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

ARCTIC ENVIRONMENTAL TEST OF SKIS AND SNOWSHOES

1. OBJECTIVE

The objective of the procedures outlined in this MTP is to provide a means of evaluating the suitability of skis and snowshoes in arctic winter environmental conditions.

2. BACKGROUND

Engineering tests of materiels are conducted to determine their characteristics and performance under various conditions of operation, and to ensure their compliance with specified requirements. Testing in a natural arctic winter environment is used to substantiate or supplement data obtained from simulated environmental tests conducted during the Engineering Design and Engineering Test Phase. Testing in the arctic winter environment is generally not authorized until data from simulated environmental tests provides reasonable assurance that the test item will function satisfactorily when subjected to the conditions that would be encountered in the arctic.

3. REQUIRED EQUIPMENT

a. Appropriate Arctic winter uniforms
b. Weapons
c. Ammunition
d. Vehicles (cargo)
e. Support aircraft
f. Drop zone
g. Parachutists adjustable individual equipment containers as required.
h. Skis and snowshoes as required.
i. General and special tools and other ancillary items required for repairs or maintenance on the test item.
j. Test equipment
k. Photographic equipment (Black and white or color)
l. Meteorological support instrumentation

4. REFERENCES

A. AR 70-8, Human Factors and Social Sciences Research.
B AR 70-10, Army Materiel Testing.
C. AR 705-5, Army Research and Development.
D. AR 750-6, Maintenance Support Planning.
E. AR 705-15, Operation of Materiel Under Extreme Conditions of Environment.
F. USATECOM Regulation 350-6, Training in New or Modified Equipment and Training Devices.

G. USATECOM Regulation 705-2, Documenting Test Plans and Reports.
H. FM 31-70, Basic Cold Weather Manual.
I. MTP 10-4-500, Arctic Preoperational Inspection, Physical Characteristics, Human Factors, Safety and Maintenance Evaluation.

5. SCOPE

5.1 SUMMARY

The procedures outlined ~~in this~~ MTP are designed to determine and evaluate the physical characteristics of skis and snowshoes in arctic environmental conditions. Specific subtests include:

a. Preoperational Inspection and Physical Characteristics - The objective of this subtest is to determine:

1) If the test and comparison items are in proper condition for testing.
2) If the test items physical characteristics conform to the applicable criteria.

b. Suitability/Compatibility - The objective of this subtest is to determine the suitability and compatibility of the test item for use in an arctic environment while the wearer or user engages in cross country or ski trail operations and utilizes skis or snowshoes.

c. Aerial Delivery - The objective of this subtest is to determine the suitability of test items for parachute operations under arctic winter conditions.

d. Human Factors Evaluation and Safety - The objective of this subtest is to determine the effectiveness of human factors aspects of skis and snowshoes during arctic testing.

e. Maintenance - The objective of this subtest is to determine the maintenance requirements for the test items by their use in an arctic environment, and to determine whether these test item maintenance requirements meet maintenance standards as defined by QMR's, TC's, SDR's, or other established criteria.

5.2 LIMITATIONS

The procedures described in this MTP are limited to the testing of skis and snowshoes under Arctic Environmental conditions. Procedures for testing boots and other foot equipment are described in MTP 10-4-006.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test items are

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delivered to the Arctic Test Center prior to 1 October.

b. TDY personnel will be used to augment assigned personnel and will be representative of the troops who will use and maintain the test items under field conditions.

c. Ensure that all test personnel are familiar with the required technical and operational characteristics of the item under test, such as stipulated in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of equipment, and familiarize all test personnel with available reference.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET) as required.

f. Record the nomenclature, serial number and manufacturer's name of the test item.

g. Prepare record forms for systematic entry of data, chronology of the test item.

h. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test.

i. Outfit test personnel in appropriate arctic winter clothing as described in MTP 10-4-500, and with individual field equipment, during conduct of testing.

j. Record the prevailing meterological conditions during the storage phase, as well as test conduct, to include:

1) Temperature
2) Humidity, relative or absolute
3) Temperature gradient
4) Atmospheric pressure
5) Precipitation
6) Solar radiation
7) Wind speed and direction
8) Frequency of readings
9) Source of data

k. Prepare skis and snowshoes in accordance with technical manuals (additional reference, FM 31-70).

6.2 TEST CONDUCT

6.2.1 Preoperational Inspection and Physical Characteristics

a. Upon receipt, carefully inspect all test items and comparison items and their shipping or packaging containers for completeness, damage, and general conditions in accordance with applicable sections of MTP 10-4-500.

6.2.2 Suitability/Compatibility

NOTE: This subtest shall be conducted in ambient air temperatures ranging from 0°F to the lowest available temperature.

a. Direct test personnel to wear the test items in accordance with appropriate technical manuals. They shall be dressed in appropriate arctic winter clothing (reference 10-4-500) with individual field gear as directed.

b. Utilize snowshoes in the following manner:

1) Inspect snowshoes to determine if they are free of ice and snow before and after testing.
2) Determine if they provide proper flotation in snow.
3) Insure that the harness secures the wearer's foot to the snowshoe.

c. Skis:

1) Insure that the release bindings of the skis are secure to boot.
2) Insure that in cable type of release bindings are free of snow and ice.
3) Repeat 1 above for the boot lock (noncable) binding.
4) Confirm the fitting of the Arlberg strap to the binding cable to prevent the ski from "running away" downhill.

d. Insure the bindings of the skis and snowshoes are properly adjusted throughout the testing procedures.

e. Outfit fifty percent of the test personnel with the test item and fifty percent of the personnel with the comparison item, and accomplish the following:

1) Conduct four 4-day field training exercises (4 days each), consisting of attack, defense, patrol and retrograde operations which will require the use of all TO & E equipment as well as special equipment issued for use under arctic conditions.

2) Conduct a 10 day ski march cross country.

3) During steps 1) and 2) accomplish the following specific tasks and report the results, on a daily basis, by completing the Comparison Compatibility form, Appendix A.

a. Utilizing snowshoes march 50 miles through dense, snow covered brush
b. Utilizing snowshoes march 50 miles over snow covered (cross country) terrain.
c. Ski downhill on prepared ski slopes.
d. Ski 200 miles over cross-country trails.
e. Transport snowshoes and skis 100 miles cross-country in tracked vehicles.
f. Transport snowshoes and skis 100 miles on secondary road in wheeled vehicles.

g. At the end of each field training exercise and at the end of the test, test personnel shall complete the opinion from Appendix B.

h. Record the following data:

1) Damage attributable to environmental effects
2) Problems encountered (movement, discomfort, etc.)
3) Damage due to wear and use, etc.
4) Temperature and meteorological conditions at test site.

i. Complete personal proficiency history resume, Appendix C.

6.2.3 Aerial Delivery

6.2.3.1 Snowshoes

a. Inspect each test and comparison item before each jump. Note any deficiencies in the test log.

b. Direct test personnel (parachutists) to attach test items in accordance with appropriate technical manuals.

c. Subject all test items to three parachute jumps.

d. Repeat steps b and c using comparison items.

e. Inspect each test and comparison item after each jump.

f. Complete the comparison-compatibility form Appendix A.

g. Complete the opinion form Appendix B.

h. Record the following data:

1) Results of pre and post jump inspections.
2) Ambient air temperature.
3) Malfunctions of test and comparison items.
4) Compatibility with parachute equipment.

i. Photograph test and comparison items attached, before and after jump.

6.2.3.2 Skis

a. Inspect each test and comparison item before each jump. Note any deficiencies in the test log.

b. Direct qualified riggers to rig 15 sets of test items.

c. Perform one low velocity air drop.

d. Repeat steps b and c using comparison items.

e. Inspect each test and comparison item after each jump.

f. Photograph test and comparison items before and after each drop.

g. Repeat steps 6.2.3.1, f and g.

h. Record the following data:

1) Type, altitude and speed of delivery aircraft.
2) Ambient air temperature.
3) Results of pre and post jump inspections.
4) Malfunctions of test and comparison items.

5) Compatibility with parachute equipment.
6) Condition of drop zone.

6.2.4 Human Factors Evaluation and Safety

a. Conduct all Human Factors and Safety tests in accordance with the applicable sections of MTP 10-4-500.

b. Conduct these tests concurrently with the operational tests described in this MTP.

c. Note any discomforts directly relatable to temperature variations.

6.2.5 Maintenance Evaluation

a. Conduct all maintenance evaluation tests (maintenance and reliability) in accordance with applicable sections of MTP 10-4-500.

b. Conduct these tests concurrently with the operational tests (Suitability/Compatibility) described in this MTP.

6.3 TEST DATA

All test data to be recorded will be as specified in the individual subtests of this MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

6.4.1 Preoperational Inspection and Physical Characteristics

Preoperational inspection and physical characteristics shall be reduced and presented in accordance with MTP 10-4-500.

6.4.2 Suitability/Compatibility

Examine the recorded data and evaluate the suitability of the test item in arctic environment by determining the following:

a. If the test item characteristics are equal to or surpass those of the comparison items.

b. If the test items are compatible with other items of clothing, individual equipment.

c. If the test items meet or exceed the appropriate specifications contained in QMR's, TC's and SDR's.

Prepare a comprehensive report on the finding of the above evaluations.

Data presented in 6.2.2, g, h shall be submitted and the oversnow mobility of the test item shall be calculated.

6.4.3 Aerial Delivery

The suitability of the item under test for airborne operations under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to and/or malfunctions of the test items attributed to parachute jumps or environmental effects shall be compared with test item specifications contained in the appropriate QMR's or TC's.

6.4.6 Human Factors Evaluation and Safety

Human Factors and Safety data shall be reduced and presented in accordance with MTP 10-4-500. Evaluate data recorded in Appendix A and B and relate results of evaluation to how the test items may be improved.

6.4.7 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with MTP 10-4-500.

APPENDIX A

COMPARISON-COMPATIBILLTY FORM

(EXTRACT PORTIONS NEEDED FOR TEST)

GENERAL: This form is to be completed by each individual after each day's use of the test or control item.

NAME:_____ DATE:_____

TEMPERATURE RANGE:_____

1. What type of exercise were you participating in?

March	Bivouac	Airborne	Tactical Exercise
Ski_____		Attack_____	
Snowshoe_____		Defense_____	
Foot_____		Patrol_____	
Vehicular_____		Other_____	
Type Parachute_____			

2. Which did you wear/use?

Test Standard

3. Which boot and binding did you wear?

A. Boot:	B. Binding:
White, VB	All Terrain
Black, VB	Balata
Mountain and Ski	Mountain
Test	Universal
Other_____	Other_____

4. What problems or difficulties did you encounter while wearing/using the .

Poor Stability	Poor Control	Snow or Ice
Poor Flotation	Loose	Stiff
Failure to Hold Binding	Poor Maneuverability	
Other_____	Other_____	

5. What did you do?

Ski downhill	Ski/Snowshoe Cross-country
Carry in Vehicle	Skijor
Climb Hills	Other _____

6. I encountered difficulties in the following movements:

Moving Thru Woods	Step Turns	1, 2, 3 Stepping
Crossing Obstacles	Skijoring	
Climbing	Downhill Control	

Other _____

Explain: _____

_____

7. I wore the _____ in conjunction with the following equipment:

Skis	Loadcarrying Equipment
Snowshoes	Other _____
Weapon-M14, M16, M79, M60 or other _____	_____
	Other _____
Rucksack	_____

8. I carried the _____ in or on:

M116	2 1/2 Ton	Other _____
M113	1/4 Ton	Other _____
Tank	Aircraft	

9. The _____ was or was not compatible with the following equipment:

Equipment	Was	Was Not
_____		
_____		
_____		

ETC.

Why was the test item not compatible with _____

_____

_____

_____

10. Did you have any problems donning or doffing the _____?

Yes No

Which handwear did you have on?

Arctic Mitten Black/White Leather Bare Hand

Anti-Contact Trigger Finger

11. Which do you like best?

Test Standard

Explain why _____

_____

_____

12. The test _____ is: More suitable than standard.

As suitable as standard.

Less suitable than standard.

Unknown

13. I have the following comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Signature)

_____

(Rank)

APPENDIX B

OPINION FORM

GENERAL: This form will be filled out by each individual at the conclusion of each field exercise, parachute jump and at the completion of the test.

NAME:_____ DATE:_____

_____

(Exercise No. or period of time)

TEMPERATURE RANGE:_____

1. Check the_____you wore/used during the period:

   Test Standard

2. Write your opinion of the_____you used:

TEST:_____

_____

_____

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_____

STANDARD: _____

_____

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_____

3. Rank by number you order of preference:
   Test_____
   Standard_____

4. Explain why you like the_____rated no. 1.

_____

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_____

_____

_____

_____
(Signature)

_____
(Rank)

APPENDIX C

PERSONAL HISTORY

GENERAL: This form is to be completed by each individual prior to testing.

NAME:_____ DATE:_____

1. Do you have any previous oversnow mobility experience?

   Yes No

2. What did you wear?

   Snowshoes Skis

3. Where was the experience obtained?

   Civilian Military

4. If civilian indicate level of interest.

   Hobby Professional

5. If military indicate MOS.

6. I wore the_____ in the_____ for_____

7. What is your general reaction, comment and criticism regarding your previous experience_____

_____

_____

_____

8. Do you own any:

   Skis Snowshoes