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Outlines procedures to be followed during cold regions environment test of conventional cannon fired artillery and mortar ammunition and components. Specifies required facilities, type and accuracy of instrumentation, test controls, and test preparation. Includes transportability, storage, and firing tests for functional performance; and general tests for reliability, safety, human factors, and value engineering. Does not include testing of the weapon used to fire the ammunition.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-102
*Test Operations Procedure 4-3-524 8 March 1983
AD No.

COLD REGIONS TEST OF INDIRECT FIRE WEAPONS AMMUNITION

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1. SCOPE. The procedures outlined in this TOP are designed to determine the characteristics of indirect artillery and mortar conventional cannon fired ammunition under cold regions environmental conditions. Testing of weapons is not included in this TOP.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities. A controlled access firing range containing firing points, impact areas, and observations posts (OP'S) adequate for firing ammunition undergoing test. Impact areas will be determined IAW AR 385-63 (ref 1, appendix C) as appropriate. The Fire Direction Center (FDC) will be located at the firing point. Test Control Point (TCP) will be located in a position

*This TOP supersedes MTP 4-4-007 dated 17 April 1970 and MTP 4-4-008 dated 26 November 1969.

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where testing can best be controlled. Ammunition storage will be accomplished IAW all appropriate regulations and procedures governing storage and security.

2.1.1 Firing Points and OP's will be surveyed to 4th order standards. Observation points will be selected to optimize the intersecting angles of the OP's to the determined point of impact/burst of the projectiles. Weapons will be layed by the orienting angle method (para 8-11, FM 6-50).

2.1.2 Designated firing point installation equipment must include muzzle velocity measurement equipment.

2.1.3 Firing points, OP's, Fire Direction Center, and Test Control Point must be interconnected by wire and/or radio communications, perferably both.

2.1.4 All positions must be provided with electrical power sufficient to meet co-located instrumentation requirements, including freedom from electromagnetic noise. Power and instrumentation cables will be emplaced to minimize damage from vehicles and personnel.

2.1.5 Positions manned by test personnel must provide for environmental and weapons effect protection (warmup shelters and bombproofs) as necessary. Electrical heat sources should be utilized whenever possible in order to minimize ice fog. Ice fog forms at temperatures below -31°F (-35°C) from condensation of water vapor on the microscopic residue of combustion, such as vehicle exhaust.

2.2 Instrumentation and data required listed below will be used as appropriate:

Use	Item	Range	Accuracy
Muzzle Velocity	Muzzle Velocity Radar	45-1300 MPS	±4 MPS (±13 FPS)
Time of Flight	Stopwatches IR Fuze Chronograph	0-10 min 0 - infinity	±0.1 sec ±0.001 sec
Burst Location or Azimuth to Burst	Automated Video System Aiming Circle	NA 0-6400 mils	±2 meters ±1 mil
Elevation Angle	Aiming Circle	-405 to +805 mils	±1 mil (±0.06 degrees)
Peak Chamber Pressure	Crush Gage	3000-115000 PSI	±3 percent

Use	Item	Range	Accuracy
General	Powder Thermometer	-60°C to +100°C	±1°C
	Scales	0 to 200 Kg	±1 gm
	Tape Measure	0 - 2 meters	±1 mm
	Sound Level Meter	0 - 140 db	±1.5 db
	Center of Gravity Equipment		

3. PREPARATION FOR TEST.

3.1 Facilities and Equipment. Make certain that survey markers and orienting points are established for the observation posts and firing points to be utilized during testing. Verify that muzzle velocity radars are properly positioned. Check telephone lines between the test control point and observations posts for continuity. If wire lines are established insure that radio equipment is available and operating adequately for backup and emergency communications and that proper electrical power is available as required for instrumentation and support equipment. Verify that ammunition storage areas are available and conform to DARCOM Regulation 385-100 (ref 10, appendix C).

3.2 Test Items.

3.2.1 Insure that standard issue ammunition for comparison with test item is on hand. Inspect all test ammunition shipping containers for completeness, general condition, and damage. Record all lot numbers and other identifying markings, and photograph one representative container. Take documentation photographs of all damaged containers. Repeat the above steps for each subcontainer exposed during the unpacking process. Assign each container an identifying serial number. Each test item of a multiple packaged container will be further indentified by a subserial number when unpacked for subsequent tests.

3.2.2 Using a random number table, unpack 10 percent of each of the total number of test and comparison items available. The sample will contain no less than 10 items of each type nor more that 150. Inspect each accessible component of these items for damage and general condition. Prepare list of missing components. Record and photograph all damage. If significant damage or deterioration is found, unpack and inspect additional samples.

3.2.3 The same items unpacked during the procedures of paragraph 3.2.2 will be used for determination of physical characteristics. The selected items will be weighed and measured to determine compliance with physical characteristics requirements.

3.2.4 Take identification photographs of one test and one comparison item, alone and together. Insure markings on items are visible in photographs.

3.2.5 Select two samples, by use of random number table, of a sufficient quantity of test and comparison items to determine degradation of firing performance by more than a percentage as determined from requirement documents when evaluated a the 10 percent significance level. One sample will be used for the Transportability test (para 5.1) and one for Controlled Storage (para 5.3).

3.2.6 Test items will be inspected in accordance with TOP 1-2-504 (ref 2, appendix C), Physical Characteristics and TOP 10-4-500 (ref 3, appendix C), Preoperative Inspection. Insure that weights and dimensions, and if required, center of gravity and moments of inertia are obtained.

3.3 Instrumentation. Insure that all instrumentation to be used during the ammunition tests is available, in operating condition, calibrated, and will not have to be recalibrated during the test.

3.4 Data Required. Record the Following:

a. Test and Comparison Ammunition: Type, NSN, DODAC No, lot number, caliber, weight zone of projectile (as applicable), observed damages, observed specification discrepancies.

b. Instrumentation: Type, nomenclature, serial number, range and accuracy, calibration due date, application, and location.

c. Personnel Data: Test personnel names, rank, MOS, experience, and degree of proficiency.

d. Meteorological Support Information: Ambient air temperature, relative humidity, suface wind velocity and direction, barometric pressure, upper air conditions, other climatic conditions as required.

4. TEST CONTROLS.

4.1 A SOMTE safety release and safety assessment report must be obtained prior to initiation of testing in accordance with TECOM Supplement 1 to AR 385-16, System Safety Engineering and Management (ref 14, appendix C). A safety SOP will be written and all applicable range and safety SOP will be adhered to during testing.

4.2 A detailed test plan will be prepared, utilizing the procedures outlined in this TOP as a guide. Each functional performance test will be conducted at environmental conditions and to applicable standards as specified in the requirements documents and test directives.

4.3 The weapon to be used for firing tests will be inspected, lubricated, and winterized IAW all applicable technical manuals and standard operating procedures (SOPs). Prior to firing the following checks and services will be performed:

a. Weapon and BII will be inventoried and inspected for completeness and serviceability.

b. Weapon will be borescoped and subjected to pullover gauge IAW the appropriate TM's.

c. Basic periodic checks.

d. Boresight before firing daily and each time the weapon is moved.

e. Verification of Equivalent Full Charge rounds remaining on tube (see TM 38-750 and weapon TM) (ref 5, appendix C).

f. Verification of Modification Work Orders applied, utilizing documentation furnished with weapon.

4.3.1 Prior to ammunition test firing, the weapon will be calibrated to determine weapon velocity error (VE) from standard muzzle velocity for each charge to be fired for testing.

4.3.2 All data, except that which results from actual firing etc., will be recorded prior to initiation of each exercise.

5. PERFORMANCE TESTS.

5.1 Transportability.

5.1.1 Objective. Determine transportability of the test item under cold regions winter conditions.

5.1.2 Methods.

a. The means of transport and test item configuration (i.e., packaged, ready rack, etc) to be used in testing, and the distance and terrain over which test items should be transported by each means, will be determined through analysis of the requirements documents. All appropriate means and conditions of transport will be included in the test and comprise a transportation cycle.

b. The random sample of test and comparison items selected for transportability testing in para 3.2.5 will undergo one transportation cycle.

c. Examples of transportation cycle mission profile and data collection forms for ammunition are shown in appendix B.

d. Air temperature and precipitation conditions will be measured and recorded prior to and following each transport test or phase and at half-hour intervals during transport.

e. Test and comparison items will be transported simultaneously in the same or identical conveyance. Damage caused by transport will be recorded and photographed as appropriate.

f. The effects of transportation upon the functional performance of the test item will be determined from the results of the firing test (para 5.3).

5.1.3 Data Required. Data to be collected with associated sample sizes and tolerance are as follows:

Data Required	Number of Samples	Tolerance
Conveyance	Each Transport	Not Applicable
Distance	Each Transport	±0.1 Miles
Type of Road	Each Transport	NA
Test Item:		
Sample Size	Each Transport	None
ID Number	Each Test Item	None
Comparison Item:		
Sample Size	Each Transport	None
ID Number	Each Comparison Item	None
Temperature	Start, Stop, 30 min. Intervals.	±2°F
Precipitation	Start, Stop, 30 min. Intervals.	Not Applicable
Damage caused by Transport	As Needed	Not Applicable
Damage Photographs	As Needed	Not Applicable

5.2 Storage.

5.2.1 Objective. Determine if storage, under cold regions winter conditions, has adverse effects on the test item's packaging and functioning.

5.2.2 Method.

a. The random sample of test and comparison items selected during preparation for test (para 3.2.5) for storage testing will be placed in a secure area under identical conditions as determined from the requirements documents. The items will be stored in a consistent manner, IAW appropriate regulations, in the orginal pallet/packaging configuration. Clear photographs will be taken of the test items after being placed in storage.

b. Upon satisfaction of specified storage criteria, test and comparison items will be inspected for damages attributable to storage. Damages will be recorded and photographed. Evidence of corrosion and leakage will be specifically recorded.

c. The effect of controlled storage on the functional performance of the test items will be determined from results of the firing test (para 5.4).

d. Surface Meteorological data will be obtained and recorded daily. Storage temperature restrictions as furnished in the safety statement or release and requirements documents will be strictly adhered to.

5.2.3 Data Required. Data to be collected with associated sample sizes and tolerances are as follows:

Data Required	Number of Samples	Tolerance
Item Number	Each Item	None
Type of Storage (Outdoors, Covered, Bunker, etc.)	Each Item	None
Length of Storage	Each Item	±1 Day
Surface MET Data	Daily	A/R
Photographs at beginning of Storage	1 Set	Not Applicable
Damage resulting from Storage	As Required	Not Applicable
Damage Photographs	As Required	Not Applicable

5.3 Firing Test.

5.3.1 Objective. Determine the accuracy and precision of the test item when fired under cold regions environmental conditions.

5.3.2 Method.

a. Items will be stored at ambient air temperature for a least 24 hours immediately prior to firing.

b. The weapon to be used in firing will be emplaced in accordance with appropriate technical manuals (TM's). When muzzle velocity radar is to be used, operation will be in accordance with applicable technical manuals (TM's) and Operating Instructions (OI's).

c. Prior to firing, all test and comparison ammunition components will be inspected for serviceability. Type classified standard ammunition items that are determined to be unserviceable will be turned into the Ammunition Supply Point (ASP) for disposition.

d. Following the serviceability inspection, ammunition will be placed in open storage at the firing position for at least 6 hours to insure that the temperature of the ammunition components are at near ambient. During this period ammunition lot numbers and serial numbers will be reverified. Items will be weighed and fuzes set, if necessary, and double checked. Firing sequence will be verified and all data collection systems will be checked. Azimuth of fire and quadrant elevation will be recorded and verified independently.

e. A sufficient number of standard warming rounds will be fired to warm tube and exercise the recoil mechanism. If the weapon has been cold soaked and high charges are to fired for the test (charge 7 or above), several warming rounds will be fired at a lower charge to warm the tube and exercise the recoil mechanism. Once the weapon has been fired at the lower charges, three rounds will be fired at the charge which the test ammunition is to be fired to orient observers, verify muzzle velocity, and gunnery computations.

f. Shot groups will be fired in accordance with a schedule designed to insure that prescribed environmental conditions are encountered for each category of test item. A sample firing schedule matrix is included in appendix B. The rate of fire for each shot group will be specified in the test plan.

g. Powder temperature, ambient air temperature, surface windspeed, and direction will be continuously monitored and recorded. Air density will be furnished at intervals specified in the test plan. If powder temperature cannot be measured directly (eg; mortar rounds), ambient air temperature will be measured at the ammunition ready area at the same height as the rounds.

h. Peak chamber pressure will be measured when required using copper crush gages, or if gun chamber has been tapped using dynamic instrumentation methods.

i. Personnel in the firing position will report all malfunctions or other irregularities occurring during firing or projectile flight to the test officer/safety officer. Each incident which might indicate a failure of the test item will be investigated in detail and a report submitted.

j. Projectile burst/impact locations will be determined using the video burst locating system. The azimuth and vertical angles from at least four observation posts to each burst/input will be measured using aiming circles as a backup system. The azimuth will be plotted on an observed fire chart to determine burst location in the horizontal plane (grid coordinates) and to derive a quick look at the impact point data and verify testing procedures. The height, in meters, of each burst above the ground at the point of impact will be determined.

k. Personnel at observation posts will observe and report fuze function, munition function, and type of burst. Submunition burst location and patterns will be recorded using motion pictures or video tape. During firing the bore will be visually checked after each round is fired to insure bore is clear and free of foreign matter. Mortar tubes will be swabbed after each 10 rounds or fire for effect IAW FM 9-207 (ref 6, appendix C).

l. Time of flight will be determined by utilizing the video burst locating system and superimposed IRIG-B time.

m. During tests of rocket assisted projectiles fired in the assisted mode, elapsed time from projectile firing to rocket ignition and rocket burn time will be determined by use of the video burst locating system.

n. Upper air meteorological data, in computer and ballistic met message format, will be obtained at 2-hour intervals throughout firing, beginning 2 hours prior to start of firing. Data will be obtained to maximum ordinate plus 200 meters. Raw upper air data will be available from the meteorological team if required.

5.3.3 Data Required. Data to be collected with associated sample sizes and tolerances are as follows:

Data Required	Number of Samples	Tolerance
Firing position coordinates	Each shot group	±1 meter
Firing position altitude	Each shot group	±1 meter

Data Required	Number of Samples	Tolerance
Weapon fire time	Each shot group	Not applicable
Type munition	Each shot group	Not applicable
Ammunition lot number and serial number	Each ammunition component	Not applicable
Charge/Zone	Each shot	None
Data Required	Number of Samples	Toleranc
Fuze type and mode	Each shot	Not appl e
Rocket mode	Each shot	Not applicable
Upper air meteorological data	2-hour intervals, to maximum oridnate plus 200 meters	As specified in FM 6-15
Observations post coordinates	1 per OP per shot group	±1 meter
Observation post altitude	1 per OP per shot group	±1 meter
Azimuth of fire	Each round	±1 mil
Deflection fired	Each round	±1 mil
Fuze setting (MT)	Each Fuze	±0.1 second
Fuze mode (multi-option)	Each Fuze	NA
Quadrant elevation	Each round	±1.0 mils
Item weights	Each item	±0.03kg
Powder temperature	Each shot group	±2°F
Ambient air temperature (at firing point)	Continuous	±2°F
Center of gravity	As Determined from Test Plan	±1 mm
Impact area Windspeed (2 meter level) (base ejected munition only)	Continuous	±2 mph

Data Required	Number of Samples	Tolerance
Impact area wind direction (base ejected munitions only)	Continuous	±10 degrees
Chamber pressure	As required	±3 percent
Elasped time from projectile firing to rocket ignition	1 per round	0.1 seconds
Rocket burn time	1 per round	±0.1 second
Video tape recording	1 per round	Not Applicable
Time of flight	1 per round	±0.1 second
Terminal effects	Each round	Not applicable
Malfunctions or other irregularities	As required	Not applicable
Azimuth to burst	1 per round per OP	±0.01 degree or ±0.5 mil
Elevation angle to burst	1 per round per OP	±0.01 degree or ±0.5 mils

5.4 Position Disclosure Effects.

5.4.1 Objective. To compare the position disclosure effects associated with the firing of test and comparison items.

5.4.2 Methods.

a. Ten each test and 10 comparison items will be fired alternately in a random manner.

b. At least three observers, located at one or more OP's to four kilometers from the firing point, will observe the flash, and smoke of the weapon. The observations will be recorded on an observer rating sheet, a sample of which is included in appendix A.

c. Motion pictures will be taken of test and comparison firing from positions at either side of the support weapons.

5.4.3 Data Required. Data to be collected, with associated sample sizes and tolerances, are as follows:

Data Required	Number of Samples	Tolerance
Muzzle flash photographs	1 test item and 1 comparison item	Not applicable
Noise (measured)	10 test items and 10 comparison items	±1.5 db ±1.6 db
Flash (observed)	3 per test and comparison item	Not applicable
Smoke (observed)	3 per test and comparison item	Not applicable
Suface meteorological data	As Required	As Required

5.5 Logistic Supportability.

5.5.1 Objective. To evaluate the logistic supportability of the ammunition and components to include manuals, operating instructions and firing tables, to be used with the test items.

5.5.2 Method. Conduct all logistic supportability tests in accordance with applicable sections of TECOM supplement 1, to DARCOM, regulation 700-15 (ref 13, appendix C).

5.5.3 Data Required. All instances in which discrepancies or improvements should be made will be documented.

5.6 Reliability.

5.6.1 Objective. Evaluate the functional reliability of the test item and each of its functioning components in a cold regions environment. The following items must be considered, insofar as they are test items or peculiar to the test item:

Howitzer	Mortar
Container	Cartridge
Round	Fuze
Fuze	Powder Increments
Powder	Fuze Wrench
Primer	Containers

Howitzer	Mortar
Ammo Tray	GFT
Fuze Wrench	
GFT	

5.6.2 Failure Definition. A chargeable failure of ammunition under test is a malfunction which prevents delivery of the munition in the vicinity of the target, which precludes proper functioning of the munition in the target area, or causes an unsafe condition to occur.

5.6.3 Method. Within the limits of safety, each failure will be investigated to determine probable cause, environmental dependence, and impact on munition effectiveness.

5.6.4 Data Required. Data to be collected with associated sample sizes and tolerances are as follows:

Data Required	Number of Samples	Tolerance
For each failure item number	1	None
Nature of failure	1	Not applicable
Probable cause	1	Not applicable
Environmental conditions	1	None
Corrective action	As required	Not applicable

5.7 Human Factors Engineering.

5.7.1 Objective. Determine if all packaging components, accessories, and integral portions of the test item are designed with good human factors engineering characteristics.

5.7.2 Method.

a. Conduct all human factors evaluations in accordance with applicable sections of TOP 1-2-611 (ref 7, appendix C).

b. Emphasis will be placed on observations of the following operations:

(1) Hand carrying of test items in their packing containers, as appropriate.

(2) Loading of test items for transport.

(3) Unloading of test items following transport.

(4) Unpacking of test items from packing containers.

(5) Preparing of test items for firing (fuze setting, primer placement and misfire, powder increments, etc.).

(6) Loading of test items for firing (ammo trays, ramming, cleaning rods, residue problems, etc.).

(7) Unloading of test items if not fired.

(8) Preparation of test items for storage if not fired.

(9) Repacking of test items into packing containers.

c. Photographs will be taken of human factors design faults.

5.7.3 Data Required. Data to be collected with associated sample sizes and tolerances are as follows:

Data Required	Number of Samples	Tolerance
For each difficulty:		
Nature of difficulty	1	Not applicable
Clothing worn by personnel	Each Test Person	Not applicable
Applicable physical characteristics of personnel	As needed	Not applicable
Environmental conditions	If applicable	
Photographs	As required	Not Applicable

5.8 Safety.

5.8.1 Objective. Determine if the hazards associated with the test item have been eliminated or controlled to an acceptable level.

5.8.2 Method.

a. Throughout all testing, the test team will be alert to all safety hazards evident during storage, handling, maintenance, or firing of test items or their related components.

b. All test participants will be instructed to bring safety hazards or potential safety hazards to the attention of the test officer/safety officer.

c. Photographs will be taken of safety hazards if possible.

d. Additional guidance is found in TOP 4-2-504 (ref 8, appendix C), Safety Testing Artillery, Mortar, and Recoilless Rifle Ammunition, MIL-STD-882A, (ref 9, appendix C) and DARCOM Reg 385-100 (ref 10, appendix C).

e. All safety incidents will be assessed by probability and severity in accordance with TOP 1-1-012 (ref 11, appendix C).

5.6.3 Data Required. Data to be collected with associated sample sizes and tolerances are as follows:

Data Required	Number of Samples	Tolerance
Safety hazard	Each hazard observed	Not applicable
Related conditions	As required	Not applicable
Photographs	As required	Not applicable

6. DATA REDUCTION AND PRESENTATION

6.1 General. All raw data will be marked under the appropriate subtest title for identification and correlation. Data will be represented in tabular, graphical, or narrative manner that best facilitates evaluation of test ammunition performance within the stated test objectives and standards. Specific instructions for data representation are given in the following paragraphs.

6.2 Test Preparation. All data will be presented in a narrative format. Descriptive data will, whenever possible, be supported by photographic materials. Narrative and photographs will be directed toward a prefunctional evaluation of the test ammunition to insure that it is in satisfactory condition for testing.

6.3 Performance Tests

6.3.1 Transportability and Storage. All data will be recorded in a format such that the effects of these subtests may be correlated with the results of Firing Tests (para 5.3). All noted effects on the test item, including damage, will be presented in narrative form, utilizing photographs as necessary.

6.3.2 Firing Tests. The mean point of impact (MPI) of each shot group for both test and comparison ammunition will be calculated and tabulated, along with the environmental conditions. The presentation will also include average muzzle velocity, time of flight, peak chamber pressure, and time to fuze function/time to rocket ignition as applicable. Storage, transportation, and aerial delivery conditions will be noted for the ammunition which has undergone those particular subtests. A sample data sheet is shown at appendix B.

6.3.3 Position Disclosure Effects. The data will be presented in narrative form, utilizing photographs and tables as required for clarification.

6.3.4 Logistic Supportability. Observations will be summarized and presented in narrative form.

6.3.5 Human Factors Engineering. Information collected through observation or interview will be presented in narrative form. Human factors information pertinent to maintenance activities will be presented in a manner lending itself to analysis using AMC Pamphlet 706-134, Engineering Design Handbook (ref 12, appendix C).

6.3.6 Reliability. Observations and deficiencies will be presented in narrative form.

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APPENDIX A - SAMPLE TEST OPERATIONS CHECKLIST*

Item	Yes	No	NA	Remarks
1. Safety Assessment Report and Release received and reviewed.				
2. Test items are inspected, available, and numbered.				
3. Weapon (s) has been inspected, serviced and section equipment inventoried and found to be serviceable.				
4. All instrumentation equipment has been calibrated, installed and is operational.				
5. Facilities are ready for testing, including electrical power, communications, warmups, and survey.				
6. Safety SOP's have been prepared and approved.				
7. All test personnel have been brief on test requirements, procedures, hazards, and special aspects of the test.				
8. Personnel have received cold weather briefing.				
9. Other.				

*This is a representative overall test operations checklist. Additional guidance for checklists is found in TECOM Pamphlet 70-3.

APPENDIX B - SAMPLE DATA COLLECTION FORMS

FIRING DATA COLLECTION FORMS

1. Firing data will be recorded on the following DA Forms:

   a. Record of Fire (DA Form 4505).

   b. Ballistic Met Message (DA Form 3675) or Computer Met Message (DA Form 3677), as appropriate.

   c. Met Data Correction Sheet (DA Form 4200).

2. Additional data collection forms will be developed as required to conduct testing.

SAMPLE TRANSPORTATION PROFILE

IF a mission profile has not been furnished with the requirements documents or test design plan, the following guideline will be used to establish the mission profile for transportation testing.

Transporting Vehicle Mobiltiy Level	Operating Distance Off-Road Percent	Operating Distance On-Road Percent
Tactical High Mobility (extreme cross-country capability)	50	50
Tactical Standard Mobility (occasional cross-country movement)	15	85
Tactical Support Mobility (infrequent off road movement)	5	95

SAMPLE TRANSPORTATION DATA COLLECTION SHEET

TEST TITLE: XM825, WP, 155MM DATE: 24 October 1981

Vehicle Type: Truck, Cargo, 5-Ton, 6X6, M813

Weather Conditions: Temperature -15 degrees F to -25 degrees F

Precipitation None

Winds 15 kts SW

Time Started: 0800

Time Stopped: 1730

Elapsed Time: 9.5 hours

Average Speed: 20 mph Distance Traveled: 100 miles

Trafficablility Conditions: Improved and unimproved dirt roads, road conditions dry.

Ammunition Components Being Transported	Amount	Parcking Configuration	Method of Tie Down	Remarks
Projectile, WP XM825	96	12 Pallets of 8 projectiles	Tie down straps	No damage recieved test items as as result of transportation.

Observer _____

_____

SAMPLE HOWITZER AND TEST ITEM DATA COLLECTION SHEET

TEST ITEM No._____ TEST ITEM_____

DATE/TIME FIRED_____ WEAPON TYPE_____

1. Propellent Temp (°F)_____
2. Fuze Type_____ Fuze Setting_____ (TI & VT only)
3. Projectile Type_____ Projectile Weight_____
4. Charge Fired_____
5. Azimuth of Lay_____ mil, Azimuth of Fire _____ mil (DF fired_____ mil)
6. Quadrant Elevation (QE)_____ mil
7. Muzzle Velocity_____ M/Sec
8. Weather Conditions:
   a) Ambient Air Temp (°F)_____
   b) Precipitation (Amount & Type_____
   c) Wind Direction_____
   d) Windspeed_____
9. Remarks and Comments (Explain and Problems of Failures):

_____

_____

_____

_____

_____

_____

_____

_____

SAMPLE OBSERVER FLASH DATA COLLECTION SHEET

TEST TITLE: _____ DATE: _____

OP No. _____ Observer _____

Grid Location: _____ Recorder _____

Altitude: _____

Equipment Utilized: _____

Round Number	Round Type	Fuze Type	Direction (mils)	Vertical Angle (mils)	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
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SAMPLE BASE EJECTION MUNITIONS DATA COLLECTION FORM

OBSERVER_____ LOCATION_____

TEST TITLE:_____ TEST ITEM_____

TEST ITEM No._____

DATE/TIME FIRED_____

1. Based on your observation during this particular firing, how would you rate the effectiveness of this round to screen the target(s)? If your rating is less than 4 please explain why.

_____6-Extremely Effective
_____5-Very Effective
_____4-Fairly Effective
_____3-Fairly Ineffective
_____2-Very Ineffective
_____1-Extremely Ineffective

_____

_____

_____

2. How would you rate the effectiveness of the round with regard to the following characteristics of the smoke system? If your rating is less than 4 please explain why.

a. Time from initiation (burst of round) to effectiveness (target obscured by smoke).

_____6-Extremely Good
_____5-Very Good
_____4-Fairly Good
_____3-Fairly Poor
_____2-Very Poor
_____1-Extremely Poor

_____

_____

_____

SAMPLE POSITION DISCLOSURE DATA COLLECTION FORM

OBSERVER _____ LOCATION _____

TEST TITLE: _____ TEST ITEM _____

TEST ITEM No. _____

DATE/TIME FIRED _____

Based on your observation of the firing of the test and comparison sounds fired, how do you rate the detection of the firing in the following areas?

	Test Round Greater	Comparison Round Greater	About the Same
1. Flash			
2. Smoke			
3. Sound			
4. Ice Fog Generation			

Please list any comments about this firing. _____

APPENDIX C - REFERENCES

1. AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat.

2. TOP 1-2-504, Physical Characteristics.

3. TOP 10-4-500, Arctic Preoperational Inspection, etc..

4. TECOM Regulation 385-7, Potential Health Hazards to Humans Participating in Tests.

5. TM 38-750, The Army Maintenance Management System (TAMMS), 31 May 1981.

6. FM 9-207, Operation and Maintenance of Ordnance Material in Cold Weather.

7. TOP 1-2-611, Cold Regions Human Factors Engineering.

8. TOP 4-2-504, Safety Testing of Artillery, Mortar, and Recoiless Rifle Ammunition.

9. MIL-STD-882A, System Safety Program Requirements, 28 June 1977.

10. DARCOM Regulation 385-100, Safety Manual, 17 August 1981.

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

12. AMC Pamphlet 706-134, Engineering Design Handbook.

13. TECOM Supplement 1 to DARCOM Reg 700-15, Integrated Logistics Support (ILS).

14. AR 385-16, System Safety Engineering and Management, with DARCOM Supplement 1 and TECOM Supplement 1.

APPENDIX D - COLD-DRY UNIFORM

The year-round temperature variation peculiar to the cold regions prohibits the prescribing of a particular uniform for any season. The clothing which is comfortable at approximately -50°F (-45°C) becomes uncomfortable at approximately -15°F (-25°C), and vice versa. Since a large fluctuation is experienced on an hour-by-hour, day-by-day basis, some degree of flexibility in uniform requirements is necessary.

The cold-wet uniform is designed to afford maximum protection against the hazards of changing temperatures, rain, wet snow, mud, and slush of a cold-wet environment.

The cold-dry uniform is designed to provide protection against the hazards of extreme temperatures, high winds, and snow of a cold-dry environment. As indicated below, the cold-wet uniform is part of the cold-dry uniform. The cold-wet uniform provides the inner insulating components of the cold-dry uniform. Progressing from cold-wet to cold-dry is accomplished by adding more insulation in the form of additional outer garments.

The necessary clothing components of the cold weather uniforms are worn as defined in TM 10-275, DA, Cold Weather Clothing and Sleeping Equipment, dated April 1968 as amended by current Supply Bulletins and 172d Infantry Brigade (Arctic) Directives.

Item	Cold-Wet	Cold-Dry
a. Undershirt man, 50% cotton, 50% wool, full sleeve.	X	X
b. Drawers, cold weather, mans, 50% cotton, 50% wool, knit, ankle length.	X	X
c. Socks, mans, wool, cushion sole, OG 408, stretch type.	X	X
d. Suspenders, trousers, scissor back type.	X	X
e. Shirt, cold weather, wool/nylon flannel, OG 108.	X	X
f. Trousers, cold weather, wool serge, OG 108.	X	X
g. Trousers, utility, cotton sateen, OG 107.	X	X
h. Trousers, camouflage, cotton/nylon, water repellent, white.	X	X
i. Liner, cold weather, trousers, nylon rip-stop, quilted, white.	X	X

Item	Cold-Wet	Cold-Dry
j. Liner, snow trousers, camouflage, nylon ripstop, quilted, white.		X
k. Boot, extreme cold weather, mens, rubber, white, with release valve.		X
*l. Boot, cold weather, mens, rubber, black, with release valve.	X	
m. Coat, cold weather, mans, cotton/nylon, wind resistant sateen.	X	X
n. Liner, cold weather, coat, nylon quilted, 6.2 ounce, OG 106.	X	X
o. Parka, extreme cold weather, mans, cotton/nylon oxford, OG 107, without hood.		X
p. Liner, extreme cold weather, parka, mans, nylon quilted, OG 106.		X
q. Cap, cold weather, cotton/nylon oxford, OG 107.	X	X
r. Hood, extreme cold weather, cotton/nylon, OG 107, with fur ruff.		X
s. Handwear:		
(1) Mitten set, arctic: Gauntlet style shell with leather palm.	X	X
**(2) Mitten shell, trigger finger, leather palm and thumb; mitten inserts, wool/nylon knit, OG, trigger finger.	X	X
**(3) Glove shells, work, leather; glove inserts, wool/nylon knit, OG 208.	X	X
(4) Gloves, cloth, work type (anticontact).	X	X
t. Special purpose clothing items:		
(1) Parka, snow camouflage, white.	X	X
(2) Trousers, snow camouflage, white.	X	X
(3) Mask, extreme cold weather.	X	X

Item	Cold-Wet	Cold-Dry
(4) Dickey, rayon, OD (local item of issue).	X	X
(5) Balaclava, wool, navy blue (local item of issue).	X	X

*Not available to CRTC.
**Items not worn at same time.