NDIA 2017
Tactical Wheeled Vehicle Conference

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RR: Providing Autonomous Mobility to the DoD
Army Leader/Follower Capability

Leader/Follower with Supervisory Operator
Follower Vehicles (Reduced Crew)

Available Today

Available Sept 2017

Leader/Follower with Unmanned Followers (No Crew Required)

Autonomous Mobility Applique System (AMAS) JCTD

Common Attributes

- L/F Convoy Size: 3 - 7 Follower Vehicles
- Roads Traveled: Primary and Secondary Roads
- Command and Control: Ability to designate vehicles as either leaders or followers
- Following Divergence: 50 centimeters
- Gap Range: 20 meters to 100 meters
- Obstacle Detect/Avoidance: Avoid static and dynamic obstacles in front of vehicles
- Software Library: Government Purpose Rights

Different Attributes

Reduce Crew Size from 2 to 1
Comparable to commercial systems (Otto (Budweiser) or Freightliner) which still require operator fail-safe

Optionally Driven Vehicle
Requires soldier in the vehicle but provides “auto pilot” capability

Fail Safe / IOP V2
Requires operator for emergency situations

Operator Design
Reduce Crew Size from 1 to 0
Exceeds current commercial system manning requirements

Vehicle Category
Optionally Manned Vehicle
Platform can be driven by a soldier or operated completely unmanned

Architecture Design
Fault Tolerant / IOP V3
Redundant systems for emergency situations

Most L/F performance attributes common between platforms except the fault tolerance of the architecture enabling unmanned operation... AGR delivers this Sep 2017 with an open software architecture
Autonomous Ground Resupply (AGR) – Sustainment Operations (SO)

- While the AGR program as a whole is focused on automation of the full logistics chain, Sustainment Operations (SO) is specifically focused on the support of convoy operations for the Brigade level and above
- SO goals
  - Develop and demonstrate a system that meets the needs of the Leader/Follower and Automated Convoy Operations (ACO) Programs of Record
  - Develop a fault-tolerant, modular, and open architecture
**Tier 1 Architecture Promotes Interoperability**

**CMI**: Commander Machine Interface. Hardware and Software that the Commander interacts with to setup and monitor the vehicles.

**RNI**: Radio Network Interface

**Autonomy Kit**: Hardware and Software that implements higher level driving and planning functions, such as Leader/Follower, Teleoperation, and Waypoint missions.

**By-Wire Active Safety Kit**: Hardware and Software that controls the physical actuation of the vehicles. Additional active safety features (e.g., Collision Mitigation Braking) are also included in this kit.

**IOP**: Interoperability Profiles

Utilizing standard IOP interfaces between the kits ensures a modular system. For example, the same Autonomy Kit could be installed on multiple vehicle types, as long as the By-Wire Kit on each vehicle adhered to IOP.
### Challenges and Solutions for LF

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<thead>
<tr>
<th>Challenges</th>
<th>Solutions</th>
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<tr>
<td>• Sensing at high speed (negative obstacles in particular)</td>
<td>• We have a manned leader</td>
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<td>• Sideways separation distances in GPS denied areas</td>
<td>• Throwing the kitchen sink: accurate INS, LADAR registration, visual registration, radar, ranging radio, etc</td>
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<td>• IOP v2 incomplete</td>
<td>• IOP v3 being improved</td>
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<td>• Cost</td>
<td>• Lower costs in numbers</td>
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<td>• Smooth transition to ACO</td>
<td>• Developing for LF with ACO in mind</td>
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<td>• Safety approval without anybody onboard</td>
<td>• RR got safety approvals in the past to deploy without anybody onboard (not POR). This is still going to be the biggest challenge.</td>
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