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13. ABSTRACT

Describes a method for evaluation of sleeping gear physical and functional performance characteristics. Identifies supporting tests, facilities, and equipment required. Provides procedures for preoperational inspection, physical characteristics, safety, personnel training, functional suitability, man portability, transportability, durability, maintainability, human factors, and value analysis.

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U. S. ARMY TEST AND EVALUATION COMMAND
EXPANDED SERVICE TEST - SYSTEM TEST OPERATIONS PROCEDURES

AMSTE-RP-702-109
Test Operations Procedure 10-3-160 12 June 1972

SLEEPING GEAR

SECTION I
GENERAL

1. Purpose and Scope.

This Test Operations Procedure(TOP) is published as a guide to assist in the preparation of a test plan to support the conduct of an Expanded Service Test (EST) of a type sleeping gear. It establishes test methods and techniques to determine if a candidate sleeping gear offered for testing meets the criteria prescribed in appropriate requirements documents and is suitable for use by the U.S. Army. Tests address preoperational activities, safety, training of test troops, maintainability, troop acceptability, and various suitability and functional areas of interest.

2. Background.

a. In the past decade the research and development community has addressed a series of problem areas surrounding the clothing and equipment of the soldier. "A Study to Conserve the Energy of the Combat Infantryman," dated 5 February 1964, led to the development and publication of a Department of Army approved Qualitative Materiel Requirement for a System of Lightweight Individual Combat Clothing and Equipment (QMR-LINCLOE), dated 1 September 1965. Sleeping gear was one of the items selected for inclusion in the family of clothing and equipment to be improved.

b. For the purpose of this procedure, sleeping gear is defined as any article of clothing or equipment which has a primary or auxiliary purpose of providing restful sleep under field conditions. Examples of sleeping gear found in the current Army inventory are: the sleeping shirt, mountain and artic sleeping bags, jungle hammock, sleeping bag outer cover (or case), pneumatic mattress, poncho with liner (auxiliary role), and the blanket. This document assumes that future testing will be directed toward the general area of these items.

3. Equipment and Facilities.

a. Equipment.

(1) Test sleeping gear and accessories.

(2) Control item as prescribed.

(3) Linear and weighing equipment.

(4) Infantry unit with TOE weapons and equipment.

(5) Airborne unit with TOE weapons and equipment.

(6) Photographic equipment.

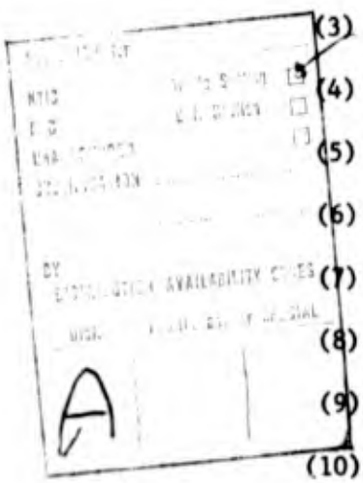
(7) Safety and first aid equipment.

(8) Decontamination equipment.

(9) Tactical vehicles, ground and air.

(10) Meteorological equipment.

(11) CB simulant agents and appropriate dispensers.



b. Facilities.

(1) Field training areas.

(2) Classroom, storage area, and office space.

SECTION II
TEST PROCEDURES

4. Supporting Tests.

a. Testing procedures are described in successive paragraphs, but there is no requirement that the subtests be conducted in the sequence of their listing. Most will be performed simultaneously with, or overlapping the procedures of, another test phase. Specific and detailed procedures should be developed by the test officer, and the test plan should reflect the state of the art at the time and place of the testing.

b. The data collected should be of sufficient quantity and quality to support reliable conclusions. This objective may be constrained by a limited number of test or control items, an inadequate period of time for optimum testing, or restrictions on manpower, funds, and/or support facilities. The test officer should consult a statistician and an experimental psychologist or test engineer to establish the experimental pattern and to identify the best means of securing the most meaningful data within the limitations imposed. The consultations should fix such requirements as the number of test personnel needed, the number of test and control items required by phase, and the optimum number of repetitions or replications required of a particular operation to produce statistically sound conclusions. Additional guidance will be found in MTP/TOP 3-1-002, Confidence Intervals and Sample Size.

c. A log book should be maintained as a chronological record of observations, remarks, meteorological data, times, comparisons, and other pertinent data as it occurs. An orderly and accurate listing of facts, opinions, and circumstances surrounding the collection of such data will expedite the essential collation process. Photographs, motion pictures, charts, and graphs are recommended as additional back-up evidence wherever appropriate.

d. All applicable TOP's, Military Standards, the tests defined in Section III, and other published documents to be considered in formulating an expanded service test plan are as follows:

	TEST SUBJECT TITLE	PUBLICATION NO.
(1)	Preoperational Inspection and Physical Characteristics (refer to para 5)	10-3-500
(2)	Safety (refer to para 6)	10-3-507
(3)	Personnel Training (refer to para 7)	10-3-501
(4)	Functional Suitability (refer to para 8)	
(5)	Man Portability/Transportability	10-3-506
(6)	Durability (refer to para 10)	10-3-502
(7)	Maintainability (refer to para 11)	10-3-504
(8)	Human Factors Evaluation (refer to para 12)	10-3-505
(9)	Value Analysis (refer to para 13)	

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Preoperational Inspection and Physical Characteristics.

a. The objectives of this phase of testing are to verify the completeness of the test item and to compare the item's physical characteristics with the criteria established in appropriate material needs documents. A further objective is to determine that each item received for the test is in serviceable condition and suitable for testing. Common MTP/TOP 10-3-500, Preoperational Inspection and Physical Characteristics, describes a series of tests to be conducted on newly arrived general supplies and equipment prior to expanded service testing.

b. In the collection of data to support test findings, it is important to identify the when, where, and why of events in addition to the terminal judgment of what happened. It is possible that a failure attributed to expanded service testing may have been a by-product of poor shipping practices or improper handling prior to being received at the test site. This type of damage or deficiency must be found prior to the conduct of other tests in order to properly identify valid test-faults as failures of testing and not the results of a pretest condition.

c. The physical characteristics of the candidate sleeping gear, as described in materiel needs documents, should be verified in the inspection phase of this preoperational exercise. Examples of the type characteristics normal to sleeping gear are:

(1) The weight and dimensions of the system.

(2) Environmental or climatic peculiarities.

(3) Physical properties of materials used, i.e., rigidity, pliancy, elasticity, fragility, texture, flammability.

(4) The color or colormetric quality desired, such as compatibility with other equipment and clothing, reflectiveness, or camouflage capability.

(5) Entry or exiting limitations.

(6) Minimum life expectancy under prescribed conditions.

(7) Number and adequacy of sizes required.

(8) Maintenance limitations.

(9) Design features required.

6. Safety.

a. The appropriate procedures of MTP/TOP 10-3-507, Safety, should be performed to determine the effectiveness of the safety features of the test item, and to confirm the safety of each component of the system received for testing.

b. During this phase, the test officer should identify any restrictions imposed by the safety release, directives, or local rulings which might influence the test results. An evaluation reflecting the judgment of the tester as to the degree safety restrictions, if any, influenced test conclusions should be included in post-test reports.

7. Personnel Training.

a. Training as outlined in applicable procedures of MTP/TOP 10-3-501, Personnel Training, should be conducted to evaluate the training package (if furnished) which accompanied the test gear, and to familiarize test personnel with:

(1) The sleeping gear to be tested.

(2) The conduct, procedures, and objectives of the test.

(3) Their individual assignments and responsibilities.

b. If instructional material or a test training package is furnished with the candidate sleeping gear, an evaluation of its adequacy should be a function of this subtest. Information such as the time required for acceptable troop orientation, completeness of the program of instruction, and recommendations for change or improvement should be recorded for inclusion in subsequent reports.

c. Sufficient pretest training should be accomplished to insure that the test soldiers are equally familiar with the test item and the control item. It is important that the performance of the test item not be degraded because of its newness, or because the test troops are unfamiliar with the item. If the test soldiers are familiar with the control item, emphasis must be placed on test item training to overcome bias due to previous use or familiarization

8. Functional Suitability.

a. Objective.

This phase of testing should determine the relative compatibility of the test item with other equipment worn, carried, or used by the soldier, and should test the ability of the item to provide restful sleep under varying conditions of environment and mission.

b. Method.

(1) A TOE Infantry unit, equipped with combat load and a representative number of test and control items, should participate in a number of field exercises. The exercises selected should encompass as many conditions of environment, geography, and tactical demand as test resources will permit. The selection of a test locale may be dictated by the type of gear being offered for testing. As an example, a new or improved arctic bag will require cold weather, while a candidate jungle hammock would be best service-tested in the tropics. In any event, the objectives of this phase of the service test may be appraised in similar training and field exercises which might include but are not limited to:

(a) Those designed to evaluate compatibility, such as:

1 Motor marches, air movements, and foot marches. During the conduct of these exercises, the sleeping gear should be stowed in its prescribed position within the load carrying system employed by the soldier, in both existence and fighting load configuration.

2 Parachute activities requiring the test gear to be mixed with the special gear required of jump activity.

3 Specialized training normal to extremes of environment, i.e., ski and snow shoe operations, or jungle and swamp operations, under tactical conditions.

4 A CB attack exercise requiring the use of protective mask, hood, and gloves.

(b) Those intended to evaluate comfort and rest objectives, such as:

1 An extended operation in a static defensive posture requiring alternating periods of work and rest.

2 Isolated base-camp situations requiring exposure to severe conditions of weather with minimum shelter made available to the test soldiers.

3 Situations requiring the use of the test and control items to provide rest and/or sleep under various conditions of exposure to moisture, wind, and temperature. These exercises should include a requirement to place the sleeping gear on different

foundations, i.e., wet surface, rocky ground, on boughs cut from local vegetation, hard stand, in fighting holes, and individual and crew-served emplacements.

(2) The testing techniques used in the above exercises should force frequent donning and doffing, packing and unpacking, laundering or cleaning as appropriate, and decontaminating.

(3) The periods of rest and sleep allowed should vary from short naps to periods of 6-8 hours of uninterrupted sleep.

(4) Sleeping gear is frequently subjected to rough usage when thrown in and out of vehicles, sat upon, or used in any number of auxiliary roles, the extent of which is limited only by the imagination of soldiers. This unorthodox but inevitable usage must be noted and evaluated wherever it occurs.

(5) Control sleeping gear (normally the standard A item) should be used in sufficient quantity to ensure valid comparisons in all functional areas. The control gear must be new, and should share identical test exposure with the test item.

c. Data Required.

(1) Test supervisory personnel should determine by observation, interview, and/or questionnaire the following information as applicable to both test and control items:

(a) The ease of carrying, pitching, striking, and pack rolling.

(b) The ease of entering or exiting, opening, and closing.

(c) Compatibility with the field uniform and other equipment worn or carried by the soldier.

(d) The ease of cleaning, drying, and maintaining.

(e) The ease of decontamination and reimpregnation.

(f) Relative comfort and warmth.

(f) Protection against moisture.

(h) Protection against crawling or flying insects, reptiles, rodents, or animals.

(i) Relative adherence to camouflage and other passive measure principles.

(2) A record of meteorological conditions of temperature, pressure, humidity, precipitation, and wind.

d. Analytical Plan.

(1) Analyze and prepare narrative report of significant findings resulting from collation of comments, opinions, and observations.

(2) Conduct an appropriate statistical analysis of the measures of effectiveness examined to determine any significant differences between test and control items in their ability to provide comfort, protection, and restful sleep. This should include the mean times recorded in each area of comparison.

9. Man Portability/Transportability.

a. The guidance found in MTP/TOP 10-3-506, Man Portability/ Transportability, should be found to determine the degree to which the carrying or transporting of the test item will influence the soldier's effectiveness.

b. Man Portability/Transportability data should be acquired throughout the conduct of all test phases. The field exercises required in many tests should provide adequate opportunities for observing test soldiers carrying and transporting the test gear under varied conditions and circumstances. Additionally, a Clothing and Equipment Test Facility (CETF), located at Fort Benning, facilitates the collection of performance data as described in MTP/TOP 10-2-509, Combat Effectiveness Test Facility. The procedures of the CETF are adaptable to other test sites if access to Fort Benning is impractical.

10. Durability.

a. The applicable procedures listed in MTP/TOP 10-3-502, Durability, should be performed to determine if the test item will successfully survive the criteria-established service-life, in a serviceable condition, while performing its intended function.

b. MTP/TOP 10-3-502 is a guide to assist in the examination of the durability of general equipment during expanded service testing. The contents of the document are necessarily broad in nature but can be adapted to this test. In addition, a careful review of all requirements documents, test directives, and pretest local guidance should be accomplished to ensure that specific durability requirements are closely examined.

11. Maintainability.

a. Pertinent procedures of MTP/TOP 10-3-504, Maintenance Evaluation, should be applied to determine if the maintenance directions contained in the instructions for use are adequate, and to compare maintenance requirements of the test item with those of the control item and with the criteria expressed in the materiel needs (MN) documents.

b. The maintenance evaluation of the test sleeping gear should be conducted concurrently with other testing whenever possible. The normal care, cleaning, and repair performed during the conduct of testing should provide data comparable to that expected from the normal user environment.

12. Human Factors Engineering.

a. The applicable procedures of MTP/TOP 10-3-505, Human Factors Engineering, should be accomplished to determine if the test item meets the human factors requirements expressed in materiel needs documents, and to what degree the test item meets with troop approval.

b. Human factors personnel should be consulted before testing begins for assistance in preparing pertinent portions of the test plans and reports and the development of interviews and questionnaire items.

c. Throughout the conduct of all testing, information and data pertaining to soldiers acceptance, degradation of performance, and compatibility of the test item with soldiers skills, aptitudes, and limitations should be collected. The use of questionnaires, interviews, and the observations of supervisors are means of obtaining such information. Once gathered, the data should be collected and integrated into the test report.

13. Value Analysis.

a. Objective.

To determine if the test item has any nonessential or costly parts or features which could be changed or eliminated without adversely affecting its functional performance.

b. Method.

A cost-consciousness orientation should encourage all test participants to report their observations and views on features or components of the test item they believe are nice-to-have but are not essential to an acceptable performance. This evaluation should be conducted concurrently with all other test phases.

c. Data Required.

The comments and opinions of test personnel and the observations of supervisors should be made a matter of record as they are reported.

d. Analytical Plan.

A subjective analysis should be prepared and supported by picture, or other visual aids, where appropriate.

Recommended changes to this publication should be forwarded to Commanding General, U.S. Army Test and Evaluation Command, ATTN: AMSTE-ME, Aberdeen Proving Ground, Maryland 21005. Technical information related to this publication may be obtained from the United States Army Infantry Board, STEBC-MO-M, Fort Benning, Georgia 31905. Additional copies of this document are available from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. This document is identified by the accession number (AD No) printed on the first page.

APPENDIX
REFERENCES

1. AR 70-10, Test and Evaluation During Research and Development.
2. National Bureau of Standards Handbook 91, Experimental Statistics.
3. TECR 70-23, Equipment Performance Reports.
4. TECR 70-24, Documenting Test Plans and Reports.
5. TECR 310-3, TECOM Test Operations Procedures Style Manual.
6. TECR 310-6, TECOM Test Operations Procedures.
7. TECR 385-6, Verification of Safety of Materiel During Testing.
8. TECR 700-1, Quality Assurance; Value Engineering.
9. TECR 750-15, Maintenance Evaluation During Testing.
10. TOP 1-1-012, Classification of Deficiencies and Shortcomings.
11. MTP 3-1-002, Confidence Intervals and Sample Size.