

# Surface Navy Warship Arctic Operability



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# Outline

- Arctic Maritime Policy and Guidance
- Ship Operational Requirements, Capabilities and Ship Changes
- Operational Requirements, Capabilities and Limitations
- Cross-decked Arctic Pack Up Kit
- Operator Guidance
- Research & Development Work



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# Arctic Maritime Policy and Guidance

2017: NORTHCOM Arctic Capabilities Based Assessment (CBA)

2017: Arctic Maritime Homeland Defense Initial Capabilities Document (ICD) approved by the Joint Requirements Oversight Council (JROC) (107-17)

2017 & forward : NDAA's require DoD identify Arctic capabilities and gaps

2018: Future Surface Combatant Force ICD (099-18)

2018: SECNAV inquiry on Surface Navy Arctic Capabilities

2018: GAO Report on Navy Capabilities in the Arctic

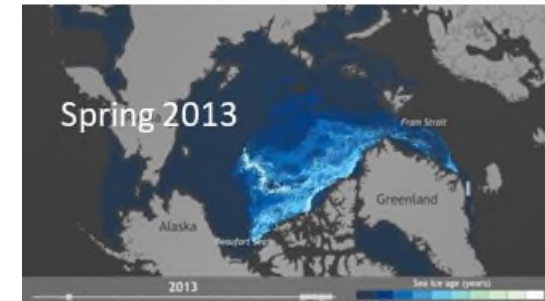
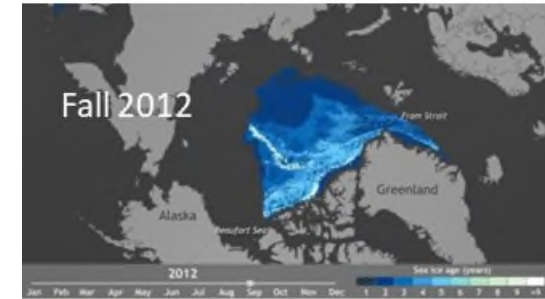
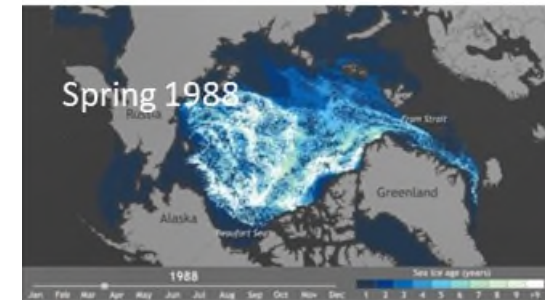
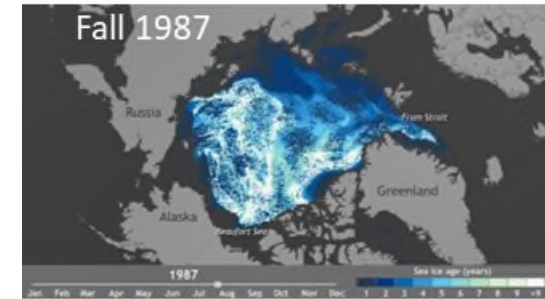
2019: NATO Arctic Manual ATP-17 updated (Rev E V1)

2019: CNO Strategic Outlook for the Arctic

2020: Chartered NAVSEA Arctic IPT Stood Up

2020: Arctic Maritime Homeland Defense Log ICD approved by J8 (043-20)

2021: Department of the Navy Blueprint for a Blue Arctic



“Naval Forces : The Department will evaluate and modernize existing and future forces to provide manned and unmanned operational presence and patrol options in cold weather and ice-diminished Arctic waters.”

# DDG 51 Operational Requirements

- 28°F water temperature
- 10°F air temperature for HVAC
- 100 knot beam wind
- 7.5 lb/ft<sup>2</sup> topside ice loading



# DDG 51 Arctic Operability Capability Tiers



Arctic Capability Tier	Ship Change	Time of Year	Requirement
	Existing capability (no changes)	Late Summer (3 Months)	28°F Water , 10°F Air 7.5 lb/ft <sup>2</sup> topside ice load
<b>1</b>	Low Impact - temporary ship changes accomplished pier-side prior to Arctic operations	Late Summer (3 Months)	28°F Water , 10°F Air 7.5 lb/ft <sup>2</sup> topside ice load
<b>2</b>	Medium Impact –Technology insertion/ship changes during maintenance availability	Late Spring to Early Fall (4-6 Months)	28°F Water , 10°F Air 7.5 lb/ft <sup>2</sup> topside ice load
<b>3</b>	High Impact - Ice strengthening for new construction only (structural modifications)	Spring to Winter (6-12 Months)	28°F Water , 10°F Air 7.5 lb/ft <sup>2</sup> topside ice load

# Adding Capability by Tiers



## Tier 1 (low impact) Temporary Changes

- Cross-decked Arctic Pack Up Kit





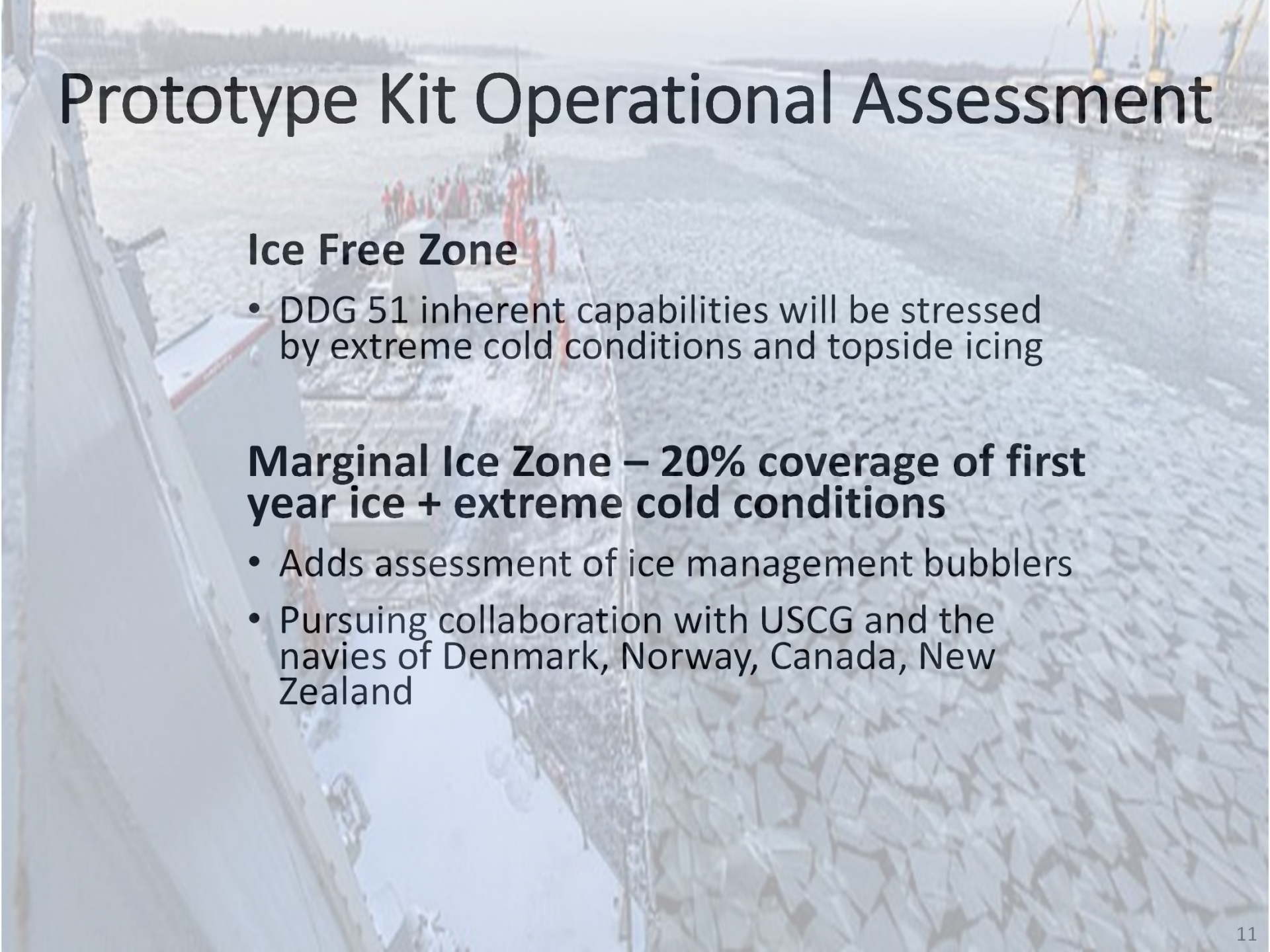
# Cross-decked Arctic Pack Up Kit

- OPNAV N96 - Office of Naval Research (ONR) - sponsored study by Naval Surface Warfare Center Carderock
- Input from NATO allies as well as partner navies (Finland & New Zealand)
- Interviews of CO/XO of USS PORTER (DDG 78), USS JAMES E. WILLIAMS (DDG 95) and USS NORMANDY (CG 60) post-Arctic ops
- Input from US Coast Guard and Arctic Submarine Lab
- Working Group (DESRON 60, C6F, USFF, SURFOR, NAVSUP, DLA, Natick Lab, NAVSEA PMS 443 and PMS 339, Technical Warrant Holders, NSWC, MSC, USCG)
- Input from NAVSEA-sponsored Gibbs & Cox study assessing commercial shipping, and oil & natural gas industry best practices and lessons learned
- Input from SURFLANT N41, USS MASON (DDG 87) and USS ROOSEVELET (DDG 80) on kit content and shipboard temporary stowage locations (fore peak, empty paint lockers, etc.)
- ONR - sponsored assessment of *prototype* kit in 2022
- TYCOM management of pre-positioned cross-decked kits

# Kit Component Examples

- Fire Resistant Environmental Ensemble clothing (PPE)
- Night vision binoculars for ice detection
- High intensity search lights
- Lithium batteries (rated to -40 degrees F)
- Portable de-icing steam lances
- In-port over the side ice management bubblers
- RHIB engine lube oil heaters
- Portable space heaters
- Traction mats

# Prototype Kit Operational Assessment



## **Ice Free Zone**

- DDG 51 inherent capabilities will be stressed by extreme cold conditions and topside icing

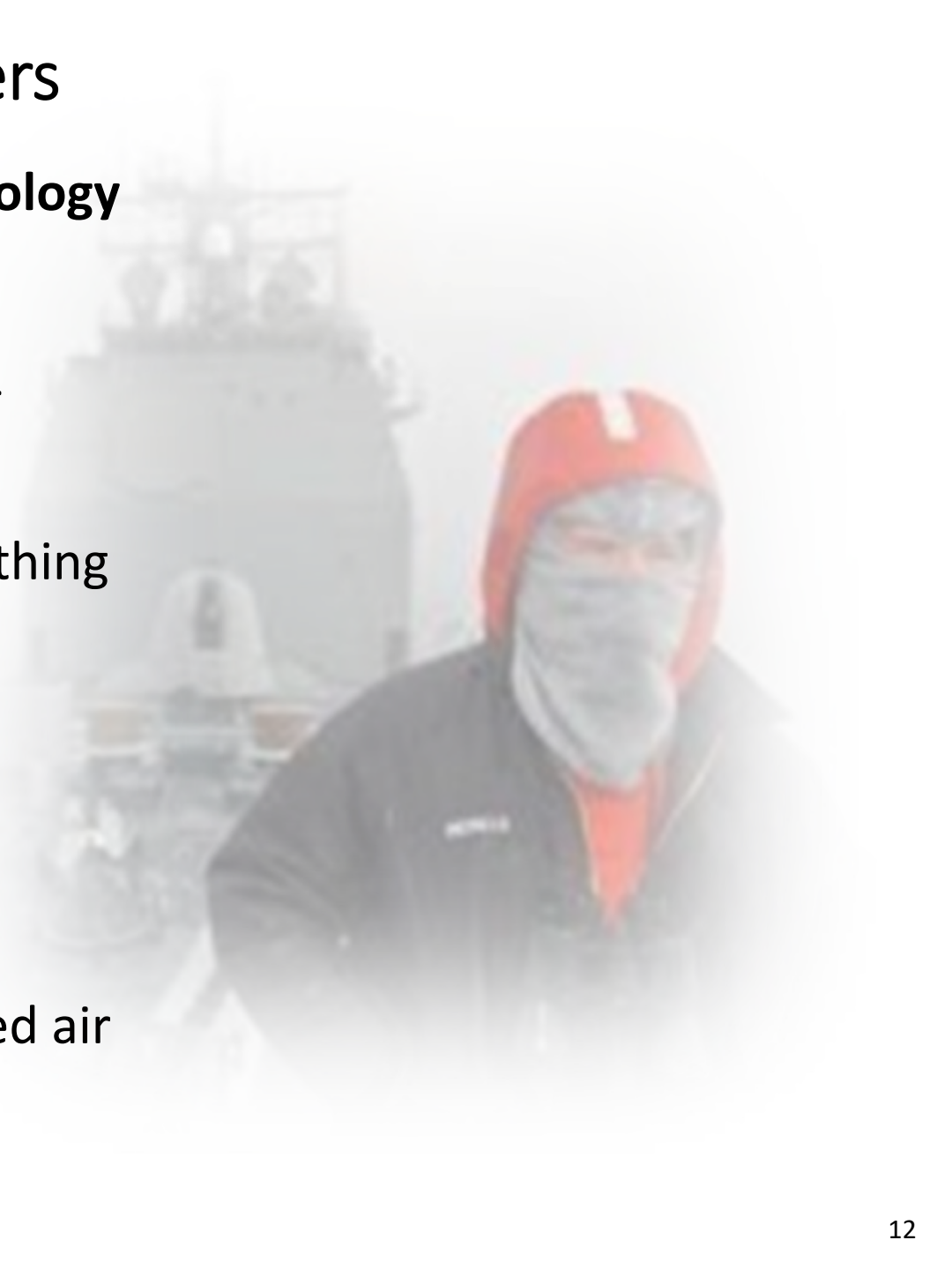
## **Marginal Ice Zone – 20% coverage of first year ice + extreme cold conditions**

- Adds assessment of ice management bubblers
- Pursuing collaboration with USCG and the navies of Denmark, Norway, Canada, New Zealand

# Adding Capability by Tiers

## Tier 2 (medium impact) Technology Insertion

- HVAC system modifications – increased heater rating
- Interior hull insulation in berthing spaces
- Piping trace heating
- Winterization of topside weapons/sensors
- Sea chest heating/compressed air blow out
- Propeller blade change out



# Adding Capability by Tiers

## **Tier 3 (high impact) Ice Strengthening, for new construction ships only**

- Increase shell plate thickness
- Decrease longitudinal stiffener spacing
- Decrease transverse frame spacing
- Modify transom geometry to reduce astern ice going power requirements



# Operator Guidance

- US Navy Cold Weather Handbook for Surface Ships
- *Integrated* Fleet Weather Center Norfolk – US National Ice Center ship MOVREP support (Optimum Track Ship Routing)
- Pre-underway check list to include drain and isolate sea water/fresh water risers near the shell, etc.
- Kit component familiarization
- Ship Mobility





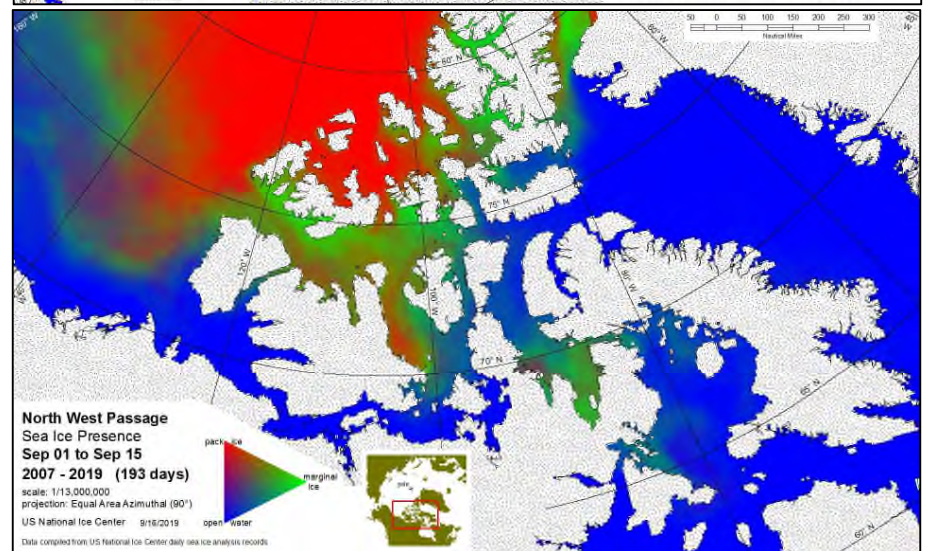
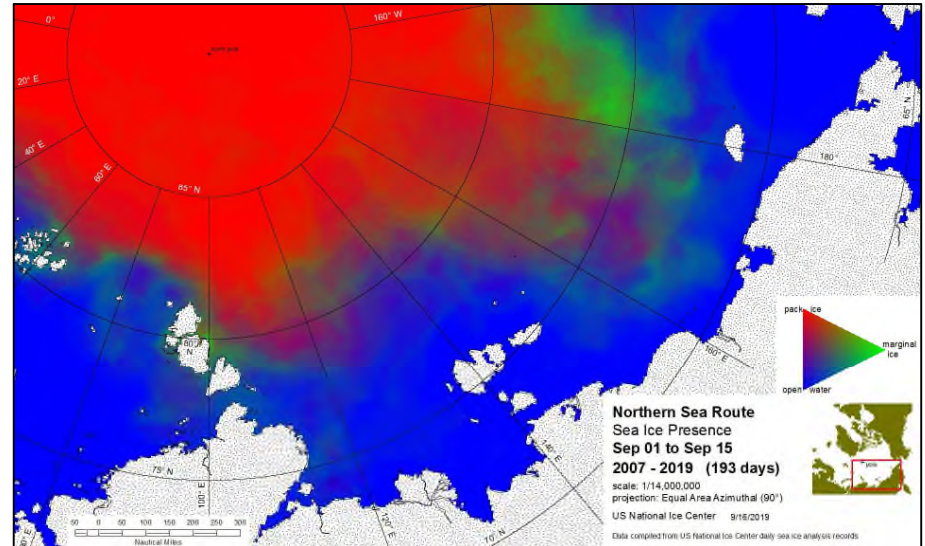
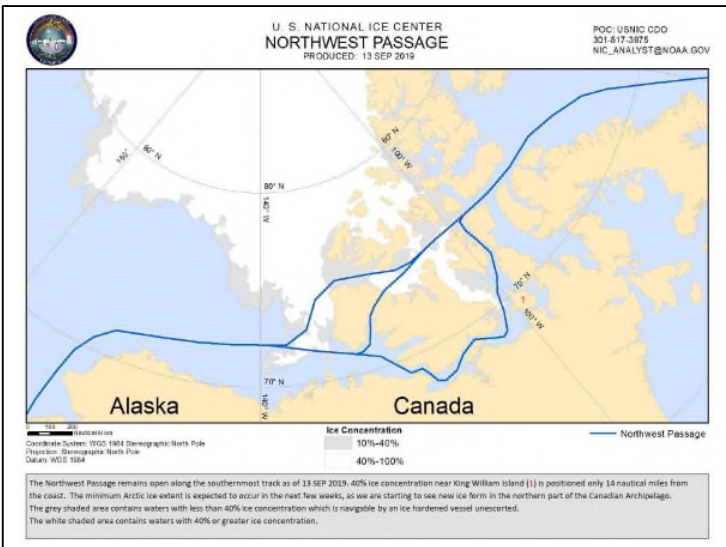
# Sea Route Products



## Northern Sea Route



## Northwest West Passage





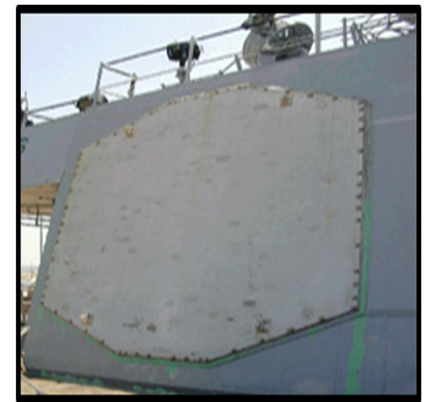
# Operator Guidance

- Tailored medical training
- Navigation, Seamanship & Shiphandling Training
  - Conning Officer Trainer
  - Integrated Navigation Team Trainer
  - Available from NATO allies
- OPNAV N3/N5 Exchange Officer Program
- *Additional* Operator Guidance required for C4I, boat launch, handling and recovery, topside sensors and weapons, UNREP, SATNAV, marine mammal avoidance, unmanned systems, flight ops, etc.



# Research & Development Work

- Anti-icing topside coatings (steel, aluminum and PCMS tiles)
- Sea ice detection in fog (passive millimeter wave imaging sensor/ ice detection software)
- Structural modifications for *new construction* ships
- Topside ice accumulation prediction and detection
- Ice-phobic RF energy transparent SPY array covers
- Durable seal/gasket elastomer material
- Artificial Intelligence-enabled collision avoidance  
Operator Decision Aid





# Summary

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# Questions and Discussion



# Contact Information

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Back Up

# Russian Navy Icebreaker – Ivan Papanin

- Strengthened & reinforced hull
- Vessel length of approximately 110m and width of 20m
- Displacement 8,500t to accommodate 60 crew members & an additional 50 members
- Speed of up to 16k and range of up to 6,000 miles
- Operate in the Arctic zone for up to 60 days
- Navigation capability through 1.5m-thick sea ice crusts
- Heavily armed



# Russian Cruiser Marshal Ustinov







# Tailored Support Products

