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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This TOP prescribes methods for evaluation of footwear undergoing cold climate testing. It contains procedures for use in evaluation of functional suitability, compatibility with arctic clothing and equipment operation, durability, troop acceptability, maintainability, and safety. It contains facility and instrumentation requirements for the accomplishment of testing.		

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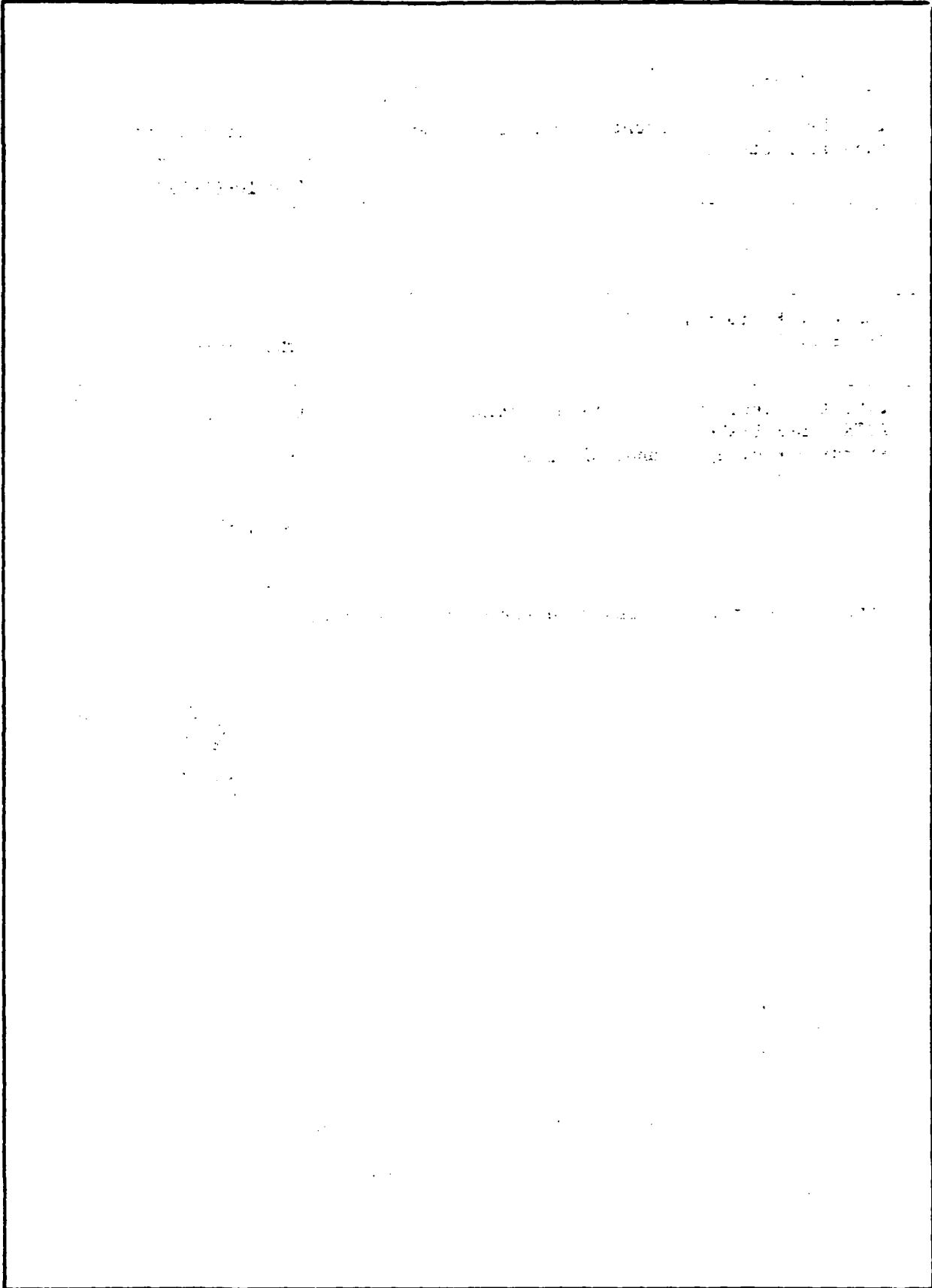
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U.S. ARMY TEST AND EVALUATION COMMAND
TEST AND OPERATIONS PROCEDURES

DRSTE-RP-702-109

*Test Operations Procedure 10-3-512
AD No.

9 May 1980

COLD REGIONS ENVIRONMENTAL TEST OF BOOT AND SIMILAR FOOTWEAR

		<u>Page</u>
Paragraph	1. SCOPE	1
	2. FACILITIES AND INSTRUMENTATION.	2
	3. PREPARATION FOR TEST.	3
	4. TEST CONTROLS	5
	5. PERFORMANCE TESTS	6
	5.1 FUNCTIONAL SUITABILITY.	6
	5.2 COMPATIBILITY	10
	5.3 DURABILITY.	11
	5.4 TROOP ACCEPTABILITY	13
	5.5 MAINTAINABILITY	14
	5.6 VALUE ENGINEERING	14
	5.7 SAFETY	15
	6. DATA REDUCTION AND PRESENTATION	15
Appendix	A DATA COLLECTION SHEETS.	A-1
	B INSTRUCTIONS AND CHECKLISTS	B-1

1. SCOPE. This Test Operations Procedure (TOP) is to be used as a guide for the environmental testing of boots and similar footwear commonly worn in cold regions. It is not intended as a reference for testing of specialized footwear such as single purpose ski boots or of footwear accessories such as skis, crampons, or snowshoes. Specific procedures cover test preparation, functional suitability in duties involving walking, marching, or use of oversnow equipment, compatibility with vehicular operation, durability, troop acceptability, maintainability, value engineering, and safety. Human factors are essentially considered throughout these procedures. Reliability as defined in applicable Required Operational Procedures may be determined from the results of the suitability and durability tests.

NOTE: Within this document a test item is defined as a single left or right boot, overshoe, etc. The term footwear refers to properly paired boots, overshoes, etc.

*This TOP supersedes MTP 10-4-006, dated 23 June 1969, including all changes.

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9 May 1980

Test Operations Procedure 10-3-512

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

2.1.1 Any heated enclosure(s) that is convenient for the sizing, fitting, and/or interviewing of test personnel and examination of test items.

2.1.2 A limited access enclosure for storing unissued test footwear.

2.1.3 A test course(s) suitable for determining functional performance characteristics of the test items. The course(s) will include a variety of subarctic terrain, vegetation, and snow-cover conditions prevalent through the temperature ranges applicable to the test footwear. Slopes along the course(s) will be sufficient for uphill, downhill, and sidehill traversal marching conditions.

2.1.4 A small arms weapons range and a drop zone.

2.2 Instrumentation.

<u>Items</u>	<u>Range</u>	<u>Min. Accuracy</u>
Foot Measuring Device, Mens and Womens, Both Feet	Size 3 to 14	$\pm \frac{1}{2}$ size
Pedometer	8 km	NA
Weight Scale	0 to 5 kg	± 1 mm
Steel Tape	0 to 3 m	± 1 mm
Depth Micrometer	0 to 3 cm	± 0.1 mm
Stopwatch	0 to 30 min	± 0.1 sec
Still and Motion Picture Equipment	NA	NA
Human Factors Engineering (HFE) Field Instrumentation Package	NA	± 1 percent
Thermometers	-55°C to 32°C	$\pm 2^\circ\text{C}$

<u>Items</u>	<u>Range</u>	<u>Min. Accuracy</u>
Thermocouples and Associated Monitoring Equipment	0°C to 55°C	±1°C
Meteorological Equipment Capabilities:		
Air and Snow Temperature	-55°C to 32°C	±2°C
Relative Humidity	0 to 100 percent	±5 percent
Wind Velocity	0 to 40 knots	±2 knots

3. PREPARATION FOR TEST.

3.1 Facilities. Insure availability.

3.2 Equipment.

3.2.1 Upon receipt, test footwear shipping containers will be inspected for damage. Test items and associated Maintenance Test Support Package (MTSP) will be unpacked and inventoried. Referencing criteria established in appropriate requirements documents, test items and MTSP will be inspected for completeness, defects, and damage. Deficiencies will be recorded and photographed. Damaged or defective test footwear will be disposed of in accordance with test sponsor's directions.

3.2.2 Identification photographs will be taken of a sample set of test footwear.

3.2.3 A unique identification number will be permanently marked on both test items of each set of test footwear. The location of the ID number will be easily visible and consistent on all test items.

3.2.4 A random sample of test footwear in each nominal foot size will be measured for dimensional characteristics not usually subject to variation, i.e., test item length, height, maximum width of heel and sole, sole length, etc. All test items will be measured for dimensional characteristics affected by wear or absorption of moisture,

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9 May 1980

Test Operations Procedure 10-3-512

i.e., tread depth at ball and heel, and weight. Measurements will be recorded by footwear size and ID number. Test supervisory personnel will subjectively note footwear material physical properties such as rigidity, pliancy, texture, color, and reflectivity.

3.2.5 Sizing and fitting of test footwear will be accomplished in the following manner:

3.2.5.1 Both feet of each individual tentatively designated as a test participant will be examined by qualified medical personnel. Only personnel free of any foot condition that might bias test conduct or evaluation will be selected as test participants.

3.2.5.2 Both feet of each test participant will be measured for length, width, ball of foot circumference, instep circumference, and heel ankle circumference. Measurements will be taken in accordance with Technical Report 72-51-CE, The Body Size of Soldiers Clothing and Personal Life Support Laboratory, U.S. Army Natick Laboratories, December 1971.

3.2.5.3 Footsize (normal footwear size) of each test participant will be measured using a foot measuring device and its associated instructions. Instructions provided in TM 10-228, Fitting of Footwear, 13 June 1966, will be used to insure proper fit under standard conditions.

3.2.6 A program of instruction will be prepared to thoroughly familiarize test participants with test footwear and the conduct of testing. Specific topics will include, but not be limited to, test criteria and objectives, footwear maintenance, and personal foot hygiene. In the event instructional material or a test training package is furnished, it will be evaluated for adequacy.

3.3 Instrumentation. Insure that all instrumentation required for test conduct is available, in operating condition, and calibrated.

3.4 Data Required.

Test Items: Footwear nomenclature; technical description; ID photographs; footwear physical measurements by item size and ID number; shipment damages and footwear specification discrepancies; list of items received and missing in MTSP.

Personnel Data: Test participant names; MOS's; ages; description of military experience; normal duties; medical evaluation of foot condition; foot anthropometric measurements; nominal boot size.

Fitting: Footwear assignment, i.e., test participant to footwear (by ID number); observations of test participant and test officer concerning fit.

4. TEST CONTROLS.

4.1 A safety release or safety statement must be obtained prior to initiation of testing in accordance with DARCOM Regulation 385-12, Life Cycle Verification of Materiel Safety. Applicable range and safety SOP's will be adhered to during testing. Test supervisors will be continuously alert for possible occurrence of cold weather injuries. Test participants will have vapor barrier boots available during low temperature (below -18°C or below the rated capability of the footwear) tests. This requirement may be relaxed if warmup shelters are readily available.

4.2 A detailed test plan will be prepared, utilizing the procedures outlined in this TOP as a guide. It will be recognized that some steps of test methodology presented herein may not be applicable to particular test footwear. Deviations from the TOP's will be cited and explained in the data acquisition procedure of the test plan forwarded to HQ, TECOM for approval.

4.3 Each test will be conducted at environmental conditions and to applicable standards as specified in the requirements documents and test directives.

4.4 Data collected throughout testing will be of sufficient quality and quantity to support conclusions. Since acquisition of such data may be constrained by limitation in the number of test or control items, manpower restrictions, inadequate time for optimum testing, or inadequate environmental conditions, the test officer will consult a statistician to identify optimum personnel, test item sample sizes, nominal footwear sizes (tariffs), or the optimum number of repetitions or replications required in a particular operation. Additional guidance may be found in TOP 3-1-002, Confidence Intervals and Sample Size.

9 May 1980

Test Operations Procedure 10-3-512

4.5 Dependent upon information provided by appropriate requirements documents, the tests described in this TOP may be performed simultaneously for comparison data on both test footwear and the standard footwear the new items would eventually replace. To equalize normal "breaking in" problems test footwear, and standard comparison footwear will be issued new. Both test and standard items will be issued at the same time, using identical fitting procedures, and with the same instructions related to wearing and caring for the footwear. Standard issue socks will be worn throughout the tests.

4.6 The individual tests in this TOP are oriented toward a test participant group size that permits constant control and observation by test supervisory personnel.

4.7 If at any time during the conduct of tests evidence of improper fit is encountered, the test participant will be removed from testing and the cause of the improper fit determined by remeasurement or medical re-evaluation. The proper record will be prepared. If no medical problem exists, the test participant will be issued new footwear in the size determined appropriate.

5. PERFORMANCE TESTS.

5.1 Functional Suitability.

5.1.1 Objective. Determine the suitability of test footwear for use in northern latitude environments through evaluation of:

Ease of donning and doffing at low temperatures.

Marching characteristics.

Thermal protection.

Compatibility with personal oversnow footwear accessories, i.e., snowshoes, skis, crampons.

Performance associated with the conduct of airborne operations, weapons firing, and conventional duties.

5.1.2 Method.

5.1.2.1 Donning and Doffing. Donning and doffing exercises will be conducted at a temperature within 6 Celsius degrees of the low temperature specified as a protective limit for the footwear. During each exercise a sample set of test footwear will be cold soaked for a minimum of 2 hours. Following the cold soak period, test participants will be observed and timed while they don the test items in low temperature conditions. The time required and any difficulties encountered will be recorded. Test participants will then wear the test footwear for 1 hour of outside activities, after which they will be observed and timed while they doff the test footwear. Note: Following donning, vigorous activity may be required to warm footwear interior to a nonhazardous level. Again the time required and any observed difficulties will be recorded. The donning and doffing exercises will be performed with test participants wearing appropriate cold weather handwear, i.e., arctic mittens, anticontact gloves, etc. The Interview Form, appendix A, will be completed by the test participants at the end of the exercise.

5.1.2.2 Marches. Marching exercises will be performed by test participants formed into a composite rifle squad. Members of this squad will wear the test footwear on a daily basis for a minimum break-in period of 2 weeks prior to the conduct of the march exercises. The number and length of marches will be determined by the type of footwear and the criteria in the stated required operational capability (ROC) or letter requirement (LR). Test courses will be similarly determined. At least half the marches will be conducted under environmental conditions characterized by temperatures in the lower half of the footwear utilization range (an adequate portion of the total distance should be marched within 6 degrees Celsius of the lowest footwear design temperature). The following additional march conditions will be met arbitrarily during the series of march exercises:

Test participants will traverse a selected number of kilometers on:

A sidehill march along a 30 percent or greater slope.

An uphill grade of which 1 kilometer is a 30 percent or greater slope.

A downhill grade of which 1 kilometer is a 30 percent or greater slope.

Soft snow above the height of the test footwear.

Ice, hard packed snow, or frozen ground.

During the marching exercises, test supervisory personnel will note and record any difficulties encountered by test participants and record spontaneous remarks pertinent to the test footwear. At the beginning, midpoint, and end of each march, the feet of each test participant will be checked by a medic for any anomalous conditions or change in condition. Test participants will change socks at the midpoint of each march. The appropriate questions on the Interview Form, appendix A, will be answered at the conclusion of each march.

5.1.2.3 Thermal Protection. Each test participant will engage in an outside activity requiring minimal physical foot movement at temperatures within 6 degrees Celsius of the minimum footwear design temperature. A thermocouple will be attached to the side of the test participant's big toe. The skin temperature will be monitored and recorded at 15-minute intervals from test initiation. Test duration will not exceed 8 hours and will terminate immediately if the skin temperature reaches the lower safety limit of 10°C or if the test participant complains of intense discomfort, see reference Test Methodology Research Investigation, Thermal Environmental Measurements, Partial Report, June 1970 TECOM Project Number 9-CO-008-000-001. The above test will be repeated using a sample of test footwear with tears, cuts, and other minor failures. Deliberate failures will not be inflicted on test items, this test will be conducted using items which have experienced these failures during regular testing. Test participants will be closely monitored during this and the following "wet boot" test to prevent cold injury. The test will be repeated again for footwear whose exterior has been soaked in water for 2 hours.

5.1.2.4 Compatibility with Oversnow Equipment.

5.1.2.4.1 Personnel engaged in this test will be proficient in the use of individual oversnow equipment. Proficiency as a result of prior duties will be verified, or will be provided through training. Training will be conducted in accordance with FM 31-70, Basic Cold Weather Manual, and TC 36-72-1, Military Mountaineering.

5.1.2.4.2 Each test participant will fasten a set of military skis, snowshoes, or crampons to their test footwear being worn. Test supervisory personnel will inspect the footwear-oversnow equipment interface for proper fit, position security, and tension as appropriate.

5.1.2.4.3 Special march exercises will be conducted over terrain appropriate for the use of each type of oversnow equipment. Marches will be performed wearing skis (cross-country), snowshoes, and crampons. Each march will include sidehill traversal and traversal of 1 kilometer of uphill grade and 1 kilometer of downhill grades with slopes between 3 and 30 percent.

5.1.2.5 Airborne Operations, Weapons Firing, Conventional Duties.

5.1.2.5.1 Dependent upon a stated ROC or LR, airborne operations will be planned for a series of paratroop drops onto snow covered earth and ice. Test participants will be jump qualified.

5.1.2.5.2 Dependent upon a stated ROC or LR, weapons and weapon ranges will be made available for evaluation of test footwear performance during actual or simulated firing. Test participants will be qualified in the operation of any weapon to which he is assigned during testing. A small arms range will be made available. Use of the range, with necessary safety requirements satisfied, will normally precede or conclude the march exercises of paragraph 5.1.2.2.

5.1.2.6 Throughout the test activities outlined in preceding paragraphs, test participants and supervisory personnel will be alert to observe and record information pertinent to general footwear comfort and to minor or serious wear/damages that might affect protective capabilities. Comfort information will include the overall comfort provided by a test item to the heel, ball, and arch of a foot, foot to heel seat anchoring, and pressure or abrasion points on the foot. Wherever possible, objective data will be supported by still and motion picture photography and video tape recordings.

5.1.2.7 Each day test participants will complete the appropriate column of the Weekly Usage Form, appendix A. The Interview Form, appendix A, will be completed following each functional test. Test footwear will be inspected for damage and wear on a weekly basis.

5.1.3 Data Required.

Donning and Doffing: Meteorological information, i.e., air and snow temperatures, windspeed, precipitation; ground conditions, i.e., snow, mud, etc.; time required to don and doff test items; other observations and difficulties encountered.

9 May 1980

Test Operations Procedure 10-3-512

Marches: Course description; list of personal clothing and equipment worn or carried on march; meteorological data (for significant march milestones or where great variation occurs); length and duration of marches; observations and difficulties encountered.

Thermal Protection: Description of test activity; meteorological data; toe skin temperatures; test duration; observations, as appropriate.

Oversnow Equipment: Type of equipment being used with test footwear; training required; test item/oversnow equipment interface problems; march data using oversnow equipment (see data required for marches); observations and difficulties encountered.

Airborne Operations: Troop equipment load; type and nomenclature of aircraft, flight speed and altitude at jump; meteorological and ground conditions; observations.

Weapons Firing: Type and nomenclature of weapons; if crew served, test participant responsibilities; positions taken in firing small arms; observations.

General: Motion picture and still photography, and video tape documentation in support of test observations; completed Weekly Usage Forms completed Interview Forms.

5.2 Compatibility.

5.2.1 Objective. To determine the compatibility of the test footwear with cold weather clothing and military vehicular equipment operating in northern latitudes.

5.2.2 Method.

5.2.2.1 MOS trained or equivalently qualified test participants will attempt to accomplish controlled mission oriented tasks while in or operating a variety of military vehicular equipments. Test participants will wear the test footwear and other items of clothing required by the arctic environment and task performance. Test participants and test supervisors (when possible) will note and record instances where test footwear adversely effect task activity. Cases of incompatibility will be supported by film or video tape documentation.

5.2.2.2 Types of vehicular equipment to be used/operated will include the following:

Tactical Wheeled Vehicles (truck $\frac{1}{2}$ -ton, $1\frac{1}{2}$ -ton, $2\frac{1}{2}$ -ton)

Commercial Wheeled Vehicles (sedan, 4-wheel drive, carryall)

Tracked Vehicles (APC, ARV, tank, SP Artillery)

Engineering Construction Equipment (graders, lifts)

Aircraft (fixed wing, rotary wing)

Maneuvers and/or road/terrain conditions will be selected to require maximum foot dexterity and action of the part of the test participants. In tracked vehicles, test participant tasks will include all crew duties through actual or simulated firing of primary and secondary (if applicable) weapons systems.

5.2.2.3 Test participants will complete Weekly Usage Forms and Interview Forms as in paragraph 5.1.2.7.

5.2.3 Data Required

Weekly Usage and Interview Forms (appendix A).

Description of type vehicle used, clothing worn, and tasks performed.

Observations of supervisory personnel and difficulties encountered.

5.3 Durability.

5.3.1 Objectives.

5.3.1.1 To determine if the test footwear meets the durability requirements of the ROC or LR when used in a cold environment.

5.3.1.2 To observe and define the location of test item wear effects, moisture, absorption, and damage to material/construction which could be a condition precluding safe or effective use.

9 May 1980

Test Operations Procedure 10-3-512

5.3.2 Method.

5.3.2.1 To the maximum extent feasible, the durability requirements of the ROC on LR will be evaluated by actual troop usage in the natural cold environment. In order to complete testing within a single test season, it may be necessary to conduct "accelerated" tests. For example, if the durability requirement is 120 days, and a reasonable average usage is 2 hours of cross-country use per duty day, then the test could be concentrated into thirty 8-hour test days. For items where fitting and sanitation permit (e.g., overshoes), the testing may be further concentrated by using more than one shift.

5.3.2.2 Durability testing may include wearings from other controlled tests. However, testing specifically for durability will be conducted over a uniform and appropriate test course. The course will be selected so that the terrain is appropriate to the type of footwear being worn.

5.3.2.3 Durability testing will be conducted during the appropriate cold season, but no upper temperature limit will be set. Tests will be started when the air temperature is in the proper category, but will not be discontinued if the temperature rises above that desired. Tests will not begin if the air temperature is below that required in the ROC or LR.

5.3.2.4 Throughout durability testing, test supervisory personnel will inspect the test footwear. All damages will be recorded in detail by test item ID number and photographed upon detection. Particular attention will be given to the following:

Cracks/tears in the protective skin/insulative material of test items.

Abrasions.

Cracks/tears in soles.

Sole wear characteristics.

Failures along seams/mold lines.

Punctures, burns, chemical/fuel damage, fading, discoloring.

Permanent crushing/compression of protective skin/insulative material.

Hardness of footwear materials (freezing of insulation, etc.).

5.3.2.5 Test items used during controlled tests will be weighed periodically to determine moisture absorbed and retained. Drying of footwear will be addressed under maintainability, paragraph 5.5.

5.3.2.6 During the designated final inspections, the depth of tread at the ball and heel of each test boot will be measured and recorded for calculation of treadwear.

5.3.2.7 If during any test a test item should become damaged or worn to the extent that its capabilities, as established by ROC or LR failure definitions, are lost and the item is unserviceable, the test footwear will be withdrawn from testing, photographed, measured as necessary, and disposed of as directed by the sponsor.

5.3.3 Data Required.

Detailed record for each pair of test items of total duty days worn, total hours worn, total miles traversed, types of terrain encountered, meteorological conditions. Weekly Usage Form (appendix A).

Damages encountered, cause, photographs, test item ID number.

End of test tread depth measurements by test item ID number.

5.4 Troop Acceptability.

5.4.1 Objective. To determine troop acceptability of test footwear.

5.4.2 Method. Throughout testing, opinion interviews will be conducted on a periodic basis. Test participants will be questioned with regard to ease of donning and doffing, comfort, ability to keep feet dry, ability to keep feet warm, fit, and test item appearance with use.

5.4.3 Data Required.

Completed Interview Forms (appendix A).

Test supervisory personnel observations on troop acceptability.

9 May 1980

Test Operations Procedure 10-3-512

5.5 Maintainability.

5.5.1 Objective. To determine if prescribed test footwear maintenance procedures and materials are adequate for troop application in a cold environment.

5.5.2 Method.

5.5.2.1 Footwear will be maintained in accordance with instructions provided by the manufacturer. If no instructions are provided, test participants will clean, dry, and polish their test footwear using designated easily available commercial detergents and wax compounds as applicable, unless specifically prohibited by test directives. Footwear material reaction will be observed and recorded.

5.5.2.2 Maintenance instructions and parts for field repairable test items will be evaluated for adequacy. Special emphasis will be placed on evaluation of cold weather patching materials, i.e., ease of application, adhering, water tightness, wear characteristics.

5.5.2.3 Footwear that readily absorbs moisture, as determined in paragraph 5.3.2.5, will be dried by exposure to room temperatures until issue footwear weight is achieved or a weight level is achieved that does not vary significantly over a period of 8 hours.

5.5.3 Data Required.

Types of cleaning and polishing materials applied to test items, and results of application.

Adequacy and clarity of footwear maintenance instructions (care, cleaning, repair).

Adequacy of repair parts and tools.

Time to repair.

5.6 Value Engineering.

5.6.1 Objective.

5.6.1.1 To determine whether the test items have any features or components which could be improved or redesigned to increase footwear effectiveness in northern latitudes without significant cost increase.

5.6.1.2 To determine whether the test items have any features or components which could be eliminated to reduce cost without adversely affecting essential performance requirements, reliability, durability, or quality.

5.6.2 Method. Test supervisory personnel will record value improvements suggestions resulting from examination and observation in use of test footwear. User comments will also be incorporated.

5.6.3 Data Required.

Records of observations and comments from user and test supervisory personnel relative to the above objectives.

5.7 Safety.

5.7.1 Objective. To determine if any safety hazards are created by the wearing of test footwear.

5.7.2 Method. Safety observations will be made by test supervisory personnel throughout all testing. All injuries, accidents, or safety hazards caused by or related to the wear of test footwear will be noted and recorded. The cause of all injuries, accidents, or safety hazards and suggested means of prevention or elimination will, when possible, be determined and recorded. Provisions of applicable safety statement/safety release will be followed in controlling or limiting test operations. Photographs and video tapes will be taken as applicable.

5.7.3 Data Required.

Description of injuries, accidents, or safety hazards.

Supporting photographs or video tapes.

Causes and associated environmental conditions.

Failure/Incident classification in accordance with MIL-STD-882

6. Data Reduction and Presentation.

6.1 The total number of complete pairs of test items received, incomplete pairs of test items received, pairs of test items rejected in preparation for testing due to defect or damage, and pairs of test items rejected due to failure during testing will be presented in

9 May 1980

Test Operations Procedure 10-3-512

tabular form. The remarks section will include a narrative description of defects or failures leading to footwear rejection with photographs to illustrate the narrative description.

6.2 Biweekly Interview Questionnaires.

6.2.1 Numerical results obtained from questionnaires will be tabulated. For each test participant, the numerical average of responses to identical questions will be calculated. The numerical average for each test participant will be used to calculate the overall average for each of the questions and will be presented in tabular form.

6.2.2 Comments obtained from test participants will be categorized. Positive and negative comments in each category will be summarized and the numerical quantity presented in tabular form.

6.3 Data from the weekly usage forms will be extracted and presented by type of usage time and temperature as shown on the Utilization Summary Form, appendix A.

Recommended changes to this publication should be forwarded to Commander, USA Army Test and Evaluation Command, ATTN: DRSTE-AD-M, Aberdeen Proving Ground, MD 21005. Technical information may be obtained from the preparing activity: Commander, USA Cold Regions Test Center, ATTN: STECR-TD-DC, APO Seattle WA 98733. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314. This document is identified by the accession number (AD No.) printed on the first page.

APPENDIX A

Interview Form

(To be used in conjunction with Interviewer Instructions and Evaluation Chart in appendix B.)

Name of Test Participant _____ Test Item SN _____

Date _____

Interviewer _____ Period Covered _____

1. Which of the words on chart V best describes your opinion of the fit of the test item?
2. Which of the words on chart I best describes your opinion of the test item in the following categories:
 - a. Vehicle operation (correlate with type vehicle)?
 - b. Traction characteristics?
 - c. Compatibility with other clothing worn?
 - d. Compatibility with oversnow equipment (type)?
 - e. Drying boot?
3. Which of the words on chart II best describes your opinion of the test item in the following categories:
 - a. Comfort while marching?
 - b. Comfort in warm enclosure?
 - c. General comfort?
4. Which of the words on chart IV best describes your opinion of donning and doffing the test item?

9 May 1980

Test Operations Procedure 10-3-512

5. Which of the words on chart III best describes your opinion of the test item in the following categories:

- a. Ability to keep your feet dry?
- b. Ability to keep your feet warm?

6. Which of the words on chart I best describes your overall evaluation of the test item?

WEEKLY USAGE FORM

Instructions: Please complete daily usage of the footwear at the conclusion of each day and return completed form to the test officers at the beginning of each test week.

Name _____ Test Item Serial No. _____

	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.
1. I was wearing test item. Test comparison item.	____	____	____	____	____	____	____
2. I wore the footwear from _____ hrs _____ hrs _____ hrs _____ hrs to _____ hrs _____ hrs _____ hrs _____ hrs	____	____	____	____	____	____	____
3. Principle activities engaged in.	____	____	____	____	____	____	____
4. Terrain conditions were. (outside activities)	____	____	____	____	____	____	____
5. Temperature conditions. (degrees Fahrenheit)	____	____	____	____	____	____	____
Above 32°F	____	____	____	____	____	____	____
32°F to 0°F	____	____	____	____	____	____	____
0°F to -25°F	____	____	____	____	____	____	____
-25°F to -50°F	____	____	____	____	____	____	____
Below -50°F	____	____	____	____	____	____	____
6. Outside precipitation	____	____	____	____	____	____	____

9 May 1980

Test Operations Procedure 10-3-512

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
7. In addition to the test item I wore:							
a. Parka.							
b. Parka w/hood and liner.							
c. Field jacket w/liner.							
d. Field trousers.							
e. Field trousers w/liner.							
f. Wood underwear top/ bottom.							
g. Cushion sole socks.							
h. Other.							
8. My feet were cold: (if yes, please explain)	Yes			No			
9. My feet were wet: (if yes, please explain)	Yes			No			
10. My boots were damaged: (if yes, please explain)	Yes			No			

11. As a person who has close personal experience with the test boots, your comments for improvement of the footwear would be greatly appreciated. A blank page is attached for your convenience.

UTILIZATION SUMMARY FORM

	Temperature Range*			Remarks
	-to- Time Km	-to- Time Km	-to- Time Km	
Vehicle operation				
Vehicle passenger				
Marching				
Guard duty				
Office work				
Snowshoeing				
Skiing				
Glacier climbing (crampons)				
Maintenance, outside				
Maintenance, inside				
Weapons testing, outside				
Weapons testing, inside				
Other training, inside				
Other training, outside				
Total				

*The temperature will be broken into three ranges. These three ranges will bracket the upper 1/3, middle 1/3, and the lower 1/3 of the temperature range for which the boot was designed. Specific temperature will be added at the time the form is completed.

9 May 1980

Test Operations Procedure 10-3-512

APPENDIX B

Instruction for Interviewer

1. Interview will be conducted in a heated, well lighted enclosure during regular duty hours, with one participant present.
2. Interviewer will have available:
 - a. Paper, pencil, and interview forms.
 - b. Charts of weather conditions concerning interview period.
 - c. Tape recorder (to be used only with participants permission).
 - d. One pair test item.
 - e. One pair comparison item (if applicable).
3. When questions requiring subjective evaluation are asked the Evaluation Chart, appendix B, will be displayed and the appropriate interval scale selected for the test participant to choose the answer that is closest to his opinion. Test and comparison items will be placed in the test participant's view.
4. After all questions have been asked each test participant will be urged to expand their answers to provide specific details to support the reason for their individual choice of answers.
5. Specific references to performance weakness during a particular weather condition or activities should be recorded in detail.

Evaluation Chart

Instructions: This chart is to be displayed during interview of test participants while considering question 1 on the interview form. The appropriate interval scale will be selected for each question.

Interval Scales

I. General

1. Extremely good.
2. Very good in most respects.
3. Moderately good.
4. Not quite adequate.
5. Barely acceptable.
6. Very poor.

III. Protection

1. Protects extremely well.
2. Protection is above average.
3. Protection is about average.
4. Protection needs improving.
5. Protection is below average.
6. Protection poor.

II. Comfort

1. Excellent comfort.
2. Comfort is very satisfactory.
3. Above average in comfort.
4. Slightly uncomfortable.
5. Very uncomfortable at times.
6. So uncomfortable it can barely be worn.

IV. Donning and Doffing

1. Extremely easy.
2. Very easy in most respects.
3. Moderately easy.
4. Not quite adequate.
5. Barely adequate.
6. Very difficult.

9 May 1980

Test Operations Procedure 10-3-512

V. Fit

1. Fits extremely well.
2. Fit is quite satisfactory.
3. Fit is about average.
4. Fit needs improving.
5. Fit is not very satisfactory.
6. Fit is very poor.

APPENDIX C

Checklist

1. PREPARATION FOR TEST

1.1 Facilities

- Heated enclosure available.
- Limited access storage for unissued items available.
- Suitable test courses available.
- Small arms range available.
- Drop zone available.

1.2 Instrumentation.

Required instrumentation is available and reserved for test.

1.3 Equipment

- Shipping containers inspected for damage.
- Test items inspected for damage and completeness.
- Identification numbers marked on test items.
- Identification photographs taken.
- Dimensional characteristics measured.

1.4 Sizing

- Tentative test participants selected.
- Test participants feet examined by medical personnel.
- Test participants feet measured.

9 May 1980

Test Operations Procedure 10-3-512

Boots fitted to test participants and issued.

Test participants briefed on test, care of boots, and hygiene.

2. TEST CONTROLS

Safety release/safety statement received and safety constraints incorporated in test plan and safety SOP.

Test participants weighed.

3. PERFORMANCE TESTS

3.1 Functional Suitability

Donning and Doffing

Footwear cold soaked for two hours.

Appropriate handwear worn during donning and doffing.

One hour of activity between donning and doffing.

Interviews completed.

3.1.2 MARCHING

Two week breakin period completed.

Feet checked by medical personnel at beginning, midpoint, and completion of each march.

Interview forms completed after each march.

3.1.3 Thermal Protection

Ambient temperature within 6°C of minimum design temperature.

Thermocouples attached to the big toes of each test participant.

Each participant's toe temperature monitored and recorded at 15-minute intervals or less.

3.1.4 Compatibility with Oversnow Equipment

Test personnel are proficient in use of individual oversnow equipment (skis, snowshoes, crampons).

Footwear/oversnow equipment interface inspected for fit, security, and tension.

Special march exercises appropriate to the equipment performed.

Questionnaires completed.

3.1.5 Airborne Operations

Test participants jump qualified.

Drops performed as dictated by ROC or LR.

Questionnaires completed.

3.1.6 Weapons Firing

Range available.

Range clearance obtained.

Range safety SOP enforced.

Questionnaires completed.

3.1.7 Conventional Duties

Daily usage forms completed.

9 May 1980

Test Operations Procedure 10-3-512

3.2 COMPATIBILITY

3.2.1 Clothing

- Interviews completed.
- Incompatibility documented by film or video tape.

3.2.2 Vehicle

- Test participant qualified to operate vehicle.
- Maneuvers selected for maximum dexterity requirements.
- Interviews completed.
- Incompatibility documented by film or video tape.

3.3 DURABILITY

- Test courses selected.
- Exercises scheduled.
- Exercises completed.
- Weekly usage form completed.
- Interviews completed.
- Footwear inspected.
- Damage documented.
- Normal usage data included.
- Footwear weighed.
- Tread measured.

3.4 TROOP ACCEPTABILITY

- Interview forms completed.
- Supervisory personnel observations documented.

3.5 MAINTAINABILITY

- Maintenance package evaluated.
- Maintenance instructions provided or available.
- Moisture test completed.

3.6 VALUE ENGINEERING

- Value improvements noted throughout testing.
- Value improvement suggestions submitted.

3.7 SAFETY

- Safety observations made throughout testing.
- Description of injuries, accidents, of safety hazards recorded and documented.
- Safety statement/safety release constraints followed.