



DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY DUGWAY PROVING GROUND
DUGWAY, UT 84022-5000

TEDT-DPW-LS

September 2015

MEMORANDUM FOR US Army Test and Evaluation Command (ATEC) Army Evaluation Center (AEC), Test Operations Division (CSTE-TM/M. Joiner), 2202 Aberdeen Boulevard, Aberdeen Proving Ground, MD 21005-5001

SUBJECT: Test Record for the Thunderstorm Advanced Technology Demonstration (ATD), US Army Test and Evaluation Command (ATEC) Project Number 2015-DT-DPG-RDECO-G2203, West Desert Test Center (WDTC) Document Number WDTC-RR-15-053

1. Subject document is forwarded to you for information and retention.
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3. TEAM DUGWAY – Empowering the Nation’s Defenders!

11/17/2015

Encl

X Ryan Harris

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ATEC Project No. 2015-DT-DPG-RDECO-G2203
WDTC Document No. WDTC-RR-15-053



DEPARTMENT OF THE ARMY
US ARMY DUGWAY PROVING GROUND
DUGWAY, UTAH 84022-5000

TEST RECORD
FOR THE
THUNDERSTORM ADVANCED TECHNOLOGY DEMONSTRATION (ATD)

Brief Description of Test: Provide simulant clouds for chemical and biological unmanned aerial systems (UASs).

Type Test and Item: Advanced technology demonstration (ATD); Proprietary technology from multiple vendors.

Location of Test:
Camp Shelby, Mississippi.

Dates of Test: 22 through 28 February 2015.

Authority: On 26 January 2015, US Army Test and Evaluation Command (ATEC), Aberdeen Proving Ground (APG), Maryland, issued a test support order through the ATEC Decision Support System (ADSS) authorizing West Desert Test Center (WDTC), US Army Dugway Proving Ground (DPG), Utah, to conduct the Thunderstorm ATD, ATEC Project Number 2015-DT-DPG-RDECO-G2203.

1. TEST ITEM(S)

None. DPG did not evaluate any test items during this demonstration. All Thunderstorm ATD participants supplied and operated their individual chemical and biological detection systems and were responsible for evaluating the performance of their technologies.

2. SUPPORTING MATERIEL, FACILITIES, AND INSTRUMENTATION

1. Facilities. Field testing was conducted at Camp Shelby, Mississippi.
2. Referee Instrumentation

(1) The Aerodynamic Particle Sizer[®] (APS[™], TSI, Shoreview, Minnesota) was used as a point detector to measure biological and other particles per liter (ppL) of air and particle-size distribution (PSD).

(2) The Gasmeter™ DX-4000 multi-component Fourier-transform infrared spectrometer (FTIR) gas analyzer (Gasmeter Technologies Inc., Toronto, Ontario, Canada) was used as a point detector to measure the concentration of chemical simulant vapors.

3. Dissemination Instrumentation

(1) The Sonomist™ (Misonix Inc., Farmingdale, New York) was used to disseminate liquid chemical simulants.

(2) Skil® blowers (Robert Bosch Tool Corporation, Mt. Prospect, Illinois) were used to disseminate dry biological simulants.

(3) Deposition dissemination was completed by contaminating a spill pad with MeS, which represented a contaminated area, and was surveyed aurally.

3. TEST OBJECTIVE

1. Conduct simulant releases during test trials and verify releases using referee equipment.

2. Provide exercise participants with a data package of information collected from the referee equipment measurements for each trial.

4. DETAILS OF TEST

1. The Thunderstorm exercise was a demonstration of experimental technologies designed to detect chemical and/or biological contamination. Small portable detectors were mounted to UASs and operated by vendor participants to remotely report the level of contamination released in an urban environment. The exercise was conducted by Joint Program Manager (JPM) for Nuclear Biological Chemical Contamination Avoidance (NBC CA) at Camp Shelby, Mississippi. Thunderstorm ATD was divided into several different threat representative exercise vignettes (subtests), to test participant's detectors in varying scenarios. DPG provided the chemical and biological simulant releases for Vignettes 2 and 10. Vignette 2 simulated a chemical spill, which was represented by a spill contaminated with a chemical simulant by DPG. Vignette 10 simulated chemical and biological releases in urban and rural environments; DPG provided simulant releases to be surveyed aurally during these trials.

2. General Procedures

(1) All exercise participants and DPG personnel were assigned a unique call sign for test site entry/exit. The call sign master list was held by the Thunderstorm ATD test officer (TO). At the end of each testing day, any anticipated changes to the Thunderstorm ATD schedule were announced at the command post (CP) before dismissal. For more immediate schedule changes, such as imminent bad weather, announcements were delivered via radio contact.

(2) All participants attended a daily safety briefing and initialed the attendance roster.

(3) All grid access was coordinated through the CP and was approved by the TO. All foreign nationals were escorted by US Government personnel at all times.

(4) Any participants arriving late were required to sign in at the CP and were informed of the information contained in the day's safety briefing.

(5) All dissemination and referee system data were collected at the end of each night of testing and uploaded to a test computer by DPG personnel. The test computer was not part of any participant-provided technology. All referee data were archived and stored on the test network.

3. Challenge Material Preparation

(1) Challenge materials included the following biological and chemical simulants:

(1) The biological simulant used was *Bacillus thurengensis* (Bt).

(2) The chemical simulant used was methyl salicylate (MeS).

(2) The chemical simulant was obtained from a commercial vendor and the biological simulant was produced at DPG. If available, the source, batch record, and lot numbers for each challenge material were recorded and provided to the test participants. DPG conducted all quality control procedures necessary to characterize the biological simulant. Quality control data were collected.

4. Instrumentation Setup and Calibration

(1) Private industry and government exercise participants set up and operated their systems and maintained proprietary control of their technology and data during the test.

(2) The APS™ and Gasmeter™ referee instruments were set up, calibrated, and used to monitor and referee testing.

(3) Instrumentation locations were recorded in the TO logbook.

5. Test Execution

(1) Participant-provided technologies were mounted to the UAS in accordance with (IAW) onsite customer directions, and flown over the test grid during disseminations. UAS flight information was recorded.

(2) Before the start of dissemination each day, referee instrumentation was powered on and operated to establish background concentrations. Background particle concentration-level data were recorded with the APS™ units for 5 minutes.

(3) Before each trial, the TO announced when the simulant dissemination would begin. The simulant was disseminated IAW Paragraph 2.c. **NOTE**: The dissemination duration was dependent on the challenge material and all dissemination durations were recorded in the TO log.

(4) All trial information was recorded in the TO log, and a summary is provided in Table 1.1.

(5) The selection of the challenge material for each trial was based on customer needs and conditions on the grid. The challenge material used for each trial was recorded (Table 1.1).

(6) The quantity of disseminated challenge materials was determined by field personnel and recorded.

5. TEST DATA

A summary of the TO log is in Enclosure 1.

6. SUMMARY OF RESULTS

During Vignettes 2 and 10, a total of 10 trials were completed with biological and chemical simulants using Sonomist™, Skil® blower, and deposition dissemination. Ambient temperature ranged from 2.8° to 8.3°C (37° to 47°F), and relative humidity was 70 percent. Average wind speeds were between 0.5 and 2.5 m/sec (1.1 and 5.6 mph).

7. OBSERVATIONS/REMARKS/VISITORS

None.

SUBMITTED BY:

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- 4 Encls
- 1. Data
- 2. References
- 3. Abbreviations
- 4. Distribution List

DISTRIBUTION approved for public release; distribution is unlimited (August 2015). Other

requests for this document shall be referred to US Army Aberdeen Proving Ground (APG), Maryland, Communications-Electronics Research, Development and Engineering Center (CERDEC), 5900 Putnam Road, (ATTN: R.Bednarczyk), Fort Belvoir, Virginia 22060.

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ENCLOSURE 1. DATA

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Table 1.1. Test Officer Log; Thunderstorm ATD.

Date (2015)	Time (hhmm) ¹	Trial Name	Exercise Vignette ² Number	Simulant	Dissemination		
					Method	Average Concentration	Peak Concentration
24 February	1050	MeS01	2	MeS ³	Deposition	5 mg/m ³	NA ⁴
24 February	1450	MeS02	2	MeS	Deposition	5 mg/m ³	NA
26 February	1147	MeS03	10	MeS	Sonomist™	8 mg/m ³	12 mg/m ³
26 February	1159	MeS04	10	MeS	Sonomist™	9 mg/m ³	15 mg/m ³
26 February	1209	MeS05	10	MeS	Sonomist™	8 mg/m ³	12 mg/m ³
26 February	1219	MeS06	10	MeS	Sonomist™	8 mg/m ³	12 mg/m ³
26 February	1245	Bt01	10	Bt ⁵	Skil® blower	12,000 ppL ⁶	34,000 ppL
26 February	1652	MeS07	10	MeS	Sonomist™	5 mg/m ³	9 mg/m ³
26 February	1915	MeS08	10	MeS	Sonomist™	5 mg/m ³	7 mg/m ³
26 February	1947	MeS09	10	MeS	Sonomist™	10 mg/m ³	16 mg/m ³

¹Central Standard Time (CST).

²Exercise subtest: Vignette 2 simulated a chemical spill; Vignette 10 simulated chemical and biological aerosol releases.

³Methyl salicylate.

⁴Not applicable.

⁵*Bacillus thurengensis*.

⁶Particles per liter (of air).

Table 1.2. Meteorological Data; Thunderstorm ATD.

Date (2015)	Time (hhmm) ¹	Trial Name	Exercise Vignette ² Number	Simulant	Dissemination Method	Temperature (°C)	RH ³ (%)	Wind Speed (m/sec)	Wind Direction (degrees)
24 February	1050	MeS01	2	MeS ⁴	Deposition	2.8	70	1.0	340
24 February	1450	MeS02	2	MeS	Deposition	5.0	70	0.5	360
26 February	1147	MeS03	10	MeS	Sonomist™	3.9	70	2.5	360
26 February	1159	MeS04	10	MeS	Sonomist™	3.9	70	2.5	360
26 February	1209	MeS05	10	MeS	Sonomist™	3.9	70	2.5	360
26 February	1219	MeS06	10	MeS	Sonomist™	3.9	70	2.5	360
26 February	1245	Bt01	10	Bt ⁵	Skil® blower	3.9	70	2.5	360
26 February	1652	MeS07	10	MeS	Sonomist™	8.3	70	1.0	340
26 February	1915	MeS08	10	MeS	Sonomist™	8.3	70	1.0	340
26 February	1947	MeS09	10	MeS	Sonomist™	6.1	70	1.0	340

¹Central Standard Time (CST).

²Exercise subtest: Vignette 2 simulated a chemical spill; Vignette 10 simulated chemical and biological aerosol releases.

³Relative humidity.

⁴Methyl salicylate.

⁵*Bacillus thurengensis*.

ENCLOSURE 2. ABBREVIATIONS

ADSS – ATEC Decision Support System

APG – Aberdeen Proving Ground

APST[™] – Aerodynamic Particle Sizer[®]

ATD – Advanced Technology Demonstration

ATEC – US Army Test and Evaluation Command

ATTN – attention

Bt – *Bacillus thurengensis*

CP – command post

CST – Central Standard Time

DPG – US Army Dugway Proving Ground

FTIR – Fourier-transform infrared

IAW – in accordance with

JPM – Joint Program Manager

MeS – methyl salicylate

NA – not applicable

NBC CA – Nuclear Biological Chemical Contamination Avoidance

ppL – particles per liter

PSD – particle-size distribution

RH – relative humidity

TO – test officer

UAS – unmanned aerial system

WDTC – West Desert Test Center

ENCLOSURE 3. DISTRIBUTION LIST

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