



Swarming USVs escorting high value unit out of port

## Problem Statement

- Fleet operations with multiple unmanned surface vessels require coordination and formation control.
- Conventional approaches are not suited to contested environments (dependent on GPS and radio comms).
- NPS/USNA faculty and students will collaborate to develop fieldable multi-USV strategies based on:
  - Graph rigidity approach for achieving specified formations
  - GPS-free navigation and radio-free swarm coordination
  - Maximum likelihood estimation for improved vessel models

## Impact

- Field tests select swarming algorithms for multiple, low-cost, unmanned surface vessels.
- Enables navigation, coordination, and resilient formation control in contested environments.
- Improves vessel and environmental modeling via in-situ data collection.
- Fosters active collaboration between USNA/NPS faculty and students to exchange knowledge, software, and hardware between institutions.

## Transition

- NPS has discussed transition with Dr. Qin, ONR Code 34 (Robotics and Autonomy, Hybrid Complex Warfare).
- USNA intends to submit a three-year grant proposal to Mrs. Cooper, ONR Division 331 (Naval Engineering), who funded prior research under the Atlantic Center for the Innovative Design and Control of Small Ships (ACCeSS) consortium.
- Another potential transition sponsor is Dr. Brizzolara, ONR Division 331 (USV and Small Combatant Craft).