



Research and Development: Small Unmanned Aerial Systems

October 26, 2021

Fiscal Year 2021 Report to Congress



Homeland
Security

United States Coast Guard

Foreword

October 26, 2021

I am pleased to present the following report, “Research and Development: Small Unmanned Aerial Systems,” which has been prepared by the U.S. Coast Guard.

House Report 116-458 accompanying the Fiscal Year 2021 Department of Homeland Security Appropriations Act (P.L. 116-260) directs the Coast Guard to provide a report on innovative technologies, analysis, and decision support for unmanned aerial systems.

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 further questions that 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,



Karl L. Schultz
Admiral, U. S. Coast Guard
Commandant





Research and Development: Small Unmanned Aerial Systems

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I. Legislative Requirement

This document responds to the direction set forth in House Report 116-458 accompanying the Fiscal Year (FY) 2021 Department of Homeland Security Appropriations Act (P.L. 116-260).

House Report 116-458 states:

“Small Unmanned Aerial Systems (sUAS).—The Committee supports the integration of unmanned aerial systems into Coast Guard operations to provide greater situational awareness and take advantage of developments in rapidly improving reconnaissance technology. The Committee includes \$3,000,000 above the request for further R&D as described in the UPL. The Committee directs the Coast Guard to report to the Committee on the results of this effort, to include the viability of sUAS on appropriate assets in its existing fleets and any plans utilize this capability for future programs, such as the OPC and PSC.”

II. Background

The Coast Guard relies on a mix of crewed fixed-wing airplanes, crewed helicopters, and unmanned aerial systems (UAS) in combination with its surface fleet to provide maritime domain awareness in the execution of its 11 statutory missions. Aircraft and surface assets working in concert provide a powerful and effective tool to prosecute law enforcement missions (counterdrug, fisheries enforcement, migrant interdiction) on the high seas. To this end, the Coast Guard began employing UAS in intelligence, surveillance, and reconnaissance roles on its National Security Cutter (NSC) fleet in 2016 and since 2015 has had a Program of Record to outfit the NSC fleet with UAS capability. The Coast Guard envisions expanding the use of UAS to other cutter platforms and eventually to shore stations; however, near-term technical hurdles prevent the employment of this technology more broadly across the Coast Guard. Specifically, UASs lack the ability to detect and avoid (DAA) other aircraft operating in their vicinity. This deficiency is overcome on the NSC by its use of air search radar to clear airspace. Other cutter classes and shore stations do not have ready access to this capability. To employ UAS capabilities fully, the Coast Guard Research and Development (R&D) program seeks to identify, evaluate, and employ DAA technologies on UAS to enable its broader use in national and international airspace.

III. Report

The Coast Guard currently operates several tiers of UAS and continues to explore an expanded use of UAS for mission execution. The Coast Guard partners with U.S. Customs and Border Protection (CBP) to operate long-range MQ-9 UAS through a joint program office, is outfitting the NSC fleet with a medium-range UAS, and 26 units throughout the Coast Guard are equipped with short-range quad-copter type UAS under the Group One UAS Prototype Program Initiative. The Coast Guard has conducted market research into low-cost/long-range autonomous UAS solutions and is exploring cooperative R&D agreements to develop these technologies. The Coast Guard also is drafting formal requirements to include UAS capability on its new Offshore Patrol Cutters (OPC), its Polar Security Cutters (PSC), and on select cutters in the legacy fleet.

In 2019, the Coast Guard's Research and Development Center (RDC) began a UAS project to evaluate vertical takeoff and landing (VTOL) capabilities; various DAA technologies (radar, optical, acoustic); and the ability to conduct shore-based search and rescue (SAR). In 2020, RDC successfully evaluated VTOL capabilities of UAS from a Coast Guard medium endurance cutter.

The additional \$3 million in R&D funding, received in 2021, enables RDC to expand the scope of its DAA and shore-based SAR efforts. During the next 2 years, this project will integrate DAA technologies onto UASs and conduct limited user evaluations from cutters and shore stations to test the system's effectiveness operating beyond visual line of sight to conduct law enforcement and SAR missions. UASs suitable for launch and recovery from smaller Coast Guard surface assets or shore stations may be relatively small in size (some under 20 pounds), necessitating a DAA solution that doesn't exceed available space, weight, and power onboard the UAS, while also leaving sufficient space, weight, and power for a capable mission sensor package. In addition to a radar/optical/acoustic sensor, a likely DAA solution also will include an automated dependent surveillance-broadcast in/out transponder, a traffic collision and avoidance system, and air traffic control radar feeds. Throughout this project, the Coast Guard is coordinating with the Federal Aviation Administration (FAA) and other government agencies seeking a DAA solution, such as CBP and the U.S. Navy. Following successful integration and testing of a DAA system, the Coast Guard can seek FAA approval for widespread use of UAS in the national airspace system.

IV. Conclusion

Additional R&D funding has enabled the Coast Guard to broaden the scope of its UAS R&D to overcome technical hurdles and to evaluate UAS suitability fully across all mission sets and geographic areas. The Coast Guard will use the outcomes of current R&D efforts and formal requirements development to expand UAS operations to other cutter classes and to shore stations, as appropriate and as resources allow.

Appendix: List of Abbreviations

Abbreviation	Definition
CBP	U.S. Customs and Border Protection
DAA	Detect and Avoid
FAA	Federal Aviation Administration
FY	Fiscal Year
NSC	National Security Cutter
OPC	Offshore Patrol Cutter
PSC	Polar Security Cutter
R&D	Research and Development
RDC	Research and Development Center
SAR	Search and Rescue
sUAS	Small Unmanned Aerial System
UAS	Unmanned Aerial System
UPL	Unfunded Priorities List
VTOL	Vertical Takeoff and Landing