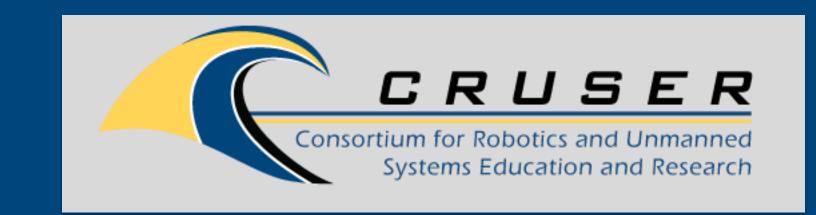
Multi-Domain UxS Swarming





- Incorporate UGV and USV capability into the NPS ARSENL swarm system
 - Hardware integration: Utilize self contained ARSENL "Swarm Brick"
 (autopilot, payload, & power supply) to quickly add autonomy package to suitable rock crawler and higher-speed UGV and small USV platforms
- Firmware update: Incorporate ARESENL-specific communications and failsafes into the open-source APMRover firmware (UGV & USV version of the ArduPilot firmware already in use in ARSENL UAVs)
- Multi-domain autonomy: Use of the Mission-based Architecture for Swarm Autonomy (MASC) approach to develop of atomic "plays" for use with new platforms and robust, mission-informed "tactics" and "phases" leveraging cross-domain heterogeneity

- On-UAV software & and ground control applications
 - All software & hardware designs maintained on the NPS Git server
 - Publicly available as appropriate (password protected as required)
- Architectural documentation and diagrams
 - NPS Technical Report
 - Operational checklists & guidance for new systems
- Field Experiment after action reports
 - Per event thresholds and objectives
 - Per mission/sortie objectives & results
 - Lessons learned & results analysis

- ONR interest in the "super swarm"
 - Large multi-vehicle system of air, surface, subsurface, and ground vehicles
 - Currently available multi-vehicle systems lack of support for this vision
 - ARSENL experience with heterogeneous aerial swarms
- This project will leverage ARSENL experience with heterogeneous aerial swarms to begin exploration of large-scale multi-vehicle systems that bridge the air, surface, and land domains (i.e., multi-domain swarming)
- Aligns with CRUSER and ASN (RD&A) unmanned vehicle priorities
 - Incorporation of advanced autonomy into unmanned systems
 - Cross-domain connectivity & human-autonomy teaming

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