FINAL REPORT
FEBRUARY 1991

REPORT NO. EVT 33-90

OPERATION DESERT STORM

ENVIRONMENTAL MONITORING OF AMMUNITION TEMPERATURES

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Operation Desert Storm. Environmental Monitoring of Ammunition Temperatures

William R. Meyer

Final

FROM January TO February 1990

The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), monitored ammunition temperatures within Saudi Arabia (SA) for a period of approximately two months in support of Operation Desert Storm. The SMCAC-DEV data logger was installed on temperature sensitive munitions by instructors from USADACS. Nuclear Weapons Department (SMCAC-AST), detailed to SA. This test is the first in a series to ensure long-term reliability of fielded ammunition within SA. The following report contains test results of selected ammunition monitored during the 4th quarter of 1990 and represents the first feedback of temperature data from SA.
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PART 1
INTRODUCTION

A. BACKGROUND. During early deployment of troops to Saudi Arabia (SA), the U.S. Army (USA), along with other services, was concerned about high temperatures having an adverse effect on stored ammunition. Long-term open storage monitoring programs were established within the USA. U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division, was assigned to instrument ammunition while U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Predictive Technology Branch, was assigned as program manager. Prior to procurement of needed instrumentation, USADACS used existing equipment to monitor ammunition within SA to get early feedback on ambient and ammunition temperatures. This is to be followed by long-term, more involved instrumentation projects with procured equipment. Long-term objectives of this program are to assure the recorded temperatures of which the ammunition is exposed does not exceed the design temperature limits which ensure safe, reliable ammunition.

B. AUTHORITY. These tests were conducted in accordance with mission responsibilities delegated by AMCCOM, Rock Island, IL.

C. OBJECTIVE. The primary objectives of temperature monitoring within SA include the following:

1. Determination of the maximum temperature ammunition is exposed to.
2. Adverse effects/degradation of ammunition after high temperature storage.
3. Methods of reducing exposure to temperatures through shielding.
4. Determination of critical components on fielded ammunition.

Realization of objectives will not be accomplished until laboratory testing and evaluation have been conducted to assess degradation of the tested items. This report contains a very small portion of the overall program.
PART 2

OPERATION DESERT STORM
ENVIRONMENTAL MONITORING OF AMMUNITION TEMPERATURES

TEST ATTENDEES

<table>
<thead>
<tr>
<th>NAME AND PHONE NUMBER</th>
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<tr>
<td>Bob Lorenz</td>
<td>Director</td>
</tr>
<tr>
<td>QASAS</td>
<td>U.S. Army Defense Ammunition Center and School</td>
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<tr>
<td>DSN 585-8246</td>
<td>ATTN: SMCAC-ASC</td>
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<tr>
<td>815-273-8246</td>
<td>Savanna, IL 61074-9639</td>
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<tr>
<td>William R. Meyer</td>
<td>Director</td>
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<tr>
<td>Test Engineer</td>
<td>U.S. Army Defense Ammunition Center and School</td>
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<td>Quinn Hartman</td>
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<td>Steven L. Von Thun</td>
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<td>U.S. Army Defense Ammunition Center and School</td>
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PART 3

TEST PROCEDURES

Test sites for instrumentation in SA are depicted on the enclosed map; i.e., Port Dammam (test site 1) and the Quarry Ammunition Supply Point (ASP) (test site 2). The Quarry ASP is located approximately 40 to 50 kilometers southwest of Dammam. Each of the test sites was instrumented as depicted in test site layouts 1-4 located in section 5 of this report. Each item to be monitored had thermistors adhered to the container’s exterior walls as shown in the detailed pallet drawings 1-4 (also located in section 5). All data points were taken at 1-hour intervals for a minimum period of 48 hours. Instrumentation included at least one ambient temperature probe per each test site. The location of temperature measurement probes included direct exposure to the sun, intermediate layers within the pallet, as well as points of location between stacked pallets of ammunition. All test pallets were uncovered and exposed directly to the environment in SA.
PART 4

TEST EQUIPMENT

A. DATA ACQUISITION SYSTEM

MANUFACTURER: Omega Engineering
MODEL NUMBER: OM-220
NUMBER OF CHANNELS: 8
DURATION BETWEEN READINGS: 1 Hour
TOTAL NUMBER OF READINGS: 32,000

B. TEST ITEMS

ITEM: HELLFIRE MISSILE (AGM-114C)

NATIONAL STOCK NUMBER: 1410-192-0293
DODIC: PD68
SERIAL NUMBER: 606501
DRAWING: 19-48-5250
WIDTH: 46-1/2 Inches
LENGTH: 76-1/4 Inches
HEIGHT: 53 Inches
WEIGHT: 1,661 Pounds

ITEM: HELLFIRE MISSILE (AGM-114A)

DODIC: PA79
DRAWING: 10-48-5250-M2011
WIDTH: 48-1/2 inches
LENGTH: 76-1/4 Inches
HEIGHT: 53 Inches
WEIGHT: 1,661 Pounds

ITEM: 155mm COPPERHEAD PROJECTILE

MODEL NUMBER: M712
DODIC: D510
DRAWING: 19-48-4359-20PM1003
WIDTH: 33 Inches
LENGTH: 64 Inches
HEIGHT: 27-1/2 Inches
WEIGHT: 1,397 Pounds
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<th>ITEM: MTSQ FUZE</th>
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PART 5

TEST RESULTS

A. TEST NO. 1:

1. Tests were conducted at Dammam Port (the port of reception of ammunition into SA) during the timeframe 31 October - 2 November 1990. Test items included the 155mm Copperhead projectiles, Hellfire missile AGM-114A, and the 155mm HE ADAM projectiles (see page 5-4). As tested, the 155mm Copperhead projectiles were stacked four-high with temperature probes located on the top, exposed directly to solar radiation, and on the third pallet from the top, which was shaded from direct sunlight. The Hellfire missiles were stacked two-high with a temperature probe located between the pallet's skids. The 155mm HE ADAM projectiles were stacked one-high with a probe located on the projectiles' surface close to the lifting plug, and a second probe located approximately 1/3 of the way down from the top of the projectile.

2. During this test, peak ambient temperature was 89 degrees Fahrenheit while the 155mm projectiles reached a maximum temperature of 116 degrees Fahrenheit when exposed directly to the sun, and 94 degrees Fahrenheit for the shaded projectiles (see graphs 1 and 2). The 155mm Copperhead projectiles, when exposed to the sun, reached 110 degrees Fahrenheit while probes shaded between pallets reached a temperature of 86 degrees Fahrenheit, 3 degrees Fahrenheit below ambient (see graphs 3 and 4). During this test, the Hellfire missile reached a maximum temperature of 122 degrees Fahrenheit when exposed directly to the sun (see graph 5).
3. Test no. 1 indicated that although SA was entering its winter season, temperature differentials of 33 degrees over ambient were possible when ammunition was exposed directly to the sun; also, due to the cooler nights of approximately 75 degrees Fahrenheit, some ammunition remained below peak ambient temperature due to thermal lag and short duration of peak daytime temperatures. Different ammunition also received different maximum temperatures, most likely due to location of the probe and thermal mass.
INDICATES LOCATION OF THERMISTOR PROBES

HELLFIRE MISSILE

155 MM HE ADAM M731

INDICATES LOCATION OF THERMISTOR PROBE

155 MM COPPERHEAD

TEST No. 1
TEST SITE DAMMAM PORT
Saudi Arabia Temperature Data
Damman Port
10/31/90 to 11/02/90

Sample Time (Hours) — Ambient Temperature

Front Side, Pallet 1
Degrees Fahrenheit

Back: Proj. 155MM, Ha. Adan, NY 31
Saudi Arabia Temperature Data
Dammam Port
10/31/90 to 11/02/90

Sample Time
(Hours)

--- Ambient Temperature

--- 4th Pallet Top

(Deares Fahrenheit)
Saudi Arabia Temperature Data
Dammam Port
10/31/98 to 11/02/98

Sample Time (Hours)

Ambient Temperature

Graph 4
Saudi Arabia Temperature Data
Dammam Port
10/31/90 to 11/02/90

Sample Time (Hours)
— Ambient Temperature

Graph 5
TEST RESULTS

B. TEST NO. 2:

1. This test was conducted at the Quarry ASP, which is located 40 - 50 kilometers southwest of the Port of Dammam, from 7-12 November 1990 on two different lots of 155mm propelling charges. The 155mm projectiles were stacked one pallet high on pad no. A07. During this test, temperature probes were located on top of the pallet as well as midway between layers (see page 5-12 for location of details).

2. Peak ambient temperature reached 96 degrees Fahrenheit while the top of the pallet reached 119 degrees Fahrenheit, and the side of the pallet facing the sun reached 123 degrees Fahrenheit (see graphs 6 and 7). Shaded interior probes remained very close to ambient with the maximum temperature reaching approximately 98 degrees Fahrenheit (see graphs 8, 9, and 10).

3. This test demonstrated that outer layers (top and sides) exposed directly to sunlight have the highest potential for heat damage. Containers shaded by outer layers within the unit load remained cool and very close to ambient. Very little heat transfer from outer to inner layers was noted, primarily due to the air space between adjacent layers (air being a poor heat transfer medium).
INDICATES LOCATION OF THERMISTOR PROBES

155 MM PROP CHARGE

TEST No. 2
TEST SITE TSA No. 1 QUARRY
Saudi Arabia Temperature Data
TSA #1 Quarry Pad A87
11/07/90 to 11/12/90

Sample Time (Hours) — Ambient Temperature

119.
185.
91.0
77.0
63.0

16.0 48.0 80.0 112. 144.
Saudia Arabia Temperature Data
USA 81 Quarry Pad 967
11/07/96 to 11/12/96

Sample Time (Hours)

Ambient Temperature

(°F or °C)

Data points:
- 126
- 112
- 98.6
- 84.9
- 79.8

Graph 7
Saudi Arabia Temperature Data
ISA 81 Quarry Pad 807
11/07/98 to 11/12/98

Sample Time (Hours)  Ambient Temperature

2A: 155MM Prop Charges: IND3X-876319
Pallet Interior Between 2nd & 3rd Row (Degrees Fahrenheit)
Saudi Arabia Temperature Data
TSA #1 Quarry Pad A07
11/07/98 to 11/12/98

Sample Time
(Hours)  —— Ambient
Temperature

2B: 155FH Prop Charges, IND83K-872319
Pallet End, 2nd Row, Towards Sun
(Degrees Fahrenheit)
Saudi Arabia Temperature Data
ISA #1 Quarry Pad A07
11/07/98 to 11/12/98

Sample Time (Hours)  Ambient Temperature

75.0
83.0
91.0
99.0

67.0
16.0  48.0  80.0  112.  144.

SA: 155Mm Prop Charges, IND82C-078819
Pallet Interior Between 4th & 5th Row (Degrees Fahrenheit)
C. TEST NO. 3:

1. This test was conducted 12-23 November 1990 on pad no. 017 at the Quarry ASP. The test was conducted on one pallet of Hellfire missiles (AGM-114C). Test probes were placed on the top containers, which were exposed directly to the sun; also, three shaded probes were placed between shipping containers and on the sides (see page 5-21 for details).

2. This test lasted 11 days with the peak ambient temperature reaching 90 degrees Fahrenheit for a short period of time while the probe between the containers only reached 95 degrees Fahrenheit. The two probes positioned fore and aft on the container's shaded sides reached 95 degrees Fahrenheit and 102 degrees Fahrenheit, respectfully, and were shaded. On the ninth day of testing, ambient temperature was only 82 degrees Fahrenheit; however, the top of the pallet approached 113 degrees Fahrenheit with all other surface probes remaining between 90 - 95 degrees Fahrenheit (see graphs 11 - 14).

3. During this test, the surface skin temperature of the container was exposed directly to the sun and was not directly dependent on ambient temperature. For instance, on the second day of testing, the container skin reached 115 degrees Fahrenheit while ambient temperature was 90 degrees Fahrenheit, or a 25 degree Fahrenheit differential. On the ninth day, the skin temperature approached 113 degrees Fahrenheit while the ambient temperature was 82 degrees Fahrenheit, or a temperature differential of 31 degrees Fahrenheit. This variation in temperature differential is due to cloud cover, length of exposure to direct sunlight, air purity (amount of particulate in the air), and wind speed, to name a few. These uncontrollable
variables make direct correlation between ambient temperature and skin temperature impossible. Indirect correlation may be derived with a window (range) of expected surface temperatures.
HELFIRE MISSILE

TEST NUMBER 3
TEST SITE TSA #1 QUARRY
INDICATES LOCATION OF THERMISTOR PROBES

HELLFIRE MISSILE

TEST No. 3
TEST SITE TSA No. 1 QUARRY

DRAFTSMAN TS
TEST ENGINEER

CHIEF, VALIDATION ENGINEERING DIVISION
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, ILLINOIS 61074-6439
Saudi Arabia Temperature Data
TSA #1 Quarry Pad A17
11/12/90 to 11/23/90

Sample Time
(Hours) —— Ambient
Temperature

24: Hellfire, 1418-01-192-6299
Between Containers
(Degrees Fahrenheit)
TEST RESULTS

D. TEST NO. 4:

1. This test was conducted 23 November - 4 December 1990 on mechanical time, superquick (MTSQ) fuzes (M577) and 23 November - 10 December 1990 on Proximity fuzes (M732) at the Quarry ASP. During this test, temperature probes were located on the top containers, between the wooden boxes, on both the exposed and shaded sides of the pallet (see test site setup on page 5-29 for details).

2. For the MTSQ fuzes, the temperature probe buried between ammunition boxes had a maximum temperature of approximately 79 degrees Fahrenheit and demonstrated thermal lag (as noted in test no. 3). The probe exposed to the shady side of the pallet reached a maximum of 102 degrees Fahrenheit and exceeded the maximum ambient temperatures of between 5 degrees Fahrenheit and 20 degrees Fahrenheit on a day-to-day basis. This gave some indication of direct sunlight hitting this side of the pallet. For Proximity fuzes, ambient temperatures ranged between 78 degrees Fahrenheit and 85 degrees Fahrenheit during testing. The probe exposed directly to the sun varied between 98 degrees Fahrenheit and 115 degrees Fahrenheit. Probes between pallet boxes remained close to ambient throughout testing with a thermal lag. Notably, this probe never reached the highs or the lows of the daily ambient temperature swings. Probes on top of the pallet reached a maximum temperature of 102 degrees Fahrenheit, or 20 degrees Fahrenheit above ambient on the 12th day of testing.

3. Upon completion of this test, the following observations were formed:
   a. Although tests were conducted during the late fall/early winter, temperatures exceeded 100 degrees Fahrenheit on the ammunition items.
b. Probes measuring inside pallet temperatures showed clear thermal lag, not cooling off or warming up as fast as ambient, which is to be expected. However, during summer months this could have an adverse effect on storing heat not dissipated off at night exposing ammunition to longer periods of high temperatures.
FUZES

TEST NUMBER 4.
TEST SITE TSA #1 QUARRY
INDICATES LOCATION OF THERMISTOR PROBES

FUZES

TEST No. 4
TEST SITE TSA No. 1 QUARRY

CHIEF, VALIDATION ENGINEERING DIVISION
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL, SAVANNA, ILLINOIS 61074-0439

5-29
Saudi Arabia Temperature Data
TSA #1
11/23/98 to 11/29/98

Sample Time
(Hours)

--- Ambient Temperature

Graph 15
Saudi Arabia Temperature Data
TSA #1
11/30/90 to 12/04/90

Sample Time (Hours)  Ambient Temperature
Saudi Arabia Temperature Data
TSA #1
11/23/90 to 11/29/90

38° Fuze, MISA M577, 1398-N285
Box Side, Shaded Side
(Degrees Fahrenheit)

Sample Time
(Hours)

--- Ambient Temperature
Saudi Arabia Temperature Data
TSA #1
11/30/98 to 12/04/98

Sample Time (Hours) -- Ambient Temperature

Degrees Fahrenheit
Saudi Arabia Temperature Data
TSA #1
12/03/98 to 12/10/98

---

Sample Time (Hours) --- Ambient Temperature

---
Saudi Arabia Temperature Data
TSA #1
11/23/90 to 12/02/90

Sample Time (Hours)
— Ambient Temperature

2A: Fuzes, Proximity IT632, 1398-N464
Between Row 2 & 3, 6 ft Down (Degrees Fahrenheit)
Saudi Arabia Temperature Data
TSA #1
12/03/90 to 12/10/90

Sample Time (Hours)

--- Ambient Temperature

--- Lines of Data

--- Graph Title

--- X-Axis: Sample Time (Hours)
--- Y-Axis: Degrees Fahrenheit

--- Data Points

--- Legend

--- Scale: 0 to 100

--- Units: Fahrenheit

--- Time Period: 12/03/90 to 12/10/90

--- Data Source: Proximity M732, 1398-N464
--- Between Row 2 & 3, 6" Deam
Saudi Arabia Temperature Data
TSA #1
12/03/90 to 12/10/90

Sample Time
(Hours)

--- Ambient
Temperature
PART 6

DISCUSSION

Although the tests in this report were conducted during late fall/early winter and were of short duration, the following insights are possible as to climatic environmental effects on ammunition storage and monitoring programs in SA:

a. Heat damage during this timeframe is highly unlikely if the critical temperature is 160 degrees Fahrenheit or greater. It can be expected that ammunition will exceed 160 degrees Fahrenheit during the summer timeframe, resulting in potential heat damage to the ammunition.

b. Some ammunition appeared to absorb more solar radiation than others with higher skin temperatures. If this observation is correct, critical items should be identified early and monitored first during full scale evaluations.

c. In lieu of protective covering, empty containers/boxes should be used as shielding on the top and sides of pallets to avoid solar radiation. Noteworthy, inner layers remained close to the ambient temperature with little heat transfer.

d. There is no direct correlation between ammunition skin temperature and ambient temperature, it is dependent on such variables as wind speed and direction, length of exposure, cloud cover, amount of particulate in the air, thermal mass of the ammunition, etc.

e. Heat damage to the ammunition cannot be determined by skin temperature probes alone, due to the thermal lag and heat transfer into the rounds. To thoroughly evaluate high temperature effects on ammunition, live ammunition of known condition must have internal thermal couples installed on critical elements in order to monitor true temperature. Safety approval must be granted prior to instrumenting any live ammunition.
PART 7

APPENDIX

Future items to be tested in SA.
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<th>ITEM</th>
<th>DODIC</th>
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<td>CHG, PROP, 8 INCH WB M188A1</td>
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<td>FUZE, MTSQ M577/M577A1</td>
<td>M285</td>
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KNOWN PROBLEM AT HIGH TEMPERATURE

- COMBUST. CASE WATER DAMAGE
- COMBUST. CASE GLUE JOINT PENETRATOR CORROSION
- STABILIZER DEPLETION
- BAG DETERIORATION
- MELTING WAX
- EVAPORATION OF LUBRICANT
- STABILIZER DEPLETION
- DAMAGED COMBUST. CART. CASE
- STABILIZER DEPLETION
- WARHEAD DETERIORATION
- STABILIZER DEPLETION
- PENETRATOR CORROSION
- DELAMINATION OF INHIBITOR
- CRACKING OF PROPELLANT
- STABILIZER DEPLETION
- STABILIZER DEPLETION
- BAG DETERIORATION
- DELAMINATION OF INHIBITOR
- CRACKING OF PROPELLANT GRAIN
- STABILIZER DEPLETION

LEAKING BATTERIES

STABILIZER DEPLETION

BAG DETERIORATION
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<td>MINE, APERS HE M74 (GEMSS)/AT HE, M75 (GEMSS)</td>
<td>K151/K184</td>
<td>CORROSION OF FUZES</td>
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<td>CAPACITOR PROBLEM</td>
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<tr>
<td>CTG, 60MM SMK, M302A1</td>
<td>B630</td>
<td>MELTING WP</td>
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<td>STABILIZER DEPLETION</td>
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<tr>
<td>CTG, 4.2 INCH SMK, M328A1</td>
<td>C706</td>
<td>MELTING WP</td>
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<td>STABILIZER DEPLETION</td>
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<tr>
<td>CTG, 81MM HE, M374A3</td>
<td>C256</td>
<td>IGNITION CARTRIDGE SENSITIVITY</td>
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<td>STABILIZER DEPLETION</td>
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<td>GRENADE, HAND, FRAG M67</td>
<td>G881</td>
<td>SHORT FUZE TIME</td>
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<tr>
<td>CTG, 81MM HE, M821</td>
<td>C888</td>
<td>HIGH TEMP. PERFORMANCE CONCERN</td>
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<td>STABILIZER DEPLETION</td>
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<td>CTG, 4.2 INCH HE, M329A2</td>
<td>C897</td>
<td>HIGH TEMP. PERFORMANCE CONCERN</td>
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<td>STABILIZER DEPLETION</td>
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<td>OBTURATOR 'GROWTH'</td>
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<td>CTG, 60MM HE, M494A</td>
<td>B632</td>
<td>HIGH TEMP. PERFORMANCE CONCERN</td>
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<td>CTG, 60MM ILLUM, M83A3</td>
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<td>HIGH TEMP. PERFORMANCE CONCERN</td>
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<td>FUNCTIONING DEFECTS</td>
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<td>CTG, 4.2 INCH HE, M329A1</td>
<td>C705</td>
<td>HIGH TEMP. PERFORMANCE CONCERN</td>
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<td>STABILIZER DEPLETION</td>
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<tr>
<td>M888, 60MM HE</td>
<td>B643</td>
<td>STABILIZER DEPLETION</td>
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<tr>
<td>155MM COPPERHEAD PROJECTILE</td>
<td>M712</td>
<td>HIGH COST PROJECTILE</td>
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WEATHER STATION
ASSEMBLY DRAWING - PAGE 3 of 3

NOTE:
AFTER FINAL ASSEMBLY AND ALIGNMENT FACING EAST THE WEATHER STATION SHOULD APPEAR AS SHOWN WHEN FACING THE CONTROL PANEL DOOR.

STEP 13
ATTACH THREE (3) GUIDE WIRES TO LEG SUPPORTS AND TIGHTEN

STEP 14
VERTICALLY LEVEL WEATHER STATION AT TWO PLACES MARKED GREEN USING PEST LEVELING DEVICES

LOCATION FOR PLACEMENT OF BASE TO LEVEL MAST (GREEN MARKS)

STEP 15
ALGN THIS SIDE OF WEATHER STATION DIRECTLY EAST AND APPLY BANDAGS TO WEATHER STATION PEST. SIX (6) BANDAGS ARE ENCLOSED WITH EACH WEATHER STATION.

LOWER SUPPORT/CONTROL ASSEMBLY

INDICATES TYPICAL BANDAGS APPLICATION

INDICATES GROUND LEVEL

DRAFTSMA TRS
TEST ENGINEER

THAT IS, WEATHER STATION
ASSEMBLY DRAWING - PAGE 3 of 3

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NOTES:
1. 37-CHANNEL DATA ACQUISITION.
2. WIRE HARNESS INSTALLATION.
   a. (2-6 CHANNEL CABLE)
   b. (2-10 CHANNEL CABLE)
3. WIRE LENGTHS (APPROX).
   a. 8 AT 25 FOOT
   b. 8 AT 50 FOOT
   c. 8 AT 75 FOOT
   d. 8 AT 100 FOOT

WEATHER STATION
1. SOLAR RADIATION.
2. AMBIENT TEMPERATURE.
3. AMBIENT HUMIDITY.
4. WIND SPEED.
5. WIND DIRECTION.

TEST ITEM
1. 1 PALLEI EACH.
2. 2 TEMPERATURE PROBES.
   a. SHIPPING CONTAINER
   b. ITEM
3. RANDOM HUMIDITY CHECKS.

SITE PLAN (TYPICAL)
WEATHER STATION

1. SOLAR RADIATION.
2. AMBIENT TEMPERATURE.
3. AMBIENT HUMIDITY.
4. WIND SPEED.
5. WIND DIRECTION.

TEST ITEM

1. 1 PALLET EACH.
2. 2 TEMPERATURE PROBES.
   a. SHIPPING CONTAINER
   b. ITEM
3. RANDOM HUMIDITY CHECKS.

NOTES:

1. 37-CHANNEL DATA ACQUISITION.
2. WIRE HARNESS INSTALLATION.
   a. (2-6 CHANNEL CABLE)
   b. (2-10 CHANNEL CABLE)
3. WIRE LENGTHS (APPROX).
   a. 8 AT 25 FOOT
   b. 8 AT 50 FOOT
   c. 8 AT 75 FOOT
   d. 8 AT 100 FOOT

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USADACS INSTRUMENTATION
SITE PLAN
(TYPICAL)

90-033-0-S00008

VALIDATION ENGINEERING DIVISION
SHEET 2 OF 5
1. SOLAR RADIATION.
2. AMBIENT TEMPERATURE.
3. AMBIENT HUMIDITY.
4. WIND SPEED.
5. WIND DIRECTION.

TEST ITEM
1. 1 SHIPPING/STORAGE CNTR. EACH.
2. EACH ITEM INSTRUMENTED.
   a. EXTERIOR SKIN TEMPERATURE.
   b. MISSILE SURFACE TEMPERATURE.
   c. INTERIOR HUMIDITY.

NOTES:
1. 37-CHANNEL DATA ACQUISITION.
2. WIRE HARNESS INSTALLATION.
   a. (2-16 CHANNEL CABLE)
   b. 8 AT 25 FOOT
   c. 8 AT 50 FOOT
   d. 8 AT 75 FOOT
   e. 8 AT 100 FOOT

FOR INFORMATION ONLY
NOTE: REPRESENTS UPGRADED 69 CHANNEL WEATHER STATIONS
FOR INFORMATION ONLY

USADACS INSTRUMENTATION SITE PLAN (TYPICAL)

VALIDATION ENGINEERING DIVISION SHEET 4 OF 5

90-033-0-S00010

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