6th Symposium on the Impacts of an Ice-Diminished Arctic on Naval and Maritime Operations

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Distribution Statement A. Approved for public release; distribution is unlimited.
The Office of Naval Research
The S&T Provider for the Navy and Marine Corps

- 4,000+ People
- 23 Locations
- $2.1B / year
- >1,000 Partners

Discover → Develop → Deliver → Technological Advantage

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Naval S&T Investment Strategy

- Assure Access to Maritime Battlespace
- Autonomy & Unmanned Systems
- Electromagnetic Maneuver Warfare
- Expeditionary & Irregular Warfare
- Information Dominance/Cyber
- Platform Design & Survivability
- Power & Energy
- Strike & Integrated Defense
- Warfighter Performance

1-2 years
Quick Reaction & Other S&T
≈ 8%

2-4 years
Technology Maturation (FNCs, etc)
≈ 30%

4-8 years
Leap Ahead Innovations (Innovative Naval Prototypes)
≈ 12%

5-20 years
Discovery & Invention (Basic and Applied Science)
≈ 45%

Focus

Broad

Current Fleet/Force
Fleet/Force in Development
Future Fleet/Force

Portfolio is balanced across near, mid, and long term S&T investments

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Navy Strategic Objectives for the Arctic

• Ensure U.S. Arctic sovereignty and provide homeland defense
• Provide ready naval forces to respond to crises and contingencies
• Preserve freedom of the seas
• Promote partnerships within the U.S. and with international allies

Navy Implementation Plan includes:

• Strategy, Policy, Missions, and Plans
• Operate Safely and Proficiently
  – Science and Technology
  – Environmental Observation and Prediction
  – Platforms, Weapons, Equipment and Sensors
• Build Trust and Confidence
• Execution
Navy forecast of sea ice through 2030

**Bering Strait**
- 6 months open water by 2025
- 51 miles wide
- 98' – 160' deep

**Northern Sea Route**
- 6 weeks open water by 2025
- Icebreaker currently required
- 41' controlling draft

**Northwest Passage**
- Intermittently open
- First open 2008
- Not open in 2012
- 33' controlling draft

**Transpolar Route**
- 2 weeks open water by 2025
- Direct, deep ocean transit

*Significant periods of open water conditions throughout large areas of the Arctic by 2025*
ONR Initiatives in the Arctic (2012-2020)

- **Arctic & Global Prediction Program**
- **Ocean Acoustics Program**
  - Marginal Ice Zone (MIZ) DRI
    2012-2016 (2014 Experiment)
  - Canada Basin Acoustic Propagation Experiment (CANAPE)
    2015-2017
  - Sea State & Boundary Layer Physics DRI
    2013-2017 (2015 Experiment)
  - Stratified Ocean Dynamics in the Arctic (SODA)
    2016 -2020 (2018 Experiment)

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Naval S&T Investments in Arctic Surface Platform Operations

Ship Stability Risk from Ice Accretion

- Early warning system that quantifies the impact of topside icing on ship stability and provides an adjusted operational envelope

Sea Ice - Hull Interactions

- Improved ice-ship interaction modeling techniques to aid in ice class ship design

Ice-Phobic Coatings for Ships

- Robust and affordable anti-icing surfaces that also reduce ice adhesion to substrates

Ice-Capable Propulsors

- Computational methods/tools for the design of ice-capable propellers/propulsors
“Today’s force is powered by naval research, and current investments will ensure the next generation of Sailors and Marines are equally dominant when called upon.” – Naval S&T Strategy