Movement by helicopter or by fixed wing aircraft equipped with conventional landing gear, skis, amphibious landing gear, or flotation kits offers an effective means of mobility in the undeveloped regions of the north.

#### 1-12. Effects of Climate

##### *a. Winter Condition.*

(1) Snow affects mobility of ground troops in a number of ways. Heavy snow cover impedes movement, either cross-country or on roads. Snow cover also blankets many terrain features, hiding obstacles to movement such as brush, stumps, rocks, ditches, small streams, fallen trees, mine fields, and other manmade obstacles. Snow cover acts as a thermal insulator which retards the freezing or thawing of underlying ground. When snow melts, it saturates the ground and often makes it impassable. Snow or ice on roads, under certain conditions, makes driving difficult and dangerous. On roads and airfields, snow increases maintenance requirements since it requires removal or compaction. Traction on compacted snow is generally better during extreme cold weather.

(2) The effect of snow cover on mobility varies greatly with both depth and physical characteristics of the snow at any particular time and location. The factors stated in this subparagraph are generalizations only. Conventional wheeled vehicles or men on foot cannot travel satisfactorily over flat terrain or roads when the depth of uncompacted snow exceeds 30 cm (12") in depth. Most tracked vehicles are slowed by a snow depth of 60 to 75 cm (24" to 29"). Low-ground-pressure

tracked vehicles can generally operate effectively in deep snow. However, snow of more than 76 cm (29") depth, especially when granular or powdery, can stop movement except for special over-snow vehicles. The physical strength of snow generally increases with reduction of temperatures. Frequently, movement across a snow covered area impassable during the day may become passable during the night after a sharp drop in temperatures. Because the depth and characteristics of snow cover can vary greatly within short distances and short spaces of time, up-to-date reconnaissance of snow conditions in the operational area is essential to the planning of overland movement.

(3) Individual oversnow mobility is enhanced by the use of skis or snowshoes.

*(a)* Skis afford greater speed in moving, particularly over prepared trails and usually require less physical effort. Condition of snow (depth, trail broken, etc.) will affect this speed. Troops mounted on skis and towed behind vehicles (skijoring) are an effective means for rapid cross-country movement where trafficability permits. Troops moving by this means will arrive at their destination less fatigued and in better condition to conduct effective operations. Three to four weeks are normally required for troops to become adequate military skiers. However, this training time is only an approximation and depends largely on the adaptability of the troops. Some personnel will become proficient in one or two weeks while others, because of lack of coordination, etc., will require additional effort.

*(b)* Snowshoes, though slower than skis, require less training. Troops in good physical condition can develop adequate proficiency in a few hours. Snowshoe movement is more practical in confined areas, such as assembly areas, field trains, mortar and artillery positions.

*(c)* As a general rule units that move on foot should be trained to become proficient on both skis and snowshoes.

*b. Summer Conditions.* The northern regions in summer are characterized by an abundance of open lakes, streams; and swamps which impede

movement. Waterways may be used for military movement if equipment or improvised rafts are available. With detailed current reconnaissance, streams, creeks, and graveled river beds may be used as routes for tracked vehicles through muskeg areas.

*c. Seasonal Changes.*

(1) During the spring breakup when river ice begins to thaw, the surrounding country may be flooded and impassable. The breakup is characterized by large ice jams. During this period vehicles should carry reduced loads. Traffic should be permitted only at night when temperatures are below freezing. This will allow engineers time to perform necessary maintenance without interruption during the day. When nights become so warm that the roads will no longer freeze, heavy traffic may turn unpaved roads into morasses. At times all movement on roads may be stopped because of deep mud.

(2) In some areas of the north, fall rains complicate military movement. Unpaved roads are thawed during the summer, and the fall rains create deep mud. Ruts made in the mud during the day will freeze on cold nights and make movement with vehicles difficult. Frozen ruts tear tires and break wheels and axles. Vehicles may break through the thinly frozen crust and may bog down. Under these conditions, vehicles should not follow in the same tracks of the preceding vehicle.

(3) As the freezeup progresses and the ground becomes firm enough for tanks and other vehicles, cross-country movement is facilitated. However, great care must be exercised when tanks and heavy equipment, such as bulldozers, are being used on streams, lakes, or muskeg. These heavy vehicles may break through thinly frozen ice or ground and sink into the mud or water. Once vehicles become mired, recovery is extremely difficult and time-consuming (see TM 5-349).

(4) Another hazard to cross-country movement is warm water springs, especially when covered with snow. Many of these springs do not freeze and cause some streams to have little or no ice and some lakes to have only thin ice. Their presence in muskeg areas can cause weak spots in otherwise trafficable terrain.

### 1-13. Terrain

*a.* Various types of terrain present different problems. Obstacles to summer movement include close tree spacing and fallen trees in forested

areas, rocky hummocks, boulders, bogs, rivers lakes, and swamps. During winter, deep in snow forested areas becomes an obstacle to movement.

*b.* Nonforested areas include the tundra. During summer, large areas of tundra resemble great plains. It is covered with a thick layer of hummocky moss interspersed with extensive marshes similar to those of temperate areas but usually not so deep because of the high permafrost table. The depth to the permafrost level will usually vary from 15 to 60 cm (6" to 24"). Tundra soils are extremely moist. Cross-country tracked vehicular traffic is possible; soft, waterlogged soils, however, afford little or no wheel traction. Trafficability of the frozen tundra surface with its light snow mantle is much better in winter than in any other season.

*c.* The most serious obstacle to movement over glaciers and ice cap areas is crevasses. Special equipment is available and must be used when traversing glaciers and ice cap areas. Trails should be selected and marked by the trailbreaking party when moving over any area that may contain crevasses. With the coming of low temperatures in winter, ice cap surfaces become hard and wind swept. Newly fallen snow is blown into snow ridges which may be obstacles to movement. Wind blown compacted snow may become so hard that it will support troops on foot. Mechanized transportation is possible on this surface if snow ridges do not interfere. In many places, ski-equipped aircraft may land and take off with safety.

### 1-14. Vehicular Mobility

If a means to move by air is not available or if weather precludes airmobility, the operation may have to be mounted with vehicles, either wheeled or tracked. If such is the case, selection and preparation of a route for vehicular movement requires special techniques.

*a.* A thorough map and terrain analysis is required to determine a number of possible routes through an area. Routes should be selected that take advantage of natural cover, gain concealment from air observation and avoid steep slopes, abrupt ravines, unfrozen swamps, open streams, and other obstacles. In winter, low terrain usually provides the best routes; in summer, routes normally should follow ridgelines where solid ground is to be found.

*b.* Suspected trouble spots on routes selected by

map study and/or aerial reconnaissance are then checked by a helicopter-borne or foot reconnaissance team. If possible, the helicopter-borne party should land and select a route over the most difficult terrain obstacles by ground reconnaissance. In selecting routes through heavily forested areas, a reconnaissance route is made for lanes which may be widened. Edges of forest are often suitable. Routes in forests should be selected where trees are widely spaced and, if possible, in sandy soil. This will make it easier for heavy equipment to break trail and clear trees.

*c.* The advance guard of the column is provided the recommended route to be used by a helicopter-supported reconnaissance team. The advance guard then moves, breaking a route which is satisfactory for heavier tracked vehicles. Vehicles that may be used to break trail are tanks or combat vehicle mounted bulldozers, and in some cases, armored personnel carriers.

*d.* As soon as possible, this route should be improved by bulldozers pushing off broken timber and, in winter, the excess snow. The road should be improved to carry all of the tracked equipment in the brigade trains and be at least one lane wide with sufficient turnouts to accommodate some returning traffic. At times, trail breaking vehicles may have to deviate slightly from the route selected by the reconnaissance unit to avoid open water and excessive slopes. However, the main supply route (MSR) capable of carrying all tracked vehicles of the unit, normally will follow the general route selected by the reconnaissance unit.

### **1-15. Time Lag**

*a.* In addition to the increased amount of time consumed in actual movement, allowance must be made for other time-consuming tasks not present in normal operations. These time-consuming tasks normally increase the time between issuance of a march order and the start of its execution. Every effort should be made to compensate for this time lag by early issuance of warning orders and fragmentary orders.

*b.* Upon receipt of the march order, men must adjust their clothing and equipment. Frequently, this will save unnecessary halts for adjustment of clothing, rucksacks, skis, or sled loads. The leaders must insure that the men do not overdress, thus increasing the possibility of overheating and exhaustion.

*c.* The unit leader must assure himself that every piece of necessary clothing and equipment is present and in serviceable condition. Although this becomes routine, it is still time consuming.

*d.* Movement will be slowed while operating in low temperatures because heated shelters (tents with stoves and fuel) usually are transported with or by the troops. Time is consumed in striking shelters and loading equipment. Similarly, when the march is completed, camp sites must be prepared, tents erected, and stoves put into operation. During the cold season, shelters are not struck until the last possible moment prior to beginning the march, so as to provide heat and shelter as long as possible. Although considerable time is consumed in pitching and striking tents, experience has taught that it is still less time consuming to utilize this transportable type shelter than to construct improvised shelters. Under certain conditions patrols and other small units can utilize snow caves and snow houses for shelter. However, this means of shelter should be reverted to only as a last resort or when other shelter is unavailable.

*e.* If vehicles are to be included in the march column in extreme cold, sufficient time should be allowed for starting and warming their engines. Engine starting and warmup procedures are prescribed in TM 9-207.

*f.* Trailbreaking detachments, which move at a slower rate than the remainder of the march unit, should be started soon enough to avoid delaying the main body. To reduce fatigue and to increase the rate of movement, trailbreaking detachments and individual members should be rotated as often as necessary.

## CHAPTER 2

### OPERATIONS

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#### Section I. PLANNING

##### 2-1. Concept

*a.* Extended areas of responsibility, reduction in troop density, and battle area isolation, plus difficulties in command and control, require the use of mission type orders that give maximum latitude to subordinate commanders. Northern operations require that tactical commanders be given every possible opportunity to exploit local situations and take the initiative when the opportunity is presented.

*b.* Planning of any scope must emphasize the logistical impact of any tactical scheme on the overall support problem. The lack of roads and shelter, plus climatic severity and other environmental difficulties, require that logistical plans be flexible and adaptable enough to permit adjustment of supply means without endangering the overall effort. Restrictions imposed by extremes of climate and terrain constitute the major change from operations in temperate areas. These restrictions may, unless proper provisions are made, constitute major obstacles to the successful conduct of the operation. Mobility is a prerequisite to success. It can be achieved only through careful planning, training, and the use of specialized equipment.

##### 2-2. Special Factors

The following special factors will influence operational planning:

*a. Low Population Density.* Settlements, supplies, quartering facilities, and lines of communication are limited. Their control or destruction becomes highly important.

*b. Roads and Railroads.* Roads and railroads may be limited and those that exist usually are vulnerable to enemy action. In addition, climatic conditions may greatly affect their use.

*c. Lakes and Waterways.* Lakes and waterways are prevalent and may either aid or hinder the

operation depending upon climatic conditions. With sufficient ice thickness, they are easily crossed and may be used as natural routes of communication or airstrips. In some instances, drifted and hard packed snow makes landing on ice difficult, requiring further preparation of the airstrip. In the summer, waterways may either be major barriers or lines of communications. Many of the streams are glacier-fed and carry great volumes of water in the summer. The amount of water in glacier-fed streams may vary considerably during any 24-hour period, particularly near its source and when daytime temperatures are warm and nighttime temperatures are near freezing. Careful reconnaissance is required to determine the daily changes in the volume of water throughout the day. Location of the main channel often changes from year to year.

*d. Mapping.* Occasionally, maps maybe unreliable or even nonexistent. Therefore, the requirement for timely aerial photographs must be utilized as a source of terrain information. With proper preplanning, suitable aerial photography can be made and converted into a photomap by supporting engineer topographic units. Unless properly laid out, annotated and referenced to known survey points, the aerial photograph will not provide necessary "map-like" accuracies for navigation and employment of indirect fire weapons.

*e. Navigation.* Difficulty of land navigation is increased by lack of landmarks, large forested areas, periods of reduced visibility, difficulty of cross-country movement, and by large magnetic declinations.

*f. Weather.* Weather is an important factor to be considered in the estimate of the situation and may dictate a course of action. As an example, the attacker or defender in a snow storm with the wind at his back has a marked advantage.

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

Figure 2-1. Windchill chart.