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Materiel Test Procedure 4-3-064
U. S. Army Field Artillery Board

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

FUZES, ROCKETS AND MISSILES

1. OBJECTIVE

The objective of this materiel test procedure is to describe tests used to determine the degree that a rocket or missile fuze meets the specific criteria of the Qualitative Materiel Requirements (QMR) and the overall suitability for use by the Army.

2. BACKGROUND

Field Artillery use of a rocket or missile require that they have a high degree of accuracy. Fuzes in this area are of paramount consideration. To ensure efficient and effective fire upon a target or target area, the fuze must cause the warhead to function at the right time in order to ensure the correct height of burst. Only a minimum amount of error can be tolerated and the probable errors in fuze functioning time must be small.

3. REQUIRED EQUIPMENT

a. Maintenance Support Facilities
b. Training Areas
c. Firing Ranges
d. Special Tools and Equipment, as required
e. Radio and Voice Communication
f. Still and Motion Picture Equipment
g. Burst Surveying and Location Equipment
h. Tape Measure
i. Stop Watch
j. Calibration Equipment, as appropriate
k. Inert Missile and Rocket Warhead
l. Appropriate Missiles and Rockets

4. REFERENCES

A. AR 385-63, Safety Regulations for Firing Ammunition for Training, Target Practice, and Combat.
B. Post (or test site) Range Regulations.
C. USAMC Regulation 385-12, Verification of Safety of Materiel from Development Through Testing, Production and Supply to Disposition.
D. USAMC Regulation 385-224, Safety Manual.
E. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
F. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.
G. MTP 4-3-500, Preoperational Inspection and Physical Characteristics.
H. MTP 4-3-501, Personnel Training.
I. MTP 4-3-502, Ammunition Functioning and Reliability.

J. MTP 4-3-511, Transportability.
K. MTP 4-3-513, Maintenance.
L. MTP 4-3-514, Safety Hazards.
M. MTP 4-3-516, Human Factors Engineering.
N. MTP 4-3-521, Training Manuals and Technical Publications.
O. MTP 5-3-527, Field Storage - Missiles and Rockets.

5. SCOPE

5.1 SUMMARY

This MTP describes the following procedures:

a. Preparation for Test - An evaluation of the condition of the test item and its physical characteristics prior to testing, and a schedule of training and equipment procurement, and knowledge of safety requirements.
b. Pre-Firing Checkout - An evaluation of the difficulties encountered and time required to ensure the test item is operable.
c. Fuze Setting, Repair, Replacement or Adjustment - A study to determine the ease or difficulty in preparing the fuze for proper functioning.
d. Firing Test - A determination of the effect of supplied firing data on the test item.
e. Adverse Conditions - A determination of the effects of darkness, cold and rain on the test item functioning and preparation.
f. Maintenance - A determination of the maintainability of the test item.
g. Safety Hazards - A study to determine actual or potential test item safety hazards.
h. Field Storage - A study to determine the effects of field storage on the test item.
i. Transportability - A study to determine the ability of the test item to be prepared for, and be transported by service personnel.
j. Fuze Functioning Reliability - A study to determine the functioning reliability of the test item.
k. Human Factors Engineering - A study to assess the degree of ease, simplicity and effort in assembling the test item.

5.2 LIMITATIONS

None.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Scheduling

6.1.1.1 Personnel

a. Ensure the availability of service personnel who have been trained using the criteria of MTP 4-3-501, in conjunction with the appropriate technical

publications and training manuals as described in MTP 4-3-521, and are competent in the handling, assembling, maintenance and operation of the test item.

b. Record the following for all service personnel:

1) Rank
2) MOS
3) Training time in MOS
4) Experience in MOS

c. Record the adequacy of supplied training literature.

6.1.1.2 Equipment and Facilities

a. Select and schedule testing areas and firing ranges
b. Make arrangement for use of equipment listed in paragraph 3
c. Ensure that maintenance support facilities are available

6.1.2 Safety

a. Secure appropriate Safety Releases.
b. Verify that all service test personnel have been adequately trained in all safety aspects of the test.

6.1.3 Preoperational Inspection and Physical Characteristics

Upon arrival, determine and record the physical characteristics and operational condition of the test item by subjecting it to the applicable procedures of MTP 4-3-500.

NOTE: Approximately 50 fuzes shall undergo a check of physical characteristics and be compared with specifications. Fuzes shall be taken at random from different packages.

6.2 TEST CONDUCT

NOTE: Subtests shall be conducted concurrently with or in conjunction with other subtests where possible.

6.2.1 Pre-Firing Checkout

a. Assemble and prepare the test item for checkout.
b. Follow prescribed checkout procedures and ensure that the test item is operable.
c. Record any difficulties encountered.
d. Note details of any errors or omissions in the checkout procedures.
e. Record time required to assemble, prepare for checkout, and checkout of the test item.

6.2.2 Fuze Setting, Repair, Replacement or Adjustment

a. Using simulated data set the fuze appropriately for several simulated firing missions and record the following:

1) Detail of any difficulties in setting.
2) Ease of reading setting position.
3) Ease of returning setting to safe.
4) Ease of returning setting to another setting after initial setting is made.
5) Time required to set, reset and return to safe position

b. Assuming the fuze to be defective, repair or replace it and record the following:

1) Assumed defect.
2) Ease of repair.
3) Ease of removal, replacement or adjustment.
4) Details of any difficulties encountered in repairing or replacing or adjusting.
5) Time required to remove, repair, replace or adjust the test item.

NOTE: Limit repair or replacement to the functions authorized to be performed by the using unit.

6.2.3 Firing Test

a. Fire the test item, using inert warheads, during the service test at short, medium, and long ranges and at both high and low quadrant elevations. All prescribed height of burst and/or fuzing options will be test fired. At least 4 of the test firings will be in a simulated tactical environment.

b. Record the following for each test item used:

1) All firing data
2) Surveyed burst location (horizontally and vertically)
3) Time of flight

NOTE: To increase sample size, all test items fired during engineering test will be used. Warhead arming and fuzing data from engineering tests will be recorded and evaluated.

6.2.4 Adverse Conditions

a. Conduct at least 4 of the firing tests during night time operations under blackout conditions, including complete performances of tests 6.2.1: Pre-Firing Checkout, 6.2.2: Fuze Setting, Repair and Replacement or Adjustment, and 6.2.3: Firing Tests, and record the following:

1) Applicable times to perform major functions.
2) Difficulties encountered due to darkness and blackout conditions.

b. Repeat step a under rain and cold weather conditions.

6.2.5 Maintenance

Evaluate the maintainability of the test item using all authorized organizational maintenance functions and a sampling of direct and general support maintenance functions and the applicable procedures of MTP 4-3-513 and record the following:

a. Man-hours required to perform corrective and scheduled maintenance.
b. Details of time consuming or difficult maintenance operation.
c. Availability and adequacy of personnel, test and calibration equipment, special and common tools and repair parts.
d. Interchangeability and frequency of replacement of parts and components.
e. Excessive maintenance requirements.
f. Safety relative to maintenance.
g. Human engineering aspect of maintenance.

6.2.6 Safety Hazards

NOTE: Safety procedures as prescribed in applicable training literature, regulation and other pertinent publications will be followed during the test.

Evaluate the safety hazards of the test item using the applicable procedures of MTP 4-3-514 recording all pertinent data and the following:

a. Details of any hazardous conditions regardless of source.
b. Any unnecessary duplication of safety features between the test item and the adaption kit and warhead.

6.2.7 Field Storage

Determine the effects of field storage on the test item by subjecting them to the storage conditions of MTP 5-3-527 and the firing procedures of paragraph 6.2.3 when appropriate.

6.2.8 Transportability

Determine the effect of surface transportation on the test item by subjecting them to the transportation tests of MTP 4-3-511 and the firing procedures of paragraph 6.2.3 when appropriate.

6.2.9 Fuze Functioning Reliability

Throughout the conduct of the test determine the functioning reliability of the test item as described in the applicable sections of MTP 4-3-502.

6.2.10 Human Factors Engineering

Throughout the conduct of the test determine the effectiveness of the test item-rocket/missile-crew relations by using the applicable procedures of MTP 4-3-516.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

Record the following:

a. For all test personnel:

1) Rank
2) MOS
3) Training time in MOS in months
4) Experience in MOS in months

b. Adequacy of supplied training literature

6.3.1.2 Preoperational Inspection and Physical Characteristics

Record data collected as described in the applicable sections of MTP 4-3-500.

6.3.2 Test Conduct

6.3.2.1 Pre-Firing Checkout

Record the following:

a. Difficulties encountered during checkout
b. Errors or omissions in the checkout procedure
c. Time required, in minutes, to:

1) Assemble the test item
2) Prepare the test item for checkout
3) Checkout the test item

6.3.2.2 Fuze Setting, Repair, Replacement or Adjustment

Record the following:

a. For simulated firing:

1) Difficulties in setting fuze
2) Ease of reading setting position
3) Ease of returning fuze setting to safe
4) Ease of setting and resetting
5) Time, in seconds, to:

a) Set fuze
b) Reset fuze
c) Return fuze to safe

b. For each assumed defect; as applicable:

1) Assumed defect
2) Ease of repair
3) Ease of removal, replacement or adjustment
4) Difficulties encountered in:

a) Repairing
b) Replacing
c) Adjusting

5) Time, in seconds, to:

a) Remove fuze
b) Repair fuze
c) Replace fuze
d) Adjust the fuze

6.3.2.3 Firing Test

Record the following for each test item fired:

a. Fuze setting
b. Missile/rocket launch elevation in degrees
c. MET data
d. Burst location, in feet, from aiming point:

1) Horizontally
2) Vertically

e. Time of flight in seconds

6.3.2.4 Adverse Conditions

Record the following for each round fired:

a. Adverse condition (blackout, cold, rain)
b. Difficulties encountered due to adverse condition
c. Times required, in seconds, to:

1) Assemble test item
2) Prepare test item for checkout
3) Checkout the test item
4) Set test item
5) Reset test item
6) Return test item to safe
7) Remove test item
8) Repair test item
9) Replace test item
10) Adjust test item

6.3.2.5 Maintenance

Record data collected as described in the applicable sections of MTP 4-3-513 and the following:

a. Man-hours required to perform corrective or scheduled maintenance
b. Time consuming or difficult maintenance operations
c. Availability and adequacy of:

1) Personnel
2) Test and calibration equipment
3) Special and common tools and repair parts

d. Interchangeability of components
e. Frequency of parts and component replacement
f. Excessive maintenance requirements
g. Safety relative to maintenance
h. Human engineering aspect of maintenance

6.3.2.6 Safety Hazards

Record the following:

a. Data collected as described in the applicable sections of MTP 4-3-514.
b. Details of hazardous conditions regardless of source.
c. Any unnecessary duplication of safety features between the test item and adaption kit and warhead.

6.3.2.7 Field Storage

Record the following; as appropriate:

a. Storage data collected as described in the applicable sections of MTP 5-3-527.
b. Firing data collected as described in paragraph 6.2.3.

6.3.2.8 Transportability

Record the following, as appropriate:

a. Transport data collected as described in the applicable sections of MTP 4-3-511.
b. Firing data collected as described in paragraph 6.2.3.

6.3.2.9 Fuze Functioning Reliability

Record data collected as described in the applicable sections of MTP 4-3-502.

6.3.2.10 Human Factors Engineering

Record data collected as described in the applicable sections of MTP 4-3-511.

6.4 DATA REDUCTION AND PRESENTATION

Data obtained from all subtests covered by applicable MTP's shall be summarized and evaluated according to procedures described in those applicable MTP's. Appropriate charts, graphs, and tabulated summaries shall be used to present the data in a clear manner.

Calculations shall be performed as specified by the individual MTP's wherever applicable, and all photographs, motion pictures and illustrative material shall be suitably identified.

In particular the following shall be summarized:

a. Adequacy of checkout procedures.
b. Difficulties encountered in setting fuzes (to include adjustment, repair, calibration or replacement).
c. Comparison of miss distance (horizontally and vertically) with firing data used.
d. Comparison of daylight to night cold weather and rain operations relative to fuze checkout, setting, repairs, adjustment and replacement.
e. Maintenance difficulties encountered.
f. Details of any safety hazards (include recommendations for corrective action).
g. Functional suitability of the test item.
h. Adequacy or inadequacy of training literature.

Submit a Safety Confirmation, based on safety data collected during conduct of this MTP in accordance with USATECOM Regulation 385-6.

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13. ABSTRACT

This Army Service Test Procedure describes test methods and techniques for evaluating the performance and characteristics of Fuzes for Rockets or Missiles, and for determining their suitability for service use by the US Army. The evaluation is related to criteria expressed in applicable Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other appropriate design requirements and specifications.

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