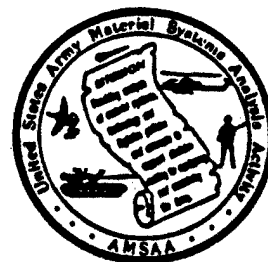


AMSAA



TECHNICAL REPORT NO. 570

**ANTI-ARMOR ADVANCED TECHNOLOGY DEMONSTRATION
(A2 ATD)**

VERIFICATION, VALIDATION AND ACCREDITATION

(VV&A) TOOLS

FOR SIMULATORS

March 1995

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**U. S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY
ABERDEEN PROVING GROUND, MARYLAND 21005-5071**

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13. ABSTRACT (Maximum 200 words) The Anti-armor Advanced Technology Demonstration (A2 ATD) is a series of Battlefield Distributed Simulation - Developmental (BDS-D) experiments focusing on A2 weapon systems evaluations. A2 ATD Experiments consist of a combination of one or more simulators coupled with modular semi-automated forces (MODSAF). Each combination requires Verification, Validation and Accreditation (VV&A) of: individual simulators, MODSAF, and the entire BDS-D simulation. Under the A2 ATD program, methodologies and tools have been designed and developed to assist in the VV&A process of individual simulators, MODSAF and the BDS-D simulation. This report outlines and describes the VV&A methodologies and tools developed and demonstrated for an individual simulator.				
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LIST OF ACRONYMS

AGS	- Armored Gun System
AMSAA	- Army Materiel Systems Analysis Activity
APC	- Armored Personnel Carrier
ATMT	- Anti-Tank Missile Test
A2 ATD	- Anti-Armor Advanced Technology Demonstration
BDS-D	- Battlefield Distributed Simulation - Developmental
CASTFOREM	- Combined Arms and Support Task Force Evaluation Model
CIG	- Computer Image Generator
CITV	- Commander's Independent Thermal Viewer
DIS	- Distributed Interactive Simulation
DISAT	- DIS Analytical Tools
DVO	- Direct View Optics
FLIR	- Forward Looking Infrared
FOR	- Field of Regard
GPS	- Gunner Primary Sight
IFOV	- Instantaneous Field of View
IOTE	- Initial Operational Test and Evaluation
LOSAT	- Line-of-Sight Anti-tank
MODSAF	- Modular Semi-Automated Forces
NFOV	- Narrow Field of View
NLOS	- Non-Line-of-Sight Anti-tank
PDU	- Protocol Data Unit
SIMAN	- Simulation Manger
STRICOM	- Simulation, Training and Instrumentation Command
TIS	- Thermal Integrated Sight
VV&A	- Verification, Validation and Accreditation
VVATT	- VV&A Test Tool
WFOV	- Wide Field of View

1. BACKGROUND

Historically, the analytical community has used constructive models such as Janus and the Combined Arms and Support Task Force Evaluation Model (CASTFOREM) to conduct analysis for the acquisition process. These types of models do not fully represent the impacts of human interaction with the system and the human influence on combat effectiveness of the system. The Training and the Research and Development communities have used real time man-in-the-loop Distributed Interactive Simulation (DIS) for several years. However, the full potential of DIS as an evaluation tool to support materiel acquisition decisions has not been realized.

The purpose of the Anti-armor Advanced Technology Demonstration (A2 ATD) is to develop and demonstrate a verified, validated, and accredited (VV&A) DIS capability to support anti-armor weapon system virtual prototyping, concept formulation, requirements definition, effectiveness evaluation, and mission area analysis on a combined arms battlefield at the battalion task force or brigade level.

The Battlefield Distributed Simulation - Developmental (BDS-D) simulation's synthetic environment represents the current state-of-the art in DIS. Upgrades to the environment, simulators, data analysis tools, and verification, validation, and accreditation are required to make BDS-D simulation a viable tool for supporting acquisition decisions. The BDS-D Advanced Technology Demonstration (ATD) is upgrading the environment and has taken the first step in verification, validation, and accreditation of the modular semi-automated forces, which simulates the computer generated forces. In addition, simulators being developed will have next generation hardware and also require verification, validation, and accreditation.

The A2 ATD technical objectives are:

1.) Demonstrate DIS as an evaluation tool and verify, validate, and accredit simulators used in the A2 ATD experiments, modular semi-automated forces (MODSAF), and the BDS-D simulation.

2.) Develop, demonstrate, and document analytical tools (techniques) to evaluate the causes of simulation outcomes.

3.) Demonstrate the linkage of constructive models (Janus and Eagle) to DIS.

4.) Demonstrate upgraded virtual prototypes (M1A2 Abrams, M2A3/M3A3 Bradley, Line of Sight Anti-Tank (LOSAT), Non-Line of Sight (NLOS)) and virtual prototypes to be developed (Comanche, Apache, Armored Gun System (AGS), Javelin).

Simulator and semi-automated forces verification, validation, and accreditation and development of analytical tools to support the evaluation of causes of simulation outcomes were initiated in FY93 to provide the foundation for six experiments in FY94, FY95 and FY96. The first FY94 experiment replicated two M1A2 Initial Operational Test and Evaluation (IOTE) vignettes to validate the BDS-D virtual simulation for the M1A2 based upon simulations of the real tanks at Ft. Hood (IOTE). Experiments 2, 3, and 5 evaluate heavy force anti-armor modernization and validate the MODSAF representations of the M1A2, M2A3/M3A3, LOSAT, NLOS, Comanche, Apache and M1A2 firing Smart Target Acquisition Fire and Forget (STAFF) in High Resolution Scenario 29 in Southwest Asia. Experiment 4 demonstrates Janus linked to BDS-D and evaluates Janus as an alternative to the Modular Semi-automated Force (MODSAF). Experiment 6 evaluates light force anti-armor modernization and validates MODSAF representations of Javelin, LOSAT, NLOS, Comanche and Apache.

2. VERIFICATION, VALIDATION AND ACCREDITATION OF MODELS, SIMULATORS AND SIMULATIONS

VV&A is required for models, simulators and simulations (MS and S) that are used to support ASARC/DAB programs. Figure 1 shows an overview of the VV&A process.

Verification: is the process of determining that the MS or S accurately represents the developer's conceptual description and specifications.

Validation: is the process of determining the extent that the MS or S represents the intended real world entity.

Accreditation: is an official certification that the MS or S has achieved an established level of credibility such that it can be used for a specific application.

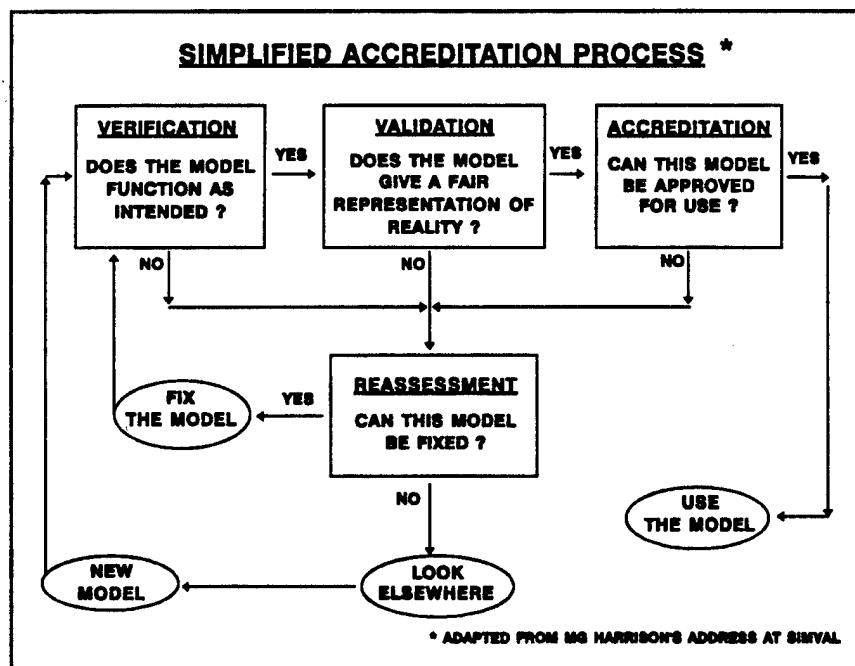


Figure 1 Simplified VV&A Process

The Battlefield Distributed Simulation - Developmental (BDS-D) is a simulation consisting of a combination of one or more simulators, modular semi-automated forces (MODSAF) and/or live systems. Each combination of simulators, MODSAF and live systems represents a unique simulation that requires Verification, Validation and Accreditation (VV&A). BDS-D VV&A requires VV&A of:

- 1.) individual simulators,
- 2.) MODSAF, and
- 3.) the BDS-D simulation.

The Anti-armor Advanced Technology Demonstration (A2 ATD) is focusing on the class of BDS-D applications that support A2 weapon systems evaluation. In support of the A2 ATD program, methodologies and tools have been designed and developed to assist in the VV&A process of individual simulators, MODSAF and the entire BDS-D simulation. In FY94 these methods and tools have also been demonstrated during VV&A of the M1A2 simulator, MODSAF version 1.2.3 and the A2 ATD Experiment 1. Experiment 1 was a BDS-D simulation using M1A2 simulators and MODSAF to replicate the M1A2 Operational Test at Ft. Hood.

The VV&A tools for the M1A2 simulator transfer well to other weapon systems/simulators. For example, nearly all weapon systems/simulators require a gunner to detect, recognize and identify targets; therefore, the M1A2 simulator VV&A methodology and tools developed to capture target acquisition capabilities are transferable.

3. PURPOSE

The purpose of this document is to outline and describe the VV&A tools developed for an individual simulator.

4. SIMULATOR VV&A TOOLS

The A2 ATD program requires VV&A of individual simulators. Since the purpose of A2 ATD centers on weapon systems evaluations, then the VV&A tools are also geared toward that end. Four of the VV&A tools were designed and developed under A2 ATD and the fifth tool, the Simulation Manger (SIMAN) was developed by STRICOM in order to control BDS-D simulations. However, A2 ATD used the SIMAN to assist in the VV&A. The five tools are:

- 1.) VV&A Test Tool (VVATT), for target acquisition experiments,
- 2.) VV&A Protocol Data Units (PDUs),
- 3.) Delivery Accuracy Logger Files,
- 4.) DIS Analytical Tools (DISAT), and
- 5.) Simulation Manager (SIMAN)

The following sections describe each one of these tools.

4.1 VV&A Test Tool (VVATT)

A2 ATD developed the VVATT to assist in the conduct and analysis of target acquisition tests for the M1A2 simulator. Two types of stationary target acquisition tests are supported:

- 1.) One tests the acquisition capability in the Instantaneous Field of View (IFOV), and
- 2.) the other tests the acquisition capability in a Field of Regard (FOR), i.e. search.

Tests are conducted at various ranges through each sensor (e.g. DVO, FLIR, etc.) coupled with a field of view type (e.g. narrow, wide, zoom, etc.). Figures 2 through 7 and Appendix A contain a sample of some of the VVATT menus and reports.

Prior to conducting a target acquisition test, the test conditions must be created. Figures 2 and 3 show the VVATT's Create Observer (i.e. simulator) and Create Target menus, respectively. The data entered into these menus can be obtained by first determining observer and target positions from MODSAF. A number of observer-target pairs are entered into the VVATT. Additionally, the test design involves range bands. Figure 4 shows an example of range band break-outs. This data is used by the VVATT to verify that the observer-target pairs are within the test range bands. For a FOR test, boards to mark the left and right boundaries for the field of regard/search are also entered on another menu screen. After the target acquisition test cases are input to the VVATT, then the test may be conducted.

The VVATT, in conjunction with the simulator, is used to execute a target acquisition test. Figure 5 shows the first VVATT menu. Here the observer's/soldier's personnel information is entered. When "Go" is depressed, the sequence of observer-target pairs will be executed and the acquisition data menu appears on the VVATT. The simulator is positioned at a particular location on the virtual battlefield and the target appears at a predefined location. In an IFOV test, the soldier looks through the sight and attempts to acquire the target at the highest level of acquisition that he can discern. Acquisition levels in ascending order are: no target, detection, recognition - target class, and identification - target nomenclature. The acquisition data menu, Figure 6, contains the choices of soldier acquisition responses. Furthermore, the soldier will also state which partitioned segment of the sight, Figure 7, the target appears in. In the FOR test, the soldier searches for a target in an area delineated by

Create Observer

Create Observer

Observer #1 of 20

Entity ID

2

Entity Type

M1A2

UTM Zone

14

Easting

608017

Northing

3458050

Location Z

269

Heading

151.000

Turret Heading

2.346

Bumper ID

01234567890

FOV Type

NFOV

Sensor

DVO

GCC X: -746906.928

GCC Y: -5406307.144

GCC Z: 3290077.019

Back

Prev

Next

Dup Prev

Accept

Cancel

Figure 2 Create Observer Menu

Create Target

Create Target

Target #1 of 20

Entity ID

12

Entity Type

BMP2

▼

UTM Zone

14

Eastings

608017

meters

Northing

3458080

meters

Location Z

2000

meters

Heading

198.000

degrees

Pitch

2.346

degrees

Roll

0.000

degrees

Bumper ID

11234567890

Exposure

Hull Defilade

▼

GCC X: -747109.438

GCC Y: -5407778.022

GCC Z: 3290975.102

GCC Range: 1731.000

Range Band: SHORT

Back

Prev

Next

Dup Prev

Dup Observ

Accept

Cancel

Figure 3 Create Target Menu

Document Title - Range Band Configuration

RANGE BANDS For ACQ Trials

	MIN	MAX
SHORT:	1600	1800
MEDIUM:	2400	2600
LONG:	3600	3800
VERY LONG:	5400	5600

Validity Check Status
Range Check OK

Default
Cancel

Save/Retrieve Configuration

File: ../Datafiles/ran1.cfg

Save Retrieve Confirm Abort

Figure 4 Range Bands Menu

— ACQ Personal Data

Student Personal Data

Name:

SSN
(4 digits for report name)

Date

Trial# (provided by test personnel)
(FOR: 1-20, IFOV: 21-40)

Input trial file: ../Datafiles/TRIAL1.DAT
--> OK, Trial file does EXIST

Output report file: ../Reportfiles/REPORT34561.DAT

Save/Retrieve Configuration

File:

Figure 5 Personnel Data Menu

Acquisition Data

IFOV Condition #1 of 40

▼ Detection

Recognition

▼ Tank ▼ APC ▼ Truck ▼ F/W ▼ R/W ▼ SP Artillery

Identification

▼ M1A2	▼ M2A3	▼ NLOS	▼ F-15 Eagle	▼ OH-68 Scout	▼ M109A6 155 How
▼ LOSAT	▼ BTR-80	▼ HIMMV	▼ F-16 Falcon	▼ AH-1 Cobra	▼ 2S19 162 How
▼ T-82	▼ BMP-2	▼ HEMTT	▼ F/A-18 Hornet	▼ AH-64 Apache	▼ M108 120 Mortar
▼ T-72		▼ BM21 roc laun	▼ SU-25	▼ RAH66 Comanche	▼ 2S12 120 Mortar
▼ T-80		▼ GAZ-66 4x4	▼ SU-29	▼ Mi-8 Hip	
				▼ Mi-24 Hind	
				▼ Mi-28 Hokum	

▼ No Target Exists

GO

ACQ STATUS
READY

Manual Timer

START
(OPTIONAL)

Elapsed: 0.00

Abort

Figure 6 Acquisition Data Menu

	Acquisition Supplemental Data				
Mark quadrant for IFOV ACQ Test <table border="1" style="width: 100%; height: 150px; border-collapse: collapse; text-align: center; vertical-align: middle;"> <tr> <td style="width: 25%; font-size: 2em;">1</td> <td style="width: 25%; font-size: 2em;">2</td> <td style="width: 25%; font-size: 2em;">3</td> <td style="width: 25%; font-size: 2em;">4</td> </tr> </table> Mark the quadrant where the target appeared GO		1	2	3	4
1	2	3	4		

Figure 7 Quadrant Data Menu

the left and right board markers. When he locates a target, the soldier states the acquisition at the highest level he can distinguish. For both IFOV and FOR tests, a stop clock tracks the time elapsed between target appearance and the soldier's response. After the target acquisition test trials are completed, the VVATT produces a report.

Appendix A pages A-2 through A-11 show the output results. Each individual observer-target pair is tracked and scored. Accounting scores for observer responses versus ground truth are maintained for detection, recognition, identification, false targets, null targets and time. Near the end of the report, summary data is produced. A sample is contained on pages A-10 and A-11.

The VVATT assists in rapidly stepping through structured target acquisition tests, scoring and summarizing the results.

4.2 VV&A Protocol Data Units (PDU's)

A PDU is a unit of data that is passed on a network between simulation entities or applications. Standard PDU's are defined by the Distributed Interactive Simulation (DIS) Community. VV&A PDU's are specialized PDU's generated by the simulator. Actually, the VV&A PDU's are not separate PDU's, but are wrapped inside an Action Response PDU customized for each VV&A category. The VV&A PDU's contain data that cannot be derived from the Standard DIS PDU's; the VV&A data contains intermediate and final calculations that the simulator must determine in order to function/operate correctly.

Six VV&A PDU's were designed, developed and used in the M1A2 simulator. These PDU's transfer well to other weapon platforms; however additional PDU's may be necessary to VV&A other weapon systems which exhibit special characteristics. Currently there are six VV&A PDU's and the structure/data fields of these PDU's are contained in Appendix B. The following briefly describes each PDU:

1.) Target Acquisition and Tracking PDU. The Target Acquisition and Tracking PDU is transmitted periodically at time intervals. From the structure contained in Appendix B, it is apparent that this information is used to analyze target tracking ability for a delivery accuracy evaluation. This PDU data can also be used to analyze search patterns for a target acquisition evaluation.

2.) Delivery Accuracy PDU. The Delivery Accuracy PDU is transmitted when a round is fired. The data in this PDU is used to conduct a delivery accuracy evaluation. This PDU is used in conjunction with the Target Acquisition and Tracking PDU in order to conduct delivery accuracy evaluations for the Sabot and HEAT rounds.

3.) Direct Fire Vulnerability PDU. The Direct Fire Vulnerability PDU is generated when the simulator receives a hit from a round. The data in this PDU provides the information to conduct an analysis regarding the direct fire vulnerability algorithms for kinetic energy, shaped charge and top-attack direct fired munitions.

4.) Indirect Fire Vulnerability PDU. The Indirect Fire Vulnerability PDU is generated when an indirect fire round detonates with a certain radius of the simulator. The information provides the ability to analyze the simulator's indirect fire algorithms for both high explosive and ICM type artillery rounds.

5.) Smart Target Acquisition Fire and Forget (STAFF) PDU. The STAFF PDU is generated when the simulator fires a STAFF munition. This PDU contains data which is customized to the STAFF munition. The STAFF round is a fire and forget round equipped with a seeker. Once a target is located by the STAFF munition, then the STAFF fires a submunition down onto the target. For analysis, the STAFF PDU is used to assess the STAFF round delivery accuracy and STAFF submunition functioning.

6.) Coax Machinegun PDU. The M1A2 simulator generates a Coax PDU when a 7.62mm tracer round is fired. A tracer round occurs on every 5th round of 7.62mm munition. The simulator models the tracer round in order to reduce the total number of packets which would be required if each round were modeled. This approach was chosen because of the 7.62mm coax machinegun's rapid firing rate. The Coax PDU contains data relative to a burst-fire weapon system. This PDU is used to evaluate the 7.62mm delivery accuracy.

The various VV&A PDU's can each be turned-on or turned-off. The capability of turning off the VV&A PDU's is necessary before conducting a BDS-D Experiment. There is concern that the Standard DIS PDU's generated during an Experiment could overload the network. Therefore, additional data/information generated by the VV&A PDU's simply add more packets on the network which potentially may cause network/real-time problems.

The VV&A PDU's were designed specifically for the M1A2 simulator; however they are sufficiently general that they may be used to capture the same data for nearly all ground platforms. The Target Acquisition and Tracking PDU is applicable to any weapon system that manual searches and tracks targets. This PDU could possibly also be used for automatic tracking. The Delivery Accuracy PDU may apply to any weapon system simulator that fires a round and uses biases and dispersion to model the fly-out. The Direct Fire Vulnerability and Indirect Fire Vulnerability PDU's are applicable to any simulator that uses the standard Army vulnerability algorithms. The Staff PDU may be used for other fly-over shoot-down type munitions. And finally the Coax PDU may be applicable to other burst-fired munitions.

4.3 Delivery Accuracy Logger Files

Prior to the A2 ATD Experiment 1, the delivery accuracy capability of the M1A2 simulator firing sabot and High Explosive Anti-Tank (HEAT) rounds was VV&A'd. Tests similar to the Technical Tests conducted on live M1A2 tanks at the Proving Ground were re-created in the virtual battlefield environment. Four major test scenarios are:

- 1.) stationary firer versus stationary targets,
- 2.) stationary firer versus moving targets,
- 3.) moving firer versus stationary targets, and
- 4.) moving firer versus moving targets.

The virtual test set-ups are created with logger files, which are comprised of PDU's. The M1A2 simulator is separately placed on the battlefield by use of the simulator console. During simulator delivery accuracy testing, the logger files are played back on the Datalogger while the soldiers in the simulators engage targets. Figures 8 through 11 graphically show the various delivery accuracy target board set-ups.

Figure 8 contains the stationary firer versus stationary target-board test. Four separate logger files were developed to place the eight collective target-boards at 1500, 2500, 3000, and 3500 meters range from the simulator. One logger file at a time is played back, while the gunners fire two sabot rounds at each target in sequence. Next, two HEAT rounds are fired at each target. Then, the 2500 meters logger file is played and the sequence continues until the last logger file is played back and engaged.

The stationary firer versus moving target-board tests are shown in Figure 9. One moving target is a crossing target and the other moving target is an evasive maneuvering target replicating the Anti-Tank Missile Test (ATMT) path. For the crossing target, three logger files were developed for target ranges of 1500, 2000 and 2500 meters distance from the simulator. The 1500 meter logger file is played back. After the target passes the marker; then the soldiers fire 2 sabot and 2 HEAT rounds. That same logger file is played back a number of times to obtain sufficient replications. Next, the 2000 meter logger file is engaged and replicated, followed by the 2500 meter logger file. In the case of the stationary firer versus maneuvering target, three logger files were developed for target ranges of 1500, 2000 and 2500

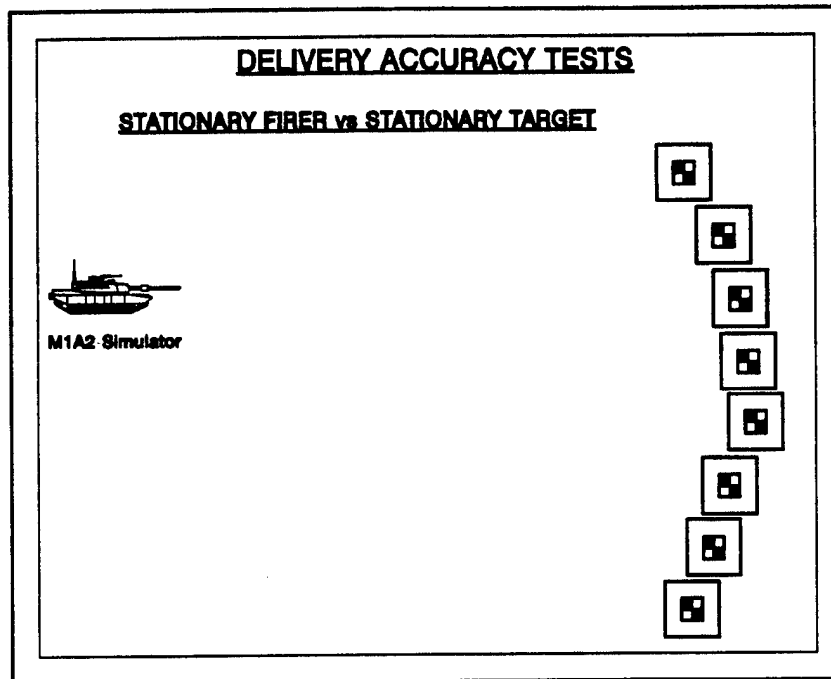


Figure 8 Stationary Firer vs Stationary Target

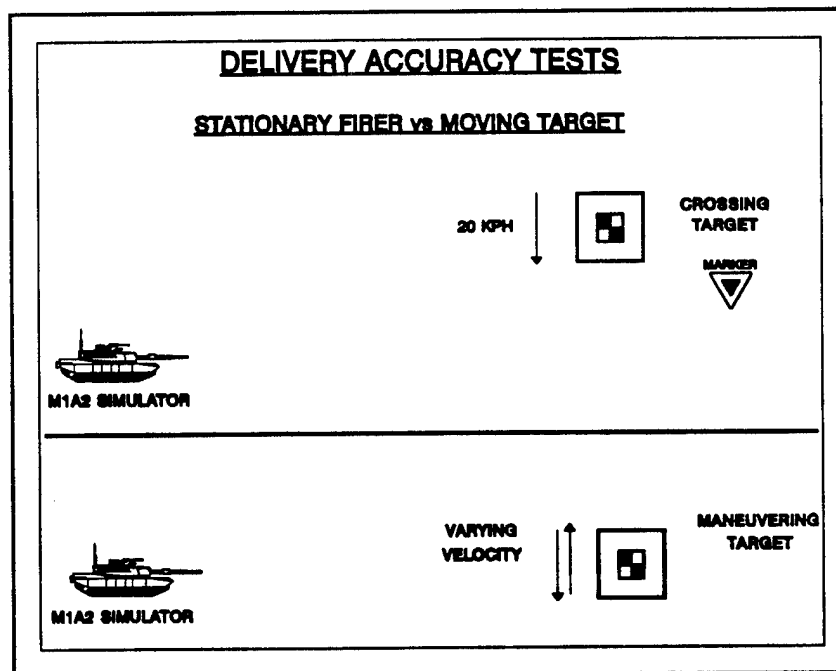


Figure 9 Stationary Firer vs Moving Target

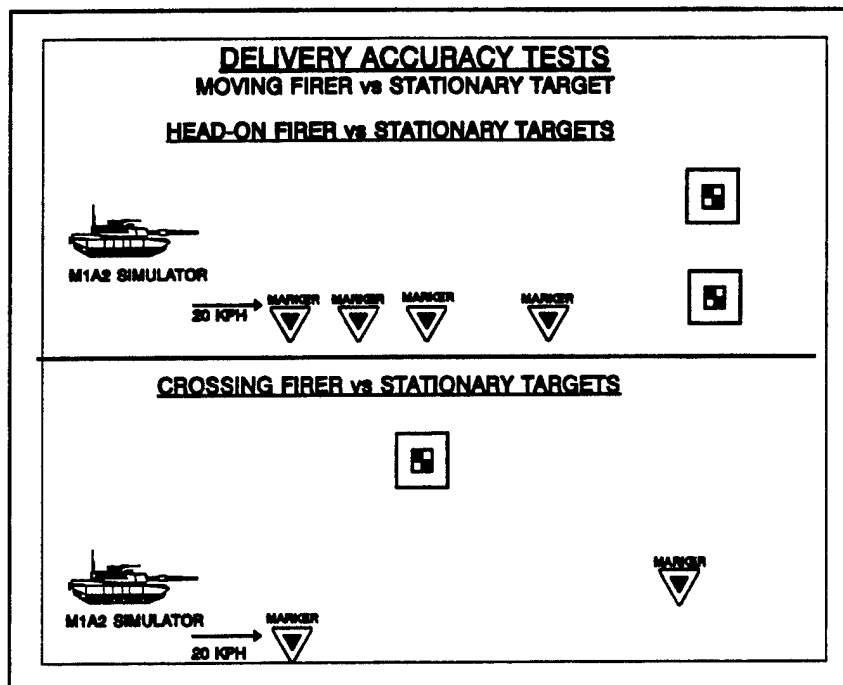


Figure 10 Moving Firer vs Stationary Target

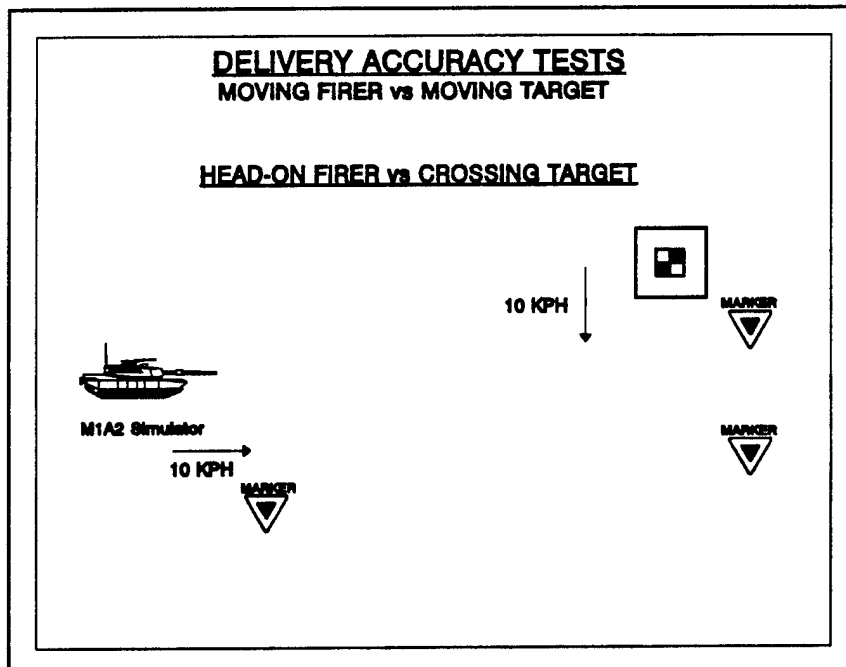


Figure 11 Moving Firer vs Moving Target

meters. During this test, the soldiers fired 10-20 sabot rounds in one replication and 10-20 HEAT rounds in the next replication.

The moving firer versus stationary targets tests are shown in Figure 10. The stationary targets and markers are played back in a logger file. The head-on firer approaches one of the target boards. As the simulator passes each marker, the gunner fires 2 sabot and 2 HEAT rounds. For the next replication, the simulator is repositioned to its previous location, drives toward the other target-board, and fires while passing the markers. This is repeated until sufficient replications are achieved.

The crossing firer versus stationary target, Figure 10, consists of two logger play back logger files. One logger file locates the target at 1000 meters range and the other logger file places the target at 1500 meters range. As in all cases, the simulator is positioned by the simulator console. In this test, the gunner slews the turret on target. As the simulator passes the first marker two sabot and two HEAT rounds are fired. Each logger file is replicated a number times.

The last delivery accuracy test examines the moving firer versus moving target scenario, as shown in Figure 11. One logger file was developed with markers and the target-board located at 1500 meters range. During the test, as the simulator passes the marker and the target is in between the markers, then the gunner fires two sabot rounds. Again, the logger file is replicated.

Logger files provide the ability to control a vehicle's path and speed, through specifying location points on the path and the vehicle's velocity and acceleration. Logger files also allow a target to sustain multiple hits without any damage or kill effect, which would interfere in a delivery accuracy test. Furthermore, the target's height above terrain can be held constant in a logger file, which is another desirable condition for delivery accuracy tests. MODSAF, on the other hand, does not permit the ability to input exact points on a path and to specify a particular velocity and acceleration between the points. MODSAF also forces vehicles to follow the terrain and to negotiate around unpassable terrain or obstacles.

4.4 DIS Analytical Tools (DISAT)

During VV&A testing, the simulator sends and receives standard DIS PDU's in addition to sending the specialized VV&A PDU's. All these PDU's are captured on a Datalogger. The Datalogged PDU's form the primary basic raw data which can be used in calculations to produce measures of effectiveness, performance, and behaviors. The DIS Analytical Tools (DISAT), developed by A2 ATD, consist of a number of computer routines which calculate certain measures of merit based on the Datalogged PDU's. A subset of the DISAT tool box was designed to support simulator VV&A.

The majority of the simulator VV&A DISAT routines simply extract the VV&A PDU's (actually Action Response PDU's), format the VV&A PDU fields and output the data. The VV&A PDU's contain the simulator's calculations. In addition to the VV&A PDU's, the DISAT uses other Standard DIS PDU's to determine critical data necessary to supplement and to validate the calculations that are contained in the VV&A PDU's. The Standard DIS PDU's typically used are the Entity State, Fire and Detonate. The DISAT formats and outputs applicable fields such as the simulator's location and heading, the target location and heading, round detonation location, etc. The DISAT also calculates the range to target, attack angle of rounds, velocity versus time and acceleration versus time.

4.5 Simulation Manager (SIMAN)

The Simulation Manager, developed by STRICOM, issues and receives Simulation Management PDU's in order to initiate and control an exercise. PDU's that SIMAN sends are: Set Data, Data Query, Action Request, Create Entity, Remove Entity, Start/Resume, and Stop/Freeze. PDU's that SIMAN receives are: Event Report, Data, Action Response, and Acknowledge. All these PDU's are not supported in the current SIMAN release. However, some of the SIMAN PDU's were used to support the M1A2 simulator VV&A, and as the SIMAN matures this tool may be more useful in facilitating the conduct of simulator VV&A.

The SIMAN issues Set Data PDU's that can be used to set the fuel level in a simulator. This Set Data was used in the M1A2 simulator VV&A to zero the fuel levels in the left and right fuel tanks, and to set the fuel level in the rear tank to a specific number of liters. Subsequently, a fuel consumption test could be executed with a known initial quantity of fuel. Without this tool either 1) the simulator code would have to be changed or 2) the fuel consumption test must be run with full rear and full auxiliary fuel cells requiring an inordinate amount of time to starve the simulator of fuel.

Another PDU that the SIMAN issues is the Data Query PDU. This PDU can be used to specify the periodic time interval that the simulator issues the Target Acquisition and Tracking VV&A PDU. The simulator is hard-coded to issue the Target Acquisition and Tracking PDU once every 2 seconds, currently; however, to support tracking analysis for delivery accuracy VV&A the data must be captured at a minimum frequency of 12 hertz. The Data Query PDU was used during the M1A2 VV&A to set the frequency of the Target Acquisition and Tracking PDU.

The Data Query PDU can also be used to change the Dead Reckoning parameters. This was not used for the M1A2 simulator VV&A; however, it could be used to support mobility/automotive performance tests. Appropriately changing the Dead Reckoning parameters will force Entity State PDU's to be generated more often. Entity State PDU's are the primary data source for mobility test data such as distance traveled, velocity, acceleration, etc. Frequent data points allow a better estimate of actual simulator performance.

SIMAN was only used for a few functions during the M1A2 VV&A; however, these functions were critical to obtaining quality data, reducing test time and avoiding temporarily changing hard-coded simulator default values.

5 . SUMMARY

The VV&A tools will continue to evolve and mature. In addition, other tools will be developed. For example, play-back logger files for vulnerability tests would significantly reduce vulnerability test set-up and execution. The VV&A tools for simulators, to-date, have been developed for the M1A2 simulator; however the tools are sufficiently general for other weapon simulators to use or adapt.

REFERENCES

1. USAMSAA, Memorandum, Subject: Anti-Armor Advanced Technology Demonstration (A2 ATD) Technology Demonstration Plan (TDP), 29 Apr 1993.
2. "Anti-Armor Advanced Technology Demonstration (A2 ATD) Line-of-Sight Anti-tank (LOSAT) Simulator Verification, Validation and Accreditation Plan", Draft AMSAA Report, Feb 1994.
3. "Anti-Armor Advanced Technology Demonstration (A2 ATD) M1A2 Simulator Verification, Validation and Accreditation Plan", Draft AMSAA Report, Dec 1993.
4. Discussions between Irene Johnson (AMSAA) and Paul Monday (Loral - Advanced Distributed Simulation), Subject: Logger Files and DISAT, Aug 1994.
5. Discussions between Irene Johnson (AMSAA) and Tung Duong (Loral - Advanced Distributed Simulation), Subject: VVATT, Feb 1995.
6. "Interface Requirements Specification/Design Document for M1A2 Simulator System", Orion Advanced Simulation and Intel Systems Inc, OASIS-LR-9301-05-02, Mar 1994.

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APPENDIX A - VVATT SAMPLE

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ADDED TARGET ACQUISITION TEST
ACTIVITY RECORD

```

1 1
2 1
3 1
4 Name: John Doe
5 SER: 111-22-3456
6 Date: 11/21/94
7 Trial Number: 1
8 Trial Type: FOR
9
10
11 CONDITION #1
12 -----
13
14 OWN VEH:
15 ID: MIA2 (Tank)
16 UTM coord: (Zone = 14, M = 3458050.000, E = 608017.000, S = 269.000)
17 GCC coord: (X = -76705.833, Y = -5406307.144, S = 3290077.019)
18 FOV: MPOV (3), Sensor: DMO (3)
19
20 BOARDS:
21 Board #1 ID: MIA2 (Tank)
22 UTM coord: (Zone = 14, M = 3458050.000, E = 608017.000, S = 2000.000)
23 GCC coord: (X = -76705.833, Y = -5407771.022, S = 3290975.102)
24 GCC range: 3701.000 (Band = 'LONG')
25 Board #2 ID: MIA2 (Tank)
26 UTM coord: (Zone = 14, M = 3458050.000, E = 608017.000, S = 4005.000)
27 GCC coord: (X = -767344.003, Y = -5409470.933, S = 3292015.343)
28 GCC range: 3718.000 (Band = 'LONG')
29
30 ACTUAL TGT:
31 Recognition: Tank (Null Defile)
32 Identification: MIA2
33 UTM coord: (Zone = 14, M = 3458050.000, E = 608017.000, S = 2000.000)
34 GCC coord: (X = -767109.438, Y = -5407771.022, S = 3290975.102)
35 GCC range: 3731.000 (Band = 'SHORT')
36
37 PERCEIVED TGT:
38 Identification: MIA2 (Tank)
39 Acquisition Time: 0.20
40
41 SCORING:
42 Detection, Recognition, and Identification
43
44
45 CONDITION #2
46 -----
47
48 OWN VEH:
49 ID: MIA3 (APC)
50 UTM coord: (Zone = 14, M = 3458050.000, E = 506090.000, S = 169.000)
51 GCC coord: (X = -855035.469, Y = -541738.065, S = 3204572.476)
52 FOV: MPOV (1), Sensor: FLIR (1)
53
54 BOARDS:
55 Board #1 ID: MIA3 (APC)
56 UTM coord: (Zone = 14, M = 3458050.000, E = 506090.000, S = 5769.000)
57 GCC coord: (X = -855785.486, Y = -5446538.755, S = 3207402.550)
58 GCC range: 5600.000 (Band = 'VERY LONG')
59
60 ACTUAL TGT:
61 NULL Target
62
63 PERCEIVED TGT:
64 NULL Target
65 Acquisition Time: 0.30
66
67 SCORING:
68 NULL Target Detected Correctly
69
70
71 CONDITION #3

```

```

72
73
74 OWN VEH:
75 ID: MIA3 (Truck)
76 UTM coord: (Zone = 14, M = 3458050.000, E = 588017.000, S = 269.000)
77 GCC coord: (X = -766705.833, Y = -5403437.243, S = 3290236.459)
78 FOV: MPOV (3), Sensor: DMO (3)
79
80 BOARDS:
81 Board #1 ID: MIA3 (Truck)
82 UTM coord: (Zone = 14, M = 3458050.000, E = 588017.000, S = 3970.000)
83 GCC coord: (X = -767350.290, Y = -5406569.729, S = 329156.717)
84 GCC range: 3701.000 (Band = 'LONG')
85 Board #2 ID: MIA3 (Truck)
86 UTM coord: (Zone = 14, M = 3458050.000, E = 588017.000, S = 5769.000)
87 GCC coord: (X = -767186.139, Y = -5409092.383, S = 3291090.125)
88 GCC range: 5500.000 (Band = 'VERY LONG')
89
90 ACTUAL TGT:
91 NULL Target
92
93 PERCEIVED TGT:
94 Identification: MIA3 (Tank)
95 Acquisition Time: 0.30
96
97 SCORING:
98 Palen Target Detected
99
100
101 CONDITION #4
102 -----
103
104 OWN VEH:
105 ID: MIA3 (Tank)
106 UTM coord: (Zone = 14, M = 347250.000, E = 607900.000, S = 318.000)
107 GCC coord: (X = -89569.515, Y = -6304505.215, S = 347182.278)
108 FOV: MPOV (3), Sensor: TV (3)
109
110 BOARDS:
111 No Board
112
113 ACTUAL TGT:
114 Recognition: APC (Null Defile)
115 Identification: MIA3
116 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
117 GCC coord: (X = -6323736.584, Y = -831271.616, S = 0.000)
118 GCC range: 8977669.709 (Band = 'INVALID > VERY LONG')
119
120 PERCEIVED TGT:
121 Identification: MIA3 (APC)
122 Acquisition Time: 0.70
123
124 SCORING:
125 Detection and Recognition
126
127
128 CONDITION #5
129 -----
130
131 OWN VEH:
132 ID: MIA3 (APC)
133 UTM coord: (Zone = 14, M = 3458050.000, E = 607900.000, S = 318.000)
134 GCC coord: (X = -747128.443, Y = -5406562.936, S = 318050.700)
135 FOV: MPOV (4), Sensor: IR (4)
136
137 BOARDS:
138 Board #1 ID: MIA3 (APC)
139 UTM coord: (Zone = 14, M = 3458050.000, E = 607900.000, S = 4018.000)
140 GCC coord: (X = -747561.432, Y = -5430906.637, S = 3290909.816)
141 GCC range: 3700.000 (Band = 'LONG')
142

```

143] ACTUAL TGT:
 144] Recognition: Truck (Full Defilede)
 145] Identification: T-62
 146] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 2100.000)
 147] GCC coord: (X = -747126.342, Y = -5408539.990, Z = 3290016.521)
 148] GCC range: 1862.000 (Band = 'INVALID < MEDIUM')
 149] -----
 150] PERCEIVED TGT:
 151] Identification: T-62 (Tank)
 152] Acquisition Time: 0.30
 153] -----
 154] SCORING:
 155] Detection
 156] -----
 157] -----
 158] CONDITION 06
 159] -----
 160] -----
 161] OWN VEH:
 162] Id: MONSTER (Truck)
 163] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 318.000)
 164] GCC coord: (X = -747126.403, Y = -5408662.996, Z = 3290050.780)
 165] GCC range: 1862.000 (Band = 'INVALID < MEDIUM')
 166] -----
 167] BOARDS:
 168] Board #1 Id: T-62 (Tank)
 169] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 5018.000)
 170] GCC coord: (X = -747126.075, Y = -5411623.141, Z = 3291903.196)
 171] GCC range: 5502.000 (Band = 'VERY LONG')
 172] -----
 173] ACTUAL TGT:
 174] Recognition: Tank (Fully Exposed)
 175] Identification: T-62
 176] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 2700.000)
 177] GCC coord: (X = -747126.556, Y = -5409046.151, Z = 3290327.716)
 178] GCC range: 2467.000 (Band = 'MEDIUM')
 179] -----
 180] PERCEIVED TGT:
 181] Identification: T-62 (Tank)
 182] Acquisition Time: 0.30
 183] -----
 184] SCORING:
 185] Detection and Recognition
 186] -----
 187] -----
 188] CONDITION 07
 189] -----
 190] -----
 191] OWN VEH:
 192] Id: JAVELIN (Others)
 193] UTM coord: (Zone = 14, M = 347250.000, E = 608017.000, Z = 318.000)
 194] GCC coord: (X = -889452.720, Y = -6306523.567, Z = 347182.170)
 195] GCC range: 3700.000 (Band = 'MEDIUM')
 196] -----
 197] BOARDS:
 198] Board #1 Id: T-62 (Tank)
 199] UTM coord: (Zone = 14, M = 347250.000, E = 608017.000, Z = 4018.000)
 200] GCC coord: (X = -889468.675, Y = -6310179.803, Z = 347384.918)
 201] GCC range: 3700.000 (Band = 'LONG')
 202] -----
 203] ACTUAL TGT:
 204] Recognition: APC (Full Defilede)
 205] Identification: BMP-2
 206] UTM coord: (Zone = 14, M = 347250.000, E = 608017.000, Z = 2790.000)
 207] GCC coord: (X = -889797.436, Y = -630865.666, Z = 347337.620)
 208] GCC range: 3472.000 (Band = 'MEDIUM')
 209] -----
 210] PERCEIVED TGT:
 211] Identification: BMP-2 (APC)
 212] Acquisition Time: 0.10
 213] -----

214] SCORING:
 215] Detection and Recognition
 216] -----
 217] -----
 218] CONDITION 08
 219] -----
 220] -----
 221] OWN VEH:
 222] Id: MIA2 (Tank)
 223] UTM coord: (Zone = 14, M = 347250.000, E = 607900.000, Z = 318.000)
 224] GCC coord: (X = -895568.616, Y = -6306505.315, Z = 347187.270)
 225] GCC range: 5502.000 (Band = 'VERY LONG')
 226] -----
 227] BOARDS:
 228] Board #1 Id: T-62 (Tank)
 229] UTM coord: (Zone = 14, M = 347250.000, E = 607900.000, Z = 5000.000)
 230] GCC coord: (X = -890347.099, Y = -6312024.194, Z = 367488.150)
 231] GCC range: 5502.000 (Band = 'VERY LONG')
 232] -----
 233] ACTUAL TGT:
 234] Recognition: Tank (Fully Exposed)
 235] Identification: T-62
 236] UTM coord: (Zone = 14, M = 347250.000, E = 607900.000, Z = 4000.000)
 237] GCC coord: (X = -890092.119, Y = -6310165.665, Z = 347384.040)
 238] GCC range: 3602.000 (Band = 'LONG')
 239] -----
 240] PERCEIVED TGT:
 241] Identification: T-62 (Tank)
 242] Acquisition Time: 0.30
 243] -----
 244] SCORING:
 245] Detection, Recognition, and Identification
 246] -----
 247] -----
 248] CONDITION 09
 249] -----
 250] -----
 251] OWN VEH:
 252] Id: MIA2 (APC)
 253] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 318.000)
 254] GCC coord: (X = -747128.413, Y = -5406962.996, Z = 329050.780)
 255] GCC range: 1862.000 (Band = 'INVALID < MEDIUM')
 256] -----
 257] BOARDS:
 258] Board #1 Id: T-62 (Tank)
 259] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 2818.000)
 260] GCC coord: (X = -747128.003, Y = -5409046.151, Z = 3290327.716)
 261] GCC range: 2500.000 (Band = 'MEDIUM')
 262] -----
 263] ACTUAL TGT:
 264] Recognition: Tank (Full Defilede)
 265] Identification: T-62
 266] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 4000.000)
 267] GCC coord: (X = -747128.325, Y = -5410081.412, Z = 3290960.478)
 268] GCC range: 3692.000 (Band = 'LONG')
 269] -----
 270] PERCEIVED TGT:
 271] Identification: T-62 (APC)
 272] Acquisition Time: 0.22
 273] -----
 274] SCORING:
 275] Detection
 276] -----
 277] -----
 278] CONDITION 10
 279] -----
 280] -----
 281] OWN VEH:
 282] Id: ELAS (Truck)
 283] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, Z = 318.000)
 284] GCC coord: (X = -747128.413, Y = -5406962.996, Z = 329050.780)

2851 FOV: MPOV (1), Sensor: FLIR (1)
2861
2871|BOARDS:
2881 Board 01 Id: TP-Elma (27)
2891 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 2000.000)
2901 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
2911 GCC range: 1692.000 (Band = 'SHORT')
2921
2931|ACTUAL TGT:
2941 Recognition: Tank (Fully Exposed)
2951 Identification: EM-21
2961 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 4000.000)
2971 GCC coord: (X = -747559.325, Y = -5410081.412, Z = 3289050.478)
2981 GCC range: 1682.000 (Band = 'LONG')
2991
3001|PERCEIVED TGT:
3011 Identification: T-72 (Tank)
3021 Acquisition Time: 0.20
3031
3041|SCORING:
3051 Detection and Recognition
3061
3071
3081|CONDITION #11
3091-----
3101
3111|OWN VEH:
3121 Id: LOSAT (Tank)
3131 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
3141 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
3151 FOV: MPOV (0), Sensor: DVO (0)
3161
3171|BOARDS:
3181 No Board
3191
3201|ACTUAL TGT:
3211 Recognition: Truck (Fully Exposed)
3221 Identification: MPOV
3231 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 5900.000)
3241 GCC coord: (X = -747781.671, Y = -5411690.596, Z = 3291955.928)
3251 GCC range: 5587.800 (Band = 'VERY LONG')
3261
3271|PERCEIVED TGT:
3281 Identification: MPOV (Truck)
3291 Acquisition Time: 0.20
3301
3311|SCORING:
3321 Detection, Recognition, and Identification
3331
3341
3351|CONDITION #12
3361-----
3371
3381|OWN VEH:
3391 Id: AB-64 (R/V)
3401 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
3411 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
3421 FOV: MPOV (0), Sensor: DVO (0)
3431
3441|BOARDS:
3451 No Board
3461
3471|ACTUAL TGT:
3481 Recognition: Tank (Fully Exposed)
3491 Identification: EM-21
3501 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 5850.000)
3511 GCC coord: (X = -747775.820, Y = -5411690.596, Z = 3291955.928)
3521 GCC range: 5532.000 (Band = 'VERY LONG')
3531
3541|PERCEIVED TGT:
3551 Identification: MPOV (Truck)

3561 Acquisition Time: 0.20
3571
3581|SCORING:
3591 Detection and Recognition
3601
3611
3621|CONDITION #13
3631-----
3641
3651|OWN VEH:
3661 Id: MPOV (Truck)
3671 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
3681 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
3691 FOV: MPOV (0), Sensor: DVO (0)
3701
3711|BOARDS:
3721 No Board
3731
3741|ACTUAL TGT:
3751 Recognition: APC (Fully Exposed)
3761 Identification: M21-60
3771 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 4000.000)
3781 GCC coord: (X = -747559.325, Y = -5410081.412, Z = 3289050.478)
3791 GCC range: 1682.000 (Band = 'LONG')
3801
3811|PERCEIVED TGT:
3821 Identification: M21 (APC)
3831 Acquisition Time: 0.20
3841
3851|SCORING:
3861 Detection and Recognition
3871
3881
3891|CONDITION #14
3901-----
3911
3921|OWN VEH:
3931 Id: JAVELIN (Others)
3941 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
3951 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
3961 FOV: MPOV (0), Sensor: DVO (0)
3971
3981|BOARDS:
3991 No Board
4001
4011|ACTUAL TGT:
4021 Recognition: Truck (Fully Exposed)
4031 Identification: EM-21
4041 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 2900.000)
4051 GCC coord: (X = -747430.599, Y = -5409149.783, Z = 3289050.955)
4061 GCC range: 2582.000 (Band = 'MEDIUM')
4071
4081|PERCEIVED TGT:
4091 Identification: MPOV (Truck)
4101 Acquisition Time: 0.20
4111
4121|SCORING:
4131 Detection and Recognition
4141
4151
4161|CONDITION #15
4171-----
4181
4191|OWN VEH:
4201 Id: M21 (Tank)
4211 UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
4221 GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
4231 FOV: MPOV (0), Sensor: DVO (0)
4241
4251|BOARDS:
4261 No Board

```

427] ACTUAL TGT:
428] Recognition: Truck (Partly Exposed)
429] Identification: CAS-66
430] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 5900.000)
431] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
432] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
433] GCC range: 5582.000 (Band = 'VERY LONG')
434]
435] PERCEIVED TGT:
436] Identification: CAS-66 (Truck)
437] Acquisition Time: 0.20
438]
439] SCORING:
440] Detection, Recognition, and Identification
441]
442]
443] CONDITION 816
444] -----
445]
446] OWN VEH:
447] Id: MIA2 (Tank)
448] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
449] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
450] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
451] GCC range: 5582.000 (Band = 'VERY LONG')
452]
453] PERCEIVED TGT:
454] Identification: P-15 (P/W)
455] Acquisition Time: 0.20
456]
457] SCORING:
458] Detection and Recognition
459]
460]
461] CONDITION 817
462] -----
463]
464] OWN VEH:
465] Id: MIA2 (Tank)
466] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
467] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
468] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
469] GCC range: 5582.000 (Band = 'VERY LONG')
470]
471] PERCEIVED TGT:
472] Identification: P-15 (P/W)
473] Acquisition Time: 0.20
474]
475] SCORING:
476] Detection and Recognition
477]
478]
479] CONDITION 818
480] -----
481]
482] OWN VEH:
483] Id: MIA2 (Tank)
484] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
485] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
486] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
487] GCC range: 5582.000 (Band = 'VERY LONG')
488]
489] PERCEIVED TGT:
490] Identification: P-15 (P/W)
491] Acquisition Time: 0.20
492]
493] SCORING:
494] Detection, Recognition, and Identification
495]
496]
497] CONDITION 819
498] -----

```

```

499]
500] OWN VEH:
501] Id: MIA2 (Tank)
502] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
503] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
504] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
505] GCC range: 5582.000 (Band = 'VERY LONG')
506]
507] PERCEIVED TGT:
508] Identification: P-15 (P/W)
509] Acquisition Time: 0.20
510]
511] SCORING:
512] Detection, Recognition, and Identification
513]
514]
515] CONDITION 820
516] -----
517]
518] OWN VEH:
519] Id: MIA2 (Tank)
520] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
521] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
522] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
523] GCC range: 5582.000 (Band = 'VERY LONG')
524]
525] PERCEIVED TGT:
526] Identification: P-15 (P/W)
527] Acquisition Time: 0.20
528]
529] SCORING:
530] Detection, Recognition, and Identification
531]
532]
533] CONDITION 821
534] -----
535]
536] OWN VEH:
537] Id: MIA2 (Tank)
538] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
539] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
540] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
541] GCC range: 5582.000 (Band = 'VERY LONG')
542]
543] PERCEIVED TGT:
544] Identification: P-15 (P/W)
545] Acquisition Time: 0.20
546]
547] SCORING:
548] Detection, Recognition, and Identification
549]
550]
551] CONDITION 822
552] -----
553]
554] OWN VEH:
555] Id: MIA2 (APC)
556] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
557] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
558] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
559] GCC range: 5582.000 (Band = 'VERY LONG')
560]
561] PERCEIVED TGT:
562] Identification: P-15 (P/W)
563] Acquisition Time: 0.20
564]
565] SCORING:
566] Detection, Recognition, and Identification
567]
568]
569] CONDITION 823
570] -----
571]
572] OWN VEH:
573] Id: MIA2 (Tank)
574] UTM coord: (Zone = 14, M = 3456819.000, E = 607900.000, S = 318.000)
575] UTM coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
576] GCC coord: (X = -747128.443, Y = -5406962.996, Z = 3289050.780)
577] GCC range: 5582.000 (Band = 'VERY LONG')
578]
579] PERCEIVED TGT:
580] Identification: P-15 (P/W)
581] Acquisition Time: 0.20
582]
583] SCORING:
584] Detection, Recognition, and Identification
585]
586]
587] CONDITION 824
588] -----

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569| 570| ACTUAL TGT:
571| Recognition: P/W (Null-Defilade)
572| Identification: SU-25
573| DTN coord: (Zone = 0, M = 1656819.000, E = 607900.000, Z = 4000.000)
574| GCC coord: (X = -747128.443, Y = -540692.996, Z = 3289050.780)
575| GCC range: 3692.000 (Band = 'LONG')
576|
577| PERCEIVED TGT:
578| Identification: SU-25 (P/W)
579| Acquisition Time: 0.20
580|
581| SCORING:
582| Detection, Recognition, and Identification
583|
584|
585| CONDITION 923
586| -----
587|
588| OWN VEH:
589| Id: M2A3 (APC)
590| DTN coord: (Zone = 14, M = 3454819.000, E = 607900.000, Z = 318.000)
591| GCC coord: (X = -747128.443, Y = -540692.996, Z = 3289050.780)
592| FOV: MAX ROOM (4), Sensor: SPECTRA PTA-18 (5)
593|
594| BOARD:
595| Board #1 Id: TB_Aline (26)
596| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
597| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
598| GCC range: 8990659.710 (Band = 'INVALID > VERY LONG')
599| Board #2 Id: TB_Aline (26)
600| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
601| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
602| GCC range: 8990659.710 (Band = 'INVALID > VERY LONG')
603|
604| ACTUAL TGT:
605| Recognition: P/W (Null-Defilade)
606| Identification: SU-29
607| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
608| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
609| GCC range: 8990659.710 (Band = 'INVALID > VERY LONG')
610|
611| PERCEIVED TGT:
612| Identification: SU-29 (P/W)
613| Acquisition Time: 0.20
614|
615| SCORING:
616| Detection, Recognition, and Identification
617|
618|
619| CONDITION 922
620| -----
621|
622| OWN VEH:
623| Id: NULL_TGT (Others)
624| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
625| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
626| FOV: NPOV (0), Sensor: DVO (0)
627|
628| BOARD:
629| Board #1 Id: TB_Aline (26)
630| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
631| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
632| GCC range: 0.000 (Band = 'INVALID < SHORT')
633| Board #2 Id: TB_Aline (26)
634| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
635| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
636| GCC range: 0.000 (Band = 'INVALID < SHORT')
637|
638| ACTUAL TGT:
639| Recognition: R/W (Null-Defilade)

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640| Identification: OR-58
641| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
642| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
643| GCC range: 0.000 (Band = 'INVALID < SHORT')
644|
645| PERCEIVED TGT:
646| Identification: OR-58 (R/W)
647| Acquisition Time: 0.05
648|
649| SCORING:
650| Detection, Recognition, and Identification
651|
652|
653| CONDITION 923
654| -----
655|
656| OWN VEH:
657| Id: NULL_TGT (Others)
658| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
659| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
660| FOV: NPOV (0), Sensor: DVO (0)
661|
662| BOARD:
663| Board #1 Id: TB_Aline (26)
664| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
665| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
666| GCC range: 0.000 (Band = 'INVALID < SHORT')
667| Board #2 Id: TB_Aline (26)
668| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
669| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
670| GCC range: 0.000 (Band = 'INVALID < SHORT')
671|
672| ACTUAL TGT:
673| Recognition: R/W (Null-Defilade)
674| Identification: AB-64
675| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
676| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
677| GCC range: 0.000 (Band = 'INVALID < SHORT')
678|
679| PERCEIVED TGT:
680| Identification: AB-64 (R/W)
681| Acquisition Time: 0.20
682|
683| SCORING:
684| Detection, Recognition, and Identification
685|
686|
687| CONDITION 924
688| -----
689|
690| OWN VEH:
691| Id: NULL_TGT (Others)
692| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
693| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
694| FOV: NPOV (0), Sensor: DVO (0)
695|
696| BOARD:
697| Board #1 Id: TB_Aline (26)
698| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
699| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
700| GCC range: 0.000 (Band = 'INVALID < SHORT')
701| Board #2 Id: TB_Aline (26)
702| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
703| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)
704| GCC range: 0.000 (Band = 'INVALID < SHORT')
705|
706| ACTUAL TGT:
707| Recognition: R/W (Null-Defilade)
708| Identification: AB-1
709| DTN coord: (Zone = 0, M = 0.000, E = 0.000, Z = 0.000)
710| GCC coord: (X = -6323734.584, Y = 831271.616, Z = 0.000)

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7214 GCC range: 0.000 (Band = 'Invalid < SHORT')
7224
7234 PERCEIVED TGT:
7244 Identification: MI-24 (R/W)
7254 Acquisition Time: 0.20
7264
7274 SCOLING:
7284 Detection, Recognition, and Identification
7294
7304 CONDITION 825
7314
7324 ONM VEH:
7334 Id: NULL_TGT (Others)
7344 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7354 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7364 POV: WFOV (0), Sensor: DVO (0)
7374
7384 BOARD:
7394 Board #1 Id: TB_Line (26)
7404 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7414 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7424 GCC range: 0.000 (Band = 'Invalid < SHORT')
7434 Board #2 Id: TB_Line (26)
7444 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7454 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7464 GCC range: 0.000 (Band = 'Invalid < SHORT')
7474 ACTUAL TGT:
7484 Recognition: R/W (Null Defilade)
7494 Identification: MI-24
7504 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7514 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7524 GCC range: 0.000 (Band = 'Invalid < SHORT')
7534 PERCEIVED TGT:
7544 Identification: MI-24 (R/W)
7554 Acquisition Time: 0.20
7564
7574 SCOLING:
7584 Detection and Recognition
7594
7604 CONDITION 826
7614
7624 ONM VEH:
7634 Id: NULL_TGT (Others)
7644 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7654 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7664 POV: WFOV (0), Sensor: DVO (0)
7674
7684 BOARD:
7694 Board #1 Id: TB_Line (26)
7704 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7714 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7724 GCC range: 0.000 (Band = 'Invalid < SHORT')
7734 Board #2 Id: TB_Line (26)
7744 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7754 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7764 GCC range: 0.000 (Band = 'Invalid < SHORT')
7774 ACTUAL TGT:
7784 Recognition: R/W (Null Defilade)
7794 Identification: MI-24
7804 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7814 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7824 GCC range: 0.000 (Band = 'Invalid < SHORT')
7834 PERCEIVED TGT:

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7844 Identification: MI-24 (R/W)
7854 Acquisition Time: 0.20
7864
7874 SCOLING:
7884 Detection, Recognition, and Identification
7894
7904 CONDITION 827
7914
7924 ONM VEH:
7934 Id: NULL_TGT (Others)
7944 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
7954 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
7964 POV: WFOV (0), Sensor: DVO (0)
7974
7984 BOARD:
7994 Board #1 Id: TB_Line (26)
8004 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8014 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8024 GCC range: 0.000 (Band = 'Invalid < SHORT')
8034 Board #2 Id: TB_Line (26)
8044 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8054 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8064 GCC range: 0.000 (Band = 'Invalid < SHORT')
8074 ACTUAL TGT:
8084 Recognition: R/W (Null Defilade)
8094 Identification: MI-24
8104 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8114 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8124 GCC range: 0.000 (Band = 'Invalid < SHORT')
8134 PERCEIVED TGT:
8144 Identification: MI-24 (R/W)
8154 Acquisition Time: 0.20
8164
8174 SCOLING:
8184 Detection, Recognition, and Identification
8194
8204 CONDITION 828
8214
8224 ONM VEH:
8234 Id: NULL_TGT (Others)
8244 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8254 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8264 POV: WFOV (0), Sensor: DVO (0)
8274
8284 BOARD:
8294 Board #1 Id: TB_Line (26)
8304 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8314 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8324 GCC range: 0.000 (Band = 'Invalid < SHORT')
8334 Board #2 Id: TB_Line (26)
8344 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8354 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8364 GCC range: 0.000 (Band = 'Invalid < SHORT')
8374 ACTUAL TGT:
8384 Recognition: R/W (Null Defilade)
8394 Identification: MI-24
8404 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8414 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8424 GCC range: 0.000 (Band = 'Invalid < SHORT')
8434 PERCEIVED TGT:
8444 Identification: MI-24
8454 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
8464 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
8474 GCC range: 0.000 (Band = 'Invalid < SHORT')
8484 ACTUAL TGT:
8494 Recognition: R/W
8504 Identification: MI-24
8514 Acquisition Time: 0.20
8524

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853 SCORING:
854 Detection and Recognition
855
856
857 CONDITION 829
858 -----
859
860 OWN VEH:
861 Id: NULL_TGT (Others)
862 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
863 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
864 POV: MPV (0), Sensor: DVO (0)
865
866 BOARDS:
867 Board #1 Id: TB_Line (26)
868 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
869 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
870 GCC range: 0.000 (Band = 'Invalid < SHORT')
871 Board #2 Id: TB_Line (26)
872 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
873 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
874 GCC range: 0.000 (Band = 'Invalid < SHORT')
875
876 ACTUAL TGT:
877 Recognition: SP Art (Null Defilade)
878 Identification: SP Art (Null Defilade)
879 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
880 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
881 GCC range: 0.000 (Band = 'Invalid < SHORT')
882
883 PERCEIVED TGT:
884 Identification: SP Art (Null Defilade)
885 Acquisition Time: 0.20
886
887 SCORING:
888 Detection, Recognition, and Identification
889
890
891 CONDITION 830
892 -----
893
894 OWN VEH:
895 Id: NULL_TGT (Others)
896 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
897 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
898 POV: MPV (0), Sensor: DVO (0)
899
900 BOARDS:
901 Board #1 Id: TB_Line (26)
902 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
903 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
904 GCC range: 0.000 (Band = 'Invalid < SHORT')
905 Board #2 Id: TB_Line (26)
906 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
907 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
908 GCC range: 0.000 (Band = 'Invalid < SHORT')
909
910 ACTUAL TGT:
911 Recognition: SP Art (Null Defilade)
912 Identification: SP Art (Null Defilade)
913 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
914 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
915 GCC range: 0.000 (Band = 'Invalid < SHORT')
916
917 PERCEIVED TGT:
918 Identification: SP Art (Null Defilade)
919 Acquisition Time: 0.20
920
921 SCORING:
922 Detection, Recognition, and Identification
923

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924 CONDITION 831
925 -----
926
927 OWN VEH:
928 Id: NULL_TGT (Others)
929 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
930 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
931 POV: MPV (0), Sensor: DVO (0)
932
933 BOARDS:
934 Board #1 Id: TB_Line (26)
935 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
936 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
937 GCC range: 0.000 (Band = 'Invalid < SHORT')
938 Board #2 Id: TB_Line (26)
939 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
940 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
941 GCC range: 0.000 (Band = 'Invalid < SHORT')
942
943 ACTUAL TGT:
944 Recognition: SP Art (Null Defilade)
945 Identification: SP Art (Null Defilade)
946 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
947 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
948 GCC range: 0.000 (Band = 'Invalid < SHORT')
949
950 PERCEIVED TGT:
951 Identification: SP Art (Null Defilade)
952 Acquisition Time: 0.20
953
954 SCORING:
955 Detection, Recognition, and Identification
956
957
958 CONDITION 832
959 -----
960
961 OWN VEH:
962 Id: NULL_TGT (Others)
963 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
964 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
965 POV: MPV (0), Sensor: DVO (0)
966
967 BOARDS:
968 Board #1 Id: TB_Line (26)
969 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
970 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
971 GCC range: 0.000 (Band = 'Invalid < SHORT')
972 Board #2 Id: TB_Line (26)
973 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
974 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
975 GCC range: 0.000 (Band = 'Invalid < SHORT')
976
977 ACTUAL TGT:
978 Recognition: SP Art (Null Defilade)
979 Identification: SP Art (Null Defilade)
980 UTM coord: (Zone = 0, M = 0.000, E = 0.000, S = 0.000)
981 GCC coord: (X = -6323734.584, Y = 831271.616, S = 0.000)
982 GCC range: 0.000 (Band = 'Invalid < SHORT')
983
984 PERCEIVED TGT:
985 Identification: SP Art (Null Defilade)
986 Acquisition Time: 0.20
987
988 SCORING:
989 Detection
990
991
992 CONDITION 833
993 -----
994

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995| 026|DOWN VEH:
996| Id: NULL_TGT (Others)
997| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
998| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
999| POI: MPOV (0), Sensor: DVO (0)
1000|
1001| 027|BOARDS:
1002| Board #1 Id: TM_Aline (26)
1003| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1004| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1005| GCC range: 0.000 (Band = 'Invalid < SHORT')
1006| Board #2 Id: TM_Aline (26)
1007| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1008| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1009| GCC range: 0.000 (Band = 'Invalid < SHORT')
1010|
1011| 1012|ACTUAL TGT:
1013| NULL Target
1014|
1015|PERCEIVED TGT:
1016| Identification: M2A1 (APC)
1017| Acquisition Time: 0.20
1018|
1019|SCORING:
1020| False Target Detected
1021|
1022| 1023|CONDITION #14
1024|-----
1025|
1026|DOWN VEH:
1027| Id: NULL_TGT (Others)
1028| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1029| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1030| POI: MPOV (0), Sensor: DVO (0)
1031|
1032|BOARDS:
1033| Board #1 Id: TM_Aline (26)
1034| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1035| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1036| GCC range: 0.000 (Band = 'Invalid < SHORT')
1037| Board #2 Id: TM_Aline (26)
1038| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1039| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1040| GCC range: 0.000 (Band = 'Invalid < SHORT')
1041|
1042|ACTUAL TGT:
1043| Recognition: Tank (Full Defilade)
1044| Identification: M1A2
1045| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1046| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1047| GCC range: 0.000 (Band = 'Invalid < SHORT')
1048|
1049|PERCEIVED TGT:
1050| Identification: M1A2 (Tank)
1051| Acquisition Time: 0.10
1052|
1053|SCORING:
1054| Detection, Recognition, and Identification
1055|
1056| 1057|CONDITION #15
1058|-----
1059|
1060|DOWN VEH:
1061| Id: NULL_TGT (Others)
1062| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1063| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1064| POI: MPOV (0), Sensor: DVO (0)
1065|

```

```

1066|BOARDS:
1067| Board #1 Id: TM_Aline (26)
1068| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1069| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1070| GCC range: 0.000 (Band = 'Invalid < SHORT')
1071| Board #2 Id: TM_Aline (26)
1072| UTM coord: (X=0, Y=0, Z=0, E=0.000, S=0.000)
1073| GCC coord: (X=-6323734.584, Y=831271.616, Z=0.000)
1074| GCC range: 0.000 (Band = 'Invalid < SHORT')
1075|
1076|ACTUAL TGT:
1077| NULL Target
1078|
1079|PERCEIVED TGT:
1080| NULL Target
1081| Acquisition Time: 0.20
1082|
1083|SCORING:
1084| NULL Target Detected Correctly
1085|
1086|

```

1087|
1088| TOTALS:
1089|-----
1090|
1091| Detection: 31 (100.0 %) out of 31
1092|
1093| Recognition:
1094| Tank: 28 (90.3 %) out of 31
1095| APC: 5 (16.1 %) out of 31
1096| Truck: 3 (9.7 %) out of 31
1097| P/W: 4 (12.9 %) out of 31
1098| P/W: 7 (22.6 %) out of 31
1099| SP_Art: 6 (19.4 %) out of 31
1100| SP_Art: 3 (9.7 %) out of 31
1101| Identification:
1102| 18 (58.1 %) out of 31
1103| MIA2: 2 (6.5 %) out of 31
1104| LOSAT: 0 (0.0 %) out of 31
1105| T-62: 1 (3.2 %) out of 31
1106| T-72: 0 (0.0 %) out of 31
1107| T-80: 0 (0.0 %) out of 31
1108| M2A3: 0 (0.0 %) out of 31
1109| BTR-60: 0 (0.0 %) out of 31
1110| BMP-2: 0 (0.0 %) out of 31
1111| BLOS: 0 (0.0 %) out of 31
1112| BLOS: 1 (3.2 %) out of 31
1113| BLOS: 1 (3.2 %) out of 31
1114| BLOS: 0 (0.0 %) out of 31
1115| BLOS: 0 (0.0 %) out of 31
1116| BLOS: 0 (0.0 %) out of 31
1117| CAS-66: 1 (3.2 %) out of 31
1118| P-15: 1 (3.2 %) out of 31
1119| P-16: 0 (0.0 %) out of 31
1120| P/A-10: 2 (6.5 %) out of 31
1121| SU-25: 1 (3.2 %) out of 31
1122| SU-26: 1 (3.2 %) out of 31
1123| SU-26: 1 (3.2 %) out of 31
1124| SU-26: 1 (3.2 %) out of 31
1125| SU-26: 1 (3.2 %) out of 31
1126| SU-26: 1 (3.2 %) out of 31
1127| SU-26: 1 (3.2 %) out of 31
1128| SU-26: 0 (0.0 %) out of 31
1129| SU-26: 0 (0.0 %) out of 31
1130| SU-26: 1 (3.2 %) out of 31
1131| SU-26: 1 (3.2 %) out of 31
1132| SU-26: 1 (3.2 %) out of 31
1133| SU-26: 1 (3.2 %) out of 31
1134| SU-26: 1 (3.2 %) out of 31
1135| SU-26: 1 (3.2 %) out of 31
1136| SU-26: 0 (0.0 %) out of 31
1137| SU-26: 0 (0.0 %) out of 31
1138| SU-26: 0 (0.0 %) out of 31
1139| SU-26: 0 (0.0 %) out of 31
1140| SU-26: 0 (0.0 %) out of 31
1141| SU-26: 0 (0.0 %) out of 31
1142| SU-26: 0 (0.0 %) out of 31
1143| SU-26: 0 (0.0 %) out of 31
1144| ACTUAL TESTS YARZ:
1145| ACT TESTS YARZ:
1146| ACT TESTS YARZ:
1147| ACT TESTS YARZ:
1148| ACT TESTS YARZ:
1149| ACT TESTS YARZ:
1150|

1151| RANGE BANDS:
1152| SHORT Min - 1602, SHORT Max - 1802
1153| MEDIUM Min - 2402, MEDIUM Max - 2602
1154| LONG Min - 3402, LONG Max - 3602
1155| VERY LONG Min - 5602, VERY LONG Max - 5802
1156|
1157|
1158| DETECTION RANGE BANDS:
1159| Invalid Range < 1602 - 12 (38.7 %) out of 31
1160| SHORT <= 1802 - 2 (6.5 %) out of 31
1161| Invalid Range < 2402 - 1 (3.2 %) out of 31
1162| MEDIUM <= 2602 - 5 (16.1 %) out of 31
1163| LONG <= 3402 - 3 (9.7 %) out of 31
1164| VERY LONG <= 5602 - 4 (12.9 %) out of 31
1165| Invalid Range > 5802 - 2 (6.5 %) out of 31
1166|
1167| RECOGNITION RANGE BANDS:
1168| Invalid Range < 1602 - 12 (38.7 %) out of 31
1169| SHORT <= 1802 - 2 (6.5 %) out of 31
1170| Invalid Range < 2402 - 5 (16.1 %) out of 31
1171| MEDIUM <= 2602 - 3 (9.7 %) out of 31
1172| LONG <= 3402 - 4 (12.9 %) out of 31
1173| VERY LONG <= 5602 - 4 (12.9 %) out of 31
1174| Invalid Range > 5802 - 2 (6.5 %) out of 31
1175|
1176| IDENTIFICATION RANGE BANDS:
1177| Invalid Range < 1602 - 9 (29.0 %) out of 31
1178| SHORT <= 1802 - 2 (6.5 %) out of 31
1179| MEDIUM <= 2602 - 1 (3.2 %) out of 31
1180| LONG <= 3402 - 3 (9.7 %) out of 31
1181| VERY LONG <= 5602 - 3 (9.7 %) out of 31
1182| Invalid Range > 5802 - 1 (3.2 %) out of 31

```

1193|
1194|
1195|DETECTION POV:
1196|   NARROW - 24 (77.4 %) out of 31
1197|   WIDE - 1 (3.2 %) out of 31
1198|   MEDIUM - 0 (0.0 %) out of 31
1199|   ROOM - 1 (3.2 %) out of 31
1200|   SMITH - 1 (3.2 %) out of 31
1201|   MIN_ROOM - 1 (3.2 %) out of 31
1202|   MAX_ROOM - 3 (9.7 %) out of 31
1203|
1204|ACCOGNITION POV:
1205|   NARROW - 22 (71.0 %) out of 31
1206|   WIDE - 1 (3.2 %) out of 31
1207|   MEDIUM - 0 (0.0 %) out of 31
1208|   ROOM - 1 (3.2 %) out of 31
1209|   SMITH - 0 (0.0 %) out of 31
1210|   MIN_ROOM - 1 (3.2 %) out of 31
1211|   MAX_ROOM - 3 (9.7 %) out of 31
1212|
1213|IDENTIFICATION POV:
1214|   NARROW - 16 (51.6 %) out of 31
1215|   WIDE - 0 (0.0 %) out of 31
1216|   MEDIUM - 0 (0.0 %) out of 31
1217|   ROOM - 0 (0.0 %) out of 31
1218|   SMITH - 0 (0.0 %) out of 31
1219|   MIN_ROOM - 0 (0.0 %) out of 31
1220|   MAX_ROOM - 2 (6.5 %) out of 31
1221|
1222|DETECTION SENSOR:
1223|   DVO - 24 (77.4 %) out of 31
1224|   FLIR - 1 (3.2 %) out of 31
1225|   OTW - 1 (3.2 %) out of 31
1226|   TV - 1 (3.2 %) out of 31
1227|   12 - 1 (3.2 %) out of 31
1228|   STEER FPA-1R - 3 (9.7 %) out of 31
1229|
1230|ACCOGNITION SENSOR:
1231|   DVO - 22 (71.0 %) out of 31
1232|   FLIR - 1 (3.2 %) out of 31
1233|   OTW - 1 (3.2 %) out of 31
1234|   TV - 1 (3.2 %) out of 31
1235|   12 - 0 (0.0 %) out of 31
1236|   STEER FPA-1R - 3 (9.7 %) out of 31
1237|
1238|IDENTIFICATION SENSOR:
1239|   DVO - 15 (48.4 %) out of 31
1240|   FLIR - 0 (0.0 %) out of 31
1241|   OTW - 1 (3.2 %) out of 31
1242|   TV - 0 (0.0 %) out of 31
1243|   12 - 0 (0.0 %) out of 31
1244|   STEER FPA-1R - 2 (6.5 %) out of 31
1245|

```

APPENDIX B - VV&A PDU's

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This section details the message formats used for transmitting VV&A data in DIS Action Response PDUs. There is a PDU format table corresponding to each one of the 6 Action Response PDUs customized for VV&A.

Field Size (bits)	Fields Of Action Response PDU Customized For Target Acquisition And Tracking VV&A	
96	PDU HEADER	Protocol Version - 8 bit enumeration
		Exercise ID - 8 bit unsigned integer
		PDU Type - 8 bit enumeration
		Padding - 8 bit unused
		Time Stamp - 32 bit unsigned integer
		Length - 16 bit unsigned integer
		Padding - 16 bits unused
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer Application - 16 bit unsigned integer Entity - 16 bit unsigned integer Group - 16 bit unsigned integer
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer Application - 16 bit unsigned integer Entity - 16 bit unsigned integer Group - 16 bit unsigned integer
32	PADDING	32 bits unused
32	REQUEST ID	32 bit unsigned integer
32	REQUEST STATUS	32 bit unsigned integer
32	NUMBER OF FIXED DATUM FIELDS	0x00000000
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001
1472	TARGET ACQUISITION AND TRACKING VV&A DATA	0x0000012C (300) (See Section 4.2.2.1.2) - 32 bit unsigned int
		0x00000580 (1408) 32 bit unsigned integer
		Sight World Position - X Coordinate - 64 bit float
		Sight World Position - Y Coordinate - 64 bit float
		Sight World Position - Z Coordinate - 64 bit float
		Sight World Orientation - Psi - 32 bit float
		Sight World Orientation - Theta - 32 bit float

Sight World Orientation - Phi - 32 bit float
Gun Wrt Sight Offset - Azimuth - 32 bit float
Gun Wrt Sight Offset - Elevation - 32 bit float
Lead Sight - 8 bit unsigned integer
Active Handle - 8 bit unsigned integer
Handle Signal - 8 bit unsigned integer
Padding - 8 bits unused
Target World Position - X Coordinate - 64 bit float
Target World Position - Y Coordinate - 64 bit float
Target World Position - Z Coordinate - 64 bit float
Target World Velocity - X Coordinate - 32 bit float
Target World Velocity - Y Coordinate - 32 bit float
Target World Velocity - Z Coordinate - 32 bit float
Target Entity- Site ID - 16 bits
Target Entity- Application ID - 16 bits
Target Entity- Entity ID - 16 bits
Ballistic Range - 16 bit unsigned int
Ballistic Superelevation - 32 bit float
Ballistic Lead - 32 bit float
Lay Error - Azimuth - 32 bit float
Lay Error - Elevation - 32 bit float
Kinematic Lead Error - 32 bit float
Target Rate Wrt Vehicle - Azimuth -32 bit float
Target Rate Wrt Vehicle - Elevation -32 bit float
Sight Tracking Rate - Azimuth -32 bit float
Sight Tracking Rate - Elevation -32 bit float
Tracking Rate Error - Azimuth -32 bit float
Tracking Rate Error - Elevation -32 bit float
Gun World Position - X Coordinate - 64 bit float
Gun World Position - Y Coordinate - 64 bit float
Gun World Position - Z Coordinate - 64 bit float
Gun World Orientation - Psi - 32 bit float
Gun World Orientation - Theta - 32 bit float
Gun World Orientation - Phi - 32 bit float
System Induced Error - 32 bit float

Figure 121: Message Format for Action Response PDU Customized For Target Acquisition and Tracking VV&A

Field Size (bits)	Fields Of Action Response PDU Customized For Delivery Accuracy VV&A	
96	PDU HEADER	Protocol Version - 8 bit enumeration
		Exercise ID - 8 bit unsigned integer
		PDU Type - 8 bit enumeration
		Padding - 8 bit unused
		Time Stamp - 32 bit unsigned integer
		Length - 16 bit unsigned integer
		Padding - 16 bits unused
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
32	PADDING	32 bits unused
32	REQUEST ID	32 bit unsigned integer
32	REQUEST STATUS	32 bit unsigned integer
32	NUMBER OF FIXED DATUM FIELDS	0x00000000
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001
8576	DELIVERY ACCURACY VV&A DATA	0x0000012D (301) (See Section 4.2.2.1.2) - 32 bit unsigned int
		0x00002140 (8512) 32 bit unsigned integer
		Sight World Position - X Coordinate - 64 bit float
		Sight World Position - Y Coordinate - 64 bit float
		Sight World Position - Z Coordinate - 64 bit float
		Sight World Orientation - Psi - 32 bit float
		Sight World Orientation - Theta - 32 bit float
		Sight World Orientation - Phi - 32 bit float
		Gun Wrt Sight Offset - Azimuth - 32 bit float
		Gun Wrt Sight Offset - Elevation - 32 bit float
		Time At Firing - 32 bit unsigned integer
		Lead Sight - 8 bit unsigned integer
		Target Hit Status - 8 bits unsigned integer
		Fire Event - Site ID - 16 bits
		Fire Event - Application ID - 16 bits
		Fire Event - Event ID - 16 bits
		Target World Position - X Coordinate - 64 bit float
		Target World Position - Y Coordinate - 64 bit float

Target World Position - Z Coordinate - 64 bit float
Target World Velocity - X Coordinate - 32 bit float
Target World Velocity - Y Coordinate - 32 bit float
Target World Velocity - Z Coordinate - 32 bit float
Target Entity- Site ID - 16 bits
Target Entity- Application ID - 16 bits
Target Entity- Entity ID - 16 bits
Ballistic Range - 16 bit unsigned int
Ballistic Superelevation - 32 bit float
Ballistic Lead - 32 bit float
Ballistic Cant - 32 bit float
Ballistic Barometric Pressure - 32 bit float
Ballistic Crosswind Direction From North - 32 bit float
Ballistic Crosswind Magnitude - 16 bit integer
Ballistic Ammo Temperature - 16 bit integer
Ballistic Air Temperature - 16 bit integer
Environment Ammo Temperature - 16 bit integer
Environment Air Temperature - 16 bit integer
Environment Crosswind Magnitude - 16 bit integer
Environment Crosswind Direction From North - 32 bit float
Environment Barometric Pressure - 32 bit float
Kinematic Lead Error - 32 bit float
Lay Error - Azimuth - 32 bit float
Lay Error - Elevation - 32 bit float
Lay Point World Position - X Coordinate - 64 bit float
Lay Point World Position - Y Coordinate - 64 bit float
Lay Point World Position - Z Coordinate - 64 bit float
Target Rate Wrt Vehicle - Azimuth -32 bit float
Target Rate Wrt Vehicle - Elevation -32 bit float
Sight Tracking Rate - Azimuth -32 bit float
Sight Tracking Rate - Elevation -32 bit float
Tracking Rate Error - Azimuth -32 bit float
Tracking Rate Error - Elevation -32 bit float

Gun World Position - X Coordinate - 64 bit float
Gun World Position - Y Coordinate - 64 bit float
Gun World Position - Z Coordinate - 64 bit float
Gun World Orientation - Psi - 32 bit float
Gun World Orientation - Theta - 32 bit float
Gun World Orientation - Phi - 32 bit float
Gun World Orientation With All But Static Round Dispersion - Psi - 32 bit float
Gun World Orientation With All But Static Round Dispersion - Theta - 32 bit float
Gun World Orientation With All But Static Round Dispersion - Phi - 32 bit float
Gun World Orientation With All Dispersions - Psi - 32 bit float
Gun World Orientation With All Dispersions - Theta - 32 bit float
Gun World Orientation With All Dispersions - Phi - 32 bit float
System Induced Error - 32 bit float
Time Of Flight To Target Range - 32 bit float
Fire-Target Mobility Status - 8 bit uns. int.
Padding - 24 bits unused
Fixed Bias - Horizontal - 32 bit float
Fixed Bias - Vertical - 32 bit float
Occasion Dispersion - Horizontal - 32 bit float
Occasion Dispersion - Vertical - 32 bit float
Static Round Dispersion - Horizontal - 32 bit float
Static Round Dispersion - Vertical - 32 bit float
Dynamic SM Dispersion Add-On - Horizontal - 32 bit float
Dynamic SM Dispersion Add-On - Vertical - 32 bit float
Dynamic MS Dispersion Add-On - Horizontal - 32 bit float
Dynamic MS Dispersion Add-On - Vertical - 32 bit float
Gun Pointing Error - Horizontal - 32 bit float
Gun Pointing Error - Vertical - 32 bit float
Total Gun Pointing Error - Horizontal - 32 bit float
Total Gun Pointing Error - Vertical - 32 bit float
Total System Error - Horizontal - 32 bit float

		Total System Error - Vertical - 32 bit float
		Miss Distance - Horizontal - 32 bit float
		Miss Distance - Vertical - 32 bit float
		Gun Direction Wrt Desired Aimpoint - Horizontal - 32 bit float
		Gun Direction Wrt Desired Aimpoint - Vertical - 32 bit float
		Vehicle World Velocity - X Component - 32 bit float
		Vehicle World Velocity - Y Component - 32 bit float
		Vehicle World Velocity - Z Component - 32 bit float
		Vehicle World Acceleration - X Component - 32 bit float
		Vehicle World Acceleration - Y Component - 32 bit float
		Vehicle World Acceleration - Z Component - 32 bit float
		Vehicle Angular Velocity - X Component - 32 bit float
		Vehicle Angular Velocity - Y Component - 32 bit float
		Vehicle Angular Velocity - Z Component - 32 bit float
		Padding - 32 bits unused
		Actual Trajectory-Target Plane Intersection World Position - X Coordinate - 64 bit float
		Actual Trajectory-Target Plane Intersection World Position - Y Coordinate - 64 bit float
		Actual Trajectory-Target Plane Intersection World Position - Z Coordinate - 64 bit float
		Padding - 64 bits unused
		Actual Flyout Trajectory - 2560 bit Trajectory-Record
		Flyout Trajectory With out Dispersions - 2560 bit Trajectory-Record

Figure 122: Message Format for Action Response PDU Customized For Delivery Accuracy VV&A.

Fields Of Action Response PDU Customized For Direct Fire Vulnerability Assessment VV&A		
Field Size (bits)		
96	PDU HEADER	Protocol Version - 8 bit enumeration
		Exercise ID - 8 bit unsigned integer
		PDU Type - 8 bit enumeration
		Padding - 8 bit unused
		Time Stamp - 32 bit unsigned integer
		Length - 16 bit unsigned integer
		Padding - 16 bits unused
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
32	PADDING	32 bits unused
32	REQUEST ID	32 bit unsigned integer
32	REQUEST STATUS	32 bit unsigned integer
32	NUMBER OF FIXED DATUM FIELDS	0x00000000
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001
1472	DIRECT FIRE VULNERABILITY ASSESSMENT VV&A DATA	0x0000012E (302)
		(See Section 4.2.2.1.2) - 32 bit unsigned int
		0x00000580 (1408)
		32 bit unsigned integer
		Direct Fire Type - 8 bits unsigned int
		Padding - 8 bits unused
		Range From Firer At Firing - 16 bit us integer
		Fire Event - Site ID - 16 bit uns. integer
		Fire Event - Application ID - 16 bit uns. int.
		Fire Event - Event ID - 16 bit uns. int.
		Firing Entity - Site ID - 16 bit uns. integer
		Firing Entity - Application ID - 16 bit uns. int.
		Firing Entity - Entity ID - 16 bit uns. int.
		DIS Munition Type
		- 64 bit Entity Type Record
		Impact Location Vehicle Position
		- X Coordinate - 64 bit float
		Impact Location Vehicle Position
		- Y Coordinate - 64 bit float
		Impact Location Vehicle Position
		- Z Coordinate - 64 bit float
		Impact Azimuth - 32 bit float
		Dispersion Of Impacting Round
		- 32 bit float
		Exposure Mode - 8 bit unsigned int
		Padding - 24 bits unused
		STAFF Submunition Attack Azimuth
		- 32 bit float
		STAFF Submunition Attack Elevation
		- 32 bit float
		M-Kill Probability
		- 32 bit float

	F-Kill Probability - 32 bit float
	M or F-Kil Probability - 32 bit float
	K-Kill Probability - 32 bit float
	M Only-Kil Probability - 32 bit float
	F Only-Kil Probability - 32 bit float
	M and F Only-Kill Probability - 32 bit float
	K Only-Kil Probability - 32 bit float
	Kill Thermometer - M Only Start - 32 bit float
	Kill Thermometer - F Only Start - 32 bit float
	Kill Thermometer - M and F Only Start - 32 bit float
	Kill Thermometer - K Only Start - 32 bit float
	Random Number Selected - 32 bit float
	Kill Type - 8 bit unsigned integer
	Old Kill Status - 8 bit unsigned integer
	New Kill Status - 8 bit unsigned integer
	Crew Casualty - 8 bit unsigned integer
	Army Munition Name[0] - 8 bit character
	.
	.
	.
	Army Munition Name[25] - 8 bit character
	Army DFVA Munition Type[0] - 8 bit char.
	.
	.
	.
	Army DFVA Munition Type[20] - 8 bit char.
	Padding - 40 bits

Figure 123: Message Format for Action Request PDU Customized For Direct Fire Vulnerability VV&A.

Field Size (bits)		Fields Of Action Response PDU Customized For Indirect Vulnerability Assessment VV&A	
96	PDU HEADER	Protocol Version - 8 bit enumeration	
		Exercise ID - 8 bit unsigned integer	
		PDU Type - 8 bit enumeration	
		Padding - 8 bit unused	
		Time Stamp - 32 bit unsigned integer	
		Length - 16 bit unsigned integer	
		Padding - 16 bits unused	
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer	
		Application - 16 bit unsigned integer	
		Entity - 16 bit unsigned integer	
		Group - 16 bit unsigned integer	
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer	
		Application - 16 bit unsigned integer	
		Entity - 16 bit unsigned integer	
		Group - 16 bit unsigned integer	
32	PADDING	32 bits unused	
32	REQUEST ID	32 bit unsigned integer	
32	REQUEST STATUS	32 bit unsigned integer	
32	NUMBER OF FIXED DATUM FIELDS	0x00000000	
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001	
2240	INDIRECT FIRE VULNERABILITY ASSESSMENT VV&A DATA	0x0000012F (303)	
		(See Section 4.2.2.1.2) - 32 bit unsigned int	
		0x00000880 (2176)	
		32 bit unsigned integer	
		Indirect Fire Type - 8 bit unsigned int	
		Environment Type - 8 bit unsigned integer	
		Exposure Type - 8 bit unsigned integer	
		Damage Function Selected - 8 bit unsigned integer	
		Kill Type - 8 bit unsigned integer	
		Environment Type - 8 bit unsigned integer	
		Exposure Type - 8 bit unsigned integer	
		Padding - 8 bits unused	
		Vehicle World Position - X Coordinate - 64 bit float	
		Vehicle World Position - Y Coordinate - 64 bit float	
		Vehicle World Position - Z Coordinate - 64 bit float	
		Detonation World Position - X Coordinate - 64 bit float	

Detonation World Position - Y Coordinate - 64 bit float
Detonation World Position - Z Coordinate - 64 bit float
DIS Munition Type - 64 bit Entity Type Record
DIS Fuze Type - 16 bit unsigned int
Padding - 16 bits unused
Environment Scalar - 32 bit float
Exposure Scalar For M-Kill - 32 bit float
Exposure Scalar For F-Kill - 32 bit float
Exposure Scalar For M or F-Kill - 32 bit float
Exposure Scalar For K-Kill - 32 bit float
Lethal Area For M-Kill - 32 bit float
Lethal Area For F-Kill - 32 bit float
Lethal Area For M or F-Kill - 32 bit float
Lethal Area For K-Kill - 32 bit float
HEM Initial Kill Probability - 32 bit float
HEM RATS Value - 32 bit float
Detonation Wrt Vehicle Offset In Range - 32 bit float
Detonation Wrt Vehicle Offset In Deflection - 32 bit float
ICM Number Of Submunitions - 16 bit float
Padding - 16 bits unused
ICM Reliability - 32 bit float
Firer-Detonation Range - 32 bit float
Pattern Cutoff Radius - 32 bit float
M-Kill Probability - 32 bit float
F-Kill Probability - 32 bit float
M or F-Kill Probability - 32 bit float
K-Kill Probability - 32 bit float
M Only-Kill Probability - 32 bit float
F Only-Kill Probability - 32 bit float
M and F Only-Kill Probability - 32 bit float

	K Only-Kill Probability - 32 bit float
	Kill Thermometer - M Only Start - 32 bit float
	Kill Thermometer - F Only Start - 32 bit float
	Kill Thermometer - M and F Only Start - 32 bit float
	Kill Thermometer - K Only Start - 32 bit float
	Random Number Selected - 32 bit float
	Driver Casualty Status - 8 bit unsigned integer
	Loader Casualty Status - 8 bit unsigned integer
	Gunner Casualty Status - 8 bit unsigned integer
	Commander Casualty Status - 8 bit unsigned integer
	Munition Terminal World Velocity - X Component - 32 bit float
	Munition Terminal World Velocity - Y Component - 32 bit float
	Munition Terminal World Velocity - Z Component - 32 bit float
	Fire Event - Site ID - 16 bits uns. int.
	Fire Event - Application ID - 16 bits uns. int.
	Fire Event - Event ID - 16 bits uns. int.
	Firing Entity - Site ID - 16 bits uns. int.
	Firing Entity - Application ID - 16 bits uns. int.
	Firing Entity- Entity ID - 16 bits uns. int.
	Army Munition Name[0] - 8 bit character
	.
	.
	Army Munition Name[25] - 8 bit character
	Army IFVA Munition Type[0] - 8 bit char.
	.
	.
	Army IFVA Munition Type[15] - 8 bit char.
	Army Fuze Type[0] - 8 bit character
	.
	.
	Army Fuze Type[10] - 8 bit character
	Padding - 24 bits unused

Figure 124: Message Format for Action Response PDU Customized For Indirect Fire Vulnerability VV&A.

Field Size (bits)	Fields Of Action Response PDU Customized For Coax Gun VV&A	
96	PDU HEADER	Protocol Version - 8 bit enumeration
		Exercise ID - 8 bit unsigned integer
		PDU Type - 8 bit enumeration
		Padding - 8 bit unused
		Time Stamp - 32 bit unsigned integer
		Length - 16 bit unsigned integer
		Padding - 16 bits unused
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer
		Application - 16 bit unsigned integer
		Entity - 16 bit unsigned integer
		Group - 16 bit unsigned integer
32	PADDING	32 bits unused
32	REQUEST ID	32 bit unsigned integer
32	REQUEST STATUS	32 bit unsigned integer
32	NUMBER OF FIXED DATUM FIELDS	0x00000000
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001
1408	COAX GUN VV&A DATA	0x00000130 (304)
		(See Section 4.2.2.1.2) - 32 bit unsigned int
		0x00000540 (1344)
		32 bit unsigned integer
		Lay Error - Azimuth
		- 32 bit float
		Lay Error - Elevation
		- 32 bit float
		Lay Point World Position - X Coordinate
		- 64 bit float
		Lay Point World Position - Y Coordinate
		- 64 bit float
		Lay Point World Position - Z Coordinate
		- 64 bit float
		Sight World Position - X Coordinate
		- 64 bit float
		Sight World Position - Y Coordinate
		- 64 bit float
		Sight World Position - Z Coordinate
		- 64 bit float
		Sight World Orientation - Psi
		- 32 bit float
		Sight World Orientation - Theta
		- 32 bit float
		Sight World Orientation - Phi
		- 32 bit float
		Lead Sight - 8 bit unsigned integer
		Padding - 24 bits unused
		Target World Position - X Coordinate
		- 64 bit float
		Target World Position - Y Coordinate
		- 64 bit float

		Target World Position - Z Coordinate - 64 bit float
		Target Entity- Site ID - 16 bits
		Target Entity- Application ID - 16 bits
		Target Entity- Entity ID - 16 bits
		Firer-Target Mobility Status - 8 bit uns. int.
		Target Hit Status - 8 bit uns. int.
		Detonation World Position - X Coordinate - 64 bit float
		Detonation World Position - Y Coordinate - 64 bit float
		Detonation World Position - Z Coordinate - 64 bit float
		Fixed Bias - Horizontal - 32 bit float
		Fixed Bias - Vertical - 32 bit float
		Burst Dispersion - Horizontal - 32 bit float
		Burst Dispersion - Vertical - 32 bit float
		Static Round Dispersion - Horizontal - 32 bit float
		Static Round Dispersion - Vertical - 32 bit float
		Dynamic SM Dispersion Add-On - Horizontal - 32 bit float
		Dynamic SM Dispersion Add-On - Vertical - 32 bit float
		Dynamic MS Dispersion Add-On - Horizontal - 32 bit float
		Dynamic MS Dispersion Add-On - Vertical - 32 bit float

Figure 125: Message Format for Action Response PDU Customized For Coax Gun VV&A.

Field Size (bits)	Fields Of Action Response PDU Customized For STAFF Round VV&A	
96	PDU HEADER	Protocol Version - 8 bit enumeration
		Exercise ID - 8 bit unsigned integer
		PDU Type - 8 bit enumeration
		Padding - 8 bit unused
		Time Stamp - 32 bit unsigned integer
		Length - 16 bit unsigned integer
		Padding - 16 bits unused
64	ORIGINATING ENTITY ID	Site - 16 bit unsigned integer Application - 16 bit unsigned integer Entity - 16 bit unsigned integer Group - 16 bit unsigned integer
64	RECEIVING ENTITY ID	Site - 16 bit unsigned integer Application - 16 bit unsigned integer Entity - 16 bit unsigned integer Group - 16 bit unsigned integer
32	PADDING	32 bits unused
32	REQUEST ID	32 bit unsigned integer
32	REQUEST STATUS	32 bit unsigned integer
32	NUMBER OF FIXED DATUM FIELDS	0x00000000
32	NUMBER OF VARIABLE DATUM FIELDS	0x00000001
1472	STAFF ROUND VV&A DATA	0x00000131 (305)
		(See Section 4.2.2.1.2) - 32 bit unsigned int
		0x00000580 (1408)
		32 bit unsigned integer
		STAFF Fire Event - Site ID - 16 bit us int
		STAFF Fire Event - Applic. ID - 16 bit us int
		STAFF Fire Event - Event ID - 16 bit us int
		STAFF Range - 16 bit unsigned integer
		Seeker Activation Range - 16 bit us integer
		Seeker Activation Status - 8 bit us integer
		Submunition Fire Status - 8 bit us integer
		Time At STAFF Firing - 32 bit us integer
		Time At Seeker Activation - 32 bit us integer
		Time At Submunition Firing - 32 bit us integer
		STAFF Reliability - 32 bit float
		Random Number Drawn Against Reliability - 32 bit float
		Antenna Beam Azimuth - 32 bit float
		Forward Look Angle - 32 bit float
		Range From Vehicle At Submunition Firing - 16 bit us int
		Target Entity - Site ID - 16 bit unsigned int
		Target Entity - Application ID - 16 bit us int
		Target Entity - Entity ID - 16 bit unsigned int
		Target World Position - X Coordinate - 64 bit float
		Target World Position - Y Coordinate - 64 bit float
		Target World Position - Z Coordinate - 64 bit float

	Target World Orientation - Psi - 32 bit float
	Target World Orientation - Theta - 32 bit float
	Target World Orientation - Phi - 32 bit float
	Number Of Targets Detected - 16 bits us int
	Firer-Target Mobility Status - 8 bit uns. int.
	Padding - 8 bits unused
	Submunition Firing Location- X Coordinate - 64 bit float
	Submunition Firing Location - Y Coordinate - 64 bit float
	Submunition Firing Location - Z Coordinate - 64 bit float
	Submunition Detonation Location - X Coordinate - 64 bit float
	Submunition Detonation Location - Y Coordinate - 64 bit float
	Submunition Detonation Location - Z Coordinate - 64 bit float
	Fixed Bias - Horizontal - 32 bit float
	Fixed Bias - Vertical - 32 bit float
	Airpoint Bias - Horizontal - 32 bit float
	Airpoint Bias - Vertical - 32 bit float
	Static Round Dispersion - Horizontal - 32 bit float
	Static Round Dispersion - Vertical - 32 bit float
	Dynamic SM Dispersion Add-On - Horizontal - 32 bit float
	Dynamic SM Dispersion Add-On - Vertical - 32 bit float
	Dynamic MS Dispersion Add-On - Horizontal - 32 bit float
	Dynamic MS Dispersion Add-On - Vertical - 32 bit float

Figure 126: Message Format for Action Response PDU Customized For STAFF Round VV&A.

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APPENDIX C - VV&A TEST DESIGN SAMPLES

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1. OVERVIEW

This Appendix gives an overview of a portion of the M1A2 VV&A Evaluation Plan and Test Design Plan for Target Acquisition and Delivery Accuracy. The purpose of this Appendix is to provide a frame of reference for the use of the simulator VV&A tools.

2. TARGET ACQUISITION

The M1A2 acquisition sensors are visually presented to the commander, gunner and driver through a Computer Image Generator (CIG). Target Acquisition is the ability to detect, recognize and identify targets; however the CIG must first accurately portray/present the targets and surrounding environment for a specific sensor device. For example the CIG must adequately portray a Forward Looking Infrared (FLIR) sensor and how that FLIR (i.e. CIG image) presents the scene to the viewer (gunner, etc). Validation of the Computer Image Generator and validation of Target Acquisition are closely linked.

Issue: How well does the M1A2 simulator's level 2 Computer Image Generator render realistic scenes for each sensor based on the environment to include terrain, cultural features and icons ?

Criteria: CIG evaluation will be evaluated by Subject Matter Experts

Issue: How well does the M1A2 simulator's target acquisition capability permit the crew to detect, recognize and identify targets ?

Criteria: Ability of the simulator crew (man-in-the-loop) to detect, recognize and identify targets must be characteristic of the M1A2 system requirements and system performance. Results will also be compared to NVESD model estimates.

The M1A2 employs four sensors as described below:

(1) The commander and gunner are equipped with the Gunner Primary Sight (GPS) which displays the Direct View Optics (DVO) in Wide Field of View (WFOV) or Narrow field of View (NFOV).

(2) The GPS is also switchable to the Thermal Imaging System (TIS) which can be magnified to WFOV or NFOV.

(3) The commander is equipped with an independent thermal flat panel display, the Commanders Independent Thermal Viewer (CITV), which operates in WFOV or NFOV.

(4) The driver is equipped with three forward looking vision blocks, i.e. out-the-window view. The commander also has three vision blocks located in the cupola. The cupola/vision blocks can be rotated around 360 degrees to provide the commander with a 360 degree view.

2.1 Test Plan

The following tests will be conducted to validate CIG performance and Target Acquisition capability:

2.1.1 CIG Characterization and Icon Representation.

The terrain, cultural features and icons must be sufficiently representative of the real world being depicted. Each icon should have the same level of fidelity/detail so that target acquisition is not unduly influenced. Furthermore there should not be any unrealistic cues, such as color, which readily distinguish friendly versus enemy targets. Subject Matter Experts will qualitatively assess the CIG and Icon Representation.

2.1.2 Target Acquisition In-field-of-View - Vehicle Target Icons.

Table 1 contains the target acquisition test matrix for the terrain, cultural features and icons. Four M1A2 qualified gunners and/or commanders will detect, recognize and identify six targets. Pairs of targets were chosen from three target classes. The six targets will consist of: a tank class - M1A2 Abrams and the T80; an infantry track vehicle class - M2A2 Bradley and the BMP2; a light wheeled vehicle class - HMMWV and BTR-60. Each target will be presented in four range bands, which are: short range (1600-1800 meters); medium range (2300-2500 meters); long range (3600-3800 meters); very long range (5400-5600 meters). Additionally null targets will appear in a randomly ordered sequence. The environmental conditions include: day 7km visibility; day with 3.5km visibility; and night. These various conditions will be replicated on different backgrounds and clutter. The number of replications conducted is a function of the environmental condition.

Each gunner will look through a given sensor and magnification (e.g. TIS (N)). One target will be presented in a certain range band and under a certain environmental condition. The gunner will attempt to acquire the target to the highest level of acquisition possible. The acquisition scale in ascending order is: no detection, detection, recognition (i.e. Tank Class, APC Class, Truck Class, Air Class), identification (e.g. M1A2, BMP2, etc.). Additionally a quadrant will be drawn on the sight glass, so that the target appears to be in one of the quadrants: far left, middle left, middle right, and far right. During the test execution, for example, a gunner will be presented with one target and he will state "M1A2 far right quadrant".

2.1.3 Target Acquisition In-field-of-View - Line Pair Boards.

The standard 2.3 by 2.3 meter line-pair target boards for detection, recognition and identification will be presented to four test gunners. The boards will be randomly spaced within four range bands. Only one board will be presented at any one time. Gunners will vocally announce the number of line-pairs that are discernable and the orientation of the lines "horizontal" or "vertical". The Target Board Test Matrix is contained in Table 1.

Table 1. Target Acquisition Test Cases

ENVIRONMENT	SENSORS					
	DVO (N)	DVO (W)	TIS (N)	TIS (W)	CITV (N)	CITV (W)
Day 7km Visibility	X	X B	X B	X	X B	X
Day 3.5km Visibility	Y	Y B	Y B	Y	Y B	Y
Night	NONE	NONE	Y B	Y	Y	Y
Notes: X = 4 simulators (i.e. gunners/commanders), 6 targets, 4 ranges, 5 replications Y = 4 simulators (i.e. gunners/commanders), 6 targets, 4 ranges, 2 replications B = Line-pair Board Test						

2.2 Data Required

The following data will be collected:

- the condition presented
 - environment (e.g. day 7km visibility, etc)
 - sensor (e.g. DVO(N), etc)
 - target (e.g. M1A2, T80, line-pair board, etc)
 - range and range band (e.g. 1620 meters, short range band)
 - observer vehicle location (X, Y, Z, heading)
 - observer sight location (X, Y, Z, heading)
 - target vehicle location (X, Y, Z, heading)
 - aspect angle of target relative to observer sight location
- gunner acquisition response
- gunner quadrant response
- gunner time (seconds) to determine highest level of acquisition

The target acquisition test will be conducted with the use of the Verification, Validation and Accreditation Test Tool (VVATT). Data will be captured by Standard Protocol Data Units (PDUs), the Target Acquisition VV&A PDUs and the VVATT.

2.3 Evaluation Plan

The data will be aggregated over both similar and varying conditions. Time to acquire and probabilities of detection, recognition, identification and false targets will be determined as a function of similar and varying conditions. Results will be compared: across conditions, to NVESD model estimates and to system requirements for acquisition.

3. DELIVERY ACCURACY

Issue: How well does the M1A2 simulator simulate the 120mm Sabot and HEAT rounds' delivery accuracy ?

Criteria: The simulated delivery accuracy must be comparable to demonstrated round performance from actual M1A2 technical tests and/or AMSAA analytical estimates.

The M1A2 Abrams tank M256 120mm main gun fire control attempts to simply point the gun so that a round, when fired, will hit the target aimpoint. The Abrams takes into account the offset of the sight to gun, air temperature, air pressure, cant, propellant temperature, crosswind, distance to target, gravity and the relative crossing motion of the target and Abrams. The fire control does not account for coriolis, but this influence is small. In practice, the fire control solution is only approximate because of differences between the actual tank environment and the sensed environment. Fire control errors are attributable to tracking errors, own-vehicle motion disturbances getting through the stabilizer, gun pointing errors (actual hardware), variations in ammunition size, shape, weight, integrity, yaw, muzzle velocity, launch characteristics, gun vibrations and influences. These unpredictable variations are characterized empirically by their statistical distributions.

Delivery accuracy is defined in terms of a distance from a desired aimpoint. This is called "total system error" and is the distance between the projectile and the desired aimpoint in the vertical plane, which is normal to the line of sight to the target and contains the desired aimpoint. Total system error is expressed as an angle. If the actual aimpoint and the desired aimpoint do not coincide, the angular distance between the two is termed "lay error". Lay error subtracted from the total system error, is termed the projectile "miss distance". Hitting probability is the result of integrating the total system error density function over the presented vertical target area, a projection of the target outline in a vertical plane containing the desired aimpoint.

3.1 Test Plan

Delivery accuracy tests are divided into four major scenarios:

- 1.) stationary firer versus stationary target,

- 2.) moving firer versus stationary target,
- 3.) stationary firer versus moving target,
- 4.) moving firer versus moving target.

In all scenarios, except moving firer versus moving target, a 2.3m x 2.3m vertical target centered on a 10m x 10m panel is used. In the moving firer versus moving target scenario, a 2.3m x 4.6m target is used. A clearly defined aimpoint is marked on each target. The gunner should follow established engagement procedures defined in the M1A2 training manual. Engagement procedures should mirror the FM 17-12 series manual as closely as possible, including ranging to target just before trigger pull.

3.1.1 Stationary Firer versus Stationary Target

Table 2 shows the stationary firer versus stationary target test matrix. In each case, the target is located out of the M1A2's narrow field of view. The gunner engages the target, and then fires a second round. The gunner continues finding targets until 60 shots have been accumulated for the engagement range.

Table 2 - Stationary Firer versus Stationary Target Test Matrix

Range (m)	Shots per Target	Number of Targets
1500	2	30
2500	2	30
3000	2	30
3500	2	30

3.1.2 Moving Firer versus Stationary Target

The moving firer versus stationary target test matrix is contained in Table 3. In the 20 kph head-on case, the M1A2 moves toward the target. The range to the target at the start of the run should be 0.5 km to 1 km farther than the engagement range. In the 20 kph crossing case, the M1A2 moves crosswise to the target.

Table 3 - Moving Firer versus Stationary Target Test Matrix

Firer Speed (kph)	Range (m)	Shots per Rep	Number of Reps
20 kph Head-on	1000	2	30
	1500	2	30
	2000	2	30
	2500	2	30
20 kph Crossing	1000	2	30
	1500	2	30

3.1.3 Stationary Firer versus Moving Target

Table 4 shows the stationary firer versus moving target test matrix. The target must remain perpendicular to the firer and the elevation of the aimpoint must remain constant. The test environment should emulate the Aberdeen Proving Ground's Bubble Moving Target Simulator.

Table 4 - Stationary Firer versus Moving Target Test Matrix

Target Path	Target Speed (kph)	Range (m)	Shots per Rep	Number of Reps
CV20	20	1500	2	30
		2000	2	30
		2500	2	30
ATMT	Variable	1500	10-20	10
		2000	10-20	10
		2500	10-20	10

CV20 is a constant speed crossing target. The ATMT path is a maneuvering combat path running for 273 seconds. In all cases the range will be kept constant. The gunner aims at the center of the target, tracks smoothly, and fires when he feels confident of hitting the target. Additional shots should be taken with the objective of being accurate.

3.1.4 Moving Firer versus Moving Target

The moving firer versus moving target test matrix is contained in Table 5. For the actual M1A2 system, this case is treated by combining stationary firer-moving target accuracy with the add-on dispersion for fire-on-the-move.

Table 5 - Moving Firer versus Moving Target Test Matrix

Crossing Speed (kph)		Range (m)	Shots per Rep	Number of Reps
Firer	Target*			
10	10	1500	3	20
* 2.3m X 4.6m vertical target				

3.2 Data Required

Following are the individual data elements required for all the delivery accuracy tests. For the stationary firer versus stationary target tests, the data elements are not required as a function of time, but rather as a function of trigger pull.

- Desired aimpoint coordinates with respect to an earth reference (w/r/t/e), x,y,z, in meters, versus time in 1/10 second intervals.
- Origin of the sight line on the simulator w/r/t/e, x,y,z in meters, versus time in 1/10 second intervals.
- Midpoint of the gun trunnion w/r/t/e, x,y,z in meters, versus time in 1/10 second intervals.
- Lay error, the desired aimpoint w/r/t the midpoint of the sight reticle in mrad, horizontal and vertical, versus time in 1/10 second intervals.
- Gun pointing direction, at trunnion, w/r/t desired aimpoint in mrad, horizontal and vertical, versus time in 1/10 second intervals.

- Inputs to the fire control computer: range(m), cant(mrad), crosswind(m/sec), propellant temperature($^{\circ}$ F), air temperature($^{\circ}$ F), air pressure(inches Hg), boresight values(mrads), computer correction factor(s) (mrads).

- Actual meteorological conditions, if different from those in f above.
- Ballistic solution (mrads), horizontal and vertical - where the fire control wants to point the gun axis at the trunnion, w/r/t the boresight line.

- Actual trajectory of the projectile at 500m increments, desired by horizontal range(m), height(m), and deflection(m), out to, and including the point of closest approach to the aimpoint.

- Projectile's time-of-flight as a function of the trajectory.
- Sight pointing, and gun pointing direction at the trunnion, w/r/t the desired aimpoint at trigger pull time, in mrads, horizontal and vertical. Tag these measurements with the trigger pull times.
- Gun-to-Sight offset, the difference between sight pointing and gun pointing directions.
- Total system error, equals the projectile location minus the desired aimpoint.
- Projectile miss distance at the point of closest approach to the desired aimpoint. Miss distance equals the total system error minus lay error. Express the miss distance in terms of horizontal and vertical deflections (m).
- Number of hits and Number of shots

Additional data items required under the stationary firer versus moving target condition and the moving firer versus moving target conditions are:

- Velocity of the desired aimpoint w/r/t/e, dx/dt , dy/dt , dz/dt , in m/sec, versus time in 1/10 second intervals.
- Target's instantaneous rate

Additional data items required under the stationary firer versus moving target, moving firer versus stationary target, and moving firer versus moving target conditions are:

- azimuth linear lead required, equals the target's instantaneous rate multiplied by the projectile's time of flight.
- kinematic lead error, equals azimuth gun-to-sight offset minus the linear lead required
- system induced error, equals kinematic lead error plus the lay error

The delivery accuracy test will be conducted with the use of the Delivery Accuracy Logger files, in order to present the scenario. Data will be captured by Standard Protocol Data Units (PDUs), the Target Acquisition and Tracking VV&A PDUs, and the Delivery Accuracy VV&A PDU's.

3.3 Evaluation Plan

The mean and standard deviation of each group's miss distances, lay errors, total system errors, etc. will be calculated. The grand mean and overall standard deviation will also be computed.

All the delivery accuracy statistics will be compared to the M1A2 technical test results, analytical estimates and quasi-combat values. The gun-to-sight offset will be compared to the fire control sensor inputs and manual inputs.

APPENDIX D - DISTRIBUTION

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STUDY GIST

SUBJECT: Technical Report Number: 570, Anti-Armor Advanced Technology Demonstration (A2 ATD) Verification, Validation and Accreditation (VV&A) Tools for Simulators.

PRINCIPAL FINDINGS: See Objectives below.

MAIN ASSUMPTIONS: Prior to the execution of the Anti-Armor Advanced Technology Demonstration (A2 ATD) Distributed Interactive Simulation (DIS) Experiments all the individual models/elements of the DIS Experiment must first be verified, validated and accredited (VV&A). The simulators and Modular Semi-automated Force (MODSAF) need to be VV&A'd before the experiment. Additionally the entire Experiment needs to be VV&A'd.

PRINCIPLE LIMITATIONS/SCOPE OF EFFORT: The VV&A tools contained in this report are based on the M1A2 simulator. However, these tools are sufficiently general that they transfer/adapt well to other weapon systems/simulators. For example, nearly all weapon systems/simulators require a gunner to detect, recognize and identify targets; therefore, the M1A2 simulator VV&A methodology and tools developed to capture target acquisition capabilities are transferable.

OBJECTIVES: The Anti-armor Advanced Technology Demonstration is a series of Battlefield Distributed Simulation - Developmental (BDS-D) experiments focusing on A2 weapon systems evaluations. A2 ATD Experiments consist of a combination of one or more simulators coupled with MODSAF. Each combination requires VV&A of: individual simulators, MODSAF and the entire BDS-D simulation. Under the A2 ATD program, methodologies and tools have been designed and developed to assist in the VV&A process of individual simulators, MODSAF and the BDS-D simulation. This report outlines and describes the VV&A methodologies and tools developed and demonstrated for an individual simulator.

BASIC APPROACH: Since the purpose of A2 ATD centers on weapon systems evaluations, then the VV&A tools are also geared toward that end. The tools are:

- 1.) VV&A Test Tool for target acquisition tests;
- 2.) VV&A Protocol Data Units for target acquisition, tracking, delivery accuracy, direct fire vulnerability, indirect fire vulnerability, Smart Target Acquisition Fire and Forget (STAFF) round, coax machinegun;
- 3.) Delivery Accuracy Logger Files for test scenarios;
- 4.) DIS Analytical Tools to format and output results;

5.) Simulation Manager for setting certain data items in the simulator (e.g. fuel quantity).

In the future, the VV&A tools will continue to evolve and mature. Additionally other tools will be developed to streamline the VV&A process.

REASON FOR PERFORMING THE STUDY OR ANALYSIS: Historically, the analytical community has used constructive models such as Janus and CASTFOREM to conduct analysis for the acquisition process. These types of models do not fully represent the impacts of human interaction with the system and the human influence on combat effectiveness of the system. The Training and the Research and Development communities have used real time man-in-the-loop DIS for several years. However, the full potential of DIS as an evaluation tool to support materiel acquisition decisions has not been realized; A2 ATD will explore the use of DIS as an evaluation tool. As one feeder into the use of DIS as an evaluation tool, each simulator participating in the experiment must be VV&A'd.

IMPACT OF THE STUDY/PLAN: The A2 ATD VV&A Tools for Simulators provides a blueprint for use in methodology, data collection and analysis to support simulator VV&A. These activities provide "credible" simulator responses/results and therefore provide the overall experiment with "credible" outcomes.

SPONSOR: This effort is sponsored by the Headquarters, Department of the Army, Assistant Secretary of the Army for Research, Development and Acquisition.

PRINCIPLE INVESTIGATOR: Irene Johnson, Combat Integration Division, AMSAA.

NAME/ADDRESS/PHONE NUMBER WHERE COMMENTS AND QUESTIONS CAN BE SENT: Director, AMSAA, ATTN: AMXSY-CD (Irene Johnson), Aberdeen Proving Ground, MD 21005-5071 (DSN 298-6608 or 410-278-6608).

DEFENSE TECHNICAL INFORMATION CENTER (DTIC) ACCESSION NUMBER OF FINAL REPORT: Report available by contacting AMSAA's Reports Processing Center, DSN 298-5676.

OTHER THAN THE SPONSOR, WHO COULD BENEFIT FROM THIS STUDY INFORMATION ? Other DoD personnel and their contractors involved in the acquisition process, DIS experiments, simulators, computer generated forces, and/or VV&A of DIS.