

United States Coast Guard Research and Development Center

2015

Annual Report



USCG Research & Development Center (RDC) Staff



The RDC is responsible for the development and execution of the Coast Guard's R&D project portfolio. The RDC organization includes an Executive Director as well as Technical and Support Divisions that work together to execute the RDC mission. The Technical Division is responsible for planning and executing projects as well as providing science, technology and operational subject matter expertise. The Research Partnership Director facilitates joint engagement and shared research with a wide range of organizations. These experts include both military and civilian scientists, engineers, and analysts, many with advanced degrees in their respective fields. In addition to their formal educations, the people assigned to the Technical Division have a vast wealth of Coast Guard-specific knowledge and experience. Many are recognized experts in topics such as Search

and Rescue, Oil Spill Response, Ballast Water Treatment, Automatic Identification System, Unmanned Systems, Arctic Operations, Marine Safety, Less-than-Lethal technologies, and Modeling and Simulation. The Technical Division is divided into six branches, based primarily on Program Areas.

The Support Division provides: informational services; internet/intranet support; office automation; safety and security support; shipping and receiving; timekeeping; accounting services; marketing and public relations; property management; and general administrative support for the RDC and CG-926 organization.

The Program Office, CG-926, provides programmatic oversight and is responsible for policy, strategic direction and communications to ensure the project portfolio is consistent with Coast Guard strategies.

U.S. Coast Guard Missions

Ports, Waterways, and Coastal Security

Maritime Environmental Protection

Aids to Navigation

Defense Readiness

Search and Rescue

Marine Safety



Living Marine Resources

Other Law Enforcement

Migrant Interdiction

Drug Interdiction

Ice Operations

The cover image is of a Coast Guard MH-60 pilot viewing a thermal image of a mannequin (Thermal Oscar) engineered by the RDC to simulate a person in the water during the 2015 Arctic Technology Evaluation Search and Rescue demonstration exercise offshore in Alaska. In addition to the Thermal Oscar, an actual Rescue Swimmer participated in the exercise.

During the 2015 Coast Guard Academy Commencement, President Obama said "America needs you and we need the Coast Guard more than ever. We need you to safeguard our ports against all threats, including terrorism. We need you to respond in times of disaster or distress and lead your rescue teams as you jump out of perfectly good helicopters."

Commanding Officer of the Coast Guard RDC

The Research and Development Center (RDC) is the sole facility authorized to conduct research, development, test, and evaluation (RDT&E) in support of the United States Coast Guard's (USCG) eleven missions. The RDT&E mission is to provide innovative technologies, premier analysis and decision support to enhance operational performance and reduce acquisition risk across all Coast Guard (CG) missions.

Let me summarize what we do and who we are. We are the execution arm of the RDT&E Program. Where the Program Office (CG-926) has the footprint in the Coast Guard Headquarters building and has the budget and policy oversight, we (RDC) develop the project plans, find partners, find co-funding, assign project staff, execute project plans, and deliver products to Coast Guard customers.

We are not a bunch of folks running around in white lab coats doing basic research. We are a professional civilian and military workforce of scientists and engineers that work together with Program Offices and operators to reduce the risk and raise the value of introducing new technology into the Coast Guard. While we have some lab capability, the field is our primary lab space. My staff are always on the road working with operators and collaborators. Some prime examples include our annual Arctic Technology Evaluations onboard the HEALY, ongoing unmanned systems testing, sweep width testing of aircraft sensors against search objects, and ongoing operational limited user evaluations, non-lethal impact munitions, entanglers, tactical communications, and night vision devices, and the Western Rivers pilot to test e-ATON.

The year 2015 marked important 'firsts' for the RDC. In June, the Commandant of the Coast Guard published the USCG Cyber Strategy, with the goal of strengthening the cyber security of the Nation's maritime domain and continuing to develop a robust internal cyber security capability. This strategy, along with the three other key strategic areas of the Arctic, Western Hemisphere, and Energy Renaissance, became the focal points around which the RDC portfolio was centered. Taking this innovative approach to the portfolio's organization ensures that the RDC's support of the Coast Guard's statutory missions continues to lead the way in both technology and policy solutions to emerging issues. In partnership with DHS, the RDC established a Coast Guard Science and Technology Innovation Center (CG-STIC). CG-STIC is a pilot test of DHS S&T's Under Secretary's concept to increase

unity-of-effort across DHS S&T and components interagency knowledge sharing, culture of innovation, and transition to end users. Additionally, the RDC, in collaboration with the Navy Research Laboratory, conducted the first in-situ burn (ISB) in more than 15 years at our Joint Maritime Test Facility co-located at Sector Mobile that is dedicated to security and safety testing. I am proud to report that this year RDC delivered 57 products in support of Coast Guard operations!

As notable as the RDC's contributions have been to Coast Guard operations, they didn't end with the work day! This year, the RDC team continued its participation with the ISAAC Magnet middle school through the Partnership in Education program, donated more than 815 pounds of food for the Feds Feed Families food drive, and celebrated with the City of New London as Admiral Zukunft officially declared New London "Connecticut's Coast Guard City."

Our biggest asset is the government staff with project management and technical skills. Military personnel bring their operational expertise to the RDC and work closely with the civilian scientists and engineers on projects that help close capability and knowledge gaps. I believe the RDC's collective flexibility, depth of technical skills, and project management discipline is unmatched. The RDC knows how to test and evaluate new capabilities and offer critical support with pre-transition evaluation of the most promising technologies.



CAPT Dennis C. Evans

A handwritten signature in blue ink that reads "D. C. Evans" followed by "CAPT, USCG" in a smaller font. To the left of the signature is a small green icon of a document with a checkmark.

D. C. Evans, CAPT, RDC

RDC in Historical Context

The 1st Congress of the United States empowered President George Washington to build and equip “so many boats or cutters, not exceeding ten, as may be necessary to be employed for the protection of the revenue.” The predecessor to today’s Coast Guard was created on August 4, 1790 and initially was called the Revenue Cutter Service. The Coast Guard has been helping to formulate national strategies to meet the needs of the United States ever since.

The RDC Rescue Craft Development



1972 modified OTS



1975 experimental prototype



1980 production



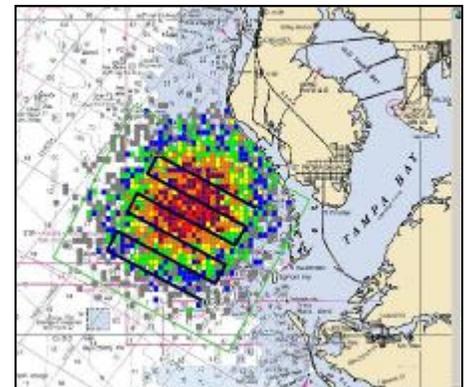
1988 experimental prototype



1996 production



The RDC has contributed to the regulation of boaters distress devices as well as to signal propagation and search patterns established for SAR operations.



The RDC Welcomes and Looks Forward to the New National Coast Guard Museum



The old RDC Building was demolished in 2015.

The RDC moved from the Groton Avery Point site in 2009 into it’s new facility in New London.



Along with the Coast Guard Academy, the New London Coast Guard Station, and the Coast Guard Museum, the RDC is proud of its contributions toward making New London the “Coast Guard City” of Connecticut.





Shown here is a mobile mount in a Coast Guard Small Response Boat that is being used to enter port patrol data for an RDC product called PROTECT - Port Resilience Operational/Tactical Enforcement to Counter Terrorism. This practical tool was developed by the RDC Coast Guard Modeling and Simulation Center of Expertise. The Game Theoretic Fish Patrol Schedule Model, Panga Research, and PROTECT leverage previous and current RDC work to support the Coast Guard Western Hemisphere Strategy and the DHS Southern Border and Approaches Campaign Plan. This tool has been deployed and is operational in New York and Boston Harbors.

RDC Solutions Aligning to Coast Guard Strategies

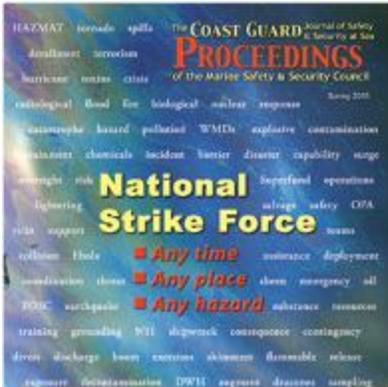
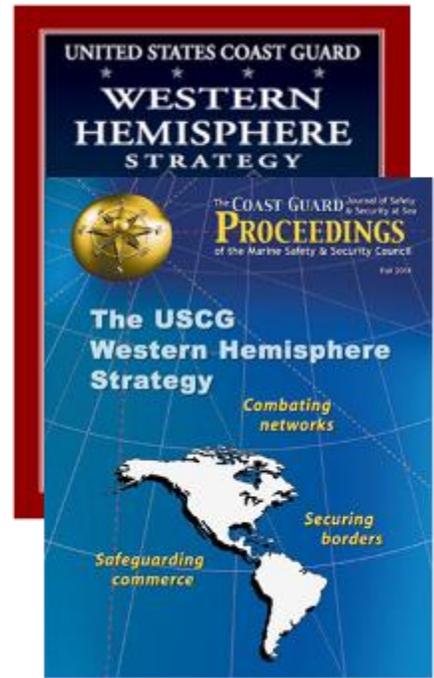
Given finite Coast Guard capacity and an increasingly complex maritime domain, the Coast Guard must continue to prioritize and manage risk across current and emerging demands.

The purpose of the RDT&E Program is to identify and examine existing or impending challenges in the Coast Guard's operational, regulatory, and support programs and develop solutions based on scientific and technological advances. In addition to these efforts, RDT&E funding supports risk mitigation efforts and services in the pre-acquisition process of major and non-major acquisition projects.

In FY15, the RDC aligned the portfolio to the four areas of Coast Guard strategic investment:

Western Hemisphere: Confront challenges in the most important geographic theater of operations, to include combating criminal networks, securing U.S borders, safeguarding commerce and building partner nation capacity. RDC project areas include:

- ◆ Unmanned Aerial Systems
- ◆ Operations Performance Improvements and Modeling
- ◆ Sensor Optimization and Visualization
- ◆ Intelligence enhancing efforts
- ◆ Search and Rescue

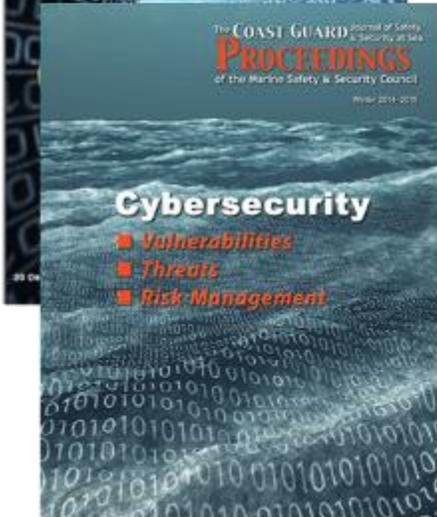


Energy Renaissance: Ensure the maritime safety, security, and stewardship of increased American energy production and transport by focusing on incident prevention, preparedness, and response capabilities. RDC project areas include:

- ◆ Waterways Management & Environmental Response
- ◆ Maritime spatial planning technologies e.g. AIS, eATON.

Arctic Strategy: Increase awareness, improve governance structure and capabilities, and broaden partnerships in an area of growing maritime usage. RDC project areas include:

- ◆ Operations
- ◆ Technology demonstrations and evaluations
- ◆ Communications analysis



Cyber Strategy: Strengthen the cyber security of the Nation's maritime domain and continue to develop a robust internal cyber security capability. RDC project areas include:

- ◆ Enabling operations
- ◆ Protecting infrastructure

Cyber Strategic Area ... and RDC Solutions

Coast Guard acquisitions and information technology management practices must be agile and adaptive to changes in the information and communications technology sector. The Coast Guard must enhance service capabilities by investing in cyber research and development to foresee and shape the future operating environment. (CG Cyber Strategy).

Cyber Security for Port Critical Infrastructure / Key Resource (CI/KR) Protection

This effort is investigating and documenting cyber-based vulnerabilities of, and threats to, Wireless Access Points (WAP)-enabled CI/KR within our maritime port facilities. CG personnel should have the capability to periodically, if not continually, monitor WAPs that can impact port operations whether they are accessible from the waterways or adjacent properties.

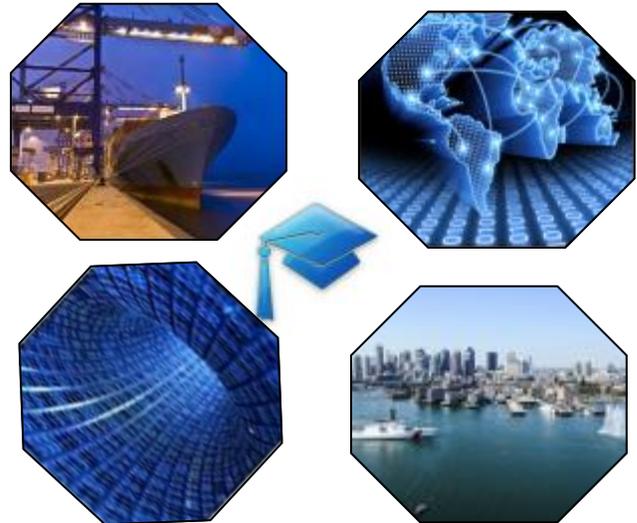


The U.S. Coast Guard's Vision for Operating in the Cyber Domain:

We will ensure the security of our cyberspace, maintain superiority over our adversaries, and safeguard our Nation's critical maritime infrastructure.

Maritime Cyber University Research

The USCG Cyber Strategy Implementation Plan has instructed the RDC to "continue coordination and collaboration on cyber research topics with the academic community". Accordingly, CG-FAC/CG CYBERCOM requested that the RDC coordinate defined academic efforts via three research questions with the DHS Center of Excellence at Rutgers and the University of Southern California along with American Military University. This is Phase I, with Phase II in the planning stages.



Hoax Location Systems and Methods

This project focuses on a "three prong" approach to help Coast Guard law enforcement and response elements combat Coast Guard Search and Rescue hoax callers. This approach specifically includes Direction Finding (DF) methods, social media exploitation and voice forensics analysis technologies for violator identification and subsequent case prosecution. The voice forensics and social media exploitations are being done in partnership with Rutgers, Purdue, and Carnegie Mellon University.



Western Hemisphere Strategic Area ...

To meet the Western Hemisphere strategic priorities, the Coast Guard strategy emphasizes the critical importance of offshore vessel and aircraft presence to support effective governance and sovereignty, as well as other strategic concepts to ensure long-term success.



“This strategy emphasizes our highest objectives through three broadly defined strategic priorities:

- ◆ Combating Networks,
- ◆ Securing Borders, and
- ◆ Safeguarding Commerce.”

**Commandant of the Coast Guard
Admiral Paul F. Zukunft**

maritime patrol aircraft (MPA) have the latest C4ISR systems to operate in a highly complex, network-centric environment. These systems must be interoperable with Department of Homeland Security (DHS), Department of Defense (DoD), North Atlantic Treaty Organization (NATO) allies, and Other Government Agencies (OGAs) at the highest levels of security classification. **(Coast Guard Strategy)**

In order to achieve more effective interdiction with maritime patrol forces, the Coast Guard will ensure cutters and

Conducted Shipboard Demonstration of USN Fire Scout MQ-8B Vertical Takeoff and Landing (VTOL) UAV to evaluate contribution to National Security Cutter (NSC) surveillance requirements tying directly to the Commandant’s Western Hemisphere Strategy.

Evaluation of Fire Scout for Use on NSC

RDC solution: The RDC is exploring applications of small UAS to increase offshore presence by enhancing surveillance time and reach from cutters and small boats.

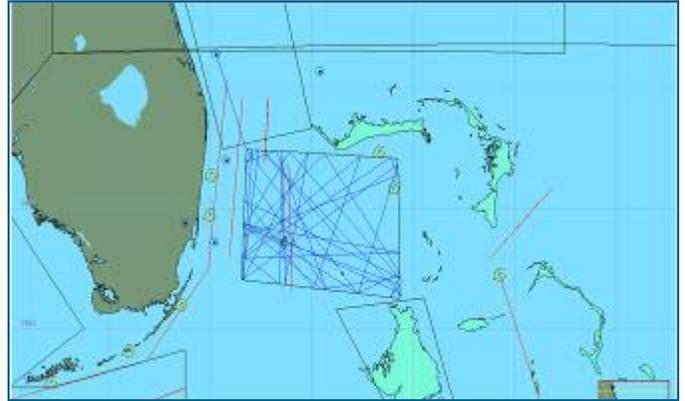
We currently have 10 active R&D Projects with DHS Joint Task Force—East as a primary stakeholder supporting joint operations in the western hemisphere.

An sUAS can provide “eye in the sky” capability to CG assets which are not equipped with flight decks, such as response cutters.

In his 2015 State of the Coast Guard address, Commandant Zukunft stated “the USCG will maximize return on investment through mission performance underpinned by efficient, accountable business processes and a clean financial audit.”

CGMOES Next Generation

The RDC continues to maintain the transitioned Coast Guard Maritime Operational Effectiveness Simulation (CGMOES) application capabilities while analyzing the functional baseline and developing requirements for the Next Generation Campaign Model (NGCM). The final implemented recommendation from this project will improve the Coast Guard’s capability to conduct trade studies to support acquisition efforts and support operational commanders with strategic force lay down options.



Robotic Aircraft for Maritime Public Safety (RAMPS)

The RAMPS project aims to identify the capabilities, benefits, risks, and technical limitations of operating small Unmanned Aerial System (sUAS) technology in a maritime environment.

The Fleet Mix Study

is a Campaign level Operational Effectiveness comparison of alternative CG Fleets that provides a comparative analysis of operational effectiveness for varying aviation and surface fleet compositions.

The RDC M&S COE analysis utilizes CGMOES 3.0 and other mission engagement tools to support the Western Hemisphere Strategy.

Develop Innovative Interdiction Patrol Tactics

This project utilizes Probabilistic-Based Search and Game Theoretic algorithms to improve patrol tactics in a given geographic area. The output incorporates optimal tactics assuming that the adversary will adapt when reaching a certain threshold of failure. The project's primary objective is to analyze the findings, derived from the model's simulation runs, to better understand the adversary's tactical shifts and leading indicators so Coast Guard operational commanders can improve the efficiency and effectiveness of their interdiction mission patrols. The second phase will determine whether significant adjustments to capabilities and/ or capacity (equipment and/ or assets respectively) might be needed.



Energy Renaissance Strategic Area ...

Ensure the maritime safety, security, and stewardship of increased American energy production and transport by focusing on incident prevention, preparedness, and response capabilities.

RDC Airborne Oil Spill Remote Sensing and Reporting

This project is developing Tactics, Techniques, and Procedures (TTP) for optimizing the use of existing CG airborne C4ISR systems to support oil spill response operations. Coast Guard spill response coordinators will have a more reliable mechanism to identify areas of actionable oil to aid the strategic deployment of response resources. CG Sensor Field Evaluations are jointly conducted with the MINOTAUR Mission System program to leverage the upgraded capability of the next fixed-wing mission system. Bureau of Safety and Environmental Enforcement is co-funding this project.



RDC Oil Sands Products Spill Response

This completed project developed decision making tools for a Federal On-scene Coordinator (FOSC) to aid in response planning for spills of oil sand products in fresh and salt water by analyzing and assessing response issues and strategies in fresh and salt waters. The G-MER Report “Risk Assessment of Transporting Canadian Oil Sands” was expanded while Partnering with the Great Lakes Restoration Initiative (GLRI).



In Mobile Alabama, the Joint Maritime Test Facility (**JMTF**) has a burn tank that provides RDC and Naval Research Laboratory principle investigators with full-scale, in-situ mock-ups and is the sole national testing facility for maritime fire protection research.

At JMTF, the CG Office of Incident Management & Preparedness, CG-MER, presented Kurt Hansen, Jim Fletcher and Shannon Jenkins the Commander's Award for Civilian Service for Outstanding performance of duty supporting the Coast Guard's Marine Environmental Protection Mission.

RDC Maritime-related Cellular Public Safety Answering Point (PSAP) 2-Way with CG-IT

This project provided call centers with the capability of exchanging mariner 9-1-1 voice communications, lat-long location data and images with CG-IT. The benefits realized from this project include improved efficiency, mission execution, resiliency, costs, geo-location confidence and overall SAR operational performance.

The following objectives were all met:

- Identify baseline capabilities: NG9-1-1, CG receipt of cellular NG9-1-1, secure digital transfer possibilities between caller and CG-IT/Rescue 21.
- Examine 9-1-1 State organizations telecommunications & CG-IT policies.
- Develop test plan and coordinate operational testing support.
- Demonstrate technology to securely transfer cellular NG9-1-1 voice/lat-long/image into CG-IT (Sprint-III), Rescue 21 (Sprint-I-II).

1 : Smart Phone



2 : Next Generation 9-1-1



4 : Joint Response



3 : CG-SAR (Command and Control, Coast Guard Information systems)



To evaluate Rescue 21's Sprint I and II alternatives, the RDC entered a Cooperative Research and Development Agreement (CRADA) with General Dynamics C4 Systems (GDC4S).



Boat Operations Quality Assurance System (BOQAS)

This project has completed a market survey and cost analysis of boat system interfaces, instruments, and displays. Using that information, the team has developed a proposal for a dedicated data acquisition system to record boat operational data to be used in engineering, safety, and training functions. Efforts are now underway to develop and install a limited set of prototype systems and then to conduct limited user evaluations which will be submitted by operators in the field.

Detection and Mitigation of Oil within the Water Column

This project is partnering with Bureau of Safety and Environmental Enforcement to mitigate such oil down to 10,000 feet. Not only is this technology to operate off-shore, but also near shore and in rivers. The resulting systems will be capable of operating of vessels of opportunity and provide capability to:

- Operate in all environmental conditions.
- Locate and mark subsurface oil for possible removal
- Detect small droplets of oil at high resolution.

The Mitigation Prototype testing and Concept Development will provide the Coast Guard and it's partners with improved operational performance and resilient response execution.



Arctic Strategic Area



Activity in the most remote reaches of Alaska continues to evolve and grow, including planned drilling operations in the Chukchi and Beaufort Seas, foreign tankers using the northern sea routes which transit through the Bering Strait and Sea, and small cruise ships pressing even further into the Arctic. As the receding ice invites increased human activity in commercial and private ventures, there is increasing demand for the Coast Guard to ensure the safety, security and stewardship of the nation's Arctic waters. (CG Arctic Strategy)

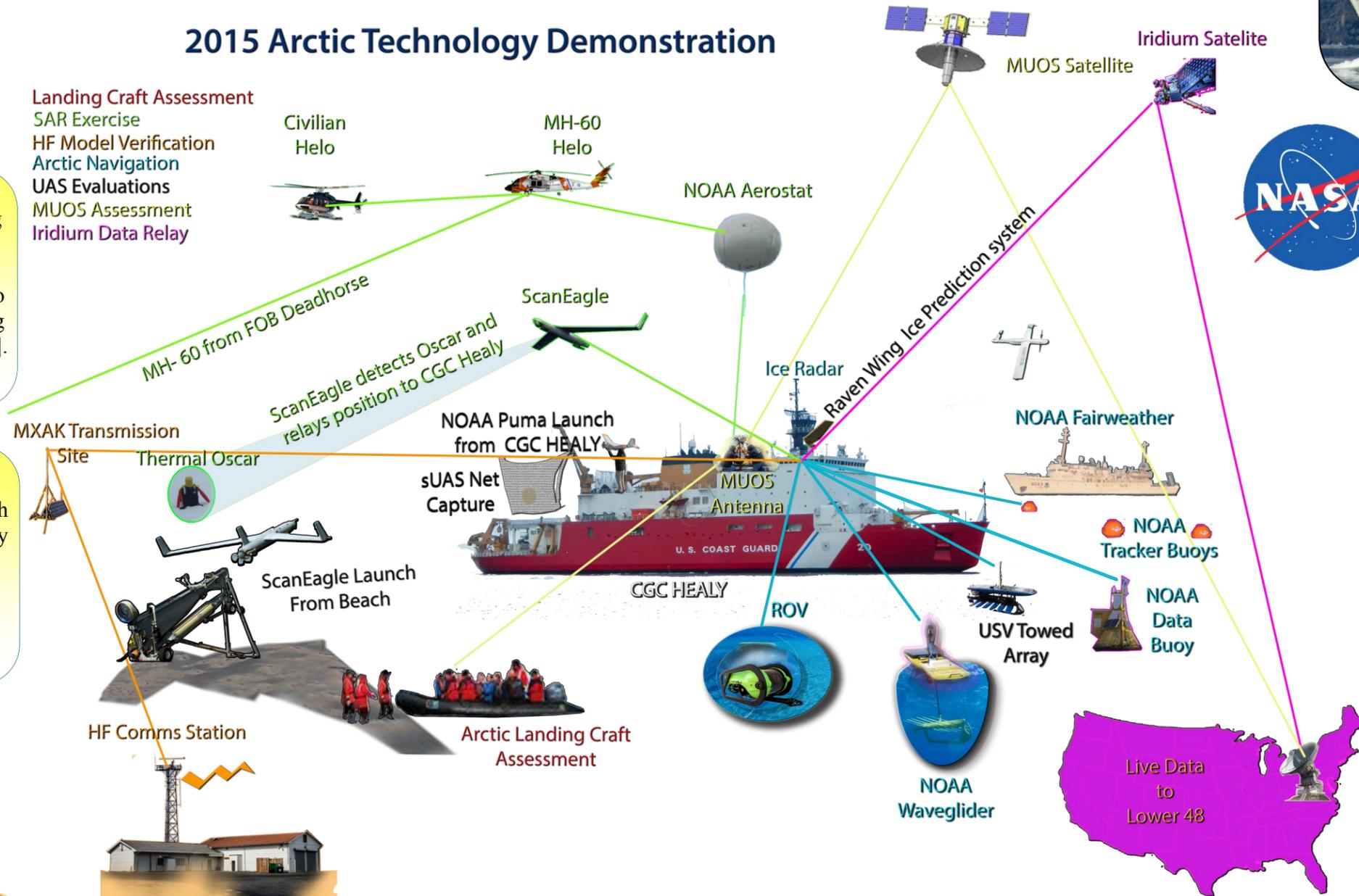
... RDC Solutions include many partnerships



We need the science ... the work that the Coast Guard RDC is doing gives us an idea of what to expect from the scientists, what the output is, how that is going to help us make decisions in regards to policy, understanding where they are coming from and why they are doing it [the research].
Denise Michels, Mayor of Nome

The Arctic Technology Demonstrations provides us with the synergy of working with the researchers and learning which ways they need to reach out to the Alaskan Native Communities as they research what really impacts those local people here.
Sudie Hargis, USCG D17 Tribal Liaison

2015 Arctic Technology Demonstration



The RDC is working in alignment with the Coast Guard's Arctic Strategy and is staying ahead of the curve in working to get technologies ready for Coast Guard missions in the Arctic. The goal is to improve Coast Guard execution in the remote and harsh environment through the application of new methods and technology.
**Rich Hansen
RDC Surface
Branch Chief**



"The Coast Guard and NOAA continue to be important partners in the effort to advance each of the nine priority objectives as described in the Final Recommendations of the Interagency Ocean Policy Task Force. Both agencies are critical to the effective implementation of the National Ocean Policy." (CG NOAA Maritime Document)



National Science Foundation
WHERE DISCOVERIES BEGIN

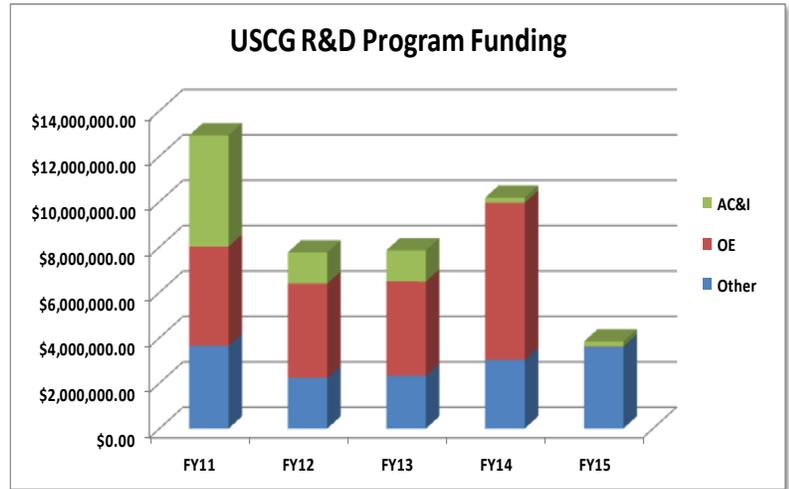


RDT&E Execution

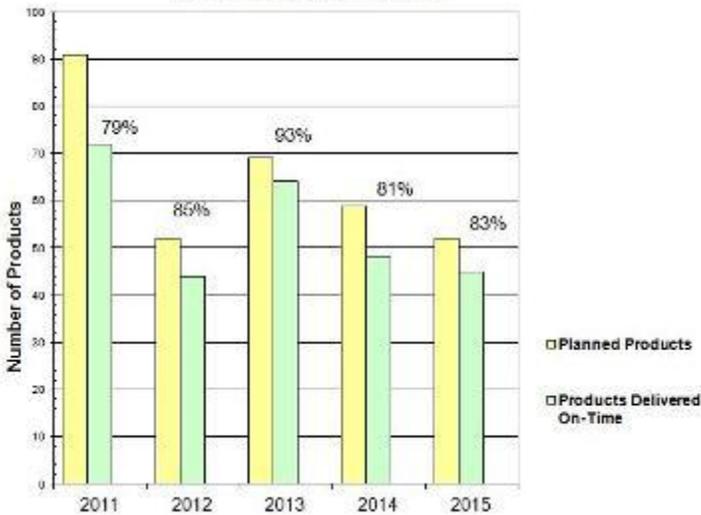
Congressional Justification for Coast Guard RDT&E

The FY15 financial provision of \$18 million helped sustain CG mission capability through applied research and partnerships with the Department of Homeland Security (DHS), the Department of Defense (DoD), as well as other Federal and private research organizations including technology transfer Cooperative Research and Development Agreements (CRADAs).

Partnerships with organizations like the DHS university Centers-of-Excellence, that are working on maritime technologies and more basic research, are critical to creating and sustaining cost effective Coast Guard R&D technology and leveraging opportunities.



Annual Product Delivery



FY15 Accomplishment Statistics

Completed

- 22 projects;
- 2 M&S COE tasks;
- 3 quick reaction studies; and

Delivered

- 57 research products

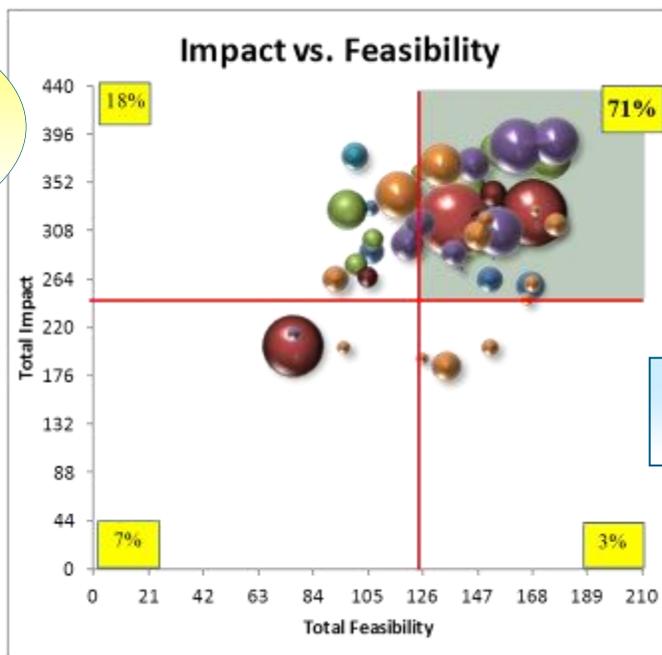
The FY15 Assessment of Portfolio Prospective resulted in a portfolio with 71% of project in the low risk and high impact quadrant

Impact

The aggregate impact axis is composed of the following criteria:

- Solution Fit,
- Customer/Sponsor Buy-in,
- Alignment with Strategy,
- Impact Builds Competencies and Leverage

“Well-balanced portfolio based on stakeholder priorities and best portfolio management practices...”



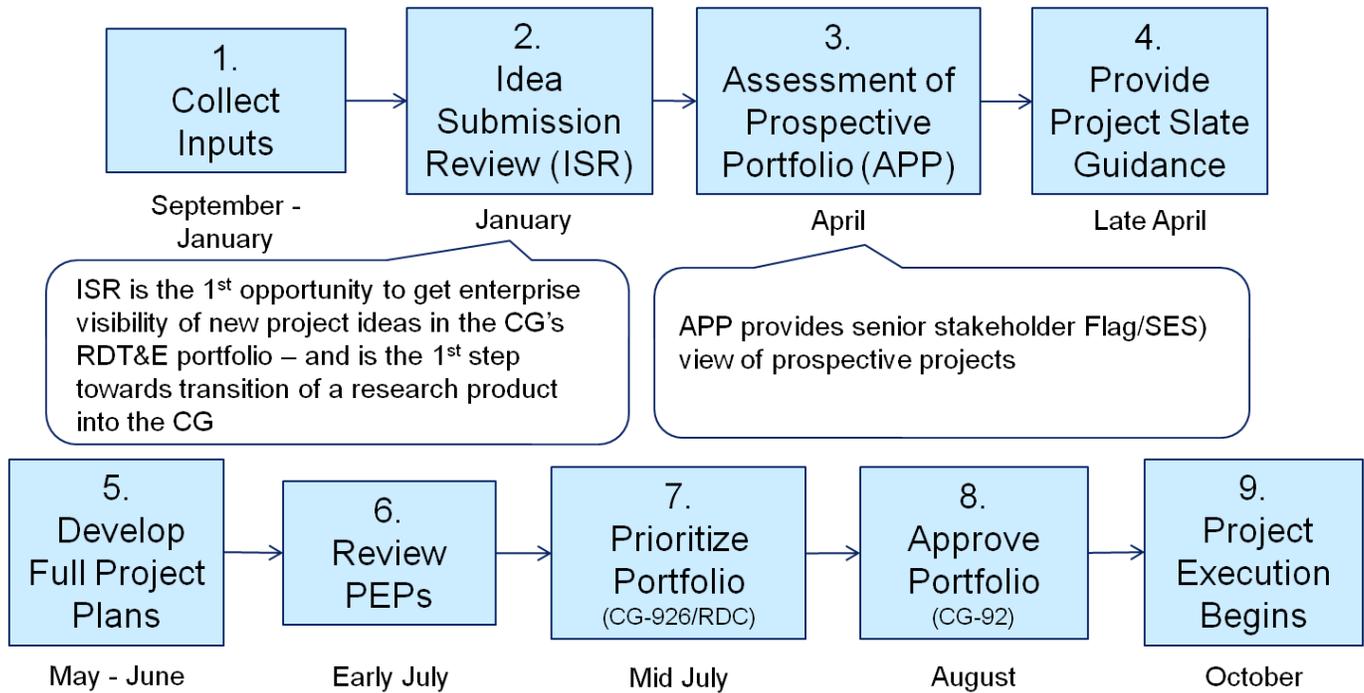
Aviation	23%
E&W	21%
C4ISR	17%
Surface	7%
TIA	3%

“The taxpayer is getting best bang for the buck!”

Feasibility

The aggregate feasibility axis is composed of the Technical Feasibility, Project Clarity, and Transition Likelihood criteria.

RDT&E Business Process



FY16 ISR Results for FY16 Portfolio

- 142 ideas submitted from 58 different Program Sponsors
- 118 of the ideas discussed during the ISR made the initial cut for RDT&E funding based on an appropriations review and prioritization.
- 10 new ideas made the final cut and are addressed in the funded portfolio 14 other new ideas were identified as potential projects for execution in out years.

Idea Submissions

- “RDC took it on and made it personal”
 - “Great process. Provides unique insights into what the field sees as important “
 - “Overall great format”
- Comments from Idea Submission Review**

“a permanent wireless tough book style laptop with MISLE capabilities, data check info, federal and state information, and secure email connectivity to assist capability and safety of Law Enforcement Officers.”

**ME1 Luke Geradot,
Sector Key West
Enforcement Officer
submitted an
Idea Request for
Vessel Boarding Teams**

The RDC Business process includes receiving Idea Submissions from the field – from the deck plate ...
“We’re Listening”.

Portfolio Assessment

Result: whereas the goal of the RDC is that all products transition to the field ... the RDC contributes to the mission even if for Cost Avoidance or a Null Hypothesis ... the result is always relevant, meaningful, practical and efficient.

- “Perspective of partners outside of the CG helps validate the need.”
 - “Collaboration among different elements of DHS was really valuable.”
 - “It’s clear that the discussion enriches the thinking process and helps the Project Manager work through the approach to take for the project.”
 - “This is a good forum to vet new starts. The forward-looking approach ensures that we have better projects from the start (vs. reviewing mid-stream when the project may not be able to be adjusted).”
- Comments from the Portfolio Assessment**

RDC Products Working for CG Missions

Abandoned Object & Vessel Marker



The Abandoned Object Marker contains a VHF-GPS beacon with a handheld receiver.

This deployable abandoned object fly away kit has been delivered with 3 tracking devices and 2 handheld receivers for use in current Coast Guard operations.

Port Resiliency Decision Framework and Toolkit (PRDFT)



Port Resilience Operational/Tactical Enforcement to Counter Terrorism (PROTECT)



PRDFT, a joint effort with Stevens Institute and other DHS S&T Centers of Expertise (COEs), have completed their assessment of the toolkit.

PROTECT and Other Deterrence Models involved three DHS S&T COEs.

Neutral Buoyancy—Tactical Boarding Gear



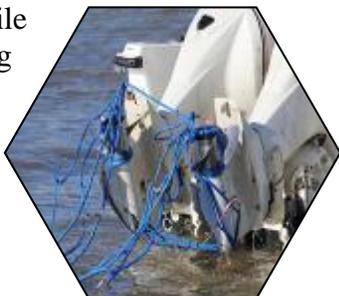
As a follow-on effort in response to a charter established in 2010, this project continues to identify gear which can maintain neutral buoyancy if Tactical Boarding Team (TBT) members' inflatable flotation system fails.

Non-Lethal Interdiction Methods

The Non-Lethal Interdiction Methods (NLIM) project partners with Technical Support Working Group (TSWG) and Joint Non-Lethal Weapons Directorate (JNLWD). By developing the Tactics, Techniques, and Procedures for these products and methods, the RDC helps to support the Coast Guard Western Hemisphere Strategy.

NLIM SNARE Limited User Evaluation:

The two units equipped with SNARE have not encountered any Non-Compliant Vessels while participating in the test.



NLIM PepperBall Limited User Evaluation:

- ◆ Non-Compliant vessels encountered - 4
- ◆ PepperBalls deployed - 4
- ◆ Non-Compliant Vessel Stopped - 4

The test has been going so well that many additional units have requested to be included in the evaluation.



From here ... You can see tomorrow

Sample of Completed 2015 RDC Projects

- ◆ Arctic Craft Investigation
- ◆ Panga Search Planning Tools/POS Calculation Analysis
- ◆ Improve SMART Protocol Effectiveness
- ◆ Support for Joint Technology Demonstration: Wide Area Surveillance Persistency and Command & Control/Situational Awareness to Non-SEAWATCH Assets
- ◆ Operational Testing of Electro-optical Sensors
- ◆ Develop a Game Theoretic Fish Patrol Schedule Model
- ◆ Great Lakes Region I Ballast Water Treatment Shipboard Approval Tests
- ◆ CGMOES Next Generation
- ◆ Ergonomics Analysis of Communications Centers
- ◆ Command Center Capability Analysis Support
- ◆ Long Range Wireless Network: Boarding Team to Cutter
- ◆ Ballast Water Management System Scalability Impacts to Type Approval Tests
- ◆ Operational Testing of Alternative Fuels
- ◆ Alternative Asset Iceberg Reconnaissance Demonstration
- ◆ Solid State Radar Applications to CG Operations Management
- ◆ Automatic Identification System (AIS) Transmit Capability
- ◆ Life Cycle Cost Analysis of Icebreaker Hull Coatings
- ◆ Cutter Boat Video Recorder
- ◆ Analysis Support For CG Airborne Use of Force Weapons Testing

Polar Icebreaker Acquisition Support



Prepared acquisition support documents including Preliminary Operational Requirements Document (PORD), Operational Requirements Document (ORD), and Alternatives Assessment (AA).

Obama Sees Need for More US Icebreakers:
...President Obama went to Alaska to talk climate change and the need to do more to combat its destructive consequences.

But what he saw there also showed him the need for new icebreakers that the U.S. Coast Guard has been calling for for years, **retired Coast Guard Commandant Adm. Robert Papp** told Congress ... **Military.Com November 2015.**

RDC Partners with the Innovation Council

Commandant's Direction 2014 states "The Coast Guard will foster a service capable of continuous innovation and learning." Toward that end the Innovation Program's goal is to help create a service

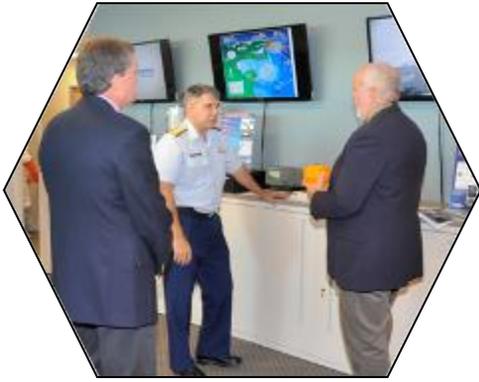


culture where innovative thinking is encouraged, recognized, and rewarded, by creating a community willing and able to generate new ideas. The Innovation Council is the cross-programmatic body that oversees the program, and the program's primary tool for soliciting and developing new ideas is our crowd sourcing site, ECIP Connect.

See <http://ecipconnect.ideascale.com/>

To learn more please contact CDR Andy Howell, thomas.a.howell@uscg.mil.

Visitors to the RDC



RDML Haycock (CG-4) and District One RDML Fagan visited RDC in November 2014.



The RDC was pleased to support a visit by VADM Michel, Deputy Commandant for Operations, accompanied by CMC Vanderwerf and LT Coty.



Ms. Michelle Godfrey, Civilian Human Resources Officer, answers questions from the audience while presenting an overview of the Civilian Human Resources, Diversity and Leadership Directorate.



VADM Stosz presented DCMS coins to RDC staff YN1 Condon for outstanding efforts in spearheading preparations for FORCECOM Finance and Admin inspection in June 2015.



In observance of Hispanic Heritage Month, RDC was pleased to have award winning poet, presenter and professor Dr. Jose Gonzalez share his thoughts and insightful profile of Hispanic culture.



RADM Gautier, Director of Congressional and Public Affairs., visited the RDC in February 2015.



The RDC welcomed NATO visitors from the Centre for Maritime Research Experimentation in September 2015.



RADM Marshall Lytle (CG-6) visited the RDC in April 2015.



The Assessment of Prospective Portfolio Panel gather outside the RDC in June 2015 during a break from project reviews.

Cooperative Research & Development Agreements (CRADAs)

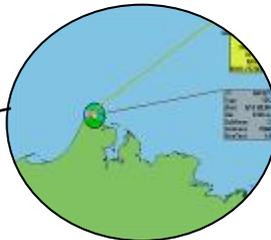
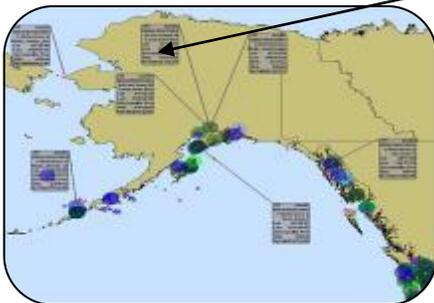
A CRADA promotes the transfer of technology to the private sector for commercial use as well as specified research or development efforts that are consistent with the mission of the Federal laboratories parties to the CRADA. The Federal party or parties agree with one or more non-Federal parties to share research resources. The Federal Laboratories can contribute all warranted and available resources EXCEPT Funds. The Department of Homeland Security (DHS), as an executive agency under 5 U.S.C. 105, is a Federal agency for purposes of 15 U.S.C. 3710(a) and may enter into a CRADA. DHS delegated its authority to the Commandant of the Coast Guard (see DHS Delegation No. 0160.1, para. 2.B(34)), and the Commandant has delegated his authority to the Coast Guard's Research and Development Center (RDC).

A list of partners that the RDC worked with during the fiscal year 2015

Marine Exchange of Alaska	Develop, demonstrate, and evaluate one promising technology approach to the "Next Generation Arctic Maritime Navigation Safety Information System".
Aerovel Corporation	Robotic Aircraft for Maritime Public Safety (RAMPS) (Aerovel)
Aerovironment, Inc.	Robotic Aircraft for Maritime Public Safety (RAMPS) (Aerovironment)
CNS Systems, Inc.	Western Rivers e-ATON Technology Demonstration (CNS)
Rose Point Navigation Systems	Western Rivers e-ATON Technology Demonstration (Rose Point)
VECTOR CONTROLS, INC	USCG Response Boat-Medium Data Recorder
Conoco Phillips	UAS Capabilities (Conoco)
Mercury Marine, Inc.	Operational Testing of Alternative Fuels (Mercury Marine)
Engility Corporation	Joint Technical Demonstration of Tactical Data Link Range Enhancement Software
General Dynamics C4 Systems Inc.	Maritime Smart Phone Public Safety Answering Point Forwarding Into Rescue21

Next Generation Arctic Navigational Safety Information System

Involved a CRADA with the Marine Exchange of Alaska.



Cockpit Laser Strike Protection

Market research is underway to find a reliable and low-burden mechanism for protecting CG Aviators against laser strike hazards. This CRADA partnership will investigate Government and industry developments in the area of cockpit laser filtering technologies.



Western Rivers e-AtoN Technology

Provides the Coast Guard and Army Corps of Engineers (USACE) and other partners with experience in distributing navigation information to users via the Automatic Identification System (AIS).

CRADAs with CNS Systems and Rose Point Navigation Systems help to place updated systems on board vessels participating in the test.

RDC Outreach and Community Support

Partners in Education (PIE) Program



The RDC continued its support to the ISAAC Magnet middle School through the Partners in Education program. At different points throughout the school year, RDC staff taught the science classes about real world applications of their current curriculum. This included the scientific method, experimentation, water bottle rockets and simple machines. The lessons included forming teams to work on projects, presentations of their efforts before a panel of judges, and tours of the RDC. The sixth, seventh, and eighth grades are all contacted at some point through the year. This program is in its fourth year.

RDC Contributes to Feds Feed Families Summer Food Drive

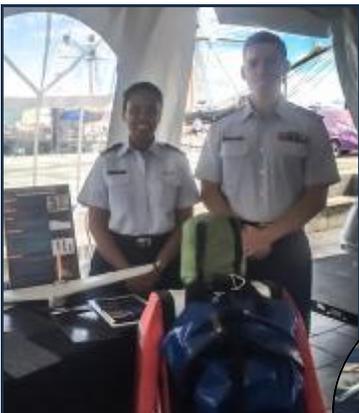


During the 2015 drive, the units located at 1 Chelsea Street donated 815 pounds of food, which more than tripled their 2015 goal of 225 pounds.

RDC runners support CG Mutual Assistance campaign



RDC Participates in New London Maritime Festival



Tables with artifacts and posters to illustrate RDC Projects and how the RDC supports the CG missions were on display during the New London September festival.



RDC Display at New London Train Station



As a placeholder until the new National Coast Guard Museum is built, the RDC has a continuous display for public viewing at the New London Train Station.

The RDC participates every year in the Marine Toys for Tots drive. The U.S. Marine Corps Reserve Toys for Tots program is a long-standing, annual event to collect new, unwrapped toys during November and December to distribute as Christmas gifts to less fortunate children throughout the United States. In 2015 the RDC donated a minivan full of toys to the program.



Coast Guard S&T Transition and Innovation Center (CG-STIC) in FY 2016

Overview

DHS Science & Technology (S&T) Directorate has explored with the USCG how to increase the unity of effort, share knowledge, create a culture of innovation, and transition technology to end-users. The result is the creation of a collaborative framework between DHS S&T, the USCG's RDT&E Program Office, and the USCG's Operations.

The CG-STIC was established as a collaborative relationship between the RDC and the DHS S&T to share and advance technologies that will be mutually beneficial to both parties.

The vision for the Center is to improve the delivery of impactful, operationally relevant and affordable solutions to the homeland security enterprise in a timely manner.



CG-STIC Objectives

- Obtain thorough understanding of user needs
 - ◆ Embed (PIONEER)
 - ◆ Innovation Council
 - ◆ Working Groups
- Culture of applied innovations
 - ◆ Modify existing tech for alternative uses
 - ◆ With FORCECOM support TTP development
- Seek transition results
 - ◆ National Stock Numbers
 - ◆ Broker deals between research



Subject: Contraband Marker RDC/LANT, STRATTON noted the RDC Blog post in TST this week and would like to volunteer as the PAC cutter to OPEST the Contraband Marker. They depart on a counter-drug patrol shortly, would it be possible to get them the prototype?

*V/r,
LT Roger Nayden
Pacific Area Cutter Forces
Coast Guard Island, BLDG 55
Alameda, CA 94501 ...*

CG-STIC Approach

- Modifying and/or innovating existing hardware/software for alternative solutions;
- Working with FORCECOM and the two Areas support collaborative development of Tactics, Techniques and Procedures (TTPs) for existing technology and associated applications;
- Acting as a broker to facilitate the experimentation, innovation and transition of potential solutions for DHS mission needs.

“As-is”
Current “paper plate” method use by Over-the-Horizon boats to mark jettisoned contraband is UnSat. Project idea: a performance gap submitted 2 years ago.

“To-be”
Under a CG-STIC CONOP the effort would have been appropriately resourced for innovation and transition; speedier delivery to operator; industry engagement to create market share; and unity of effort (broader applicability, e.g. CBP).



*Subject: Contraband Marker RDC,
That’s a slick kit. Let me know if we can assist with any additional controlled testing.
Fred Scali
SOUTHCOM JIATFS J7 ...*

Executive Director of the Coast Guard RDC



Bert Macesker, RDC Executive Director

There is a saying that you can't move forward when you're looking in the rear view mirror. While it makes sense that we need to scan the horizon for opportunities I believe it is also important to know where we have been. Since the 1970s the RDC has served Coast Guard men and women and taxpayers by introducing many new capabilities and technologies in areas that include SAR, ATON, oil spill prevention and response, and maritime security. The RDC has a library of 2000 products that include studies, technology evaluations, and prototypes. Many Coast Guard modernizations had their start as R&D projects. This timeline of achievements is punctuated with some global technological innovations that we exploited. For example, it was in 1978 when DoD launched the first experimental GPS satellite. The RDC leveraged this innovation to make significant advancements in navigation and ATON by developing Differential GPS.

Not everything results in a direct transition but instead builds on each other to ultimately increase our knowledge base or improve capabilities. An innovative approach to SAR in the late 70's was the experimental use of trained pigeons to detect search objects. An interesting concept that we tested that demonstrated better day-time detection rates compared to human observers. Of course today, we've gone from looking out the window with humans (or pigeons) to reliance on RDC field-tested advance sensor payloads that operate day or night. People that lived in Connecticut back in the early 90's may recall the prototype single-line laser on our roof that served as a range beacon across Long Island Sound. Though the system proved capable and could be operated less expensively than conventional aids, the cost-benefit was precluded by other technologies, primarily, GPS. Examples of our many transitions include the years of incremental improvements to ATON including environmentally friendly power saving technologies and applications of light-emitting diodes as an even more efficient and cost-effective light source. Today, the RDC is at the center of supporting the modernization of our waterway systems in a way that will re-balance the use of synthetic, virtual, and physical aids to navigation while maintaining safety standards.

We are excited that the Coast Guard National Museum is coming to New London, now a Coast Guard City. It will be within direct line-of-sight of the RDC. In fact, we already display Coast Guard art, on loan, in our spaces. Besides adding color to typical government office décor the displays remind the scientists, engineers, and visitors about the Coast Guard's incredible history and achievements. We have been a part of that history and anticipate sharing some of our more interesting projects and prototypes developed along the way. That sharing started with this past year's static display at the New London Train Station and participation in a variety of events such as the Maritime Heritage Festival and hosting of the US Life Saving Service Heritage Association.

Operating in this budget environment reinforces our need to leverage every single resource and capability we have. We have been aggressively developing partnerships with a wide range of organizations. From shared research with several DHS Centers of Excellence, to exploring engagement with universities, FFRDCs, and industry we have ensured our work shows a return on investment to a wide range of Coast Guard stakeholders.

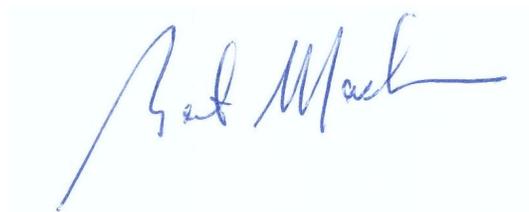
RDC Reflections and Future

We are always trying new ways to serve our customers. This past year we aligned our support to the Commandant's strategies in the Arctic, Western Hemisphere, Cyber, and Energy Renaissance. This is exemplified by projects like our Arctic Technology Evaluations with the HEALY, delivery of innovative patrol tactics and maritime object tracking technologies, assessment of maritime critical infrastructure wireless access vulnerabilities, and the first in-situ burn research testing at our Joint Maritime Test facility. We created groupings of projects that target a regional/technological emphasis where we can help reinforce strategies and better communicate the collective impact of our project portfolio. We jumped at the opportunity to be the first component innovation center. We are running our first prize competition in the search for design innovation of environmentally friendly buoys. We are compressing our project planning cycle for soliciting project ideas (ISR) and conducting the portfolio review (APP) with senior leadership so that our Congressional Justification submissions will be more precise and timely.

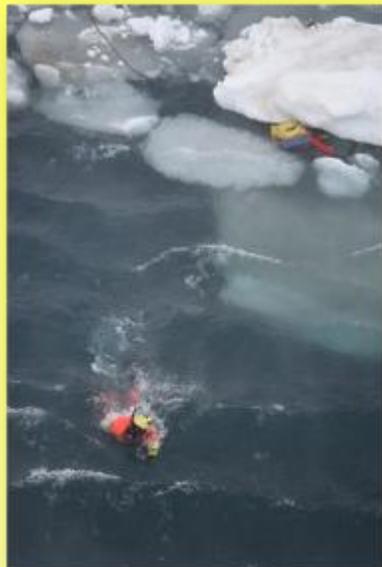
Looking ahead, we need to equip ourselves to tackle the big problems and assist Coast Guard leaders with implementing the next strategies. The recent release of the Human Capital Strategy resulted in a number of idea submissions for FY17 new project starts. We need to show a return on investment for every project or study we undertake. The "return" can take many forms from more effective, efficient, and focused operations to offering decision makers options for courses of actions.

I believe that integrating the Innovation Program into the RDT&E Program Office presents a great opportunity to find project ideas and innovation from both the bottom-up (ISR) and top-down (leadership-driven challenges). In 2015, we will look for more opportunities to partner with operational commanders in pilot projects and limited user evaluations such as the successful evaluations in D7, 8, and 11 involving non-lethal technologies. We will host a ribbon cutting of the new collaborative effort with DHS S&T in creating a Coast Guard S&T Innovation Center (CG-STIC). Because we will never be able to address all the ideas we receive, we promise to aggressively seek out new partnerships and explore new ways of doing business to execute as much as we possible can.

In a world that increasingly craves information in 10 second sound bites it is important for the Coast Guard to retain its institutional knowledge in research, science, and technology history while keeping organic skills fresh. This, I believe, is what gives us the ability to recognize those game-changing innovation opportunities and to continue the history of incremental improvement in mission execution through technology introductions. The National Coast Guard Museum Association, Inc. website states "Respect the past, engage the present and look to the FUTURE." The RDC is perfectly positioned as a strategic resource for the Coast Guard and DHS to execute this vision in the area of science and technology.



B.N. Macesker, RDC Executive Director



Images provided on the front and back covers reflect the RDC and Technical Partners conducting a Search and Rescue Exercise during the Arctic Technical Evaluation Expedition in July 2015.

More details regarding these events and other work done by the RDC can be found on the CGPortal or DHS HSIN RDC Blogs or by sending an email request to:

RDC-Info@uscg.mil



Mission

Provide innovative technologies, premier analysis, and decision support to enhance operational performance and reduce acquisition risk across all USCG missions.

Vision

To be the Coast Guard Authority for Research & Development; Test & Evaluation; and Acquisition & Operational Analysis.



U.S. Coast Guard Research & Development Center

**1 Chelsea Street, New London, CT 06320-5506, 860-271-2600
<http://www.uscg.mil/acquisition/rdc/rdc.asp>**

