

AUTONOMOUS AND REMOTE OPERATIONS TRAINING AND RESEARCH AT U.S. MARITIME ACADEMIES

Maritime Education, Training, Research & Innovation Virtual summit



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Overview

- Discussions with stakeholders at US Maritime Academies
- Focus on Deck side of house
- Key questions
 - Current technologies in place
 - A&RO training and research
 - Curriculum, training
 - Factors supporting and inhibiting A&RO
 - MARAD's role
 - Comparison between, and cooperation among, academies



A&RO Technologies



- Only one academy has A&RO vessel
- Small model boats, off-shelf drone technology or open source software
- Most academies report **no** or **little** progress to achieving A&RO technologies

“Uphill battle to get anything”

Training and Curriculum

- Some planning for Fall 2021
- Developing remote control station
- Dual interdisciplinary D/E course
- Topic in related courses
 - BRM
 - Integrated Bridge Sys. II
 - Mechatronics
 - Revamping older classes such as controls labs
- ETO major (in development) has potential to integrate A&RO
- Longer term – potential for Autonomous course in EE MS degree



A&RO Research

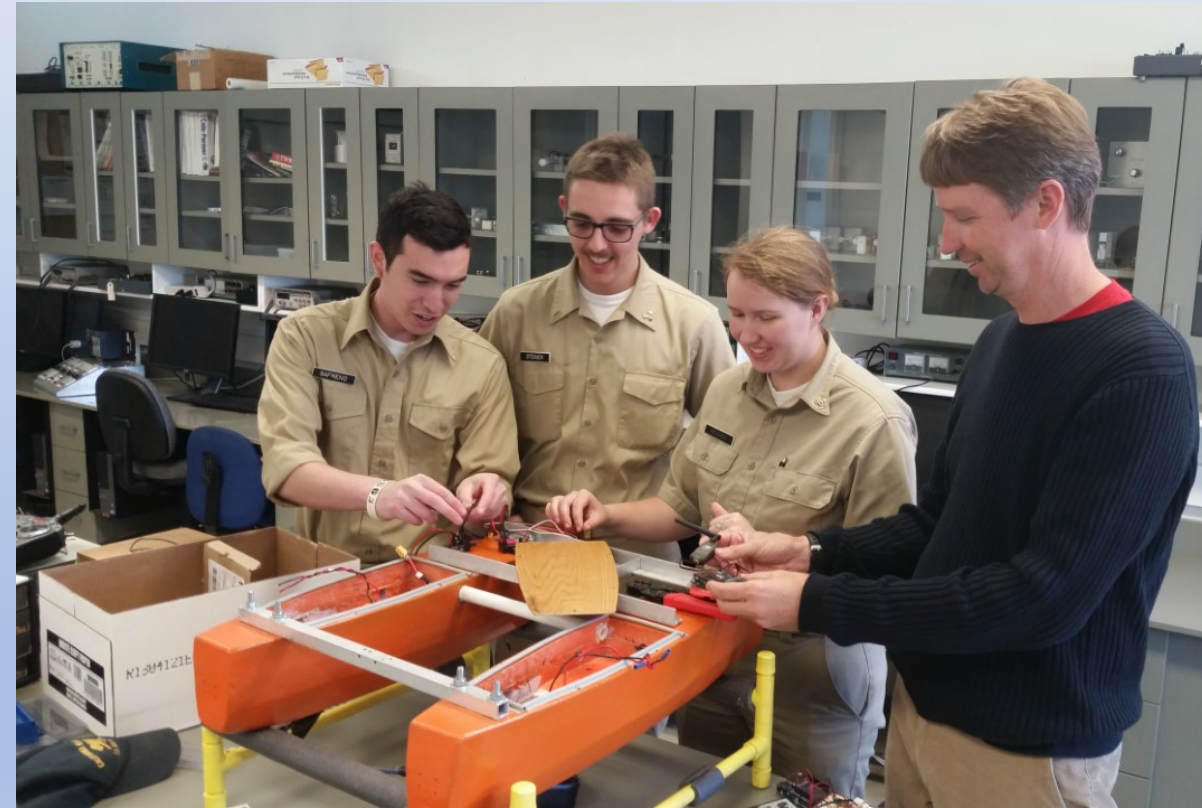
- Some on engine side, not well incorporated with deck
- Engine efficiency testing using RC vessel
- Informally: Drone program for aviation side of house
- Need for better integration of COLREGS expertise into engine side of training

“Focus on teaching precludes focus on research.”

A&RO Training & Research Goals

- Cadet experience in shore-control centers
- Teambuilding (D&E)
- ‘Alexa’ style control and testing, appropriate lingo, etc.
- Testing grounds on both coasts

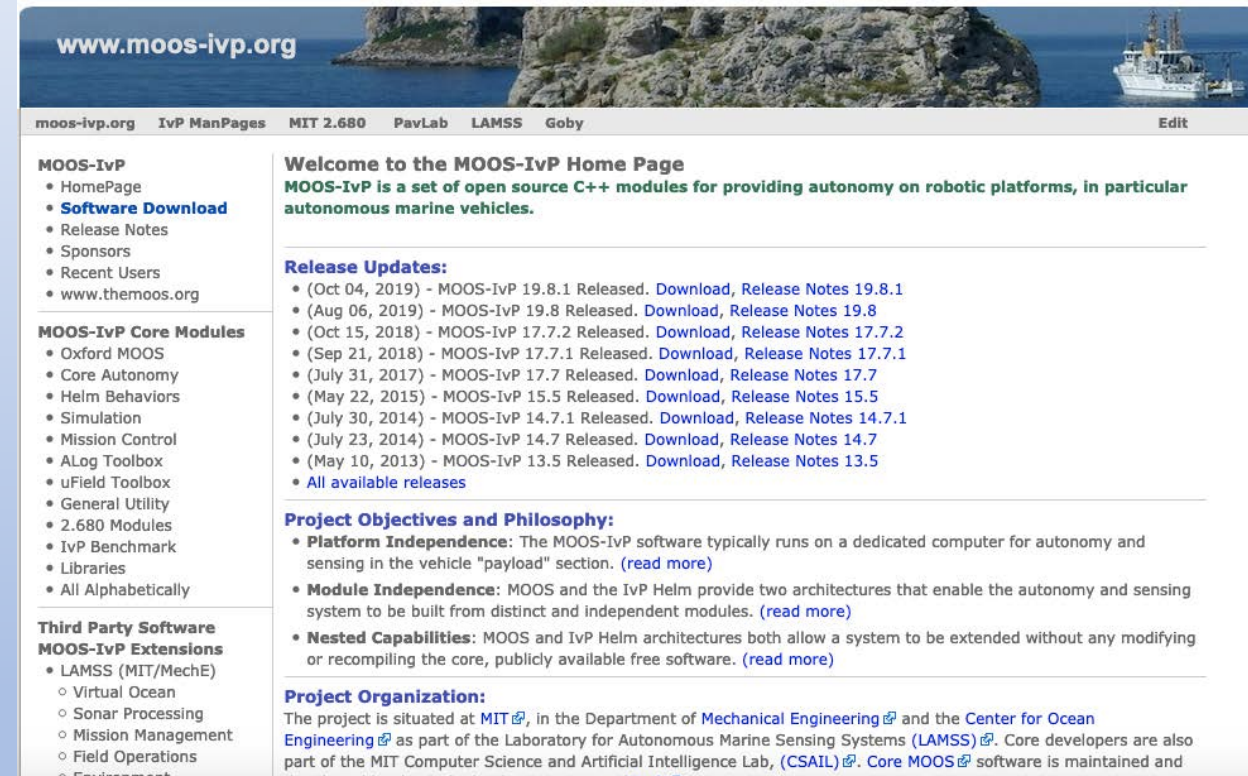
“Hard to tell what we will need,”



Support for A&RO

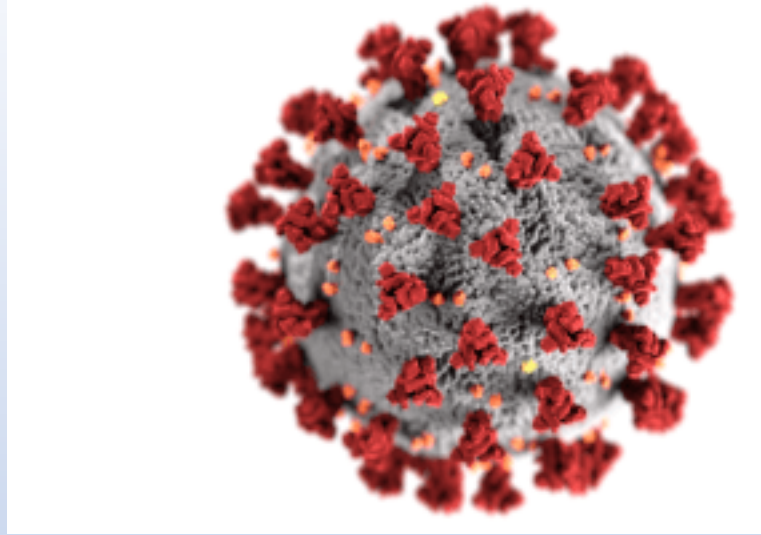
- Internal
- Industry developers
- Open-source software (MIT MOOS IvP)

“In the beginning, there was hesitation. People believed that A&RO will ruin the department and ruin jobs. Now that sentiment is gone and we recognize it’s coming and we need to be a proponent.”

The image is a screenshot of the MOOS-IvP website. The header features the URL 'www.moos-ivp.org' and a navigation bar with links to 'moos-ivp.org', 'IvP ManPages', 'MIT 2.680', 'PavLab', 'LAMSS', 'Goby', and an 'Edit' button. The main content area is divided into three columns. The left column contains links for 'MOOS-IvP' (HomePage, Software Download, Release Notes, Sponsors, Recent Users, www.themoos.org) and 'MOOS-IvP Core Modules' (Oxford MOOS, Core Autonomy, Helm Behaviors, Simulation, Mission Control, ALog Toolbox, uField Toolbox, General Utility, 2.680 Modules, IvP Benchmark, Libraries, All Alphabetically). The middle column has a 'Welcome to the MOOS-IvP Home Page' message, a 'Release Updates' section listing various versions from 2013 to 2019 with download and release notes links, and a 'Project Objectives and Philosophy' section with bullet points on Platform Independence, Module Independence, and Nested Capabilities. The right column contains a 'Project Organization' section describing the project's location at MIT and its affiliation with the Laboratory for Autonomous Marine Sensing Systems (LAMSS) and the Center for Ocean Engineering.

Barriers to A&RO

- Internal
- \$\$\$
- Room in curriculum
- Regulatory, wait and see
- Dock space
- Unions?
- COVID



A&RO & MARAD

- Varies by Academy
- Conferences (e.g. 'Achieving Critical MASS')
- Testing grounds, test centers
- Raise awareness, promote future
- Funding



“MARAD should help develop this so we’re prepared; it’s a huge disruptor.”

“Hey, all academies, we want to fund this project...”

Comparison and Cooperation



- Significant variance between US academies
- Significant lag behind EU
- Limited cooperation. Too early?

“I don’t know enough about other academies to answer”

“We’re behind. We don’t even have a DP system yet.”

... Additional thoughts

- Will future operator need four-year degree? USCG 3rd mate license?
- Third party specialists vs. maritime generalists
- A&RO will be better with rigorous integration of deck officers. How do we accomplish that?

“Troubleshooting is a skill. Are they engineering that out of the operations side or will that be something that has to be taught?”

--The End--

Autonomous and Remote Operations Training and Research at U.S. Maritime Academies

Elizabeth McNie, PhD

Assoc. Prof., Cal Maritime

November 9, 2009

Summary:

Autonomous & Remote Operations Training and Research at the US Maritime Academies

by Elizabeth McNie, PhD

- Very limited use of A&RO technology
- Training/courses in infancy
- Research (deck side) limited by resources and focus on teaching
- Currently more barriers to A&RO than support for it
- Need for greater involvement by MARAD
 - Research and technology grants
 - Testing grounds, test centers
 - Education, conferences
- US Academies perceived to be 'behind' peers
- Cooperation between academies very limited - if any