1 July 1970

Materiel Test Procedure 4-2-131*
Aberdeen Proving Ground

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

PYROTECHNIC SIGNALS

1. OBJECTIVE

The objective of this MTP is to describe the basic methods for conducting tests, particularly engineering tests, of ground- and air-launched pyrotechnic signals to determine whether they comply with Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), and Technical Characteristics (TC's). A safety evaluation is included to provide data required for issuance of a Safety Release to permit service testing. The test procedures of this MTP are suitable for engineer design tests, initial production tests, etc.

2. BACKGROUND

Pyrotechnic signals are devices for conveying tactical information such as identification, location, and warning by means of illumination, smoke, sound, or a combination of these features. Pyrotechnic signals used by ground troops may be launched by means of a pyrotechnic pistol, rifle grenade launcher, or hand-held rocket. Aircraft also use a number of pyrotechnic devices, including pyrotechnic pistols to signal between aircraft and pyrotechnics which are dropped as signals and illuminants from aircraft.

Pyrotechnics used as signals often are attached to a parachute to prolong the length of time that they are visible. A typical light-producing signal may consist of a single parachute-supported star or any number of freely falling stars, with or without colored tracers.

3. REQUIRED EQUIPMENT

a. Standard Firing Ranges.
b. Range Facilities.
c. Environmental Test Facilities.
d. Fixture to permit remote firing (similar to Figure 1).
e. X-Ray Equipment as necessary.
f. Personnel Protection Devices (similar to Figure 2).
g. Mirror Position Finders (similar to Figure 3).
h. Angle Measuring Devices (similar to Figure 4).
i. Stop Watch.
j. Cinetheodolite or other appropriate instrument for observing pyrotechnics launched from an aircraft.
k. Weapons and ammunition 7.62mm and caliber.50.
l. Equipment requirements of referenced MTP's.
m. Meteorological Equipment to provide:

1) Ambient temperature

*Supersedes Interim Pamphlet 10-95.

2) Windspeed
3) Wind direction

n. Photographic equipment.

4. REFERENCES

A. AR 70-38, Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions.
B. FM 23-30, Grenades and Pyrotechnics.
C. TM 9-1290, Pyrotechnic Pistol and Projector Signals.
D. TM 9-1370-200, Military Pyrotechnics.
E. USAMC Regulation 385-12, Verification of Safety of Materiel From Development Through Testing, Production, and Supply to Disposition.
F. USAMC Regulation 385-224, AMC Safety Manual.
G. USAMC Regulation 700-34, Release of End Items for Issue.
H. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
I. MIL-P-20464, Pyrotechnic: Method of Determining Candlepower and Color Value.
J. MIL-STD-331, Fuze and Fuze Components, Environmental and Performance Tests for, 10 January 1966.
K. MIL-STD-810, Environmental Test Methods.
L. Installation safety procedures and regulations.
M. MTP 2-2-815, Rain and Freezing Rain.
N. MTP 3-1-002, Confidence Intervals and Sample Size.
O. MTP 3-2-030, Grenade Launcher.
P. MTP 3-2-615, Radio Frequency Radiation Hazards to Electroexplosive Devices.
Q. MTP 4-2-015, Close Support Rockets and Missiles.
R. MTP 4-2-080, Grenades.
S. MTP 4-2-500, Ammunition Characteristics.
T. MTP 4-2-504, Safety Evaluation - Artillery, Mortar, and Recoilless Rifle Ammunition.
U. MTP 4-2-509, Airdrop Capability of Explosive Materiel.
V. MTP 4-2-601, Drop Tower Tests for Munitions.
W. MTP 4-2-602, Rough Handling Tests.
X. MTP 4-2-804, Laboratory Vibration Tests.
Y. MTP 4-2-818, Testing for Fungus Resistance.
Z. MTP 4-2-819, Sand and Dust Testing of Ammunition.
AA. MTP 4-2-820, Humidity Tests.
AB. MTP 4-2-826, Solar Radiation Tests.
AC. MTP 7-1-002, Air Portability and Airdrop Service Testing.
AD. MTP 4-2-132, Evaluation of Tactical Luminants

5. SCOPE

5.1 SUMMARY

This pamphlet covers engineering tests of both hand-held and air launched pyrotechnic signals. The following are subtests contained in this MTP.

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a. Safety Evaluation, paragraph 6.2.1.
b. Supplementary Environmental and Shock Tests, paragraph 6.2.2.
c. Performance Tests - Hand-held Pyrotechnics, paragraph 6.2.3.
d. Performance Tests - Rifle Launched Pyrotechnics, paragraph 6.2.4.
e. Performance Tests - Pyrotechnics Launched from Aircraft, paragraph 6.2.5.
f. Vulnerability, paragraph 6.2.6.
g. Reliability, paragraph 6.2.7.

5.2 LIMITATIONS

This test procedure is limited to pyrotechnic signals launched by hand-held or other simple devices. It does not include pyrotechnics launched by artillery weapons or mortars. The procedure also does not include photoflash units.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

a. Inspect test item packaging for evidence of damage and deterioration, and record:

1) Name of contractor
2) Number of contract
3) Date of manufacture
4) Other pertinent markings
5) Amount and type of damage or deterioration
6) Weight and dimensions of test item package

b. Unpack test item and inspect for damage and defects. Record the following:

1) Amount and type of damage
2) Defects in test item
3) Pertinent dimensions and weight of test item

6.1.2 Sample Size

The sample size for the safety evaluation will depend, as indicated in paragraph 6.2.1, upon a design review, the extent of prior testing, and the statistical reliability desired. MTP 4-2-504 and paragraph 6.2.7 will aid in this determination. Increased severity testing is a factor that can reduce sample size. These same factors are considered in determining the number of items for environmental and shock tests and performance tests.

6.1.3 Characteristics Data Sheet

A characteristics data sheet, suitable for the formal report and other

uses, is assembled and printed. It consists of a photograph of the test item (exploded or cross-sectional view preferred) reduced in size and combined, on a glossy 8- by 10-inch print, with a listing of all principal physical and performance characteristics. Guidance is provided in MTP 4-2-500.

6.2 TEST CONDUCT

6.2.1 Safety Evaluation

The safety evaluation is a portion of the engineering test that is conducted before service testing in order to establish a reasonable assurance that the test item can be service tested, at locations that include the climatic test sites, with a minimum risk to personnel. A successful safety evaluation permits a Safety Release by USATECOM, as defined in USATECOM Regulation 385-6. The safety evaluation is normally the first phase of the engineering test. It is also normally part of the initial production test to meet the requirements of USAMC Regulation 700-34.

The approach to a safety evaluation used in MTP 4-2-504 on ammunition is applicable to pyrotechnics. To achieve the desired statistical confidence in the safety of the test item would require a sample size that is uneconomically large and impractical to test. Thus, the total safety evaluation must encompass not only firing tests of reasonable proportions, but engineering judgment based upon other factors as well. The safety evaluation of pyrotechnics involves the following steps:

6.2.1.1 Design Review

Study the design of the test item to determine which components have adequately proven themselves in designs of other pyrotechnics and which are relatively untried and deserving of more attention. Test results of similar pyrotechnics and components are studied to determine the extent to which these results may add to confidence in the safety of the pyrotechnic.

6.2.1.2 Review of Prior Testing

Review data from tests conducted by the design agency for use in the safety evaluation. Such tests may include both field tests and laboratory tests, many of which may be in conformance with MIL-STD-331. In addition, all field data from engineer design and other tests conducted at proving grounds are considered in determining the statistical confidence in the safety of the item.

6.2.1.3 Safety Statement

AMC Regulation 385-12 requires the submission of a Safety Statement from the developer prior to the commencement of the engineering test. Review of the Safety Statement is mandatory in connection with the design review prescribed in 6.2.1.1 above.

6.2.1.4 Adequacy of Safety Features

Manipulate all external safety devices, to determine and record the adequacy of the safety devices and their susceptibility to accidental disengagement.

6.2.1.5 Adequacy of Manufacture

Carefully inspect all items to be used in the safety evaluation to assure that all components are in compliance with specifications and that there are no manufacturing flaws or any damaged or missing components. Selected items may be subjected to X-ray examination as deemed necessary. All observations are recorded.

6.2.1.6 Ambient Conditions Performance Safety Check

a. Fire a minimum of 20 signals, randomly selected from the test groups, from the special holding fixture described in paragraph 6.2.3 or a suitable substitute fixture to permit remote controlled firing. Record results.

b. If any unsafe malfunction occurs fire additional rounds and disassemble rounds as necessary to determine the cause of the malfunction. Record results.

CAUTION: Tests described in paragraph 6.2.1.7 below will not be conducted until safe performance under ambient conditions is assured. All safety evaluation firing is performed remotedly.

6.2.1.7 Shock, Vibration, and Environmental Tests

The number of signals selected for these tests depends upon statistical considerations, cost and availability of test items, and amount of data available from prior testing of the same or similar items. The signals are subjected to certain standard transportation, rough handling, and climatic tests that simulate the extreme conditions that may be encountered. MTP 4-2-504 may be used for guidance on the number of test items that should be exposed to the various tests, which are:

6.2.1.7.1 High Temperature Storage - Packaged signals are subjected to 7 days of cycled exposure which attempts to simulate the temperatures signals would experience of stored in their storage containers and exposed to the hot-dry conditions of AR 70-38. Approximately 48 signals is the usual sample size.

a. Subject test item to 7 days of cycled exposure, each cycle composed of:

1) 6 hours at 93°F, 10 to 15 percent relative humidity
2) 6 hours increasing to 155°F
3) 4 hours at 155°F, less than 5 percent relative humidity
4) 8 hours decreasing to 93°F

b. At the completion of step a:

1) Determine and record damage to test item package
2) Open package, determine and record damage to test item

NOTE: A similar storage test is covered by MTP 4-2-820.

6.2.1.7.2 High Temperature Operating Test - Most munitions are required to perform properly only under the intermediate and wet conditions of AR 70-38. This includes munitions being exposed to the direct sunlight. The assumption is made that in the hot-dry climate of AR 70-38 munitions will be provided with ventilated shade. (If, however, a specific requirement exists for safety or satisfactory performance while exposed to the hot-dry sun, a test under hot-dry solar radiation conditions, or a 160°F temperature equivalent (see MTP 4-2-826), is conducted instead of the intermediate climate test described below.)

a. Subject the unpackaged test item from the high temperature storage test, paragraph 6.2.1.7.1, to 24 hours exposure at the highest temperature the items would realize if exposure to the solar radiation conditions described under intermediate conditions in AR 70-38. Control and measure, test conditions using a solar radiation chamber as described in MTP 4-2-826.

NOTE: If use of a solar radiation chamber is impractical, a temperature of 145°F will be assumed to be the equivalent temperature.

b. At the completion of the exposure period, inspect the test item for damage and exudation. Record results.

c. Fire test item at the conditioned temperature.and record firing data as described in paragraph 6.2.3.

6.2.1.7.3 Low Temperature Storage and Operating Test - The following is to be considered an overtest, for safety purposes only, for those tests which are required to only meet the intermediate conditions of AR 70-38. If the items are safe to fire at -50°F but do not perform satisfactorily, a later test, conducted at -35°F, is used to evaluate performance.

a. Expose approximately 24 packaged signals to -50°F for 3 days
b. At the completion of step a perform the following:

1) Inspect and handle the test item package and record any damage incurred and the ability of the package to withstand handling at low temperatures.
2) Inspect the test items and record any damage.
3) Recondition the test items, as necessary, to -50°F, fire the test item and record firing data as described in paragraph 6.2.3.

6.2.1.7.4 Transportation - Vibration Test - Packaged signals are vibrated to simulate transportation in trucks, trailers, and aircraft. Approximately 48 packaged signals is the usual sample size. In the event of either safety or performance failures, engineering judgment is used to determine how the test should be moderated.

a. Conduct test, with 50 percent of samples at 145°F and 50 percent of samples at -50°F as described in MTP 4-2-804.

b. At the completion of step a fire the test item at the test temperature and record firing data as described in paragraph 6.2.3.

6.2.1.7.5 Rough Handling Test - This test includes a 7-foot packaged drop test, a loose cargo test, and a 5-foot unpackaged drop test. Approximately 48 signals is the usual sample size.

a. Conduct the sequential rough handling test as described in MTP 4-2-602.

b. Fire the test item at the test temperatures and record firing data as described in paragraph 6.2.3 after each indicated inspection.

6.2.1.7.6 Forty-Foot Packaged Drop - Conduct the test as described in MTP 4-2-601 using the following guidelines:

a. Two to five packages of signals is the usual package size

b. The test materiel is normally inspected at the point of impact to determine the nature and degree of damage to both the packaging and test samples.

c. In some instances, the packages are removed from the drop location with remote handling equipment for assurance that such a drop and subsequent handling will not cause detonation and that the items are safe for disposal.

6.2.1.7.7 Radio Frequency Hazard Test - Conduct radio frequency hazards tests on electrical or electronic fuzes using the procedures described in MTP 3-2-615.

6.2.2 Supplementary Environmental and Shock Tests

In addition to environmental tests conducted during the safety evaluation, the test director will select those additional tests, from the tests below that he deems necessary considering QMR requirements, potential use and prior testing on the same or similar items. He will normally expose some of the test items to sequences of extreme environments which the materiel could encounter during its life. Appendix A of MTP 4-2-015 provides a general approach to sequential testing. These environments may include those of 6.2.1 above. One sequence would assume that the item will be sent to the arctic, another that the item will be sent to the tropics, and another that it will be sent to the desert. After each exposure all items are examined and a representative sample test-fired. The remainder are sent through the next environments of the sequence.

6.2.2.1 High and Low Operating Temperatures

If the test items failed to perform satisfactorily at either the high or low temperatures of the safety evaluation (paragraph 6.2.1) and are required to meet only the intermediate temperature requirements of AR 70-38, conduct additional temperature tests using the temperature extremes specified for intermediate type environment (intermediate hot-dry and intermediate cold) of AR 70-38.

The method of testing is described in paragraphs 6.2.1.7.2 and 6.2.1.7.3. Record data as described in paragraphs 6.2.1.7.2 and 6.2.1.7.3.

6.2.2.2 Solar Radiation

Conduct the test, which is primarily for heat effects, as described in MTP 4-2-826 using the following guidelines:

a. Expose the test items to the intermediate solar radiation conditions of AR 70-38 for five days.
b. At the completion of step a the test item is examined and then fired at the equivalent peak temperature.

6.2.2.3 Salt Spray (Fog)

Evaluate the corrosive effect of an ocean environment by conducting the test in accordance with method 509, MIL-STD-810.

6.2.2.4 Fungus Resistance

Conduct test as described in MTP 4-2-818 or method 508, MIL-STD-810.

6.2.2.5 High Humidity

Conduct test as described in MTP 4-2-820.

6.2.2.6 Water Immersion

a. Condition test item at 113°F.
b. Immerse test item in water, temperature of water 64°F, at a 3 foot depth for 2 hours.
c. Determine and record the effect of water immersion on the test item.
d. Determine and record water immersion effect on hand-held launching devices by including the launcher (with signal) in one phase of the test, if required.

NOTE: This is the leakage test of MIL-STD-810B.

6.2.2.7 Sand and Dust

Conduct test as described in MTP 4-2-819.

6.2.2.8 Rain and Freezing Rain

a. Conduct freezing rain test in accordance with MTP 2-2-815
b. Unless otherwise indicated the immersion test of paragraph 6.2.2.6 shall be considered an adequate replacement for the rain test of MTP 2-2-815.

6.2.2.9 Temperature Shock

Conduct test as described in MIL-STD-810, method 503, except that the high temperature will be in accordance with that for the high temperature operating test described in paragraph 6.2.1.7.1. The low temperature will be -50°F, and the maximum time for transfer between chambers will be 30 seconds.

6.2.2.10 Air Transportability

a. Place test item in an altitude chamber and reduce pressure and temperature to simulate a 50,000-foot altitude and -65°F temperature.
b. Condition the test item for 2 hours.
c. Restore ambient conditions as quickly as facility will permit.
d. Determine and record effect of altitude and temperature on the test item.

6.2.2.11 Air Delivery

Conduct test for airdrop of the test item as described in MTP 4-2-509.

6.2.2.12 Jolt and Jumble

a. Conduct the tests, which are sometimes used on an overtest of packaged items, in accordance with MTP 4-2-602.
b. At the completion of tests ensure that the test items are safe from handling and firng though they need not be able to function properly.

6.2.3 Performance Tests - Hand-Held Pyrotechnics

Signals are fired first from a special holding fixture (Figure 1) to determine whether they can be fired safely by hand. All of the firing portion of the safety evaluation, paragraph 6.2.1, must be successfully completed using a fixture for remote firing before hand firing is conducted. Usually, 50 percent or more of the signals are fired in this remote way. If no critical malfunction occurs - e.g., rocket motor blowup:

Conduct the hand held vertical firing phase as shown in Figure 2. This figure illustrates protective measures taken during hand firing, including use of armored vest, shield over booth to protect face, hard hat, and welder's gloves and sleeves. Safety glasses and shoes are also worn. All firings comply with safety precautions as specified by installation SOP's and regulations. Sample size is chosen with due consideration to reliability requirements (paragraph 6.2.7).

For all firings the following data are recorded:

a. Fuze delay: the time from firing to expulsion of the element from the signal body, measured and recorded to 0.1 second by manually operated stop watch.
b. Altitude of function: the height at which the expulsion occurs. Altitude of function is determined by use of mirror position finders (Figure 3). The operation of mirror position finders is described in the Appendix A.
c. Angle from vertical of the functioning position, determined by

the angle measuring device shown in Figure 4: More specifically, this angle is the whole number of degrees between the zenith and functioning point as seen from the measuring device on top of the bombproof immediately adjacent to the firing booth (Figure 5). The observer stands directly beneath the device and, sighting through the peephole, visually determines the angle from the vertical by use of the concentric circles.

d. Burning time of star or smoke composition: measured and recorded to the nearest 0.1 second by manually operated stop watch.

e. Burning time for cluster of five stars: Rather than time the individual stars, the time intervals from functioning to extinction of the third and fifth longest burning stars, respectively, are measured and recorded to 0.1 second by manually operated stop watches.

f. Number of stars in cluster.

g. Rate of descent of parachute-supported signals: measured by mirror position finder and recorded to nearest foot per second.

h. Color of stars or smoke composition: as noted by visual observation.

i. Position of functioning along the trajectory: e.g., ascending, apex, or descending - as noted by visual observation.

j. Flight characteristics of signal body: e.g., wobbled, tumbled, etc.

k. Candlepower and color value for illuminating flares as appropriate: representative sample measured in accordance with MIL-P-20464.

l. Performance of parachute, if applicable.

m. Ambient temperature, several times during the day of firing.

n. Wind velocity and direction, several times during the day of firing.

6.2.4 Performance Tests - Rifle-Launched and Pistol Launched Pyrotechnics

Rifle launched and pistol launched pyrotechnics are evaluated in the same manner as hand launched pyrotechnics except that the launching procedures follow, as appropriate those for rifle grenades described in MTP 4-2-080 and MTP 3-2-030. Record data as in paragraph 6.2.3.

6.2.5 Performance Tests - Pyrotechnics Launched From Aircraft

Before testing aircraft pyrotechnics aloft in aircraft, testing to the extent possible is conducted on the ground following essentially the procedures of paragraph 6.2.3. Once such testing is completed, the pyrotechnics are launched from aircraft - the nature of the aircraft, the altitude, and the speeds to be govered by the QMR, SDR, or other guidance document. Observation of the pyrotechnic is made by cinetheodolite or other appropriate instruments as applicable. The measurements and observations are similar to those described in paragraph 6.2.3. If the Pyrotechnic Evaluation Range is used at the Yuma Proving Ground, Arizona, refer to MTP 4-2-132.

6.2.6 Vulnerability

When a vulnerability test (sometimes called a bullet impact test) is

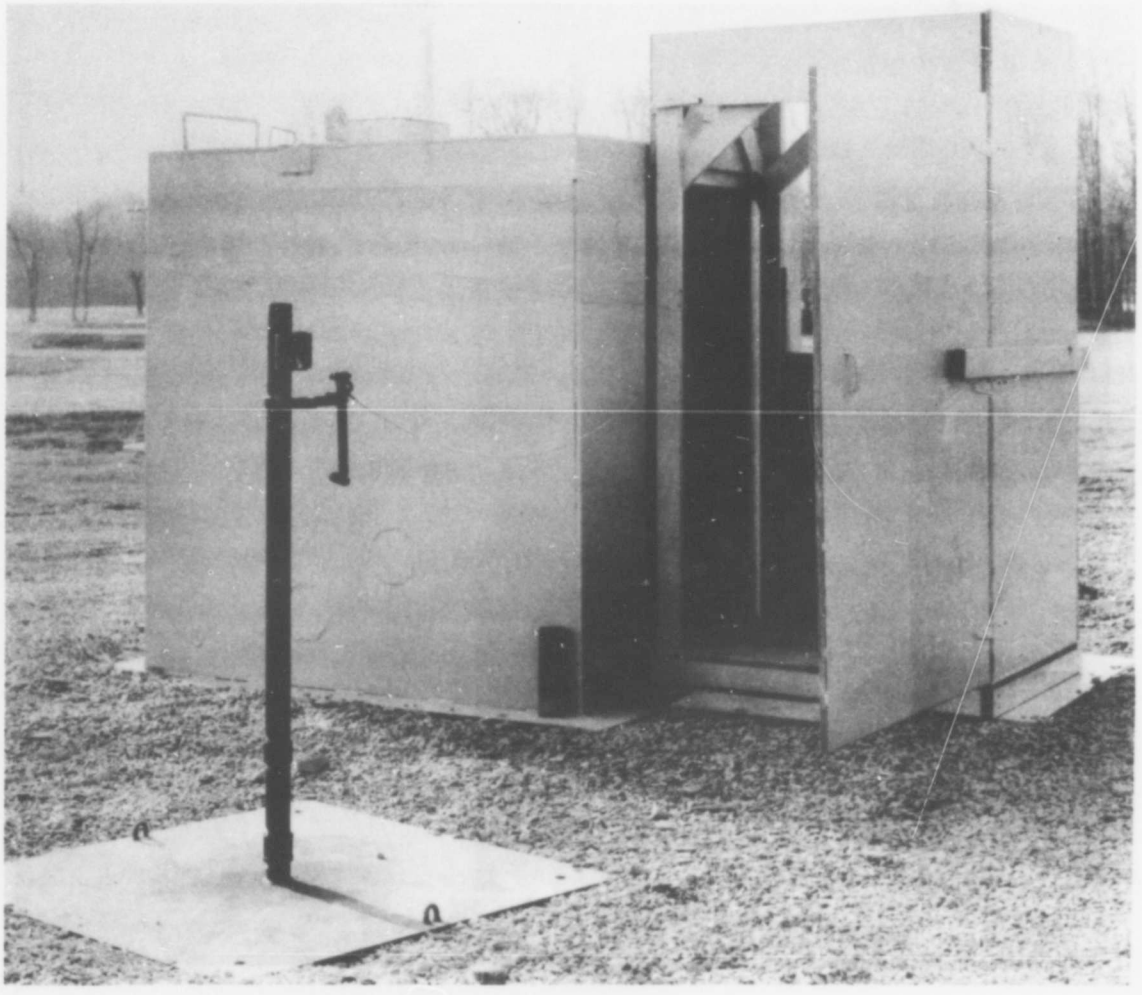

Figure 1. Firing Fixture for Ground Signals

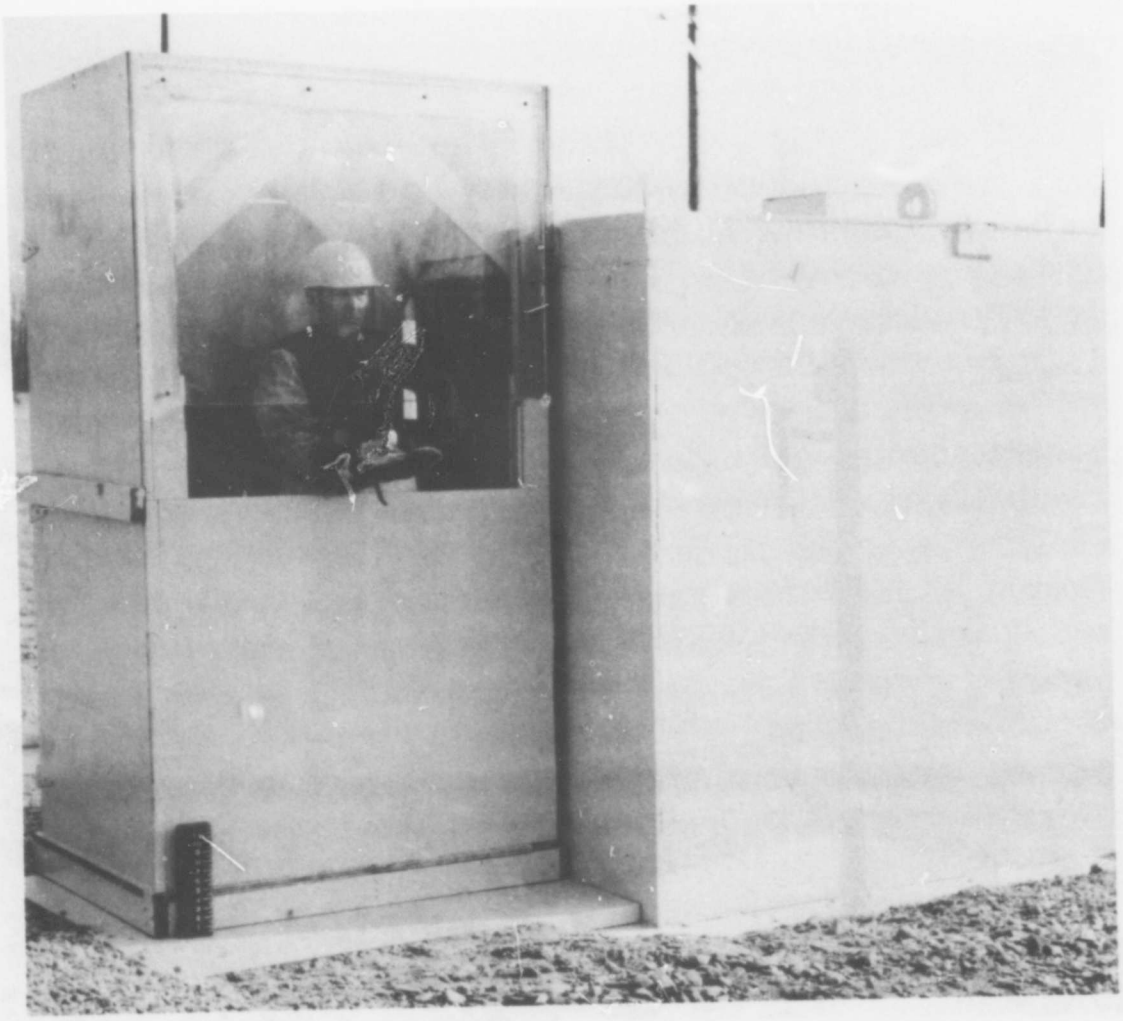

Figure 2. Firing Booth for the Hand Firing of Ground Signals.

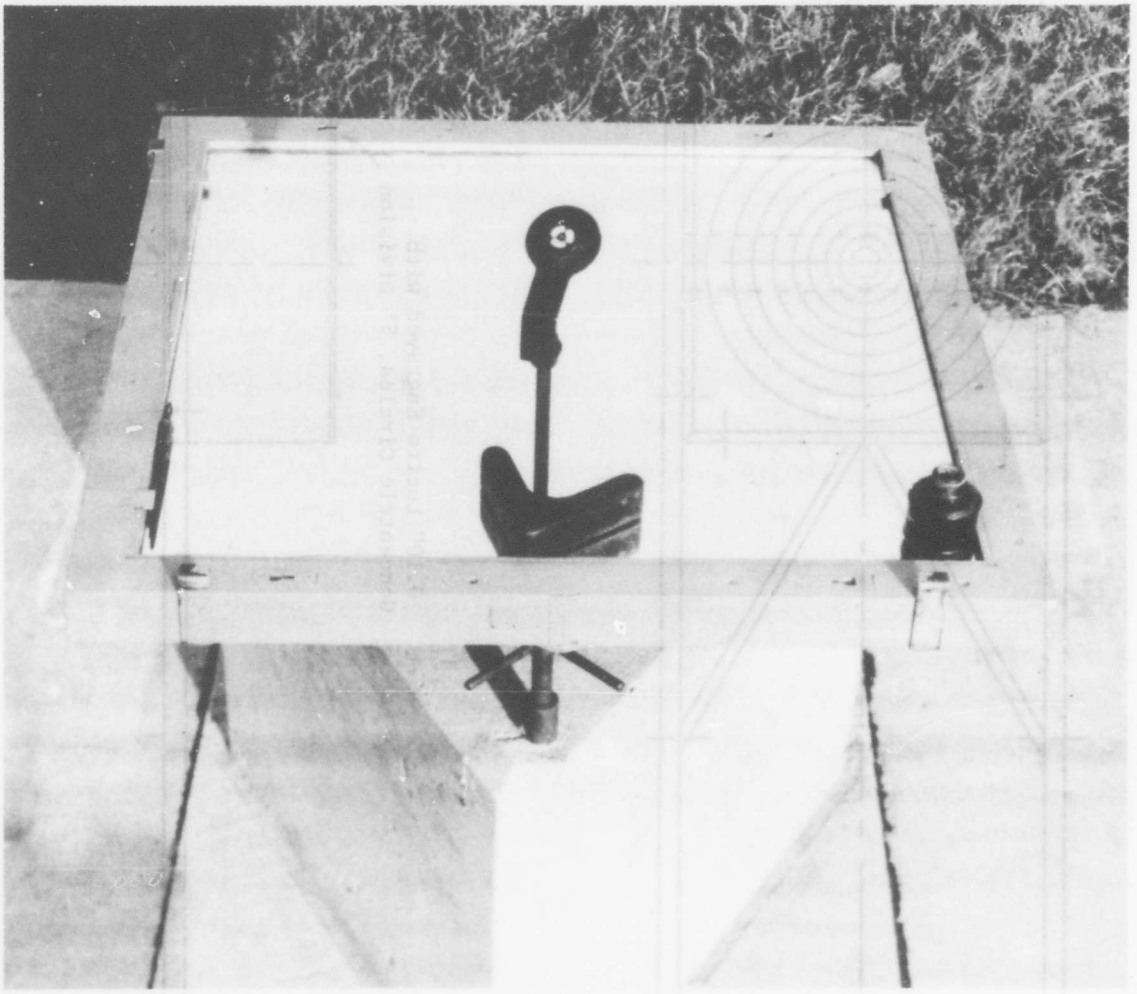

Figure 3. Mirror Position Finder.

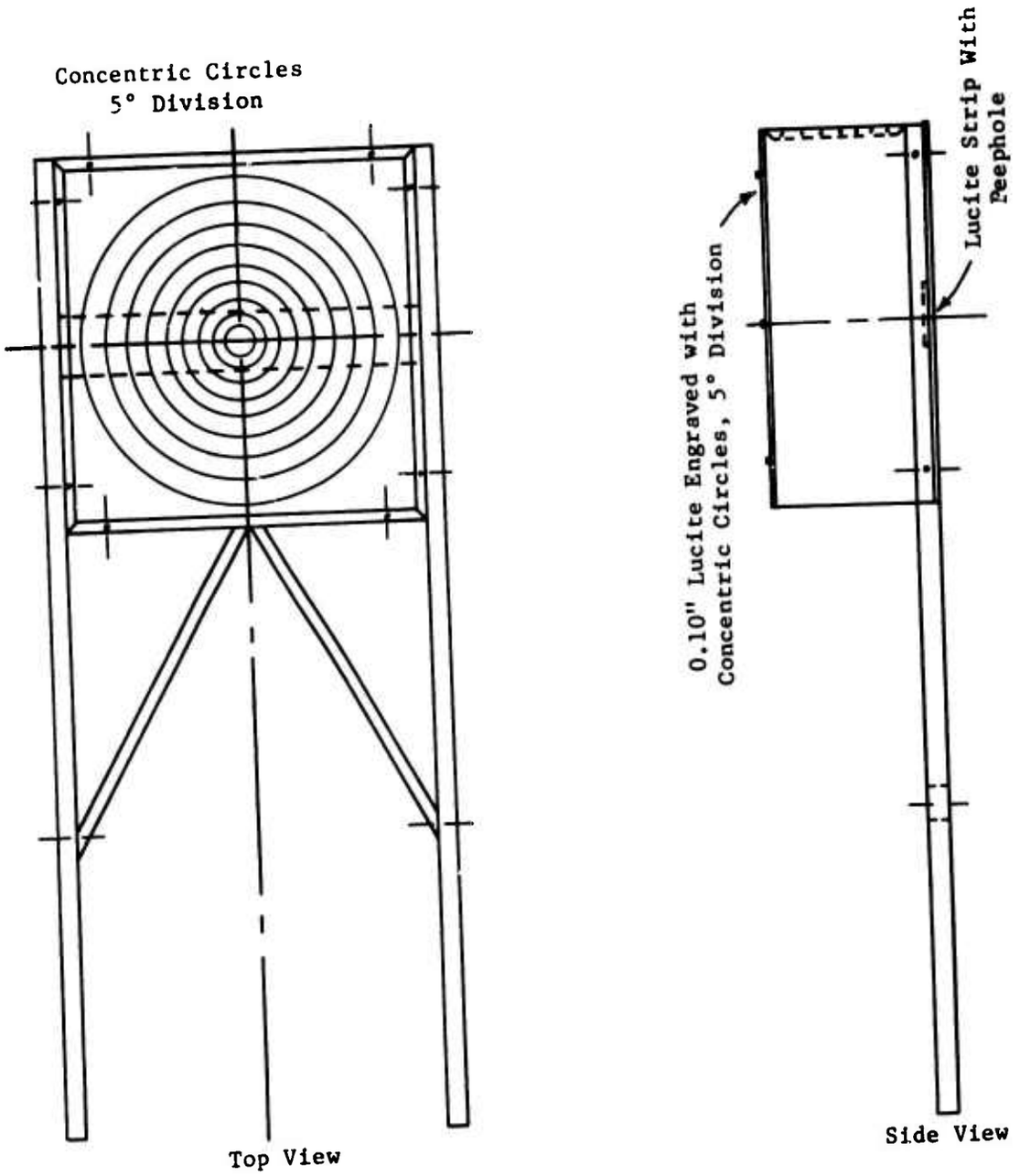

Figure 4. Device for Measuring Angles from the Vertical.

Figure 5. Firing Position for Ground Signal Showing Firing Booth and Location of Angle Measuring Device.

required, the test is conducted using 7.62-mm and caliber .50 projectiles fired at close range at service velocity. Several test items, unpackaged and grouped, are fired upon with several types of ammunition. Satisfactory performance requires that the test items not detonate or ignite, and that they be safe to dispose of. The recorded data will include: number and types of projectiles, location of each impact, appropriate photographs, and description of results.

6.2.7 Reliability

When a mission reliability requirement is stated, MTP 3-1-002 is used to provide guidance on sample size and to determine whether the desired reliability was achieved with the desired confidence. A precise defnition of satisfactory performance is a prerequisite to a reliability analysis. Data are obtained for two reliability analyses: (a) overall reliability which includes a summation of all the satisfactory and unsatisfactory samples of each subtest and (b) selected-conditions reliability which includes all sample groups except those in which the test items suffered damage or deterioration during environmental or rough handling tests, and those in which statistically significant failures occurred in a particular subtest.

For safety reliability, all firings that are conducted during the test program are used, and any unsafe event must be fully investigated as to cause. Appropriate design or manufacturing changes must be made immediately.

6.3 TEST DATA

On a round-by-round basis, all exposure conditions, performance characteristics of paragraph 6.2.3 (6.2.4 and 6.2.5, as applicable), conditions of launch, significant weather conditions, and observations are recorded.

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 General

The mean and standard deviations of all numerical values will be determined for each parameter measured, the effect of environmental exposures determined, and an evaluation made against the requirements stated in QMR's, SDR's, or specification. The results of the safety evaluation will be stated in accordance with USATECOM Regulation 385-6, and any temperature or handing limitations will be noted.

Data will be presented in the form of tables, graphs, photographs and diagrams as applicable.

6.4.2 Reliability

Mission reliability, both overall reliability and selected-conditions reliability (as defined in par. 6.2.7), is determined in accordance with statistical techniques of MTP 3-1-002. Unless otherwise stated, a

satisfactory mission will be considered one in which the minimum safety and performance requirements have been met. Selected-conditions reliability is used to exclude certain test environments that need attention and to prevent them from biasing the relaibility under other conditions.

Safety reliability is not achieved if even one unsafe firing has occurred. The conditions leading to the unsafe firing must be completely corrected by design or manufacturing change, and sufficient firing data accumulated to prove the change.

APPENDIX A

DESCRIPTION AND OPERATION OF MIRROR POSITION FINDER (FIG. A-1)

A mirror position finder consists essentially of a piece of high-grade plate glass mounted horizontally in a well-constructed wooden frame. The glass is about 5/16-inch thick, etched in centimeter squares over an area 60 by 60 centimeters on the bottom surface. The entire bottom surface of the glass is silvered.

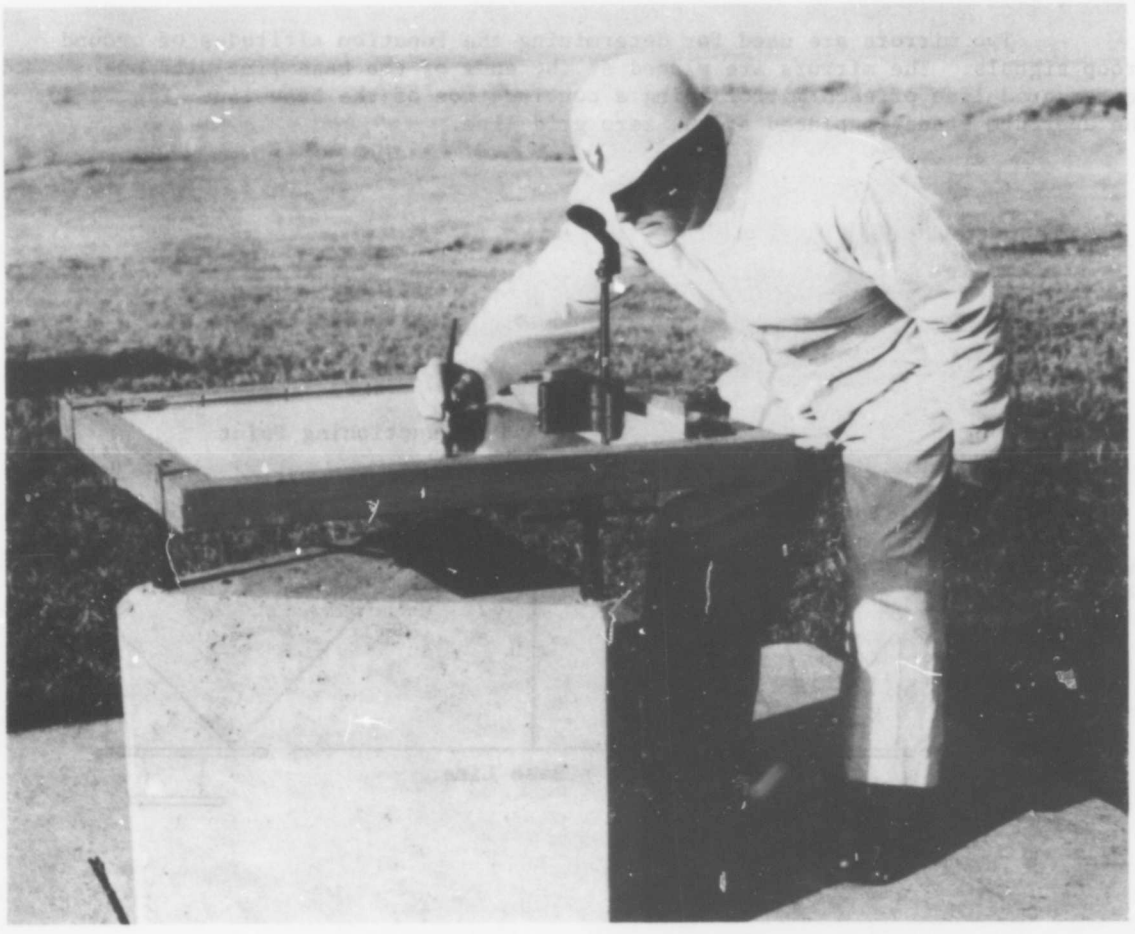

Figure A-1. Observer Plotting Functioning Image on Mirror Position Finder.

The mirror is leveled in the horizontal plane, and, by means of an alidade, the etched lines or grid lines on the glass are made parallel to the base line.

Observations are made by sighting through a peepsight or aperture. The aperture stand is of special design consisting of a heavy cast iron base, vertical iron rod, and an angular bracket fastened to the top of the rod. The bracket contains a skeleton diaphragm with an opening 1 millimeter in diameter.

The height of this aperture above the top surface of the glass must be known.

Observations sighted through the aperture are plotted on the mirror at the point at which the functioning image occurs.

Two mirrors are used for determining the function altitudes of ground troop signals. The mirrors are placed at the ends of the base line with one center grid line of each mirror being a continuation of the base line (Fig. A-2). The aperture stand is placed at the zero grid line.

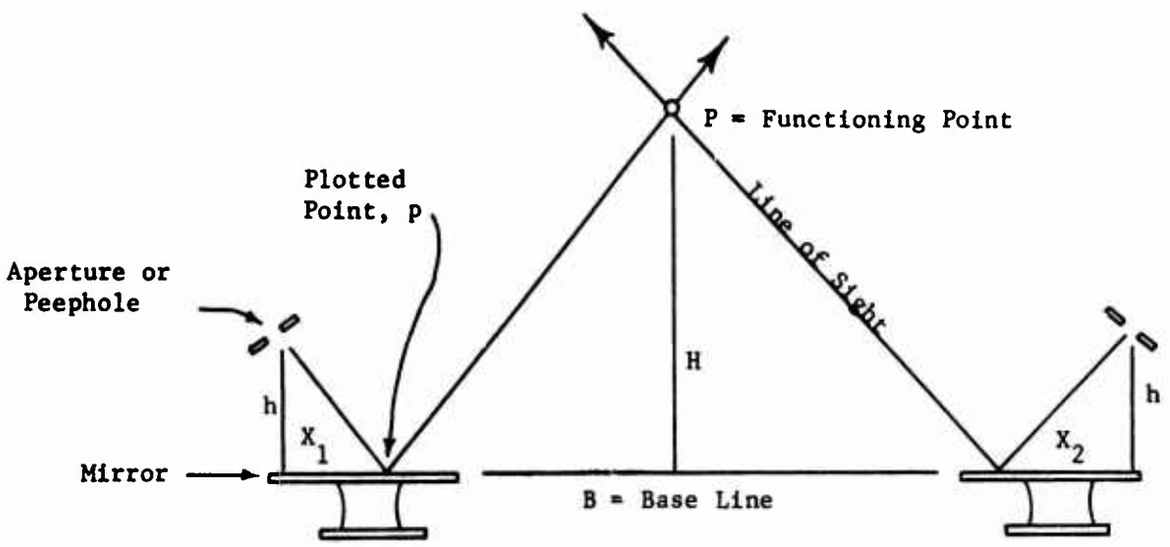

Figure A-2. Schematic for Determination of H.

The altitude, H, of the functioning point, P, is computed from

$$H = \frac{Bh}{X_1 + X_2}$$

Where

H = altitude of functioning point in units of feet.

B = base line in units of feet.

h = height of eye aperture (peephole) in units of centimeters.

X_1 and X_2 = mirror distance (origin to plotted point p, in centimeters).

Sample Solution:

B = 800 ft

h = 30 cm

X_1 = 16.00 cm

X_2 = 14.00 cm

$$H = \frac{Bh}{X_1 + X_2} = \frac{(800 \text{ ft})\ (30.00 \text{ cm})}{16.00 \text{ cm} + 14.00 \text{ cm}} = 800.00 \text{ ft.}$$

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13. ABSTRACT

Procedures utilized for evaluating ground-and air-launched pyrotechnic signals are described. Pyrotechnic signals launched by artillery weapons or mortars are excluded.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Ground launched pyrotechnics Air launched pyrotechnics