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RECENT COMBAT EXPERIENCE HIGHLIGHTED A NUMBER OF DEFICIENCIES IN COMBAT SEARCH AND RESCUE (CSAR) DURING JOINT OPERATIONS THAT MAY LIMIT A JOINT FORCE COMMANDER'S (JFC) ABILITY TO PROVIDE FULL DIMENSIONAL PROTECTION. MISSION AREA DEFICIENCIES ENCOMPASSED SEVERAL INTEROPERABILITY ISSUES, SUCH AS NONSTANDARD TACTICS, TECHNIQUES, AND PROCEDURES AND INCOMPATIBLE COMMUNICATIONS CAPABILITIES. AS A RESULT, IN 1995, THE OFFICE OF THE SECRETARY OF DEFENSE (OSD) CHARTERED THE JOINT COMBAT SEARCH AND RESCUE (JCSAR) JOINT TEST AND EVALUATION (JT&E), LOCATED AT NELLIS AFB, NV, TO STUDY THE CSAR MISSION ARE AS IT APPLIES TO U.S. FORCES ENGAGED IN JOINT OPERATIONS. THE JT&E CHARTER EXTENDS FOR THREE YEARS TO DEVELOP AND RECOMMEND SOLUTIONS TO JOINT CSAR DEFICIENCIES.

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Executive Summary

Recent combat experience highlighted a number of deficiencies in Combat Search and Rescue (CSAR) during joint operations that may limit a Joint Force Commander's (JFC) ability to provide full dimensional protection. Mission area deficiencies encompassed several interoperability issues, such as nonstandard tactics, techniques, and procedures and incompatible communications capabilities. As a result, in 1995 the Office of the Secretary of Defense (OSD) chartered the Joint Combat Search and Rescue (JCSAR) Joint Test and Evaluation (JT&E), located at Nellis AFB, NV, to study the CSAR mission area as it applies to U.S. forces engaged in joint operations. The JT&E charter extends for three years to develop and recommend solutions to joint CSAR deficiencies.

Mission Studied

The JCSAR Joint Test Force (JTF) assessed the entire JCSAR process from the initial isolating event to recovery. For test purposes the JCSAR JTF assessed the following mission segments:

- Location and Identification (Loc/Id) of the isolated personnel
- Mission Planning
- Mission Execution for recovering the isolated personnel.

The Virtual Simulation 2 (VS 2) test concentrated on Mission Execution.

Administration and Assets

The VS 2 exercise was a joint services experimental exercise conducted at various sites in the U.S. as shown in Figure 1. Performed as Delivery Order (DO) #0051 under the Lockheed Martin Advanced Distributed Simulation Technology II (ADST II), the exercise was conducted from April 27 to May 18, 1998. The exercise was Contract administered by the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM). The experiment utilized a synthetic environment that employed virtual and constructive simulations to depict friendly and hostile air and ground forces as well as two survivors in realistic combat situations. The scenarios were developed on the Nellis Terrain database. These scenarios were designed to produce survivability events, provide fratricide risk, and induce the mission commanders to make tactical decisions that affected survivor rescue outcomes.

Objectives

The primary objectives of the VS 2 test were to:

- Assess the effectiveness of E-8 Joint Stars, E-3 Airborne Warning and Control System (AWACS), and E-2C Hawkeye airborne C4I elements in conducting JCSAR operations.
- Assess the effectiveness of Search and Rescue Task Force (SARTF) elements in conducting JCSAR operations.
- Identify and assess critical factors affecting JCSAR mission execution.
- Assess the impact of joint interoperability issues on the JCSAR mission effectiveness
- Identify and assess the critical areas that impact the mission effectiveness of JCSAR operations
- Assess VS 1 derived enhancements:
    - Joint Tactical Information Distribution System (JTIDS) available to SARTF
    - Airborne Mission Commander (AMC) training
    - Mixed Rescue Escort (RESCORT), joint fixed wing and rotary wing packages
    - Armed Rescue Vehicles (HH-60H only)
- Identify potential enhancements that impact mission effectiveness

Tasks

Development of the software modifications to the Multi-Purpose Digital Display (MPDD), Simulyzer software, and the generation of three new models for the simulator devices at the Aviation Test Bed, Ft. Rucker were performed by TASC in San Antonio, TX. ASTi Corporation in Herndon, VA performed modifications to the ASTi radio simulators. The final integration phase was completed at the AVTB from January to April, 1998 during scheduled Sub-System Integration Tests (SSITs). In accordance with the Government Statement of Work, the experiment's test trial window was divided into three SSITs and one Mission Rehearsal Test (MRT). The first SSIT was scrubbed due to difficulties experienced with the Defense Simulation Internet (DSI) network. As a result of these difficulties, T1 lines were installed at each of the sites for use during all test periods and for the final VS2 exercise.

The entire trial run matrix was executed within the allocated test periods with no additional time periods required for further integration and testing.

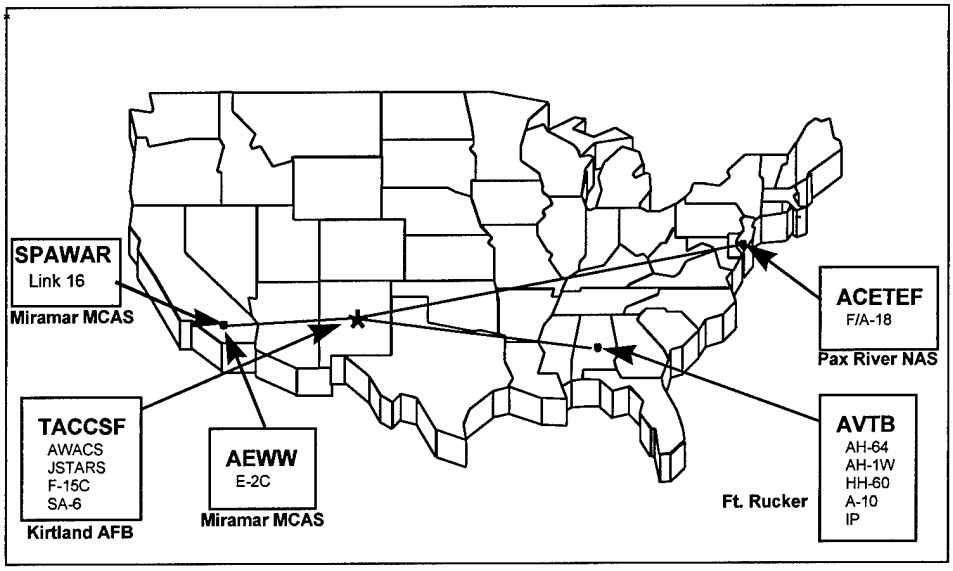

Figure 1 JCSAR VS2 Sites

In accordance with the Government SOW, this Final Report includes a description of the experiment, its conditions and conduct, and lessons learned. This report addresses the inter-connectivity of simulation systems and the modifications to equipment in support of JCSAR VS2 requirements. This report does not include discussion of data analysis nor conclusions as to whether the customer(s) achieved their objectives of the experiment.

1. INTRODUCTION

1.1 Purpose

The purpose of this final report is to document the ADST II effort that supported the Joint Combat Search and Rescue, Virtual Simulation 2 (JCSAR VS2) exercise. This report includes a full description of the experiment, its conditions, and lessons learned. A more detailed description of the design modifications performed in support of the JCSAR VS2 effort is found in a separately prepared document entitled the "Design Description Document" document number ADST-II-MISC-JCSARVS2-9700465.

1.2 Contract Overview

JCSAR VS2 was performed as DO #0051 under the Lockheed Martin Corporation (LMC) ADST II contract with STRICOM. The DO was performed in three stages as shown in Fig 2. The contract required LMC to perform modifications identified during VS1 in support of the VS2 exercise. All modifications were successfully completed. The contract also required LMC to support the actual VS2 exercise at the AVTB, Ft. Rucker, Alabama that was held during the month of May, 1998.

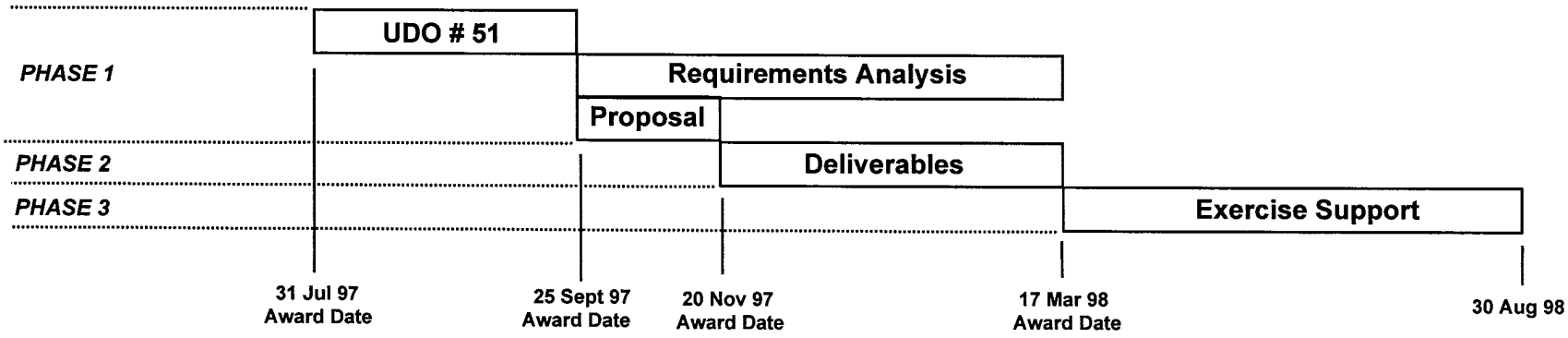

Figure 2 DO #0051 Contract Structure

1.3 Experiment Overview.

The purpose of JCSAR VS2 was to use man-in-the-loop simulators and simulated forces to evaluate joint services combat search and rescue (CSAR) tactics. The VS2 experiment was conducted from 27 April 1998 through 18 May 1998. Two separate sets of aircrewmembers were used to execute various scenarios for data collection. One JCSAR mission was performed each day for six days for each set of aircrews for a total of twelve missions. Each set of crewmembers were provided two days of training to familiarize them with the simulators at AVTB. At the conclusion of each mission, aircrew debriefs were conducted and data gathered from the mission was processed for delivery to JCSAR data analysts at Nellis AFB, NV.

Each scenario event included a two-hour scripted ground and air battle that provided crews with a realistic simulated combat environment for conducting CSAR operations. Scenario events began with two simultaneous shootdowns and issuance of launch orders by a White Force Joint Search and Rescue Center to alert CSAR crews. In order to prevent crew gaming, each day of testing presented crews with one of six different threat laydowns and opposing force (OPFOR) mission profiles.

Data collected from the experiment will be used to evaluate tactics employed by the aircrews to complete their mission. Each scenario presented a different tactical situation and aircraft platform mix that necessitated in employing different tactics to complete the mission.

1.4 Technical Overview

This delivery order relied on the Integrated Product Team (IPT) approach that included the JCSAR Users, pilots from all of the services, STRICOM and the ADST II design team. The development work was performed at the Operational Support Facility (OSF) in Orlando and at the TASC Corporation, San Antonio, TX, from October 1997 through April 1998. Technical Interchange Meetings (TIMs) were held during the development. This approach ensured that the end product met the users expectations. A series of long haul Sub-System Integration Tests (SSITs) were performed from December 1997 through April 1998 with TACCSF, ACTEF and AEWW. A full mission rehearsal test was performed during March 1998 to effectively test design modifications with a full up network and crewmembers.

The Multi Purpose Digital Displays in the cockpits at AVTB, Ft. Rucker, were modified to incorporate the addition of a Joint Information Tactical Distribution System (JTIDS) as well as some refinements to the Radar Warning Receiver (RWR) display. A mod was incorporated for emitter operations: lock-on tones, missile launch tone for the Mig-29, SA-2, and SA-6.

Three database models were added to the DED files: E-2C, SA-2 missile site radar, and SA-6 missile site radar.

The Simulyzer software package, a tool used for data collection, was modified to correct deficiencies in the Killer-Victim Scorecard function and the handling of emission PDUs. A mod was also incorporated to automate the processing of IFF PDUs. Additional modifications were incorporated to enhance the data analysts job, eg PDU field correction.

The ASTi server was modified to incorporate secure comm capabilities and to provide the radio operators with a radio receiver indicator function. The radio receiver indicator function was required for the E-2C simulator at AEWW, Miramar MCAS. The ASTi hand held terminals were modified to provide an indication to the operator that a radio/frequency is in secure mode and the capability to select a radio/frequency to be in secure mode.

A terrain LOS server was developed for use with the ASTi servers. The LOS server computes whether a transmitter-receiver pair has unobstructed line-of-sight for communications. A new Terrain LOS PDU was created for this function.

The RWA and FWA simulators were modified to issue a fire PDU for every chaff/flare that was launched.

The RWA simulators at Ft. Rucker were modified to correct a Height-Above-Terrain (HAT) problem that caused the RWAs to crash while flying through the database.

A JTIDS gateway was installed at AVTB and utilized during the JCSAR effort. The JTIDS gateway consisted of a workstation that processed and transferred data to and from the simulator devices and TACCSF via a STU line.

A detailed description of all the modifications that were performed for the JCSAR VS2 program are documented in the Design Description Document, document number ADST-II-MISC-JCSARVS2-9700465.

2. Applicable Documents

2.1 Government

a) AMSTI-97-W080, Statement of Work for Joint Combat Search and Rescue (JCSAR) Virtual Simulation 2 (VS 2) Delivery Order, version 1.4, dated 02 September 1997.

b) JCSAR VS-2 IRD, Interface Requirements Document, dated 09 September 1997.

c) NIP-JCSAR-1026, Joint Combat Search and Rescue Network Integration Plan, Rev 1, dated 01 April 1998.

d) LSE-IDD-00-U-RAC0, Interface Design Description for the Link-16 Engine, (15 May 97)

e) LSE-SUM-00-U-RBC0, Software User Manual for the Link-16 Engine, Version 3.2, (15 May 1997)

f) JCSAR-VS 2/SD-01-0498, JCSAR Virtual Simulation 2 Scenario Document, dated April 1998

g) JCSAR-DTP/VS2-01-0498, JCSAR Virtual Simulation 2, Detailed Test Plan, dated April 1998, (Lockheed Martin Document Number, T-21044, cataloged as a Reference document)

2.2 Non-Government

a) IEEE-STD-1278.1, Standard for Distributed Interactive Simulation – Application Protocols (1995)

b) IEEE-STD-1278.2, Standard for Distributed Interactive Simulation – Communication Services (1995)

c) MTR 96W0000027, Overview of Navy Link16, (May 1996)

d) ADST-II-MISC-JCSARVS2-9700465, Design Description Document for Joint Combat Search and Rescue, Virtual Simulation 2, (JCSAR VS2), dated 20 May 98, Revision 1.

3. System Description

3.1 System Configuration

The following table summarizes the AVTB assets that were utilized during the JCSAR VS2 experiment.

A network diagram is included in the Design Description Document, document number ADST-II-MISC-JCSARVS2-9700465.

ADST II AVTB ASSET	PURPOSE	PROTOCOL
Rotary Wing Aircraft (RWA) Simulator	Helicopter Simulator	DIS
Rotary Wing Aircraft (RWA) and Fixed Wing Aircraft (FWA) simulators.	Simulators for various helicopters and A-10 Escort vehicles.	SIMNET
Stealth	Battlefield Display for downed aircraft survivor role-player	DIS
ModSAF Workstations	Semi-Automated Forces for OPFOR, two BLUFOR M1 Platoons, & Scout Section	DIS
ASTi Servers	Simulated Radio Communications	DIS
Plan View Display	Terrain Map of the battlefield for Exercise Control	DIS
Radio Monitor	Used to monitor radio communications during exercises	DIS
Data Loggers	Record of DIS PDUs for Data Collection & Analysis	DIS
JTIDS	Provides additional tactical situational awareness data to aircrewmembers.	LINK-16
XCIAU	Convert SIMNET PDUs to DIS PDUs and DIS PDUs to SIMNET PDUs	DIS/SIMNET

Table 1 ADST II AVTB Assets

3.2 Network Diagram

A network diagram for the AVTB assets utilized during VS2 is shown in Figure 3.

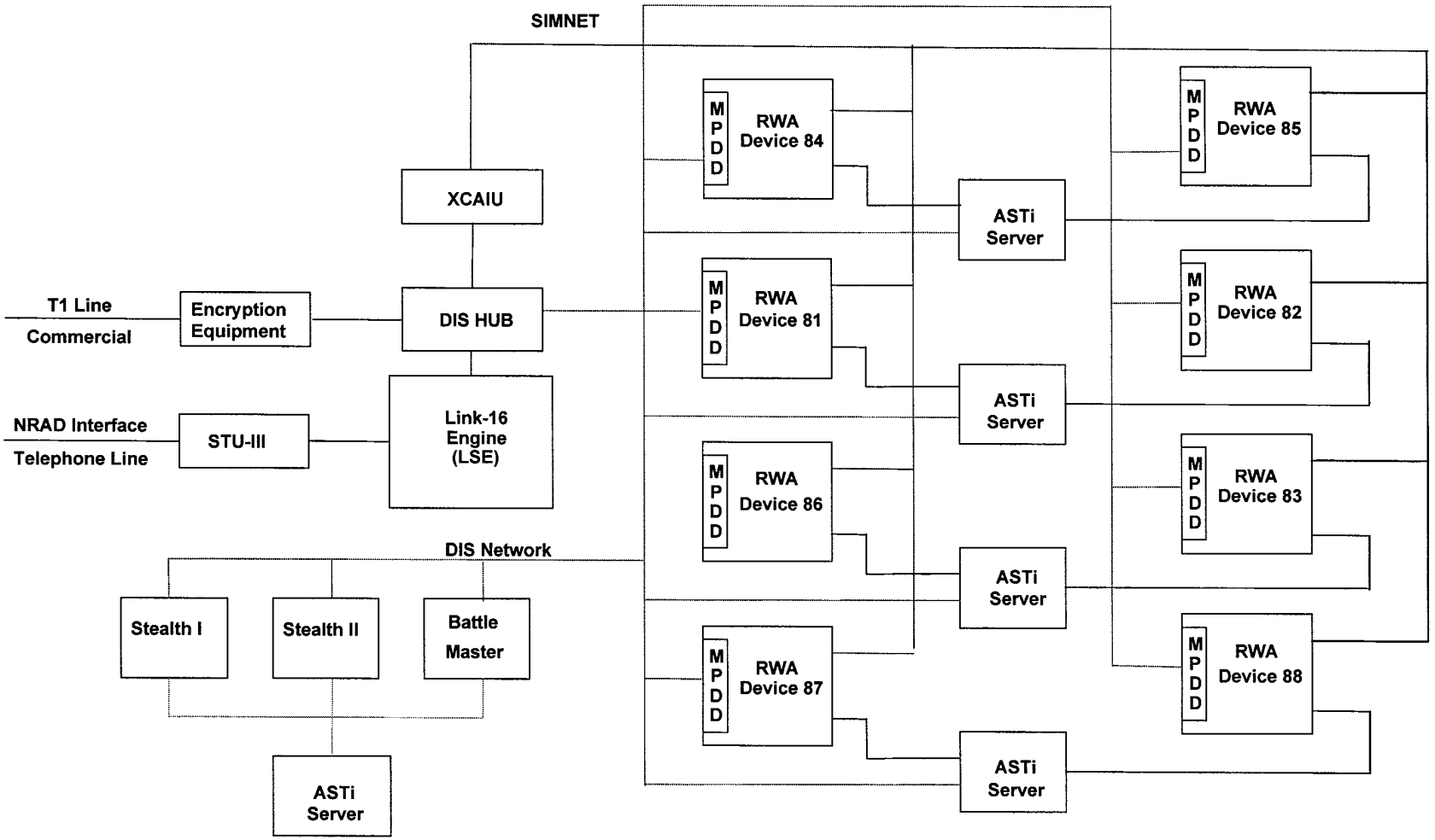

Figure 3 JCSAR VS2 AVTB Network Diagram

3.3 Description of System Components

This section discusses the description, functionality and operation of AVTB assets utilized during the JCSAR VS2 effort. Additional technical information, such as a more detailed technical description is provided separately in the Design Description Document.

3.3.1 ASTi Servers

The ASTi servers provided tactical communications links between simulators located at all sites as well as between assets within the AVTB facility. Two JCSAR VS2 ASTi radio models were developed which included secure mode communications capability for fourteen tactical channels. Two separate models were required because the simulator cockpits at AVTB were equipped with a new comm control panel. A separate ASTi *.DLL file was required for the cockpits and the Battlemaster station. The new *.DLL files, developed by ASTi in Herndon, VA, modified the Hand Held Terminals (HHTs) to display whether or not the selected radio was in secure mode.

3.3.2 SIMNET Devices

The AVTB has eight reconfigurable simulators, two of which are dedicated to fixed wing aircraft, specifically the A-10 aircraft and are SIMNET devices. Five of the reconfigurable simulators are used for helicopters and these are also SIMNET devices.

3.3.3 Meta VR Channel Surfer

The remaining re-configurable simulator is also used for helicopter simulations but has been upgraded with a Meta VR image generator and Host based on Pentium PC computers. This particular simulator is a DIS device.

3.3.4 JTIDS (Link-16)

The Joint Tactical Information Distribution System provides a secure, jam-resistant, digital communication system for data and voice. It supports the positive identification and precise location of all participating platforms, greatly reducing the possibility of blue-on-blue engagements.

The JCSAR program provided a JTIDS capability to the AVTB facility. A workstation with simulated JTIDS interface software is connected to each of the MPDDs in the cockpits. The MPDD was modified to include a JTIDS display.

3.3.5 Theater of Operations (Database)

The existing ADST II Nellis Database was utilized for the JCSAR VS2 experiment.

3.3.6 T-1 Interface

Due to difficulties with the DSI network, a commercial T-1 line was used. Encryption equipment was provided on-loan from TACCSF, Kirtland AFB, NM to AVTB for this effort.

3.3.7 ModSAF

Three ModSAF workstations (DEC ALPHAs) were used. The ModSAF version used for this experiment, version 3.0, was identical to the version used for the BICEP program. Minor changes were made to this release to incorporate the original modifications from the VS1 experiment. Additional DIS enumerations were added in order to comply with the NIP. All changes were captured and stored at the AVTB since the software is classified.

3.3.8 Data Logger

The Data Logger is an ADST II asset that captures the network traffic and places the data packets on a disk or tape file. The Data Logger performs the following functions:

a. Packet Recording - Receives packets from the DIS network, time stamps and then writes to a disk or tape.

b. Packet Playback - Packets from a recorded exercise can be transmitted in real time or faster than real time. The Data Logger can also suspend playback (freeze time) and skip backward or forward to a designated point in time. The logger can be controlled directly from the keyboard or remotely from the Plan View Display (PVD). Playback is visible to any device on the network (PVD, Stealth Vehicle, a vehicle simulator).

c. Copying or Converting - Files are copied to another file, which can be on the same or a different medium; and files from the older version of the Data Logger can be converted to a format compatible with the current version of the Data Logger.

3.3.8.1 Video Teleconferencing

Video teleconferencing was accomplished using existing AVTB assets (workstations and cameras) but utilizing 'T-Bone' conferencing software obtained from the Internet. The classified teleconferences were sent over the T-1 lines utilizing the encryption equipment.

3.3.9 Stealth System

The ADST II Stealth gives the Observer/Controller (O/C) personnel a "window" into the virtual battlefield allowing them to make covert observations of the action occurring during the scenario. In addition, through the use of the data logger, the Stealth gives observers and analysts an After Action Review (AAR) capability. The Stealth is a visual display platform that consists of a Plain View Display (PVD), various input devices, and three video displays that provide the operator with a panoramic, 3D view of the battlefield.

The Stealth permits the controller to fly around the virtual battlefield and view the simulation without interfering with the action. The features of the Stealth allow the observer to survey the virtual battlefield from a variety of different perspectives, including:

a. Tethered View - Allows the user to attach unnoticed to any vehicle on the virtual battlefield.

b. Mimic View - Places the user in any vehicle on the virtual battlefield and provides the same view as the vehicle commander.

c. Orbit View - Allows the operator to remain attached to any vehicle on the virtual battlefield and to rotate 360° about that vehicle, while still maintaining the vehicle as a center point of view.

d. Free Fly Mode - Permits independent 3-D movement anywhere in the virtual battlefield.

3.4 Database and Scenario Development

The existing ADST II Nellis terrain database was used to support the experiment as shown in Figure 4.

A series of twelve scenarios were developed to support the JCSAR VS2 effort. Each scenario contained two CSAR missions, a downed pilot in the northern sector of the database and a downed pilot in the southern sector of the database. Additional blue and red forces were generated at the AVTB using ModSAF and at TACCSF using MSIM and STAGE workstations. A detailed description of the scenarios is provided in the Virtual Simulation 2 Scenario Document, document number the JCSAR-VS 2/SD-01-0498.

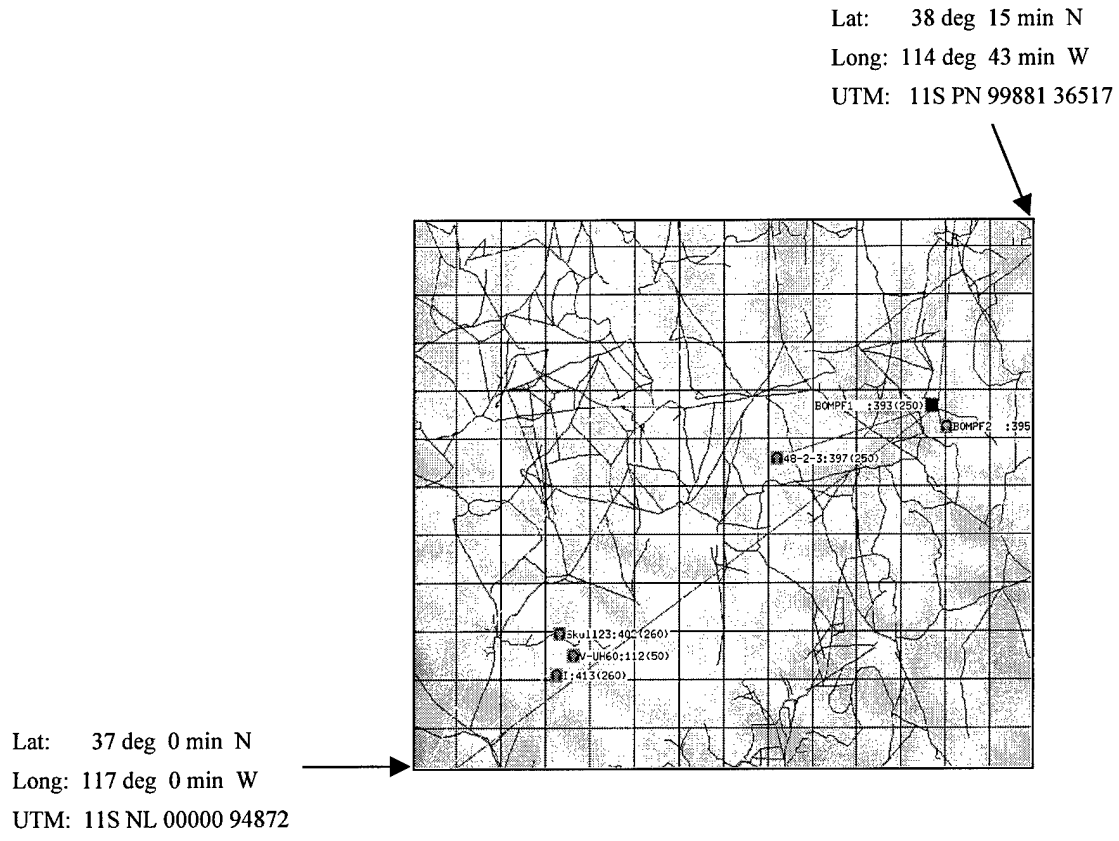

Figure 4 Nellis Terrain Database Area

4. Conduct of The Experiment

4.1 Aircrew Training

In order to get the maximum benefit from air crewmembers, a two day period of time was set aside for training to bring them up to a level of confidence on the simulator systems prior to conducting the experiment for data gathering. This aircrew training consisted of one day of classroom training for simulator familiarization and one practice mission in the simulators themselves. AVTB Battlemasters provided classroom and hands-on training for familiarization and orientation on the actual operation of the simulators.

4.2 Experiment and Trial Runs

One scenario mission was scheduled for a trial run prior to conducting the experiment. The actual experiment consisted of twelve missions, one mission per day with each mission lasting two hours. These missions were conducted using simulated daytime conditions. Two different sets of aircrews were used for the experiment. One set of aircrewmembers was utilized for scenarios 1 through 6. A separate set of aircrewmembers was used for scenarios 7 through 12. Table 2 defines the site configuration and scenario used for each day of the VS2 exercise. A daily test log for the VS2 experiment is provided in Appendix A.

Date	Simulator Configuration				Scenario
	UH-60L	AH-1W	HH-60G	A-10	
3 May 98	X	X	X	X	#1
4 May 98	X	X	X	X	#2
5 May 98	X	X	X	X	#3
6 May 98	X	X	X		#4
7 May 98	X	X	X		#5
8 May 98	X	X	X		#6
13 May 98	X	X	X	X	#7
14 May 98	X	X	X	X	#8
15 May 98	X	X	X	X	#9
16 May 98	X	X	X		#10
17 May 98	X	X	X		#11
18 may 98	X	X			#12

Table 2 AVTB VS2 Configuration Matrix

5. Observations and Lessons Learned

5.1 Development and Integration

- Observation #1

The integration effort for the ASTi radio modifications was hampered by a lack of hardware assets.

- Discussion #1

AVTB assets at Fort Rucker are utilized by an assortment of customers to the point where it is problematic to schedule OSF integration work. The activities and assets must be scheduled well in advance which is not conducive to solving integration problems as they occur.

This was very evident when integrating the new ASTi secure communications mode, radio receiver indicator, and the Line-of-Sight (LOS) server workstation. These modifications were tested at ASTi in Herndon, VA but could not be fully tested and integrated with all sites being connected via a long haul network. The SSITs that were scheduled provided an opportunity to test and find problems but more network time was needed to fully analyze and fix those problems. The LOS server was developed and successfully integrated with each of the individual sites but experienced additional problems when all sites were connected via long haul. Consequently, this function was not utilized during the VS2 experiment.

- Lesson Learned #1

The OSF needs to acquire the assets that will allow integration and test to occur without having to schedule AVTB assets. This would consist of an ASTi server (probably two of them), one of each device (AVTB cockpit, Armor sims, etc) that is fielded at each of the sites, and a T-1 connection to effectively connect the sites for integration activities that could be accomplished in the evenings or weekends.

- Observation #2

Parallel development activities

- Discussion #2

The ASTi modifications required for JCSAR VS2, secure mode and radio receive indicator, were simultaneously being developed for another DO. This parallel development could have been combined thus saving funds for both programs.

- Lesson Learned #2

There needs to be communication between programs as to what development efforts are being performed to determine if any commonality exists. If there is commonality, then cost savings can be realized for each program.

5.2 Experiment

- Observation #1

Communications between the Battlemaster and technicians was not adequate.

- Discussion #1

AVTB is a large facility that is separated into secure and non-secure areas. It is imperative during an experiment that the technicians maintaining the equipment be readily available to fix any problems that may occur. The Battlemaster is the experiment coordinator. Problems are reported to him and he dispatches the technicians to fix them. Currently they utilized a personal paging system. When the technician is paged to fix a problem, he must report to the Battlemaster to find out where the problem is. This is very inefficient especially if the technician is outside the secure area.

- Lesson Learned #1

The AVTB requires a set of hand held, two-way radios, which have a secure transmission mode. DODTS at Ft. Rucker currently utilizes a two-way radio system. These radios are utilized during DODTS training exercises. Additional radios should be purchased for the AVTB facility that could be used for all training and experiments outside of the DODTS activities.

5.3 Overall

- Observation #1

Reliability of GT-111 simulator devices posed a high risk

- Discussion #1

The equipment that drives the simulator devices at the AVTB are past the end of their life cycle. Parts are almost impossible to come by and they require a lot of maintenance to keep them running, especially during experiments. One of the devices at AVTB has been upgraded utilizing COTS equipment (Pentium PCs). This upgrade increased the reliability of the simulator considerably. During the Mission Rehearsal Test and the actual VS2 experiment, the GT-111s experienced numerous problems, which caused an interruption to the scheduled activities, the devices had to be re-booted. The upgraded device experienced NO downtime during any of the JCSAR activities.

- Lesson Learned #1

Upgrade the remaining simulator devices with the same equipment.

6. Conclusion

The JCSAR VS2 experiment was an example of a complex coordination effort between five sites in different parts of the country. The successful integration of multiple Government assets provided the customer, JCSAR Joint Test & Evaluation (JT&E) based at Nellis AFB, NV, with a network of simulator devices to effectively gather data to validate existing CSAR procedures and tactics as well as evaluate new ones. This experiment also demonstrated that simulator assets throughout the United States can be used together in an integrated mode for multi-service operational training or the evaluation of new tactical concepts.

The data gathered from this experiment will undoubtedly provide an enhanced framework for the rescue and recovery for downed aviators.

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8. Acronym List

ACETEF	Air Combat Environmental Test and Evaluation Facility
ADST	Advanced Distributed Simulation Technology
AEWW	Airborne Early Warning Wing
AGL	Above Ground Level
ASTi	Advanced Simulation Technology Inc
AVTB	Aviation Test Bed
CM	Configuration Management
CTDB	Correlated Terrain Database
DED	Dynamic Entity Database
DIS	Distributed Interactive Simulation
DLGW	Data Link Gateway
FWA	Fixed Wing Aircraft
GFE	Government Furnished Equipment
GUI	Graphical User Interface
HHT	Hand Held Terminal
IFF	Identify Friend or Foe
ID	Identification
JCSAR	Joint Combat Search and Rescue
JTIDS	Joint Tactical Information Distribution System
LAN	Local Area Network
LOS	Line-of-Sight
LSE	Link 16 Engine
MPDD	Multi-Purpose Digital Display
ModSAF	Modular Semi-Automated Forces
NIP	Network Integration Plan

Acronym List - *continued*

PC	Personal Computer
PDU	Protocol Data Unit
PPLI	Precision Positional Location Information
RWA	Rotary Wing Aircraft
RWR	Radar Warning Receiver
Rx	Receiver
SA	Situational Awareness
SATCOM	Satellite Communications
SGI	Silicon Graphics Inc
STRICOM	Simulation, Training, and Instrumentation Command
SRC	Source
TACCSF	Theater Air Command and Control Simulation Facility
Tx	Transmitter
VS	Virtual Simulation
WAN	Wide Area Network
XCIAU	Cell Interface Adapter Unit

Appendix A – VS2 Daily Test Log

Sunday, May 03, 1998:

- All simulator devices up and running for exercise
- No ModSAF crashes during exercise.
- Device 82: RC Dump, re-boot
- Power supply on Device 85, 81 and 82 went down, blown fuses (problem fixed)

After Exercise Engineering De-Brief:

- Device 81: no radar altitude warning tone
- Device 81: Maverick missiles launch in pairs – designed to work that way
- Device 81: MPDD waypoint creation, sets waypoint to lower left corner of database (operator error)
- Device 84: left side channel flashing, B/P problems, board re-seats
- AVTB putting out multiple detonate PDUs for Mark 82 bomb. Munition on A-10 is a cluster bomb which puts out multiple detonate PDUs. Wrong munitions being sent in Fire PDU.
- ACETF receiving an erroneous velocity in chaff/flare entity state PDU from AVTB. This is causing the F-18s to come in and out during exercise. Decision made to eliminate entity state PDU for chaff/flares and just send fire PDU.
- All devices powered off due to severe storms in area. Devices powered up after storm. Device 81 not responding
- Another storm in the middle of the night brought power down. Device 81 not responding.

Monday, May 4, 1998:

- Work continued on Device 81. Scenario modified to accommodate loss of A-10 simulator at AVTB. Work on Device 81 is progressing. Device 81 (A-10) ready for exercise.
- Mark 82 bombs generating too many detonate PDUs. Weapons load changed to six ADMs and two Sidewinders for A-10s.
- Device 85: complete power failure. New power drop used for device 85, device up and ready. Comms reset on devices 85 and 84.
- Exercise was conducted with chaff/flare mods (removal of entity state PDU) on devices 81, 82 and 83. Other devices were upgraded after the exercise.
- Updated Database DED files to correct E-3C model. E-3C was flying upside down. *Discnst.** file transferred from Stealth 2 to Stealth 1.
  No ModSAF crashes during exercise.

After Exercise Engineering De-Brief:

- Sandy 22 (A-10) shot down. No indication at TACSSF that it was dead. Still getting IFF Squawk. Review of logs indicated that AVTB was properly sending kill information.
- TACSSF commented that no radar warning tone was heard on Raptor prior to enemy missile hit. Mission playback revealed that RWR tone was being given in the cockpit. Pilot ignored or over tasked to respond to RWR tone.

Tuesday, May 5, 1998:

- Mark 82 bomb problem not resolved. A-10 weapons load changed again to 6 Mavericks and 2 Sidewinders.
- Cobra's weapon load changed to 8 hellfire missiles.
- No JTIDS will be used today in AVTB devices.
- Device 82: RC Dump twice, re-boot.
- Device 87: simulator pitched down while in-flight. Texture maps reloaded.
- Entity state PDUs still being sent out for chaff/flares for device 81 & 82 (A-10s). Wrong software load on devices.

After Exercise Engineering De-Brief:

- Device 88: front seat navigation/RWR tones, too much static and when hot mic used an ear piercing tone is heard in headset. Tone generator in ASTi switched to VOX to eliminate static and unwanted tones.
- Device 81: Three enemy vehicles NE of survivor showing up as friendlies (M2 Bradley's) on MPDD.

Wednesday, May 6, 1998:

- JTIDS will be used today. No A-10 aircraft (Device 81/82) will be used today.
- ModSAF crash at Battlemaster's station (1414 hours)
- No RC Dumps on any device during exercise.

After Exercise Engineering De-Brief:

- No problems reported.

Thursday, May 7, 1998:

- MPDD crash on device 88 at 1430 hours
- Device 87, no RWR tones
- Added 30 mm cannon capability to Jolly helicopter simulation

Friday, May 8, 1998:

- ModSAF crash in Stealth 2 at 1310 hours
- ModSAF crash in Stealth 1 at 1315 hours
- Hot microphone reported at TACSSF

Saturday, May 7, 1998 through Monday, May 11,1998:

- Stand down for maintenance.

Tuesday, May 12, 1998:

- Training day for new crews with TACCSF

Wednesday, May 13, 1998:

- Device 86: no RWR tones in headset
- Device 86: unable to lock FLIR on ground or air targets. (not fixed, Meta VR device)
- Device 82: RC Dump
- Device 83: communications with TACCSF extremely weak
  Stealth 1: ModSAF screen lock-up, cleared itself.

After Exercise Engineering De-Brief:

- No technical difficulties

Thursday, May 14, 1998:

- Device 87: control, pedals out of alignment. Device brought down, pedals aligned, and simulator brought up and returned to exercised.
- Device 82: RC Dump

After Exercise Engineering De-Brief:

- Device 88: Pilot ICS intermittent (could not duplicate problem).
- Device 87: Fuel flow indication not correct (used less than 300 lbs in two hours). Torque indicator does not match position of collective (potentiometer replaced).
- Device 85: C0-pilot floor switch for microphone intermittent.
- Device 84: pedal calibration

Friday, May 15, 1998:

- No JTIDS used today.
- Sandy 22 (A-10 simulator) had an MPDD crash (operator error)
- Device 87 & 88 experienced several uncommanded attitude pitch up & downs

After Exercise Engineering De-Brief:

- No problems reported (except what was noted above)

Saturday, May 16, 1998:

- JTIDS went down. Problem at TACCSF.

After Exercise Engineering De-Brief:

- No problems reported (except what was noted above)

Sunday, May 17, 1998:

- Device 84: Left side display channel went off (exercised continued)
- Device 87: FLIR intermittently switching to TV. Bad switch

After Exercise Engineering De-Brief:

- No problems reported (except what was noted above)

Monday, May 18, 1998:

- No problems reported

After Exercise Engineering De-Brief:

- No problems reported