CHEMICAL AGENT DETECTOR KIT

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13. ABSTRACT

Describes a method for evaluation of chemical agent detector kit operational and functional performance. Identifies supporting tests, facilities, and equipment required. Provides procedures for compatibility with combat tasks.

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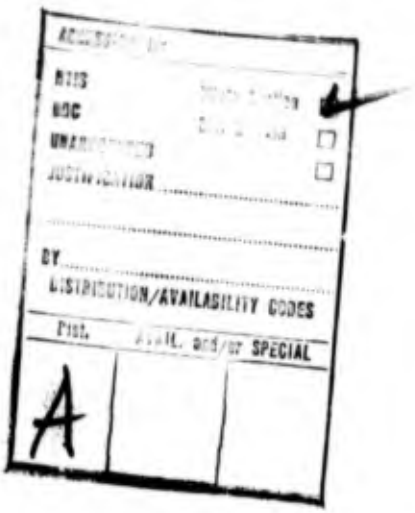

II

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

AMSTE-RP-702-107
*Test Operations Procedure 8-3-070 12 September 1972

CHEMICAL AGENT DETECTOR KIT

SECTION I
GENERAL

1. Purpose and Scope.

a. This document provides procedures for testing chemical agent detector kits. It establishes test methods and techniques to determine whether the test item meets the criteria described in applicable requirements documents and is suitable for use by the U.S. Army.

b. During all phases of testing, the test soldiers should be equipped with field uniforms, protective items (to include protective clothing, masks, and gloves), weapons, and equipment appropriate for the prevailing weather and the activities in which they are engaged. Test soldiers should be informed as to the objectives of the test, and the specific objectives of each test phase in which they are to participate.

c. The general concept of the test will be to determine if the test item is suitable for use by the personnel for whom it was intended. Particular attention should be given to determining if the test item can be operated readily, and whether it interferes signficantly with

*This TOP supersedes MTP 8-3-070, 3 May 1971, including all changes.

the test soldiers' performance of duties in a simulated toxic combat environment. Test exercises which simulate combat environments may be conducted on instrumented clothing and equipment test facilities, if available, supplemented by exercises requiring the performance of specific combat tasks such as obstacle course negotiation and chemical defensive measures. Test exercises should be conducted during both daylight and darkness.

d. The distinct phases of testing include preoperational inspection and physical characteristics, personnel training, compatibility with combat tasks, and airdrop operations. Throughout all phases of testing, evaluation should be made with respect to safety, durability, maintainability, human factors engineering, and value analysis. Photographic coverage including motion pictures should be used where appropriate to supplement other data obtained.

e. In consideration of the potential hazards which may result from the use of chemical agents, the procedures herein apply to testing conducted without the actual use of toxic chemical agents. If technical information is desired relative to the ability of the test item to detect and identify specific chemical agents, those data may be obtained from the results of the engineering tests.

2. Background.

a. Because chemical agents may be used as weapons in war, there is a need for devices to accurately detect and identify chemical agents, so that defensive measures may be taken for the protection of personnel, supplies, facilities and equipment. A goal in the development of chemical agent detector kits has been to develop one that has the capability to detect and differentiate between classes of chemical agents in air, on surfaces, and during desorbtion from surfaces, and to function properly in all environmental conditions where chemical agents will be a threat.

b. A variety of detector kits has been introduced. As new or improved devices are developed, expanded service testing will be required to determine the suitability of the test item when used by troops representative of those who will use it in the field.

3. Equipment and Facilities.

a. Equipment.

(1) Test items.

(2) Control items, if provided.

(3) Safety and first aid equipment.

(4) Photographic equipment, still and motion.

(5) Linear and weight measurement tools.

(6) Meteorological equipment, for determining temperature, relative humidity, atmospheric pressure, wind speed and direction, and precipitation.

(7) Communications equipment.

(8) Tactical vehicles, ground and air.

(9) Stopwatches.

(10) Parachutes and related equipment.

(11) Test troop unit with TOE weapons and equipment.

(12) Chemical agent simulants.

(13) Individual chemical protective clothing and equipment.

b. Facilities.

(1) Field training areas.

(2) Instrumented clothing and equipment test facility, if available.

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

SECTION II
TEST PROCEDURES

4. Supporting Tests.

a. The procedures outlined in this document provide general guidance to the test officer for an expanded service test of chemical agent detector kits. Detailed specific procedures will depend upon the characteristics of the item being tested and the stated requirements in the applicable requirements documents.

b. During all test phases, sufficient data should be collected so as to arrive at valid conclusions. In determining the best way to collect sufficient data, the test officer may find that his statistical objectives are constrained by limited numbers of test items, limited time, limited manpower, and a limited amount of support and control equipment. It is advantageous for the test officer to consult with a statistical analyst, an experimental psychologist, and an experienced test engineer prior to preparing the test plan or conducting the test, to assist him in developing the experimental pattern. The proper pattern for the experiment will aid in the control of bias, will simplify the requisite calculations of the analysis, and will permit clear estimation of the effects of the factors The suggested consultants can advise and assist the test officer in determining appropriate techniques for random sampling, the sample size required to estimate the true performance, how to estimate average performance (or variability of performance) from a sample, how to compare materials or products with respect to average performance (or variability of performance), the number of test soldiers needed, and the number of replications required for a specific operation. Statistical guidance is found in TOP 3-1-002, Confidence Intervals and Sample Size, and in National Bureau of Standards Handbook 91, Experimental Statistics.

c. Common Service TOP's, the tests defined in Section III, and other published documents to be considered in formulating a service test plan are listed below. Additional reference material is in the appendix.

	TEST SUBJECT TITLE	PUBLICATION NO.
(1)	Preoperational Inspection and Physical Characteristics	8-3-500
(2)	Safety	8-3-506
(3)	Personnel Training	10-3-501
(4)	Compatibility with Combat Tasks (refer to para 5)	
(5)	Durability	8-3-503
(6)	Maintainability	8-3-507
(7)	Airdrop Operations	7-3-511
(8)	Human Factors Engineering	8-3-509
(9)	Value Analysis	TECOM Reg 700-1

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Compatibility with Combat Tasks.

a. Objectives.

(1) To determine to what extent the test item interferes with the performance of normal duties during daylight or darkness.

(2) To determine whether the soldier can properly employ the test item in a simulated toxic environment.

(3) To determine if the test item is compatible with standard items of clothing and equipment.

b. Method.

(1) Test soldiers will accomplish practical and realistic procedures to determine to what extent carrying or operating the test item affects the soldier's ability to perform normal combat tasks, such as performing crew-served weapons drill; using fire control equipment; operating military vehicles; observing, detecting, locating, and identifying hostile targets; maneuvering; marching; throwing hand grenades; digging hasty fighting positions; preparing and using cover, camouflage and concealment; using communications electronic equipment; and other activities related to combat tasks.

(2) Test soldiers equipped with fighting and existence loads, as appropriate, should perform these combat tasks under simulated combat conditions. When control items are provided, comparative data for the test item and control item should be obtained.

(3) These exercises should be conducted during both daylight and darkness, and during inclement weather that occurs during the test period.

(4) Many applicable procedures that may be accomplished to determine the compatibility of the test item with standard items of clothing and equipment and to evaluate the effects of the test item on the individual soldier's combat effectiveness are described in MTP/TOP 10-2-509, Combat Effectiveness Test Facility. An instrumented clothing and equipment test facility located at Fort Benning enables the collection of this type performance data. The procedures described in MTP/TOP 10-2-509 are adaptable to other test sites if access to Fort Benning facilities is impractical.

(5) During the conduct of the field exercises, the test soldiers should be subjected to a series of simulated chemical attacks, through the use of chemical agent simulants. The chemical agent simulants that are used should be disseminated in various manners, such as sprayed into the air in the vicinity of the test soldiers, and applied to the surfaces of equipment which the test soldiers are to handle or operate. In this way, situations will be presented for the evaluation of the test item's capability to detect chemical agents in the air, on surfaces, and during desorption from surfaces. Prior to implementing the simulated chemical attacks, the test soldiers should be warned that a chemical attack is imminent. The test soldiers should be pretested for visual acuity and color perception. The test soldiers should don individual protective clothing, mask, hood, and gloves and should employ the test item in accordance with applicable instructions for its use. The use of the test item by test soldiers should be closely observed to determine whether the test item gives a positive indication of either the presence or the absence of chemical agents, whether the timeliness of the test item's response to chemical agents is adequate, whether the kit can be operated within the specified times, and whether the test item is able to differentiate between classes of chemical agents (simulated). Any indications of incompatibility between the test item and the protective clothing and equipment, and any difficulties in operation of the test item should be noted.

NOTE: It is recognized that the conduct of the field exercises described above is contingent on the development of suitable chemical simulants. There are some non-toxic substances (e.g., insecticides), that are presently available from commercial sources, that cause detector materials to respond with color changes similar to that caused by certain actual chemical agents. However, if suitable simulants are not available during the conduct of an expanded service test, the capability of the test item to detect and differentiate between various chemical agents may be determined from engineering test data. The Chemical Agent Identification Training Set (SCAITS) is undergoing type classification and should presently be available for the conduct of field exercises.

(6) During the conduct of test activities, determination should be made by observation, questionnaires, or interrogation of test soldiers, as to what extent the test item interrupted the soldiers' duties under simulated toxic combat conditions and whether the soldiers can properly use the test item for its intended function.

(7) Meteorological data (temperature, relative humidity, atmospheric pressure, wind speed and direction, and precipitation) should be recorded during all phases of the tests.

c. Data Required.

(1) A detailed description of test exercises conducted to include date, time, and location.

(2) Meteorological data for period of each exercise.

(3) Performance data (time required, amount of material moved, distance traveled, etc.) for each test activity.

(4) A record of any difficulties in performance of tasks that are attributable to the test item, and any difficulties in operating the test item.

(5) Comments, observations, or other evidence describing the effects of the test item on the actions and activities of test participants.

d. Analytical Plan.

(1) A comparison analysis should be made, using appropriate statistical methods, to determine any significant difference in performance data between test and control items, or between test item and established criteria. The comparison results should indicate whether the test item is worse than, equal to, or better than the control item or the established criteria.

(2) The results of comments, observations, or other unquantified data should be analyzed to determine subjectively if applicable criteria have been met.

Recommended changes to this publication should be forwarded to Commanding General, US Army Test & 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, Test and Evaluation During Development and Acquisition of Materiel.

2. FM 21-40, Chemical, Biological, Radiological and Nuclear Defense.

3. FM 21-48, Chemical, Biological, Radiological (CBR) and Nuclear Defense Training Exercises.

4. TM 10-277, Protective Clothing, Chemical Operations.

5. National Bureau of Standards Handbook 91, Experimental Statistics.

6. TECR 70-23, Equipment Performance Reports.

7. TECR 70-24, Documenting Test Plans and Reports.

8. TECR 310-3, TECOM Test Operations Procedures Style Manual.

9. TECR 310-6, TECOM Test Operations Procedures.

10. TECR 385-6, Verification of Safety of Materiel During Testing.

11. TECR 700-1, Quality Assurance; Value Engineering.

12. TECR 750-15, Maintenance Evaluation During Testing.

13. TOP 1-1-012, Classification of Deficiencies and Shortcomings.

14. MTP/TOP 3-1-002, Confidence Intervals and Sample Size.

15. MTP/TOP 10-2-509, Combat Effectiveness Test Facility.