Space Support Element Toolset, etc ...

Rapid Prototyping Support to Army Space Forces

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By LTC Jeffrey Souder

The American buildup of military forces in Southwest Asia, leading up to Operation Iraqi Freedom (OIF), provided U.S. Army Space and Missile Defense Command (SMDC) soldiers the opportunity to satisfy a Special Operations Command Central Command (SOCCENT) Request For Forces. This request, forwarded via U.S. Strategic Command, requested the deployment of Space personnel and equipment in direct support to deployed Special Forces units supporting both Operation Enduring Freedom (OEF) and OIF. This SOCCENT request for forces (received Nov. 21, 2002) resulted in Space and Missile Defense Battle Lab's "Project Alpha," a rapidly-prototyped initial build of five Space Support Element Toolset-Light (SSET-L) suites of equipment for deployed special forces units, the SMDC Operations Center (SMDCOC), the Spectral Operations Resource Center (SORC)-Rear and SORC-Forward. The timeline from receipt of the SOCCENT request to the initial fielding of an SSET-L was less than three months.

Immediately following the deployment of personnel and Project Alpha equipment in accordance with the SOCCENT request for forces, the Space and Missile Defense Battle Lab began efforts on "Project Bravo" and "Project Charlie," the build of another seven SSET-L equipment suites, which were fielded with seven deployed and deploying Army Space Support Teams (ARSST).

In all, 12 SSET-L suites were fielded within extremely limited wartime timelines and along tight fiscal constraints. The direct result was the very successful design, build, testing, training, deployment, and sustainment of multiple suites of rapidly-prototyped equipment sets that provided immediate capabilities to operational Space, information operations (IO), and missile defense related combat requirements.

Collectively, over a six-month period (December 2002 - May 2003), Army Space Command, and the Space and Missile Defense Battle Lab (SMDBL) deployed the largest and most capable Space force in our Army's history. These forces included the deployment of six ARSSTs, personnel to two Joint Space Support Teams, two Materiel Training and Fielding Teams, 12 rapidly-prototyped Space equipment suites, a SORC-Rear and -Forward, an element co-located with the U.S. Air Force's Eagle Vision 1 ground station, the first ever tactically mobile ground-based laser weapon system (ZEUS) and one JTAGS Team. These forces supported combat locations in two theaters while supporting SOCCENT, CENTCOM and two services (Army, Marines). They were committed to two major operations, OIF and OEF, at four levels (Army, Joint, Combined, Coalition) and were integrated at four echelons (Division, Corps, Joint Task Force, Combined Forces Land Component Command). In the continental U.S., a combat-oriented SMDCOC conducted home station operations center tasks supporting deployed forces. This operation collectively provided unprecedented Space support to United States tactical forces engaged in the global war on terrorism.

This article, in particular, provides a detailed look at U.S. Army Space and Missile Defense Battle Lab's rapid-prototyping of SSET-L equipment suites and its support to the Army and Joint Space Warfighters in OEF and OIF.

The Equipment

The design of the SSET-L equipment suite was based upon lessons learned during the past three years of Space and Missile Defese Battle Lab experimentation and demonstration, after action reports from ARSSTs, and emerging Army, Space and strategic doctrine. The SSET-Ls were built primarily using Commercial Off-The-Shelf and Government Off-The-Shelf technologies (hardware, software and communications). Each SSET-L consisted of two Space Operations System (SOS) workstations, one Communications Suite and one satellite antenna dish

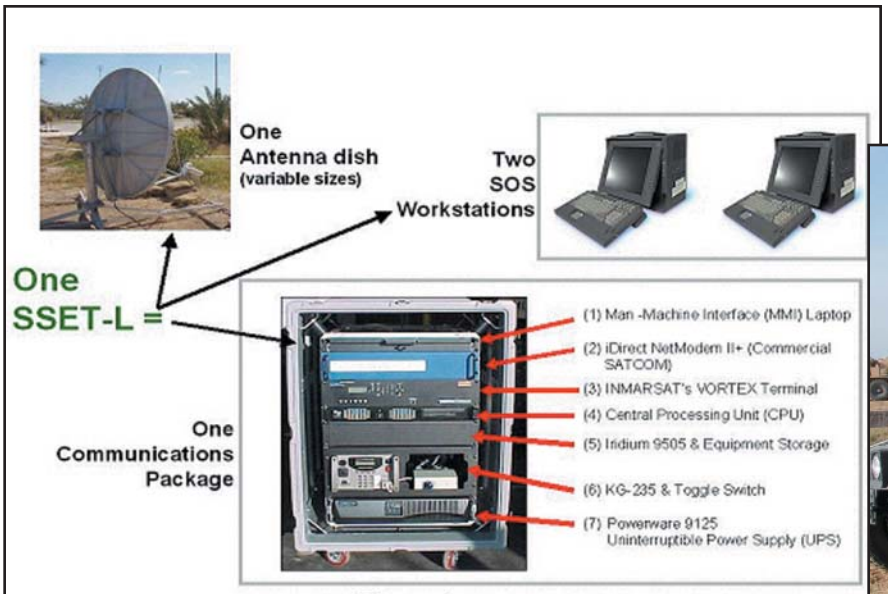

Figure 1

Figure 2

(varying sizes were provided). Figure 1 provides photos and a summary of SSET-L components.

Each SOS workstation included various software applications to include:

- SBMCS (Space Battle Management Core System) — Space order of battle data, GPS navigational accuracy calculating and other Space-specified data
- BattleScape Standard — used for Battlespace situational awareness
- W3 (Wireless Web-based Warfighter) — various reachback applications
- AWarE (Advanced Warfare Environment) — receipt and display of missile warning and air defense situational awareness
- Falcon View — 2D and 3D visualization and simulations
- BRITE (Broadcast Remote Intelligence Technology Experiment) — near-real-time reachback to collateral National Imagery
- PDS-M (Processing Display System-Migration) — display tactical ballistic missile warning
- STRED (Standard Tactical Receive Equipment Display) — used for display of national intelligence
- Edge Viewer — situational awareness
- ELT 3500 (Electronic Light Table) — imagery file format conversion
- MS Office 2000 — used for various reports (Word, Powerpoint, Excel)

Each SSET-L suite of communications hardware suite included:

- Commercial Satellite Communications Terminal, an I-Direct NetModem II+, which provided up to 900 Kbps uplink and 2.0 Mbps downlink data rates (secure, up to SECRET), with connectivity to the NIPRNET, the worldwide Web and various databases
- INMARSAT Terminal, a Vortex Terminal which provided multiplexing of up to 128 kbps (secure up to SECRET), and used for voice, data, and facsimile
- Iridium model 9505 mobile satellite service phone (voice with encryption, secure up to SECRET)
- Man Machine Interface Laptop, used to configure SSET-L components
- UPS (Uninterrupted Power Supply) with voltage conditioning
- KG-235 providing data encryption for both I-Direct and INMARSAT satellite services

ARSST 14, attached to the 4th Infantry Division, had a HMMWV-mounted version of the SSET-L. Figure 2 (above) provides a picture of ARSST 14.

The Space Warfighters

Deployed Army Space forces in support of OIF included five SSET-L equipped ARSSTs, one SSET-L equipped SORC-Forward Team, an SSET-L and operator co-located with the Eagle Vision 1 direct satellite downlink station and two SSET-L equipped Joint Space Support Teams. Support directly related to OEF included an SSET-L equipped ARSST that provided direct support to the Combined Joint Task Force-180 in Afghanistan. In the continental United States, SSET-L capabilities enabled the SORC-Rear and the SMDCOC. Figure 3 (page 67) depicts the systems architecture for the SSET-L equipped forces.

The Missions and Tasks Supported

Of the four Space mission areas (Space Force Enhancement, Space Control, Space Support and Space Force Application), the SSET-Ls provided the ARSST and Joint Space Support Teams capabilities primarily in support of Space Force Enhancement. To a lesser extent, these teams supported Space control, IO and Missile Defense/Missile Warning. This support included, but was

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not limited to:

· Global Positioning System Accuracy/Navigational Accuracy Products. This included analysis and implications of GPS jamming and analysis of GPS interference reports.

· Satellite Reconnaissance Advanced Notification Reporting. These reports provided information on Red, Gray, and Blue overflights.

· 3-dimensional "fly-thrus," for both air and ground route planning

· 2-dimensional imagery and map products. These included large charts, rectified city images and imagery. These products supported Long Range Surveillance Detachments, Corps Aviation assets and Office of Reconstruction and Humanitarian Assistance/Coalition Provisional Auth-ority map requirements (production of imagery maps for city planners/developers, showing lines of communication and war damage). The SSET-L provided the 1st Marine Expeditionary Force Topographic Team access to timely commercial imagery they could not acquire rapidly without the SSET-L.

· 3-dimensional perspective views (still perspective views of a specific "look angle")

· Development of Space-related candidate targets (this analysis supported Space control efforts).

· Support to Blue Force Tracking (BFT). This included assessing technical tasks, architectures and requirements for managing and displaying the Blue Force picture, to include ensuring Grenadier BRAT data was tracked and displayed in a timely manner.

· Analysis of Computer Network Operations (CNO) from a Space perspective. This analysis was integrated into various IO plans.

· Missile Analysis Support. This included briefings on Iraqi missile systems and included developing missile profiles for Air Defense elements

· Missile Warning/Tactical Ballistic Missile (TBM) Warning. The SSET-L was used to receive and display real-world TBM warning using data feeds from Command and Control Personal Computer (C2PC), Integrated Broadcast System-Simplex, and Integrated Broadcast System-Integrated. This task integrated data feeds from Defense Satellite Program and from multiple sea-based and land-based radars. Also provided was analysis of missile coverage, and TBM Warning Plans and continuous operations for notification throughout the Area of Operations.

· Development of Annex N (Space) to various Operations Orders

· Development of the Space Intelligence Estimate

· SATCOM Planning and Assessments. This included:

· Sun-Conjunction Activity/ Information Analysis/Reports/ Charts, which provided outage times for communications systems

· UHF SATCOM troubleshooting to investigate incidents of interference

· Tracking of SATCOM Status and monitoring of SATCOM operational capabilities

· UHF Scintillation analysis and products

· HF Illumination Charts

· Support to daily targeting board meetings and working groups, operational planning group meetings and Information Operations (IO) meetings.

· Download of before and after national imagery to support target development and battle damage assessment in deep operations coordination centers and in some cases supporting Army tactical missile system strikes.

Critical to the deployed Space Forces' ability to accomplish these missions and tasks was their capability to reach back, using organic secure high bandwidth communications, to multiple Operations Centers, databases and organizations. Further development of communications support Space forces is certain to retain organic and robust reach back capabilities.

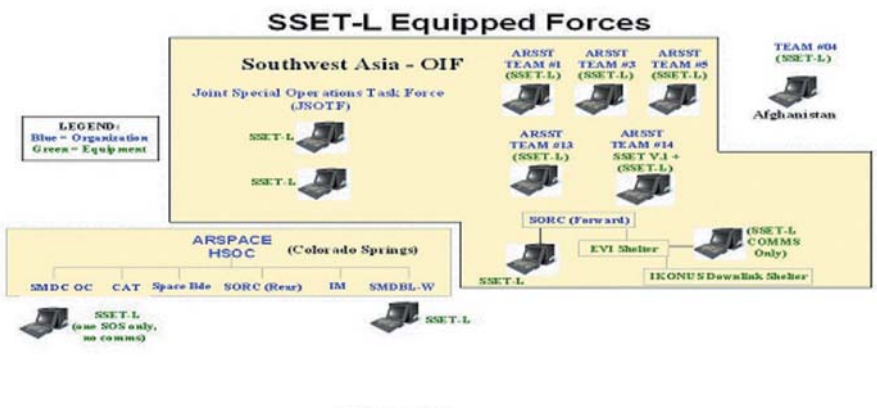

Figure 3

The Road Ahead

SSET-L concepts and capabilities, along with supporting doctrine (tactics, techniques, and procedures included), evolving organization, leadership, personnel, facilities, and training requirements are continuing throughout SMDC at an unrelenting pace to support both the current and future forces. Following is a summary of ongoing efforts.

Current Force and Future Force Related Efforts

Current Force:

· Further refinement of SSET-L software, hardware, and communications

· ARSS team Modernization to include the design and development of the ARSS Tactical Set

· Equip Major Command Space operations officers with next-generation SOS workstations

· SORC and SMDCOC modernization

· Designing, equipping, and training Stryker Brigade Combat Team 4 (2nd Cavalry Regiment) Strategic Support Element (two Space Operations officers, one enlisted seventy-four bravo)

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Future Force:

- Concept and doctrinal development of strategic support (in accordance with U.S. Strategic Command's five mission areas of; Global Strike, Space, IO/CNO, Global Missile Defense, Global C4ISR) to Unit of Employment "X" and "Y" Strategic Support Elements
- Concept and doctrinal development of strategic support to Units of Action.

Conclusion

The lessons from SSET-L efforts to support OIF and OEF are currently being captured and analyzed. This analysis will continue for many months, and will permit SMDC to continue its support to operational warfighters, while adhering to the "Mud to Space" concept of tactical support. Feedback from "the field" remains a critical source of input, expertise, and requirements for this effort. Each of you is invited to provide the SMDBL your comments, suggestions, requirements, and insights to this continuing effort.

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WRAASE receivers and there was a demand for weather support at progressively lower tactical levels. In Iraqi Freedom, great progress had been made in moving to real-time tactical weather prediction with enhanced systems and capabilities. In 1991, the Army used commercial sources to augment its map-making capabilities. It had dated maps at the outset of the campaign and faced delays in getting more accurate topographical products. It was able to combine several systems to achieve success. In Iraqi Freedom, the military map-making system had been significantly enhanced. Real-time, accurate tactical terrain data was available to units and readily updated using digitized databases and models.

The Army also used missile defense in Operation Desert Storm. In 1991, the threat was from Scuds or modified Scuds. In 2003, the threat came from shorter-range systems and cruise missiles. In terms of missile defense readiness, Opera-tion Desert Shield/Desert Storm seemed more like a crisis response operation. The 11th ADA Brigade began to move to the theater on C+5. The warning system TERS was assembled. By 2003, there was a well-integrated missile defense system with new systems and capabilities that had been extensively tested and exercised. Missile defense units in 2003 benefited from more than a decade of experience in the Persian Gulf.

Missile defense posture also changed. In 1990-1991, missile defense was concentrated around key cities and supported combatant Corps in breaching operations. In 2003, there was an integrated missile defense network that allowed the units to maneuver with the V Corps deep in Iraq.

In the Gulf War of 1990-1991, the Iraqis launched 93 missiles against Coalition targets. The Army claimed that it intercepted 79 percent of the missiles targeting Saudi Arabia and 40 percent of those targeting Israel. A GAO investigation determined that only nine percent of the claimed interceptions could be verified. In 2003, according to open sources, the Iraqis launched 17 ballistic missiles and two cruise missiles. All ballistic missiles were intercepted or were considered to pose no danger and declared "out of bounds." One cruise missile eluded the defenses. In Operation Desert Storm, the primary issue was the failure to intercept incoming missiles, while in Operation Iraqi Freedom the discussion has revolved around incidents of fratricide involving missile defense units.

The challenge in Desert Storm was to normalize and operationalize Space-based capabilities in the Army. This had been accomplished by the late 1990s and the use of Space-based systems has been integrated into Army training and exercises and into Army and Joint doctrine. The challenge now is to leverage Space in the process of Army transformation.

— Dr. Lewis Bernstein
and Roy McCullough