



# Research and Development on Unmanned Surface Vehicles

*November 15, 2022*

Fiscal Year 2022 Report to Congress



**Homeland  
Security**

*United States Coast Guard*

# Foreword

November 15, 2022

I am pleased to present the following report, “Research and Development on Unmanned Surface Vehicles,” which has been prepared by the U.S. Coast Guard.

This document was compiled pursuant to the House Report 117-87 accompanying the Fiscal Year 2022 Department of Homeland Security Appropriations Act (P.L. 117-103), which directs the Coast Guard to provide plans for research and development activities related to unmanned surface vehicles, including an evaluation of wind and solar powered vessels with surface and subsurface capabilities.



Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

The Honorable Lucille Roybal-Allard  
Chairwoman, House Appropriations Subcommittee on Homeland Security

The Honorable Chuck Fleischmann  
Ranking Member, House Appropriations Subcommittee on Homeland Security

The Honorable Chris Murphy  
Chair, Senate Appropriations Subcommittee on Homeland Security

The Honorable Shelley Moore Capito  
Ranking Member, Senate Appropriations Subcommittee on Homeland Security

I am happy to answer any questions you may have, or your staff may contact my Senate Liaison Office at (202) 224-2913 or House Liaison Office at (202) 225-4775.

Sincerely,

A handwritten signature in blue ink that reads "LL Fagan".

Linda L. Fagan  
Admiral, U.S. Coast Guard  
Commandant



# Research and Development on Unmanned Surface Vehicles

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# I. Legislative Requirement

This document responds to the direction set forth in House Report 117-87 accompanying the Fiscal Year (FY) 2022 Department of Homeland Security (DHS) Appropriations Act (P.L. 117-103).

House Report 117-87 states:

Unmanned Surface Vehicles (USV).—The Committee directs the Coast Guard to report on its plans for research and development activities related to USVs, including an evaluation of wind and solar powered vessels with surface and subsurface capabilities, not later than 90 days after the date of enactment of this Act. The Committee also expects to be updated on the findings of this research as they become available.

## II. Report

The Coast Guard is researching new technologies, including autonomous systems, to improve maritime domain awareness (MDA). Increasing MDA can contribute positively to numerous Coast Guard mission sets, including counter-drug, migrant interdiction, critical infrastructure surveillance, port and coastal surveillance, environmental monitoring, spill monitoring, fisheries enforcement, security zone enforcement, and enforcement of laws and treaties. It is essential for the Coast Guard to achieve comprehensive MDA in the maritime regions under U.S. jurisdiction, and to have the ability to communicate, integrate, and analyze information rapidly that will facilitate effective and appropriate actions.

USVs offer the potential to expand MDA by providing distributed low-cost intelligence, surveillance, and reconnaissance (ISR) platforms. USVs could enhance the performance of crewed assets by expanding ISR capabilities in the vicinity of the crewed asset. Likewise, USVs can fill gaps where it is too risky to send people or when crewed assets are unavailable.

### Unmanned Surface Vehicle Research and Development

DHS Science and Technology Directorate (S&T) in partnership with the Coast Guard is managing the Maritime Unmanned Systems Technology (MUST) USV research and development project. This multi-year project began in 2019 to evaluate the use of USVs to provide persistent and cost-effective ISR capability for law enforcement, security, and pollution response missions in support of broad MDA objectives. Other participants include Cherokee Nation Strategic Programs, Naval Research Lab, University of Southern Mississippi Maritime Research Center, Penn State Applied Research Lab, and the Homeland Security Systems Engineering and Development Institute.

The MUST project is developing a USV with a surface capability focus and with some limited subsurface capability to avoid inclement weather or counter detection. The selected Ocean Aero Triton USV is wind and solar powered, which enables it to remain at sea for long durations, ideally for several months at a time. Since 2019, S&T has acquired six Triton USVs, completed system design work and currently is completing sensor suite integration (including development of a custom acoustic sensor and central payload manager), extensive at-sea testing of the basic vehicle, and undertaking modeling efforts to inform system employment. The sensor suite includes an acoustic sensor, surface radar, electro-optical/infrared camera, encryption capable Automatic Identification System receiver, and pollution detector.

For calendar year (CY) 2022, the team tested individual sensors, finalized integration of the sensor suite, completed a technical readiness review, improved vessel reliability, and is concluding acceptance testing of individual vessels. For the remainder of CY 2022, the team will conduct progressively challenging sea trials culminating with a full system test event in the Gulf of Mexico to evaluate the system's ability to detect, classify, and track targets of interest related to Coast Guard law enforcement missions. In CY 2023, the team plans to continue test and evaluation events, conduct an analysis of alternatives and business case analysis, refine cyber security and data management requirements, and complete modeling and simulation to inform concept of operations development. This project is scheduled to terminate at the end of

CY 2023.

In addition to the MUST project, the Coast Guard Research and Development Center (RDC) is researching autonomous and/or optionally operated vessels utilizing two RDC-owned small boats. Planned efforts include improving search autonomy, exploring computer vision for target detection and collision avoidance, search and rescue payload deployment, autonomous launch and recovery from Coast Guard cutters, and cooperative tasking with unmanned aircraft systems.

### III. Conclusion

These efforts are some of the first extensive forays into USV research and development by DHS and the Coast Guard. While these projects provide an opportunity to better understand USV technology and capabilities, it is evident that operational USV employment requires additional development before these systems are capable of meeting Coast Guard mission needs.

## Appendix: Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
CY	Calendar Year
DHS	Department of Homeland Security
FY	Fiscal Year
ISR	Intelligence, Surveillance, and Reconnaissance
MDA	Maritime Domain Awareness
MUST	Maritime Unmanned Systems Technology
RDC	Research and Development Center
S&T	Science and Technology Directorate
USV	Unmanned Surface Vehicle