# Ground Robotics Capabilities Conference
## Joint Ground Robotics Enterprise Update

7 April 2015

# Joint Ground Robotics Enterprise

- Expanded Scope
    - Small Unmanned Air Systems
    - Cross-Domain, Teaming and Swarming

- Interoperability Efforts
    - Interoperability Profiles
    - Common Control Architecture
    - Common Modular Radios & Military Waveforms

- Capstone Demonstration
    - Bringing it all together

# Cross-Domain, Teaming & Swarming

- Cross-Domain Comms/Data Sharing for Collaboration
    - Enhanced Functional Capability within the Unit
    - Unit Force Multiplier
    - New or enhanced Operational Capabilities
- Swarming – Multiple platforms operating is synchronicity
    - 1-N UGVs, 1-M UAVs, or mixed domain (1-N) + (1-M)
- Teaming – Unmanned Systems in support of Manned Operations
    - i.e. AH-64 Apache plus Grey Eagle, Shadow teaming
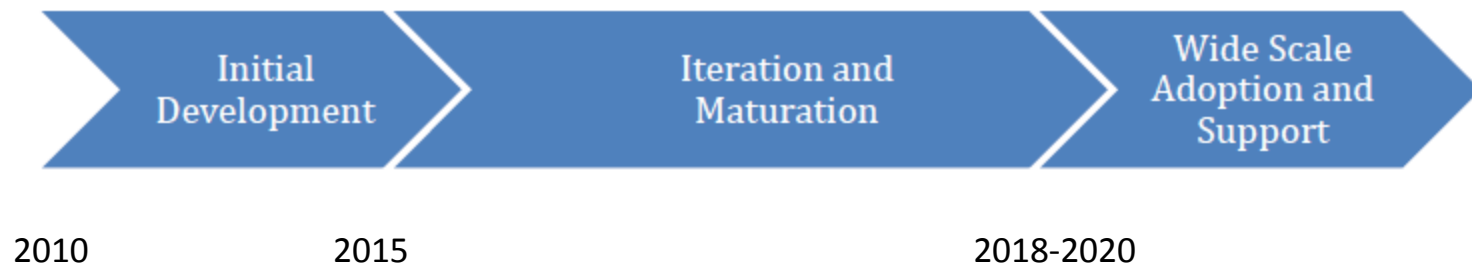    - Robotic Wingman providing over-watch capability

# Interoperability Efforts

- **Interoperability Profiles (IOPs)** - Alignment and transition of current military standards and IOPs to a collaborative Industry – National Advanced Mobility Consortium - organization

- **Common Control Architecture** - Establishment of long-term hierarchy for small unmanned systems, both tactical air and ground with Industry partnership

- **Common Radio & Waveform** - Transition from non-standard radios to a military software defined/modular communications investment for small unmanned systems, both tactical air and ground

# Interoperability Profiles (IOP)

- OSD (AT&L) commissioned a small study to be performed by the National Advanced Mobility Consortium (NAMC)
  - Develop a strategy for how Government and industry might work together to further advance the current IOP standard
  - With the pending release of (IOP) Version 2.0, the Government will have completed the *Initial Development* stage, which has resulted in a well-defined set of IOP documents and initial demonstration of technically sound underpinnings for a RAS interoperability architecture

- Transition IOP into an *"Iteration & Maturation"* stage of development

| Initial Development | Iteration and Maturation | Wide Scale Adoption and Support |
|---|---|---|
| 2010 | 2015 | 2018-2020 |

# Common Control Architecture

**Enable Open Development of Compatible, Integrated Software Running on Common Hardware**

- Wearable, hand-held, tablet, or laptop computers

**Purpose**

- Significantly reduce the cost, logistics, and weight of carrying multiple portable controllers
- Increase situation awareness by integrating information from multiple, heterogeneous RAS

**Heterogeneous Robotics and Autonomous Systems (RAS)**

- Tactical air platforms (Group 1 UAS)
- Ground vehicles/systems

**Representative Operational Environments**

- Tactical dismounted operations (e.g. CLARK)
- Support and logistics operations (e.g. runway clearing)

Army's TOGA Prototype

# Common Radio & Waveform

➤ No standard military waveform can meet all collected threshold requirements (partially met data rate, latency, networking, SWaP, security, EMI/EMC, etc.)

➤ The "big R" requirements do not explicitly call out UAV-Nett Warrior or UAV-UGV coordination (due to current implementation limitations)

➤ Current roadmaps of the UAV and UGV communications systems do not address interoperability (constrained by the operational requirements)

Although no immediate military solution is available today that can meet all the capabilities required by the UGS and UAS stakeholders' organizations, the JTN waveform has demonstrated its potential ability and flexibility through a standard framework to close these unattended gaps with a reasonable investment

| | Current | Phase 1 Short-Term | Phase 2 Mid-Term | Phase 3 Long-Term |
|---|---|---|---|---|
| | Existing | 2 Years | 2-5 years | > 5 years |
| SWaP and Fitness | Must support Swap and Networking | Must support Swap and Networking | Must support Swap and Networking | Must support Swap and Networking |
| Performance | Partial Meet the Throughput and Delay in the required range | Partial Meet the Throughput and Delay in the required range | Meet All Threshold Throughput and Delay in the Threshold range | Meet the Objective Throughput and Delay in the Objective range |
| Support Current Force | Hybrid with existing or commercial radios | Mixed Military Radio | Single Military Radio | Single Military Radio |
| Interoperability & Electromagnetic Compatibility | Current Requirement | CREW EW (data) | CREW EW (data) | CREW EW (data) |

# Capstone Proof of Concept

- Utilize IOP Instantiations

- Leverage a common control architecture

- Multiple platforms (air & ground)

- Multiple "common" controllers (hand-held or station)