U.S. Coast Guard Research & Development Center FY26 Research Program Portfolio

CG RDC FY26 Research Program Portfolio
A. Arsenault | October 2025

CG Research & Development Center
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Autonomy Research Program

Program Definition

The strategic application of automation and autonomous technologies to advance the capabilities of physical, virtual, and other systems. Integration of autonomy/autonomous systems with legacy assets and infrastructure also comprises a key focus. Unique expertise will also include how autonomy may be used by other maritime stakeholders and/or adversaries, how that use will impact the service, and how the service will need to adapt to maintain a competitive edge. The transition goal of this program is to provide clear opportunities for USCG adoption and incorporation of autonomous technology across its operational missions and support functions and how it will interact with autonomy within the Marine Transportation System (MTS) and the public.

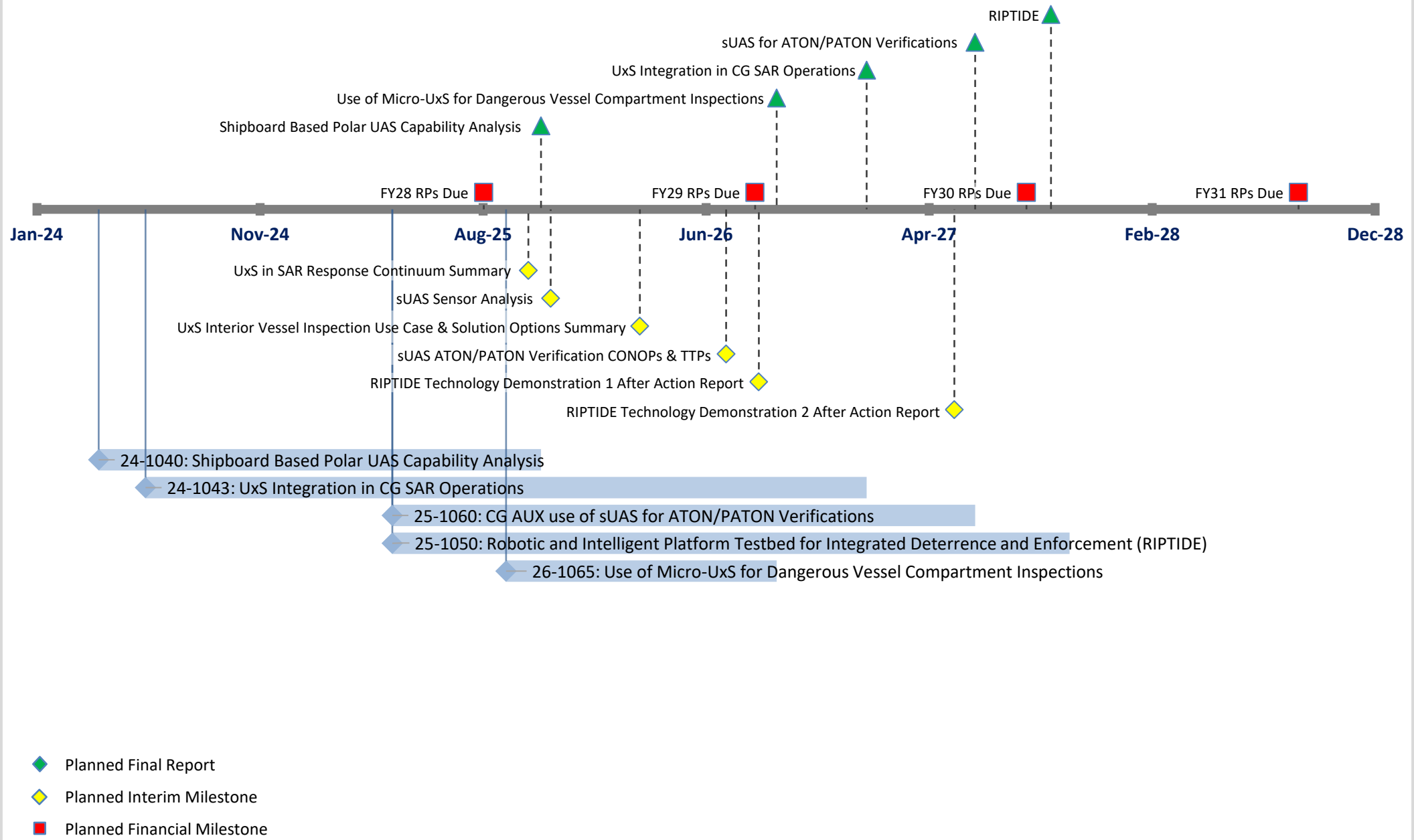
Cutter-Based UxS Integration – Mock USV Recovery

Beyond Visual Line of Sight UAS Detect & Avoid System Technology

Program Team

Program Champion:	**RDC Experimentation Lead:**
RDML Grable (CG-7/CG-FD&I)	LCDR Ryan Cassidy
	RDC Transition Lead:
RDC Research Program Chief:	Mr. Scott Fields
Mr. Evan Gross	

Research Program Roadmap | Autonomy



Shipboard Based Polar UAS Capability Analysis

24-1040

Mission Need: Uncrewed aircraft technologies to extend awareness and logistics for polar operations.

Objectives

- Identify and evaluate emerging Uncrewed Aircraft System (UAS) technologies to enhance U.S. Coast Guard (CG) operations in arctic regions.
- Analyze possible UAS and identify integration considerations tailored for CG Polar Security Cutter assets.
- Cultivate joint arctic UAS efforts, interagency cooperation and allied nation information sharing to gain better understanding of uncrewed aerial sensor capability in characterizing marine domain awareness in polar conditions.
- Inform future capabilities and operational documents.

Notes

- Most objectives were addressed by International Cooperative Engagement Program for Polar Research (ICE PPR) and Office of Naval Research (ONR) Global in 2023 and 2024 through field experiments. Plan to analyze data from the ONR Global Frozen Flyer project which was created by the executive officer for the ICE PPR, Office Symbol: DCNO, N9.

Sponsor's Rep: CG-RAS
Ops Rep: PAC-3

Stakeholder(s): CG-711, CG-AIR-A, CG-C5I, CG-751, CGD-A, LANT-5, NOAA, CG-MER

RDC Principal Investigator:
Mr. Ross Vassallo

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation: 1 Apr 24

Complete Initial Review of ONR Frozen Flyer Data	26 Jun 24 ✓
Complete Technology Focus Analysis on ONR Data	9 Aug 24 ✓
Shipboard Based Polar UAS Capability Analysis (Report)	**Nov 25** ★

Completion: Nov 25

Use of Micro-UxS for Dangerous Vessel Compartment Inspections

26-1065

Mission Need: Expanded toolset for the inspection of dangerous vessel compartments.

Objectives

- Characterize the state of technology for micro-Uncrewed Systems (UxS).
- Prototype the integration of micro-UxS into U.S. Coast Guard (CG) vessel inspections.
- Determine the safety and efficiency benefits of performing dangerous vessel compartment inspections assisted by micro-UxS.
- Determine the impact on inspection capabilities for viewing difficult to access locations within a vessel's internal structure.
- Map the utility of micro-UxS capabilities to vessel inspection requirements.


Source:XD4Solutions

Notes

- Implementation action of the CG Unmanned Systems Strategic Plan.
- Supports CG Force Design 28 Technology campaign to accelerate adoption of secure, state-of-the-market technology to enhance operational effectiveness.
- Potential partnership with the National Urban Security Technology Laboratory for the U.S. Department of Homeland Security System Assessment and Validation for Emergency Responders (SAVER) program.
- Leverage similar work done by the International Maritime Organization and classification societies.

Sponsor's Rep: CG-CVC
Ops Rep: MTS

Stakeholder(s): CG-741, CG-FAC, CG-INV, CG-RAS, CG-TECH

RDC Principal Investigator:
Mr. Ross Vassallo

Anticipated Outcome/ Transition:
Recommendations on Tech Availability & Applicability
Recommendations for Tactics, Techniques & Procedures

Effort Timeline / Key Milestones

Initiation: Oct 25		
Define Use Cases	Dec 25	
UxS Interior Vessel Inspection Use Case & Solution Options Summary (Brief)	**Mar 26**	★
Complete Evaluation Plan	Jun 26	
Conduct Field Evaluation	Jul 26	
Use of Micro-UxS for Dangerous Vessel Compartment Inspections (Report)	**Sep 26**	★
Completion: Sep 26		

UxS Integration in Coast Guard SAR Operations

24-1043

Mission Need: Improved response outcomes through UxS integration into CG SAR operations.

Objectives

- Identify critical gaps in current U.S. Coast Guard (CG) Search and Rescue (SAR) operations to determine where integration of Uncrewed Systems (UxS) technologies could significantly enhance operational effectiveness along the case response continuum.
- Characterize current capabilities within the UxS market, focusing on technological maturity and potential adaptability to SAR operations.
- Investigate how other SAR organizations, both domestic and international, currently utilize UxS.
- Conduct targeted trials to evaluate the feasibility and integration potential of selected UxS technologies within simulated SAR scenarios.
- Demonstrate capabilities of available deployable Drone in a Box UxS.
- Deliver SAR-specific UxS integration recommendations to facilitate the implementation and operationalization of the CG UxS Strategic Plan.

Notes

- Leverages RDC Effort 1028, "Cutter-Based Uncrewed Systems (UxS) Integration Analysis."
- Benchmark U.S. Department of Defense, Other Government Agencies, and allied nations' UxS programs.
- Addresses imperatives highlighted by UxS Strategic Plan.
- Execute field test events in coordination with Robotic and Intelligence Platform Testbed for Integrated Deterrence and Enforcement (RIPTIDE) initiatives.

Sponsor's Rep: CG-SAR **Ops Rep:** LANT-3	**Stakeholder(s):** CG-RAS, CG-711, CG-731, CG-741, CG-751, CG-5RI, CG-TECH
RDC Principal Investigator: Ms. Marie Whalen	
Anticipated Outcome/ Transition:	Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation: 3 Jun 24		
UxS SAR Exercise with USCG Southeast District	14 Feb 25	✓
UxS SAR Capabilities Baseline	28 Feb 25	✓
UxS in SAR Response Continuum Summary (Brief)	**Oct 25**	★
UxS for SAR Technology RIPTIDE Event Complete	May 26	
Drone in a Box Demonstration Complete	Jul 26	
Uncrewed Systems Integration in CG Search and Rescue Operations Foundation to Transition (Report)	**Jan 27**	★
Completion: Jan 27		

CG Auxiliary use of Small Uncrewed Aircraft Systems (sUAS) for Aids to Navigation (ATON)/Private ATON (PATON) Verifications

25-1060

Mission Need: A reliable and repeatable method for conducting ATON/PATON verifications.

Objectives

- Establish a comprehensive understanding of the sensor uncertainties inherent in the U.S. Coast Guard's (CG) Short Range Uncrewed Aircraft System (UAS) program, specifically focusing on the Parrot, Skydio, and Puma systems.
- Demonstrate the feasibility and accuracy of using UAS to replicate current PATON/ATON verification processes.
- Define Concept of Operations (CONOPS) and Tactics, Techniques and Procedures (TTPs) for PATON/ATON vignettes, outlining the operational framework, procedures, best practices, efficiency and process improvements for deploying UAS.
- Develop and deploy a secure user interface that seamlessly integrates UAS-derived PATON/ATON data with relevant CG databases (ArcGIS, SEXTANT, Looking Glass).

Notes

- Builds on work completed by RDC effort 1020, "PATON Improvements."
- Use CG Auxiliary/PATON as first testbed for expansion to ATON. Leverage AVA mobile application tool methodology for data transference.
- Partner with Sectors and Districts for vignette development and testing.
- Potential partnership with CG Academy for UAS and ATON project topics.
- Potential partnership with Canadian and U.K. Coast Guard.
- Potential contracting with the U.S. Army Engineer Research and Development Center, Naval Air Systems Command, Air Force Research Laboratory, or Environmental Systems Research Institute for database integration.

Sponsor's Rep: CG-NAV
Ops Rep: Districts

Stakeholder(s): CG-711, CG-751, CG-AUX, CGD-GL, CGD-NE, CG-RAS, CG-TECH

RDC Principal Investigator:
Ms. Shelly Wyman, P.E.

Anticipated Outcome/ Transition:
Recommendations for Tactics, Techniques & Procedures
Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation: 1 May 25

Conduct sUAS Sensor Uncertainties Tests	1 May 25 ✓
Conduct PATON Vignette	Oct 25
sUAS Sensor Analysis (Report)	**Nov 25** ★
Conduct ATON Post-Storm Proof of Concept Vignette	Mar 26
sUAS PATON/ATON Verification CONOPs & TTPs (Brief)	**Jul 26** ★
Develop Data Integration	Nov 26
CG Auxiliary use of sUAS for ATON/PATON Verifications (Report)	**Jun 27** ★

Completion: Jun 27

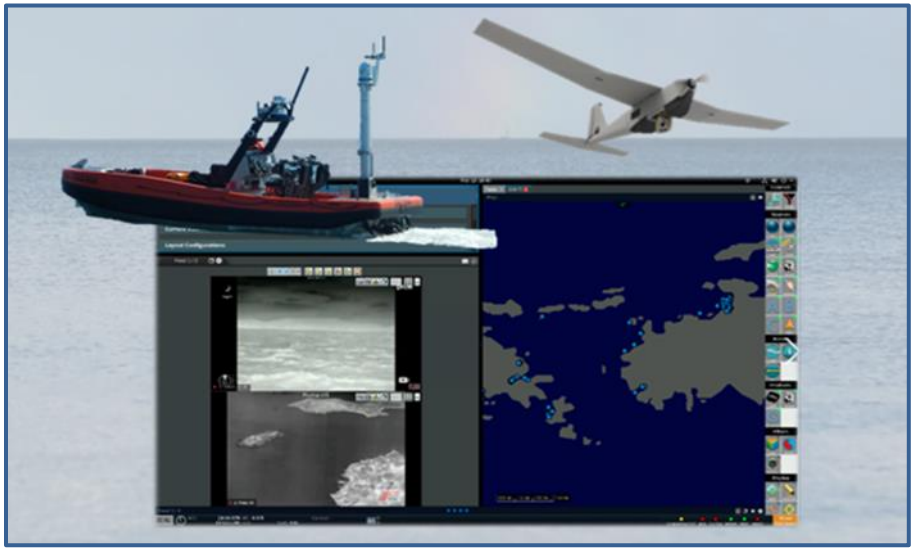
Robotic and Intelligent Platform Testbed for Integrated Deterrence and Enforcement (RIPTIDE)

25-1050

Mission Need: Rapid integration of uncrewed systems through layered autonomy.

Objectives

- Expand existing Maritime Domain Awareness capability sprint model.
- Prototype the integration of high Technical Readiness Level autonomous systems to identify enabling technologies.
- Perform interoperability assessments with U.S. Coast Guard (CG) legacy systems.
- Streamline the assessment of emerging autonomous technologies.
- Incubate emerging technology to provide robust deployable and/or Data-as-a-Service options for CG operators.
- Provide the mechanism to translate innovations from industry, academia, and Other Government Agencies into push-button CG capabilities.



Notes

- Demonstration execution in proximity to United States Southern and Northern maritime borders.
- Potential partners include National Urban Security Technology Laboratory, Department of Defense partner laboratories, Customs and Border Protection Innovation Team, in addition to industry partners.

Sponsor's Rep: CG-RAS
Ops Rep: N/A

Stakeholder(s): CG-SEA-E, CG-721, CG-731, CG-751, CG-761, CG-791, SFLC, AREAs, CG-TECH

RDC Principal Investigator:
Mr. Derek Meier

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

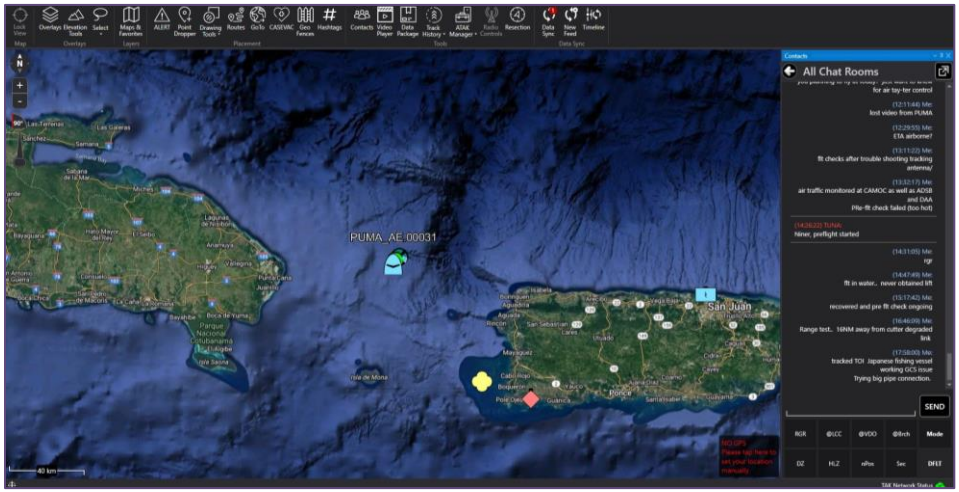
Initiation: 1 May 25		
Contract Test and Evaluation / Integration Agent for Demonstration Integration and Execution	Jan 26	
RIPTIDE Technology Demonstration 1	Jul 26	
RIDTIDE Technology Demonstration 1 After Action Report (Brief)	**Sep 26**	★
RIPTIDE Technology Demonstration 2	Jan 27	
RIPTIDE Technology Demonstration 2 After Action Report (Brief)	**May 27**	★
RIPTIDE Technology Demonstration 3	Jun 27	
Robotic and Intelligent Platform Testbed for Integrated Deterrence and Enforcement (Report)	**Oct 27**	★
Completion: Oct 27		

Connectivity Research Program

Program Definition

Traditional Command, Control, Communications, Computers, Cyber, and Intelligence (C5I) focus extended to include Information Technology (IT) and networking, mobile device solutions, data connectivity from all sensors and platforms (crewed or uncrewed), at any latitude and longitude. This also includes next generation remote command and control and bringing data to decision makers wherever they are, enabling tasking to flow automatically to all assets, and maintaining consistent and reliable communication pathways.

Starlink Aboard CGC Healy

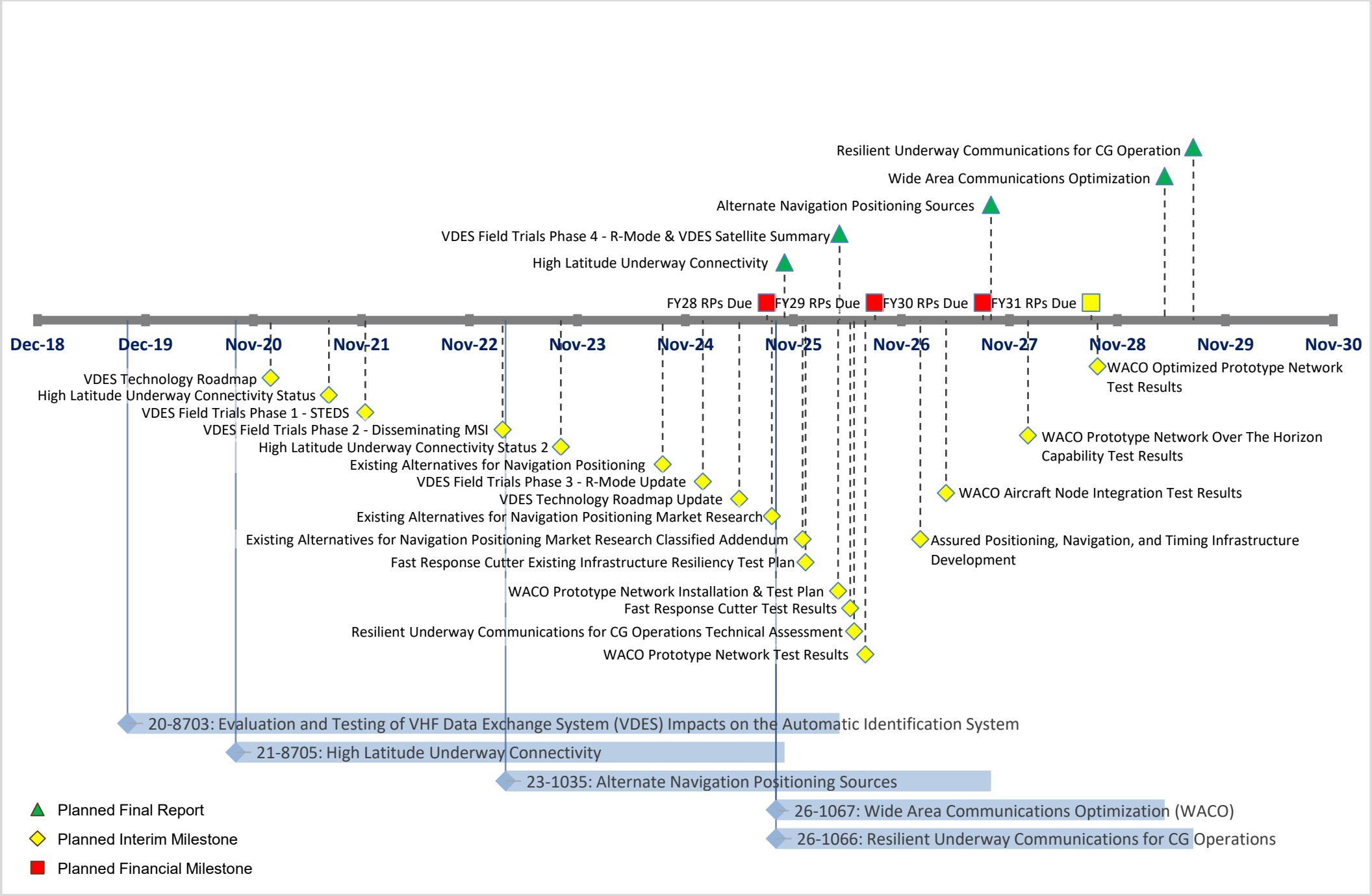


Team Awareness Kit (TAK) Op Demo COQUI

Program Team

Program Champion:	**RDC Experimentation Lead:**
RDML Dash (CG-C5I) RDML Grable (CG-7/CG-FD&I)	LCDR Ryan Cassidy **RDC Transition Lead:**
RDC Research Program Chief: Mr. Sean Lester	Mr. Scott Fields

Research Program Roadmap | Connectivity



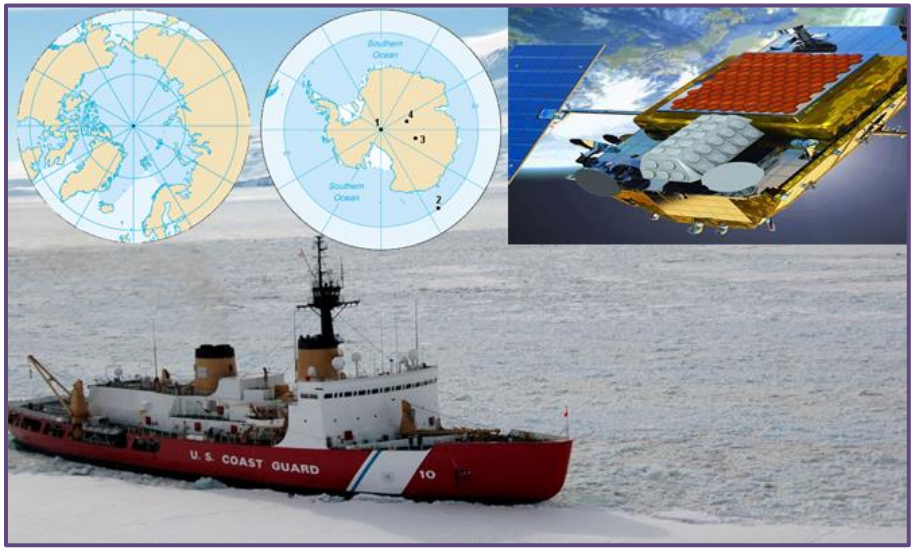
High Latitude Underway Connectivity

21-8705

Mission Need: Provide network connectivity to Cutters operating at high latitudes.

Objectives

- Influence the desired minimum connectivity functional characteristics by analyzing previous U.S. Coast Guard (CG) Research and Development Center (RDC) arctic communications and cutter connectivity projects within last 10 years.
- Influence the desired minimum connectivity functional characteristics by analyzing prior U.S. Department of Defense (DOD) High Latitude (Hi-Lat) research projects within last 10 years, including U.S. Navy (USN) and North Atlantic Treaty Organization Combined Joint Operations from the Sea.
- Deploy a prototype solution and perform a Limited User Evaluation and report on system capabilities.



Notes

- Leverage RDC effort 6208, "Arctic Communications Technology Assessments," 8702, "Evaluate Network Accelerator Technology to Improve Cutter Information Technology Performance," and 7759, "Evaluation of Potential CG Use of CubeSats."
- Partner with the U.S. Department of Homeland Security Science and Technology Directorate; Command, Control, Communications, Computers, Cyber, and Intelligence Service Center (C5ISC) Deployed Connectivity Section; Air Force Research Lab; and Naval Information Warfare Center.
- Inform C5ISC SATCOM procurement.
- Link with DOD Lab Sync Arctic Comms effort and International Cooperative Engagement Program for Polar Research.

Sponsor's Rep: CG-761
Ops Rep: AREA-6

Stakeholder(s): CG-SID-6, CG-C5I-E, CG-751, C5ISC, ALC, CGCYBER, CG-TECH

RDC Principal Investigator:
Mr. Jon Turban, P.E.

Anticipated Outcome/ Transition: Provide Sponsor/Product Line Tested Prototype Recommendation for Acquisition Milestone Support

Effort Timeline / Key Milestones

Initiation: 1 Oct 20	
Review of Previous Efforts and Research Completed	18 Mar 21 ✓
High Latitude Satellite Systems Market Research Completed	18 Mar 21 ✓
High Latitude Underway Connectivity – Status Update (Brief)	**12 Aug 21 ✓ ★**
High Latitude Underway Connectivity – Status Update 2 (Brief)	**5 Oct 23 ✓ ★**
Cooperative Research & Development Agreement (CRADA) Established	10 Jun 24 ✓
Limited User Evaluation Complete	30 Mar 25 ✓
CGC POLAR STAR Hughes (OneWeb) CRADA Complete	12 Jun 25 ✓
High Latitude Underway Connectivity – Final Report (Report)	**Oct 25 ★**
Completion: Oct 25	

Evaluation and Testing of VHF Data Exchange System (VDES) Impacts on the Automatic Identification System (AIS)

20-8703

Mission Need: Determine VDES benefits and path to implementation to support CG operations.

Objectives

- Understand the capabilities and limitations of VDES.
- Identify steps for U.S. Coast Guard (CG) Implementation of VDES.
- Identify steps to shift CG tactical data transmissions from AIS channels to VDES application specific message channels.
- Evaluate VDES capabilities to disseminate various types of Maritime Safety Information (MSI).
- Understand the requirements for CG shore-side management of VDES.
- Develop AIS/VDES-transmit application to disseminating search patterns.
- Assess feasibility, accuracy and technical limitations of VDES Ranging Mode (R-Mode) implementation in the United States.
- Investigate the ability to use VDES R-Mode to detect position spoofing efforts by bad actors.
- Evaluate VDES satellite capabilities and limitations for transmitting MSI in the high-latitudes, offshore, and other remote regions.

Notes

- Work closely with the Canadian Coast Guard; Electronics and Information Services, Quebec; and the U.S. Army Corps of Engineers, Engineer Research & Development Center.
- Leverage prior CG Research and Development Center work completed concerning options and impacts for VDES and AIS.
- Establish Cooperative Research and Development Agreement with VDES satellite commercial providers on test evaluation.

Sponsor's Rep: CG-761
Ops Rep: CGD-NE

Stakeholder(s): CG-SID-6, CG-C5I-E, CG-C5I-A, CG-NAV, NAVCEN, C5ISC, CGCYBER, CG-TECH

RDC Principal Investigator:
Ms. Anita Faubert

Anticipated Outcome/ Transition: Recommendations for Standards/Regulations/Policy
Recommendations for Product Line Tech Insertion

Effort Timeline / Key Milestones

Initiation: 1 Oct 19

Technology Roadmap Investigation Complete	30 Sep 20 ✓
Very High Frequency Data Exchange System (VDES) Technology Roadmap (Report)	**27 Jan 21 ✓ ★**
Phase 1 Field Trials – VDES Evaluation of CG Tactical Data Transmission	1 Oct 21 ✓
Sensitive but Unclassified Tactical Information Exchange and Display System Using VDES (Report)	**13 Dec 21 ✓ ★**
Phase 2 Field Trials – VDES Evaluation of the Dissemination of MSI	8 Dec 22 ✓
Disseminating MSI Using VDES Field Trial Summary (Report)	**22 Mar 23 ✓ ★**
VDES R-Mode Field Trial Update (Report)	**27 Jan 25 ✓ ★**
VDES Technology Roadmap Update (Report)	**30 May 25 ✓ ★**
Complete Phase 3 & Phase 4 Field Trials – Evaluation of R-Mode & VDES-Satellite	Dec 25
VDES R-Mode and Satellite Field Trial Summary (Report)	**May 26 ★**

Completion: May 26

Alternate Navigation Positioning Sources

23-1035

Mission Need: Navigation alternatives for the Global Positioning System (GPS).

Objectives

- Identify Alternate Positioning, Navigation, and Timing (APNT) solutions that provide robustness and resilience to platforms navigating in areas where the critical GPS signal may be spoofed or jammed.
- Understand and analyze the state of research, both within the U.S. and North Atlantic Treaty Organization, regarding navigation in GPS –degraded or –denied environments.
- Partner with government and contractors to drive APNT system and sensor development and testing by providing polar research transits and operational afloat systems for testing opportunities.

Notes

- Office of Naval Research Electro-optical/Infrared Celestial Navigation efforts ongoing.
- Leverage ongoing work of the Naval Surface Warfare Center Dahlgren Division, Office of Naval Research, U.S. Fleet Forces Command, and Air Force Research Laboratory.
- Coordinate with CG-NAV and CG Navigation Center (NAVCEN) Positioning, Navigation, and Timing Working Group on alternative solutions.

Sponsor's Rep: CG-761 **Ops Rep:** N/A	**Stakeholder(s):** CG-NAV, C5ISC, NAVCEN, CG-TECH, CG-SID-6, CG-C5I-E, CG-751, CG-7511, CG-C5I-A5
RDC Principal Investigator: APNT Research Team	
Anticipated Outcome/ Transition:	Provide Sponsor/Product Line Tested Prototype Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation:

Please e-mail RDC-Info@uscg.mil for information concerning the milestones and deliverable schedule.

Completion:

Wide Area Communications Optimization (WACO)

26-1067

Mission Need: Real time bidirectional data transfer between shore sites and underway assets.

Objectives

- Prototype communications network using currently available U.S. Coast Guard (CG) equipment that links together at least two nodes, such as Sector and boat.
- Support Coastal Sentinel by leveraging prototype communications network development, integration, and testing.
- Determine bandwidth limitations and message receipt accuracy of Prototype Network (ProNet).
- Connect ProNet to CG data systems such as Sextant.
- Integrate Aircraft or Unmanned Aerial Vehicle into the prototype communications network and demonstrate sending video or imagery.
- Integrate Over the Horizon (OTH) communications capability.
- Optimize network to maximize bandwidth capability while reducing cost.
- Connect ProNet to classified CG data systems.

Notes

- Heavily supports Coastal Sentinel sensor integration effort.
- Leverage USCG Northeast District for initial prototyping and USCG Southwest District (CGD-SW) for operational testing as appropriate.
- Determine cost/benefit analysis of existing solutions such as Starlink, mesh networks, short burst data modems, and radios.

Sponsor's Rep: CG-C5I-E4
Ops Rep:

Stakeholder(s): CG-C5I-E, CG-TECH

RDC Principal Investigator:
Mr. Benjamin Berman

Anticipated Outcome/ Transition: Recommendations for Product Line Tech Insertion
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: Oct 25

Develop and Test Prototype Communications Network	Jan 26	
Prototype Network Installation and Test Plan (Brief)	**Apr 26**	★
Install/Test Prototype Network	May 26	
Prototype Network Test Results (Brief)	**Jul 26**	★
Install/Test Aircraft Node and Connect to Prototype Network	Oct 26	
Complete Aircraft Node Integration Test Plan & Test at CGD-SW	Feb 27	
Aircraft Node Integration Test Results (Brief)	**Apr 27**	★
Install/Test OTH Comms Hardware into Prototype Network	Aug 27	
Complete OTH Comms Test Plan & Test at CGD-SW	Nov 27	
Prototype Network OTH Capability Test Results (Brief)	**Jan 28**	★
Test Optimization at RDC	Apr 28	
Optimized Prototype Network Test Plan	Jun 28	
Perform Optimized Prototype Network Test at CGD-SW	Jul 28	
Optimized Prototype Network Test Results (Brief)	**Sep 28**	★
Wide Area Communications Optimization (Report)	**May 29**	★

Completion: May 29

Resilient Underway Communications for CG Operations

26-1066

Mission Need: Improve the resiliency of underway communications on CG vessels.

Objectives

- Identify additional underway NIPRnet and SIPRnet satellite and terrestrial communication channels.
- Evaluate additional underway technologies on CG vessels.
- Communicate in a satellite denied environment.
- Manage traffic with a Software Defined Wide Area Network (SD-WAN).

Notes

- Potential partnerships:
  - C5ISC-Alexandria Deployable Connectivity Section
  - Hughes Network Systems/RDC Cooperative Research and Development Agreement
  - Air Force Research Lab
  - Mitre
  - Navy PMW 160 Tactical Networks
  - Navy Program Executive Office Digital and Enterprise Services

Sponsor's Rep: C5ISC
Ops Rep: LANT-6, PAC-6

Stakeholder(s): C5ISC, CG-761, CG-TECH, CG-C5I

RDC Principal Investigator:
Mr. Jon Turban, P.E.

Anticipated Outcome/ Transition: Provide Sponsor/Product Line Tested Prototype Recommendations for Product Line Tech Insertion

Effort Timeline / Key Milestones

Initiation: Oct 25	
Effort Kickoff	Nov 25
Initiate Prototype(s)/Prep for Underway Testing	Feb 26
Resilient Underway Communications for CG Operations Technical Assessment (Brief)	**Jun 26** ★
Selection of Prioritized Systems for Underway Testing	Jul 26
Complete Underway Test System 1	Jan 27
Complete Underway Test System 2	Oct 27
Complete Underway Test System 3	Jun 28
Complete Prototype(s)/Prep for Underway Testing	Oct 28
Complete Underway Test System 4	Mar 29
Resilient Underway Communications for CG Operations (Report)	**Aug 29** ★
Completion: Aug 29	

Data, Modeling, and Decision Support Research Program

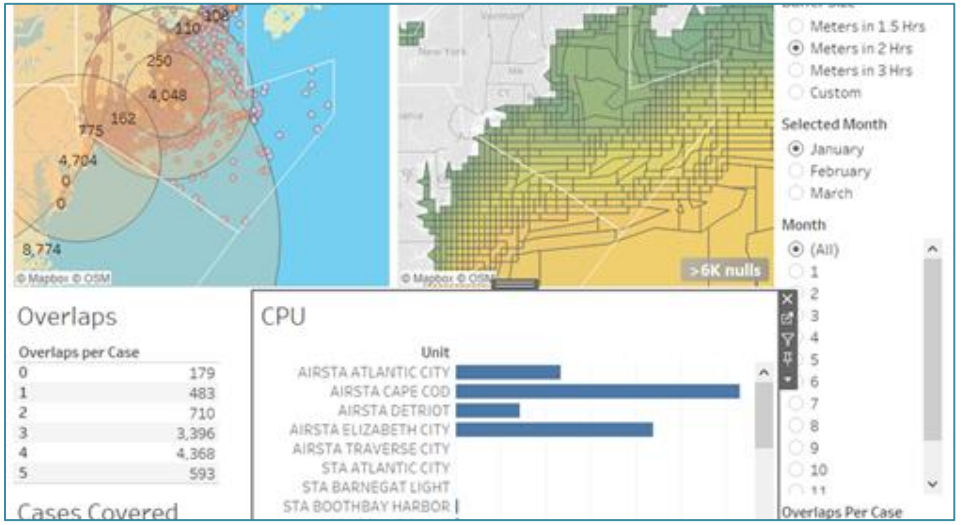
Program Definition

The focus of DMDS is on enhancing Coast Guard effectiveness through the use of data, with research supporting incorporation and development of advanced methodologies, use of emerging data technologies, and complex analytics. The end goal is to provide operators, support personnel, and leadership effective decision support tools. Research Program areas include domain awareness and target of interest identification, artificial intelligence and natural language processing, modeling and simulation, and data analytics. Research also supports the investigation of emerging data and decision support tools, technologies, and capabilities.

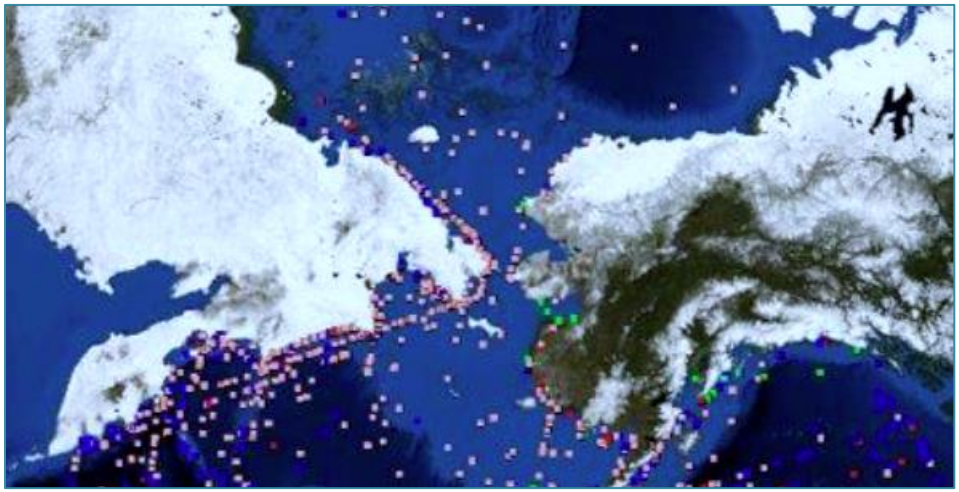
Core functions:

Data analysis, interpretation, & visualization

Model development & testing



Search and Rescue Asset Boundaries Dashboard

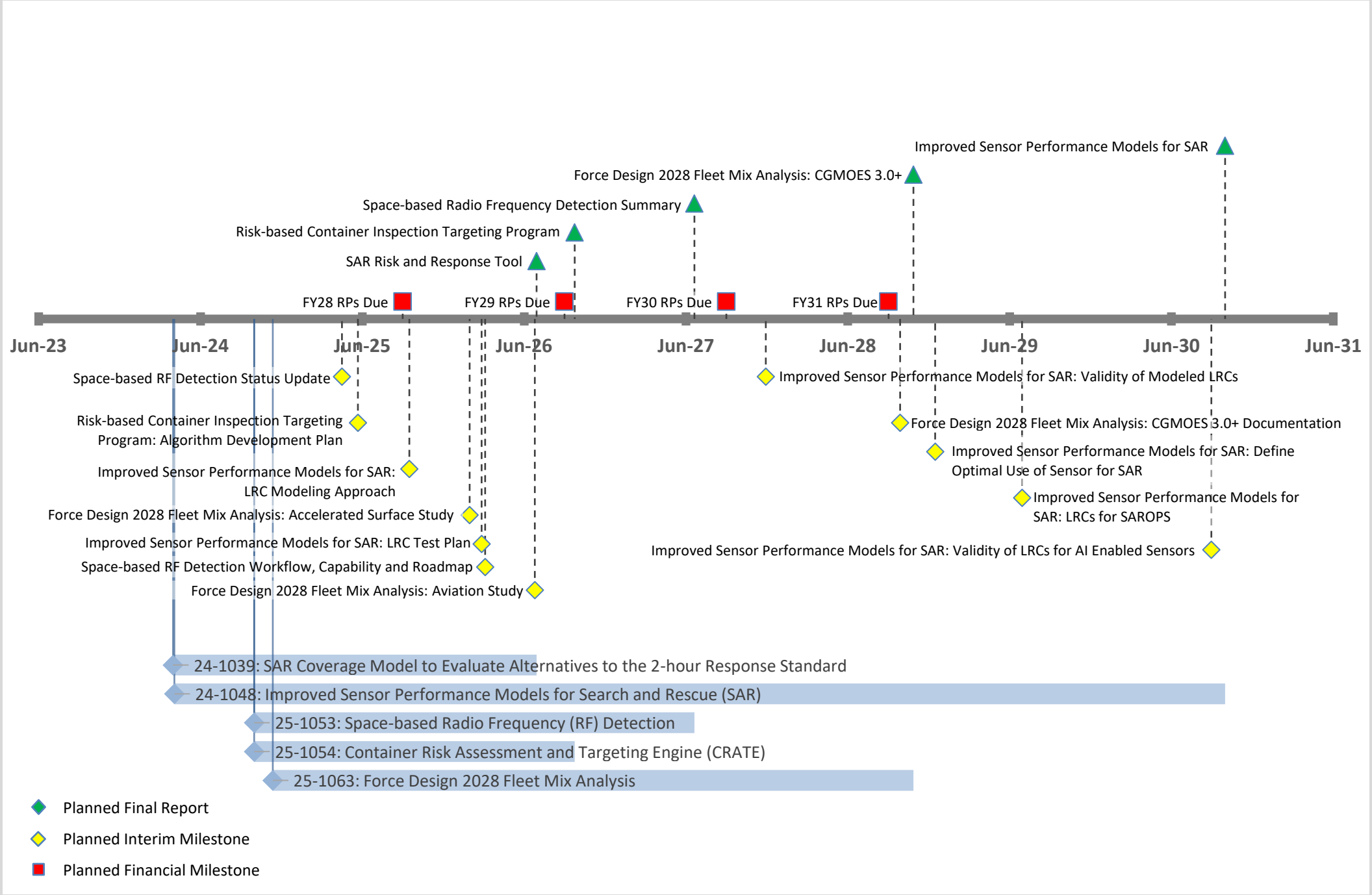


International Maritime Organization Polar Code Survival Time Requirement Simulation

Program Team

Program Champion:	**RDC Experimentation Lead:**
RDML Dash (CG-C5I)	LCDR Paul Larouche
Mr. Campo (CG-TECH)	**RDC Transition Lead:**
RDC Research Program Chief:	Mr. Scott Fields
CDR Julia Harder	

Research Program Roadmap | Data, Modeling, and Decision Support



SAR Coverage Model to Evaluate Alternatives to the 2-hour Response Standard

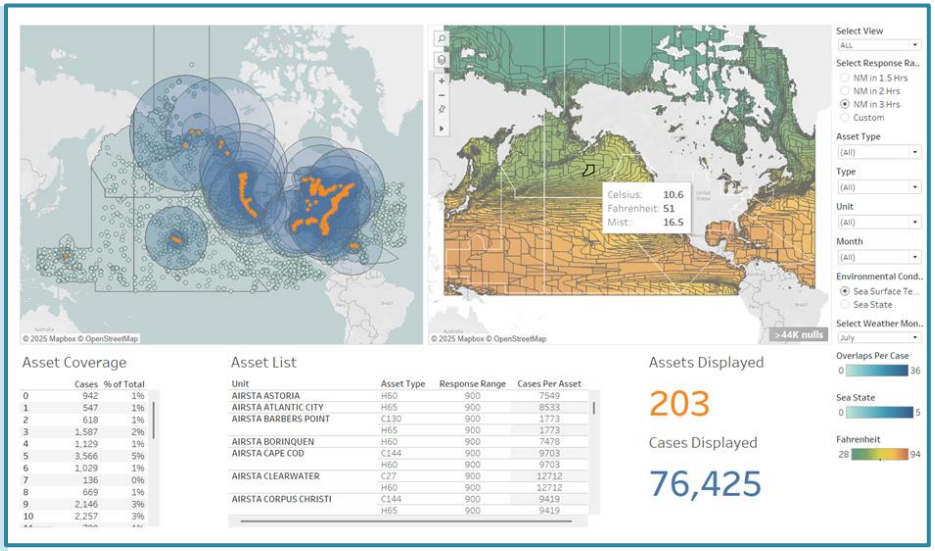
24-1039

Mission Need: Position response resources efficiently around the CG's Area of Responsibility.

Objectives

Current U.S. Coast Guard (CG) asset siting is based, in part, on a 2-hour Search and Rescue (SAR) response standard, but this standard is based on limited, and potentially outdated, factors.

- Identify and evaluate potential risk and response paradigms for CG SAR.
- If a feasible paradigm is identified, develop a prototype SAR risk and response tool that leverages the new methodology.
- Improve effectiveness of SAR system.
- Analyze basing and siting of SAR resources.



Notes

- Research may benefit from existing tools for siting decision support:
  - Coastal Zone Assets & Resources Model.

Sponsor's Rep: CG-SAR
Ops Rep:

Stakeholder(s): CG-PAE

RDC Principal Investigator:
Ms. Christine Mahoney

Anticipated Outcome/ Transition: Recommendations for Standards/Regulations/Policy
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: 1 Apr 24

Literature Review of SAR Response Standard and Emergency Response Siting Methodologies Completed	30 Aug 24 ✓
Definition of Constraints for New Siting Methodology Completed	16 Oct 24 ✓
Develop Analytical Approach to Model SAR Response Completed	14 May 25 ✓
Prototype Risk and Response Tool Complete	Apr 26
SAR Risk and Response Tool (Report)	**Jun 26** ★

Completion: Jun 26

Container Risk Assessment and Targeting Engine (CRATE)

25-1054

Mission Need: Efficient identification of high-risk cargo for targeted inspection.

Objectives

- Objectives:
  - Increase the likelihood of target container inspections revealing safety deficiencies by leveraging data already available and/or easily accessible to the U.S. Coast Guard (CG).
  - Exploration of contraband targeting.
- Approach:
  - Understand the container inspection process.
  - Familiarize with available data sources.
  - Develop method and metrics for evaluating targeting effectiveness.
  - Identify and develop initial rule-based solution.
  - Prototype initial rule-based method at various locations.
  - Develop and test Machine Learning (ML) method from curated data.

Notes

- Driven by previous work performed in partnership between Sector NY, Stevens Institute of Technology, and Customs and Border Protection's National Targeting Center (NTC).
- Hazcheck Detect (commercial service used by NTC) is a potential benchmark.
- Leverage lessons learned in ML application from RDC Effort 7532, "Improved Efficiency in Domestic Inspections" and extensive academic research on container targeting.

Sponsor's Rep: CG-FAC
Ops Rep: MIFC LANT

Stakeholder(s): NTC, Sector NY, MSU Savannah, Sector LA/LB, CG CITAT, ICC

RDC Principal Investigator:
Ms. Kathleen Rice

Anticipated Outcome/ Transition: Recommendations for Tactics, Techniques & Procedures
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: 1 Oct 24	
Virtual Kickoff Meeting with Sponsor & Stakeholders	31 Oct 24 ✓
Familiarize with Available Data Sources	21 Feb 25 ✓
Initiate Data Engineering/Analysis	7 Mar 25 ✓
Port Container Inspection Visits (Sector NY, MSU Savanah, Sector LA-LB)	2 May 25 ✓
Risk-Based Container Targeting Inspection Program: Algorithm Development Plan Summary (Brief)	**23 May 25 ✓ ★**
Develop Rule-Based Method & Evaluation Process	16 Sep 25 ✓
Prototype and Evaluate Rule-Based Method	Nov 25
Develop ML Method from Newly Collected Data	Mar 26
Prototype and Evaluate ML Method	May 26
Container Risk Assessment and Targeting Engine Report (Report)	**Sep 26 ★**
Completion: Sep 26	

Space-based Radio Frequency (RF) Detection

25-1053

Mission Need: Increase Maritime Domain Awareness (MDA) through space-based RF detection.

Objectives

- Recommendations on technology applicability and workflow procedures.
- Provide a roadmap to harness promising advancements in space sensor capabilities, with a particular focus on space-based RF detection.
- Investigate existing space-based RF detection capabilities.
- Identify business use cases to use Government-Off-The Shelf (GOTS)/Commercial-Off-The Shelf (COTS) solutions for real-world missions (Search and Rescue; Illegal, Unreported and Unregulated Fishing; drug interdiction; migrant ops).
- Identify gaps and analyze workflows and procedures.
- Investigate the capabilities of U.S. Coast Guard (CG) systems to display space-based RF detection information.
- Evaluate integration and effectiveness of current space-based applications on CG missions.

Notes

- National Reconnaissance Office, National Security Agency, Air Force Research Laboratory, and U.S. Space Force collaboration.
- Leverage Defense Innovation Unit Hybrid Space Architecture II project.
- Leverage joint DHS S&T/RDC Digital Selective Calling detection from space under RDC effort 1027, "Next Generation Distress Communication Capability for Alaska and the Arctic."
- Leverage DHS S&T Rescue 21 Augmentation from Space (RASP) reports and findings.

Sponsor's Rep: CG-2AI
Ops Rep: Sector Boston

Stakeholder(s): CG-C5I-E, MIFC, CG-741, CG-761, JIATF-S

RDC Principal Investigator:
Mr. Paul Harvey

Anticipated Outcome/ Transition:
Recommendations on Tech Availability & Applicability
Recommendations for Tactics, Techniques & Procedures

Effort Timeline / Key Milestones

Initiation: 1 Oct 24	
Determine Space-based RF Detection Capabilities	31 Mar 25 ✓
Determine Use Case Applicability	31 Mar 25 ✓
Space-based Radio Frequency Detection Status Update (Brief)	**17 Apr 25** ✓ ★
Determine Roadmap for Space-based RF Detection	Oct 25
Space-based RF Detection Workflow Analysis	Nov 25
Space-based RF Detection Capability Gap Analysis	Jan 26
Space-based Radio Frequency Detection Workflow, Capability and Roadmap (Report)	**Mar 26** ★
Impact Analysis	Oct 26
Space-based Radio Frequency Detection Summary (Report)	**Jun 27** ★
Completion: Jun 27	

Force Design 2028 Fleet Mix Analysis

25-1063

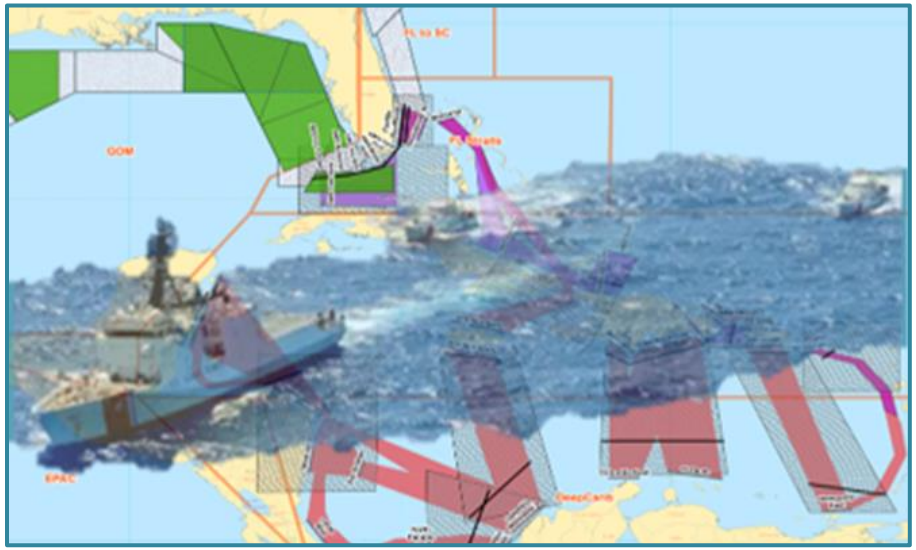
Mission Need: Capability for CG-wide asset allocation and force-structure decision support.

Objectives

- Use Coast Guard Maritime Operational Effectiveness Simulation (CGMOES) 3.0 tool to assess operational effectiveness, force structure, and system-wide tradeoffs of projected and proposed cutter and aircraft fleet mixes within the offshore operational environment.
- Compare Program of Record against alternative Medium Endurance Cutter platforms.
- Compare alternative aviation mixes.
- Upgrade CGMOES to 3.0+ to support ongoing fleet analysis studies through FY 2030. Upgrade includes:
  - Expand the model with additional Concept of Operations, tactics, and capabilities.
  - User documents.
  - Model Verification, Validation, and Accreditation.
  - Transition to a U.S. Coast Guard (CG) operational cloud environment.
  - Modernize data structure.
  - Modernize metrics output visualization.

Notes

- Under the Enterprise Fleet Mix & Design Analysis Charter (led by CG-PAE) signed by the VCG and the Line of Effort (LOE) 2 USCG Fleet Mix Analysis Working Group Charter, signed by DCO.
- LOE 2 WG co-lead is CG-771; support development of study questions and data validation by Subject Matter Experts.
- Explore efficiency enhancements to reduce study time, to include development of an automated surface asset scheduling tool.



Effort Timeline / Key Milestones

Initiation: 12 Nov 24		
Enterprise Fleet Mix & Design Analysis Charter Signed	12 Nov 24 ✓	
LOE 2 USCG Fleet Mix Analysis Working Group Charter Signed	11 Feb 25 ✓	
Force Design 2028 Fleet Mix Analysis: Accelerated Surface Study (Report)	**Jan 26**	★
Transition CGMOES 3.0 to CG Operational Cloud	Jun 26	
Force Design 2028 Fleet Mix Analysis: Aviation Study (Report)	**Jun 26**	★
Force Design 2028 Fleet Mix Analysis: CGMOES 3.0+ Documentation (Report)	**Sep 28**	★
Force Design 2028 Fleet Mix Analysis: CGMOES 3.0+ (Tool)	**Oct 28**	★
Completion: Oct 28		

Sponsor's Rep: CG-PAE **Ops Rep:**	**Stakeholder(s):** CG-7, CG-TECH-3, CG-SI, C5ISC, LANT, PAC
RDC Principal Investigator: CDR Julia Harder	
Anticipated Outcome/ Transition:	Recommendations for Acquisition Milestone Support Recommendations for Cost/Risk Avoidance

Improved Sensor Performance Models for Search and Rescue

24-1048

Mission Need: A time and cost-effective methodology to incorporate sensor capabilities in SAROPS.

Objectives

- Establish empirical Lateral Range Curves (LRC) for one selected sensor type through field experiments.
- Determine if LRCs produced by physics-based models appropriately estimate empirical LRCs for selected sensor type.
- Define the optimal employment of the selected sensor type for Search and Rescue (SAR) missions.
- Define LRCs for inclusion in the Search and Rescue Optimal Planning System (SAROPS). The basis of these LRCs will be either physics-based models or the traditional analysis approach, based on the findings of the second objective.
- Define a process to compute LRCs for sensors enabled with object detection algorithms.
- Determine if LRCs computed for AI enabled sensors appropriately estimate empirical LRCs.

Notes

- Validates LRC modeling approaches identified in RDC Effort 7937, "Incorporating Sensor Performance in SAROPS."
- Leverages RDC's previous work developing SAROPS sensor inputs.

Sponsor's Rep: CG-SAR
Ops Rep: N/A

Stakeholder(s): CG-AIR-A, CG-7, AREAs, Districts, Sectors, FORCECOM

RDC Principal Investigator:
Dr. Maggie Exton

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability
Recommendations for Cost/Risk Avoidance

Effort Timeline / Key Milestones

Initiation: 4 Apr 24

Definition of Combinations of Sensor, Search Asset, and Search Object for Validation Complete	30 Jun 25 ✓
Develop Improved Sensor Performance Models for SAR: LRC Modeling Approach (Brief)	**16 Sep 25 ✓ ★**
Develop Improved Sensor Performance Models for SAR: LRCs Test Plan (Brief)	**Feb 26 ★**
Develop Improved Sensor Performance Models for SAR: Validity of Modeled LRCs (Brief)	**Nov 27 ★**
Define Optimal Use of Sensor for SAR (Brief)	**Dec 28 ★**
Develop Improved Sensor Performance Models for SAR: LRCs for SAROPS (Report)	**Jun 29 ★**
Develop Improved Sensor Performance Models for SAR: Validity of LRCs for AI Enabled Sensors (Brief)	**Aug 30 ★**
Develop Improved Sensor Performance Models for Search and Rescue (Report)	**Sep 30 ★**

Completion: Sep 30

Defense and Safety Systems Research Program

Program Definition

Ensuring the safety of Coast Guard members, the Maritime Transportation System (MTS), and the public now and into the future.

Defensive systems including non-lethal vessel stopping technologies, counter uncrewed systems (C-UxS), cybersecurity and redundancy in Operational Technology (OT) and navigation systems will protect our assets from evolving threats.

Safety systems focused on improvements to mariner safety will bolster fire protection systems and fire response, enhance lifesaving equipment, and increase the probability of successful search and rescue.

Assessing modern vessel construction techniques and materials will ensure that the service knows how to regulate, respond to emergencies, and utilize advancements in ship design.

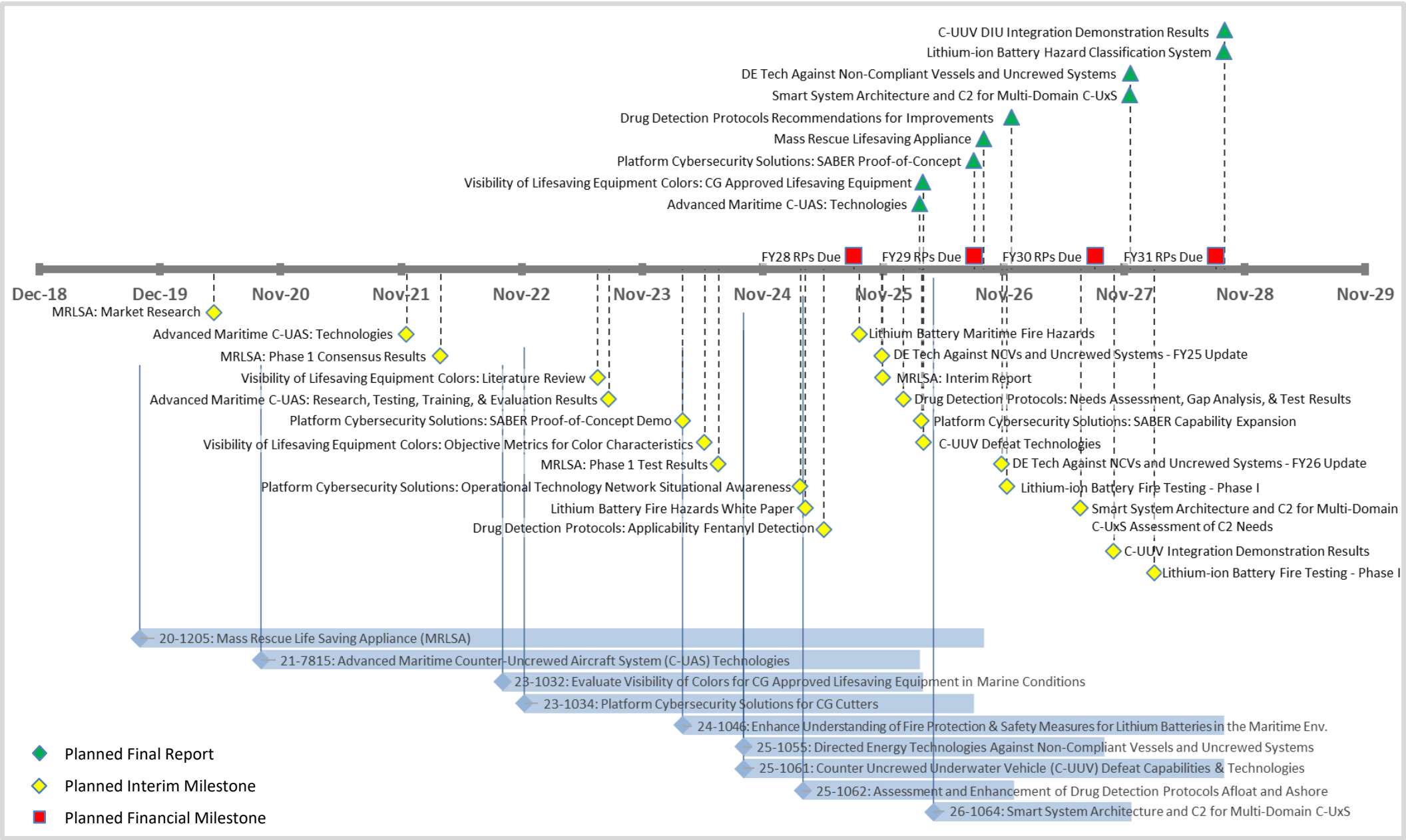
Program Team

Program Champion:	**RDC Experimentation Lead:**
RDML Grable (CG-7/CG-FD&I) RADM Arguin (CG-5P)	LCDR Ryan Cassidy **RDC Transition Lead:**
RDC Research Program Chief:	Mr. Scott Fields
Ms. Amy Cutting	

USCGC Munro interdicts suspected drug smuggling vessel. Defensive systems will provide increased domain awareness to enforce borders and security zones.

Abandon ship drills provide an opportunity to assess improvements to maritime safety systems.

Research Program Roadmap | Defense and Safety Systems



Advanced Maritime Counter-Uncrewed Aircraft System (C-UAS) Technologies

21-7815

Mission Need: Operationally effective C-UAS force protection capability.

Objectives

- Assess new developments in kinetic C-UAS solutions in the open market and with other government agencies as technologies evolve.
- Automate object detection and classification based on Electro-Optical/Infrared camera data by collaborating with optics companies to incorporate additional sensor modalities to aid UAS detection and target discrimination.
- Explore applicability of data fusion algorithms and machine learning to combine multiple data types into single threat track to reduce operator workload, uncertainty, and response time.
- Provide technical guidance on system employment for various mission sets based on legal authority and tactics, techniques, and procedures.

Notes

- Follow-on for RDC effort 7812, "Maritime Counter Unmanned Aircraft Systems."

Sponsor's Rep: CG-RAS
Ops Rep: CGD-NE

Stakeholder(s): CG-711, CG-721, CG-751, LANT-3, PAC, CGD-NE, NSWC Dahlgren, CGCYBER, CG-TECH

RDC Principal Investigator:
C-UAS Research Team

Anticipated Outcome/ Transition: Provide Sponsor/Product Line Tested Prototype Recommendations for Acquisition Milestone Support

Effort Timeline / Key Milestones

Initiation:

Please e-mail RDC-Info@uscg.mil for information concerning the milestones and deliverable schedule.

Completion:

Evaluate Visibility of Colors for CG Approved Lifesaving Equipment in Marine Conditions

23-1032

Mission Need: Optimal lifesaving equipment detectability.

Objectives

- Conduct literature review of High Visibility Safety Apparel (HSVA) and lifesaving equipment visibility/probability of detection research.
- Carry out industry/professional society review of standards for HSVA and Search and Rescue (SAR) equipment colors and/or color schemes.
- Perform domestic and international governmental review of approved/required colors in SAR scenarios.
- Define optimal visual detectability and conspicuity color characteristics in marine conditions via a marine environment high visibility color standard.
- Conduct field trials to validate high visibility color standard from shore, afloat and aviation assets in various weather, light and sea-state conditions.
- Enable sponsor and stakeholders to use for lifesaving equipment color evaluations and standards revision, if appropriate.

Notes

- Engage RDC Human Factors Subject Matter Experts and CG-SID-7 Portfolio Manager, as well as CG Aux for experiment support.
- Review previous RDC visibility, visual distress signal, and detectability projects for experiment techniques, findings and conclusions.
- Involve global maritime stakeholders in results review for possible revisions to international policy and regulations.
- Leverage DOD, North Atlantic Treaty Organization, Maritime Administration, and Cruise Lines Industry Association interest.

Sponsor's Rep: CG-ENG
Ops Rep: N/A

Stakeholder(s): CG-BSX, CG-5P, CG-5R, CG-711, CG-731, CG-751, WOPL, NMC, NBSAC, IMO NCSR

RDC Principal Investigator:
Mr. Josh Pennington

Anticipated Outcome/ Transition: Recommendations for Standards/Regulations/Policy

Effort Timeline / Key Milestones

Initiation: 3 Oct 22	
Technical Review	8 Mar 23 ✓
Lifesaving Equipment Colors; Literature Review (Report)	**19 Jul 23 ✓ ★**
Research & Define Color Characteristics	27 Oct 23 ✓
Objective Metrics for Lifesaving Equipment Color Characteristics (Report)	**6 Jun 24 ✓ ★**
KDP – Sponsor Concurrence on Color Characteristics	14 Jun 24 ✓
Field Trial Test Plan	30 Aug 24 ✓
Field Trials Complete	6 Jun 25 ✓
Data Analysis Complete	Dec 25
Visibility of Potential Colors for CG Approved Lifesaving Equipment (Report)	**Mar 26 ★**
Completion: Mar 26	

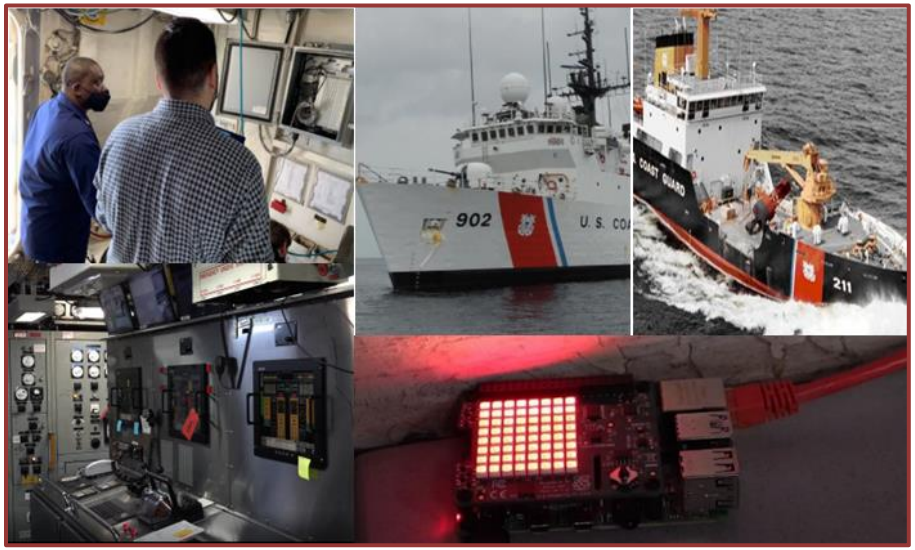
Platform Cybersecurity Solutions for CG Cutters

23-1034

Mission Need: Cyber resilient Operational Technology (OT) systems on CG cutters.

Objectives

- Explore how the U.S. Navy's Situational Awareness Boundary Enforcement and Response (SABER) program of record for ship/carrier cyber defense could be used to monitor U.S. Coast Guard (CG) Cutter (CGC) OT systems and protect against cyber threats.
- Survey CGC OT systems and determine how SABER could be integrated with a critical OT system to improve cutter cyber resiliency.
- Perform an analysis of SABER's ability to inform cutter crews of anomalies and cybersecurity threats to OT systems on a Fast Response Cutter (FRC) and a National Security Cutter (NSC).
- Explore, develop, and test SABER's Boundary Enforcement and Response for the NSC's Coast Guard Machinery Control System (CGMCS).
- Inform requirements for new acquisition systems to improve cyber resiliency for future CG assets.



Notes

- Effort aligns with Cyber Strategic Outlook 2021 Line of Effort 1: Defend and Operate the Enterprise Mission Platform, by ensuring secure and resilient OT networks on CG assets to support all missions.
- Partnerships with Naval Sea Systems Command (NAVSEA) Cyber Engineering and Digital Transformation Directorate (SEA 03) and the Naval Surface Warfare Center Philadelphia Division for a proof-of-concept demonstration on the FRC Machinery Control and Monitoring System (MCMS) and NSC CGMCS.

Sponsor's Rep: CG-791
Ops Rep: CGD-SW

Stakeholder(s): CGCYBER, CG-SEA-E, CG-C5I-E, CG-751, CG-761, CG-SEA-A, CG-C5I-A, SFLC, C5ISC, CG-TECH

RDC Principal Investigator:
Mr. Rob Coburn

Anticipated Outcome/ Transition: Recommendations for Product Line Tech Insertion
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: 7 Dec 22	
SABER Working Group Sessions with NAVSEA 03	29 Mar 23 ✓
MCMS Trainer SABER Lab Test and Data Collection	22 Nov 23 ✓
SABER Proof-of-Concept Demonstration (Brief)	**1 Apr 24 ✓ ★**
FRC MCMS Pier Side SABER Test and Data Collection	7 May 24 ✓
FRC MCMS Pier Side CGCYBER Red Team Exercise	13 Sep 24 ✓
OT Network Situational Awareness (Report)	**24 Mar 25 ✓ ★**
NSC CGMCS SABER Validation	Dec 25
NSC CGMCS SABER Lab Demonstration	Jan 26
CG SABER Capability Expansion (Brief)	**Mar 26 ★**
Perform Analysis of Logistics for CG SABER Sustainment	May 26
SABER Proof-of-Concept for CG Cutter Operational Technology Cybersecurity (Report)	**Aug 26 ★**
Completion: Aug 26	

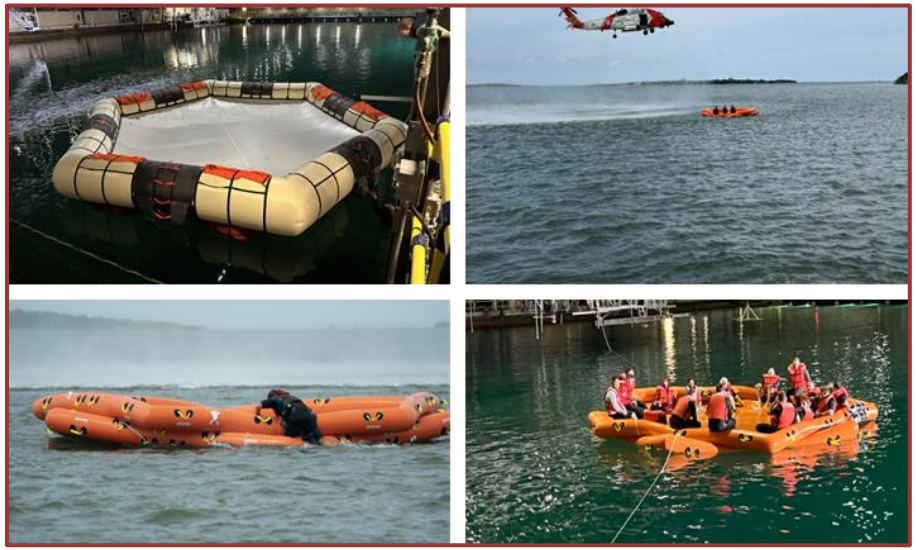
Mass Rescue Lifesaving Appliance (MRLSA)

20-1205

Mission Need: Lightweight, easy to use, temporary, mass rescue survivor platform.

Objectives

- Find, promote, or develop the technology to manufacture an extremely compact, lightweight, rescue intervention device to safely keep 100+ persons out of the water for up to 24 hours.
- Phase 1 includes developing a prototype device and testing in a controlled environment, including weight tests, and human subject boarding exercises.
- Phase II option includes final design for testing in open water including deploying from U.S. Coast Guard (CG) assets (air, afloat).
- Transition the developmental result to the Office of Search and Rescue and capability stakeholders for implementation as a mass rescue tool.



Notes

- Partnership with Air Force Research Laboratory.
- U.S. Department of Homeland Security (DHS) Science & Technology (S&T) funded Broad Agency Announcement (BAA) for prototype development.
- Investigate National Aeronautics and Space Administration or other government agency partnership.

Sponsor's Rep: CG-SAR
Ops Rep: N/A

Stakeholder(s): DHS S&T, CG-711, CG-731, CG-751

RDC Principal Investigator:
Ms. Monica Cisternelli

Anticipated Outcome/ Transition: Provide Sponsor/Product Line Tested Prototype Recommendations for Standards/Regulations/Policy

Effort Timeline / Key Milestones

Initiation: 1 Oct 19	
Request for Information Complete	1 Mar 20 ✓
MRLSA: Market Research Summary (Report)	**13 May 20 ✓ ★**
BAA Released and Interim Brief Completed	28 Sep 21 ✓
MRLSA: Phase 1 Consensus Results (Brief)	**30 Mar 22 ✓ ★**
DHS Contract Award	12 Sep 22 ✓
Prototype Development Complete, Phase 1 Testing	19 Apr 24 ✓
MRLSA: Phase 1 Test Results (Brief)	**19 Jul 24 ✓ ★**
Phase 2 Testing	26 Aug 25 ✓
MRLSA Interim Report (Report)	**Nov 25 ★**
Fixed-Wing Deployment	Jul 26
MRLSA Final Report (Report)	**Sep 26 ★**
Completion: Sep 26	

Assessment and Enhancement of Drug Detection Protocols Afloat and Ashore

25-1062

Mission Need: Capability to detect illicit drugs, illegal fentanyl, and precursors in the maritime domain.

Objectives

Optimize Existing Afloat Detection Capabilities:

- Analyze current U.S. Coast Guard (CG) procedures and training for drug interdiction at sea, identifying limitations related to fentanyl detection.
- Test and Evaluate (T&E) the capability of existing and proposed technologies to validate equivalent performance for CG operations.
- Recommend technologies for both bulk and trace detection for afloat deployment.

Assess Ashore Detection Capabilities for the Future:

- Identify historical cases of drug smuggling in shipping containers and other commercial maritime cargo.
- Propose sampling and analysis process for bulk and trace detection of illicit drugs during cargo inspections.

Notes

- On 29 Jan 2025, Acting Commandant of the CG Admiral Lunday issued an action order directing the CG to increase its operational focus on combating illegal fentanyl entering the United States.
- Partner with the Department of Homeland Security (DHS) Science and Technology (S&T) and Other Government Agencies (OGAs) to advance low-Technology Readiness Level technologies for fentanyl detection.
- Contract with laboratory for equipment testing.
- Leverage lessons learned from RDC effort 5807, "Drug and Explosives Detection Technologies."

Sponsor's Rep: CG-MLE
Ops Rep: LANT-35LE

Stakeholder(s): CG-721, CG-761, CG-C5I-E, PAC-35LE, C5ISC, CG-NSF, CG-MSRT, CG-MSST, CGA

RDC Principal Investigator:
Ms. Sara Mikovic, P.E.

Anticipated Outcome/ Transition:
Recommendations for Tactics, Techniques & Procedures
Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation: 1 Apr 25

Applicability of Commercially Available Fentanyl Detection Equipment to CG Law Enforcement Operations (Report)	**3 Jun 25** ✓ ★
Kicked off Fentanyl Detection R&D with DHS S&T	14 Jul 25 ✓
Analysis of CG and OGA Extant Drug Detection Policies and Procedures, Afloat	Oct 25
Trace & Bulk Detection Instruments Market Research	Nov 25
Test & Evaluate Existing Equipment	Nov 25
Needs Assessment, Gap Analysis, & Test Results of CG Drug Detection Procedures and Capabilities (Brief)	**Jan 26** ★
Analysis of CG and OGA Extant Drug Detection Policies and Procedures, Ashore	Mar 26
Test & Evaluate New Technologies	Aug 26
Assessment of CG Drug Detection Protocols and Recommendations for Improvements Afloat and Ashore (Report)	**Dec 26** ★

Completion: Dec 26

Directed Energy Technologies Against Non-Compliant Vessels and Uncrewed Systems

25-1055

Mission Need: Non-lethal capabilities to deter and defeat crewed and uncrewed systems.

Objectives

- Assess the technical readiness of existing and emerging Directed Energy (DE) technologies and analyze their applications to Non-Compliant Vessel (NCV) stopping and Counter-Uncrewed Systems (C-UxS) operations.
- Execute two phase experimentation and development event with industry, academia, and government participation.
- Conduct experimentation event for prototype development of DE solutions for NCV and C-UxS Operations.
- Leverage the U.S. Department of Defense, U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate, and Other Government Agency (OGA) investments in DE.
- Develop plans for integration and testing of DE prototypes on afloat platforms.

Notes

- Leverages results from RDC effort 5678, "Non-Compliant Vessel Stopping Using Less-Than-Lethal Radio Frequency Technologies," 7815, "Advanced Maritime Counter-Uncrewed Aircraft System (C-UAS) Technologies," and 7812, "Counter Unmanned Aerial System (cUAS)."
- Focus on both air and surface targets.
- Joint DHS S&T/RDC project.

Sponsor's Rep: CG-RAS
Ops Rep: CGD-SW

Stakeholder(s): CG-MLE, CG-MSR, CG-SEA-A, SFLC, CG-C5I-E, CG-761, LANTAREA, PACAREA, CG-TECH

RDC Principal Investigator:
DE Research Team

Anticipated Outcome/ Transition:
Recommendations on Tech Availability & Applicability
Recommendations for Tactics, Techniques & Procedures

Effort Timeline / Key Milestones

Initiation:

Please e-mail RDC-Info@uscg.mil for information concerning the milestones and deliverable schedule.

Completion:

Smart System Architecture and C2 for Multi-Domain C-UxS

26-1064

Mission Need: Integrated system architecture to enable countering uncrewed systems in all domains.

Objectives

- Identify opportunities to network Counter-Uncrewed Aircraft Systems within U.S. Coast Guard (CG) units and with both Department of Defense (DOD) and Law Enforcement partners depending on mission set.
- Explore and define standard protocols for sensors to enhance interoperability between Counter-Uncrewed Systems (C-UxS).
- Analyze requirements of aerial, surface, and sub-surface Command and Control (C2) systems utilized by the CG and anticipated to be available in the next 3-5 years for operational use. Identify commonalities and differences.
- Conduct assessment of existing multi-domain C2 systems and identify unique needs of the CG that would deviate from those systems.
- Prototype a multi-domain C2 system.
- Work with C5ISC to prototype data paths and implement test of multi-domain C2 data sharing.

Notes

- Partner with DOD entities that are working on countering multiple domains from one C2 (U.S. Navy's Counter-uncrewed Experimentation and Advanced Development and Enhanced Battlespace Reconnaissance, Intelligence, and Surveillance Software; U.S. Air Force Small Uncrewed Aircraft Defense System).
- Engage with defense and international partners that have conducted multi-domain UxS operations and C-UxS operations.

Sponsor's Rep: CG-RAS
Ops Rep: CGD-SW

Stakeholder(s): CG-721, CG-MSR, CG-TECH

RDC Principal Investigator:
C-UxS Research Team

Anticipated Outcome/ Transition: Recommendations for Product Line Tech Insertion
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation:

Please e-mail RDC-Info@uscg.mil for information concerning the milestones and deliverable schedule.

Completion:

Counter Uncrewed Underwater Vehicle (C-UUV) Defeat Capabilities & Technologies

25-1061

Mission Need: Modular response asset capabilities to deter and defeat adversarial UUVs.

Objectives

- Deliver decision support information regarding improved C-UUV capabilities for deterring and defeating UUVs.
- Refine U.S. Coast Guard (CG) Concepts of Operation for response to adversarial UUVs.
- Establish procedures for control/custody of defeated UUVs with domestic security partners.
- Provide CG support and participate in Defense Innovation Unit C-UUV effort.

Notes

- Leverages results from RDC effort 5922, "Counter Uncrewed Underwater Vehicle (C-UUV) Technology."
- Coordinated with C-UUV Community of Interest (COI) prior and ongoing work.
- Research informed by the interagency C-UUV National Action Plan.
- Aligned with goals of CG Unmanned Systems Strategic Plan.
- Possible partnership opportunities with Office of Naval Research Global, North American Treaty Organization allies, U.S. Navy Fleet Forces Command, and U.S. Navy's numbered fleet Science Advisors.

Sponsor's Rep: CG-RAS
Ops Rep: N/A

Stakeholder(s): CG-SEA-E, CG-731, CG-5R, CG-ODO, CG-761, CG-TECH

RDC Principal Investigator:
C-UUV Research Team

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation:

Please e-mail RDC-Info@uscg.mil for information concerning the milestones and deliverable schedule.

Completion:

Enhance Understanding of Fire Protection and Safety Measures for Lithium Batteries in the Maritime Environment

24-1046

Mission Need: Address vessel and personnel safety knowledge gaps concerning lithium-ion batteries.

Objectives

- Inform fire mitigation strategies, suppression technologies, shipboard battery storage space classifications, and emergency response actions through marine lithium-ion (li-ion) battery literature review.
- Determine effect of differing marine li-ion battery chemical properties, configuration, and quantity on fire behavior and propagation.
- Identify knowledge, policy, and regulatory gaps in safety, fire protection, and vessel survivability for marine li-ion batteries.
- Assist sponsor in developing fire experimental test plans to address fire risks, personnel hazards, optimal fire suppression procedures, and post-fire safety guidelines.
- Conduct laboratory li-ion battery fire testing to develop fire data for advanced fire modeling and marine li-ion battery hazard categorization.
- Inform future policy, procurement, and regulatory considerations among CG-ENG, CG-5RI, and CG platform managers through literature review and fire-test data analysis.

Notes

- Engage community of interest including RDC power/propulsion project staff; CG fire protection engineers; U.S. Department of Defense, U.S. Department of Transportation (DOT), U.S. Department of Energy, and other government agencies; classification societies; marine fire and salvage; maritime industry leaders, etc. to leverage expertise.
- International Maritime Organization (IMO), DOT, Maritime Administration and first responder organization interest.

Sponsor's Rep: CG-ENG
Ops Rep: Districts (drm) (dpi)

Stakeholder(s): CG-5P, CG-5R, CG-5PS, CG-SEA-E, CG-SHORE-E2, CG-731, CG-751, CG-LMI, MSC, DOT, IMO

RDC Principal Investigator:
Mr. Josh Pennington

Anticipated Outcome/ Transition:
Recommendations for Standards/Regulations/Policy
Recommendations on Tech Availability & Applicability

Effort Timeline / Key Milestones

Initiation: 1 Apr 24	
Marine Li-ion Battery Literature Review Complete	2 Apr 25 ✓
Lithium Battery Fire Hazards in the Maritime Environment (White Paper)	**8 Apr 25 ✓ ★**
Lithium Battery Maritime Fire Hazards (Report)	**18 Sep 25 ✓ ★**
Marine Li-ion Battery Fire Test Plan Complete	Jan 26
Li-ion Battery Fire Testing (FY26) – Phase I Complete	Jun 26
Lithium-ion Battery Fire Testing – Phase I (Report)	**Dec 26 ★**
Li-ion Battery Fire Testing (FY27) – Phase II Complete	Jul 27
Lithium-ion Battery Fire Testing – Phase II (Report)	**Feb 28 ★**
Marine Li-ion Battery Hazard Classification System Complete	May 28
Marine Lithium-ion Battery Hazard Classification System (Report)	**Sep 28 ★**
Completion: Sep 28	

Waterways Management and Response Research Program

Program Definition

Waterways Management and Response Lines of Effort identify performance gaps and develop methods and technologies to advance Marine Transportation System (MTS) efficiency and resilience, marine environmental protection, safe navigation, and safety of life at sea. The MTS faces risks and challenges due to natural and man-made interventions. Some of these challenges can result from interruption of electronic marine navigation systems due to geomagnetic storms or intentional adversarial activity; geophysical changes and extreme weather events affecting port facilities and infrastructure; increased commercial and recreational activity in both the nearshore and offshore marine zones, Great Lakes, and Arctic; changing risks associated with alternative fuels; larger vessels using ports and waterways designed for the mid-20th century; increased, competing waterway uses; and maritime-related activity during seasons and in areas activities weren't traditionally common.

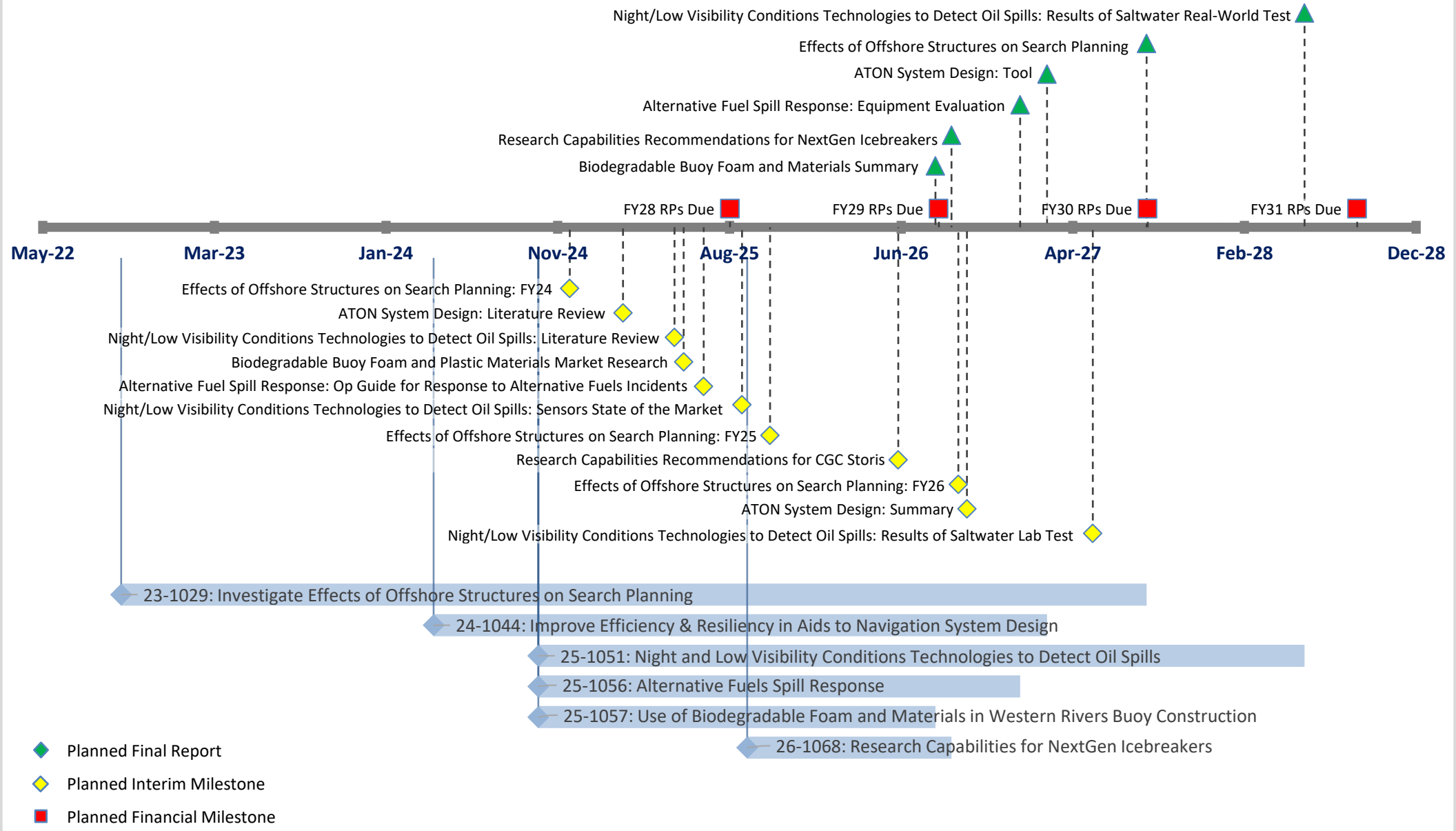
Visual Aids to Navigation Retain a Vital Role in Marine Safety

Evaluating Technology for Dielectric Fluid Recovery

Program Team

Program Champion:	**RDC Experimentation Lead:**
RADM Arguin (CG-5P)	LCDR Paul Larouche
RDML Chamie (CG-5R)	**RDC Transition Lead:**
RDC Research Program Chief:	Mr. Scott Fields
Mr. M. J. Lewandowski	

Research Program Roadmap | Waterways Management and Response



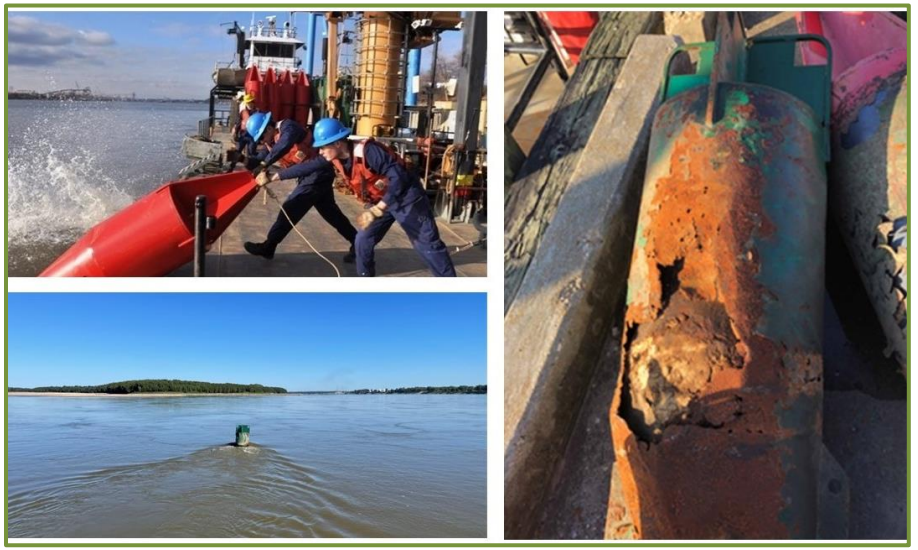
Use of Biodegradable Foam and Materials in Western Rivers Buoy Construction

25-1057

Mission Need: An environmentally sound solution for plastic foam in river Aids to Navigation buoys.

Objectives

- Determine if there is a cost-efficient alternative to the plastic foam used in river buoys that provides similar performance characteristics but naturally degrades over time and minimizes plastic waste in the environment.
- Identify biodegradable foam and other materials with a high technology readiness level that are commercially available or under development.
- Provide market research results and cost analysis on biodegradable alternatives compared to current foam system.
- Perform lab tests to assess the biodegradability of the foam materials.
- Develop and field test a river buoy prototype(s) with a foam alternative(s).



Notes

- Engage with industry developing bio-degradable plastic alternatives.
- Use results of RDC effort 2703, "Next Generation Aids to Navigation Buoys & Alternative Moorings," to identify commercially available solutions.
- Partner with government labs (Air Force Research Laboratory, Naval Research Laboratory, etc.) or U.S. Coast Guard (CG) Academy.

Sponsor's Rep: SILC-WOPL
Ops Rep: CGD-H

Stakeholder(s): CG-NAV, CGD-H (dpw), CG-SHORE-V, AREAs

RDC Principal Investigator:
Dr. Benedette Adewale

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: 1 Oct 24

Investigate Current River Buoy Manufacturing, Operations, and Disposal Processes	7 Nov 24 ✓
Identify Biodegradable Buoy Foam and Materials	2 Jun 25 ✓
Biodegradable Buoy Foam and Plastic Materials Market Research Update (Brief)	**12 Jun 25 ✓ ★**
Key Decision Point – Path Forward Foam Alternatives & Buoy Prototyping	18 Aug 25 ✓
Start Biodegradability Lab Testing – Foam Alternatives	22 Aug 25 ✓
Develop River Buoy Prototype with Foam Alternative at CG Industrial Facility & Start Field Trials	Dec 25
Complete Lab & Field Trials – River Buoy Prototype	Jun 26
Biodegradable Buoy Foam and Materials Summary (Report)	**Aug 26 ★**

Completion: Aug 26

Research Capabilities for NextGen Icebreakers

26-1068

Mission Need: Identify Next-generation icebreaker state-of-the-art research capabilities.

Objectives

- Determine and prioritize research community's research capability needs for polar research within the next 10 years.
- Evaluate and identify commercially available and emerging research equipment suitable for icebreaker deployment, assessing the technological maturity, cost-effectiveness, and maintainability.
- Recommend a prioritized suite of research instrumentation and equipment for the CGC *Storis* refit.
- Modernize icebreakers capabilities to collect high-quality data to enhance understanding of the Arctic environment and support informed decision-making related to national security, maritime safety, and environmental protection.
- Provide recommendations for outfitting future Polar-capable vessels to meet different research mission needs.

Notes

- Anticipate partnerships with the Department of Defense Labs, National Labs, the National Science Foundation, Interagency Arctic Research Policy Committee, U.S. Arctic Research Commission, members of the International Cooperative Engagement Program for Polar Research (ICE-PPR), and the Icebreaker Collaboration Effort (ICE Pact).

Sponsor's Rep: CG-751
Ops Rep: PAC-3, LANT-5, TF-Arctic

Stakeholder(s): PCO, CG-SEA-E, LREPL, CASP

RDC Principal Investigator:
Ms. Shalane Regan

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability
Recommendations for Standards/Regulations/Policy

Effort Timeline / Key Milestones

Initiation: Oct 25		
Assessment of Current Capabilities of CGC *Healy* and Capabilities Needed by Research Community	Jan 26	
Identification of Constraints of NextGen Icebreakers	Feb 26	
Request for Information and Review of Available Research Equipment	Mar 26	
Results Analysis and Development of Recommendations	Jun 26	
Research Capabilities Recommendations for CGC *Storis* (Report)	**Jun 26**	★
Research Capabilities Recommendations for NextGen Icebreakers (Report)	**Sep 26**	★
Completion: Sep 26		

Alternative Fuels Spill Response

25-1056

Mission Need: Response guidance for alternative fuels discharges and spills.

Objectives

- Determine discharge/incident risks for alternative fuels.
- Examine incident likelihood (probability) by alternative fuel type, then identify safety hazards and potential environmental damage (consequences).
- Provide operational guidance to field responders about priority alternative fuels spill response.
- Evaluate adequacy of existing oil spill response equipment and strategies for alternative fuel spills/incidents.
- Test effectiveness of existing oil spill response technologies with several low-sulfur fuel oil blends at a test facility.

Notes

- Engage community of interest: U.S. Coast Guard (CG) District Response Advisory Teams, CG Sectors, and Regional Response Teams.
- Coordinate with Oil Spill Removal Organizations, Federal On-Scene Coordinators (FOSC), and other pollution response organization interest.

Effort Timeline / Key Milestones

Initiation: 1 Oct 24	
Conduct Literature Review of Alternative Fuels	14 Mar 25 ✓
Operational Guide for Response to Alternative Fuels Incidents (Report)	**17 Jul 25** ✓ ★
Key Decision Point – Additional Alternative Fuels Study/Evaluation	11 Sep 25 ✓
Identify Mechanical Response Technologies for Testing with Low-Sulfur Fuel Oils	Dec 25
Develop Test Plan	Mar 26
Low-Sulfur Fuel Oil Mechanical Response Evaluation at Test Facility	Jun 26
Develop Test Report	Nov 26
Spill Response Equipment Evaluation: Mechanical Recovery, Low-Sulfur Fuel Oils (Report)	**Jan 27** ★
Completion: Jan 27	

Sponsor's Rep: CG-MER
Ops Rep: CGD-NE

Stakeholder(s): CG-721, CG-ENG, NSFCC, ICCOPR, District Response Advisory Teams, FOSCs, AREAs

RDC Principal Investigator:
Mr. Alexander Balsley, P.E.

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability
Recommendations for Cost/Risk Avoidance

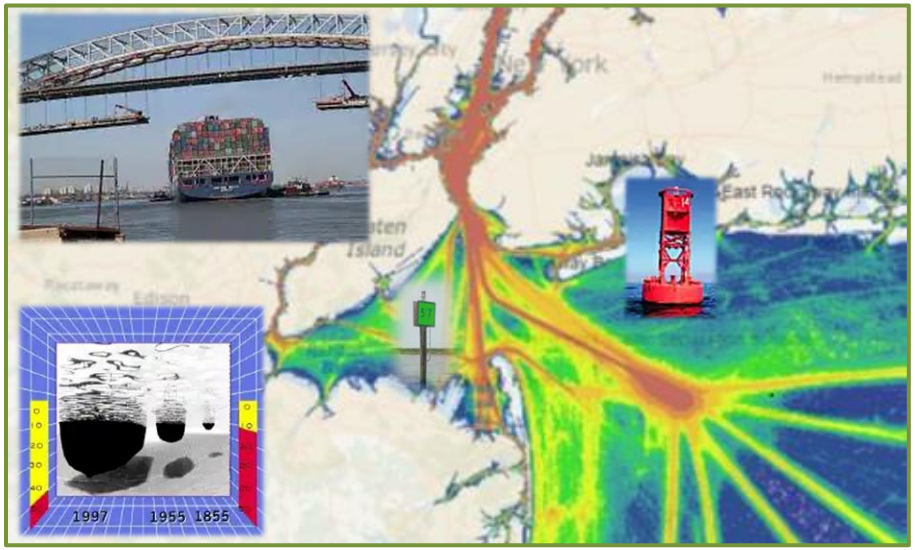
Improve Efficiency and Resiliency in Aids to Navigation (ATON) System Design

24-1044

Mission Need: Modernize ATON design standards for the future.

Objectives

- Update 1990's-based ATON system design tool standards to reflect the physical characteristics of modern ATON, the characteristics of modern vessels (e.g., increased draft and size), or the emergence of electronic navigation technologies in use today.
- Partner with sponsor to develop and integrate Geographic Information System-based risk assessment tools within the Waterways Design module in the U.S. ATON Information Management System (USAIMS) application.
- Provide recommendations on future work, including on Marine Transportation System transit risks and economic impacts due to Global Navigation Satellite System disruption scenarios and development of a cost-benefit analysis tool to evaluate ATON system design configurations.



Notes

- Leverage USAIMS modernization initiatives.
- Leverage U.S. Department of Homeland Security Science and Technology efforts on novel waterway use risks and ATON system resilience.
- Collaborate with U.S. Army Corps of Engineers, U.S. Maritime Administration Center for Maritime Innovation, and industry partners.
- Leverage International Organization for Marine Aids to Navigation and international partners' work (through DCO-I).
- Leverage previous RDC ATON risk assessment work.

Sponsor's Rep: CG-NAV
Ops Rep: Districts (dpw)

Stakeholder(s): CG-5PW, WWM, NAVCEN, SILC-WOPL, CG-C5I-E, CG-761

RDC Principal Investigator:
Mr. James Spilsbury

Anticipated Outcome/ Transition: Recommendations for Tactics, Techniques & Procedures
Provide Sponsor Tested Prototype

Effort Timeline / Key Milestones

Initiation: 1 Apr 24	
Identify Existing Tools, Guidelines, and Studies used for ATON System Design	31 Oct 24 ✓
Complete Literature Review	28 Jan 25 ✓
Develop Test Plan for Additional Studies Required	28 Jan 25 ✓
Literature Review of ATON System Design (Brief)	**26 Feb 25 ✓ ★**
Key Decision Point 1 – Path Forward on Methodology for Modernizing ATON System Design	10 Mar 25 ✓
ATON System Design Summary (Report)	**Oct 26 ★**
Key Decision Point 2 - Continue to ATON System Design Visualization Tool Development	Oct 26
Complete Beta Testing of ATON System Design Tool	Dec 26
ATON System Design Tool (Tool & Brief)	**Mar 27 ★**
Completion: Mar 27	

Investigate Effects of Offshore Structures on Search Planning

23-1029

Mission Need: Determine the impacts of offshore structures on search and rescue operations.

Objectives

- Literature review and workshop with sponsor and stakeholders to determine current state of offshore structures and SAR impacts.
- Collect and analyze real-time wind and current measurements to determine impact of changes due to offshore structures with Leeway Drift Studies.
- Research, verify and implement updates to atmospheric and oceanographic models to account for offshore structures.
- Conduct modeling and field tests to determine the impact to search object detection using prioritized sensors at US or United Kingdom (UK) based offshore structures.

Notes

- Partnership with the Bureau of Safety and Environmental Enforcement, U.S. Coast Guard Academy, National Oceanographic and Atmospheric Administration Integrated Ocean Observing System and, with the Bureau of Ocean Energy Management.
- International partners (UK, Denmark, Norway, Dutch, Sweden).
- Possible collaboration with the State of NY Maritime College - SUNY Maritime.
- Leverage Maritime Risk Symposium.

Sponsor's Rep: CG-SAR
Ops Rep: LANT-3

Stakeholder(s): NAVCEN, CG-NAV, CG-MER, CG-711/731/751/741/761, LANT, CGD-NE, FORCECOM

RDC Principal Investigator:
Ms. Monica Cisternelli

Anticipated Outcome/ Transition: Recommendations for Standards/ Regulations/Policy

Effort Timeline / Key Milestones

Initiation: 3 Oct 22

UK Leeway Drift	24 Mar 23 ✓
US Leeway Drifts: Pre – Construction	3 May 24 ✓
Investigate Effects of Offshore Structures on Search Planning: FY24 Annual Update (Brief)	**25 Nov 24 ✓ ★**
Preliminary Simulator Detection Experiment	Nov 25
Investigate Effects of Offshore Structures on Search Planning: FY25 Annual Update (Brief)	**Nov 25 ★**
US Leeway Drift: Post – Construction	Jul 26
Large Scale Detection Modeling and Experiments	Sep 26
Investigate Effects of Offshore Structures on Search Planning: FY26 Annual Update (Brief)	**Oct 26 ★**
Investigate Effect of Offshore Structures on Search Planning (Report)	**Aug 27 ★**

Completion: Aug 27

Night and Low Visibility Conditions Technologies to Detect Oil Spills

25-1051

Mission Need: Overcome oil spill detection limitations during darkness and low visibility conditions.

Objectives

- Determine the most suitable sensor or combination of sensors that will allow oil detection in darkness or reduced visibility conditions.
- Provide attributes and limitations of each sensor type for determining what sensor or sensor suite is most appropriate for U.S. Coast Guard (CG) field use.
- Incorporate this information in an easy reference guide for CG-MER and Federal On-Scene Coordinators.
- Improve the speed and scale of oil spill response in night and low visibility conditions.
- Increase detection in low visibility and nighttime conditions for diesel and medium crude oil.
- Identify platforms suitable for experimentation of sensors.

Notes

- The range of application should include sensors that are vessel or aircraft mounted, small Uncrewed Systems payload, and handheld.
- Leverage work done by the Bureau of Safety and Environmental Enforcement, other agencies, and the Naval Postgraduate School.

Sponsor's Rep: CG-MER
Ops Rep: NSFCC

Stakeholder(s): CG-721, CG-NSF, NOAA, CGD-GL, GLCOE, BSEE

RDC Principal Investigator:
Mr. Michael Wurl

Anticipated Outcome/ Transition: Recommendations on Tech Availability & Applicability
Provide Sponsor/Product Line Tested Prototype

Effort Timeline / Key Milestones

Initiation: 1 Oct 24	
Complete Literature Review on Existing Research/Use for Night and During Low Visibility Oil Detection	13 Feb 25 ✓
Literature Review: Night and Low Visibility Oil Detection Capabilities and Research (Report)	**27 May 25 ✓ ★**
Complete Market Research on Available Sensors that can Detect Oil at Night or During Low Visibility	29 Aug 25 ✓
State of the Market of Night/Low Visibility Sensors and Sensors Chosen for Testing (Brief)	**22 Sep 25 ✓ ★**
Complete Sensor Purchases/Agreements	Jan 26
Laboratory Saltwater Sensor Testing in Low Light and Poor Visibility	Jun 26
Night and Low Visibility Oil Detection: Results of Saltwater Laboratory Experimentation (Report)	**May 27 ★**
Real-World Saltwater Sensor Testing in Low Light and Poor Visibility	Jun 27
Night and Low Visibility Oil Detection: Results of Saltwater Real-World Experimentation (Report)	**Jun 28 ★**
Completion: Jun 28	