



U.S. Coast Guard Arctic Response Workshop

**April 23, 2010
Anchorage, AK**

Coastal Response Research Center

U. S. Coast Guard Research and Development Center



FOREWORD

The Coastal Response Research Center, a member of the Environmental Research Group at the University of New Hampshire (UNH), develops new approaches to spill response and restoration through research and synthesis of information. The Center's mission requires it to serve as a hub for research, development, and technology transfer to the oil spill community. The Center facilitated a workshop entitled "U.S Coast Guard Arctic Response Workshop" for the U.S. Coast Guard Research and Development (R&D) Center (New London, CT). The workshop was held at the Millennium Hotel in Anchorage, Alaska on April 23, 2010. This report provides a summary of the workshop, and outlines methods of detection, mitigation on water, and cleanup along the shoreline in the event of an oil spill in ice infested waters in the Arctic and Great Lakes. Finally, a list of potential exercises to improve response capabilities was developed. Workshop participants represented a broad spectrum of constituencies and expertise including governmental agencies, industry, non-governmental organizations (NGOs) and indigenous people from the Arctic. The findings of this report will be used as a guide for development of response exercises in the Arctic and Great Lakes.

I hope you find the report interesting and exploring the discussion insightful. If you have any comments, please contact me. I look forward to hearing from you.

Sincerely,

A handwritten signature in blue ink, consisting of a stylized 'N' followed by a horizontal line.

Nancy E. Kinner, Ph.D.
CRRC Co-Director, UNH
Professor of Civil/Environmental Engineering

ACKNOWLEDGEMENTS

The authors of this report were: Zachary Magdol, Joseph Cunningham, Nancy Kinner, and Tyler Crowe. The Center acknowledges the time and effort provided by the participants in the workshop, whose contributions have been synthesized in this report. In addition, the Center acknowledges the thoughtful input and comments received from the reviewers of the draft report: Kurt Hansen and John McLeod (USCG).

The workshop was planned by Kurt Hansen (USCG), Nancy Kinner (CRRC), Christy Bohl (MMS), Jeffrey Estes (USCG), Larry Iwamoto (AK DEC), Lee Majors (AK Clean Seas), Scott Pegau (PWS OSRI), Mark Wagner (USCG), John Whitney (NOAA), and Kathy Mandsager (CRRC). The Center gratefully acknowledges David Dickins, Jeffery Estes, Gary Folley, Chris Petrich, Al Allen, and Ed Owens for giving plenary talks.

Citation:

Coastal Response Research Center. 2010. U.S. Coast Guard Arctic Response Workshop Report. University of New Hampshire, Durham, NH, 12 pp and appendices.

TABLE OF CONTENTS

Forward.....	1
Acknowledgements	2
I. Introduction	4
II. Workshop Organization and Structure.....	5
III. Discussion.....	6
A. Detection of Oil in Water and Ice	6
B. Mitigation of Oil on Water and Ice	7
C. Shoreline Cleanup	7
IV. Exercise Synthesis and Integration	9
V. Next Steps	10
VI. References	11
Appendix:	
A. Workshop Agenda	
B. Workshop Participants	

I. INTRODUCTION

Increasing average global temperatures have led to a dramatic decrease in the overall sea ice extent in the Arctic, with a measured reduction in both coverage and thickness. For example, sea ice coverage has been on a steady decline for the past 30 years, with an average decrease of 2.6% per decade (National Snow and Ice Data Center NSIDC, 2010). If these trends are to continue, the NSIDC predicts the Arctic will be ice-free by 2030.

The decrease in Arctic sea ice has increased human activity in the region. Waters that were once inaccessible are becoming navigable during the summer months, increasing options for shipping, fishing, tourism, and oil, gas, and mineral exploration. The US Geological Survey (USGS) estimates that the Arctic may contain 80 billion barrels of oil and 17,000 trillion cubic feet of natural gas. As Arctic waters become more easily accessible, development and transport of these resources becomes more likely.

While there have been few spills in the region, the Arctic is an area of high risk. Unpredictable and rapidly changing weather, ice coating of vessels, ice-breaking hazards, and limited navigational data are but a few of the challenges that increase the risk of accidents (CRRC 2009).

The Arctic is a unique environment that is particularly sensitive to disturbance and has a limited ability to recover from damage, including oil spills. An accidental spill in the Arctic and sub-Arctic regions could be environmentally devastating (CRRC, 2009). The very limited resources available to respond to a significant spill, along with the unique challenges the region poses due to sea ice, could result in long-term contaminations of Arctic habitats. A spill would also be disastrous for the people who depend on the natural resources for sustenance, cultural stability and employment.

Many spill response techniques, including mechanical recovery, dispersant application, and *in situ* burning were developed and validated for use in warmer, ice-free waters, and efficacy may be reduced in the frigid, ice covered and broken ice conditions often present in the Arctic. Detection of oil, a critical step in recovery, is also hindered.

Validation of response techniques in Arctic conditions is difficult due to the remoteness, extreme weather, and expense. While response techniques have been developed for use in ice-covered conditions, there are few opportunities to test them, or have responders gain practice with them, in spill exercises. One potential solution to this dilemma is testing response techniques in the Great Lakes during the winter months. Although the Great Lakes are freshwater, they often experience Arctic-like weather conditions during the winter months, and could provide an acceptable location for testing of response equipment in frigid and broken ice conditions. In addition, the USCG has more icebreaker capability in the Great Lakes, which would help facilitate on-water exercises. While not all techniques can be validated in a freshwater environment (i.e., dispersants), the proximity to major cities may make exercises in the Great Lakes a cost-effective substitute.

A workshop was held to seek input from practitioners to develop a plan to gain a better understanding of the efficacy of oil spill response techniques in the Arctic. The workshop:

- (1) Gathered information on state-of-the-art equipment, operations plans, and training techniques that can be used in the detection, mitigation, and cleanup of oil in the Arctic; and
- (2) Compiled a list of potential exercises that can be conducted in the Great Lakes (GL) and Alaska (AK).

II. WORKSHOP ORGANIZATION & STRUCTURE

The workshop, held at the Millennium Hotel in Anchorage, AK on April 23, 2010, consisted of plenary sessions where invited speakers presented relevant information on topics including: existing contingency plans, lessons learned from the M/V *Selendang Ayu*, characteristics of ice, and detection and mitigation of oil on water, ice and shorelines. The participants discussed potential exercises that could help prepare responders for incidents in the Arctic

The workshop agenda (Appendix A), participants (Appendix B), and discussion format were identified and developed by an Organizing Committee representing government, industry, and academia. The Organizing Committee consisted of:

Kurt Hansen, USCG R&D kurt.a.hansen@uscg.mil
Nancy Kinner, CRRC nancy.kinner@unh.edu
Christy Bohl, US MMS christy.bohl@mms.gov
Jeffrey Estes, USCG Sector Anchorage jeffrey.l.estes@uscg.mil
Larry Iwamoto, AK DEC larry.iwamoto@alaska.gov
Lee Majors, Alaska Clean Seas lmajors@alaskacleanseas.org
Scott Pegau, PWS OSRI wspegau@pwssc.org
Mark Wagner, USCG D17 mark.c.wagner@uscg.mil
John Whitney, NOAA john.whitney@noaa.gov

The participants included representatives from: indigenous communities; NGOs; industry; response organizations; and governmental entities with a vested interest in the Arctic.

This report contains a summary of the discussions, as well as a list of potential exercises to improve Arctic response. There were three main topics of discussion: (1) Detection of oil in the Arctic environment; (2) Mitigation of oil on water; and (3) Shoreline cleanup in the Arctic environment. Presentations were made by experts on each of these topics at the beginning of each session (see Appendix C for copies of the presentation slides). Four terms were defined at the beginning of the meeting.

1. *Experiments*: tests a new concept based on research.
2. *Exercise*: application of the experimental research. It is the process of determining the feasibility or practicality of a certain response tactic. It is a learning experience where experts are on scene, but the responders are those using the technology.

3. *Drill*: evaluation of stated capabilities by responders.
4. *Demonstration*: making an exercise or drill public.

III. DISCUSSION

The workshop participants determined whether the exercises could be performed in the Great Lakes or Alaska and whether oil was needed. A table outlining the proposed exercises and the conditions with which they can be performed is included for each topic (Tables 1-3).

A. Detection of Oil in the Arctic Environment

David Dickens, of DF Dickens Associates, gave a presentation on the topic of detection of oil in arctic conditions. Following the presentation a discussion convened, and the table below captures these results.

Table 1: Exercises for Detection of Oil in the Arctic Marine Environment

	Performed in the Great Lakes	Performed in Alaska
Without oil	<ul style="list-style-type: none"> • Test logistics of autonomous underwater vehicle (AUV) technology with different sensors • Test cross-boundary equipment agreements 	<ul style="list-style-type: none"> • Test aerial unmanned vehicles (permitting, logistics, sensors, data transmission) • Demonstrate shipboard infrared (IR) and radar for detecting a target • Use over flights to update NOAA manuals • Test cross-boundary equipment agreements • Evaluate synthetic aperture radar (SAR) satellite tracking
With oil	<ul style="list-style-type: none"> • Test dogs' abilities at sniffing oil under ice (could be done in any freshwater). Start at a minimum depth of 2 ft and increasing smell sensitivity to 6 ft 	<ul style="list-style-type: none"> • Test dogs' abilities at sniffing oil under ice • Demonstrate shipboard IR and radar for detecting a target • Evaluate ice tracking buoys

Other topics mentioned during the discussion were the possibility of using whale oil as a surrogate to petroleum based-oil, developing safety protocols for working on ice, and exploring additional sensors.

The highest priority tests were: testing the cross-boundary agreements, evaluating the ability of IR and radar to detect a target, and updating the NOAA over flight manuals. Secondary priorities were: test the surrogates for oil in conjunction with ice tracking buoys, and SAR satellite mapping. Tertiary goals were the testing of AUVs and testing/training oil-detecting dogs.

B. Mitigation of Oil on Water

Al Allen, of Spiltec, gave an opening presentation on mitigation of oil on water. A discussion on potential exercises for mitigation of oil on water followed. This section outlines the results of the discussion.

The group concluded that many of the exercises proposed could be done in the Great Lakes and Alaskan regions. The most appropriate and effective of these locations for an Arctic spill scenario must be determined (Table 3).

The group concluded that the primary goals should be to determine the operational limitations of booms, testing the concept of open apex, vessel-based ice management, and ice management using ice-strengthened vessels. Secondary goals should include an exercise on existing methodologies to deploy dispersants. Tertiary goals are testing of response platforms for use in overflood and/or rotting ice conditions and fixed wing ignition, where permitted. It was noted that the equipment for testing response platforms for over flood and rotting ice conditions are already present in the Beaufort Sea.

C. Shoreline Cleanup

The introductory presentation on shoreline cleanup and assessment was given by Ed Owens, of Polaris Applied Sciences. The group discussion, following the presentation, identified possible activities for exercising shoreline cleanup and assessment techniques.

Table 2: Exercises for Shoreline Cleanup and Assessment

	Performed in the Great Lakes	Performed in Alaska
Without oil	<ul style="list-style-type: none">• Test assembling, outfitting, mobilizing, safety, communications plan, and equipping SCAT teams• Evaluate surf washing (clay/oil flocculation and/or oil-mineral aggregates (OMA))• Evaluate shoreline trenching	<ul style="list-style-type: none">• Assembling, outfitting, mobilizing, safety, communications, plan, equip SCAT teams• Evaluate surf washing (clay/oil flocculation and/or OMA)
With oil	<ul style="list-style-type: none">• Evaluate surf washing (clay/oil flocculation and/or OMA)	<ul style="list-style-type: none">• Evaluate surf washing (clay/oil flocculation and/or OMA)

The exercises are unique in that they can all be done independent of the detection and marine mitigation exercises. The shoreline tests must involve local communities and indigenous peoples because of their local knowledge and the limited personnel available with experience in these environments.

The group concluded that all exercises could be performed without oil or using a surrogate oil, to ensure that practice is successful while inflicting minimal damage on the environment.

Table 3: Exercises for Mitigation of Oil Spills in Arctic Waters

	To be Performed in the Great Lakes	To be Performed in Alaska
Without oil	<ul style="list-style-type: none"> • Determine operational limitations of fireproof and/or ice-strengthened conventional booms • Testing concept of open apex • Provide experience for spill responders • Vessel based ice management (rivers and open water) using a z-drive ice breaker or other ice vessels • Ice management using ice deflection booms, barges, tow boats and other ice-strengthened vessels • Exercise existing methodologies to deploy dispersants (SINTEF articulating arm, spray booms, helicopter, fixed-wing, new gel-based dispersant equipment, fire monitors, deflection boom, APEX dispersion) • Test response platforms for use in over flood and/or rotting ice conditions (e.g., ARCTOS, airboats, hovercraft) • Test fixed-wing ignition after experimentation phase completed • Evaluate self-propelled skimmer after experimental phase 	<ul style="list-style-type: none"> • Determine operational limitations of fireproof and/or ice-strengthened conventional booms • Testing concept of open apex • Provide experience for spill responders • Evaluate ice management technique using ice deflection booms, barges, tow boats and other ice-strengthened vessels • Exercise existing methodologies to deploy dispersants (SINTEF articulating arm, spray booms, helicopter, fixed-wing, new gel-based dispersant equipment, fire monitors, deflection boom, APEX dispersion). • Test response platforms for use in over flood and/or rotting ice conditions (e.g., ARCTOS, airboats, hovercraft) • Test fixed-wing ignition after experimentation phase completed
With oil	<ul style="list-style-type: none"> • Determine operational limitations of fireproof and/or ice-strengthened conventional booms • Test concept of open apex • Provide experience for spill responders 	<ul style="list-style-type: none"> • Determine operational limitations of fireproof and/or ice-strengthened conventional booms • Test concept of open apex • Provide experience for spill responders • Evaluate Fuzzy Disc skimmers and grooved drum skimmers (and possible other devices) after experimental phase

IV. EXERCISE SYNTHESIS & INTEGRATION

The synthesis discussion determined which exercises could be integrated, where they could be conducted, and whether oil was necessary to complete the exercise. The order in which the exercises should be conducted was then determined. The overall Arctic exercise hierarchy, in order of sequence, is below.

Phase I: Detection and Shoreline Assessment without Oil:

- Test logistics of autonomous underwater vehicle (AUV) technology with different sensors.
- Test aircraft (e.g., Dash-7 oil surveillance plane, Twin Otter) and cross-boundary agreements.
- Exercise aerial unmanned vehicles (i.e., permitting, logistics, sensors, data transmission).
- Demonstrate shipboard infrared (IR) and radar for detecting a target.
- Verify NOAA manuals with over-flights for ice conditions and false positives.
- Exercise dog sniffing for detecting oil under ice (e.g., ice thickness 2 – 6 ft).
- Exercise ice tracking buoy.
- Test synthetic aperture radar (SAR) satellites for mapping ice composition and movement.
- Exercise assembling, outfitting, mobilizing, the safety of, and the communications plan for Shoreline Cleanup Assessment Technique (SCAT) teams.

Phase II: Ice Management without Oil:

- Determine operational limitations of fireproof and/or ice strengthened conventional booms
- Test concept of open apex.
- Test vessel based ice management in rivers and open water, using a z-drive ice breaker or other ice vessels.
- Exercise ice management using ice deflection booms, barges, tow boats and other ice-strengthened vessels.
- Exercise existing methods to deploy dispersants (e.g., SINTEF articulating arm, spray booms, helicopter, fixed-wing, gel-based dispersant equipment, fire monitors, deflection boom, open apex dispersion, ARKTOS (amphibious) vehicles).
- Test response platforms for use in over-flood and/or rotting ice conditions (e.g., ARCTOS vehicle, airboats, hovercraft).
- Exercise fixed-wing *in situ* burn ignition after experimentation phase is complete (approximately 6 months).

Phase III: Deployment of Experimental Equipment without Oil

- Repeat Phases I and II.
- Test self-propelled tethered skimmer after experimental phase.
- Exercise fuzzy disc skimmers and grooved drum skimmers.
- Exercise surf washing (e.g., clay/oil flocculation, oil mineral aggregate (OMA)).

Phase IV: Deployment of Experimental Equipment without Oil

- Repeat Phase III using oil, or a surrogate (e.g., whale oil, peat moss) where applicable.

V. NEXT STEPS

A similar workshop focusing on oil spills in ice environments was held in Cleveland, OH on August 25, 2010. The outcomes of these two workshops will be the basis for an initiative by the USCG R&D Center (New London, CT) on response technologies and related exercises on oil spills in ice. As part of this initiative the USCG will develop a plan for relevant exercises in the Great Lakes and/or Arctic regions and perform these based on available funding.

VI. REFERENCES

1. Coastal Response Research Center (2009) . “Opening the Arctic Seas: Envisioning Disasters and Framing Solutions” University of New Hampshire, Durham NH.
2. Transportation Research Board of the National Academy of Sciences. 2008. Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment. Special Report 293. National Academies Press. Washington, DC.
2. National Snow and Ice Data Center (NSIDC). 2008. "Arctic Sea Ice Down to Second-Lowest Extent; Likely Record-Low Volume" Press Release - October 2, 2008
3. National Snow and Ice Data Center (NSIDC). 2010. "Arctic sea ice reaches lowest extent for 2010” Press Release – September 15, 2010
http://nsidc.org/news/press/20100915_minimum.html
4. Symon, Carolyn. Arris, Lelani. Heal, Bill. 2005. Arctic Climate Impact Assessment. Cambridge University Press. New York, NY.
5. United Nations Environment Programme (UNEP). 2007. Global Outlook for Ice and Snow. Birkeland: SMI Distribution Services Ltd., 235 pp.
6. United States Geological Survey. 2008. Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle. USGS Fact Sheet 2008-3049
7. Weller, G. 2005. Summary and Synthesis of the ACIA. In: Arctic Climate Impact Assessment, pp. 989-1020. New York: Cambridge University Press.



U.S. COAST GUARD ARCTIC RESPONSE WORKSHOP



**FRIDAY, APRIL 23, 2010
MILLENNIUM HOTEL, ANCHORAGE, AK**

AGENDA

- 8:00 Registration and Continental Breakfast
- 8:30 Introductions/Expectations Nancy E. Kinner, UNH Co-Director,
Coastal Response Research Center
- 8:45 Background Kurt Hansen, Acquisition Directorate,
U.S. Coast Guard R&D Center
- 9:00 Past Experiences/Exercises David Dickins
DF Dickins Associates, LLC
- 9:15 Current Scenarios in Existing Contingency Plans:
Barge Failure Jeffrey Estes, U.S. Coast Guard, Anchorage
Tanker Failure Jeffrey Estes
Blowout Kurt Hansen
- 9:30 Learning From the Selendang Ayu Gary Folley,
AK DEC, On Scene Coordinator
- 9:45 Ice Characteristics Chris Petrich, Floating Ice Group,
University of Alaska, Fairbanks
- 10:00 *Break*
- 10:15 Detection (a brief overview) David Dickins, President
Group Discussion DF Dickins Associates, LLC
- 11:45 *Lunch*
- 12:30 Mitigation on Water (a brief overview) Al Allen, Oil Spill Consultant,
Group Discussion Spiltec
- 2:00 Cleanup on Shoreline (a brief overview) Ed Owens, Principal
Group Discussion Polaris Applied Sciences
- 3:30 *Break*
- 3:45 Develop List of Potential Exercises and Next Steps
- 5:00 Closing



U.S. Coast Guard Arctic Response Workshop

April 23, 2010



Participants

Al Allen
Spiltec
alan@spiltec.com

*Christy Bohl
U.S. Minerals Management Service
christy.bohl@mms.gov

Mike Bronson
BP
michael.bronson@bp.com

Gordon Brower
North Slope Borough
gordon.brower@north-slope.org

David Dickins
DF Dickins Associates, LLC
dfdickins@sbcglobal.net

Hajo Eicken
University of Alaska, Fairbanks
Hajo.eicken@gi.alaska.edu

*MSTCS Jeffrey Estes
U.S. Coast Guard, Sector Anchorage
jeffrey.l.estes@uscg.mil

Gary Folley
Alaska Dept of Environmental Conservation
gary.folley@alaska.gov

*Kurt Hansen
U.S. Coast Guard, Research & Development Ctr
kurt.a.hansen@uscg.mil

Eppie Hogan
BP
eppie.hogan@bp.com

*Larry Iwamoto

Alaska Dept of Environmental Conservation
larry.iwamoto@alaska.gov

Ken Lee
Fisheries & Ocean Canada
leek@mar.dfo-mpo.gc.ca

*Lee Majors
Alaska Clean Seas
lmajors@alaskacleanseas.org

John McLeod
U.S. Coast Guard, Research & Development Ctr
john.a.mcleod@uscg.mil

Cecil McNutt
U.S. Coast Guard, D17
cecil.d.mcnutt@uscg.mil

Judy Miller
ASRC Energy
judy.miller@asrcenergy.com

Herb Oertli
U.S. Coast Guard, D9
herb.l.oertli@uscg.mil

Ed Owens
Polaris Applied Sciences
ehowens@polarisappliedsciences.com

CDR Steven Pearson
U.S. Coast Guard, Sector Anchorage
steven.t.pearson@uscg.mil

*W. Scott Pegau
PWS Oil Spill Recovery Institute
wspegau@pwssc.org

Christian Petrich
University of Alaska, Fairbanks

chris.petrich@gi.alaska.edu

Peter Pritchard
Alaska Chadux Corporation
ppritchard@chadux.com

Fenton Rexford
Tribal Administrator for Kaktovik
okomailak@yahoo.com

Ricardo Rodriguez
U.S. Coast Guard, D17
ricardo.rodriguez@uscg.mil

Michele Sherwood
U.S. Environmental Protection Agency
sherwood.michele@epamail.epa.gov

Becky Silves
ConocoPhillips
becky.silves@conocophillips.com

David Simmerman
DOD (SUPSALV)
simmermandw@essmnavy.net

Walt Tague
Crowley
walt.tague@crowley.com

*Mark Wagner
U.S. Coast Guard, D17
mark.c.wagner@uscg.mil

*John Whitney
NOAA ERD SSC
john.whitney@noaa.gov

Robert Whittier
U.S. Environmental Protection Agency
whittier.robert@epa.gov

Heather Ballesterio
Coastal Response Research Center
heather.ballesterio@unh.edu

Joseph Cunningham
Coastal Response Research Center
joseph.cunningham@unh.edu

Zachary Magdol
Coastal Response Research Center
zachary.magdol@unh.edu

*Kathy Mandsager
Coastal Response Research Center
kathy.mandsager@unh.edu

CRRC Staff:

*Nancy Kinner
Coastal Response Research Center
nancy.kinner@unh.edu