Uncrewed Maritime Systems: Navy Should Improve Its Approach to Maximize Early Investments
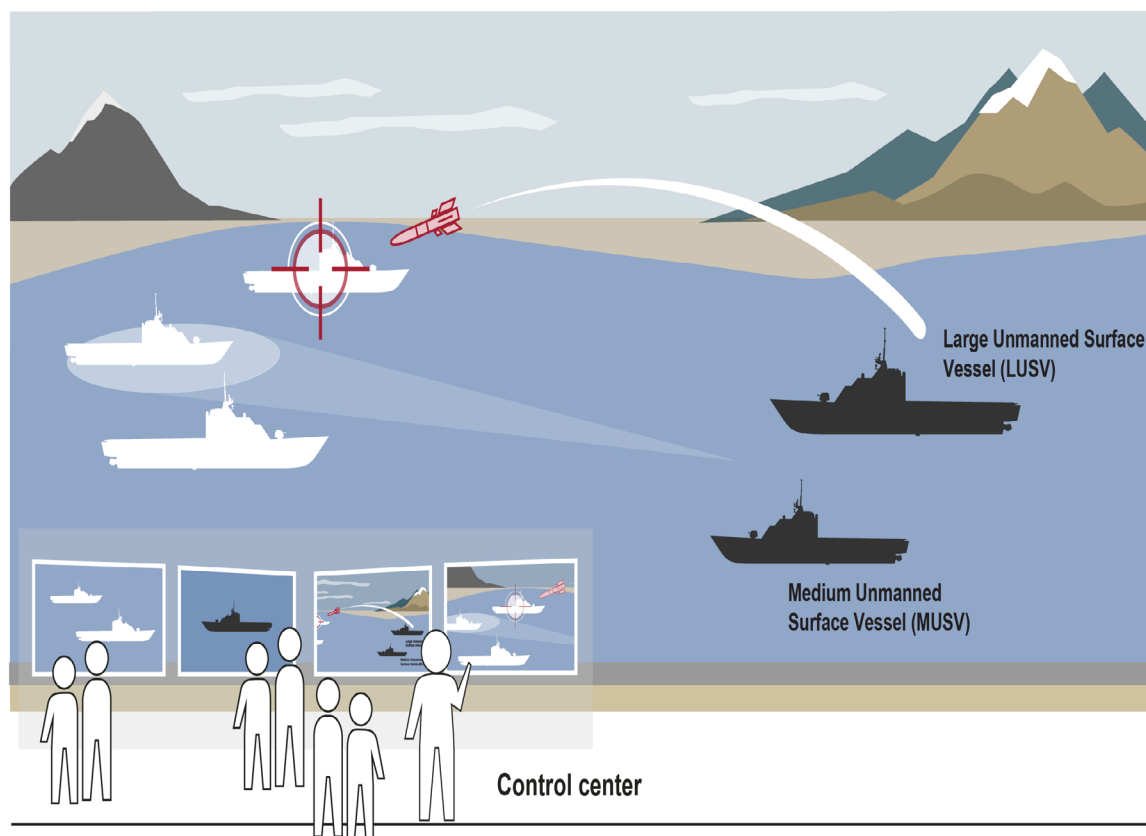
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Contracting and National Security Acquisitions

Navy Envisions Using Uncrewed Assets to Accomplish A Variety of Missions

- The Navy initially imagined that uncrewed systems would be used to replace human effort for dull (painting) and dangerous (mine hunting) jobs.

- The Navy is now emphasizing lethality and distributed maritime operations – thus, the Navy is focusing on how uncrewed systems could directly contribute to lethality and warfare.
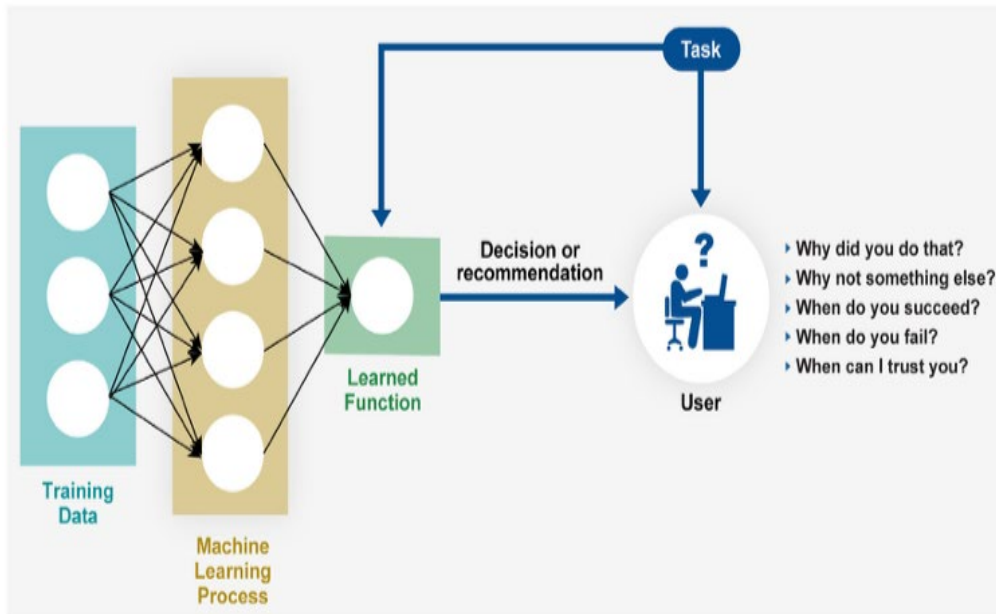

Large Unmanned Surface Vessel (LUSV)

Medium Unmanned Surface Vessel (MUSV)

Control center

Source: GAO analysis of Navy documents. | GAO-22-104567

"Robot" Ships Require a Physical Vessel Combined with a Digital Infrastructure

- Navy has operated uncrewed air assets for several decades and some uncrewed maritime systems, such as systems for oceanography and mine countermeasures missions.
- Navy is currently developing a number of larger, more complex uncrewed maritime systems.

Figure 7: Notional Example of Artificial Intelligence Model Complexity

Task

Training Data

Machine Learning Process

Learned Function

Decision or recommendation

User
- Why did you do that?
- Why not something else?
- When do you succeed?
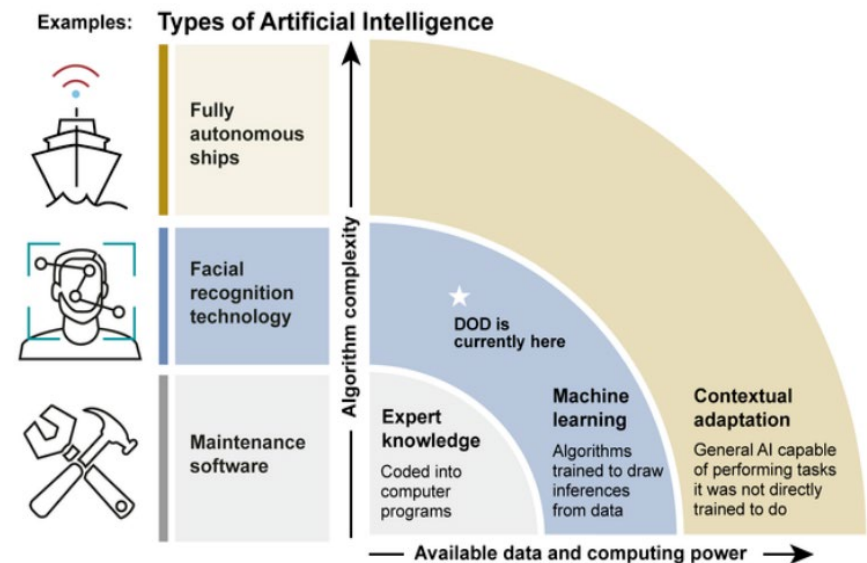- When do you fail?
- When can I trust you?

Source: GAO representation of Defense Advanced Research Projects Agency and other information. | GAO-22-104765

- The Navy also needs to develop the software and digital infrastructure capabilities to operate these systems without a crew on board.

- The Navy is planning to use the same digital infrastructure for all of its major uncrewed maritime efforts.

Navy's Approach is a Work in Progress

- We have advocated for DOD to use prototyping more often to retire risk before starting a full fledged acquisition. To be successful prototyping must be well-planned and well-executed to achieve their goals.

- We found issues with the Navy's cost estimates, management, and planning for these new assets to fully capture benefits of prototyping.
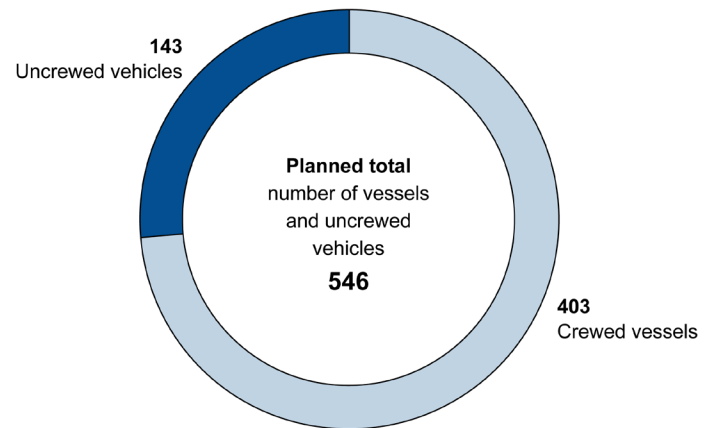

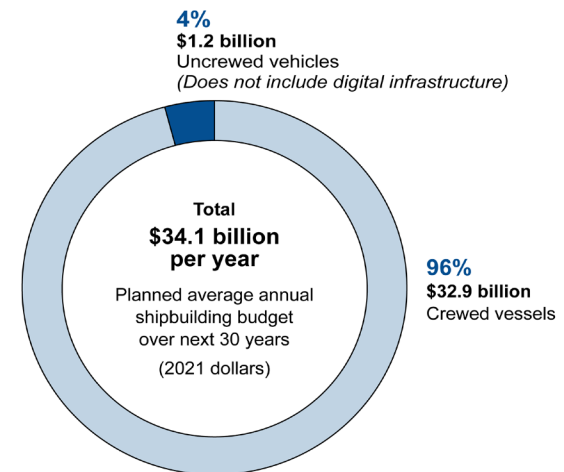Types of Artificial Intelligence (AI) and Associated DOD Examples

Source: GAO analysis of information from the Department of Defense (DOD) and academic experts. | GAO-22-104765

Navy Has Yet to Gain an Understanding of the Costs of Acquiring and Sustaining this New Class of Assets

- Navy plans to add uncrewed systems to its fleet without changing its plan for crewed ships.

- This puts extra pressure on affordability that was already a challenge in reaching the Navy's goal of 355 ships.

- Navy's FY23 shipbuilding plan contains no cost estimates for uncrewed systems.

143
Uncrewed vehicles

Planned total
number of vessels
and uncrewed
vehicles
546

403
Crewed vessels

Source: GAO analysis of Navy Shipbuilding Plan. | GAO-22-104567

4%
$1.2 billion
Uncrewed vehicles
(Does not include digital infrastructure)

Total
$34.1 billion
per year

Planned average annual
shipbuilding budget
over next 30 years

(2021 dollars)

96%
$32.9 billion
Crewed vessels

Source: GAO depiction of Congressional Budget Office analysis of Navy Shipbuilding Plan. | GAO-22-104567
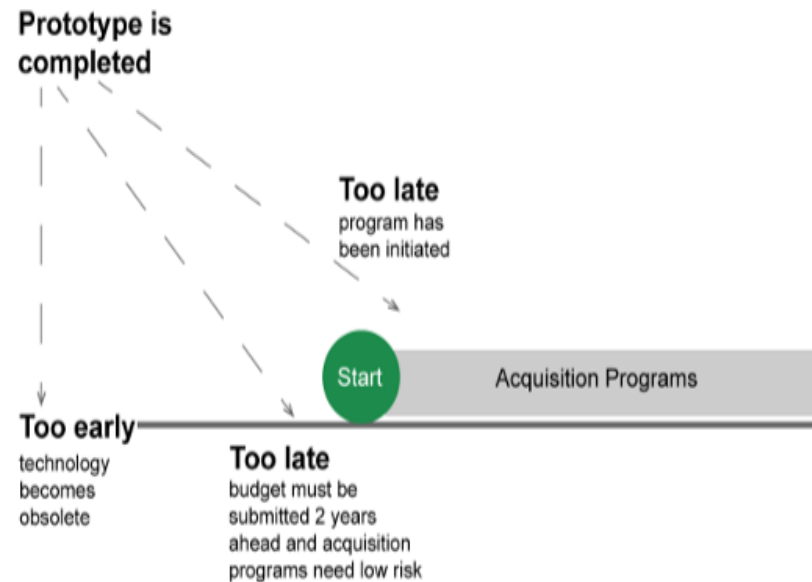
Navy Is Missing Opportunities to Better Manage Efforts to Achieve Its Uncrewed Maritime System Objectives

- Navy does not have a governance structure that can effectively manage and resource its portfolio of uncrewed maritime systems, such as prototype planning, requirements development, and acquisition.

- Without an "internal champion" (e.g. governance/leadership) the digital infrastructure, in particular, remain woefully behind the prototyping effort.

- In line with a portfolio approach, the Navy established strategic objectives for uncrewed system programs, but has no metrics to measure progress and make improvements.

Navy's Plans for Prototyping Do Not Contain Key Details to Achieve Its Vision

- The Navy has not established transition criteria to move from prototyping to acquisition.

- There is no integrated schedule. Without a schedule, the Navy risks out of sequence work such as solving an issue on the MUSV after the LUSV starts construction.

- The Navy has not drafted key milestones that it plans to reach during the prototyping process for each program. As a result, the Navy's prototyping program does not have clear aims.

Figure 9: Challenges with Synchronizing Completion of Prototypes and the Start of Acquisition Programs

Prototype is completed

Too late
program has been initiated

Start — Acquisition Programs

Too early
technology becomes obsolete

Too late
budget must be submitted 2 years ahead and acquisition programs need low risk

Source: GAO. | GAO-17-309

GAO

Recommendations

1. The Navy should develop a full understanding of costs including operating and digital infrastructure costs.
2. Navy should pursue a portfolio approach that encompasses all aspects of uncrewed maritime systems.
3. Navy should create metrics to assess its progress against the uncrewed maritime system strategic objectives.
4. Navy should develop transition criteria for each uncrewed program we reviewed.
5. Navy should develop a master schedule for prototyping.
6. Navy should establish development milestones for the prototyping process that show progress towards the technologies and capabilities it is trying to achieve.
7. The Navy should establish development milestones towards achieving the certifications needed to operate the uncrewed maritime systems with the fleet and as stand-a-lone assets.

Final Thought and Questions

If the Navy does not implement leading prototyping and portfolio practices, it may not get the most of the billions of dollars it is investing in these prototypes and would also likely begin future uncrewed acquisitions with more risk than planned.