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OVERHEAD COVER FOR FOXHOLES

Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland

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Describes a method for evaluation of overhead cover kit operational and functional performance characteristics. Identifies supporting tests, facilities, and equipment required, provides procedures for preoperational inspection, physical characteristics, safety, personnel training, ease of employment, functional suitability, portability, human factors, and value analysis. Applicable to foxhole and other small emplacement covers.

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EXPANDED SERVICE TEST - SYSTEM TEST OPERATIONS PROCEDURES

AMSTE-RP-702-109
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OVERHEAD COVER FOR FOXHOLES

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SECTION I
GENERAL

1. Purpose and Scope.

a. This Test Operations Procedure (TOP) is a guide to assist the test officer in preparing a plan to support the Expanded Service Test (EST) of a type overhead cover for foxholes and other small emplacements. It describes methods and techniques to be used in determining if a candidate cover meets the criteria established in the appropriate materiel needs documents and is suitable for use by the US Army.

b. These procedures address: (1) a preoperational inspection and check of the physical characteristics of the candidate item; (2) appropriate tests to inspect the functional response of the item; and (3) an examination of the human factors and value engineering aspects of the item.

*This TOP supersedes MTP 10-3-024, 8 July 1970.

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c. The degree of protection from blast and thermal radiation which a candidate item might provide will be obtained from engineering test data and will not be addressed in these procedures.

2. Background.

a. The Small Development Requirement (SDR) for a small, lightweight, easily carried kit to provide protection in the form of overhead cover for a foxhole or small crew-served weapons emplacements was approved 24 November 1965. Following a series of Military Potential, Engineering, and Service Tests, a dacron fabric cover was pronounced suitable for Army use in 1970 and ordered into production in 1972.

b. Developed by the Army Mobility Equipment Research Development Center, the 5-by-7 foot dacron fabric cover is laminated with a thin polyester film. When stretched over a foxhole or small crew-served weapons emplacement it will support 18 inches of protective soil. Tabular sections (or pockets) are sewn into two sides of the sheet to provide a means of anchoring it firmly to the ground. Snaps are located along two edges and two or more items may be snap-fastened together. The 1½-pound fabric sheet can also serve as a ground cover, litter, or hammock.

3. Equipment and Facilities.

a. Equipment.

- (1) Test item.
- (2) Control item.
- (3) Weighing equipment.
- (4) Measuring equipment.
- (5) Photographing equipment.
- (6) Meteorological equipment.
- (7) First aid and safety equipment.
- (8) Communications equipment.
- (9) Tactical vehicles, air and ground.
- (10) Other items prescribed in referenced MTP/TOP.

b. Facilities.

- (1) Suitable field area for preparation of emplacements.
- (2) Classroom, office, and storage space.

SECTION II
TEST PROCEDURES

4. Supporting Tests.

a. Although the following test procedures are described in successive paragraphs, they need not be conducted in the order of their appearance. Some will overlap or be conducted simultaneously. The subtests are designed with sufficient flexibility to allow a test officer the opportunity to tailor a plan to the precise characteristics and requirements of a specific item, and the state-of-the-art at the time and place of testing.

b. Data must be obtained in sufficient quantities to support valid conclusions. This objective may be constrained by limited numbers of test and/or control items, a limited time to accomplish testing, or limited funds, manpower, or support facilities. To identify the best means of securing meaningful data within the limitations imposed, the test officer should utilize available statistical and human factors expertise. The statistician will contribute to selecting an overall experimental pattern or design, and fixing such data as the number of test soldiers required, the number of items to be tested, and the number of repetitions or replications required of specific operations. Human factors representative will assist the test officer in the development and presentation of questionnaires, techniques of interview, and the human factors input needed in procedures, plans, and reports. Additional statistical guidance may be found in MTP/TOP 3-1-002, Confidence Intervals and Sample Size.

c. The maintenance of a log book for entering pertinent comments and observations, meteorological data, times, comparisons, and other specific and applicable information will aid in the collation of test data to support findings. Photographs, motion pictures, charts, graphs, and other pictorial or graphic supplements should be used when appropriate.

d. Common Service MTP/TOP, the tests defined in Section III, and other published documents to be considered in formulating an EST plan are listed in the reference appendix or below:

<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
(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) Ease of Emplacement (refer to para 8)	
(5) Functional Suitability (refer to para 9)	
(6) Portability (refer to para 10)	10-3-506
(7) Human Factors Engineering (refer to para 11)	10-3-505
(8) Value Analysis (refer to para 12)	

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Preoperational Inspection and Physical Characteristics.

a. The applicable procedures of TOP 10-3-500 should be performed to: (1) verify the completeness of the test item, (2) compare its physical characteristics with the criteria established in the appropriate materiel needs documents, and (3) determine that the test item is in a serviceable condition and suitable for subsequent testing.

b. In collecting data to support test findings, it is important to isolate the when and where of events in addition to the ultimate judgment of what happened. It is possible that a shortcoming or failure, attributed to the mechanics of testing, may have originated as a fault of inadequate product control during manufacturing, poor handling or shipping practices, or pre-test deterioration. A

substandard condition, if one exists, must be discovered during this preliminary phase, identified, and properly recorded if subsequent test reports are to be creditable.

6. Safety.

a. The appropriate procedures of MTP/TOP 10-3-507 should be applied to determine the effectiveness of safety features incorporated in the design of the test item, and to confirm all safety measures associated with the conduct of the expanded service test.

b. Safety will be considered throughout the course of the expanded service test and, to the extent possible, will be evaluated concurrently with or as an adjunct to other subtests. The safety area of concern applies to the real and potential hazards of the test item itself, and to its relation to any combination of items with which it may be used. Particular attention shall be placed on the verification of safety limitations and compilation of data pertinent to the safety confirmation required by TECOM Reg 385-6, Verification of Safety of Materiel During Testing.

c. In the absence of a Safety Release, and when directed by competent authority, the limitations established by the developer and cited in a safety statement may be used in lieu of a Safety Release. The test officer should identify restrictions imposed by the Safety Release, directives, or other sources which in his judgment may influence test results, and reveal the extent of the influence in appropriate reports.

7. Personnel Training.

a. This subtest should be conducted in accordance with the applicable procedures of MTP/TOP 10-3-501, Operator Training and Familiarization, to determine the adequacy of the program of instruction proposed for the test item, and to orient test personnel with the scope, objectives, and mechanics of the expanded service test.

b. To minimize bias and achieve a higher degree of validity during tests involving comparisons, sufficient training should be conducted with the test foxhole cover to produce a test soldier equally familiar with both test and control items.

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8. Ease of Employment.

a. Objective. To test the degree of difficulty encountered by a soldier in placing the test foxhole cover in service.

b. Method.

(1) A series of foxholes and other appropriate emplacements should be dug in various types of soil. The emplacements will be representative of the type, size, and configuration prescribed in the appropriate needs documents as standards to be serviced by the test cover. Normally, a platoon defensive position, to include individual foxholes, two-man foxholes, crew-served weapons emplacements, and command holes arranged in a logical tactical array will provide a suitable representation.

(2) Test soldiers, equipped with a proper combat load, to include a test or control foxhole cover, will complete the above defensive position by emplacing the covers over the prepared holes in a timed exercise. To achieve maximum validity, the tactical exercise should be conducted during the day, at night, and during periods of adverse weather conditions. Environmental and/or CB clothing should be worn when prescribed in the needs documents or directives.

NOTE: Emplacements of foxhole cover is herein defined as removing the item from its place of carry, placing the cover over the hole, securing the cover by means prescribed in operating instructions or other applicable documents, and covering the item with dirt or other specified protective-layer material to a prescribed depth, and camouflaging.

c. Data Required. The following information should be recorded:

- (1) Number, size, and type of emplacements covered.
- (2) Type of cover used (test or control).
- (3) Time required for emplacement by individual, type hole, type soil, and description of overhead protective layer material prescribed.
- (4) Compatibility of emplacement process with the wearing of environmental clothing as prescribed.

- (5) Difficulties encountered.
- (6) Light and weather conditions of each exercise.
- (7) Comparison of ease of emplacing test versus control items.
- (8) Comments and observations of test personnel.

d. Analytical Plan.

(1) Collate information and data obtained, and prepare a narrative report to include:

- (a) A subjective analysis of comments and observations.
- (b) An analysis of mean-time and comparison data of significance.

(2) Supplement the narrative report with pictures, graphs, or charts when appropriate.

9. Functional Suitability.

a. Objective. To examine the test cover's capability to facilitate the construction of overhead protection for foxholes and small gun emplacements.

NOTE: Inherent with a requirement that a foxhole cover must be light and easily carried by man is the fact that an item which can meet such a criterion will afford little or no direct protection against hostile weapons. To protect its user, a typical foxhole cover must bridge the top of a foxhole with a surface strong enough to support dirt or other material to a depth necessary to absorb blast, shrapnel, and other external forces without allowing such force to penetrate the foxhole or collapse its walls. Thus, the foxhole cover becomes the foundation or support for a protective layer, not a protection within itself. The cover should have a degree of ability to protect against chemical and biological agents (in liquid form) with or without an earth cover. This subtest will be directed toward a determination of the structural capability of the emplaced foxhole cover and not the degree of personnel protection afforded.

b. Method.

(1) The test item should be emplaced over appropriate holes in strict accordance with the provisions of the instructions for

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installation provided with each cover. Once emplaced, the cover will furnish the foundation for overhead cover construction in accordance with the dictates of the applicable needs documents. As an example, the needs criteria might be expressed as "the system must have a 99-percent probability of continuous support of at least 18" (essential), 36" (desirable) of earth cover for a period of at least 48 hours (essential), 1 week (desirable)."

(2) Once emplaced and covered with earth or other material to the depth prescribed in the needs documents, the cover will be allowed to remain in place for the prescribed period of time. Periodic inspections should be made to establish the time and extent of any failure which may occur. Failure will be defined as:

(a) Complete or partial collapse of the foxhole cover except when collapse may be definitely attributed to a failure of the earth foundation.

(b) Vertical sag of the cover in excess of a distance specified in applicable documents.

(c) Tears, rips, or separations which allow the built-up earth cover to fall into the hole to an extent detrimental to tactical utilization of the emplacement.

(3) The degree of structural support furnished by the cover may be further tested by subjecting the covered hole to the force of static weights as may be indicated in the appropriate needs documents. The extent or degree of protection afforded against such forces as blast (overpressure) and thermal radiation will usually be a function of tests other than the EST. However, the degree of structural support furnished will directly correlate to soil depth and density. That depth support will provide some protection from blast.

(4) Both test and control covers should be emplaced over similar holes, in similar soil, and covered to identical depths, and subjected to the same conditions and procedures to give an adequate appraisal of comparative structural worth.

(5) The tests should be repeated with two or more items snap-fastened together and emplaced over appropriate holes in strict accordance with the instructions provided with the covers.

c. Data Required. Record the following for each cover emplaced:

- (1) Type and dimensions of hole covered.
- (2) Material used to build up protection.
- (3) Depth of built-up protection.
- (4) Type of cover used - test or control.
- (5) Evidence of failures noted - to include time detected and extent of failure.
- (6) Comments and observations of test participants.
- (7) Meteorological conditions, to include precipitation for each 24-hour period.

d. Analytical Plan. Collate data obtained, compare results with expressed criteria, and after analyzation of pertinent results, prepare a narrative report supported with pictures or charts when appropriate.

10. Portability.

a. This supporting test should be conducted in accordance with the applicable procedures of TOP 10-3-506, Man-Portability/Transportability, to determine the suitability of the test item for individual carry.

b. The field exercise conditions of the two previous subtests should normally provide adequate opportunity for observing test soldiers handling, carrying, and transporting the test foxhole cover over varying distances and terrain. When necessary, special exercises or courses may be conducted or traversed in order to ensure that combat equipped test soldiers are observed while carrying and transporting the test item under varying combat oriented conditions.

c. A Clothing and Equipment Test Facility (CETF) operated by the Infantry Board and located at Fort Benning, Georgia, offers an appropriate test of portability and compatibility with the combat-related tasks of a soldier on the move.

11. Human Factors Engineering.

a. Perform the applicable procedures of TOP 10-3-505, Human Factors Evaluation, to determine if the test item is suitable for

Army use from the standpoint of compliance with human factors principles.

b. Throughout the course of the EST, a man/test-item relationship will be examined as representative test soldiers employ the foxhole cover and are confronted with tasks and environmental conditions normally encountered in tactical situations. Specific human factors criteria may be expressed in some needs documents which will require special procedures to be developed to insure an adequate human factors evaluation.

12. Value Analysis.

a. Objective. To identify potential fruitful areas for subsequent value engineering by the developer.

b. Method. Throughout the course of the EST, note will be made of any unnecessary or costly test item feature which might be eliminated or modified without compromising the effectiveness of the candidate cover.

c. Data Required. Comments, observations, and reports related to the identification of potential areas for an appropriate value engineering re-evaluation.

d. Analytical Plan. Data collected should be analyzed and a narrative prepared recommending developer improvement where applicable. Recommendations should be supported with pictorial or graphic illustration when appropriate.

Recommended changes to this publication should be forwarded to Commanding General, US Army Test and Evaluation Command, ATTN: AMSTE-ME, Aberdeen Proving Ground, Maryland 21005. Technical information related to this publication may be obtained from US Army Infantry Board, ATTN: 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, Research and Development, Test and Evaluation During Development and Acquisition of Materiel.
2. TECOM Reg 70-23, Equipment Performance Reports.
3. TECOM Reg 70-24, Documenting Test Plans and Reports.
4. TECOM Reg 70-34, Risk Analysis for Suitability Reports.
5. TECOM Reg 385-6, Verification of Safety of Materiel During Testing.
6. TECOM Reg 700-1, Value Engineering.
7. TECOM Reg 750-15, Maintenance Evaluation During Testing.
8. FM 5-15, Field Fortifications.
9. TOP 1-1-012, Classification of Deficiencies and Shortcomings.
10. TOP 1-1-046, Field Combat Test Exercises.
11. TOP 1-1-045, General Supplies and Equipment Testing.
12. TOP 1-1-046, Field Combat Test Exercises.
13. TOP 3-1-002, Confidence Levels and Sample Size.