Autonomous and Unmanned Vessels: Current Status and What the Future Probably Holds

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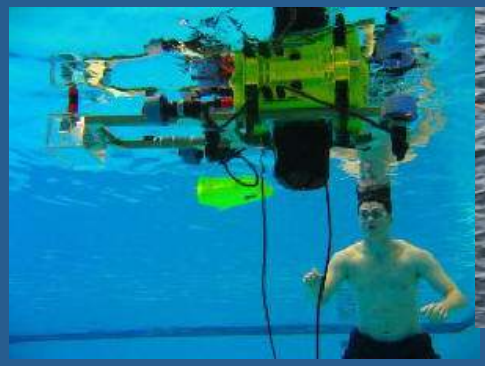
Who is Paul?

- A civilian professor of the US Naval Academy
- Naval architect and boat/shipbuilder
- Ferry and tug deckhand
- Research areas: marine composites ASVs and special craft

Autonomous Surface Vessels

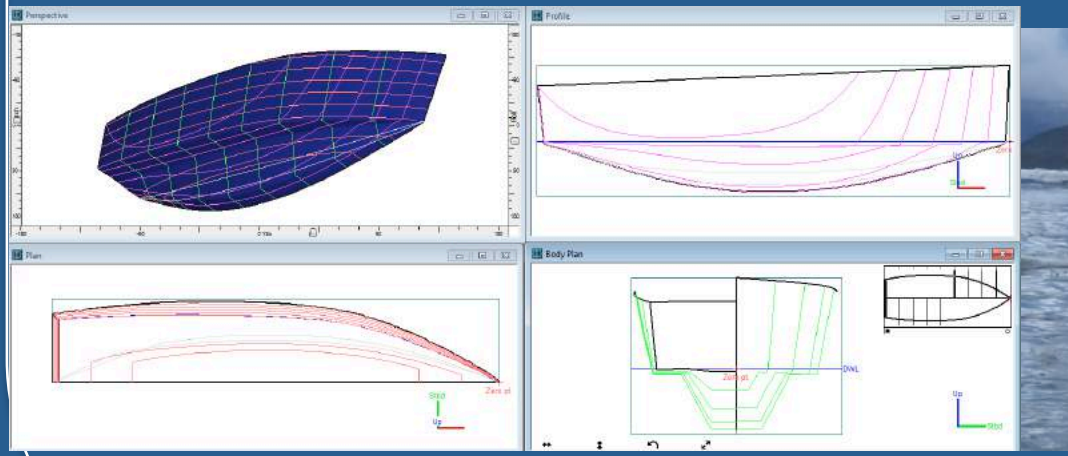
- "Unmanned" generally means controlled off the boat
- "Autonomous" means free running after launch, usually has over-ride capability
- Near-term will include both unmanned and autonomous ships
- Perhaps 200 now operational or in development



Center of Excellence for the Navy at NPS in Monterey

Minty2: A typical ASV

- Aberystwyth University & USNA project
- A small (3 m) oceanographic vessel with one month endurance, 4 knots
- 27 sensors, including side scan sonar
- Has operated in Greenland, Faroe Islands, Wales, Scottish lochs, Thames River



Sail-Powered Autonomous Surface Vessels
SP-ASVs (4 - 40 feet)

- Primary propulsion provided by sails
- Benefits include stealth, long-endurance, “green”, cheap
- Drawbacks include reliance on wind and more complicated systems and control algorithms – small ones are too slow to overcome currents

- My first SP-USV project – 2004 – 27 feet – 6 months endurance

- Suited to passive surveillance, oceanography & hydrography

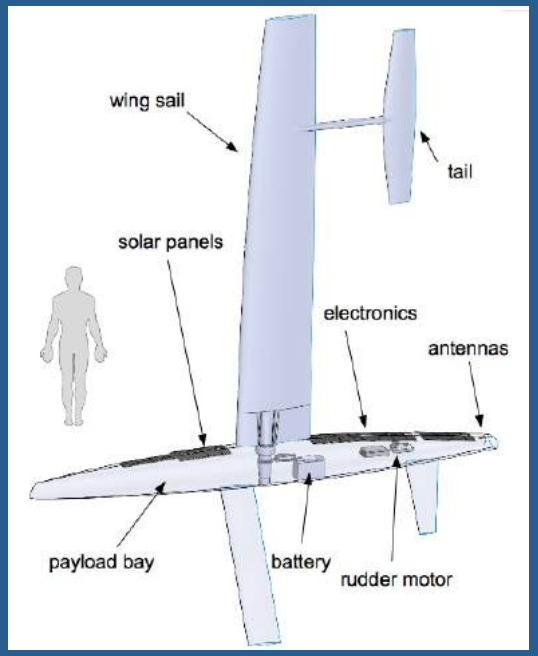
ARRTOO: A Hybrid ASV

- Two-month project sponsored by British National Environmental Research Center
- Two person launch/ recovery from ramp or on deck of small RV
- Two month endurance

40% Scale Prototype
30 kg displacement
10 kg payload
Sail speed up to 5 knots
Motoring speed up to 10 knots
O2, Turbidity, Temps

SailDrone

- Well funded and talented West Coast effort
- 19-feet long, 500+ pounds
- Up to 6 knots
- 6 feet draft
- 6000+ miles sailed!



USNA SP-ASVs

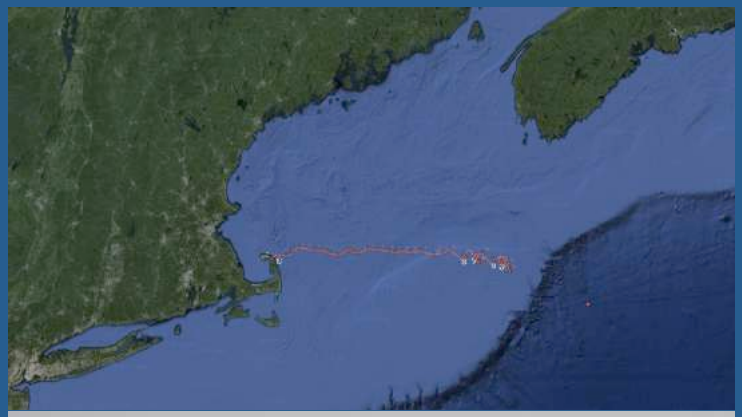
- Project started in 2007
- Primary goal is student learning through hands-on engineering and construction. 5-10 mids/yr
- Task is to compete in annual SailBot and WRSC Regattas and MicroTransat Race

- 9 vessels built
- All fit within SailBot Rules
  - 2 meter length
  - 3 meter beam
  - 1.5 meter draft
  - 5 meter total height
- 5 for racing
- 3 for voyaging
- 1 “Lego” boat (test platform for rigs)

Racing SailBots

Weight about 25 kg, top speed 7.4 knots
Payload about 2.5 kg
Endurance of 24 hours
One is used for bottom profiling at USNA

Voyaging SailBots

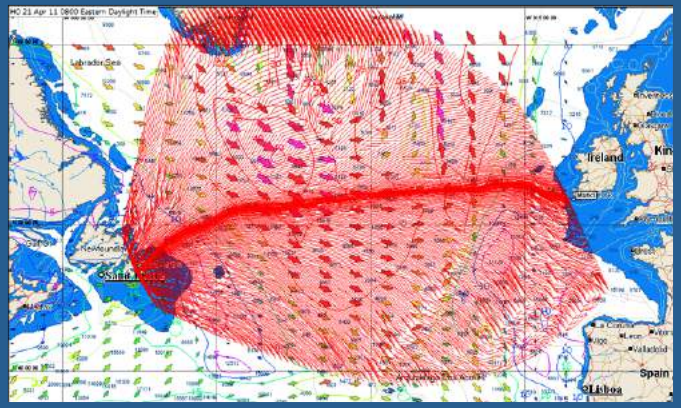


Weight about 30-120 pounds. Top speed about 4 knots.
Payload about 15 - 50 pounds.
Endurance of 2 - ? Months.

SP-ASV Challenges

Naval Architecture

- Performance
- Payload
- Watertight integrity
- Durability
- Controllability



Systems

- Power management
  - Generation (~0.63 A)
  - Consumption (~0.43 A)
- Navigation
  - Routing
  - Collision Avoidance
- Legal

Legal Issues

Collision Avoidance
- USCG “Opinion”
- EU “Opinion”

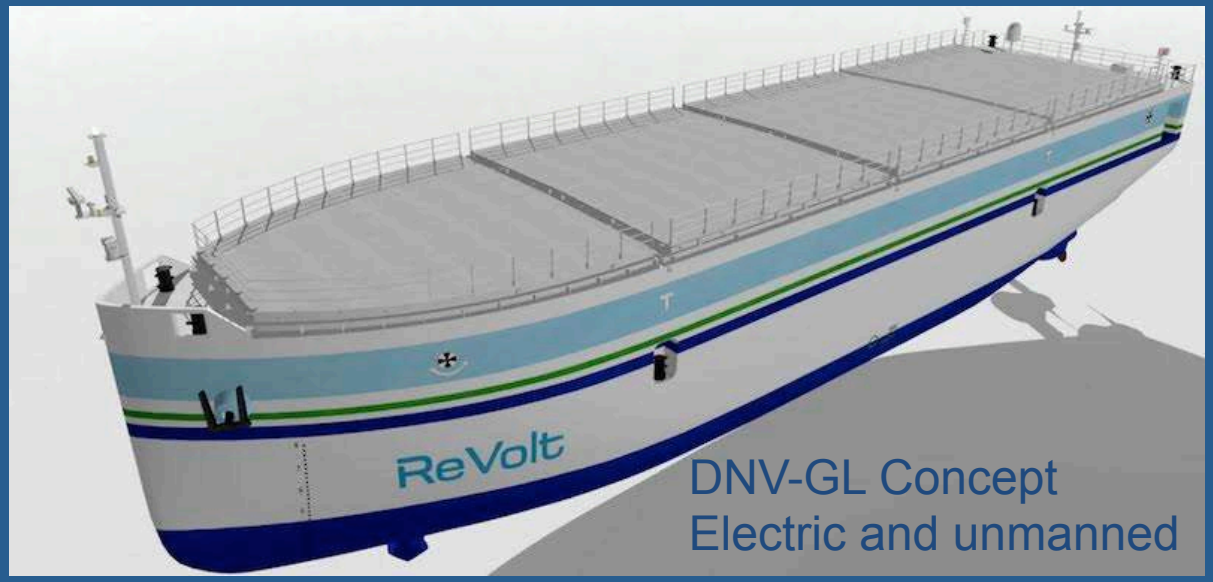
Research
- Obstacle Avoidance
- World Server

Current Situation
- Notice to Mariners

- Vessel or “Oceanographic Device”

The Future?

- No doubt we will see more ASVs and USVs.
- “Automation improves safety.”
- Will they keep a good lookout or just follow a predetermined course?



Thanks!

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Google “Miller USNA” for my webpages with half a dozen articles on our boats, systems and their development.