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COLD REGIONS ENVIRONMENTAL TEST OF CB PROTECTIVE MASKS  
(U) ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING  
GROUND MD W J HASLEM 01 NOV 86 TOP-8-4-006

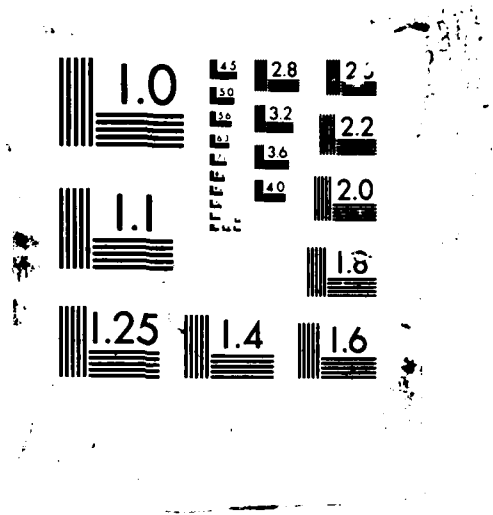
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This TOP prescribes methods for testing CB Protective Masks and associated winterization kits in the natural cold regions environment. It contains procedures for storage, transportability, environmental performance, logistic supportability, reliability, human factors, and safety tests. It describes the necessary facilities and instrumentation requirements for test accomplishment.

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

AMSTE-RP-702-107

\*Test Operations Procedure (TOP) 8-4-006

1 November 1986

AD No.

COLD REGIONS ENVIRONMENTAL TEST OF CB PROTECTIVE MASKS

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1. SCOPE. This TOP prescribes methods for testing protective masks in the natural cold regions environment. It contains procedures for storage, transportation, environmental performance, logistic supportability, reliability, human factors, and safety tests. It describes the necessary facilities and instrumentation requirements for test accomplishment.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

<u>ITEM</u>	<u>REQUIREMENT</u>
Storage area	Secure unsheltered storage area which is fully exposed to the environment
Vehicles	Tactical wheeled and tracked vehicles and UH-1 aircraft
Snow course	Snow-covered course with typical subarctic terrain for skiing and snowshoeing
Human performance course	Human performance obstacle course
Small arms firing range	25-meter firing range with Canadian-type bull targets

\*This TOP supersedes MTP 8-4-006, 15 January 1970.

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2.2 Instrumentation.

<u>Devices for Measuring</u>	<u>Permissible Error of Measurement</u>
Temperature (e.g., thermocouples)	$\pm 1^{\circ}\text{C}$
Time (e.g., stopwatches)	$\pm 0.1$ second
Weight (e.g., weighing scales)	$\pm 1\%$ of full scale
Dimensions and Anthropometry Kit	$\pm 0.1$ cm
Weight (e.g., anthropometry kit)	$\pm 0.1$ kg
Wind direction	$\pm 2^{\circ}$
Windspeed	$\pm 0.1$ m/s



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A-1	

The permissible error of measurement for instrumentation is the two-sigma value for normal distribution; thus, the stated errors should not be exceeded in more than one measurement of 20.

3. REQUIRED TEST CONDITIONS.

3.1 Calibration. All instrumentation to be used will be calibrated and tagged with a current calibration tag (DA Label 80).

3.2 Storage Site. A secure storage site which is fully exposed to the natural environment will be located. A secure steel mesh cage, exposed to the weather, will suffice.

3.3 Test Data. A detailed test plan will be developed, coordinated, and approved prior to testing. The test officer will establish and maintain a project field notebook and project file as described in TECOM Pamphlet 70-3<sup>1</sup>. Data forms will be developed, approved, and printed so that they are available prior to beginning the test. Software needed to handle test data will be developed prior to the start of testing. Human factors checklists and questionnaires will also be designed in accordance with TOP 1-2-611<sup>2</sup>.

3.4 Test Documentation. In addition to the detailed test plan, a safety release, an environmental impact assessment, a system support package, and funding will be on hand before beginning the test.

\*Footnote numbers match those in Appendix D, References.

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### 3.5 Test Controls.

3.5.1 Sample Size. Depending on reliability requirements, cost and prototype availability, a minimum of 22 test items will be allocated for this test. A sample of masks of each size is required. Test items should be new, or reconditioned if shipped from another test agency, and should be representative of the population from which they were drawn. With the assumption of a binomial distribution and no failures, a sample size of 22 gives a reliability of 90 percent at the 90 percent confidence limit.

3.5.2 Air Temperature. All tests will be conducted within the storage and operation temperature limits specified in the requirements document and in the detailed test plan. Missions will not be started unless temperatures are within, and expected to remain within, the required limits. If ambient air temperatures unexpectedly change during a mission, do the following: (1) continue mission to completion if temperature rises above upper limit, or (2) stop mission and bring test items inside a building or shelter if temperatures drop below the lower limit.

3.5.3 Test Personnel. Mask users as a group will provide a representative sample of head sizes and shapes. Personnel will not be excluded because their size falls outside the 5th to 95th percentile. Also, since head shape tends to become more definitive with age, older subjects should be included in the group. When testing the mask, subjects will be dressed with identical types and amounts of appropriate military standard cold weather clothing and in the appropriate Mission Oriented Protective Posture (MOPP).

3.5.4 Safety. The test officer will ensure that tests are performed in the safest manner possible. The detailed test plan will include safety procedures, precautions, and emergency procedures, as necessary. Information based on the test item safety release will be incorporated in the detailed test plan and will be adhered to throughout the test. Mask users will be constantly observed by experienced test supervisory personnel for symptoms of cold injury. All suspected cold injuries will be referred to competent medical personnel for confirmation and treatment. Test participants will not be required to continue wearing masks after they indicate they are in pain or are uncomfortable. All such incidents will be fully investigated prior to continuing testing.

3.5.5 Uniforms. Soldiers who wear test masks will wear MOPP clothing, as appropriate, as listed in appendix B and FM 3-4. In addition, cold weather clothing will be used as required for environmental protection. The exact components will depend on the temperature, wind-chill, and type of activity. At any rate, all participants undergoing a test activity will all wear the same components. MOPP clothing will be worn during all testing. Normally masks will be carried in MOPP zero, I and II gear and worn in MOPP III and IV gear. Donning will be done going from MOPP I or II to MOPP III or IV. Doffing would be the reverse. All testing will be accomplished as though the soldiers were engaged in a chemical war.

#### 4. TEST PROCEDURES.

##### 4.1 Preoperational Inspection.

###### 4.1.1 Method.

a. Upon receipt, inspect all packaging and note and photograph any damage or deterioration. The test items will then be unpackaged, thoroughly inspected, and any discrepancies in number of items expected or listed on the SSP will be reported. Representative samples of each size mask and carrier will be measured and weighed. Identification photographs will be obtained in the photographic studio, if not already available.

b. If permanent serial numbers are not already present on the test items, test identification numbers will be assigned and the test items will be marked by an appropriate method.

###### 4.1.2 Data Required.

- a. Test item dimensions (packaged or unpackaged) ( $\pm 0.5$  cm).
- b. Test item weight (packaged or unpackaged) ( $\pm 1$  gram).
- c. Test item serial numbers
- d. Description of missing components
- e. Description, with photographs, of damage

##### 4.2 New Equipment Training.

4.2.1 Method. Mask users and maintainers will be trained on the use and maintenance of the test items. Normally, this training is performed on-site by the developer, a contractor, or by the test officer if he/she has been previously trained. Military personnel of the proper MOS will be trained, as well as other test team personnel. The test officer will subjectively evaluate the adequacy of the training and will fully document any problems that occur with the training or with the use of the test items during training. The adequacy of any training literature or aids will also be evaluated.

###### 4.2.2 Data Required.

- a. Number of personnel trained
- b. Name and MOS of each person trained
- c. Hours of training:

- (1) Lectures ( $\pm 0.1$  hour)
- (2) Hands-on ( $\pm 0.1$  hour)
- (3) Maintenance ( $\pm 0.1$  hour)
- d. Subjective evaluation of training.
- e. Description of training problems.
- f. Time masks used during training ( $\pm 1$  hour)
- g. Copy of NET lesson plan.
- h. Description of training aids used or required

#### 4.3 Storage and Transportation.

##### 4.3.1 Method.

a. Storage: Depending upon the availability of the test items, a sample of test masks, in unpackaged unit storage configuration, will be placed in secure open storage for a minimum of 60 days. As explained in paragraph 4.2, care will be taken to ensure that the test items are not exposed to temperatures lower than those specified in the requirements document. At the completion of storage, the test items will be carefully inspected, photographed (if necessary to document damage), and then put into service during other testing phases.

b. Transportation: No special transportation test is required. Instead, masks and carriers will be transported as necessary to accomplish other testing. General purpose protective masks will be transported by wheeled and tracked vehicles, aircraft, and while using oversnow equipment during environmental performance testing. Combat vehicle masks and aircraft masks will be transported in their appropriate and available vehicles.

##### 4.3.2 Data Required.

- a. Storage duration ( $\pm 0.5$  day)
- b. Storage temperatures:
  - (1) Daily range ( $\pm 1^{\circ}\text{C}$ )
  - (2) Daily average ( $\pm 1^{\circ}\text{C}$ )
- c. Transportation data:
  - (1) Type vehicle



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- (2) Damage or problems encountered
- (3) Miles or hours for each transportation mode.
- (4) Terrain, conditions, and miles or hours of transport when (2) occurred

d. Photographs of damage or deterioration

#### 4.4 Compatibility and Fit.

##### 4.4.1 Method.

a. The test mask system will be carried and used by appropriate MOS personnel to evaluate compatibility of the mask and hood with the cold-weather uniform and equipment for aviators, infantry, and armor (Appendices B and C), as appropriate. The masks will be checked for compatibility with the M1 helmet, the Personal Armor System for Ground Troops (PASGT) helmet, the CVC helmet, and the aircrew helmet. The test officer, test NCO, and test participants will be interviewed concerning compatibility. Test supervisory personnel will investigate any cases of reported incompatibility and, if practical, the incidents will be documented photographically.

b. A large group from which to draw test personnel should be available to enable gathering as much data as possible regarding fit versus face size. In the choice of the final users, effort should be made to include a representative sample of personnel in the 0 to 100 percentile of face size. Test personnel will be fitted with the test mask in accordance with the instructions provided in the technical manual for the mask system. The fit of each mask will be evaluated by exposing the participants to isoamyl acetate (banana oil) fumes after the mask has been donned. If the isoamyl acetate odor is detected, the test officer or NCO will attempt to properly adjust the mask and if the masks cannot be properly fitted, a different size mask will be issued. If proper fit still cannot be made, then the person will be removed from the test and the incident will be reported by a TIR. Appropriate anthropometric measurements will be taken of all test personnel by the human factors specialist to determine percentile sizes. The name, MOS, and size of masks of personnel properly fitted will be recorded, along with the anthropometric measurements of all test personnel.

c. A series of mask and hood donning exercises will be conducted using at least 10 personnel of appropriate MOS, each dressed in the cold-weather uniform. Practice sessions of donning the test masks with and without the hood will be conducted until the test participants gain facility in donning, doffing, and using the mask system and until learning-curve effects are eliminated. The personnel will then be timed, three times each, while donning the masks both with and without hoods, while sitting, standing, kneeling, and in the prone position. A separate donning exercise will be conducted outdoors, and the temperature and windspeed will be recorded.

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Other donning situations appropriate to the MOS will also be timed while seated in the appropriate aircraft, and combat vehicle crews will be timed while at typical locations in armored vehicles.

d. While worn during this and other subtests, compatibility of the masks, hoods, and carriers will be continuously observed. Specifically, the following items will be noted:

(1) Infantry mode: communications, vision, and compatibility with individual clothing and equipment, load carrying equipment, body armor, helmets, canteens, and individual- and crew-served weapons.

(2) Armor mode: compatibility with individual clothing items, sighting devices, communication equipment, fire control devices, and other specified systems of armored vehicles and self-propelled weapons.

(3) Aviation mode: compatibility with aircraft controls, sights, oxygen system, and individual clothing and equipment items (e.g., vest, armor, helmet, gloves, goggles, microphones).

(4) Special purposes mode: compatibility with the clothing and equipment used in special purpose operations (e.g., EOD).

#### 4.4.2 Data Required.

- a. Name and MOS of test each participant.
- b. Sizes issued to each test participant.
- c. Anthropometric measurements and percentiles for each test participant. As a minimum, the following will be measured:
  - (1) Head circumference
  - (2) Bitragion - menton curvature
  - (3) Head length
  - (4) Head height
  - (5) Face breadth
  - (6) Face length
- d. Serial numbers of masks fitted and issued.
- e. Detailed descriptions and photographs of fitting problems.
- f. Results of isoamyl acetate fume tests.

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- g. Donning and doffing times for each position and configuration.
- h. Complete description, with appropriate photographs, of compatibility problems.
- i. Temperatures and wind data during each test phase.

#### 4.5 Environmental Performance.

##### 4.5.1 Method.

- a. Five typical cold regions activities will be tested.

- (1) Carry and usage.
- (2) Cold regions performance (obstacle) course.
- (3) Skiing and snowshoe exercises.
- (4) Bivouac.
- (5) Canister replacement.

These activities will normally be performed in climatic design type C1 temperatures (AR 70-38) as available. However, activities (2) and (3) may also be conducted below C1 to check for conditions that lead to lens frosting.

- b. All test participants will be required to carry the test mask system throughout the test season whenever they are on duty. As much wearing time as possible will be accumulated. On at least one occasion for each mask type, participants will attempt to wear the mask for 12 hours.

(1) In the event of a comparison test, comparison items will be carried by selected personnel. Using a daily usage log (Appendix A), participants will be required to record their daily activities, lowest temperature encountered, and hours that the test mask and comparison mask were worn. All prescribed carry positions will be investigated. The log will be returned to the test officer or NCO once a week, and the mask system will be inspected. Any comments of interest will be recorded. The carry and usage data will be reported and used for the calculations in the reliability and durability subtest (para 4.8).

(2) All participants will be interviewed twice during the test using the interview form (Appendix A). The first interview will occur at approximately the midway point in the carry portion of the test, and the second interview will occur at the conclusion of the carry portion of the test.

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c. A series of exercises will be run to determine the effects of the cold regions environment on the new masks during extended use. Ten test participants will wear the cold-weather uniform, carry an M16 rifle, and the All-Purpose Lightweight Individual Carrying Equipment (ALICE) weighted to a load equivalent to that of a typical cold regions fighting load (15-16 kg). The exercises will consist of skiing for at least 15 km per day for 4 days, and snowshoeing at least 10 km per day for 4 days. Each day personnel will alternate the mask worn if a standard or comparison mask is used. As many of these exercises as possible will be completed within lower extremes of the temperature range prescribed in the requirements document. At the completion of each phase (skiing and snowshoeing), personnel will be interviewed concerning the effectiveness of each mask system using the interview form (Appendix A).

d. Additionally, a 4-day cold regions bivouac field exercise will be conducted during which the mask systems will be carried and used in conjunction with typical cold regions field equipment (Appendix C). Ten test participants will wear the test masks and the comparison mask for an 8-hour period while working at a moderate rate and completing such typical cold regions tasks as erecting and striking 10-man tents, packing Ahkios, performing sentry duty, etc. An additional 8 hours of wear will be accumulated during the night while test personnel are sleeping in the mask. This exercise will be completed in C1 temperature ranges, as available. Each day the participant will wear one type of mask. Each morning the participants will change mask systems. At the conclusion of the bivouac, participants will be interviewed concerning the comfort and use of the mask systems using the interview form, Appendix A.

e. After each 4-day exercise, each mask will be decontaminated and sanitized in accordance with instructions in the operator's manual. Also, anytime that masks are rotated among users, the masks will first be sanitized. All decontamination will be done while the soldier is in the appropriate MOPP clothing.

f. The test group will be required to replace the canisters in their masks. After familiarization and training to eliminate major learning curve effects, personnel will be timed while replacing the canister both indoors (barehanded), outdoors with CB handwear, and outdoors dressed in the cold-weather uniform and wearing trigger finger mittens. The exercise will be repeated three times under each condition and followed by an isoamyl acetate leakage test. Observations will be recorded and the personnel will be interviewed at the completion of the exercise to determine if the replacement of the canister filter elements can be done quickly and easily in a cold regions environment.

g. After each major exercise during the environmental performance subtest, the test officer or NCO will inspect the mask systems to determine if they are functional or if they have been damaged during the exercises. Personnel will be exposed to isoamyl acetate vapors during these inspections

to determine if the masks are leaking. Observations will be recorded and reported.

h. Photographic or video coverage will be obtained to document typical test procedures and trouble areas.

i. Masks will be exposed to typical battlefield contaminants and substances peculiar to cold regions such as antifreeze, MOGAS and diesel additives, arctic engine oil, insect repellent, lens defogging liquids, etc., to determine whether these substances adversely affect the masks. A representative sample of masks will be exposed at least three times during the test.

#### 4.5.2 Data Required.

- a. Completed usage log (Appendix A)
- b. Completed interview form (Appendix A)
- c. Obstacle course times ( $\pm 1$  sec)
- d. Canister replacement times ( $\pm 1$  sec)
- e. Interview results
- f. Tester observations
- g. Complete description of test activities and difficulties encountered.
- h. Photographs or video coverage
- i. Conditions and activities leading to mask leakage (isoamyl acetate) and follow up action.
- j. Detailed description and photographs of all damage from decontamination, sanitization or exposure to battlefield contaminants.

#### 4.6 Human Factors.

##### 4.6.1 Method.

a. Throughout testing, personnel will be observed while using the mask systems and cold-weather uniforms and equipment for any incompatibilities or human factors problems. Photographs will be taken as appropriate. Further, personnel will be interviewed concerning human factors problems during the interviews conducted in conjunction with the environmental performance exercise. Specific questions will cover communications, vision, and glare.

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b. A controlled exercise will be conducted using the test participants to determine intelligible voice transmission range of all mask systems. The modified rhyme test procedure for speech intelligibility will be followed. Tests will be done with both the speaker and the listener masked.

c. The new masks will be used with typical communications devices, as available, to determine compatibility. The devices used will be reported and the effectiveness of communication will be subjectively evaluated and reported.

d. Eight personnel, preferably expert marksmen, will participate in firing exercises while wearing cold-weather uniforms. The personnel, wearing trigger-finger mittens and without masks, will fire the M16A1 rifle at Canadian bull-type targets at a 25-meter range in a prone supported position. They will first fire enough rounds to zero their weapons. Then each test person will fire 10 rounds without masks to establish a baseline score for comparison with the scores achieved while wearing the test masks. The radial distance from the center of the bulls-eye to each hit will be measured in centimeters. After baseline firings, all personnel will fire 20 familiarization rounds while wearing each mask type. Ten rounds will be fired in the standing supported position and 10 rounds in the prone supported position. The targets will be scored and used to evaluate any learning curve effects for each mask type. After the mask familiarization firings, test personnel will fire and score 10 rounds from a standing supported position. The firing series will then be repeated in a prone supported position. A limited number of trials with the test masks will be conducted from the standing (unsupported), kneeling, foxhole, and rapid fire (prone) positions. If any unusual difficulties are experienced with these positions, a complete firing series will be executed from that position using all eight personnel. It is preferred that most participants have normal uncorrected vision; however, some participants will wear combat spectacles/inserts, as required.

e. Compatibility of the test masks and protective hearing devices, (e.g., earplugs and muffs) will be subjectively evaluated during the firing phase subtest.

f. The test masks will be employed with other optical devices to determine the compatibility of the masks with these devices. The optical devices used will be reported and any problems will be subjectively evaluated and reported.

g. Primary participants will be directed to drink from a canteen while wearing the test masks. The results will be reported and personnel will be interviewed to determine if the mask allows adequate drinking capability.

h. The human factors checklist will be completed for the mask systems by the human factors evaluator and test officer (Appendix A).

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i. Personnel who wear eyeglasses will be fitted with combat spectacles or inserts and tested for vision capability while wearing the mask. The vision tests will be administered by medical personnel and will be similar to those given the firers. Field of view will be determined for masked personnel, both with and without spectacles.

j. A controlled exercise will be conducted using the test participants to determine the ability to clear the masks in a cold climate. Participants will conduct normal activities without the masks until normal heat build-up is experienced. At this time, the test masks will be donned, cleared, and the activities continued. A standard mask will be used for comparison.

k. Participants in armored vehicle testing and operation will conduct simulated weapon firing, range sightings, and vehicle operations while wearing alternately the test masks and the standard armored crewman's mask, with and without hood. The under-the-helmet hood configuration will be observed with the test masks.

l. Aviation personnel will perform normal aviation related missions, to include flying, in both the test and standard aircrewman's masks (in MOPP IV dress). The hoods for the new masks will be observed in the under the helmet configuration.

m. Compatibility of the test masks with MOPP clothing will be investigated and any compatibility problems will be fully documented.

#### 4.6.2 Data Required.

- a. Interview form results (Appendix A).
- b. Photographic coverage.
- c. Speech-intelligibility test results.
- d. Communication device capability.
- e. Vision tests (firers).
- f. Firing data.
- g. Optical device compatibility.
- h. Drinking capability.
- i. Human factors checklist (appendix A).
- j. Vision test (with corrective lens).

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k. Radial miss distance ( $\pm 0.1$  cm).

l. Field of view ( $\pm 1$  degree).

4.7 Logistic Supportability. Logistic supportability testing will be conducted in accordance with TOP 8-4-015<sup>3</sup>.

4.8 Reliability/Durability.

4.8.1 Method.

a. No special reliability/durability test will be conducted. Instead reliability and durability data will be obtained throughout the entire test, but especially from the environmental performance subtest (para 4.5). Insofar as practical, testing will be conducted in accordance with an approved mission profile, if available. Histories of individual mask systems will be kept with respect to storage, carrying and wearing times, and conditions of usage. Indications or evidence of deterioration or leakage will be noted.

b. Failures will be assessed using approved failure definitions and scoring criteria, or judgement. A complete description of the failure circumstances will be recorded for each failure, e.g., hours of wear or carry, temperature at the time of failure, possible cause of failure, and photographs, if helpful. Incidents will be cross referenced to the Test Incident Reports (TIR).

c. Masks experiencing failures will not be withdrawn from testing unless they are unserviceable. They will continue to be carried and worn to accumulate additional use data, however, generally only one life threatening operational mission failure will be charged to each mask, because once a mask fails in such a way that the wearer would have died, the mask would not be recovered for reuse.

4.8.2 Data Required

a. Total hours carried ( $\pm 1$  hour)

b. Total hours worn ( $\pm 1$  hour)

c. Documentation of each failure, to include:

(1) Serial number

(2) TIR number

(3) Failure analysis and scoring

(4) Additional relevant information not on TIR



#### 4.9 Safety.

##### 4.9.1 Method.

a. The test masks and accessory components will be inspected to ensure that they comply with the provisions contained in the safety release. The adequacy of those safety provisions will be observed throughout testing.

b. Throughout testing the protective mask and accessory components will be observed for any defect, omission, or condition that would present a safety hazard to the user. All injuries, accidents, or unsafe features attributable to the mask system will be fully documented and reported. Test personnel will be interviewed and examined for physiological hazards such as cold injury, fatigue, skin irritation, skin rash, headache, respiratory difficulties, and impaired vision. If any of the above difficulties are encountered, expert opinion of medical personnel will be obtained to determine the validity, cause, and possible remedy of the difficulty.

c. During field exercises at low temperatures, all test participants will be constantly monitored by test supervisory personnel for cold injury indications. Test participants will be removed from the exercise if they indicate they are in pain or if they report being abnormally cold as a result of wearing the mask. All such incidents will be fully investigated, including the use of instrumentation, if necessary, to establish whether the masks are safe for use at low temperatures specified in the requirements document.

##### 4.9.2 Data Required.

- a. Adequacy of the safety release.
- b. Adequacy of safety procedures and warnings in the operator and maintenance literature.
- c. Adequacy of safety warning labels or other markings.
- d. A complete description of each safety incident, injury, or accident associated with the use or carry of the mask system.
- e. Results of test personnel safety interviews.
- f. Medical personnel findings of any physiological hazard found.
- g. Photographs or video coverage of unsafe features or difficulties, if appropriate.

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4.10 Value Engineering.

4.10.1 Method. Throughout testing, test personnel will be alert for any indications of inadequate value in the mask system. Features or functions which are not needed or which could be provided in a less expensive manner will be identified and reported by TIR.

4.10.2 Data Required.

a. A complete description of any features of the mask system that are not needed or that could be provided in a less expensive way.

b. Data necessary to support a value engineering proposal.

c. Suggested value engineering investigations.

4.11 Post Test Inspection.4.11.1 Method.

a. At test completion, all masks and accessory components will be inventoried and inspected for any damage or deterioration not previously detected. Any shortages or defects will be fully documented.

b. If possible, masks tested will be shipped to Dugway Proving Ground (DPG) for leakage testing with dioctyl phthalate (DOP), and a sample of canisters will be sent to the Chemical Research, Development, and Engineering Center (CRDEC) at Aberdeen Proving Ground for gas life tests.

4.11.2 Data Required.

a. A list of missing test items or components.

b. Complete descriptions and TIRs for any unreported damage or deterioration.

c. DOP mask leakage data from DPG.

d. Gas life data from APG.

5. PRESENTATION OF DATA.

5.1 Preoperational Inspection. The data, observations, and photographs will be used to determine and document receipt condition of the test items and to establish that all test items are in suitable condition to begin testing. Data will be presented in narrative and tabular format to summarize results.

5.2 New Equipment Training. The adequacy of the training will be subjectively determined and fully documented in the report in narrative form.

5.3 Storage and Transportation. Quantitative data will be recorded, tabulated, and summarized in tables and graphs. Additionally, if sufficient data are available, statistical comparisons of data will be made of storage or transport that resulted in increased failures or other operational abnormalities. Damage, malfunctions, or difficulties will be reported narratively and by use of photographs or video, if helpful.

5.4 Compatibility and Fit. Quantitative anthropometric and fit data will be reported in tabular form. Fit and compatibility will be subjectively determined and reported in narrative format. Statistical comparisons of timed events will be made to identify differences by mask type or other relevant parameters. Compatibility problems will be documented by photographic or video means, if possible.

5.5 Environmental Performance. Data recorded on daily data checklists and interview forms will be tabulated and grouped by specific environmental parameters, such as temperature category or windspeed, to see if the results are affected by these environmental factors. Statistical techniques will be used that are appropriate to the amount and distribution of data. The results will be discussed narratively in the report. All problems in using the mask systems in the cold regions environment will be fully discussed and documented with appropriate photographs or video, if feasible.

5.6 Human Factors. Data obtained from checklists and questionnaires will be summarized and presented in narrative form. Questionnaires will be summarized with average ratings presented. Additionally, all human factor observations will be reported narratively, with photographs, if applicable.

5.7 Logistic Supportability. Data will be reduced and presented as specified in TOP 8-4-015.

5.8 Reliability/Durability. Data will be compiled and presented in tabular form. Failures will be assessed in accordance with the approved failure definition and scoring criteria, if available. All carry and use hours will be accumulated and combined for reliability/durability calculations.

5.9 Safety. All safety hazards or incidents will be fully documented and reported narratively. Safety incidents will be classified as to severity and frequency in accordance with MIL-STD-882<sup>4</sup>.

5.10 Value Engineering. Any value engineering suggestion will be discussed narratively and with illustrations, as needed.

5.11 Post Test Inspection. Additional data will be reported by TIR and summarized narratively in the final report. Quantitative data from DPG will be presented in tabular form with a summary in narrative form, if the data is available at the time of report preparation. If not, the agent test data will be reported separately by DPG.

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Recommended changes to this publication should be forwarded to Commander, U.S. Army Test and Evaluation Command, ATTN: AMSTE-TC-M, Aberdeen Proving Ground, MD 21005-5055. Technical information may be obtained from the preparing activity: Commander, U.S. Army Cold Regions Test Center, ATTN: STECR-TA, APO Seattle, WA 98733-7850. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22304-6145. This document is identified by the accession number (AD No.) printed on the first page.

APPENDIX A - USAGE LOG, QUESTIONNAIRE, AND CHECKLIST

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Daily Usage Log . . . . .	A- 2
Interview Forms . . . . .	A- 3
Design Checklist. . . . .	A-14



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INTERVIEW FORMS

Name \_\_\_\_\_ Type of Mask \_\_\_\_\_  
Date \_\_\_\_\_ Mask Mode Inf Arm Avn  
Mask Number \_\_\_\_\_ Optical Devices (Glasses)  
Present Yes No

Circle appropriate response.

## Question 1:

a. How do you rate the overall function of your mask?

- \_\_\_\_\_ 6 - Excellent  
\_\_\_\_\_ 5 - Very Good  
\_\_\_\_\_ 4 - Good  
\_\_\_\_\_ 3 - Could Use Some Minor Changes  
\_\_\_\_\_ 2 - Not Very Good  
\_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Question 2:

a. How do you rate the compatibility of the mask you are wearing with your uniform?

- \_\_\_\_\_ 6 - Excellent  
\_\_\_\_\_ 5 - Very Good  
\_\_\_\_\_ 4 - Good  
\_\_\_\_\_ 3 - Could Use Some Minor Changes  
\_\_\_\_\_ 2 - Not Very Good  
\_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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## Question 3:

a. How would you rate your ability to communicate while wearing the mask?

- ☐ 6 - Excellent
- ☐ 5 - Very Good
- ☐ 4 - Good
- ☐ 3 - Could Use Some Minor Changes
- ☐ 2 - Not Very Good
- ☐ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 4:

a. How would you rate your ability to see while wearing the mask at night?

- ☐ 6 - Excellent
- ☐ 5 - Very Good
- ☐ 4 - Good
- ☐ 3 - Could Use Some Minor Changes
- ☐ 2 - Not Very Good
- ☐ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 5:

a. How would you rate your ability to see while wearing the mask during daylight?

- ☐ 6 - Excellent
- ☐ 5 - Very Good
- ☐ 4 - Good
- ☐ 3 - Could Use Some Minor Changes
- ☐ 2 - Not Very Good
- ☐ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



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## Question 6:

a. How would you rate your ability to breathe during normal activities (walking, sitting, driving, etc.)?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 7:

a. How would you rate your ability to breathe during strenuous activities (running, skiing, snowshoeing, etc.)?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 8:

a. For each of the positions listed, rate the ease of putting on your mask while wearing cold-weather handwear. (If you have not put on a mask in a specific position check NA.)

## Prone

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult
- \_\_\_\_\_ NA

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## Sitting

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult
- \_\_\_\_\_ NA

## Kneeling

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult
- \_\_\_\_\_ NA

## Standing

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult
- \_\_\_\_\_ NA

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 9:

a. How would you rate the ease of taking your mask off (called doffing)?

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Question 10:

a. How would you rate the ease of putting the hood on?

- ☐ 6 - Extremely Easy
- ☐ 5 - Very Easy
- ☐ 4 - Easy
- ☐ 3 - Difficult
- ☐ 2 - Very Difficult
- ☐ 1 - Extremely Difficult

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 11:

a. How would you rate the pliability of your mask?

- ☐ 6 - Excellent
- ☐ 5 - Very Good
- ☐ 4 - Good
- ☐ 3 - Could Be Somewhat Better
- ☐ 2 - Not Very Good
- ☐ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

c. How many layers of clothing were you carrying the mask under?

- (1) None (mask carried on top of outer layer).
- (2) One layer (mask under parka).
- (3) Two layers (mask under parka and additional layer).

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## Question 12:

a. How would you rate the comfort of the mask while performing assigned tasks?

- \_\_\_\_\_ 6 - Excellent Comfort
- \_\_\_\_\_ 5 - Above Average Comfort
- \_\_\_\_\_ 4 - About Average Comfort
- \_\_\_\_\_ 3 - Slightly Uncomfortable
- \_\_\_\_\_ 2 - Very Uncomfortable at Times
- \_\_\_\_\_ 1 - So Uncomfortable It Can Barely Be Worn

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 13:

a. How would you rate the ease of clearing your mask?

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 14:

a. How would you rate the ease of installing the hood?

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Question 15:

a. How would you rate the ease of drinking while wearing your mask?

- \_\_\_\_\_ 6 - Extremely Easy
- \_\_\_\_\_ 5 - Very Easy
- \_\_\_\_\_ 4 - Easy
- \_\_\_\_\_ 3 - Difficult
- \_\_\_\_\_ 2 - Very Difficult
- \_\_\_\_\_ 1 - Extremely Difficult

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 16:

a. How would you rate your efficiency while wearing your mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Improvement
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 17:

a. How do you rate the compatibility of the mask with protective hearing devices?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Improvement
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Question 18:

a. How do you rate the compatibility of the masks with optical devices (specify devices)?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Improvement
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 19:

a. How do you rate the corrective lens inserts of the mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Improvement
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Question 20:

a. How do you rate the compatibility of the mask with MOPP-4 protective clothing?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Improvement
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Question 21:

a. How would you rate your ability to fire from the foxhole position while wearing your mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

b. How would you rate your ability to fire from the prone position while wearing your mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

c. How would you rate your ability to fire from the kneeling position while wearing your mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

d. How would you rate your ability to fire from the standing position while wearing your mask?

- \_\_\_\_\_ 6 - Excellent
- \_\_\_\_\_ 5 - Very Good
- \_\_\_\_\_ 4 - Good
- \_\_\_\_\_ 3 - Could Use Some Minor Changes
- \_\_\_\_\_ 2 - Not Very Good
- \_\_\_\_\_ 1 - Poor

e. Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Question 22:

a. Were the lenses on the mask free of glare? Yes \_\_\_\_ No \_\_\_\_ . If no, under what circumstances did you have glare? \_\_\_\_\_

b. Did you get glare during the day? Yes \_\_\_\_ No \_\_\_\_ . At night? Yes \_\_\_\_ No \_\_\_\_ .

## Question 23:

a. When you put your mask on and cleared it, did the mask lenses become foggy? (Note: fog means moisture on the inside or outside of the lenses) Yes \_\_\_\_ No \_\_\_\_

b. If yes, how much time went by before the fogging disappeared?

- \_\_\_\_ 6 - Less than 1 minute
- \_\_\_\_ 5 - More than 1 minute, but less than 5
- \_\_\_\_ 4 - More than 5 minutes
- \_\_\_\_ 3 - Fogging did not disappear

c. If fogging did occur, what was the weather like and what were you doing? \_\_\_\_\_

## Question 24:

a. Did you ever have any frost form on the lenses? (note: frost means moisture/ice.) Yes \_\_\_\_ No \_\_\_\_

b. If yes, what was the problem and under what circumstances did you experience the problem? \_\_\_\_\_

c. If yes, can you remember the temperature? \_\_\_\_\_

## Question 25:

a. Did you ever have frost form on any other part of the mask, inside or out? Yes \_\_\_\_ No \_\_\_\_

b. If yes, what were the circumstances? \_\_\_\_\_

c. If yes, can you remember the temperature? \_\_\_\_\_



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Question 26:

Did you have any accident caused by wearing your mask? Yes \_\_\_\_ No \_\_\_\_  
If yes, describe the accident. \_\_\_\_\_

---

Question 27:

a. Did you notice if the mask "crazed" or formed opaque stress lines when flexed at very low temperature? Yes \_\_\_\_ No \_\_\_\_

b. If yes, what was the temperature? \_\_\_\_\_ degrees F.

c. If yes, on what area of the mask did it occur? Lens \_\_\_\_  
Facepiece \_\_\_\_ Both \_\_\_\_

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HUMAN FACTORS DESIGN CHECKLIST

The following will be observed; the design will be rated as follows:

S Satisfactory  
 M Marginal  
 U Unsatisfactory  
 NA Not Applicable

<u>Item</u>	<u>S</u>	<u>M</u>	<u>U</u>	<u>NA</u>	<u>Comments</u>
1. Mask designed for 5th (female) to 95th (male) percentile personnel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Mask is compatible with steel helmet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. a. Mask is compatible with parka hood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Mask is compatible with PASGT helmet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Mask is compatible with standard facemask (white).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Mask is compatible with balaclava.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Mask is compatible with cap, extreme cold weather.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Mask allows adequate drinking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Mask does not distort vision.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Mask allows adequate field of view.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Straps are easily replaced if broken.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Inside of face plates are fog resistant or easily accessible for cleaning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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<u>Item</u>	<u>S</u>	<u>M</u>	<u>U</u>	<u>NA</u>	<u>Comments</u>
12. Mask allows use of binoculars without removal or loosening of adjustments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Mask allows aiming and firing of weapons without removal or loosening of adjustments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Metal components do not touch skin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. a. Eye lenses are shatterproof.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Eye outsert is shatterproof.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. Mask is provided with adequate adjustment to assure snug fit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Adjustments can be made while mask is being worn.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. Fasteners, components have dull, nonreflective finish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19. Pack carried items fold, collapse, to take up minimum space.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. Individual items weigh as little as possible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21. Replacement of breathing canister is done without tools.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
22. Audible activation of fasteners is minimized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
23. Carrying or wearing the mask does not interfere with running, throwing, climbing, crawling, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
24. Preparation for use obvious or instructions provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
25. Special instructions permanently attached.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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<u>Item</u>	<u>S</u>	<u>M</u>	<u>U</u>	<u>NA</u>	<u>Comments</u>
26. Mask is compatible with hearing protective devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
27. Mask collects no frost during use in cold weather.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
28. Mask can be cleared after donning in cold weather.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
29. Mask is comfortable for extended periods of wear.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
30. Resuscitation tube is easily attached while wearing mask.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
31. Mask can be donned within specified time frame.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
32. Hood can be easily installed in cold weather after mask has been donned.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
33. Mask retained adequate pliability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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APPENDIX B - COLD-WEATHER UNIFORM

The year-round temperature variation peculiar to the cold regions prohibits the prescribing of a particular uniform for any season. The clothing which is comfortable at approximately -45°C (-50°F) becomes uncomfortable at approximately -25°C (-15°F), and vice versa. Since a large fluctuation is experienced on an hour-by-hour, day-by-day basis, some degree of flexibility in uniform requirements is necessary.

The cold-wet uniform is designed to afford maximum protection against the hazards of changing temperatures, rain, wet snow, mud, and slush of a cold-wet environment.

The cold-dry uniform is designed to provide protection against the hazards of extreme temperatures, high winds, and snow of a cold-dry environment. As indicated below, the cold-wet uniform is part of the cold-dry uniform. The cold-wet uniform provides the inner insulating components of the cold-dry uniform. Progressing from cold-wet to cold-dry is accomplished by adding more insulation in the form of additional outer garments.

The Extended Cold-Weather Clothing System (ECWCS) is a head-to-toe system incorporating the latest available technology in cold weather clothing. It is designed to provide soldiers increased environmental protection and to provide a substantial weight reduction over the current standard cold weather clothing. While the ECWCS has been type classified several modifications will be made to the system before it is issued to user units. ECWCS systems used during testing are prototypes and could vary from type classified items.

The necessary clothing components of the cold weather uniforms are worn as defined in TM 10-275, DA, Cold Weather Clothing and Sleeping Equipment, dated April 1968 as amended by current Supply Bulletins and 6th Infantry Division (Light) Directives.

<u>Item</u>	<u>Cold- Wet</u>	<u>Cold- Dry</u>	<u>ECWCS*</u>
a. Undershirt, man's, 50% cotton, 50% wool, full sleeve.	X	X	
b. Drawers, cold weather, man's, 50% cotton, 50% wool, knit, ankle length.	X	X	
c. Socks, man's, wool, cushion sole, OG 408, stretch type.	X	X	X
d. Suspenders, trousers, scissors-back type.	X	X	
e. Shirt, cold weather, wool/nylon flannel, OG 108.	X	X	

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<u>Item</u>	<u>Cold- Wet</u>	<u>Cold- Dry</u>	<u>ECWCS*</u>
f. Trousers, cold weather, wool serge, OG 108.	X	X	
g. Trousers, utility, cotton sateen, OG 107.	X	X	X
h. Trousers, camouflage, cotton/nylon, water repellent, white.	X	X	
i. Liner, cold weather, trousers, nylon rip-stop, quilted, white.	X	X	
j. Liner, snow trousers, camouflage, nylon ripstop, quilted, white.		X	
k. Boot, extreme cold weather, man's, rubber, white, with release valve.		X	X
*l. Boot, cold weather, man's, rubber, black, with release valve.	X		
m. Coat, cold weather, man's, cotton/nylon, wind-resistant sateen.	X	X	
n. Liner, coat, cold weather, nylon quilted, 6.2 ounce, OG 106.	X	X	
o. Parka, extreme cold weather, man's, cotton/nylon oxford, OG 107, without hood.		X	
p. Liner, parka, extreme cold weather, man's, nylon quilted, OG 106.		X	
q. Cap, cold weather, cotton/nylon oxford, OG 107.	X	X	
r. Hood, extreme cold weather, cotton/nylon, OG 107, with fur ruff.		X	
<b>**s. Handwear:</b>			
(1) Mitten set, arctic: gauntlet style shell with leather palm.	X	X	X
(2) Mitten shell, trigger finger, leather palm and thumb; mitten inserts, wool/nylon knit, OG, trigger finger.	X	X	X
(3) Glove shells, work, leather; glove inserts, wool/nylon knit, OG 208.	X	X	

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<u>Item</u>	<u>Cold- Wet</u>	<u>Cold- Dry</u>	<u>ECWCS*</u>
(4) Gloves, cloth, work type (anticoncontact).	X	X	
t. Special-purpose clothing items:			
(1) Parka, snow camouflage, white.	X	X	X
(2) Trousers, snow camouflage, white.	X	X	X
(3) Mask, extreme cold weather.	X	X	
(4) Dickey, rayon, OD (local item of issue).	X	X	
(5) Balaclava, wool, navy blue (local item of issue).	X	X	X
u. A battle dress uniform (BDU) cap.			X
v. Polypropylene (PP) socks.			X
w. PP long sleeve, turtleneck undershirt and PP long under pants.			X
x. A fiberpile shirt.			X
y. A polytetrafluoroethylene (PTFE) parka with hood.			X
z. PTFE trousers.			X
aa. Fiberpile bib overalls.			X
bb. A 4-ounce polyester batting liner for the field coat and field trousers.			X
cc. NBC Protective Clothing:			
(1) Battledress overgarment (BDO).			
(2) Chemical-protective glove set.			
(3) Chemical-protective footwear covers.			
(4) Chemical-protective helmet cover.			
(5) Protective mask.			

\*Not available to CRTC.

\*\*Items not worn at same time.

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APPENDIX C - TYPICAL COLD REGIONS FIGHTING LOAD, AND EXISTENCE LOADS  
SUPPLEMENTAL LOAD AND AHKIO LOAD

The following items should be carried or worn by all personnel during winter months while conducting cold regions winter operations.

The typical cold regions fighting and existence load may be modified to include new items of equipment and tailored to meet the tactical scenario. The combat loads shown follow instructions received from the Combat Developments Activity, Alaska. They are carried in or attached to the appropriate components of the All-Purpose Lightweight Individual Carrying Equipment (ALICE) per instructions contained in TC 10-19, dated 21 July 1976.

1. Fighting Load (carried on the person):

<u>Item</u>	<u>Quantity</u>
Cap, insulating, helmet liner/helmet	1
Helmet w/liner and camouflage cover	1
Undershirt, 50/50	1
Undershirt, cotton	As desired
Drawers, 50/50	1
Drawers, cotton	As desired
Socks, cushion sole	1
Suspenders, trousers	1
Trousers, cotton/nylon, water repellent	1
Shirt, wool, OG 108	1
Boots, insulated	1
*Coat, cotton/nylon, w/liner	1
*Parka	1
*Liner, parka	1
Hood, winter	1
Muffler, wool	1
Mittens, set, arctic	1
Mittens, shells, trigger finger	1
Inserts, mitten, trigger finger	1
Overwhites, set	1
Body armor	1
Individual weapon	1
**Skis w/poles	1
**Snowshoes	1
Grenade, M26A2	Per basic load
Bayonet w/scabbard	1
Canteen, arctic (full), w/cover and cup	1
Belt w/first aid packet and pouch	1
Pouch, ammo, w/ammo	2
Suspenders, pack, combat	1
Protective mask	1
Lipstick, antichap, cold climate	1



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<u>Item</u>	<u>Quantity</u>
Sunglasses w/case	1
Box, match, waterproof w/matches	1
Personal items (i.e., cigarettes, matches, notebook, pencil, etc.)	As desired

\*Either coat or parka or both depending upon temperature.

\*\*One or the other but not both. Ski wax carried by two members of the team.

2. Existence Load (carried in rucksack):

<u>Item</u>	<u>Quantity</u>
Rucksack	1
Socks, cushion sole	2
Liner, trousers	1
Inserts, mitten, trigger finger	1
Bag, sleeping, type II	1
Case, water repellent	1
Bag, waterproof	1
Mattress, pneumatic	1
Poncho	1
C-rations	1
Toilet articles	1
Towel, turkish	1
Strap, natural color	1
Face mask, extreme cold weather	1
*Climbers, ski	1
Entrenching tool w/cover	1

\*For personnel wearing skis.

3. Supplemental Existence Load:

The following items are not immediately needed by the individual. They are normally carried in the duffle bag on unit transportation, and should be available when needed:

<u>Item</u>	<u>Quantity</u>
Undershirt, 50/50	1
Drawers, 50/50	1
Socks, cushion sole	3
Trousers, cotton/nylon, water repellent	1
Shirt, wool, OG 108	1

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<u>Item</u>	<u>Quantity</u>
*Parka, cotton/nylon	1
*Liner, parka, nylon quilted	1
*Coat, cotton, nylon, w/liner	1
*Mittens, set, arctic	1
*Mittens, shells, trigger finger	1
Skis w/poles, climbers, and wax, or snowshoes	1

\*Temperature at time of mission will determine which of these items are worn, and which are carried in the supplemental load.

4. Ahkio Load:

a. Tent group equipment: A tent group is normally a squad size unit but may contain only the members of a tank crew or comparable size unit, i.e., platoon or company, Cp or FDC.

b. The following is the tent group equipment for an infantry squad (10 soldiers) as outlined in FM 31-70, as amended. This load in a like new condition weights approximately 160 kg (350 pounds) with Ahkio.

<u>Item</u>	<u>Quantity</u>
Sled, scow-type, 90 kg (200 lb) capacity (Ahkio)	1
Ten-man tent	1
Yukon stove	1
Five-gallon gasoline can (filled)	1
Five-gallon water can (filled) w/cover	1
Cases of C-rations	2
120-foot climbing rope	1
Gasoline lantern	1
Box of candles	1
Squad cook sets	2
One-burner squad stoves	2
Axe	1
Saw (Buck or Swede)	1
Machete w/sheath	1
D-handle shovel	1
Ski repair kit	1

5. NBC Protective Clothing:

	<u>Quantity</u>
Battledress overgarment (set)	1
Chemical-protective glove set	1
Chemical-protective footwear cover	2
Chemical-protective helmet cover	1
Protective mask	1

APPENDIX D - REFERENCES

1. TECOM Pamphlet 70-3, Research Development and Acquisition, Project Engineer's Handbook, 16 June 1978.
2. TOP 1-2-610, Human Factors Engineering, Parts I and II, 30 November 1983.
3. TOP 8-4-015, Cold Regions Logistic Supportability Testing of Chemical, Biological, and Radiological Defense Equipment, 24 June 1985.
4. MIL-STD-882B, System Safety Program Requirements, 30 March 1984.

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