

AD 718772

31 October 1967

Materiel Test Procedure 8-2-070
Dugway Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

CHEMICAL AGENT DETECTOR KITS

1. OBJECTIVE

The objective of this materiel test procedure (MTP) is to determine the technical performance and safety aspects of chemical agent detector kits, relative to the criteria cited in applicable Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), Technical Characteristics (TC's), and other requirements and specifications that pertain to a particular test item.

2. BACKGROUND

A chemical agent is defined as a compound, which, in suitably dispersed form produces toxic (damaging or lethal) effects on man, animals, plants or materials. With the increasing possibility that chemical agents may be used as weapons in war, the need for devices to accurately detect and identify chemical agents is also increased since defensive measures must be taken for the protection of personnel, supplies, facilities and equipment.

A variety of kits for the detection of chemical agent contamination of food, water and air have been introduced. Most detection kits are the "go/no-go" type. However some kits may be used to quantitatively determine chemical agents in water while others are multipurpose kits. Refill kits also exist which may be used in conjunction with other kits for the detection of V agents.

A goal in the development of chemical agent detector kits has been to develop one combination kit that would give a rapid indication of toxic agents in air, water, or on surfaces. One recent advance includes the "plaquet" concept as incorporated in a multipurpose kit. This consists essentially of several plastic "holders" containing reagent impregnated disks. When a toxic agent is present, the disk specifically treated to detect that agent indicates a significant color which signals the presence of the agent.

3. REQUIRED EQUIPMENT

a. Protective Clothing, as required including:

- 1) Gloves
- 2) Masks
- 3) Protective coveralls

b. Decontamination Equipment, as required

c. Chemical Agent Generators/Disseminators, as required

d. Environmental Test Chambers, as required

e. Photographic Equipment, as required (both color and black and white)

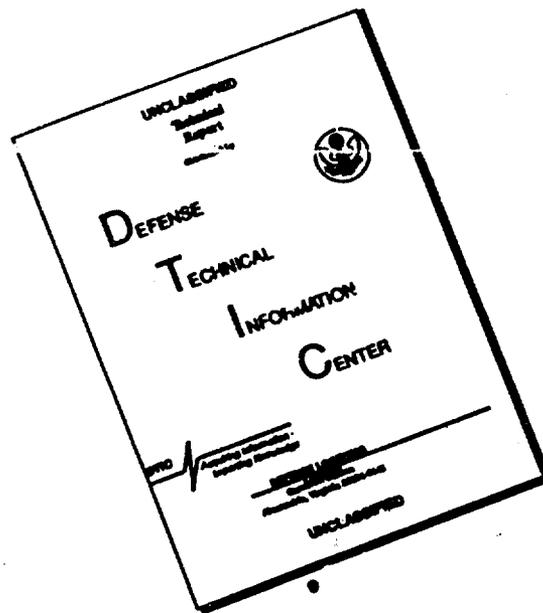
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- f. Chemical Laboratory Facilities, as required
- g. Transportation Facilities, as required
- h. Test Site for Air Operations, as required
- i. "Standard" Comparison Items, as required
- j. Communication Facilities and Equipment, as required
- k. Materials Handling Equipment, as required
- l. Meteorological Equipment including:
 - 1) Anemometers
 - 2) Thermometers
 - 3) Humidity recording devices
 - 4) Barometers

4. REFERENCES

- A. TM 3-250, Storage, Shipment, and Handling of Chemical Agents and Hazardous Chemicals, Departments of Army and Air Force.
- B. TM 3-304, Protective Clothing and Accessories, Departments of Army and Air Force.
- C. TM 3-6665-254-12, Organizational Maintenance Manual: Detector Kit, Chemical Agent, ABC-M18A1, Headquarters, Department of the Army, May 1967.
- D. MIL-STD-810, Environmental Test Methods.
- E. AR 705-15, Operation of Materiel Under Extreme Conditions of Environment.
- F. AR 705-35, Criteria for Air Portability and Air Drop of Materiel.
- G. USATECOM Regulation 385-6, Safety Release.
- H. USATECOM Regulation 385-8, Safety, Training for Test.
- I. DPG Regulation 385-5, Safety, Range and Agent Control.
- J. DPG Regulation 385-6, Safety, Agent Alerts and Alarms.
- K. AMC Pamphlet 706-134, Engineering Design Handbook, Maintainability Guide for Design, February 1966.
- L. Technical Facilities Brochure, Dugway Proving Ground, Dugway, Utah, 1 August 1965, FOR OFFICIAL USE ONLY.
- M. Training Manual, Test Division Test Operations Directorate, Dugway Proving Ground, Dugway, Utah, August 1963.
- N. Woodson, W.E. and Conover, D.W., Human Engineering Guide to Equipment Designers, Second Edition, University of California Press, Berkeley, California, 1966.
- O. MTP 7-1-002, Air Portability and Air Drop Service Testing.
- P. MTP 7-2-509, Air Drop Capability of Materiel.
- Q. MTP 8-2-500, Receipt Inspection.
- R. MTP 8-2-503, Rough Handling and Surface Transport.
- S. MTP 8-2-510, Decontamination.

5. SCOPE

5.1 SUMMARY

The subtests outlined in this MTP provide general procedures for

determining the technical characteristics and performance of the test items. Specific testing requirements and procedures shall be dictated by the performance and characteristics criteria for a particular test item.

The following subtests shall be performed on a selective basis as required to determine if the test item meets the criteria established.

a. Receipt Inspection - An inspection of the test item, as received, to: (1) determine its physical characteristics and condition; (2) locate any defects it might have; and (3) identify damage received during transport, if necessary. During this inspection, test items will also be serialized for subsequent identification purposes.

b. Safety Evaluation - The objectives of this evaluation are (1) to check the Safety Statement issued by the developing agency; (2) to insure that adequate safety features have been incorporated; and (3) to obtain data to be included in the Safety Release Recommendation. (Reference USATECOM Regulation 385-6).

c. Simulated Environmental Testing - A study to determine the effects of extreme temperatures, fungus, humidity, dust, solar radiation, and water (fresh water and salt water) on the test item.

d. Rough Handling and Surface Transport - A study to determine the effects of rough handling and surface transport on the physical and operational characteristics of the test item.

e. Air Transportability - A study to determine the effects of subjecting the test item to air transport conditions.

f. Air Drop Capability - A study to determine the effects on the test item resulting from its being subjected to air drop conditions (delivery by parachute) and to determine the ease or difficulty involved in delivery of the test item by parachutist.

g. Decontamination Aspects - A study to determine the relative ease or difficulty involved in decontamination of the test item and the effects of decontamination.

h. Maintenance Aspects - A study to determine the technical characteristics of the test item relative to design for maintainability provisions, aspects, and instructions.

i. Operational Characteristics - A study to determine: (1) the sensitivity of the test item to prescribed agents; (2) item capability to provide the required response within the time limits prescribed; and (3) sensitivity to agents or substances other than those desired.

j. Field Detection - A study to determine the capability of the test item to detect the prescribed agents under field conditions within the time limits and response requirements stipulated by governing criteria.

k. Operational Reliability - A study to determine if the test item meets specified reliability criteria.

l. Human Factors - The objective of this subtest is to determine the characteristics of the test item that involve human factors considerations in handling and operating the test item.

5.2 LIMITATIONS

None

6. PROCEDURE

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6.1 PREPARATION FOR TEST

6.1.1 Safety Statement Verification

The test officer shall verify that a Safety Statement has been received from the developing agency prior to the start of testing.

NOTE: The Safety statement includes information pertaining to operational limitations and potential safety hazards which are peculiar to the test item.

6.1.2 Personnel Safety

a. The test plan shall ensure that tests are performed in the safest manner consistent with the accomplishment of the mission. The over-riding principle shall be to limit the exposure to a minimum number of personnel, for a minimum amount of time to a minimum amount of hazardous material consistent with safe and efficient operations. Plans shall include safety procedures, precautions and emergency procedures, as necessary. Information based on the test item Safety Statement shall be incorporated into the test plan including: the evaluation of potential hazards; analysis of risks; limitations and special precautions. Special equipment and techniques, as required shall also be incorporated.

b. A specific individual shall be responsible for the safety aspects of each test. He must understand the operation and hazards of the test item, and the required additional equipment and facilities. He shall review test procedures for the purpose of evaluating hazards and recommend control measures.

c. All personnel who participate in or observe the test shall be informed of the hazards involved and the precautions required to ensure proper test methods and procedures.

6.1.3 Security

Security considerations shall be adequately determined and provided for as applicable to each procedure.

6.1.4 Logistical Requirements

Ensure that all logistical requirements are satisfied.

6.2 TEST CONDUCT

6.2.1 Receipt Inspection

a. Perform a receipt inspection of the test item as described by the applicable sections of MTP 8-2-500.

b. Record any damage to the test item.

c. Obtain photographs of damaged components.

d. Number and identify each test item to be used.

e. Determine and record the following for each test item:

1) Length

- 2) Width
- 3) Height
- 4) Weight

6.2.2 Safety Evaluation

Determine the test item's safety as follows:

- a. Observe the operation of the test item in accordance with existing instructions, instruction manuals, directives, SOP's, and similar guidance. Record any features of the test item which might constitute a hazard to personnel.
- b. Throughout the conduct of other tests, hazardous features shall be specifically observed and noted.
- c. The safety aspects included in the Safety Statement prepared by the developing agency shall be verified.
- d. The data to be included in the Safety Release required by USATECOM Regulation 385-6, shall be obtained.

6.2.3 Simulated Environmental Testing

6.2.3.1 Extreme Temperature Tests

Unless otherwise directed, the test item shall be subject to the following temperature tests:

6.2.3.1.1 Low Temperature Tests - Place a minimum of 10 test items in a temperature chamber and perform the following:

- a. Reduce the chamber temperature to -80°F (-62.2°C). Maintain it at -80°F for a period of 72 hours, and then visually inspect the test items and record any damages.
- b. Raise the chamber temperature to -65°F (-53.9°C), or its minimum operating temperature, and maintain this temperature until stabilization is reached. If stabilization is attained in less than 24 hours, maintain temperature for a complete 24 hour interval. Perform the following:

NOTE: Stabilization, unless otherwise specified, is considered to be reached when the temperature of the test item does not change more than 3.6°F (2°C) per hour.

- 1) Visually inspect the test items and record damages.
- 2) Verify operability of the test items as described in paragraph 6.2.9.

NOTE: Operability checks should be accomplished within 15 minutes of removing the test items from the chamber.

c. Increase the chamber temperature to local ambient temperature and perform the following:

- 1) Visually inspect the test items and record damages.

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- 2) Verify the operability of the test items as described in paragraph 6.2.9.

6.2.3.1.2 High Temperature Tests - Place a minimum of 10 test items in a temperature chamber and perform the following:

- a. Adjust the chamber to a temperature of 155°F (88.3°C) and an absolute humidity of 13 grains/ft³, and maintain these conditions for a minimum of 4 hours, then visually inspect the test items and record any damages.

- b. Adjust the chamber to a temperature of 120°F (48.9°C) and a relative humidity of no greater than 15% and maintain these conditions for a minimum of 24 hours and perform the following:

- 1) Visually inspect the test items and record any damages.
- 2) Verify the operability of the test items as described in paragraph 6.2.9.

- c. Adjust the chamber to local ambient temperature and humidity and perform the following:

- 1) Visually inspect the test items and record any damages.
- 2) Verify the operability of the test items as described in paragraph 6.2.9.

6.2.3.2 Fungus Tests

- a. Subject a minimum of 10 test items to the fungus exposure of reference 4 D (MIL-STD-810), Method 508.

- b. At the completion of the exposure period perform the following:

- 1) Disassemble $\frac{1}{2}$ of the items tested and record evidence of fungus on the components.
- 2) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.3.3 Humidity Tests

- a. Subject a minimum of 10 test items to the humidity cycling of reference 4 D (MIL-STD-810), Method 508.

- b. At the conclusion of humidity cycling perform the following:

- 1) Inspect the test items and record any signs of corrosion.
- 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for corrosion and/or deterioration.
- 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.3.4 Dust Tests

- a. Subject a minimum of 10 test items to the dust exposure of reference 4D (MIL-STD-810), Method 510.
- b. At the completion of the exposure period perform the following:
- 1) Inspect the test items and record any surface wear or damage.
 - 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for damage and/or the presence of dust.
 - 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.3.5 Solar Radiation Tests

- a. Subject a minimum of 10 test items to the solar radiation of reference 4D (MIL-STD-810), Method 505.
- b. At the conclusion of the solar radiation cycling period perform the following:
- 1) Inspect the test items and record any evidence of deterioration.
 - 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for evidence of deterioration.
 - 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.3.6 Water Immersion Tests

- a. Immerse a minimum of 10 test items, packaged in their original containers, in water to a predetermined depth.

NOTE: The water depth and temperature, and location of immersion shall be in accordance with applicable criteria and quality control system requirements and stipulated in the test directive.

- b. Record the following with the test items immersed:
- 1) Depth of water over container
 - 2) Temperature of water
 - 3) Presence of bubbling to indicate container leakage
 - 4) Immersion time until bubbling occurs
 - 5) Total immersion time
- c. At the completion of the immersion test, remove the test items from their containers and perform the following:
- 1) Visually inspect the test items for, and record the presence of, corrosion.

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- 2) Disassemble $\frac{1}{2}$ of the test items and inspect the components for and record:
 - a) Evidence of water penetration
 - b) Presence of corrosion
- 3) Verify the operability of the test items by subjecting the remaining items to the procedures of paragraph 6.2.9.

6.2.3.7 Rain Tests

a. Subject a minimum of 10 test items to the rain condition of reference 4 D (MIL-STD-810) Method 506.

b. At the conclusion of the rain tests perform the following:

- 1) Inspect the test items and record any evidence of corrosion.
- 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for corrosion and water penetration.
- 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.3.8 Salt Fog Tests

a. Subject a minimum of 10 test items to the conditions of reference 4D (MIL-STD-810), Method 509.

b. At the conclusion of salt fog tests perform the following:

- 1) Inspect the test items and record any evidence of corrosion.

NOTE: Test items shall be rinsed with fresh water prior to inspection.

- 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for corrosion and salt water penetration.
- 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.4 Rough Handling and Surface Transport Tests

6.2.4.1 Handling and Transportation Tests

a. Subject a minimum of 10 test items, in their original package containers, as described by the applicable sections of MTP 8-2-503.

b. At the completion of testing perform the following:

- 1) Inspect the test items and record any evidence of wear and damage.
- 2) Disassemble $\frac{1}{2}$ of the items tested and inspect the components for cracks, wear and damage.

- 3) Verify the operability of the remaining test items using the procedures of paragraph 6.2.9.

6.2.4.2 Vibration Tests

- a. Conduct vibration tests on a minimum of 10 test items as described by the applicable sections of MIL-STD-810, Method 514 (for Equipment Category g, Shipment by Common Carrier).
- b. At the completion of vibration testing repeat the procedures of paragraph 6.2.4.1, step b.

6.2.4.3 Shock Tests

- a. Conduct shock tests on a minimum of 10 test items as described by the applicable sections of MIL-STD-810, Method 516.
- b. At the completion of shock testing repeat the procedures of paragraph 6.2.4.1, step b.

6.2.5 Air Transportability

Determine the effects of altitude and vibration, similar to that which will be experienced by the test item in flight and in the handling during loading and unloading operations.

NOTE: Background information on air transportability is contained in MTP 7-1-002.

6.2.5.1 Loading/Unloading

a. Load the test items (in their shipping containers, if applicable) aboard aircraft or simulated aircraft as indicated in the test plan loading schedule using normal loading equipment and record the following:

- 1) Type of aircraft used/simulated
- 2) Shipping container dimensions
- 3) Shipping container weight
- 4) Shipping container material
- 5) Method of tie-down
- 6) Damage to package occurring during loading

b. Unload the test items from the aircraft/simulated aircraft and record:

- 1) Equipment used in unloading
- 2) Difficulties encountered during unloading operations

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6.2.5.2 Simulated Flight Test

a. Subject a minimum of 10 test items (in shipping containers, if applicable) to the following simulated conditions simultaneously:

- 1) Ambient pressure equal to that of the maximum altitude that the test item is expected to be flown
- 2) Flight vibration conditions as described by the applicable sections of MIL-STD-810, Method 514

b. At the completion of altitude/vibration testing repeat the procedures of paragraph 6.2.4.1, step b.

6.2.6. Air Drop Capability

The air drop of the test item, when in its shipping containers and when assembled for field use, shall be determined as described in the applicable sections of MTP 7-2-509 and as follows:

6.2.6.1 Shipping Container Test

a. Rig a minimum of 10 test items in the appropriate air drop containers and drop the containers from aircraft flying at the altitude and speed stipulated in the test plan. Record the following:

- 1) Aircraft used
- 2) Aircraft altitude
- 3) Aircraft air speed
- 4) Meteorological conditions
- 5) Air delivery system trajectory and impact velocities
- 6) Acceleration "G" force magnitude impact

b. Conduct visual coverage of the air drop test procedures with motion and still camera.

c. At the completion of the test, perform the following:

- 1) Visually examine the test item's package for, and record the presence of cracks, breaks, undone bindings, etc.
- 2) Visually examine the test items for, and record the presence of damages and/or deformations.
- 3) Verify the operability of the test item by subjecting the remaining test items to the procedures of paragraph 6.2.8.

6.2.6.2 Field Use Tests

Repeat steps a, b, and c.2 and c.3 with the test item dropped in field use conditions.

6.2.6.3 Aerial Delivery by Parachutist

Perform the following:

- a. Subject a minimum of 10 test items to aerial delivery by parachutists wearing the kit during the jump operation and equipped with other items normally carried.
- b. Record any interference with other items of clothing, equipment or with the normal mobility of the parachutist during transport and jump operations.
- c. Inspect the test items after landing and record any evidence of damage.
- d. Disassemble $\frac{1}{2}$ of the test items and inspect the components for damage.
- e. Verify the operability of the test items using the procedures of paragraph 6.2.9.

6.2.7 Decontamination Aspects

- a. Decontaminate the test item as described by the applicable sections of MTP 8-2-510.

NOTE: The test item shall be decontaminated in accordance with applicable criteria. Various candidate test items, decontamination agents and other methods shall be used.

- b. After the decontamination, verify the operability of the test items using the procedures of paragraph 6.2.9.

6.2.8 Maintenance Aspects

- a. Determine the test item maintenance aspects in accordance with AMC Pamphlet 706-134.

NOTE: The features of design which permit or enhance the accomplishment of maintenance by personnel of average skill under environmental conditions, similar to those in which maintenance is to be performed, shall be recorded.

- b. Determine and record the following, as required:
 - 1) Ease of maintenance performed
 - 2) Component interchangeability
 - 3) Adequacy and accuracy of the maintenance documentation
 - 4) Maintenance category of the test item

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6.2.9 Operational Characteristics

These tests shall be conducted so that capability of the test item to meet minimum time and sensitivity requirements, set forth in the applicable material requirements documents, can be determined.

6.2.9.1 Sensitivity and Response

a. Determine and record the threshold concentration detection limits for chemical agents in:

- 1) Air
- 2) Water
- 3) (on) Surfaces

NOTE: 1. Prescribed concentrations of designated chemical agents shall be provided utilizing an appropriate gas generator. Sampling shall be performed using the appropriate plaquet or sampler, as applicable.

2. A minimum of 5 determinations shall be made for each chemical agent.

b. Repeat the determinations at prescribed intervals throughout the entire test cycle to ensure that the sensitivity of the test item does not degrade with operation, time or specific types of testing.

NOTE: Consistency and reliability of responses shall be verified by the repetitive testing to establish a pattern of response characteristics and limitations of responses.

6.2.9.2 Interference Aspects

a. Determine and record the threshold concentration detection limits for chemical agents and in the presence of various other contaminants in:

- 1) Water
- 2) Other liquids
- 3) Vapors
- 4) Smokes

NOTE: Agents and substances other than those the test item is designated to detect shall be suitably dispersed so that the test item is exposed to them. These shall normally include common substances such as those that might be encountered under actual conditions of use. The test item shall be operated in the normal manner and interferences shall be recorded.

Examples of contaminants as follows:

- 1) Smoke from smoke marking grenades, smoke pots, WP grenades
- 2) Smoke from burning wood, rubber, rubbish
- 3) Fumes from decomposing animals and waste
- 4) Insecticides and defoliants
- 5) Ammonia
- 6) Explosion fumes
- 7) Fog oil smoke from smoke generator
- 8) Petroleum fire smoke
- 9) Engine exhaust gases

b. Record the following:

- 1) Interference contaminant identity
- 2) Chemical agent identity
- 3) Response time

6.2.10 Field Operability

a. The test item shall be operated under field conditions in accordance with the applicable criteria for the item being tested.

b. Meteorological conditions and limitations shall be as prescribed in the applicable materiel requirements criteria. Tests shall not normally be conducted in winds greater than 16 kilometers per hour nor during periods of significant precipitation.

c. All tests shall be repeated for each chemical agent. A sample list of munitions and agents that could be used is provided as follows:

<u>Munition</u>	<u>Agent</u>	<u>Quantity</u>
M139 Bomblet	GF	1
M139 Bomblet	Only a burster, no agent	1
115mm Howitzer Shell	GB	1
4.2 inch Mortar Shell	HD	1
4.2 inch Mortar Shell	HN-3	1
155mm Howitzer Shell	Only high explosive, no agent	1
4.2 inch Mortar Shell	L	1
4.2 inch Mortar Shell	CG	1
155mm Howitzer Shell	VX	1

d. Test subjects participating in field trials shall be adequately protected by protective clothing and equipment in accordance with safety requirements.

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e. Color photographs shall be taken, as required, to record typical color reactions of the test item, where applicable.

f. False responses shall be noted and possible and probable causes listed when known. The capability of the test item to respond to and detect prescribed agents in the field at the levels of interest shall be noted.

6.2.10.1 Air Tests

Detect and record chemical agents in air under the prescribed conditions, as applicable.

NOTE: A chemical bomblet or other suitable dissemination means shall be used to disseminate the agent desired. As soon as possible after the bomblet has been detonated, test personnel shall move into the area of the crater and proceed to identify the agent using standard operating procedures. Several soldiers shall carry test kits; others shall carry standard kits of other types that have already been tested. Checks shall have been made to ascertain that the contents of these standard kits have not deteriorated. The test personnel performing the test shall use two samplers each and shall not be told the agent for which they are testing. They shall work independently within the area and shall not compare the results. When the results of the two samplers are not in agreement, a third sampler shall be used to check the results.

6.2.10.2 Water Tests

Detect and record chemical agents from contaminated water.

NOTE: Test personnel shall make tests of a reservoir or containers of water previously exposed within the agent dissemination area. A sufficient number of tests to provide a valid data basis for calculating a reliability estimate shall be performed. Test personnel shall take a sample of the water in the plastic bags provided. The water shall then be analyzed immediately in the laboratory for known agent and for the agent reported.

6.2.10.3 Surface Tests

Detect and record chemical agents from contaminated surfaces.

NOTE: Test personnel shall test for agent on sample plates of glass and metal previously exposed within the agent dissemination area. Test item performance shall be compared with results obtained with detector paper and control kits as required. If available, previous reports shall be used to aid in evaluation. If additional evaluation is required perform laboratory procedure to obtain analysis for comparison purposes.

6.2.11 Operational Reliability

Reliability testing shall be conducted under the conditions prescribed in the test criteria and other applicable instructions, as based upon the requirements contained in the applicable QMR (or SDR) and TC's over the entire period of testing.

NOTE: The test item shall be handled, transported, stored (or chamber conditioned) and operated in accordance with applicable instructions. Tests shall be conducted under conditions which are as nearly alike as possible.

6.2.12 Human Factors

During conduct of the other applicable subtests, observations shall be made relative to the human factors engineering characteristics of the test item. Observe and record the following:

- a. Carrying strap adequacy
- b. Ease of handling
- c. Ease of carrying
- d. Ease of operating
- e. Ease of interpretation of response by the item operator (level of skill required)
- f. Ease of interpretation of responses under various lighting conditions
- g. Compatibility with other clothing and equipment
- h. Ease of handling items when wearing protective clothing, gloves, etc. (including cold weather clothing)
- i. Adequacy and simplicity of operating instructions
- j. Time required for interpreting response
- k. Factors which caused frequent complaints from operators

NOTE: Background information on human factors engineering testing is available in reference 4N.

6.3 TEST DATA

6.3.1 Receipt Inspection

- a. Record the following for each test item:
 - 1) Test item identification number
 - 2) Receipt inspection data as collected under the applicable section of MTP 8-2-500
 - 3) Test item description
 - 4) Total number of test items inspected
 - 5) Length in inches
 - 6) Width in inches

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- 7) Height in inches
- 8) Weight in pounds

b. Retain all photographs

6.3.2 Safety Evaluation

Record any test item feature which constitutes a safety hazard.

6.3.3 Simulated Environmental Testing

6.3.3.1 Extreme Temperature Tests

6.3.3.1.1 Low Temperature Tests -

Record the following for each test item, as applicable:

- a. Test item identification number
- b. For temperature of -80°F :
 - 1) Damages incurred
- c. For temperature of -65°F :
 - 1) Damages incurred
 - 2) Operability data collected as described in paragraph 6.2.9
- d. For ambient temperature:
 - 1) Temperature in $^{\circ}\text{F}$
 - 2) Test item damage
 - 3) Operability data collected as described in paragraph 6.2.9

6.3.3.1.2 High Temperature Tests -

Record the following for each test item, as applicable:

- a. Test item identification number
- b. For temperature of 155°F :
 - 1) Damages incurred
- c. For temperature of 120°F :
 - 1) Damages incurred
 - 2) Operability data collected as described in paragraph 6.2.9
- d. For ambient temperature:
 - 1) Temperature in $^{\circ}\text{F}$

- 2) Damages incurred
- 3) Operability data collected as described in paragraph 6.2.9.
- 4) Damage incurred due to testing
- 5) Component damage (disassembled items only)

6.3.3.2 Fungus Tests

Record the following for each test item as applicable:

- Method 508
- a. Test item identification number
 - b. Data as collected under the applicable sections of MIL-STD-810,
 - c. Evidence of fungus on:
 - 1) Test item
 - 2) Components (disassembled items only)
 - d. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.3 Humidity Tests

Record the following for each test item as applicable:

- Method 508
- a. Test item identification number
 - b. Data as collected under the applicable sections of MIL-STD 810,
 - c. Evidence of corrosion on:
 - 1) Test item
 - 2) Components (disassembled items only)
 - d. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.4 Dust Tests

Record the following for each test item as applicable:

- Method 510
- a. Test item identification number
 - b. Data as collected under the applicable sections of MIL-STD-810,
 - c. Wear and damage to
 - 1) Test item
 - 2) Components (disassembled items only)

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- d. Evidence of dust on components
- e. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.5 Solar Radiation Tests

Record the following for each test item as applicable:

- a. Test item identification number
- b. Data as collected under the applicable sections of MJL-STD-810, Method 505
- c. Evidence of deterioration of:

- 1) Test item
- 2) Components (disassembled items only)

- d. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.6 Water Immersion Tests

Record the following for each test item, as applicable:

- a. Test item identification number
- b. During immersion:
 - 1) Depth of water over container, in inches
 - 2) Water temperature, in °F
 - 3) Presence of bubbling, if any
 - 4) Immersion time to bubbling, if any, in minutes
 - 5) Total immersion time, in minutes
- c. For the test item:
 - 1) Presence of corrosion:
 - a) Test item
 - b) Test item components
 - 2) Presence of water penetration
 - 3) Operability data collected as described in paragraph 6.2.9

- d. Evidence of corrosion and moisture on:

- 1) Test item
- 2) Components (disassembled items only)

- e. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.7 Rain Tests

Record the following for each test item as applicable:

- Method 506
- a. Test item identification number
 - b. Data as collected under the applicable sections of MIL-STD-810,
 - c. Evidence of corrosion and moisture on:
 - 1) Test item
 - 2) Components (disassembled items only)
 - d. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.3.8 Salt Fog Tests

Record the following for each test item as applicable:

- Method 509
- a. Test item identification number
 - b. Data as collected under the applicable sections of MIL-STD-810,
 - c. Evidence of corrosion on test item.
 - d. Evidence of corrosion and moisture on components (disassembled items only)
 - e. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.4 Rough Handling and Surface Transport Tests

6.3.4.1 Handling and Transportation Tests

Record the following for each test item, as applicable:

- a. Test item identification number
- b. Data as collected under the applicable sections of MTP-8-2-503
- c. Evidence of wear and damage to:
 - 1) Test item
 - 2) Components (disassembled items only)
- d. Operability data as collected under applicable sections of paragraph 6.2.9

6.3.4.2 Vibration Tests

Record the following for each test item, as applicable.

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- a. Record data as collected under the applicable sections of MIL-STD-810, Method 514.
- b. Record data as collected under paragraph 6.2.4.1, step b.

6.3.4.3 Shock Tests

Record the following for each test item as applicable:

- a. Data as collected under the applicable sections of MIL-STD-810, Method 516
- b. Data as collected under paragraph 6.2.4.1, step b

6.3.5 Air Transportability

6.3.5.1 Loading/Unloading

Record the following:

- a. Type of aircraft used/simulated
- b. Shipping container:
 - 1) Length, width and height in inches
 - 2) Weight, in pounds
 - 3) Material (steel, aluminum, metal/reinforced plastic, etc.)
- c. Equipment used in loading
- d. Method of container tie down
- e. Damage to test item incurred during loading
- f. Difficulties encountered while loading
- g. Equipment used in unloading
- h. Difficulties encountered while unloading

6.3.5.2 Simulated Flight Test

Record the following for each test item as applicable:

- a. Test item identification number
- b. Altitude simulated in feet
- c. Ambient pressure in test chamber in inches of Hg.
- d. Data as collected under the applicable sections of MIL-STD-810, Method 514
- e. Data as collected under paragraph 6.2.4.1, step b

6.3.6 Air Drop Capability

6.3.6.1 Shipping Containers and Field Use Tests

a. Record the following for each test item:

- 1) Condition of test item (packaged, ready for field use)
- 2) Test item identification
- 3) Aircraft used
- 4) Aircraft airspeed
- 5) Air conditions (calm, turbulent)
- 6) Air delivery system trajectory
- 7) Test item impact velocity in fps
- 8) Acceleration force at impact in "G's"
- 9) For test item package:
 - a) Packaging material used
 - b) Presence of cracks, breaks, etc.
 - c) Undone binding
- 10) For the test item:
 - a) Damage or deformation
 - b) Operability data collected as described in paragraph 6.2.8

b. Retain all motion and still pictures.

6.3.6.2 Aerial Delivery by Parachutist

a. Record the following for each test item as applicable:

- 1) Test item identification number
- 2) Aircraft position at release
- 3) Aircraft velocity at release in miles per hour
- 4) Aircraft altitude at release in feet
- 5) Impact force in pounds
- 6) Interference with parachutists' clothing or normal mobility during:
 - a) Transport operations
 - b) Jump operations
- 7) Evidence of damage to:
 - a) Test item
 - b) Components (disassembled items only)
- 8) Operability data as collected under the applicable sections of paragraph 6.2.9

b. Retain all photographs.

6.3.7 Decontamination Aspects

Record the following for each test item:

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- a. Data as collected under the applicable sections of MTP 8-2-510
- b. Operability data as collected under the applicable sections of paragraph 6.2.9

6.3.8 Maintenance Aspects

- a. Record the following:
 - 1) Special tools required for maintenance
 - 2) Special skills required to perform maintenance
 - 3) Required maintenance
 - 4) Ease of maintenance
 - 5) Interchangeability of components
 - 6) Adequacy and accuracy of the maintenance documentation
 - 7) Maintenance category of the test item
- b. Retain all photographs.

6.3.9 Operational Characteristics

6.3.9.1 Sensitivity and Response

Record the following for each determination:

- a. Test item identification number
- b. Threshold chemical agent concentration (in applicable units) for:
 - 1) Air
 - 2) Water
 - 3) (on) Surfaces
- c. Determination number (1, 2, 3, 4, 5)
- d. Response time in seconds
- e. Chemical agent identity
- f. Determination identity (air, water, etc.)

6.3.9.2 Interference Aspects

Record the following for each determination:

- a. Test item identification number
- b. Threshold chemical agent concentration (in applicable units) for:
 - 1) Water
 - 2) Other liquids
 - 3) Vapors
 - 4) Smokes
- c. Determination number (1, 2, 3, 4, 5)
- d. Response time in seconds
- e. Chemical agent identity

- f. Determination identity (water, smoke, etc.)
- g. Interference contaminant identity (exhaust gases, insecticide, smoke ingredient, etc.)

6.3.10 Field Operability

6.3.10.1 Air Tests

a. Record the following for each determination:

- 1) Test item identification number
- 2) Threshold chemical agent concentration (in applicable units)
- 3) Determination identity (air test)
- 4) Determination number (1, 2, 3, 4, 5)
- 5) Chemical agent identity
- 6) Response time in seconds
- 7) Ambient temperature in degrees F.
- 8) Barometric pressure in inches of Hg.
- 9) Wind velocity in kilometers per hour
- 10) Weather condition (clear, cloudy, fog, etc.)
- 11) Relative humidity in percent
- 12) Detector kit identity

b. Retain all photographs

6.3.10.2 Water Tests

a. Record the following for each determination:

- 1) Test item identification number
- 2) Threshold chemical agent concentration (in applicable units)
- 3) Determination identity (water test)
- 4) Determination number (1, 2, 3, 4, 5)
- 5) Chemical agent identity
- 6) Response time in seconds
- 7) Ambient temperature in degrees F.
- 8) Barometric pressure in inches of Hg.
- 9) Wind velocity in kilometers per hour
- 10) Weather condition (clear, cloudy, fog, etc.)
- 11) Relative humidity in percent
- 12) Detector kit identity

b. Retain all photographs

6.3.10.3 Surface Tests

a. Record the following for each determination:

- 1) Test item identification number
- 2) Threshold chemical agent concentration (in applicable units)
- 3) Determination identity (surface test)

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- 4) Determination number (1, 2, 3, 4, 5)
- 5) Chemical agent identity
- 6) Response time in seconds
- 7) Surface plate identity
- 8) Ambient temperature in degrees F.
- 9) Barometric pressure in inches of Hg.
- 10) Weather condition (clear, cloudy, fog, etc.)
- 11) Wind velocity in kilometers per hour
- 12) Relative humidity in percent
- 13) Detector kit identity

b. Retain all photographs

6.3.11 Operational Reliability

Record the following for all operability tests:

- a. Total number of items tested
- b. Number of malfunctioning or non-functioning items
- c. Reasons for malfunctions/non-functions
- d. Test item identity

6.3.12 Human Factors

Record the following for the test item, as applicable:

- a. Carrying strap adequacy
- b. Ease of handling
- c. Ease of carrying
- d. Ease of operating
- e. Ease of interpretation of response (skill level required)
- f. Ease of interpretation of responses under various lighting conditions.
- g. Compatibility with other clothing and equipment
- h. Ease of handling the test item when wearing protective clothing, gloves etc. (including cold weather clothing)
- i. Adequacy and simplicity of operating instructions
- j. Time required for interpreting response (too lengthy, etc.)
- k. Factors which caused frequent complaints from operators

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Receipt Inspection

- a. Data collected as a result of this procedure shall be presented as indicated in the applicable portions of MTP 8-2-500.
- b. The description of the item, number of items tested, and conditions upon receipt shall be presented in tabular form.
- c. Results of the leak subtest shall be presented in narrative or other convenient form.
- d. Photographs and X-ray pictures shall be used to substantiate results.

6.4.2 Safety Evaluation

a. A Safety Release Recommendation (USATECOM Regulation 385-6) shall be forwarded to U. S. Army Test and Evaluation Command within 30 days of the beginning of the test. The Safety Release Recommendation shall contain the following information: Special safety considerations on hazards to personnel and materiel (including developmental types of equipment as well as standard components used in assemblage of items being tested).

b. Data and comments relative to safety hazards observed during any phase of testing

c. Comments relative to suggested safety improvements

6.4.3 Simulated Environmental Testing

a. The results of the subtests conducted shall be presented in tabular or other suitable form.

b. The results of the operational check tests performed at the conclusion of the various environmental tests shall be presented in narrative or other suitable form.

6.4.4 Rough Handling and Surface Transport

a. The results of this subtest shall be presented as indicated in applicable portions of MTP 8-2-503.

b. Tables, photographs, narrative comments or other suitable means of presentation shall be used to report the results.

6.4.5 Air Transportability

a. The results of this subtest shall be presented as prescribed in MTP 7-1-002.

b. Air transport conditions shall be reported in tabular or other convenient form.

c. Narrative comments, photos, etc., may be included, if required.

6.4.6 Air Drop Capability

6.4.6.1 Shipping Container and Field Use Tests

a. The results of these tests shall be presented as described in MTP 7-2-509.

b. Narrative comments, photos, etc. shall be included, as required.

6.4.6.2 Aerial Delivery by Parachutist

a. Present the data for each test item in tabular form for comparison and evaluation.

b. Narrative comments, photos, etc. shall be included, as applicable.

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c. Operability results shall be presented in tabular form.

6.4.7 Decontamination Aspects

- a. Present the results as described in MTP 8-2-510.
- b. Operability results shall be presented in tabular form.
- c. Narrative comments shall be used to summarize results and the performance of the test items.

6.4.8 Maintenance Aspects

Data from this test shall be presented in narrative form. The report shall be supplemented by photos, drawings or other devices to substantiate the conclusions and recommendations.

6.4.9 Operational Characteristics

6.4.9.1 Sensitivity and Response

Present the following:

a. Data in tabular form to indicate:

- 1) Agents detected
- 2) Methods of introducing aerosol or testing water or surfaces (include sampling results)
- 3) Responses by test item (include photographs of color indications as applicable) and make the necessary computations to show mean response time and threshold sensitivity.

b. Data in tabular form regarding responses of test item under various conditions as compared to actual requirements or objectives.

c. Comments relative to deficiencies, shortcomings, or other inadequacies of the test item as regards operational sensitivity and response

d. Photographs and narrative comments as necessary to substantiate conclusions and recommendations.

6.4.9.2 Interference Aspects

Present the following:

a. Data in tabular form to indicate:

- 1) Agents detected
- 2) Interference contaminant and method of introduction
- 3) Medium contaminated (air, water, etc)
- 4) Responses by the test item (include photographs of color indications, as applicable, and make the necessary computations to show mean response time and threshold sensitivity)

b. Present comparison tables to show the effects of interference

contaminants on the test item performance.

c. Comments relative to deficiencies, shortcomings or other test item inadequacies.

d. Narrative comments, photos, etc. shall be included as necessary to substantiate conclusions and recommendations.

6.4.10 Field Operability

Present the following:

a. Data in tabular and photographic form to indicate the results of the various detection tests performed under field conditions and for comparison with "laboratory" results.

b. Compare the test item results with those for "standard" detection kits for the various tests performed.

c. Data regarding the type of agent used and the results of attempted detection relative to desired or required results.

d. Degree to which the test item satisfied governing criteria for performance.

e. When applicable, data regarding false responses and possible or probable causes.

f. Meteorological conditions shall be presented with the data to show their effect on test item performance.

g. Narrative comments, photos etc. shall be used to supplement tabular data and to substantiate conclusions and recommendations.

6.4.11 Operational Reliability

Data collected in accordance with paragraph 6.3.11 shall be submitted to a qualified reliability analyst for evaluation. Evaluated data shall be presented in tabular form, or as otherwise appropriate, supplemented by graphic or art presentations and narrative comments as required to substantiate conclusions. Indicate the number of tests, number of successful performances, number of failures and malfunctions, and present an estimate of reliability based upon the analysis of recorded data.

6.4.12 Human Factors

a. Data from this subtest shall be presented in tabular, narrative, or other suitable form supplemented by photographs and graphic or art presentations as required.

b. A summary of comments regarding shortcomings and recommended improvements shall be presented.

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GLOSSARY

1. Safety Statement: A statement issued by the developing agency which includes information pertaining to operational limitations and specific hazards peculiar to the systems, items, or components to be tested.
2. Safety Release Recommendation: A statement issued by the testing agency containing information pertaining to the safety of, or the hazards involved to personnel, of all materiel, including development types and standard components used in the assemblage of items being tested. Within thirty (30) days of the beginning of the test, this safety release recommendation shall be forwarded to U. S. Army Test and Evaluation Command in compliance with TECOM Regulation 385-6.