CSI

Common Systems Integration —

Bringing It All Together

LTC Jennifer Jensen and John Kaczynski

Imagine you are an infantry company commander leading your Soldiers against a terrorist safe house to kill a high-value target. You are about to launch your assault when you receive communications that the target location has moved a block north of your original plan. You've planned this mission for days. Suddenly your target proves elusive. Or is it?

With one click you are instantly viewing a tactical map showing the insurgent's new location, including all available coalition assets in the immediate area. Next, you notice that a Shadow Unmanned Aircraft System (UAS) is loitering in your area. You click on the Shadow icon to pull up real-time video and targeting information for the building. Another click and you're listening to a satellite communication conversation on your laptop about your target. You learn the target's about to move again. With this cutting-edge technology and real-time communication, tracking the enemy has never been easier.

CSI

The Program Executive Officer for Aviation recently stood up the CSI Product Office in the UAS Project Office (PO) to ensure that commanders and troops on the ground have access to all the military assets in their area. CSI PO's objective is to achieve Joint interoperability among all military services' UAS and develop common solutions to support unmanned systems through horizontal integration. Ultimately, this goal will reduce life-cycle costs and increase system interoperability throughout the Joint operational environment. The CSI mission is to develop and deploy "one system" that builds upon existing ground support equipment, such as the ground control stations (GCS) and remote video terminals from other product offices within PM UAS. PM CSI's ultimate goal is to centrally manage the ground equipment to ensure that each GCS has standard interfaces and is interoperable with existing UAS platforms and future unmanned and manned aircraft. This consolidation of effort on a common GCS will significantly reduce life-cycle costs since each new technology upgrade or modification would only be made once rather than multiple times on each type of ground station. CSI's goals are to:

- Provide guidance to UAS product managers and their prime contractors to overcome deficiencies and achieve interoperability and commonality through contractual requirements and performance specifications.
- Develop horizontal integration of interoperability and commonality across the Army UAS fleet.
- Develop interoperability with manned aviation platforms.
- Provide dominating situational awareness (SA) to the Army and Joint forces through standard dissemination means.
- Develop common airspace integration solutions.
- Bridge the gap between Current and Future Modular Forces.
- Develop and implement common and cost-effective supportability and logistics.

CSI has released interoperability specification Version 1.0, which will be implemented by 2008. It focuses on defining the standardized communication protocols and message formats across interfaces, as well as moving forward with an interoperable GCS controlling various types of UAS platforms. This initial specification is the basis of the Joint interoperability specification being developed in conjunction with the U.S. Air Force (USAF) and U.S. Marine Corps.

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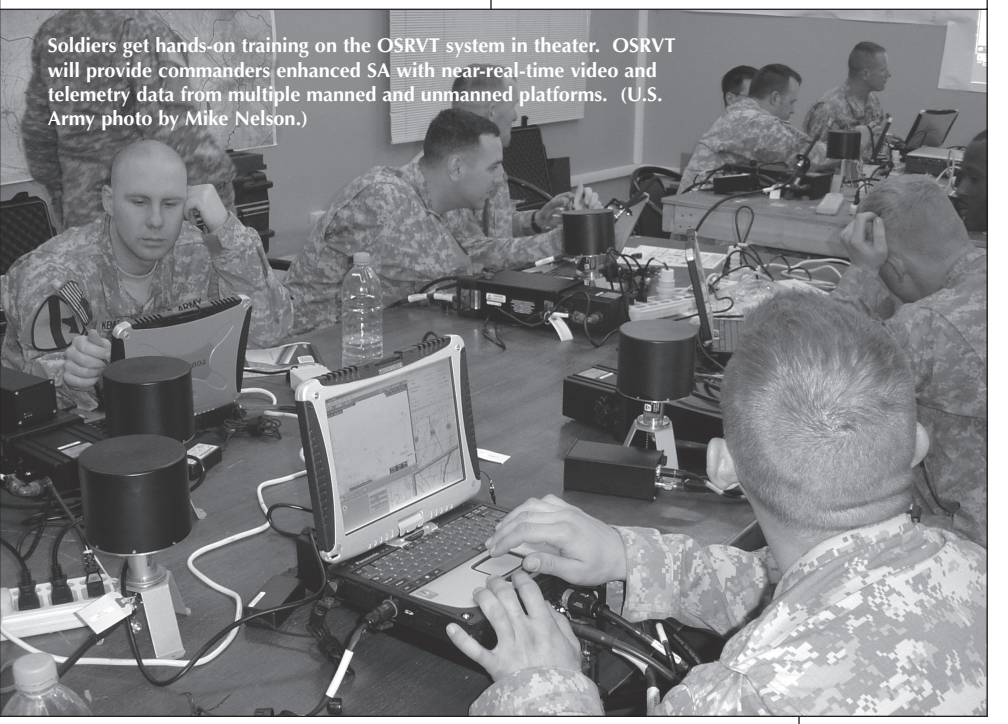
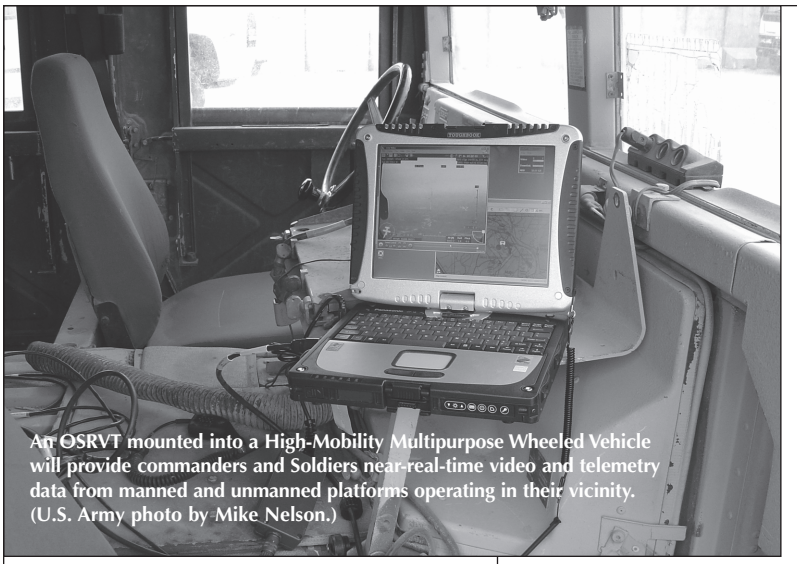
CSI is also working the first edition of the Joint Interoperability Profile that is geared toward Level 2 interaction of manned and unmanned platform sensors by defining a fixed subset of "end-to-end" specification variables into one interoperable mode of operation. The goal is for every user to be served at a uniform minimum. The levels of interaction are defined as follows:

- Level 1 = Indirect receipt of platform sensor's product.



Soldiers get hands-on training on the OSRVT system in theater. OSRVT will provide commanders enhanced SA with near-real-time video and telemetry data from multiple manned and unmanned platforms. (U.S. Army photo by Mike Nelson.)



An OSRVT mounted into a High-Mobility Multipurpose Wheeled Vehicle will provide commanders and Soldiers near-real-time video and telemetry data from manned and unmanned platforms operating in their vicinity. (U.S. Army photo by Mike Nelson.)

- Level 2 = Direct receipt of platform sensor's product.
- Level 3 = Command and control platform's sensor.
- Level 4 = Command and control of platform.
- Level 5 = Launch and recovery operations for unmanned platforms.

The next step is releasing Version 2.0 of the interoperability specification, which is planned for an FY11 implementation. It will focus on controlling multiple platforms of the same type through a digital network. Step three, Version 3.0, implemented by FY13, will support control of up to eight air vehicles of different types in a system network. Ultimately, the vision is to create one system that warfighters can use by clicking on an icon to display different platforms. This would allow users to send and receive information in their desired format. The goal is to provide the right product to the right users through the right pipeline. The U.S. Army's UAS mission and technology with its highly flexible, rapidly changing and ever-increasing demand, make a "one-system" solution ideal for Army aviation. New uses are continually being developed for both the UAS platforms and their product dissemination.

CSI is responsible for transferring emerging technology from research and development and integrating it into the GCS. Potential technologies include advanced payloads that will include multi- and hyper-spectral cameras, minefield detection systems and low-cost common digital data links. In addition, CSI will manage common product processors capable of compression mosaicing and aiding target recognition algorithms. The current funding level for technology transfer is approximately $15 million-$20 million annually.

CSI leads the effort to develop a common One System GCS that allows a single GCS to fly both a Shadow and Warrior UAS. Having this One System GCS provides enhanced flexibility to our combatant commanders. The common GCS will provide additional operational capabilities including:

- Interoperability.
- Commonality.
- Airworthiness certification.
- Weapons control.
- Laser designation.
- Digital processing.
- A gateway to Future Combat Systems (FCS).

A common GCS holds many benefits for Army aviators, including significantly simplifying training, reducing the logistics supportability requirements and reducing life-cycle costs across all systems. Likewise, the open system architecture would simplify incorporation of future upgrades and interoperability requirements for FCS.

Simulation and Training

A GCS trainer is being developed that will allow the air vehicle and payload operators to hone their skills without having to actually launch an aircraft. The GCS trainer is very similar to how manned aircraft simulators operate today. CSI is ensuring commonality, interoperability and reuse of existing UAS training capabilities by guiding continued development and sustainment of the simulation training systems used for introductory, crew and proficiency training of Army aircraft operators and payload operators.

The simulation systems comprised the Multiple Unified Simulation Environment (MUSE)/Air Force Synthetic Environment for Reconnaissance and Surveillance that is developed and maintained by the Joint Technology Center/Systems Integration Laboratory (JTC/SIL). It simulates the air vehicle, the payload(s) visual scenery and the data link while directly interfacing with tactical UAS equipment. It provides the capabilities to teach pre-flight/flight operations mission execution; weapons engagement; emergency operations; and command, control, communications, computers and intelligence messaging.

MUSE interfaces directly with tactical hardware in a classroom environment and is loaded in each Army UAS GCS as an embedded trainer. It currently has common hardware and software for teaching both Hunter and Shadow operations, and it will include Warrior UAS capability later this year. Additionally, the MUSE training system is interoperable with many simulation systems across the services to include manned and unmanned platforms.

One System Remote Video Terminal (OSRVT)

Tactical commanders have a significant and growing need for real-time UAS video and intelligence dissemination. This capability is the key to expanding use of UAS to support our warfighters through an OSRVT. With OSRVT, communications and video/intelligence from all the Joint services' UAS will be available in tactical operations centers across the battlefield. CSI has Logistics Assistance Representatives and contractor logistics support onsite to support OSRVT training, fielding and sustainment operations in theater.

CSI is currently in Iraq and Afghanistan fielding the OSRVT to provide enhanced SA with near-real-time video and telemetry data from multiple manned and unmanned platforms including: Hunter, Shadow, Predator, Pioneer, IGNAT, Raven and other UAS and manned Litening Pod platforms. The OSRVT kit consists of ultra-high-frequency modem, cables, software and an optional extended range antenna. Software supports decoding telemetry and metadata from multiple UAS, links data onto FalconView maps and supports off-target calculations. OSRVT capabilities include:

- Real-time video — analog 30 Force Protection Systems (FPS) and digital — reduced rate 8-15 FPS.
- Icons on the map for geospatial awareness.
- Off-target calculations anywhere on video window.
- Intuitive presentation for best grasp of SA — both map and video.

The OSRVT is currently not a Program of Record and receives funding through the individual services, unit transfers and Department of the Army supplementals. The OSRVT is scheduled for multiple upgrades to include bidirectional control, Precise Precision Service and Selective Availability Anti-Spoofing Module Global Positioning System upgrade, and ultimately expand to embedding the capability into current and future battle command systems.

CSI works in partnership with the JTC/SIL Certification Center. The JTC/SIL Certification Center is developing hardware-in-the-loop (HWIL) simulation that will be used to certify compliance with the interoperability profiles. The current efforts include:

- Integrate Tactical Common Data link hardware.
- Integrate Extended Range/Multi-Purpose (ER/MP) Warrior avionics.
- Demonstrate Shadow and ER/MP interoperability.
- Prototype and test network interoperability.
- Develop radio frequency simulation to interface with HWIL and control data-link emulator.
- Conduct trade studies as required.

Maintaining operational perspective is essential for framing user requirements and then considering the entire doctrine, organization, training, materiel, leadership and education, personnel and facilities spectrum to translate these warfighter needs into system performance requirements. CSI continues to translate requirements for interoperability at every echelon thoughout the Army as well as the other services. Additionally, CSI continues to develop products that bridge the gap between the Current and Future Modular Forces. While this task is not easily attainable, CSI has the right people and the right strategies in place to pave the way to the future for UAS.

Bruce Ottenwess, a General Atomics Aeronautical Systems airframe and power plant mechanic, conducts preflight checks before launching a Predator MQ-1 UAS at Balad Air Base, Iraq, Jan. 31, 2007. OSRVT is providing enhanced SA to operational units supporting ongoing combat operations in Iraq and Afghanistan. (USAF photo by SSGT Michael R. Holzworth, 31st Communications Squadron.)

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