

Assured Arctic Awareness (Triple A)

Mr. Andy Coon, STO PM

Mr. John Kamp, STO PM

Industry Day briefing

March 30, 2012





AAA Proposer Day Agenda

March 30, 2012

- (45 min) Registration
- (5 min) Welcome and Introductions – Andy Coon
- (20 min) DARPA Overview – Woodbury, or Appleby, or Coon
- (60 min) AAA Program Brief
 - Program Motivation, BAA scope - Andy Coon
 - BAA technology areas, testing – John Kamp
 - Contracts overview – SwatloskiCanadian Defence – Keith Niall
NSF's Arctic Research Support & Logistics Program
 - Renée Crain
- (30 min) Break and Collect Q&A's
- (30 min) Q&A until done

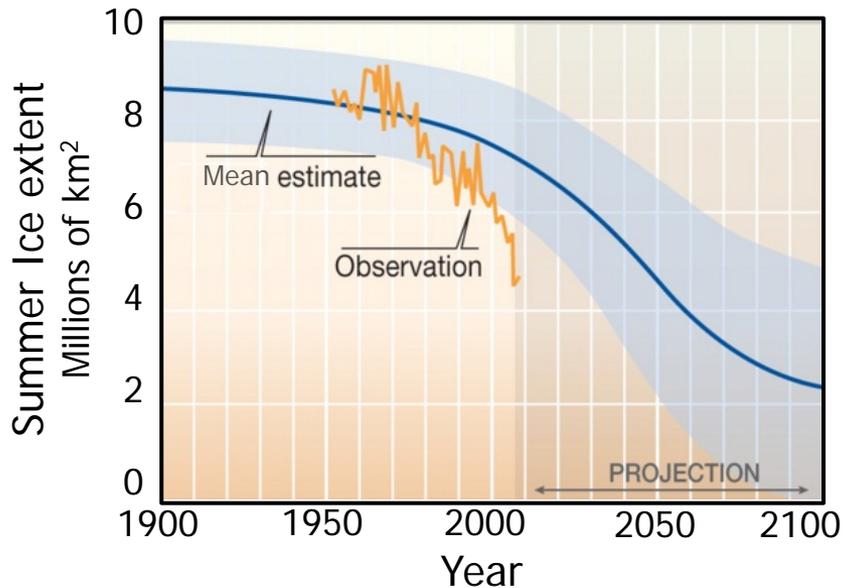


Program Overview and Motivation

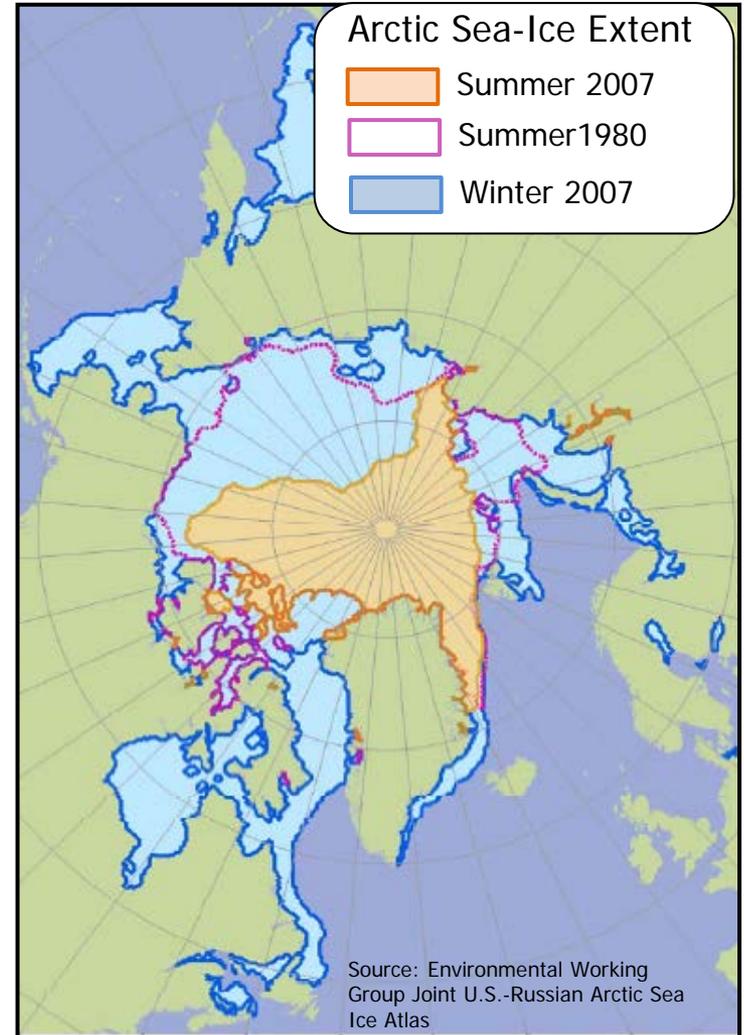


Arctic Ice Extent

- Extent varies seasonally
 - Max (March 2007): ~15 million km²
 - Min (September 2007): ~5 million km²
 - 48 US States: 8.1 million km²
- Summer extent declining



Source: Max Planck Institute for Meteorology



Source: Environmental Working Group Joint U.S.-Russian Arctic Sea Ice Atlas



Retreating ice will...

...expose new trade routes and resources,...



... with challenging surveys to claim seafloor rights

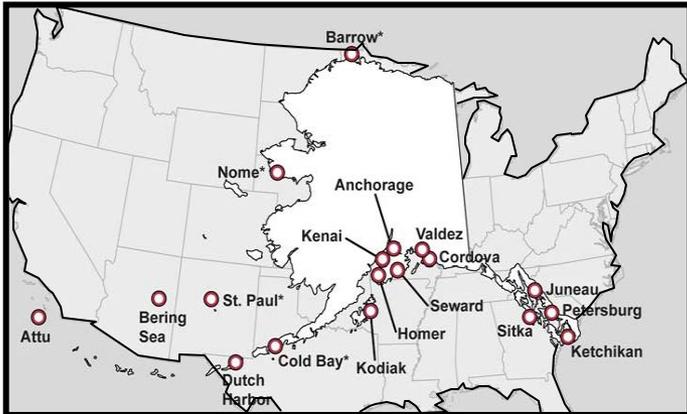


- Average transportation cost (London-Tokyo) reduced by 40% (~6000nmi shorter)
- Arctic predicted to hold a large fraction of the world's undiscovered oil (13%) and natural gas (30%)

- UN Convention on Law of Sea Treaty (UNCLOS):
 - Complex geological criteria to claim seafloor extensions
 - Not ratified by US
- Russia claims greatest portion of the seafloor
- China increasing activity in region

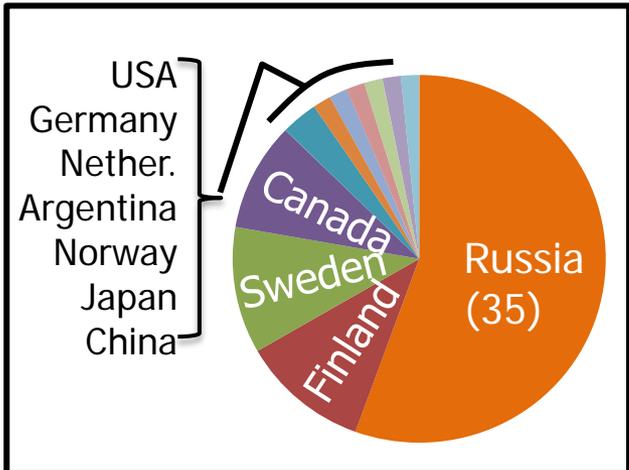


We are an Arctic nation with little presence



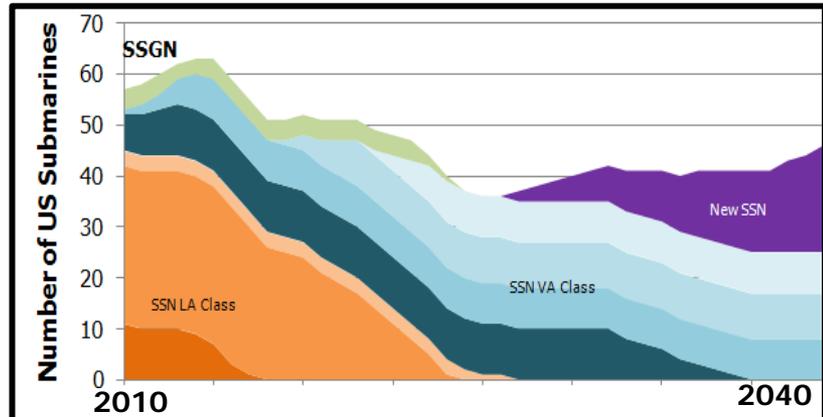
USCG ports well below Arctic circle.

- GAO estimates \$3-6B for Coast Guard forward infrastructure



Worlds Ice Breakers.

- One medium ice breaker \$0.8B



Submarine force structure decline.

- SSN cost >\$2B per copy
- SSNs to decline from 51 to 38 by 2028
- Arctic adds 1 new Ocean (8% of world surface)

Traditional forward presence will require billions in investment

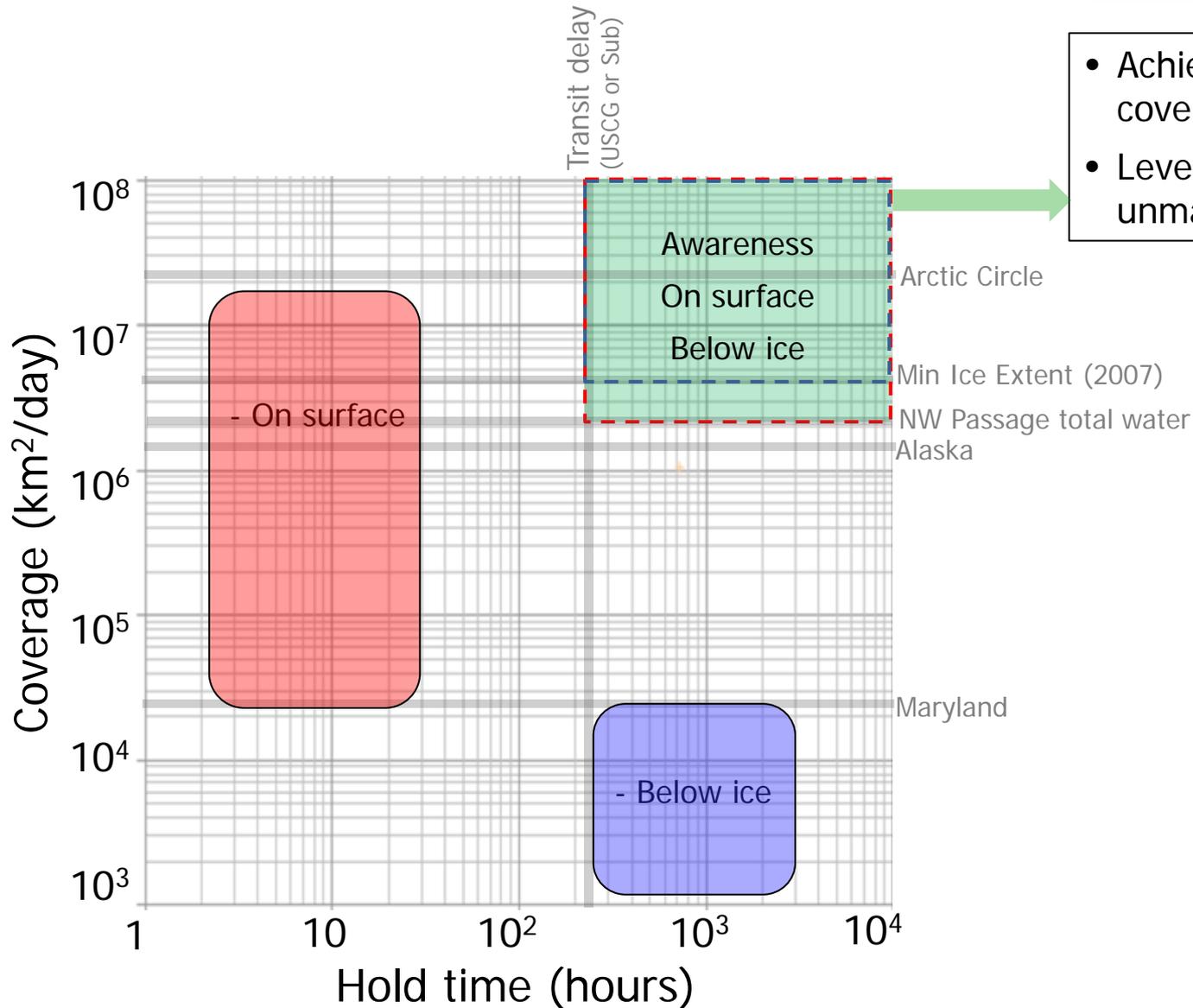


Absent this traditional investment, how do we achieve effective response in the Arctic?



Through assured awareness

(Find and hold targets)

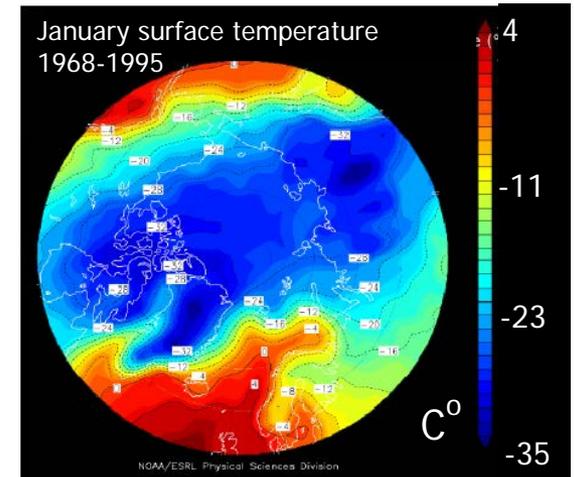


- Achieve affordable coverage and holding
- Leverage distributed unmanned systems

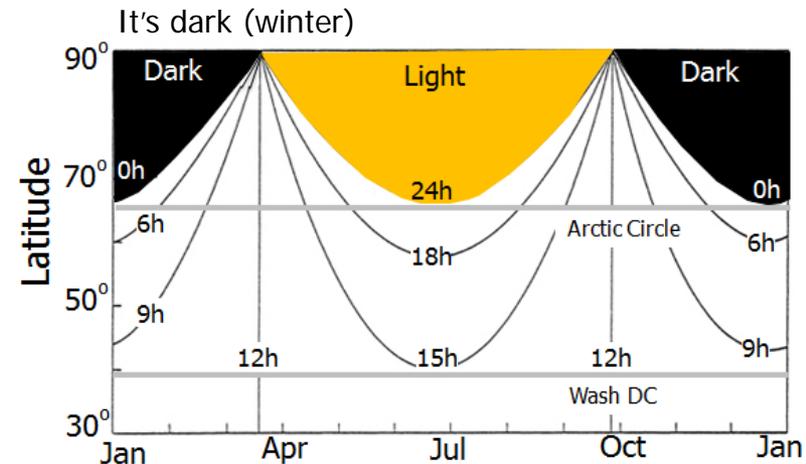


Arctic challenges

- Surface situation awareness
 - Mean temperature -30° to 0° (C°) depending on location
 - Need to design for $-65^{\circ}C$
 - Extended dark period (e.g., Winter)
 - inhibits EO, solar power
 - Cloud cover ($\sim 50\%$ winter / $\sim 85\%$ summer)
 - Inhibits EO/IR
 - No access to geosynchronous satellites above 70° N latitude
 - Limits stare options and traditional communications
 - Ionosphere instability
 - Disrupts RF comms / radar
- Under-ice situation awareness
 - Isolation from overhead assets (GPS, satellite)
 - No GPS navigation or satellite communication
 - Unable to tow traditional towed arrays or drop sonobuoys



It's cold





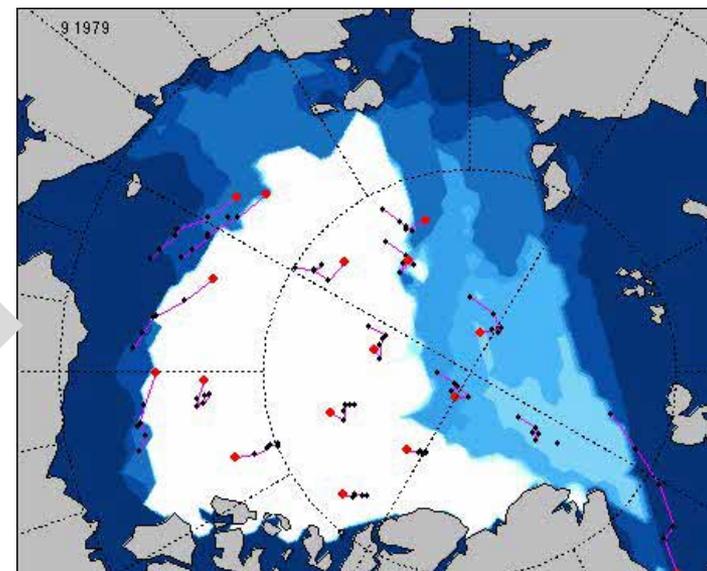
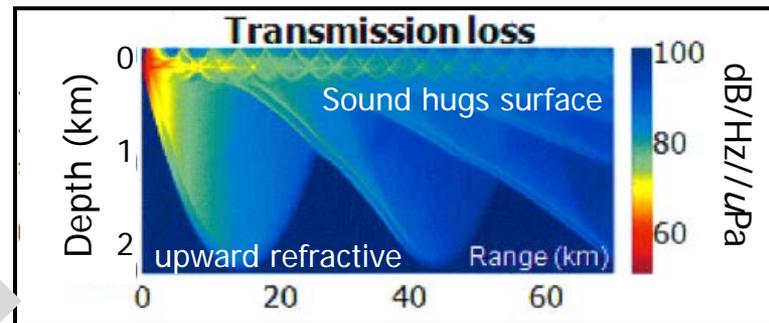
Can we leverage, rather than fight, the properties of the Arctic?

Turn limitations into opportunities



Examples: On/Under the ice

- Limitations
 - Ice limits access between water/air-borne systems
 - Ice limits traditional ocean surface mobility
 - Ships cannot tow arrays
 - Aircraft cannot drop sonobuoys
 - Ice ceiling roughness limits sound transmission due to upward refractive propagation
 - Remoteness limits energy for active sonar
- leverage emergent acoustic changes
 - Opportunistic active acoustics from ice dynamics
 - Propagation phenomena evolving from ice change
- leverage thinner ice
 - ~1-2 m thickness will ease ice penetration
 - Small electronics permit small diameter thermal penetrators for efficient design (seedling)
- leverage ice movement
 - Drifts ~6 km/day and 10% faster per decade
 - Sensor movement for seafloor for mapping
 - Momentum for mechanical energy harvesting





Examples: On the water

- Limitations

- Polar orbits (e.g., satellite revisit gaps) and fog
- Transits for UAVs and aircraft
- Ice floe dynamics and shipping density

- leverage ship's "arctic" signatures (EM/acoustic)

- Ship radars used at low grazing angle to detect ice/ ships
- Underwater acoustic ducts for shallow propulsion acoustics

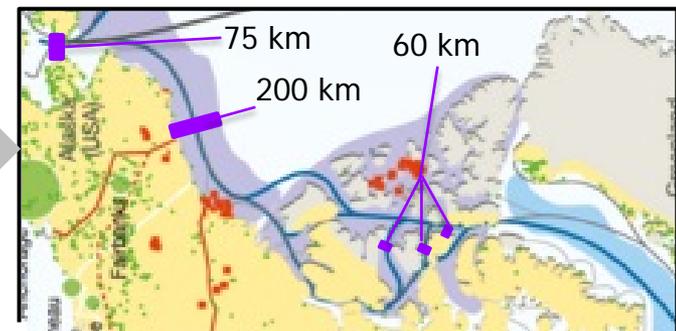
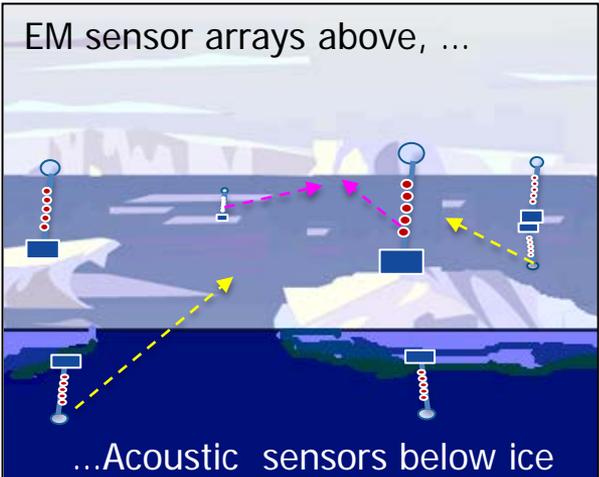
- leverage mobile floating-ice

- Ice floes are free drifting; migration (~ 1 m/s) is driven by surface winds suggesting sails

- leverage narrow choke points

- Bering Strait: 75 km; Lancaster Sound: 60 km

Arctic fog and ice





How big to think

- “The following system metrics are provided to assist in scoping proposed efforts:”

Metrics	Threshold	Goal
Coverage Area	>1M km ²	>10M km ²
Endurance	>60 days	> 1 year
Probability of detection	>0.9 after target in coverage area for <12 hours.	>0.9 after target in coverage area for < 1 hour
False alarm rate	2/day	1/day
Hold time	< 1 hour between detections for 24 hours	Continuous for >12 days

- “Proposals should indicate how the proposed technology will support the system metrics, and should cite the quantitative and qualitative success criteria for the enabling technology or subsystem being proposed.”
 - You need to develop your own success criteria (be bold)
 - If your technology is linked to a specific compelling system concept, linkage between the technology and system metrics become more important



BAA Overview



Highlights

- “DARPA is soliciting innovative research proposals in the area of assuring surface and subsurface situation awareness in the Arctic.”
- “The focus of this phase is to develop a rich set of technology options, and establish their technical feasibility.”
 - Establishing technical feasibility implies testing in climactic labs or Arctic
- “Proposals should provide system frameworks for context to rationalize the proposed technology”
 - Is your technology key to enabling several system concepts?
 - Is there a single compelling concept enabled by your technology?
- This solicitation is for an initial exploratory effort of 6-9 months duration.
 - Casting a wide net to capture wide range of technology and system concepts
 - Awardees should expect to be under contract by the end June (goal)
- “Awards are expected to be in the range of \$250,000 to \$500,000”
 - Include GFE/GFI as best as possible so we know the real cost



Considerations for good proposals

- “Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems.”
- “Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice, that requires development of new manned or space-based platforms, or that is only a concept of employment or operations using existing platforms and systems.”
 - Good proven ideas that just need investment are not sought.
 - Focus on hard technical problems requiring creative solutions and unique DARPA expertise and management.
 - Give context of other approaches. Don’t assume we are the expert in your area. Be quantitative. Is there a new insight or technology enabler? Show us why this will work now.
- “Proposals will be evaluated using the following criteria, listed in descending order of importance:...”
 - Rate your strength and weakness for each category as if you were the reviewer



Considerations for good proposals (cont'd)

- A premise of the program is the unique physical attributes and emergent environmental trends in the Arctic offers opportunities to tailor new technology that otherwise limits traditional approaches.
 - “Proposals that demonstrate creative and surprising solutions that support this premise are of particular interest.”
 - “This will be of further interest when a case is made for the affordability of such solutions relative to more traditional approaches.”
 - Ideally there is a narrative that describes how a perceived limitation creatively can be turned into an opportunity.



Technical area one: under-ice awareness

- “Proposed solutions in this area should leverage unique Arctic properties (e.g., under-ice acoustic propagation, noise, and non-acoustic properties) to enable distributed unmanned autonomous systems to find and hold targets underwater.”
- “Primary interest lies in anti-submarine warfare (ASW), however innovative approaches for the detection of structures, bathymetry, and other measurements where compelling cases are made for their strategic value will be considered.”



Technical area two: surface awareness

- “Proposed solutions in this area will leverage unique Arctic properties (e.g., electromagnetic and optical phenomena, ice distributions within a coverage area, the narrow passageways for shipping traffic, and other unique attributes) to enable distributed unmanned autonomous systems to find and hold surface contacts in the marginal ice zone and summer ice-free waters.”
- “Primary interest lies in surface ship and ice tracking, however, innovative approaches for the detection of other activity and conditions of concern where compelling cases are made for their strategic value will be considered.”



Deliverables

- Deliverables should at least include: quarterly financial and status reports; Kickoff presentation; Mid-term presentation; Final report and presentation.
- A detailed final report should be planned after completion of the effort but prior to contract completion.
- “In the event that proposers do not submit the list, the Government will assume that it automatically has “unlimited rights” to all noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument.”



Awards

- Multiple awards are possible.
- The anticipated scope is expected to be \$250k-\$500k per award excluding potential, but justified testing in the Arctic.
- The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation, and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if it is later determined to be necessary.



Other items

- No Human or animal use anticipated
- Expecting unclassified proposals
- Foreign participants and/or individuals may participate to the extent that such participants comply with any necessary Non-Disclosure Agreements, Security Regulations, Export Control Laws, and other governing statutes applicable under the circumstances.



Evaluative criteria

- Proposals will be evaluated using the following criteria, listed in descending order of importance:
- 5.1.1 Overall Scientific and Technical Merit;
- 5.1.2 Potential Contribution and Relevance to the DARPA Mission;
- 5.1.3 Proposer's Capabilities and/or Related Experience and
- 5.1.4 Cost Realism.



5.1.1 Overall Scientific and Technical Merit

- The proposed technical approach is feasible, achievable, complete and supported by a proposed technical team that has the expertise and experience to lead and to accomplish the proposed tasks.
- Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final product that achieves the goal can be expected as a result of award.
- The proposal clearly identifies major technical risks and clearly defines feasible planned mitigation strategies and efforts to address those risks.
- The proposal clearly explains the technical approach(es) that will be employed to meet or exceed each program goal and system metric listed in Section 1.2. and provides ample justification as to why the approach(es) is / are feasible.
- Other factors to be considered will include the structure, clarity, and responsiveness to the statement of work; the quality of proposed deliverables; and the linkage of the statement of work, technical approach(es), risk mitigation plans, costs, and deliverables of the prime contractor and all subcontractors through a logical, well structured, and traceable technical plan.



5.1.2 Potential Contribution and Relevance to the DARPA Mission

- The potential contributions of the proposed effort with relevance to the national technology base will be evaluated.
- Specifically, DARPA's mission is to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their application.



5.1.3 Proposer's Capabilities and/or Related Experience

- The proposer's prior experience in similar efforts must clearly demonstrate an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule.
- The proposed team has the expertise to manage the cost and schedule.
- Similar efforts completed/ongoing by the proposer in this area are fully described including identification of other Government sponsors.



5.1.4 Cost Realism

- The objective of this criterion is to establish that the proposed costs are realistic for the technical and management approach offered, as well as to determine the proposer's practical understanding of the effort.
- The proposal will be reviewed to determine if the costs proposed are based on realistic assumptions, reflect a sufficient understanding of the technical goals and objectives of the BAA, and are consistent with the proposer's technical approach (to include the proposed Statement of Work).
- At a minimum, this will involve review, at the prime and subcontract level, of the type and number of labor hours proposed per task as well as the types and kinds of materials, equipment and fabrication costs proposed.
- It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. For efforts with a likelihood of commercial application, appropriate direct cost sharing may be a positive factor in the evaluation.
- The evaluation criterion recognizes that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies.



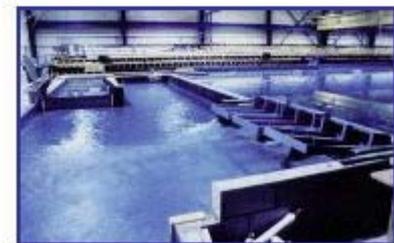
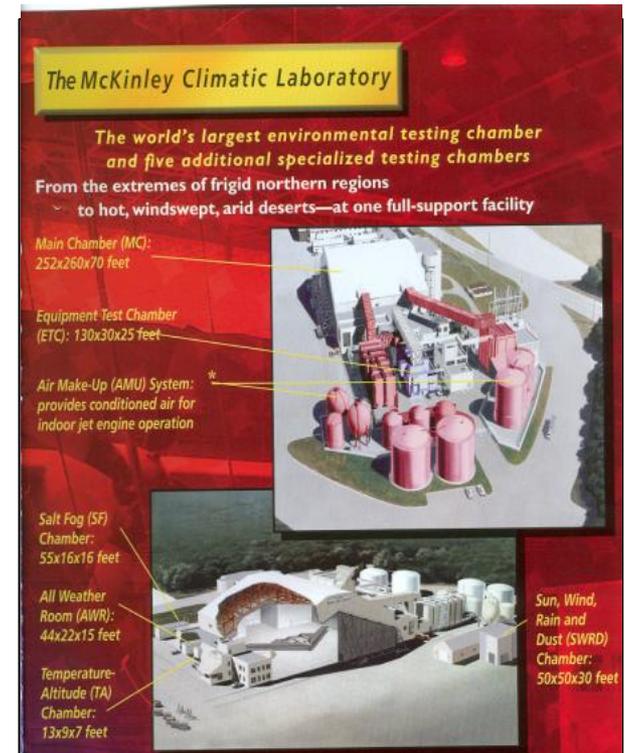
Field tests

- “The government will host at least two field demonstrations with Arctic-like conditions to support awarded efforts”.
- For pricing demonstrations support and travel costs, proposers should plan for two people for one week at Eglin AFB, FL, and one week in Hanover, NH to support initial phase demonstration and testing, with facility and standard instrumentation costs borne by the government.
- Proposers should include unique demonstration costs in their proposal.
- The exact dates and details for field testing will be developed after contract award.
- “Proposals should describe requirements for government-furnished equipment, information, and services needed to conduct engineering and field tests.”
- “To the extent measurements are needed in the Arctic to support feasibility, proposals should provide rationale as to why climactic laboratories cannot provide adequate results”.
- “DARPA support for an Arctic field test will depend on the rationale and demand across efforts for such testing”



Testing facilities

- Initial cold testing at McKinley Climatic Laboratory (Eglin AFB, FL)
 - Refrigerated hangar
 - Can test to below -65°C , make snow, ice, winds...
- Ice Engineering Facility (CRREL, Hanover, NH)
 - Refrigerated towing tanks
 - Create ice, ice floes in moving water...
- Cold Regions Test Center, Ft Greely, AK
 - Arctic range facility
- Additional information, points of contact, and links for climactic laboratories and Arctic testing can found at
<http://www.solers.com/BAAinfo-reg/aaa>



The Research Area is an ice hydraulics room where large-scale physical models of sections of rivers and lakes can be built and operated to simulate natural conditions and test scale models.



Schedule

- Posting Date 16 March 2012
- Proposal Due Date 3 May 2012
 - Proposals must be submitted to the DARPA T-FIMS BAA Submission System on or before 4:00 p.m., local time, (due date).
 - Proposers are warned that the likelihood of funding is greatly reduced for proposals submitted after the initial closing date deadline.
 - Answers to questions not found in BAA will be posted on FBO
- One-on-one discussions to get feedback while appointments last
 - See registration website
- BAA Closing Date: 12 September 2012
- Estimated start date 30 June 2012
 - Period of Performance 6-9 months
- First Government field demo: August 2012 (CRREL)
- Second Government field demo November 2012 (McKinley Climactic Lab)



After this phase of effort

- “At the completion of this initial phase, DARPA anticipates a wide-range of technologies and system concepts to shape a possible follow on solicitation which may take the form of specific system developments or a DARPA challenge.”
 - Future opportunity, if pursued, will come from a new solicitation likely in 2013
 - You do not need to participate in this phase to participate in subsequent effort
 - Successful participation in this phase does not ensure participation in subsequent phases



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