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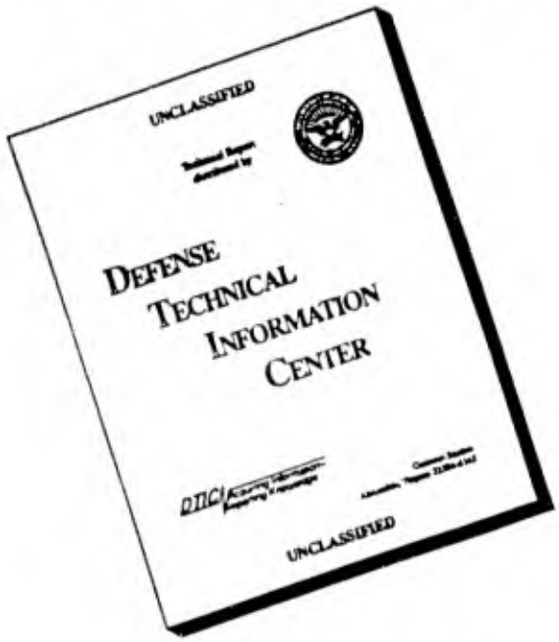

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HumRRO

Technical Report 56 February 1964

CATALOGED BY DDC
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Cold-Weather Operational Training of Infantry Forces in the Strategic Army Corps

by
Norman F. Washburne

432095

Training Methods Division

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY

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SUBJECT: Cold Weather Operational Training of Infantry Forces in the Strategic Army Corps

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1. The attached report is for your information and retention.

2. The general objective of this research task was to study the more pressing operational problems and requirements that are generated by the effects of extreme cold weather on troop performance, training, leadership and motivation. This report is addressed specifically to the cold weather operational training problems of infantry forces in the Strategic Army Corps (STRAC).

3. The conclusions and recommendations of the report are based upon observations and data collected during the training and maneuver phases of Exercise LITTLE BEAR (1960).

FOR THE CHIEF OF RESEARCH AND DEVELOPMENT:

1 Incl
as

WILLIAM G. SULLIVAN
Colonel, GS
Chief, Human Factors and
Operations Research Division

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COLD WEATHER OPERATIONAL TRAINING OF INFANTRY FORCES IN THE STRATEGIC ARMY CORPS, by Norman F. Washburne, Feb 64, 48 p. incl. illus. tables, 6 ref. (Technical Report 86)
(Contract DA 44-188-ARO-2) (DA Proj 2J024701A712) Report For Official Use Only

This research was undertaken to study the training problems of infantry forces in the Strategic Army Corps during cold weather operations. A research team was attached to CONUS forces to observe troop performance during the training and maneuver phases of Exercise LITTLE BEAR in Alaska during the winter of 1960. The data indicated areas of training content needing greater emphasis, and included suggestions regarding the context in which certain portions of the training should be given.

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COLD-WEATHER OPERATIONAL TRAINING OF INFANTRY FORCES IN THE STRATEGIC ARMY CORPS

by

Norman F. Washburne

Approved:

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The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
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Task COLDSPOT II

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CREDITS

Dr. Norman F. Washburne served as the Task Leader on Task COLDSPOT. Much of the substantive data collected during Exercise LITTLE BEAR was gathered by Pfc Terrence B. Farrell and Pfc Matthew A. Waters, who were assigned to this project during its final year.

This report was prepared in draft form by Dr. Washburne, and revised and completed by Mrs. Lola M. Zook and Dr. Robert Vineberg.

The cooperation of the U.S. Army, Alaska, is gratefully acknowledged, as is the wholehearted support given this project by the officers and men of the First Battle Group, 12th Infantry, during Exercise LITTLE BEAR.

Mr. Paul A. Townsend, Quartermaster Research and Engineering Command, deserves special thanks for his critical review of an early draft of the section of this report that concerned skiing and snowshoeing. Information furnished by Mr. Townsend was most useful but he, of course, bears no responsibility for statements or interpretations appearing in the report.

CONTENTS

Page

Summary and Recommendations

Military Problem vii
Research Method vii
Findings viii
Conclusions and Implications viii
Recommendations viii

Description of the Research

The Research Approach 3

Exercise LITTLE BEAR 6
- General Plan 6
- Objectives of the Exercise 6
- Composition of U.S. Force 7
- Training Schedule 8

HumRRO Participation in Exercise LITTLE BEAR 9
- Research Procedures 9
- Collection of Data on Small-Unit Activities 10

Findings 12
- Military Evaluations 12
- General Observations 13
- Small-Unit Checklist Results 14
  - Presentation of Data 14
  - Clothing at Hand (List I) 16
  - Personal Equipment at Hand (List II) 17
  - Maintenance of Clothing and Personal Equipment (List III) 18
  - Individual's Care of Self (List IV) 20
  - Group Equipment (List V) 22
  - Group Activities and Maintenance of Group Equipment (List VI) 22
  - Movement and Tactics (List VII) 25
  - Duties of Small-Unit Leaders (List VIII) 26
  - Activities Ranked by Performance and Type 28
- Summary of Main Findings Bearing on Training 32

Discussion and Implications 32

Page

References 38

Appendix

Computation of Indexes 39

Figure

Figure

1 Small-Unit Cold Weather Checklist: Observation Form . . . 11

Tables

Table

1 Reported Observation Situations. 15
2 Clothing at Hand (List I) 17
3 Personal Equipment at Hand (List II) 18
4 Maintenance of Clothing and Personal Equipment (List III) 19
5 Individual's Care of Self (List IV). 21
6 Group Equipment (List V) 22
7 Group Activities and Maintenance of Group Equipment (List VI) 24
8 Movement and Tactics (List VII) 25
9 Duties of Small-Unit Leaders (List VIII) 27
10 Summary of Performance Rankings by Type of Activity . . . 28
11 Skills and Techniques Ranked by Performance Index and Classed by Category 29

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SUMMARY AND RECOMMENDATIONS

MILITARY PROBLEM

More information is needed concerning the effects of arctic and subarctic conditions on the specific military skills of individuals and the capabilities of units. Such information will be of assistance in improving ways of training troops and managing operations so as to overcome the detrimental effects of prolonged and extremely cold weather upon military capabilities and performance.

The general objective of Task COLDSPOT was to study, under a variety of circumstances, the more pressing operational problems and requirements that are generated by the effects of extreme cold weather on troop performance, training, leadership, and motivation. The first published report on the Task presented a survey of literature in the field, which suggested lines for subsequent inquiry and research.[1] The present report is concerned specifically with the cold-weather operational training problems of infantry forces in the Strategic Army Corps (STRAC).

The Army units in STRAC, a major component of the defensive capability of the United States, are expected to maintain readiness to move out of their home bases in Continental United States (CONUS) on very short notice and engage attacking ground forces anywhere in the world. This implies that the men of STRAC must be trained and equipped for operations in every sort of environment, from desert to jungle, from the Temperate Zone to the Arctic. In view of the geopolitical situation today, the ability of STRAC forces to operate effectively in extremely cold weather is especially important.

It was the purpose of this research to observe current cold-weather training methods with a view to increasing their effectiveness, thus enhancing the ability of STRAC forces to operate in cold climates.

RESEARCH METHOD

A Human Resources Research Office research team was attached to CONUS forces to observe troop performance during the training and maneuver phases of Exercise LITTLE BEAR. The maneuver phase was conducted in Alaska during the winter of 1960 with U.S. Army, Alaska (USARAL) troops functioning as the aggressors. Specific activities of military personnel in small infantry units, both in training and in field performance, were observed to provide quantitative information for military and research consideration.

The conclusions and recommendations of this report reflect three years of observation and testing of STRAC units prior to and during winter maneuvers in Alaska and other far-northern locations, as well as the observations and experience (both military and research) during Exercise LITTLE BEAR.[2] Premises as to the effect of cold-weather training programs on troop performance, stemming from the earlier exploratory work, were informally evaluated during Exercise LITTLE BEAR.

[1] Reference 6.

[2] The military analysis of the exercise is presented in References 4 and 5.

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SUMMARY AND RECOMMENDATIONS

FINDINGS

Data on performances specific to cold weather and on the use of items of arctic equipment, assembled from observation of small-unit activities throughout training and field phases of the exercise, are tabulated in the report. Areas for possible improvement of training were identified on the basis of these and other observations.

CONCLUSIONS AND IMPLICATIONS

1. A high proportion of training and maneuver time is devoted to learning skiing, survival techniques, and safety and comfort skills; this has the effect of deemphasizing training in tactical effectiveness, that is, in *applying* the techniques the men have been learning.

2. Although STRAC forces spent nearly half their training time on the acquisition of skiing skills, in general they did not become very proficient in skiing; ski-mounted columns never achieved greater daily mileage than that achieved by columns of men on snowshoes, on which training had been minimal.

3. While large-scale exercises such as LITTLE BEAR confer major training benefits, especially in providing experience at command levels and in providing individual experience in cold-weather living, they are relatively ineffective as training for small-unit activities and in certain aspects of individual performance.

4. If all STRAC units are expected to be combat ready for far-northern assignments, it would appear that the annual Alaskan exercise should be supplemented by some form of annual training for all STRAC units in operational techniques in deep snow and cold weather, such as short-term training conducted in CONUS on military reservations as close as possible to the home base of the training unit.

RECOMMENDATIONS

1. Cold-weather training for STRAC forces should emphasize offensive and defensive combat techniques in deep snow, target acquisition, the firing and handling of weapons, and camouflage and concealment of weapons. Greater emphasis should be given to land-navigation techniques, to proper preparations for movement by helicopter or tracked vehicle, and to immediate fighting effectiveness upon disembarkation. Insofar as it is feasible and commensurate with safety requirements, techniques of survival should be taught within the context of specific combat skills and procedures.

2. Careful attention should be given to the high proportion of STRAC training time given over to military skiing, with a view to the possibility of sharply reducing the emphasis on skiing in general training. Consideration might be given to greater usage of other means of troop movement, for example, snowshoeing and use of helicopters.

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DESCRIPTION OF THE RESEARCH

COLD-WEATHER OPERATIONAL TRAINING
OF INFANTRY FORCES IN THE STRATEGIC ARMY CORPS

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THE RESEARCH APPROACH

The goal of this study was to analyze the current training programs of Strategic Army Corps (STRAC) forces for infantry operations in extreme cold weather and deep snow, in order to suggest revisions in the training programs that would lead to a mastery of essential cold-weather operational techniques in as short a time as possible.

This goal is not an easy one to attain. The varied, unspecialized nature of infantry missions makes it difficult to determine what training content is essential. It is particularly difficult to identify those skills, knowledges, and techniques that should be eliminated from current training programs because of their low utility or high cost. Yet it is important to make this identification because the effectiveness of a training program is, in part, a function of its simplicity. Any nonessential training content will not only consume time but will also reduce the effectiveness of training in necessary subjects.

Understandably, there is controversy about the relative necessity of certain skills and techniques in military operations in the Far North. Much of the recorded experience in cold-weather techniques is highly specialized and not necessarily applicable in a military context; not enough information of a quantitative nature is yet available to provide guidelines to certain aspects of military activities. At present, decisions as to what should or should not be eliminated from operational training must, in part, be based on opinion. Therefore, in the research reported here, emphasis was placed on the systematic collection of quantitative data, along with detailed observational records, to broaden the scope of the information available to military authorities, as well as to provide a more comprehensive basis for considering its training implications.

During January and February 1958, a HumRRO team from the U.S. Army Leadership (now Training Center) Human Research Unit observed Exercise COLD BAY. Team members conducted extensive interviews and tests with the men of the participating STRAC forces to study factors bearing on effective and ineffective performance by individuals facing the problems of far-northern field operations.

As the first step under Task COLDSPOT, in 1958 a survey of human factors in military operations in extreme cold weather was undertaken. This survey included a review of the appropriate military and scientific literature, interviews with experts in arctic problems, visits to operating units and test sites throughout the Far North, and more than 500 interviews with officers and men who had operational experience there. The results of this survey have been previously reported.[1]

[1]Reference 6.

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In January and February 1959, the author joined the 2d Airborne Battle Group of the 503d Infantry during their training in Alaska prior to Exercise CARIBOU CREEK. The preexercise training was observed in detail, and during the exercise both the 503d Infantry (a STRAC unit) and the 1st Battle Group, 23d Infantry (an Alaska-based unit which acted as aggressor) were observed. In the meantime, another representative of HumRRO attended the Army's Cold Weather and Mountain School to obtain direct experience with the regular winter course for officers.

Further exploratory work with Army forces in Greenland was undertaken during the summer of 1959 by the author and other HumRRO representatives from the Training Methods Division. They observed the effects of polar environment on certain aspects of behavior and tried out some techniques for measuring behavior experimentally.

From these various exploratory activities and from the appraisals of skilled technical observers of the Alaskan exercises, certain general opinions were formed as to major considerations bearing on infantry training for cold-weather operations. They are offered here as the premises that, in general, served as guidelines in planning HumRRO's information-gathering activities in Exercise LITTLE BEAR.

1. Tactical principles of infantry operations are unchanged by the far-northern environment, but men must learn to modify their techniques of applying these principles to meet the challenges of climate and terrain. In general, it can be said that failures or partial failures in cold-weather operations occur either because the ordinary principles of tactics are ignored, or because Temperate-Zone techniques of applying them are not modified enough to function successfully in deep snow and cold weather. In one Alaskan maneuver, for instance, an "aggressor" task force was "wiped out" by an atomic burst because they ignored the elementary tactical principle of maintaining dispersion and were clustered together in a small area. One cause of the "clustering" was a failure to modify movement techniques sufficiently to avoid stalling a motorized column at a steep, slippery hill, so that it closed up like an accordion.

2. Cross-country mobility is of critical importance in far-northern terrain. The scarcity of roads and trails places a premium on ability to move across country. Even where roads and trails are available, forces ordinarily move very slowly as compared with normal speeds in the Temperate Zone. Furthermore, the fact that there are so few roads and trails means that lines of communication are readily spotted and therefore easily interdicted; as a result, road- and trail-bound forces are very vulnerable.

3. Overreaction to the threat of extreme cold weather hampers mobility in the Far North. So much emergency and protective equipment is carried by military units in the Far North that they are retarded by the sheer weight of the materiel. This is true both for the individual foot soldier, whose full field load weighs over 118 pounds,[2] and for

[2]Reference 1, p. 281.

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whole units, which use heavy motorized equipment to transport tools, tents, stoves, food, and fuel in quantities greatly in excess of those normal for Temperate-Zone operations. The use of heavy motorized equipment itself imposes burdensome requirements for POL resupply, which limits the range of the force from supply sources and restricts movement to roads and trails. When units' loads are increased unnecessarily, there is a corresponding increase in the problems of mobility.

4. Learning new or modified techniques for operations in deep snow and cold weather of itself degrades the tactical proficiency of units new to the Far North. This statement can be considered the basic thesis of Task COLDSPOT research. Earlier observations had indicated that, because training in skiing, survival skills, and the use of cold-weather equipment was new to STRAC troops, their training programs tended to concentrate on the techniques themselves at the expense of training in application of the techniques to tactical problems. The research described in this report was in large measure designed to determine whether this tendency was a general one, which would be demonstrated in this maneuver also, rather than an idiosyncrasy of the units previously observed.

5. Most special cold-weather knowledges can be best taught concurrently with skills and techniques. From earlier observations, the impression was gained that a large part of the cold-weather instruction—given in a classroom and employing standard textual material—was not very meaningful to trainees and was therefore largely ineffective. The use of a field or functional context when giving instruction on such topics as the principles involved in pitching a tent in snow or the techniques of maintaining proper bodily warmth probably would make the material more meaningful to the trainees and would also tend to increase their motivation to learn it.

6. Cold-weather training programs need to be centered on the small unit. The fact that infantry missions are group missions and infantry tactics are, for the most part, group tactics is of particular significance in the far-northern environment. Therefore, to be most effective, training should be carried out within the framework of the working unit. This is not to minimize the importance of individual skills, knowledges, and techniques to be learned in the Far North or the problems of integrating and sequencing individual training and group training but rather to recognize the importance of applying these individual skills in coordination within the unit. For this reason the present study was focused on the training programs for small-unit infantry operations in deep snow and cold weather.

The applicability of the impressions and premises just discussed was assessed by a HumRRO research team attached to the 1st Battle Group, 12th Infantry, throughout the training and maneuver phases of Exercise LITTLE BEAR conducted in Alaska during the winter of 1960.

EXERCISE *LITTLE BEAR*

General Plan

Exercise LITTLE BEAR was a partly free, partly controlled maneuver involving the Alaska-based 1st Battle Group, 9th Infantry (reinforced) as Aggressors and the 1st Battle Group, 12th Infantry (reinforced) based in the Continental United States (CONUS), as U.S. forces. The exercise was conducted approximately 170 miles northeast of Anchorage, in the Lake Louise-Gulkana area.

The maneuver area consisted of a rough rectangle 50 miles long and 25 miles wide. This particular location was selected because it represented all typical features of northern regions with low elevation, rolling hills, numerous lakes, and muskeg, and provided a history of extreme cold and adequate snow. It was a typical undeveloped area with no road net or other lines of communication.

The maneuver itself took place during 10 to 19 February 1960. Training for the U.S. Force began 8 November 1959 with cadre training at the U.S. Army Cold Weather and Mountain School at Fort Greely, Alaska. Premaneuver training for the troops involved was conducted at Fort Lewis, Washington, during December and individual and unit training was conducted at Fort Richardson, Alaska, from 11 to 29 January.

Objectives of the Exercise

As in any large-scale exercise, there were a number of objectives for Exercise LITTLE BEAR. In the first place, field training in cold-weather operations was to be provided for the units designated. The training objectives listed in "Annex B (Objectives of Exercise) to Maneuver Plan, Exercise LITTLE BEAR"[3] included, along with some specialized objectives, the following tactics and techniques generally applicable to northern operations under winter conditions:

(1) Cross-country movements in areas having poorly developed or nonexisting road nets and communication lines.
(2) Tactical operations emphasizing development of techniques for conduct of the offense and defense, to include sustained operations.
(3) Employment and defense against nuclear and conventional weapons in areas where overland mobility will be restricted.
(4) Utilization of the transportation company (light helicopter) (augmented), for deployment of troops, resupply, and evacuation (U.S. Force only).
(5) Resupply to individuals, units, and organizations on independent type missions.
(6) Integrated training in survival, evasion, and escape.

[3] "Annex B (Objectives of Exercise) to Maneuver Plan, Exercise LITTLE BEAR," Hq. USARAL, Fort Richardson, Alaska, 2 November 1959.

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(7) Aggressive use of all available intelligence collection and dissemination means; timeliness, complete reporting, and nuclear target intelligence.

(8) Employment of long range patrols, operating for several days, to include necessary support.

(9) Construction of field fortifications and barriers in deep snow and frozen ground.

(10) Combat techniques in deep snow and extreme cold.

(11) Deception activities in the undeveloped areas of the North.

In addition to the training objectives, there were a number of objectives of an operational nature evaluating the capabilities of a reinforced battle group for northern operations. For example, the different transportation equipment supplied to the opposing task forces provided a comparison of an air-mobile force as opposed to a ground-mobile, armor-supported force. A company of armored personnel carriers and a company of light tanks were assigned to the Aggressor Force which thus had superior mobility on the ground. Although the U.S. Force had no tanks and very limited tracked-vehicle support, it had a company of H-21 helicopters at its disposal for air mobility. The advantages and disadvantages of each type of movement capability were observed in detail by representatives of the U.S. Army, Alaska.

In addition, studies were made of equipment needs and distribution. A number of troop tests of new or proposed equipment were carried out during the exercise.

Included in the list of tests and evaluations to be conducted during the exercise was a survey by HumRRO of human factors in military performance in extreme cold weather.[4]

Composition of U.S. Force

For the exercise, the U.S. Force was constituted as follows:

Unit	Origin	Strength
1st Battle Group, 12th Infantry (Companies A to E)	CONUS	1,253
Company B, 4th Engineer Battalion (Combat), with Tactical Atomic Demolition Munitions	CONUS	112
Battery A, 2d Howitzer Battalion, 1st Artillery Detachment, Field Artillery Missile Battery, HONEST JOHN Rocket (CHOPPER JOHN)	CONUS	5
2d Area Support Platoon (Augmented), Company B, 124th Signal Battalion	CONUS	35
Team Voice Intercept and Jamming, 317th U.S. Army Security Agency Battalion	CONUS/USARAL	29
2d Direct Support Platoon (Augmented), Company A, 704th Ordnance Battalion	CONUS	23
Combat Support Section (Flight B), Direct Support Platoon, 4th Aviation Company	CONUS	4
80th Transportation Company (Light Helicopter) (H-21) (Reduced Strength)	USARAL	113
334th Transportation Detachment (Cargo Helicopter, Field Maintenance)	USARAL	55

(Continued)

[4]See also Reference 6.

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Unit	Origin	Strength
Clothing and Equipment Personnel, 4th Quartermaster Company	CONUS	3
Team FA-22, 77th Special Forces Group	CONUS	8
4th Military Intelligence Detachment	CONUS	5
Team FB, Interrogator, 319th Military Intelligence Battalion	CONUS	3
Team Counterintelligence Corps, 467th Counter-intelligence Corps Detachment	USARAL	2
Rifle Squad, U.S. Medical Research Laboratory	CONUS	10
HumRRO Detail	CONUS	3

Training Schedule

Cadre training was given to 18 officers and 110 enlisted men from the 1st Battle Group, 12th Infantry at the U.S. Army Cold Weather and Mountain School, Fort Greely, from 8 November through 6 December. Meanwhile, a liaison officer from USARAL was sent to Fort Lewis to aid the battle group in planning and training prior to movement to Alaska.

Preliminary ski training and training in the use of cold-weather equipment were conducted for the troops at Fort Lewis and on Mt. Rainier during December, prior to movement to Alaska. After movement to the Fort Richardson area in Alaska, there followed three weeks of individual and small-unit training in skiing and in cold-weather tactical and survival techniques. The Task Force moved to the maneuver area between 30 January and 8 February, and the maneuver was conducted from 10 through 19 February.

The program of preliminary instruction carried out at Fort Lewis before moving the Task Force, to Alaska was listed as follows:[5]

Subject	Hours
Introduction	1
Principles of Cold Weather Clothing	1
First Aid, Hygiene and Medical Evacuation in Cold-Weather Operations	3
CBR Flame and Smoke Warfare in Cold-Weather Operations	1
Map Reading and Land Navigation	28
Weapons Maintenance in Extreme Cold	1
Rations, Individual and Small-Unit Feeding	1
Shelters, 5- and 10-Man Tents	1
Fortifications, Mines, and Demolitions in Cold-Weather Operations	1
Use and Care of Special Equipment Used in Cold-Weather Operations	1
Emergency Procedures Used in Cold-Weather Operations	1
Skiing on Straw	8

(Continued)

[5]Reference 5.

Subject	Hours
Skiing on Snow	32
Logistical and Administrative Support in Cold-Weather Operations	1
SOP, 1st Battle Group, 12th Infantry in Cold-Weather Operations	1
Trailbreaking Operations	1
Cold-Weather Problems in Cross-Country Marches and Security	1
Individual Combat Techniques on Snow-Covered Terrain	2
Total Hours	86

The individual and unit training of the infantry companies of the 1st Battle Group, 12th Infantry that took place at Fort Richardson, Alaska, prior to the exercise was listed as follows:

Subject	Hours
Use and Care of 5- and 10-Man Tents	3
Winter Mine Warfare	2
Shelters and Bivouacs	8
Fire and Movement	5
Fighting Techniques	2
Camouflage and Concealment	2
Ski Training	24
Snowshoe Training	2
Skijoring	2
Familiarization Firing	16
Platoon Field Exercise	20
Company Field Exercise	30
Battle Group Exercise	60
Utilization of Army Aviation	4
Total Hours	180

HumRRO PARTICIPATION IN EXERCISE *LITTLE BEAR*

Research Procedures

The HumRRO research team, consisting of the author and two enlisted specialists, was attached to the U.S. Force, joining it at Fort Lewis just before the movement from CONUS to Fort Richardson. The team remained with the Task Force throughout its period of duty in Alaska.

The individual and unit training program of the Task Force in Alaska was observed in detail. The two enlisted specialists were assigned to observe the small units during training and field work, while the author primarily observed planning and operations at the command and staff level.

At the end of the exercise, comprehensive interviews were held with each of the officers in the command group and with qualified military observers, to obtain the benefit of varied military viewpoints and experience during all phases of the exercise. The Army's final report of the exercise was reviewed, as was the formal critique offered by the U.S. Army, Alaska.[6]

Collection of Data on Small-Unit Activities

Prior to the exercise, the Small-Unit Cold Weather Checklist was developed as the main data-gathering instrument. It was designed for use by the observers in recording the clothing, equipment, weapons, skills, and techniques used and emphasized by small infantry units preparing for and carrying out a maneuver in cold weather and deep snow.

The checklist was a small sturdily bound booklet designed to fit easily into a field jacket or parka pocket. The first page (Figure 1) was designed for the coding of the observational situation. There followed eight lists of clothing, equipment, or skills:

I Clothing at Hand
II Personal Equipment at Hand
III Maintenance of Clothing and Personal Equipment
IV Individual's Care of Self
V Group Equipment
VI Group Activities and Maintenance of Group Equipment
VII Movement and Tactics
VIII Duties of Small Unit Leaders

The specific contents of each of these lists, covering more than 60 items of clothing and equipment and about 120 performance items, are presented in a series of tables in the next section. FM 31-70, Basic Cold Weather Manual,[7] and FM 31-71, Northern Operations,[8] were the basic sources for selection of the contents of the checklist.

The two enlisted specialists observed the cold-weather training of small units and their experiences during the maneuver and filled out checklists based on their observations. To ensure sustained coverage of such activities during the training-maneuver period, one observer was assigned to a single platoon for the entire exercise. To provide a sampling of the differences among platoons, the other observer moved from unit to unit throughout the battle group.

The observers were instructed to fill out a checklist from memory at the end of each observation period. The timing was flexible, depending in part on the activities being observed, but no observation period was to be longer than six consecutive hours. The roving observer was to report on only one unit during any one observation period. The checklists were filled out in private and turned in to the research supervisor as soon as possible. No member of the battle group being observed was allowed to read the checklist either before or after it was filled out.

[6]See References 4 and 5.
[7]Reference 1.
[8]Reference 2.

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Small-Unit Cold Weather Checklist: **Observation Form**

Book_____Page 1

_____ on _____ at _____
FILLED OUT BY MO DAY TIME

_____
UNIT OBSERVED

_____ _____
LEADER ASST LEADER

_____ _____
DATE OBSERVED MISSION

_____ _____
NUMBER OF MEN IN UNIT HOURS OBSERVED

Situation: (circle appropriate words)

1. DAY	1. CLEAR	1. SNOWING	1. INDOORS
2. NIGHT	2. PARTLY CLOUDY	2. RAINING	2. OUTDOORS
	3. CLOUDY	3. FOG	

Ground Cover: (circle appropriate words)

1. NONE	1. CRUST	1. WET
2. SPARSE	2. LOOSE	2. MOIST
3. PLENTIFUL	3. PACKED	3. DRY

Wind Speed: _____ to _____ Temp. _____ to _____
RANGE IN KNOTS RANGE IN DEGREES F.

Area Designation: _____

Figure 1

For each item on the checklist, the observer entered a code number to indicate the approximate proportion of men in the unit who had the item or practiced the technique correctly during the observation period. Code numbers from 4-to-0 were used, meaning respectively "all," "most," "about half," "only a few," and "none." If an item was not applicable to the location or activities of the period, the observer recorded this fact.

To check the reliability of these observations, the roving observer joined the permanent observer and independently observed his unit and filled out checklists on five different occasions. Analysis of the scores awarded independently by the two observers to the same unit indicate

high reliability. On the five reliability checks, 82% of all checklist designations were identical for the two observers and 99% were either identical or only one code designation away.

FINDINGS

The findings with regard to training and other human-factors aspects of Exercise LITTLE BEAR, and also the discussion which follows this section, reflect (1) HumRRO experience during the exercise—including the observations made by the author and the small-unit data collected by the enlisted specialists—and (2) military viewpoints—as indicated in opinions expressed by the command and staff officers of the task force and professional military observers and in conclusions stated in the CONUS and USARAL final reports on Exercise LITTLE BEAR.

Military Evaluations[9]

After detailed consideration of experience during the premaneuver and maneuver phases, military observers felt that Exercise LITTLE BEAR had proved to be an "outstanding training vehicle" for both STRAC and USARAL troops, as well as a very realistic testing ground for doctrine and equipment. Military consensus was that, in general, premaneuver training and operational planning and execution during the maneuver had been carried out well.

As intended, the maneuver served to identify, for military observers, certain areas in which preparation for cold-weather combat could and should be improved. The following exerpts from Section VII, "Conclusions and Recommendations," Part IV, "Operations and Training," of the USARAL Final Report reveal or imply some of the shortcomings that were noted during the exercise, or bear on human-factors aspects of the environment:

1. PRE-MANEUVER TRAINING . . .
   b. Recommendations . . . (1) . . .
      (2) USARAL Level.
         (a) The following subjects be added to the program conducted at the home station. . . .
            1. Establishment of bivouac areas to include security.
            2. Techniques of extended ground reconnaissance.
            3. Field expedients in medical evacuation.
            4. Snowshoeing (this will permit additional time for skiing and related subjects after arrival in Alaska).
            5. Techniques in loading and lashing of sled, 200-pound capacity.
            6. Technique of dead reckoning.
            7. Utilization of Army aviation, to include loading and unloading procedures, using the types of aircraft that will be available for the Exercise. . . .
         (c) Routine range firing program be replaced by familiarization firing under deep snow conditions during the individual and unit

[9]Details appear in the CONUS and USARAL final reports of the exercise, References 4 and 5.

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training phase in Alaska. This training should include use of various types of firing positions, weapons rests, use of skis and snowshoes when firing, firing of crew-served weapons, and the handling of weapons in deep snow.

(d) Additional emphasis be given to offensive and defensive combat techniques in deep snow, and techniques of trailbreaking during the individual and unit training phase.

2. OPERATIONS . . .

a. Conclusions. (1) . . . .

(m) Intensive training in land navigation at all levels is required for effective operations in this area.

(2) Infantry . . .

(a) Troops on skis or snowshoes averaged only 6 to 8 miles per day. This low mileage is attributed to excessive equipment carried by individuals and units, lack of satisfactory oversnow vehicles, improper route selection, and lack of training and inexperience in trail-breaking techniques. . . .

(6) Aviation. . . . (c) . . .

5. The majority of ground personnel still believe that helicopters can fly straight up and down and don't need approach paths.

6. Considerable time was lost in initiating alternate plans. The battle group staff officers apparently need additional training in the utilization of Army aviation, capabilities and limitations of cargo aircraft, effects of weather on the aircraft operating capabilities, and the effect of continuous operations on maintenance and aircraft availability.

(d) Tactics. . . .

2. Heliborne operations require that participating troops must:

a. Be experienced, so that they can be landed under fire and be ready to function upon debarking.

b. Unload in a minimum of time, because the helicopter is most vulnerable on the ground and usually lands the troops close to the enemy to expedite the engagement.

c. Seek cover rapidly and clear the landing area.

d. Set up suppressing fire power immediately.

e. Be briefed before landing.

3. Infantry units caused considerable loss of time and made the aircraft vulnerable to artillery fire on pick-up points and objectives by not being prepared when aircraft arrived. . . .

b. Recommendations. . . . (1) . . .

(2) Infantry. . . . (a) . . .

(b) USARAL level. 1. Further study be made on reduction of the individual and unit loads applicable to cold weather conditions for the purpose of increasing combat effectiveness and cross-country mobility.

General Observations

In the course of his varied opportunities to observe exercise activities both at the command and staff level and in small units, the author came to feel that certain performances seemed to be particularly effective or ineffective. The fact that the following observations by the author have counterparts in the military evaluation excerpts just quoted tends to confirm his impressions:

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(1) The STRAC troops were not very effective in cross-country movement on skis. Trailbreaking parties were not dispatched sufficiently ahead of the main body and the general level of skiing proficiency was so low that ski columns moved no faster than columns on snowshoes. At no time did a ski column manage to move more than nine miles in the course of a day. This is in marked contrast with highly skilled ski troops who can generally be counted on to march 30 miles or more over terrain such as that encountered in the maneuver area. It is to be noted that troops on snowshoes moved just as far each day as did troops on skis and that the 66 hours of scheduled ski training produced no more oversnow mobility, under the conditions of this exercise, than did the two hours of scheduled snowshoe training. It must be added, however, that where excessive loads are involved, the mobility of even expert skiers and snowshoers becomes equalized. This is particularly applicable when heavy loads are being transported through soft powdery snow.

(2) Considerable time and effectiveness were lost because of navigational errors, both on the ground and in the air.

(3) The STRAC Task Force made imaginative use of heliborne troop movements throughout the exercise. However, these movements could have been even more effective had the troops been trained in efficient loading and unloading procedures on the ground.

In view of the relative lack of skill in skiing and in navigation, it is appropriate to note that of the 156 hours of preexercise training in specific skills at Fort Lewis and Fort Richardson, 66 hours (42%) were spent in ski training and 28 hours (18%) were spent in land navigation.

Not specifically mentioned in the final report of USARAL was another observation of the author, that techniques of weapon use and individual combat skills did not receive much attention during the maneuver. No effective means of umpiring the combat performance of very small units was employed during Exercise LITTLE BEAR—presumably because to have done so would have been excessively expensive.

Small-Unit Checklist Results

Presentation of Data

The mean length of time covered by the checklists was 5 hours and 15 minutes. Seventy-three percent of them covered a full 6-hour period. The observer who was permanently attached to a single platoon filled out 84 Small-Unit Cold Weather Checklists during the premaneuver and maneuver phases; the observer who rotated from unit to unit filled out 47, and the author, who ordinarily made observations at the command and staff level, filled out 5, for a total of 136.

Most of the observations were made out of doors in fair weather during the daytime hours in plentiful, dry powdery snow (Table 1). Although the maneuver itself comprised only about one-third of the time period during which observations were made, about half the total number of observations were recorded during the maneuver

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Table 1

Reported Observation Situations

(N = 136)

Situation	Number	Percent
Daytime	86	63.2
Nighttime	40	29.4
Day and night	10	7.4
Clear	81	59.6
Partly cloudy	39	28.7
Cloudy	10	7.4
Snowing	3	2.2
Raining	0	0.0
Fog	1	0.7
Other	2	1.4
Indoors	13	9.6
Outdoors	104	76.5
In and out	19	13.9

Situation	Number	Percent
Snow*		
None	14	10.3
Sparse	8	5.9
Plentiful	113	83.1
Varied	1	0.7
Crust	4	3.2
Loose	100	81.3
Packed	14	11.5
Variable	5	4.0
Wet	1	0.7
Moist	25	18.7
Dry	106	80.6

*For condition and moisture content summaries, percentages are based on number of observations in which this entry was made, rather than on total N which includes "no snow" periods.

(primarily because the maneuver involved a 24-hour day with continuous activity). In general, the observations covered the actual operation quite evenly, although the roving observer lost time because of the difficulty of moving from one unit to another.

Temperatures reported during the observed periods ranged from −30 to +35°F., the mean minimum temperature being +6.3° and the mean maximum temperature, 11.6°. The groups observed were usually platoons; the mean number of men present was 52.6.

In filling out a checklist, the observer entered a number (from 4 to 0) for each item to indicate the proportion of men having the item of equipment on hand or displaying the skill or technique in question during the period being reported: if the item was not applicable to the observation period, the observer entered "X."

For instance, if the item, "Muzzle and receiver free of snow," in List III was not applicable—for example, because the men were not carrying their rifles—the observer placed an X after item 15 on his checklist booklet. If the item was applicable, and if all the men succeeded in keeping their rifle muzzles and receiving carriages free of snow throughout the period, the observer entered "4"; if none was successful, a zero was entered. The other values were: most of the men, 3; about half, 2; only a few, 1. Whenever an observer scored an item as 3 or less, he was supposed to enter an explanatory comment to aid in interpreting the findings.

Summary statistics have been computed and are presented, in terms of the eight topical sublists, in Tables 2 to 9. For each item in the checklist, an index figure was derived from the observers' reports. If possession or use of an item of clothing or equipment is involved, the statistic is referred to as the Equipment Index (Tables 2, 3, and 6)

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and is based on the number of periods in which the observer was in a position to see whether the item was on hand. If displaying a technique or performing a skill is involved, the statistic is referred to as the Performance Index (Tables 4, 5, 7, 8, and 9) and is based on the number of periods in which the skill could or should have been used, according to standing operating procedures.

On most items (exceptions are noted in the tables), data were recorded in a large enough proportion of the 136 observation periods to provide meaningful information. For more than three-fourths of the equipment items, the observers reported that in 90% of the periods they were in a position to observe whether the item was on hand. As was to be expected, applicability of the skill and technique items varied considerably (e.g., sunglasses would not be needed during low-illumination periods; mess utensils would not be in use during a nighttime period); however, about half the items were considered applicable for over 60% of the periods and virtually all items were classed as applicable in at least a third of the periods.

The Equipment and Performance Indexes can be regarded as rough indicators of adherence to doctrine and thus, indirectly, as estimates of the effectiveness of training during the exercise. The index ranges from 1 to 0. A score of 1 means that, at some time during all the applicable observation periods, every man observed had the item of equipment or displayed mastery of the skill or technique in question. A score of zero means that none of those observed had the item of equipment or displayed the skill or technique. A weighting process, described in the Appendix, was used in computing the values between these extremes.

Each of the eight sublists of the Small-Unit Cold Weather Checklist will be discussed in turn. Major aspects or considerations will be described and the items of the sublist will be tabulated with their Equipment or Performance Indexes, as computed from the reports of the observers. The findings will then be examined, reflecting comments and explanations noted by observers, as applicable.

Clothing at Hand (List I)

Most of the cold-weather protective clothing items available for issue by the Army were included in this list. In obtaining this information, it was anticipated that the STRAC troops would be issued and would carry nearly all these items but would not have occasion to use all those included, even in the course of six weeks of Alaskan winter (see Table 2). About half the items on the list were in common use. The rest were used infrequently or were kept on hand only for emergency. Many of the items were not appropriate for the weather conditions occurring during the exercise. For instance, most of the men would have been uncomfortably warm if they had worn their trouser liners. Part of the logistic problem for the small infantry unit stems from the fact that the men are required to carry extra clothing items in case the weather turns very cold.

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Table 2

Clothing at Hand (List I)

Item No.	Item	Equipment Index
28.	Winter underwear	.97
24.	Trouser shell	.93
18.	Cushion-soled socks	.90
13.	Thermal boots, black	.90
7.	Three-fingered mitten shells	.85
8.	Trigger-finger woolen inserts	.84
20.	Extra socks	.67[a]
1.	Pile cap	.66
22.	Field jacket	.63
9.	Extra trigger-finger inserts	.55
23.	Parka or jacket liner	.55
15.	Mukluks	.52[b]
10.	Arctic mittens	.50[c]
11.	Arctic mitten liners	.48[c]
21.	Parka	.38
27.	Suspenders	.38[a]
2.	Cotton cap	.37
25.	Trouser liner	.27
19.	Woolen ski socks	.19[a]
4.	Leather glove shells	.02
5.	Woolen glove inserts	.02
6.	Extra woolen glove inserts	.01
3.	Fur-lined leather gloves	.01
16.	Combat boots	.01
17.	Rubber overshoes	.00
26.	Woolen trousers	.00
12.	Anti-contact gloves	—[d]
14.	Thermal boots, white	—[d]

[a]Based on permanent observer's reports only; roving observer not able to make enough observations.

[b]Mukluks carried, but worn only by those with reaction to foot sweating or having a foot injury.

[c]Arctic mittens and liners carried rather than worn.

[d]Not issued.

Personal Equipment at Hand (List II)

Most of the items of personal equipment recommended for the infantry soldier in extreme cold weather were included in this list (see Table 3). These data were gathered to determine which items were most commonly used in STRAC cold-weather training.

The items most often at hand proved to be personal weapon, rucksack, skis and ski poles, emergency thong, first-aid packet, air mattress with outer sleeping bag, and canteen. All other items listed were on hand less than half of the time. Of those not used very much, the most important was the compass, which received an equipment index of only .04.

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Table 3

Personal Equipment at Hand (List II)

Item No.	Item	Equipment Index
4.	Rucksack	.81
17.	Personal weapon	.80
13.	Emergency thong	.77
16.	Ski poles	.69
15.	Skis	.69
8.	First-aid packet	.66
3.	Air mattress	.67
12.	Waterproof matches	.61*
2.	Outer sleeping bag	.59
10.	Canteen	.56
11.	Knife	.55*
1.	Inner sleeping bag	.48
14.	Ration package	.48
19.	Protective mask	.44
9.	Sunglasses	.37
18.	Mess kit	.19
5.	Bandoleers	.12
7.	Compass	.04
6.	Pistol belt	.00

*Based on permanent observer's reports only.

Maintenance of Clothing and Personal Equipment (List III)

Previous observations led to some specific expectations about the level of skill that would be displayed by STRAC forces in Alaska in techniques for the care and maintenance of personal clothing and gear in cold weather (see Table 4):

(1) While cleanliness is very important in the Far North because dirt conducts heat and reduces the insulating properties of clothing, water, soap, and time are hard to come by during an arctic maneuver. Hence, it was anticipated that the Performance Indexes on three items concerning the cleanliness of clothing (1, 3, and 5) would reflect a low level of performance.

(2) Keeping dry is as important as cleanliness because wet clothing does not insulate well. If men become sweaty on the march and then are pinned down by hostile fire in cold weather, the proportion of casualties from cold is likely to be high. Keeping one's clothing dry or changing it when wet is, therefore, a most important cold-weather technique. However, little success was expected in this area for two reasons noted in earlier observations: First, newcomers to the Far North react to waking up cold by dressing too warmly; second, commanders of ski columns, eager to take advantage of the freshness of their men, may ignore the recommendation of the Basic Cold Weather

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Manual[10] by not calling a halt 15 minutes after the start of the march to allow time for the adjustment of clothing.

(3) In the COLD BAY and CARIBOU CREEK maneuvers, observed in 1958 and 1959, it had been noted that STRAC troops on a ski march tended to fall down so often that their weapons became inoperative. It was anticipated that the muzzles and receivers of rifles would frequently be clogged with snow (item 15, List III).

Table 4

Maintenance of Clothing and Personal Equipment (List III)

Item No.	Item	Performance Index
Clothing		
1.	Clothing dry or changed when wet	.95
2.	Outer clothing mended	.90
5.	Socks clean	.60[a]
1.	Outer clothing clean	.54
3.	Underwear clean	.36[a]
Sleeping Bags		
7.	Sleeping bags kept dry	.84
8.	Sleeping bags fluffed	.04[a]
6.	Sleeping bags aired	.03
Personal Weapons		
15.	Muzzles and receivers free of snow	.60
13.	Personal weapons stored properly	.46
9.	Personal weapons lubricated	.18[a]
10.	Proper personal-weapon lubricants used	.10[b]
12.	Personal weapons examined before firing	.09[b]
11.	Personal weapons stripped when cleaned	.07[b]
14.	Frozen weapon parts thawed slowly	—[c]
Skis		
18.	Ski bindings in good condition	.73
19.	Ski poles in good condition	.73
20.	Skis properly stored	.70
21.	Proper emergency ski repairs	.50[a]
16.	Skis properly tarred or lacquered	.40
17.	Proper ski waxes used	.10[a]
Utensils		
22.	Canteens not overfilled	.60
24.	Snow melting properly done	.44
23.	Mess utensils clean	.28

[a]Based on permanent observer's reports only.

[b]Personal weapons were rarely cleaned, examined, or fired. These observations relate only to preparation for scheduled qualifying range firing prior to exercise.

[c]No freezing of weapons occurred during range firing. During exercise, little attention paid to weapon condition.

[10]Reference 1.

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(4) Finally, it was expected that techniques that take extra time and effort, such as thawing frozen weapon parts slowly (item 14) and stirring melting snow constantly to avoid forming a steam bubble at the bottom of the pot (item 24), would not be frequently carried out.

Contrary to expectations, clothing was normally kept dry or changed when wet and this item received a Performance Index of .95. As was anticipated, however, cleanliness of clothing posed something of a problem; cleanliness of outer clothing received a Performance Index of .54 and cleanliness of underwear, an even lower index of .36.

While the men managed to do a fair job of keeping the muzzles and receivers of their rifles free of snow (Performance Index, .60), their personal weapons received little other attention, a lack that—if carried over in to actual combat—would have severe repercussions.

It was surprising that, despite the emphasis on ski training, little attention was given to the proper tarring and waxing of skis. In fact, the maintenance of skis, bindings, and poles was never really satisfactory, even though the men were primarily dependent on skiing for nonvehicular oversnow mobility. The amount of attention devoted to proper waxing during the maneuver is of particular significance with respect to the conclusions that legitimately can be drawn from this study concerning the relative effectiveness of the use of skis and the use of snowshoes. Depending upon snow conditions, the use of proper waxes can be a far more critical consideration for the novice than for the expert. Failure to use a proper wax can slow down and fatigue a relatively untrained skier to a far greater degree than it can affect an expert.

Finally, cleanliness of mess utensils was even less satisfactory than cleanliness of clothing. As anticipated, snow melting was not usually done properly. In many instances, canteens, when used, were overfilled.

Individual's Care of Self (List IV)

Not only personal cleanliness but various health factors and protective practices were covered in the list of items on the important techniques of individual self-care (Table 5). Several items reflected the fact that hard work in arctic gear makes for considerable sweating, which has two negative effects: dehydration with resultant pathology, and dampening of clothing with resultant loss of insulating quality. Consequently, it is most important to avoid overheating. However, this is largely beyond the control of the individual infantryman who is pressed to keep up with his column by unit leaders eager to reach the objective on schedule.

Bodily cleanliness was not a strong point of the infantry soldier in the arctic field. Personal cleanliness is very difficult to maintain in any field situation, but especially so in the Far North where considerable effort must be expended to obtain supplies of water. Discipline in the use of prescribed waste facilities was reasonably high.

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Table 5

Individual's Care of Self (List IV)

Item No.	Item	Performance Index
Physical Factors		
4.	Avoids overheating	.92
16.	Sleeping bag properly insulated	.92
17.	Wears clothing correctly	.86
8.	Avoids dehydration	.85
7.	Three adequate meals eaten daily	.67
11.	Individuals not overloaded	.55
15.	Wears minimum of clothes in sleeping bag	–[a]
Cleanliness		
5.	Prescribed waste facilities used	.78
3.	Hair short	.75
2.	Clean-shaven	.71
1.	Body clean	.32[b]
Protective Practices		
9.	Buddy system followed	.95
13.	Doesn't huddle, stays alert	.61
6.	Self and others observed for frostbite	.58
18.	Camouflage clothing appropriate	.52
10.	Sunglasses worn when necessary	.23
12.	Protective mask correctly worn	.04
14.	Avoids wild animals	–[c]

[a]Undefined term; data not meaningful.
[b]Based on permanent observer's reports only.
[c]The only wild animal, a moose, close to troops, was avoided.

Contrary to expectations, the men managed to avoid becoming overheated. In part, this may have been a result of the fact that ski columns frequently had to stop to wait for laggards to catch up, so that there was ample opportunity for men to ventilate clothing and cool down while resting.

Because of the increased weight of the full field load to provide for extremely cold weather, some individuals were overburdened with clothing, equipment, and mock ammunition. In general, the men wore clothing correctly and apparently insulated their sleeping bags properly.

Because the human body uses up a great deal of fuel keeping warm and moving about under the bulk of arctic gear, adequate rations are very important, yet many men missed meals. Factors that may have contributed to this are (1) the large amount of fuel and time required to thaw and heat frozen rations and (2) the difficulty of supply in roadless terrain.

As had been anticipated, the buddy system was scrupulously followed, although observation of self and others for signs of frostbite was not done so consistently as had been anticipated, perhaps because

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the men found Alaska warmer than they had expected and became confident that the cold held no great threats for them.

Sunglasses, apparently not deemed necessary by the men, were seldom worn, but no cases of snow blindness were reported. The protective mask was almost never worn. When it got cold or when the men tired, they tended to huddle up and they did not stay alert. Camouflage clothing was not always appropriate to the terrain.

Group Equipment (List V)

Some of the items of group equipment usually issued to small infantry units in the Far North were listed in order to obtain information on how they were utilized by the STRAC forces (see Table 6).

Table 6

Group Equipment (List V)

Item No.	Item	Equipment Index
1.	Crew-served weapons	.78
4.	Signal gear	.66
3.	Tracked vehicles	.32
2.	Wheeled vehicles	.18
7.	Ten-man tents	.73
6.	Five-man tents	.07
5.	Two-man tents	.00
9.	Plastic boat sleds	.80
8.	Cargo sleds	.31
10.	Yukon stoves	.74
11.	Herman Nelson heater	.00
14.	Machetes	.59
12.	Axe	.57
13.	Saw	.05
15.	Axe handles	.02
16.	Trail snowshoes	.35
17.	Bear Paw snowshoes	.00

The most frequently used pieces of group equipment proved to be plastic boat sleds, Yukon stoves, and signal gear. The crew-served weapons were usually at hand but were rarely fired. The low index figures for tracked and wheeled vehicles reflect the fact that, as part of the maneuver plan, only a limited number of vehicles were allowed to the STRAC forces in Exercise LITTLE BEAR. Ten-man tents were virtually the only ones used.

Group Activities and Maintenance of Group Equipment (List VI)

This list covers various practices used by groups in coping with the problems of existence and movement in the field under cold-weather

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conditions, and in the use and maintenance of group equipment. The following are some of the considerations involved in the selection of items for inclusion in the list:

(1) Maintenance of track discipline and camouflage is of vital importance to small infantry units moving across a trackless terrain. The snow records every move a man makes so distinctly that it can be seen for miles from the air. Highly skilled ski troops confuse aerial observation by skiing in the tracks of the men ahead of them to conceal the number of men in the column, and by making deceptive tracks and installations. The imprecise marks made by the unskilled military skier are due to his faulty efforts to follow the tracks of the preceeding men. Also contributing to his imprecision are his unwillingness to stay out of cleared areas, his lack of realization of his own visibility, and his fatigue at the end of the march, which makes him unwilling or unable to take effective deceptive action.

(2) Clearing off or packing snow for tent sites is a procedure recommended to increase the comfort of the men. If the tent is pitched on loose snow, its internal heat tends to melt the base away, wetting clothing and gear. However, clearing three or four feet of snow is hard work, and previous observations had indicated that it was frequently not done when the men expected to occupy the site for only a short time.

(3) Correct handling of stoves is particularly important because of the almost universal tendency of men in the Far North to keep heating devices at too high temperatures; even Eskimos and old arctic hands heat their dwellings to uncomfortable levels. For the soldier in the field, the tendency is dangerous because his clothes get wet from perspiration, and if he has to move outside in a hurry he faces the danger of freezing. Overheated Yukon stoves are also a fire threat.

(4) Because so much time and fuel is necessary for food preparation, food should be prepared for as large a group as possible at one time as a conservation measure.

Rules of camouflage were most frequently honored in the breach (see Table 7) but, all things considered, track discipline was better than might have been anticipated (item 17). Sleds were frequently overloaded.

Snow was not actually cleared for tent sites, but correct and efficient tent pitching was usually achieved. Quite often snow and ice were not removed from the tents before striking.

In many instances draft channels for Yukon stoves were not constructed. On the other hand, the men usually went to the trouble of building an appropriate base for the Yukon stove. Since the officers of the Task Force were concerned with the threat of fire, there was considerable emphasis on various practices for the correct handling of the stove.

Food service was individual and "catch-as-catch-can" much of the time. It may be that commanders, new to the Far North and

Table 7

Group Activities and Maintenance of Group Equipment (List VI)

Item No.	Item	Performance Index
Tents		
2.	Tent poles properly supported	.99
4.	Tent securely anchored	.97
3.	Tents pitched with entrance downwind	.94
5.	Tents pitched within 20 minutes	.71
1.	Snow cleared from tent sites	.54[a]
6.	Snow and ice removed before striking	.44
Stoves		
12.	Fuel-can properly installed	1.00
11.	Draft diverter for liquid fuel	.98
13.	Stoves not overheated	.98
7.	Tent ventilators kept open	.95
9.	Appropriate base for Yukon stove	.91
8.	Draft channels constructed	.56
10.	Spark arrester installed for solid fuel	.18
Vehicles		
25.	Passenger compartments not overheated	.98
22.	Vehicles lubricated	.91[b]
26.	Proper procedure to avoid carbonmonoxide poisoning followed	.89
23.	Vehicles operational	.87
24.	Vehicles properly camouflaged	.46
Other		
19.	Designated latrines used	.72
14.	Tools sharp, clean, oiled	.70
20.	Sleds properly loaded	.59
21.	Crew-served weapons lubricated	.56[b]
17.	Track discipline and camouflage	.55
16.	Food—large group	.53
15.	Improvised shelter adequate	.40
18.	Only lower boughs cut	.40

[a]Observer's statement means snow was packed down for tent sites; it was never actually cleared.

[b]Insufficient opportunity to observe; not valid.

confronted with difficult logistical problems, found it particularly hard to support field messes instead of combat-ration meals.

The STRAC forces were able to keep their limited allotment of vehicles operational most of the time. While American forces usually perform vehicle maintenance well, the difficulty of the terrain and of POL resupply limited the utility of land vehicles in the Far North. Safety rules for the temperature of passenger compartments and the procedures needed to avoid carbon monoxide poisoning were quite rigorously enforced.

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Movement and Tactics (List VII)

This list consisted of skills, knowledges, and techniques important for infantry tactics in the Far North. The Performance Indexes reflect a major premise of the research—that, in cold-weather training, the emphasis on skiing and survival skills would be detrimental to training in and performance of tactical skills and techniques. Techniques of movement are covered in items 1 to 8, and techniques of combat make up the remainder of the list (see Table 8).

Table 8

Movement and Tactics (List VII)

Item No.	Item	Performance Index
Movement		
3.	Trail discipline obeyed	.71
6.	Accurate knowledge of squad mission	.70
7.	Accurate knowledge of platoon mission	.67
5.	Accurate knowledge of position of leaders	.67
2.	Trail breaking adequate	.66
1.	Military skiing adequate	.63
8.	Accurate knowledge of company mission	.60
4.	Accurate knowledge of unit position	.44
Attack and Defense		
25.	All defensive emplacements have clear view of firing sector	.84
10.	Cover and concealment properly used on attack	.71
12.	Men fresh and rested for attack	.71
11.	Proper dispersion maintained	.19
9.	Skis, poles, etc., used as weapon supports	.14
Machineguns		
19.	Machinegun crews know sector of fire	.94
16.	Machinegun emplacements properly constructed	.77
15.	Machinegun emplacements properly camouflaged	.70
14.	Machinegun emplacements enable grazing fire for 750 yards	.65
20.	Covered routes of approach	.36
13.	Alternate machinegun emplacements maintained	.32
17.	Machinegun emplacements have range cards	.16
18.	Machinegun emplacements have aiming stakes	.02
Mortars		
22.	Aiming stakes positioned at mortar emplacements	.31
21.	Mortar emplacements dispersed	.14
Riflemen		
24.	Riflemen know their sectors	.84
23.	Riflemen defensive positions properly constructed	.63

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The pattern revealed in Table 8 is not one of strong performance, although certain performances were good. Movement techniques on the average showed better performance than those bearing on tactics.

It should be mentioned that both the author and skilled military observers are of the opinion that the Performance Indexes associated with the adequacy of military skiing, trail breaking, and track discipline are somewhat high. The enlisted specialists on whose reports the Performance Indexes are based had not had the opportunity to watch a really highly skilled ski force at work, and their standards for military skiing consequently were somewhat low.

Severe training deficiencies in dispersion and in proper fire techniques in deep snow are revealed in items 9, 11, and 21. Little attention was paid to the use of skis and poles as weapon supports in snow, and the failure to maintain dispersion that was generally evident is the type of error that could lead to some bitter lessons in actual combat.

Duties of Small-Unit Leaders (List VIII)

The list of duties devolving upon the small-unit leader in cold-weather operations was derived from FM 31-70, the Basic Cold Weather Manual.[11] Previous observations as to areas where performance might be comparatively weak had led to the following expectations:

(1) The small-unit leader is responsible for organizing and controlling cooking (item 1), but earlier observations had indicated that men in the field were issued combat rations and, to a considerable extent, prepared and ate their meals individually when they could get them.

(2) Because of the wisdom both of distributing the hard jobs among the men to conserve their energy and of training as many men as possible in each job, nearly every leadership manual suggests rotating individuals on all tasks (item 12). However, small-unit leaders, thinking of the task at hand rather than of training effectiveness, are more likely to use their most efficient men in the critical tasks instead of rotating the men from job to job. In view of this tendency, a low score was anticipated on the leaders' actions in rotating trailbreaking parties (item 14). Because only a few of the skiers in any unit are proficient enough to break trail efficiently, they are the ones who normally perform the job.

(3) Calling a first rest 15 minutes after beginning march (item 15) and calling frequent short rests (item 16) are procedures recommended in order to give men a chance to adjust their clothing to avoid overheating and to minimize fatigue. However, an inexperienced ski column starts and stops so frequently, because of men falling down or failing to climb hills rapidly, that an organized rest stop is very rare indeed.

(4) Navigational skills (items 17 and 18), which, throughout the Army,[12] have proved to be difficult to acquire are tested severely

[11] Reference 1.

[12] For example, see studies conducted under HumRRO Tasks PATROL and RIFLEMAN, listed in Reference 3.

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in the Far North where magnetic declinations are great, the terrain unfamiliar, and dead reckoning nearly impossible.

(5) It was anticipated that weakness would be found in maintaining communication with the parent unit (item 21) because radio communication is uncertain in the Far North and personal communication by runner is slow due to the difficult terrain.

In general, weaknesses were revealed approximately as anticipated (see Table 9). The Performance Indexes were comparatively low in organization and control of cooking, camouflage of the bivouac

Table 9

Duties of Small-Unit Leaders (List VIII)

Item No.	Item	Performance Index
Bivouac Procedures		
11.	Maintains fire guard	.96
3.	Determines exact tent location	.83
7.	Designates sites for weapon and ski racks	.66
6.	Designates latrine and garbage disposal sites	.62
4.	Designates area from which construction materials and firewood will be obtained	.52
1.	Organizes and controls cooking	.48
5.	Selects water point	.18
Security Measures		
2.	Posts security guard	.87
10.	Maintains security guard	.84
19.	Knows probable enemy threat	.50
13.	Outlines and rehearses action to be taken in event of attack	.49
8.	Breaks minimum number of trails in bivouac area	.35
22.	Makes deceptive tracks and installations	.11
Trail Procedures		
24.	Checks men and equipment before movement	.46
16.	Calls frequent short rests	.22
14.	Rotates trail-breaking parties	.19
15.	Calls first rest 15 minutes after beginning march	.12
Navigation		
17.	Navigates accurately	.69
18.	Knows position of parent units	.64
Communications		
20.	Maintains communication with men	.73
21.	Maintains communication with parent unit	.68
General		
23.	Conserves his own energy	.70
9.	Organizes work details	.70
12.	Rotates individuals in all jobs	.63

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area, and calling of rests, and not very much higher on rotation of individuals in jobs, navigation, and communication. In fact, the only aspects of the duties of small-unit leaders that received Performance Indexes of .80 or more were posting of the security guard, determination of tent sites, and maintenance of security and fire guards.

Activities Ranked by Performance and Type

In order to obtain an estimate of the types of activities that received greatest emphasis and attention during Exercise LITTLE BEAR, items taken from the lists dealing with performance (III, IV, VI, VII, and VIII) in the Small-Unit Cold Weather Checklist were analyzed further. Valid items from the lists of skills and techniques were classified into general categories and then ranked in order of their Performance Index. The results are summarized in Table 10 and the detailed rankings listed in Table 11.

Table 10

Summary of Performance Rankings by Type of Activity

Category	Number	Median Index	Number of Indexes Above .80
1. Tactics	39	.61	6
2. Movement	16	.59	0
3. Safety and comfort	44	.72	19
4. Other	10	—	1
Total	109	.63	26

There were 109 items concerned with skill and technique that had Performance Indexes based on sufficient numbers of observations to seem valid. Of these, 39 were classed as Tactics, 16 as Movement, 44 as Safety and Comfort, and 10 as Other. If there was doubt as to which category an item best fitted, the foregoing order was used as basis for priority. Thus, if a skill could be classified as either Tactics or Movement, it was classed as Tactics.

The median Performance Indexes of Tactics and Movement items, .61 and .59 respectively, were both significantly lower ($U = 574.0$, $p = .005$ for the Safety and Comfort/Tactics distributions; $U = 213.5$, $p = .01$ for the Safety and Comfort/Movement distributions) than the median Performance Index of the Safety and Comfort items (.72).

It is noteworthy that of the 26 skill and technique items that received Performance Indexes of .80 and above, 19 were classified as Safety and Comfort, 6 as Tactics, one as Other, and none as Movement. Combining Tactics and Other as opposed to Safety and Comfort, a chi-square test indicates a probability of less than .001 that this was a chance occurrence ($X^2 = 13.54$; $df = 1$; $p = .001$).

These statistics tend to support the premise that proficiency in and concern with Safety and Comfort, that is, learning the techniques

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for safety and comfort in the far-northern environment, were significantly greater than was the case for learning the techniques of Tactics and Movement.

Table 11

Skills and Techniques
Ranked by Performance Index and Classed by Category

Skill	Category			
	Tactics	Movement	Safety and Comfort	Other
Fuel cans properly installed for stoves			1.00	
Tent poles suitably supported			.99	
Draft diverters installed on stoves for liquid fuel			.98	
Stoves not overheated			.98	
Vehicle passenger compartments not overheated			.98	
Tents securely anchored			.97	
Leaders maintained fire guard			.96	
Buddy system followed			.95	
Clothing dry or changed when wet			.95	
Tent ventilators kept open			.95	
Machinegun crews knew sector of fire	.94			
Tents pitched with entrance downwind			.94	
Men avoided overheating			.92	
Sleeping bags properly insulated			.92	
Appropriate bases built for Yukon stoves			.91	
Outer clothing mended			.90	
Proper procedures followed to avoid carbon-monoxide poisoning in vehicles			.89	
Leaders posted security guards	.87			
Vehicles operational				.87
Men wore clothing correctly			.86	
Men avoided dehydration			.85	
All defensive emplacements had clear view of sector	.84			
Leaders maintained security guards	.84			
Riflemen knew their sectors	.84			
Sleeping bags kept dry			.84	
Leaders determined exact tent location	.83			
Prescribed waste-disposal facilities utilized			.78	
Machinegun emplacements properly constructed	.77			
Hair short			.75	
Leaders maintained communication with men	.73			
Ski bindings in good condition		.73		
Ski poles in good condition		.73		
Designated latrines used			.72	
Cover and concealment properly used on attack	.71			
Men fresh and rested for attack	.71			

(Continued)

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Table 11 (Continued)

Skills and Techniques
Ranked by Performance Index and Classed by Category

Skill	Category			
	Tactics	Movement	Safety and Comfort	Other
Trail discipline obeyed		.71		
Individuals clean shaven			.71	
Tents pitched within 20 minutes			.71	
Machinegun emplacements properly camouflaged	.70			
Men had accurate knowledge of squad mission	.70			
Skis properly stored		.70		
Leaders conserved own energy				.70
Leaders organized work details				.70
Tools sharp, cleaned, and oiled				.70
Leaders navigated accurately		.69		
Leaders maintained communication with parent unit	.68			
Men had accurate knowledge of platoon mission	.67			
Men had accurate knowledge of position of leader	.67			
Three adequate meals eaten daily			.67	
Trail breaking adequate		.66		
Leaders designated sites for weapon and ski racks				.66
Machinegun emplacements enabled grazing fire 750 yards	.65			
Leaders knew position of parent unit	.64			
Riflemen defensive position properly constructed	*.63			
Military skiing adequate		*.63		
Leaders rotated individuals in all jobs				*.63
Leaders designated latrine and garbage sites			.62	
Men did not huddle—stayed alert	.61			
Men had accurate knowledge of company mission	.60			
Rifle muzzles and receivers kept free of snow	.60			
Canteens not overfilled			.60	
Socks clean			.60	
Sleds properly loaded		.59		
Self and others observed for frostbite			.58	
Yukon stove draft channels constructed			.56	
Truck discipline and camouflage maintained	.55			
Individuals not overloaded		.55		
Outer clothing clean			.54	
Snow cleared from tent sites			.54	
Food prepared for as large a group as possible				.53
Camouflage clothing appropriate to terrain	.52			
Leaders designated areas to obtain firewood, etc.				.52
Leaders knew probable enemy threat	.50			

(Continued)

*Median

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Table 11 (Continued)

Skills and Techniques
Ranked by Performance Index and Classed by Category

Skill	Category			
	Tactics	Movement	Safety and Comfort	Other
Proper emergency ski repairs carried out		.50		
Leaders outlined and rehearsed action in case of attack	.49			
Leaders organized and controlled cooking			.48	
Personal weapons stored properly	.46			
Vehicles properly camouflaged	.46			
Leaders checked men and equipment before movement			.46	
Men had accurate knowledge of unit position		.44		
Snow and ice removed from tents before striking			.44	
Snow melting properly done			.44	
Only lower boughs cut	.40			
Skis properly tarred or lacquered		.40		
Improvised shelters adequate			.40	
Routes of approach covered in machinegun emplacement	.36			
Underwear clean			.36	
Leaders broke minimum of trails in bivouac area	.35			
Alternate machinegun emplacements maintained	.32			
Body clean			.32	
Aiming stacks positioned at mortar emplacements	.31			
Mess utensils clean			.28	
Sunglasses worn when necessary			.23	
Leaders called frequent short rests		.22		
Proper dispersion maintained	.19			
Leaders rotated trail-breaking parties		.19		
Spark arrester used for solid fuels in Yukon stoves			.18	
Leaders selected water point				.18
Personal weapons lubricated				.18
Machinegun emplacements had range cards	.16			
Mortar emplacements dispersed	.14			
Skis, poles, etc., used as weapon supports	.14			
Leaders called first rest 15 minutes after beginning of march		.12		
Leaders made deceptive tracks and installations	.11			
Proper ski waxes used		.10		
Protective masks correctly used	.04			
Sleeping bags fluffed			.04	
Sleeping bags aired			.03	
Machinegun emplacements had aiming stakes	.02			

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Summary of Main Findings Bearing on Training

The performance of the STRAC forces in Exercise LITTLE BEAR after 266 hours of preexercise training was, in general, considered satisfactory by military observers. Certain aspects of performance that indicated a need for improved training were noted by military and/or research personnel. These included the following:

(1) Techniques of weapon use and individual combat skills did not receive a great deal of attention.

(2) Camouflage, concealment, cover, and deception could have been better.

(3) Cross-country ski marches were as slow as snowshoe marches, although nearly half the Fort Lewis portion of training for the exercise had been ski training, as compared with an insignificant amount of time spent on snowshoe training.

(4) Despite emphasis on skiing, maintenance of skis was not fully satisfactory.

(5) There was considerable error in land navigation.

(6) Heliborne movements could have been more successful had the infantry been taught better techniques for (a) loading, (b) unloading, (c) dispersing and setting up suppressive fire immediately on disembarkation, and (d) implementing alternate plans when weather, pilot fatigue, and so forth, make helicopter movement unreliable.

(7) There was little training in use of protective masks.

(8) Much of the cold-weather uniform carried by the men in the maneuver was not used.

In general, high proficiency in movement and tactics was not achieved; during training there was a disproportionate emphasis on techniques for safety and comfort as compared with tactics and movement in the Far North.

DISCUSSION AND IMPLICATIONS

1. Observations of Exercises COLD BAY, CARIBOU CREEK, and LITTLE BEAR led to the conclusion that such relatively large-scale exercises, when viewed strictly as training activities, have both advantages and disadvantages.

An important aspect of such exercises is the training and experience they offer to command and staff officers at the battle group, division, corps, and army levels. For instance, they allow practice in relatively large-scale troop movements by air or sea and experience with new organizational and tactical concepts and with new or proposed items of equipment. Similarly, they are excellent media for training command and staff officers of the battle group in winter operations in the Far North, coordination and control of attached units, and logistics and supply while operating independently under conditions requiring dispersion and mobility. Finally, they offer almost unparalleled opportunity to appraise the military judgment of officers operating in a realistic, very competitive, stressful situation.

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For the smaller military unit, in addition to providing experience in cold weather and deep snow with the specialized equipment necessary to operate under these conditions, such exercises give men a sense of what it means to be part of a large task force. These are valuable benefits.

On the other hand, in most large-scale maneuvers, because the emphasis is on the performance of the task force as a whole, there are some training disadvantages for the small unit. Primary emphasis is on being in the right place at the right time, rather than on what the unit is to do once it gets there. Under these circumstances, the finesse used in umpiring small-unit actions is necessarily limited. For instance, while strength ratios used by the umpires may be quite realistic in determining the number of casualties to be attributed to each side in an engagement, there are not enough umpires available to determine which men should be casualties in view of their relative skills in individual fighting techniques. Consequently, at the individual and small-unit level the men concentrate on learning skills dealing with movement, safety, and comfort, rather than on combat techniques, which do not seem to "count" under the circumstances of the maneuver.

2. Viewed in relation to STRAC readiness, the annual Alaskan maneuver as the sole source of cold-weather training cannot be adequate, since only one STRAC battle group receives such training each year. Ideally, of course, all STRAC divisions would be combat ready at all times for every environment. To achieve combat readiness in deep-snow and cold-weather operations, training in addition to that now scheduled should be carried out annually by each STRAC division.

3. STRAC forces did not become as proficient as ski-mounted light infantry even in the course of six weeks of intensive training. Although nearly half their training time at Fort Lewis was spent on attaining skiing skills, STRAC ski-mounted columns never achieved greater daily mileage than that achieved by columns of men on snowshoes. Unfortunately, information collected during the present study does not provide a basis for determining all the factors that would account for this apparent similarity of performance between ski-mounted and snowshoe columns. This similarity may have been due to particular situational factors, restricted conditions for observation, or failure to maintain and use equipment properly (as in moving through deep powdery snow with heavy loads and failing to use proper waxes). In addition, the effectiveness of utilizing different combinations of skis and snowshoes was not assessed. Nevertheless, the relatively unsatisfactory performance of STRAC ski-mounted troops suggests that the type and amount of STRAC training for cold-weather operations should be carefully examined.

The amount and proportion of skiing and snowshoeing that ought to be included in STRAC cold-weather training will depend upon a variety of factors including:

a. The intended mobility of the recipients of training
b. The kinds of terrain ultimately to be encountered
c. The amount of time available for training in skiing and snowshoeing

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d. The rate at which persons receiving such training acquire proficiency

e. The extent to which personnel and training policies permit the maintenance of adequate levels of proficiency in skiing and snowshoeing

If troops are adequately trained to use skis, there is little question that they will have greater mobility on flat and rolling terrain than troops using snowshoes, and will be far superior in mountainous or icy terrain. However, troops not adequately trained for military skiing will have low mobility even on relatively level terrain and, because of the fatigue incurred during movement, are not likely to arrive at their objective in fighting condition. Commanders of such troops may have a false sense of oversnow mobility. In contrast, troops using snowshoes will move slowly on such terrain but are more likely to arrive at their objective ready to fight. In mountainous terrain, troops who are poorly trained for skiing will probably do no better than troops on snowshoes, and on icy terrain they are likely to do worse.

It may be that the concept of STRAC cold-weather operations should be modified so that mobility is provided by adequate support from tracked vehicles and helicopters, with the men moving only short distances on skis or snowshoes. However, Canadian Army experience indicates that in an emergency long-distance forced marches on snowshoes are feasible.

4. The high proportion of training and maneuver time devoted to skiing, and to techniques of survival, safety, and comfort has the effect of deemphasizing training in tactical effectiveness. It would appear that training in combat techniques should be coordinated with training to keep safe and to move across the terrain. The fact that survival and movement skills in the Far North are new and untried leads the men to concentrate on them, whereas they are not, after all, the primary mission, even though essential to its accomplishment. It is possible that, if troops were given additional prior training on survival and comfort skills, the tactical skills might receive a larger proportion of attention during the maneuver itself.

5. Training in the proper use of cold-weather clothing and gear would probably be most effective if conducted under cold-weather conditions—that is, taught in a functional context. With the exception of some rudimentary or preliminary information, most of the material now covered in a formal classroom setting could probably be taught better in the field concurrently with training in tactical operations, beginning with modest field exercises. Such exercises should, of course, be administered with appropriate caution, limited initial objectives, and an awareness of the tolerance that must be exhibited toward troops operating in the snow and cold for the first time.

6. On the basis of the observations and findings in this study, it is concluded that the essential training content for small units in the Far North, listed in order of relative urgency, is:

a. Tactical adaptations, such as offensive and defensive combat techniques in deep snow, target acquisition, the firing and handling of

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weapons in deep snow, and camouflage and concealment in the far-northern environment.

b. Movement skills, such as land navigation, efficient use of helicopters and armored personnel carriers, and skiing and snowshoeing.

c. The proper use of special cold-weather clothing and equipment.

d. Techniques of escape, evasion, and survival.

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AND
APPENDIX

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Appendix

COMPUTATION OF INDEXES

An example of the computation of Performance Indexes is presented below. Computation of Equipment Indexes was the same, except that the applicability figures were based on whether the observer was in a position to see whether or not the item of equipment or clothing was on hand.

Skill or Technique

List III, Item 15:
Muzzle and receiver free of snow

	Number of Observations	Percent
Periods on which performance was:		
Applicable	129	95
Not applicable	7	5
Total	136	100

	Number of Periods	Percent of Periods		Weights		Weighted Percentages
Proportions of men observed who displayed the skill:						
All	34	26.4	x	1.00	=	26.4
Most	26	20.1	x	.75	=	15.1
About half	46	35.7	x	.50	=	17.8
Only a few	2	1.5	x	.25	=	0.4
None	21	16.3	x	.00	=	0.0
Total	129	100.0				59.7

$$\text{Performance Index} = \frac{59.7}{100} = .60$$

In the example, the number of times that each score was reported was translated into percentages of the sum of the number of times that the item was applicable. Thus in 34, or 26.4%, of the 129 observed training periods in which the men observed had their rifles with them, all the men kept their rifle muzzles and receivers free of snow. In 26, or 20.1%, of such periods, most of the men kept the critical parts free of snow; in 46, or 35.7%, about half the men were successful at this; in 2, or 1.5%, only a few men were successful; and in 21, or 16.3%, none were successful.

The proportions All, Most, Half, Few, and None were assigned weights of 1.00, 0.75, 0.50, 0.25, and 0.00 respectively, and the percentages described above were multiplied by the appropriate weights. The resultant products were summed, divided by 100, and rounded to two decimal places to arrive at the Performance Index.

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COLD WEATHER OPERATIONAL TRAINING OF INFANTRY FORCES IN THE STRATEGIC ARMY CORPS, by Norman F. Washburne, Feb 64, 48 p. incl. illus. tables, 6 ref. (Technical Report 86)

(Contract DA 44 188 ARO-2) (DA Proj 2J024701A712) Report For Official Use Only

This research was undertaken to study the training problems of infantry forces in the Strategic Army Corps during cold weather operations. A research team was attached to CONUS forces to observe troop performance during the training and maneuver phases of Exercise LITTLE BEAR in Alaska during the winter of 1960. The data indicated areas of training content needing greater emphasis, and included suggestions regarding the context in which certain portions of the training should be given.

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