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The Arctic

*Emerging frontier,
new opportunities*

*U.S. Coast Guard
Arctic Strategy*

Scientific Support

The U.S. Coast Guard Research and Development Center evaluates Arctic operational capabilities.

by MR. RICHARD L. HANSEN
Branch Chief
U.S. Coast Guard Research and Development Center

DR. JONATHAN M. BERKSON
Marine Science Program Manager
U.S. Coast Guard

LCDR KENNETH J. BODA
Strategic Analyst
U.S. Coast Guard

Science operations, research, and development in the Arctic have long been significant U.S. Coast Guard mission sets. Modern research projects help the service to meet hazards and threats in this remote locale.

In support of these missions, the U.S. Coast Guard created the Research and Development Center (RDC), a facility that provides research and development, as well as testing and evaluation services. These efforts are broad and varied, support the acquisitions and regulatory processes, and improve overall Coast Guard operations and mission support.

Evaluating Arctic Capacity

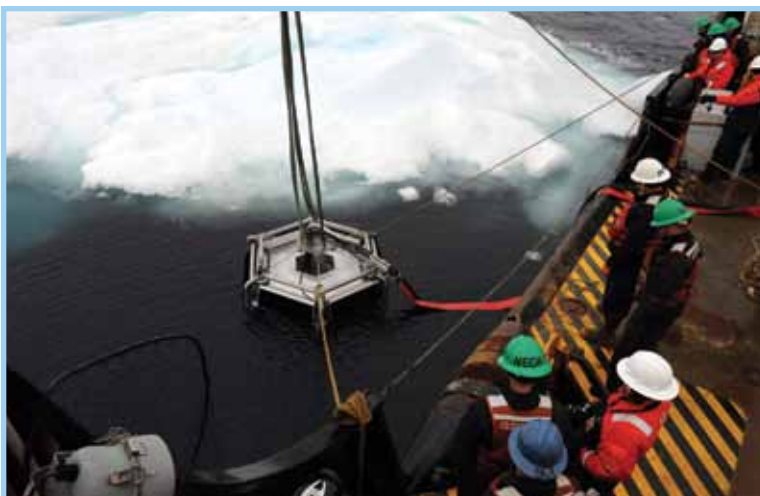
The center's efforts in the Arctic region include delivering a high latitude study in July 2010, which evaluated polar icebreaker capabilities, requirements, and Arctic and Antarctic mission needs.

To address the aging polar-class icebreakers, RDC also conducted a business case analysis that explored several options from major overhauls to icebreakers *Polar Sea* and *Polar Star*, as well as new build and lease options. The Department of Homeland Security forwarded this report to Congress in November 2011.

Arctic Oil Spill Response

An Arctic oil spill can cause major environmental damage, and the harsh weather and lack of logistical support would present huge challenges for response agencies. As such, the RDC has worked to evaluate and develop methods and equipment to respond to Arctic spills.¹ One finding: Equipment deployment exercises had not been conducted in ice, due to the lack of availability of ice-strengthened ships or ice-breakers.

In 2009, the Research and Development Center initiated efforts to evaluate technologies and determine a comprehensive approach to responding in ice. Results from that investigation led to the first dock-side demonstration at USCG Sector Sault Ste Marie in April 2011, where initial results highlighted the need for improved equipment. In January 2012, a second demonstration took place, consisting of a four-day sea trial, with demonstrations and observations on selected equipment, including four different skimmers, one fire boom, a remotely operated vehicle, and a vessel's fire-monitor system.



A "polar bear" skimmer is deployed from USCGC *Sycamore* during an *Arctic Shield 2012* exercise. U.S. Coast Guard photos.

Participants included crew from the Coast Guard buoy tender *Hollyhock*, three commercial tugboats, more than 50 personnel from multiple state and federal agencies, the Canadian government, and oil spill removal organizations.

Lessons learned were evaluated, and the technologies were again demonstrated as a part of the *Arctic Shield 2012* spilled oil recovery system exercise in August 2012, off of Barrow, Alaska. Another collaborative field demonstration in the Great Lakes incorporating a unified command occurred in February of 2013, along with plans for a more extensive demonstration in the Arctic in September of 2013.

Search and Rescue Challenges

At this time, the Coast Guard has no data on appropriate search swipe widths to assist search and rescue (SAR) mission controllers in developing search plans

for ice-covered waters. Should a maritime mishap occur in the icy Arctic waters, search and rescue controllers have only "liquid-water" search performance data available to guide search pattern assignments for response craft.

The RDC is addressing this SAR planning data gap by conducting mission-realistic search performance tests in the Great Lakes during winter weather conditions to develop a preliminary set of search planning data for Coast Guard helicopters and airboats searching ice-covered waters.

Response Asset Assessment

The Research and Development Center continues to address Arctic capability gaps by investigating response craft and cutter boats capable of operating in the Chukchi and Beaufort Seas. The results document a search of all types of craft for potential use in the Arctic.² Based on these findings, the Coast Guard invited industry to propose solutions that would then be brought up to the waters off Barrow, Alaska, to demonstrate their ability to meet the Coast Guard's needs. Two craft, selected from a field of industry proposals were tested, and the RDC delivered a report on the results in 2012.

Looking Forward

Continuing Arctic challenges include safe natural resource development, protecting wildlife and fish stocks, supporting safe shipping tourism, and ensuring food security for the indigenous communities. We are witnessing environmental and ecosystem changes in this region, demonstrating its fragile nature.

Support for Arctic science has been an important part of Coast Guard missions, and the demand for



From left, the USCG Research and Development Center demonstrates the ARKTOS, a two-hulled articulated amphibious evacuation vehicle, and a Coast Guard special purpose craft air boat.

U.S. Coast Guard-Supported Scientific and Geographic Discoveries

- 1957: USCGC *Northwind* discovers the Northwind Ridge and Northwind Abyssal Plain.
- 1960s: USCG Wind-class icebreakers advance understanding of physical, chemical, and biological processes in the Bering, Chukchi, and Beaufort Seas.
- 1988, 1992: USCGC *Polar Star* collects *benthic foraminifera* census.
- 1994: USCGC *Polar Sea* is the first U.S. surface vessel to reach the North Pole.
- 2003: USCGC *Healy* discovers the Healy Seamount—a previously unmapped rise that climbs more than 3,000 meters above the surrounding seafloor.
- Scientists aboard USCGC *Healy* report a decapod from Arctic ocean vents and note first report of the species *hymenodora glacialis* near marine hydrothermal vents.
- 2003-2011: USCGC *Healy* and Canadian CGC *Louis St. Laurent* map the U.S. and Canadian extended continental shelves in the Arctic Ocean.
- 2008: NOAA conducts ice seal population survey aboard USCGC *Polar Sea*.
- 2009: *Healy* discovers a seamount (still to be named).



Dr. Larry Mayer (left) and Capt. Andy Armstrong watch as an underwater mountain, called a seamount, is discovered on the Arctic Ocean floor on Aug. 25, 2009. USCGC *Healy*'s high-tech mapping system uncovered the seamount in the midst of an otherwise flat and featureless stretch of seafloor approximately 3,800 meters deep. U.S. Coast Guard photo by Petty Officer Patrick Kelley.

polar science and technology has never been greater. Whether it is oil spill response capability, improved response assets, or new anti-icing technology, the RDC is helping the Coast Guard chart an appropriate course for its expanding Arctic operations. It is clear that the Coast Guard has an enduring role in protecting the maritime Arctic by providing safety, security, and stewardship, while supporting our nation's science needs.

About the authors:

Mr. Richard L. Hansen is the branch chief of the Coast Guard Research and Development Center, New London, Conn. Previously he worked acoustics and weapons systems for the U.S. Navy, overseeing submarine construction and overhauls. He holds a B.S. from Northeastern University, and an M.S. from Worcester Polytechnic Institute.

Dr. Jonathan M. Berkson, the marine science program manager for the U.S. Coast Guard, received a Ph.D. in geophysics from the University of Wisconsin-Madison. Prior to this assignment, he worked at the NATO Undersea Research Centre in LaSpezia, Italy, and the Naval Research Laboratory in Washington, D.C.

LCDR Kenneth J. Boda is a strategic analyst at Coast Guard headquarters. He has served aboard USCGC *Polar Sea*, USCGC *Eagle*, and as a marine science instructor at the Coast Guard Academy. LCDR Boda is a graduate of the Coast Guard Academy, and holds master's degrees from Columbia University, and the Naval War College.

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Story, Jason, and Scot Tripp, Lou Steinbrecher, Mike Sprague, Bob McKenna. *Arctic Craft Investigation Report*. CG-D-02-12, RDC UDI #1215 Part A, August 2011.

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Endnotes:

¹ Hansen, Kurt and Marion Lewandowski. *Using Demonstrations to Advance Approaches to Response for Oil in ice Environments*. Arctic Technology Conference, OTC Paper 909318, February 2011.

² Story, Jason, and Scot Tripp, Lou Steinbrecher, Mike Sprague, Bob McKenna. *Arctic Craft Investigation Market Research Report*, RDC UDI #1215 Part B, August 2011.



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