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Materiel Test Procedure 4-1-001
Aberdeen Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND
BACKGROUND DOCUMENT

TESTING AMMUNITION AND EXPLOSIVES

1. COMMODITIES COVERED

Volume IV of the Materiel Test Procedures (MTP's) covers the testing of ammunition and explosives. This category includes ammunition for artillery, tank, recoilless rifle, mortar, small arms, and aircraft weapons; small rockets and missiles; mines; demolition equipment; pyrotechnics; grenades; and flame throwers.

2. COGNIZANT AGENCIES AND OFFICES

The principal agencies and offices concerned with the testing of ammunition and explosives, and their involvement, are:

a. USACDC (Combat Developments Command) Headquarters, Fort Belvoir, Virginia, together with the following USACDC commodity agencies: Responsible for QMR's and SDR's:

- 1) Armor Agency, Fort Knox, Kentucky.
- 2) Aviation Agency, Fort Rucker, Alabama.
- 3) Engineer Agency, Fort Belvoir, Virginia.
- 4) Field Artillery Agency, Fort Sill, Oklahoma.
- 5) Infantry Agency, Fort Benning, Georgia.
- 6) Air Defense Agency, Ft. Bliss, Texas.

b. Project Managers, USAMC (Army Materiel Command): Specific project managers are assigned to direct and manage the funding, development, and procurement of weapon systems (that may include the ammunition) and classes of munitions.

c. USAMUCOM (Munitions Command), Dover, New Jersey: Responsible for the actual development of ammunition and explosives.

d. USAMICOM (Missile Command), Redstone Arsenal, Alabama: Responsible for the actual development of large rockets and missiles.

e. USAPSA (Ammunition Procurement and Supply Agency), Joliet, Illinois: Responsible for procurement of most type-classified ammunition items.

f. USATECOM (Test and Evaluation Command) Headquarters, Materiel Testing Directorates as follows; responsible for testing of materiel indicated:

- 1) Armor: Ammunition for combat vehicles.
- 2) Aviation: Ammunition fired, dropped, or launched

STATEMENT OF WORK CLASSIFIED

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- from aircraft.
- 3) Electronics: Ammunition related to surveillance type operations.
 - 4) Field Artillery: Artillery ammunition.
 - 5) General Equipment: Mines and demolitions.
 - 6) Infantry: Ammunition for small arms, recoilless rifles, and mortars; grenades, flame throwers, and hand pyrotechnics.
 - 7) Air Defense: Ammunition for Air Defense Weapon Systems

g. Aberdeen Proving Ground: Principal engineering test agency for testing ammunition and explosives.

h. Yuma Proving Ground, Yuma, Arizona: Primarily responsible for desert field environmental tests; secondary agency for engineering tests.

i. Arctic Test Center, Fort Greely, Alaska: Responsible for arctic field environmental tests.

j. Tropic Test Center, Panama Canal Zone: Responsible for tropic field environmental tests.

k. Airborne, Electronics and Special Warfare Board, Fort Bragg, North Carolina: Responsible for service tests involving special warfare items.

l. Armor and Engineer Board, Fort Know: Responsible for service tests of mines, demolitions, and ammunition for combat vehicles.

m. Aviation Test Board, Fort Rucker: Responsible for service tests of ammunition for aircraft-mounted items.

n. Infantry Board, Fort Benning: Responsible for service tests of ammunition for infantry weapons.

o. Artillery Board, Fort Sill: Responsible for service tests of ammunition for field artillery, including self-propelled and towed.

p. Jefferson Proving Ground, Madison, Indiana: Principal acceptance test agency for ammunition and explosives.

q. Air Defense Board, Fort Bliss: Responsible for service tests of ammunition for air defense weapons.

3. ENVIRONMENTAL TESTING OF AMMUNITION AND EXPLOSIVES

Environmental tests are conducted to determine whether an item will perform effectively in the environments of its intended use. The most important policies regarding environmental testing of ammunition and explosives, including those in AR 70-38, are:

a. All Army equipment is required to perform effectively in the wet-warm, wet-hot, intermediate hot-dry, and intermediate cold climatic categories of AR 70-38. Ammunition and explosives are almost always additionally required to perform in the hot-dry and cold climatic regions, and such a requirement is stated in the QMR or SDR.

b. Because testing of material in special adverse environments, such as arctic, desert, jungle, seashore, and mountains, is costly in terms of manpower, money, materiel, and time, the maximum amount of testing will be performed in climatic chambers which simulate the adverse environments.

c. To reduce the amount of testing in adverse natural environments, assurance must be obtained that chamber testing has been fully exploited.

Environmental testing of ammunition and components is conducted in part during the various development phases. In the earliest stages, the design agency may choose to prove that certain components can perform adequately under the climatic extremes by either conducting its own tests or requesting that the tests be performed by USATECOM. This will usually occur during the ED or CE phase.

Upon receipt of the prototype for ET, the ET agency will perform all those environmental tests required by the QMR and SDR that are within the capabilities of its environmental chambers. The ET agency will utilize all of the data from earlier testing conducted by USATECOM agencies sponsored by the design agency, providing data results are usable and no modifications have been made that will affect test results. Though the design agency may resort to certain overtests, it is normally the policy of the ET agency to confine testing to simulation of the conditions specified in AR 70-38 insofar as possible. Standard chamber testing of ammunition involves high temperature, low temperature, solar radiation, sand and dust, salt spray, and high humidity. Improvised tests involving wind and rain are possible within limitations. Fungus tests are performed for USATECOM by Frankford Arsenal, Edgewood Arsenal, or White Sands Missile Range. The importance of climatic tests in chambers cannot be overstated because, in addition to the policies stated above, the extreme conditions that are desired are seldom found at the climatic test sites. In conducting environmental tests it must be remembered that AR 70-38 defines climatic conditions, not test procedures. For test procedures, aside from those that are specially devised and described in MTP's, MIL-STD-810B will be the document used most by the ET agency. MIL-STD-331 is sometimes used for fuzes. The ET agency confines its environmental testing to climatic chambers and those natural environments which it is convenient to utilize.

The climatic test sites (Yuma Proving Ground, Arctic Test Center, and Tropic Test Center) are expected to write the test plans and conduct the tests in their specialized climatic areas. Tests are expected to serve the needs of both the ET and the ST.

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Environmental testing of ammunition and explosives includes testing under adverse conditions not related to the weather; namely, transportation-vibration, rough handling, and radio-frequency radiation. A safety test also includes a 40-foot drop of the packaged item.

4. TEST PLANS

Test plans will include subtests from Volume IV of the MTP's required to evaluate the test item in compliance with stated objectives even though test data are to be obtained from other sources (e.g., ED tests, field use, etc.).

In MTP Volume IV the approach to writing the test plan is to first refer to the appropriate commodity test pamphlet for the item that is to be tested (e.g., MTP 3-2-050, Small Arms; 4-2-050, Mortars). This commodity MTP in turn lists the common MTP's and other documents suitable for use in testing and evaluating the items.

Test plans are submitted by the test agency to USATECOM Headquarters for approval.

Local guidance for writing test plans may exist, e.g., MTD Procedure 705-17.

5. SAFETY DURING TESTING

Safety is paramount in all USATECOM test operations. In the overall scheme of developing and testing, four safety oriented documents are developed. The documents are:

5.1 SAFETY STATEMENT

This is a document that expresses the considered opinion of the developing agency regarding the hazards and safety limitations that may be presented by the materiel. The safety statement must be furnished to the ET agency before testing begins, as it contains the developer's recommended actions to minimize hazards and exposure of test personnel during the ET. (An interim safety statement may be made available for the conduct of an EMT.)

5.2 STANDING OPERATING PROCEDURE (SOP)

AMCR 385-100 states "Prior to starting any operation involving ammunition, explosives, or other hazardous operation, an adequate standing operating procedure shall be developed and then approved by the Commanding Officer of the establishment or by a qualified member of his staff who has been delegated the responsibility for review of and authority for approval of Standing Operating Procedures." Each test agency maintains its own file of SOP's. Before conducting a test the test director must be sure that an SOP to provide safety during the testing of a particular item has been: written, studied by him and others who will participate on the range, and posted on the range.

Test planning is done in a manner that permits minimum hazard testing (i.e., using completely inert-loaded projectiles or inert-loaded projectiles with spotting charges) when test objectives can be met in that manner. Personnel take cover during firing until the safety of the item has been ascertained, and even after that they are exposed only when test objectives so require. The provisions of AMCR 385-100 apply to the safety of all testing.

SOP's for a hazardous operation are usually written with a broad, general scope to permit application to many situations. An SOP covering, for example, the firing of weapons fits this category. These SOP's are permanent documents which are amended by supplements and changes and periodically updated. SOP's or supplements are prepared for specific tests of individual items whenever general SOP's do not apply. These are usually transitory documents that are rescinded when no longer needed.

5.3 SAFETY RELEASE

The safety release is a statement issued by USATECOM, in accordance with USATECOM Regulation 385-6, which stipulates that a specific item is safe for the ST based upon the results of the safety evaluation performed by the ET agency during the early portion of the ET. The safety evaluation consists of appropriate design studies and shock, vibration, performance, and climatic tests. The safety release will express specific hazards that exist, operational limitations, and actions that may be necessary to reduce the hazards and exposure of personnel during the ST. (An interim safety release, which is issued for concurrent or integrated ET's and ST's, is a preliminary or provisional document based on the developer's safety statement.)

5.4 SAFETY CONFIRMATION

This is a consolidation of all safety information issued at the conclusion of the ST in accordance with USATECOM Regulation 385-6. It indicates the degree to which the item meets any safety requirements in the guidance document and recommends limitations, precautions, and warnings necessary for the safety of user personnel.

6. ACCEPTANCE TEST PROCEDURES

Acceptance Test Procedures (ATP's) are prepared by USATECOM testing activities (USATECOM Reg. 700-9) to achieve uniformity in acceptance testing among the agencies concerned. The ATP is based upon procurement specifications or purchase description which are, by nature, difficult to read. The ATP is designed to clarify and to standardize interpretations of, the specification.

When appropriate, a general ATP is written for a common type, or family, of items with supplements prepared for each item in the group.

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For example, a general ATP covers acceptance testing of ground signals, hand-fired, with supplements prepared for specific single-star, cluster, and smoke signals; a general ATP for artillery ammunition metal parts has supplements for metal parts tests of specific projectiles.

The agency performing the acceptance test is responsible for initiating a new or revised ATP when an appropriate one is not available; responsibility for the staffing and publishing of all ATP's is assigned to Aberdeen Proving Ground.

REFERENCES

1. AR 70-10, Test and Evaluation During Research and Development of Materiel.
2. AR 70-38, Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions.
3. AR 71-3, User Field Tests, Experiments and Evaluation.
4. AR 320-5, Dictionary of United States Army Terms.
5. DA Pam 11-25, Life Cycle Management Model for Army Systems.
6. AMCR 70-7, Test and Evaluation of Materiel.
7. AMCR 385-100, Safety: AMC Safety Manual.
8. AMCR 715-509, Quality Assurance Technical Procedures.
9. MIL-STD-331, Fuze and Fuze Components, Environmental and Performance Tests for.
10. MIL-STD-810B, Environmental Test Methods.
11. USATECOM Regulations:
 - a. 10-18, Aberdeen Proving Ground, Aberdeen Proving Ground, Md.
 - b. 70-8, Test Resource Management System (TRMS).
 - c. 70-9, Test Priorities.
 - d. 70-11, Research and Development of Instrumentation.
 - e. 70-12, USATECOM Test Methodology Research Investigations (RCS STEPO-160).
 - f. 70-23, Equipment Performance Reports (EPR's).
 - g. 70-24, Documenting Test Plans and Reports.
 - h. 385-6, Verification of Safety of Materiel During Testing.
 - i. 700-1, Value Engineering.
 - j. 700-5, Instrumentation Master Plan.
 - k. 700-8, Ammunition Acceptance and Reconditioning Testing.
 - l. 705-11, Authorized Testing Terminology.
12. MTD Procedures (Aberdeen Proving Ground):
 - a. 210-2, Technical Testing Resources.
 - b. 700-9, Research and Development of Instrumentation.
 - c. 705-6, Preparation and Distribution of Technical Reports.
 - d. 705-17, Policy, Preparation and Distribution of Test Plans.
 - e. 728-6, Value Engineering and Cost Reduction.
 - f. 728-29, Test Methodology Research Investigations.

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13. ABSTRACT This document provides background information relative to testing of ammunition and explosives. It identifies the principal agencies and offices concerned with such testing, and their involvement of each. In addition to ammunition for artillery, tank, recoilless rifle, mortar, small arms and aircraft weapons, it also concerns small rockets and missiles, mines, demolition equipment, pyrotechnics, grenades and flame throwers.			

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