Thunderstorm Contested Logistics
Demonstration Out-brief

Sponsored by:
Rapid Reaction Technology Office (RRTO) / Capability Prototypes

12 Nov 2021
Agenda

Agenda:
0930 – Welcome – Mr. Matt Goodyear and Mr. Guy
0933 – Opening Remarks – Mr. Jon Lazar
0935 – Thunderstorm CONLOG Demo Overview – Dr. Jeff Bean
0950 – JPEM CONLOG Demo Overview – Mr. Dennis Danko
0958 – Closing Remarks – Mr. Jon Lazar
1000 – Event remains open for Q&A

***Please use Q&A tool to ask questions of the panel
***For technical issues please message in the Chat or call 814-865-3416
Thunderstorm Event Summary

- **Focus Area:** Innovative Technologies for the Contested Logistics Environment
- **Technology Areas:**
  - Multi-Capable Distribution Platforms
  - Resilient Logistics Command and Control (C2)
  - Logistics Intelligence
  - Demand Reduction
- **Demonstration Site:** The Crucible, Fredericksburg, VA
- **Stakeholders:** Joint Mission Forum
- **Demonstrator Statistics:**
  - 22 vendors presented 24 technologies
  - 7 technology vendors collaborated to provide ad-hoc, rapid capabilities
  - 16 non-traditional and small business vendors participated
- **Observer Statistics:**
  - 26 government representatives attended; total attendees limited per OUSD(R&E) guidance
  - 19 government agencies represented, including Joint Staff J-7/J-8, OUSD(R&E), USSOCOM, USCENTCOM, Marine Corps Warfighting Lab (MCWL), AFRL, NRL, NAVAIR, Naval Systems Warfare Center
Thunderstorm Demonstration Event Overview

- The Thunderstorm Demonstration Team is working to get event outcomes reported quickly for government stakeholders
  - Highlights briefed 1 week post-event
    - Today, we’ll give a brief overview of each vendors demonstration at Thunderstorm
  - 2-minute event highlight video will be available in approximately 1 week
  - 60-second videos highlighting each technology will be available in ~1 month
  - Event overview will be briefed to the Joint Mission Forum (Dec 2021/Jan 2022)
  - Full report detailing technologies presented will be released in Jan 2022
# Thunderstorm Demonstration Technology Vendors

## Thunderstorm Contested Logistics

<table>
<thead>
<tr>
<th>Demonstrator</th>
<th>Technology Name</th>
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<tbody>
<tr>
<td>Centauri, LLC</td>
<td>COPERS (Common Operating Picture for Emergency Response Situation Awareness)</td>
<td>DropDrone</td>
<td>iLJAS Cargo Hook</td>
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<tr>
<td>Craitor Inc.</td>
<td>Craitor Portable, Ruggedized, Intelligent, 3D Printer</td>
<td>HyperSpec AI</td>
<td>Real Time Map Generation / Aerial to Ground Imagery based Geo Localization</td>
</tr>
<tr>
<td>Distributed Spectrum LLC</td>
<td>Modular RF Data Collection and Analysis Platform for Edge Spectrum</td>
<td>Immobileyes, Inc.</td>
<td>Intelligent Optical Jamming System using multi-UAV team</td>
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<tr>
<td>GIW Technologies</td>
<td>Printed Aerospace modular drones</td>
<td>Lockheed Martin Aero</td>
<td>Autonomous AI-enabled InspectorR (AAR)</td>
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<tr>
<td>GreenSight Inc.</td>
<td>SAEPO Secure Collaborative Swarming Computing Stack</td>
<td>Lockheed Martin RMS</td>
<td>Contested Logistics Command and Control Visualization (CLC2V)</td>
</tr>
<tr>
<td>GreenSight Inc.</td>
<td>Automated Aerial Runway Inspection and Safety Scan (AARIS)</td>
<td>Lockheed Martin RMS</td>
<td>Flexible Multipurpose Training</td>
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<tr>
<td>IoT/AI</td>
<td>Pico Technology sensor and communications system</td>
<td>Motorola Solutions - Applied Technology</td>
<td>AirBender™ Technology for Resilient C2 Communications in Contested Environments</td>
</tr>
<tr>
<td>ChicDrone LLC</td>
<td>AVARII Swarm</td>
<td>Sandoval Custom Creations, Inc.</td>
<td>Rapid Tactical Operations and Reconnaissance Platform (RAPTOR) edge-based Analytics</td>
</tr>
<tr>
<td>Phelps 2020</td>
<td>Crystal, SAM, 5K-TVS, and AI-Blade</td>
<td>SICDRONE</td>
<td>SIGS SUAS</td>
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<tr>
<td>UltraCell LLC, An Advent Company</td>
<td>Honey Badger 20 and XOS5 mobile chargers</td>
<td>Target Arm Inc.</td>
<td>Universal and Autonomous UAS Launch and Recovery for Maritime Applications</td>
</tr>
<tr>
<td>USACE Engineer Research Development Center</td>
<td>Severe Impact Resilience for Assured C2</td>
<td>TETAC</td>
<td>Energetic Strike and Logistical Delivery SUAS (ESLD)</td>
</tr>
<tr>
<td>TMCgonz, Inc.</td>
<td></td>
<td>OTTO 2 Phase Liquid Immersion Computing Data Center Solutions</td>
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<tr>
<td>US Army Combat Capabilities Development Command</td>
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<td>Autonomous Drone Delivery from Airdrop Systems (ADDAS)</td>
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Craitor

The Craitor team demonstrated their ruggedized 3D printer technology using both nylon and Ultem. The system is designed to print while being subjected to shock and vibration. Impulse events are measured with onboard IMUs and recorded so that print quality can be scored, based on part requirements.
Distributed Spectrum demonstrated their hardware-agnostic software that scans the RF spectrum and alerts when potential adversarial frequency jamming occurs. The software is compatible with any software defined radio (SDR) and can also support signal classification and jammer localization.
DropDrone briefed their sUAS Cargo Hook capability. This hardware is part of their sUAS Resupply system. A potential use case would be for a sUAS to be retrofitted with the Cargo Hook and actuated by an infrared beacon in order to release the sUAS’ payload. The infrared beacon could potentially be carried by dismounted warfighters and be used to perform resupply missions in contested environments.
GLW Technologies demonstrated their ability to rapidly design and fabricate UAS airframe hardware using fieldable 3D printers. The modular UAS airframe parts can be rapidly fabricated in the field as needed to facilitate repairs and address changing missions and payloads.
Greensight demonstrated their UAS-based AARISS system, which is a standalone system that can be deployed to rapidly detect foreign object debris (FOB). This system could be used to automatically inspect austere runways prior to landing using real time detection, analysis and reporting.
Immobileyes demonstrated their non-lethal Laser Storm optical jamming system, which directs eye-safe laser beams in an adversary’s direction to cause visual interference for non-lethal intervention. It uses multiple wavelength lasers to counter filtering eyewear and splits each beam with added movement to create a “dynamic shower” of beams.
IoT/AI briefed their Pico Technology which is a next-gen edge computing platform for tracking/tagging, communications, and covert EW/ISR sensors. This open platform employs advanced mesh networking, unique encoding for secure communications, requires low power and interfaces to ATAK or other COPS.
The KBR/Centauri Corp. team demonstrated their Common Operating Picture (COP) for Emergency Response for Situational Awareness (COPERS) by integrating with the Thunderstorm demonstration team’s Tag, Track, and Locate (TTL) system to provide live-tracking of UAS operations.
LM Skunk Works demonstrated the platform for their Autonomous Aircraft InspectoR (AAIR), which provides defect detection for airframes as well as land/sea platforms. Once fully developed, the system is intended to utilize small DoD-approved UAVs to perform autonomous scans of desired assets, pass imagery data to a defect detection AI to ID, classify, and localize surface defects for the maintainers to further interrogate.
Lockheed Martin demonstrated their Contested Logistics C2 Visualization (CLC2V) which is a visualization technology that enables Multi-Domain Operations and live, virtual, constructive training. This system provides real time contested C2 logistics in a 3D visualization for actionable situational awareness.
Lockheed Martin demonstrated their Flexible Maintenance Trainer technologies, which combine augmented and mixed reality for point of need support and instruction. Using AR/MR/VR technology has the potential to reduce errors, lower operating costs, and create safer training environments.
Motorola Solutions demonstrated their AirBender™ technology, which provides wideband, frequency-hopping to provide jamming-resistant cellular communications in contested and/or congested environments. Demonstrations included 4G cellular using five hops to provide full-motion video, ATAK services, and voice services to five phones.
Ohio Drone demonstrated their low-cost AVARII UAS swarm. At the event, up to 5 drones were flying and being commanded simultaneously. Those synchronized flights took place during light rain and moderate wind gusts. The payloads are easily interchangeable and could potentially include counter-swarm, reconnaissance, jamming, or other desired payload packages.
Phelps 2020 demonstrated their Crystal/Lucid View (video enhancement) and Al-Blade (video analytics) technologies. Crystal performs real-time, edge processing to improve the visibility of live EO/IR video which supports the LucidView desktop application. The miniaturized Al-Blade board supports the performance of video analytics and AI operations at the edge.
The university-government collaboration of the University of Pittsburgh, Johns Hopkins University, and USACE-ERDC demonstrated their Spines intrusion-tolerant network. This system offers a way to ensure critical C2 data is delivered despite successful intrusions to the network.
SCCI demonstrated their Rapid Tactical Operations and Reconnaissance (RAPTOR) capability. RAPTOR is a video surveillance hardware/software system that provides the end-user with a “single pane of glass” information solution. At its current maturity level, RAPTOR includes the following analytic capabilities: facial recognition, aircraft trail number reader, license plate reader, and boat detection.
SICDRONE demonstrated their SIC5 vectored robot aircraft (VRA) within the confines of the demonstration location. SIC5’s thrust vectoring enhances the aircraft’s control, stability, acceleration, maneuverability and speed with the aircraft’s top speed reported at 100 mph and level station-keeping reported in winds up to 50 mph. SIC5 offers a quick swap battery and payload modules up to 5 lbs.
The Target Arm team successfully demonstrated their Tular Drone Launch and Recovery System several times while in a static position. This technology will allow for operation of a drone from the security of a moving vehicle, watercraft, or autonomous UGV with one-button launch and recovery.
TETAC briefed their Energetic Strike and Logistical Delivery (ESLD) sUAS. This capability is designed to utilize sensors and payloads to define/validate the types of threats within the battlespace, kinetically mitigate those treats, and establish/maintain control of the airspace while supplying/re-supplying the warfighter.
TMGCore demonstrated their High-Performance Computing (HPC) with Two Phase Liquid Immersion Cooling (2PLIC) system. This capability was designed to allow for tactical Edge computing in support of C4ISR needs for big data analytics, AI, and large data storage, while reducing targetability, latency, and bottle necks associated with cloud computing.
The US Army DEVCOM Soldier Center team demonstrated their autonomous drone delivery technology. The system is designed to extend the payload delivery range of Group 1 or 2 drones by leveraging the Joint Precision Airdrop System (JPADS). Once deployed from JPADS, DEVCOM’s UAS prototype has the potential of delivering a 13lbs payload up to two miles, and drop that payload within 5 meters of its intended location.
UltraCell demonstrated their Reformed Methanol Micro-Fuel Cell (RMFC) technologies with their Honey Badger 20 (HB20) and XX55 systems that generate electric power using a water/methanol mixture. The RMFC systems supports off-the-grid expeditionary power and mobile charging.
The KBR/Centauri Corp. team integrated with the Thunderstorm demonstration team’s Tag, Track, and Locate (TTL) system to provide live-tracking of UAS operations. Additionally, COPERS collaborated with Distributed Spectrum to provide ad-hoc geographic situational awareness of their alerted sensors. Prior to the Thunderstorm event, Distributed Spectrum did not have the ability to display these detections on a COP. However, within hours, Distributed Spectrum was able to display their software notifications on COPERS. They plan to continue collaboration efforts.

GLW Technologies designed and fabricated a payload interface to mount and carry the jammer used in Distributed Spectrum’s demonstration. This was performed in mere hours on Monday evening with the part ready to use first thing on Tuesday morning. Another demonstrator, Craitor also assisted in the printing of these modules and other components with their ruggedized additive manufacturing platform.
Contested Logistics Maritime Experiments

- Ten technologies evaluated in an underway scenario based on the Expeditionary Advanced Base Operations (EABO) Tactical Concept
  - Focused on using unmanned platforms for battlespace preparation/ISR and Assured PNT systems for freedom of maneuver in a denied environment.
  - All 10 systems were networked and exchanged data via Wave Relay Mobile Ad Hoc Network
  - Data was fed into COPERS system and used to develop and maintain the Common Operational Picture (COP) for the Joint Force Commander
- To demonstrate long range ISR, Triton UxV operated off the coast of Panama City, FL and shared contact data with Stiletto in Norfolk
- SeaSats USV demonstrated use of camera for ISR and contact identification first, then integrated TSC Nimble Nessie as decoy to highlight platform capabilities
- JVAB conducted on-the-water vulnerability analysis of each of the three assured PNT systems, the Wave Relay mobile network and 3 of the unmanned systems
# Maritime Demonstration Technology Vendors

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<tr>
<td>Booz Allen Hamilton</td>
<td>VEGA Situational Awareness and Decision Making</td>
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<tr>
<td>Collins Aerospace</td>
<td>Mounted Assured Position Navigation and Timing System (MAPS)</td>
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<tr>
<td>Collins Aerospace</td>
<td>Thermal Energy Harvesting and Conversion (TEHC)</td>
</tr>
<tr>
<td>iXblue Defense Systems</td>
<td>Marins M5 Inertial Navigation System (INS)</td>
</tr>
<tr>
<td>Ocean Aero</td>
<td>Triton Gen III AUSV</td>
</tr>
<tr>
<td>Persistent Systems, LLC</td>
<td>Wave Relay® Mobile Ad-hoc Networking</td>
</tr>
<tr>
<td>Pierce Aerospace</td>
<td>Flight Portal ID (FPID)</td>
</tr>
<tr>
<td>SeaSatellites, Inc.</td>
<td>AI for GNSS Denied Nav with Long-Range ASV</td>
</tr>
<tr>
<td>Sea Machines Robotics Inc.</td>
<td>AI-Enabled SA with Non-Emitting Sensors</td>
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Contact information

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