



Ways Forward for SEARCH

To: Neil Swanberg, Simon Stephenson, and Renée Crain (NSF), Hajo Eicken (SEARCH SSC Chair), Peter Schlosser (Past SSC Chair)

From: Helen Wiggins and Susan Fox (ARCUS)

This memo summarizes ways forward for SEARCH through two new activities: (1) commencement of a Strategic Planning Process and (2) launch of a Pilot Project(s) to test new models of SEARCH implementation and collaboration. Through implementation of these activities, SEARCH will be well positioned to succeed its promise as an innovative and cross-cutting scientific program.

I. SEARCH Status and Successes: Where We Are Now

SEARCH is a unique interdisciplinary and multi-agency program that has developed significantly over the past several years. It is now a well-recognized program with many successes:



- SEARCH can boast a large and diverse community of arctic scientists who support the SEARCH program. The scientific capacity of SEARCH is impressive.
- A myriad of reports summarizing SEARCH scientific priorities has emerged from the SEARCH community (see Appendix A, "SEARCH Development Timeline").
- The Observing component of SEARCH thrives, with over 50 projects funded through NSF's Arctic Observing Network (AON) and additional contributions from other agencies. The AON Design and Implementation (ADI) process will facilitate a well-designed Arctic Observing System.
- SEARCH has convened the Understanding Arctic Change Task Force to develop a long-term vision for understanding the arctic system, which will significantly advance SEARCH's "Understanding Change" component.
- SEARCH activities have developed and fostered collaborations with several national and international arctic programs (ARCSS, DAMOCLES, etc.)
- The Sea Ice Outlook demonstrates the capacity of SEARCH to create innovative community science projects that not only advance scientific knowledge, but also serve stakeholders and the public.

II. SEARCH Challenges and Needs

As a complex, multi-agency program that addresses pan-arctic interdisciplinary arctic change, SEARCH faces inherent challenges that more "traditional" disciplinary or thematic programs do not face. It is neither easy nor straightforward to plan and implement a cutting-edge effort like SEARCH. As such, SEARCH needs to:

1. Move forward quickly to take advantage of emerging opportunities – We are at a stage in SEARCH where we can take advantage of emerging opportunities and community energy, and respond to urgent information needs of rapid arctic change. SEARCH should also demonstrate

its ability and willingness to test new models of programmatic implementation. The results of OPERA place the impetus on SEARCH to move forward on key SEARCH issues that require a rapid response, but with a strategically planned approach.

2. Define a clear long-term vision, goals, and measures of success – To build on the successes thus far and to move strategically to the next stage, we must have clear, defined, and tractable vision and goals. Without this, SEARCH runs the risk of using resources on activities that are ad-hoc, uncoordinated, and at best result in only incremental progress, without significant evolution towards a common vision.

3. Adopt an action plan to enact the vision and goals – To make SEARCH vision and goals a reality, we must develop a clear implementation and action plan that charts a path for the next several years. This plan would define appropriate structures, processes, activities, and milestones.

We have the capacity and energy to move forward—we just need a clear path to do so. Thus, to address these needs, we see two approaches:

1. Embark on Strategic Planning Process – Undertake a collaborative strategic planning process to produce a clear SEARCH vision (e.g., "SEARCH 2015") and a supporting action plan to realize that vision.

2. Launch a Pilot Project – Develop and launch a small pilot project(s), focused on a specific theme(s) or science question(s), to test activities towards innovative SEARCH implementation.

The strategic planning and pilot project activities would be done concurrently with active SEARCH efforts, including AON/ADI, the Understanding Arctic Change Task Force, the Sea Ice Outlook, and SEARCH data management (if a data project is funded through OPERA).

III. Way Forward #1: Strategic Planning

The Benefits of Strategic Planning

Strategic planning energizes and moves an organization or program toward its mission and goals. It:

- Clarifies purpose and vision.
- Paints a picture of where the organization will go, the anticipated outcomes, and how to get there.
- Provides a guide to focus and prioritize time, people, and resources in running a successful effort.
- Engages diverse stakeholders and results in products that help to recruit partners and participants.

"I skate to where the puck is going to be, not where it has been." – Wayne Gretzky

Strategic planning is critical to the success of any organization or complex project (Mintzberg 2005). With distributed collaborative efforts such as SEARCH, careful planning, communication, and clarity of roles becomes even more important (Olson et al. 2008).

Indeed, a formal planning process is essential for significant progress. Positive and high-impact innovation in an organization occurs when changes are intentional (i.e., planned) and strategic (see Figure 1, below).



Figure 1. Adapted from Palmer and Kaplan, 2007. Strategically planned changes—whether incremental or transformative—produce benefits for an organization.

Our goal here is to introduce a process that moves SEARCH forward and allows us to anticipate and manage subsequent change. These changes may be minor or major, but they would occur in a constructive context, especially important when maturing a complex collaborative program such as SEARCH.

Strategic Planning in a SEARCH Context

The strategic planning process proposed here would be designed to fit SEARCH's unique needs. In addition to standard planning best practices (e.g. setting clear goals, setting timeline and milestones, process for assessing progress, etc.), we must consider several issues specific to SEARCH:

- The community will need to clarify and document what SEARCH is - as its role as an umbrella structure to coordinate sets of projects, as a funding source to implement new scientific priorities, and/or as a structure and process that can synthesize ongoing research.
- SEARCH must *prioritize* goals, objectives, and activities. Because the program is so broad, we cannot do everything at once nor please all communities at all times.

- SEARCH must be nimble, adaptive to changing science priorities, and able to take advantage of emerging opportunities. We need to develop a mechanism for revising plans as necessary.
- We will need to define clear roles and responsibilities for all SEARCH entities, including the Science Steering Committee (SSC), Panels, Interagency Program Management Committee (IPMC), and the Science Management Office, and consider changes to current structures. Updating the Terms of Reference would be part of this process.
- SEARCH strategic planning should incorporate a combination of "top-down" (i.e., programmatic vision and funding from agencies) and "bottom-up" (i.e., scientific vision and energy from the community). SEARCH cannot succeed without "top-to-bottom" processes that move together toward a cohesive vision. A traditional model of funding individual projects or efforts is not sufficient without coordination and cohesive planning.
- We will need to draw from several different literatures, including: strategic planning, organizational management, collaboratories/virtual organizations, SEARCH science planning (i.e., existing SEARCH documents), and emerging scientific priorities (e.g., as identified in SoA). We would essentially marry planning practices from the corporate and organizational literature with the SEARCH scientific context.
- The strategic planning process should include diverse perspectives from internal and external communities, including:
 - SEARCH *leadership* – SSC, panels, and IPMC.
 - Successful *international* arctic programs.
 - Successful *interdisciplinary* programs.
 - Successful U.S. *interagency* science programs.
 - *Broader arctic science community*, including projects and programs that may be 'components' of SEARCH (BEST/BSIERP, etc.).
 - *Outside experts*, including those in strategic planning for science programs or associations, visionaries in Collaboratory or Virtual Organization development, etc.
 - SEARCH *stakeholders* – decision-makers, representatives from northern communities, etc. —those who will use the science.
- We will need to design an assessment process that includes annual review of measurable goals, and planning that is tied to annual budgeting processes.

IV. Way Forward #2: SEARCH Pilot Project(s)

A fundamental challenge in SEARCH is that its broad focus makes it difficult to enact large-scale innovative developments. A solution to this is to begin testing new approaches through pilot project(s). Smaller-scale pilot projects would allow us to test new models for planning and implementation (e.g., collaboratory concepts, cross-project and cross-agency coordination, etc.). A pilot project could be developed quickly, and would allow us to be adaptive without risking large amounts of resources. It would focus on a *tractable* science theme or question.

For example, the SEARCH SSC, with input from the IPMC, could select a priority theme or topic that is ready for a creative pilot effort (e.g. 'changing arctic sea ice', 'changing permafrost', etc.). We would first assess what current relevant activities and projects were already underway on which to build. We would define strategic goals and products over short-term (1–2 year) time frame, focusing on interdisciplinary and cross-cutting activities. We would then define and implement a plan for meeting the project goals (including required staffing, roles of SSC, Panels, agencies, and specific activities), and include formative evaluation activities to assess and refine progress throughout the project.

V. Immediate Next Steps

Again, both the strategic planning process and pilot projects would be done concurrently with current SEARCH activities—it is important to build on our current successes and maintain momentum.

The immediate next step is for the SEARCH leadership to provide feedback on the ideas summarized within this memo. Do these ideas resonate with you? Do they represent a direction you'd like to see SEARCH go?

If so, these ideas would be presented to the SSC for discussion; if the SSC supported this direction, we would aim to start planning in earnest this fall. An example timeline of how activities might be phased is presented in Appendix B.

List of Appendices:

Appendix A: SEARCH Development Timeline

Appendix B: Example Timeline and Phasing

Appendix C: Selected References

Appendix A. Brief SEARCH Development Timeline

1990–1999: Development of the SEARCH program as a number of scientists became concerned about the changes they were observing in arctic ocean and atmospheric conditions. The group circulated an open letter proposing a program to track and understand major changes in the arctic environment. An open workshop was held in 1997 on ocean and atmospheric changes in the Arctic.

1999: The Interagency Arctic Research Policy Committee (IARPC) included SEARCH as “ready for immediate attention” in the U.S. Arctic Research Plan.

2001: Initial *SEARCH Science Plan* was published from a workshop held in 1999, which was attended by 39 researchers.

2003: The *SEARCH Implementation Strategy* was published by the SEARCH SSC and IPMC (then Interagency Working Group, IWG) in October 2003 and widely circulated at the first *SEARCH Open Science Meeting*, which provided an international forum for presentation and discussion of research that addressed the basic premise of SEARCH.

2005: *SEARCH Implementation Workshop* was held to establish priorities and next steps for implementation, particularly during the International Polar Year. The resulting report summarized priority science questions and activities across the Observing, Understanding, and Responding to Change domains.

2006: NSF released an Announcement of Opportunity for the creation of an Arctic Observing Network (AON).

2008: SEARCH held the *Arctic Observation Integration Workshops*, a series of three workshops and resulting report to advance planning and implementation of an integrated Arctic Observation System.

2009: Small SEARCH/AON Interagency Meeting held to advance interagency coordination.

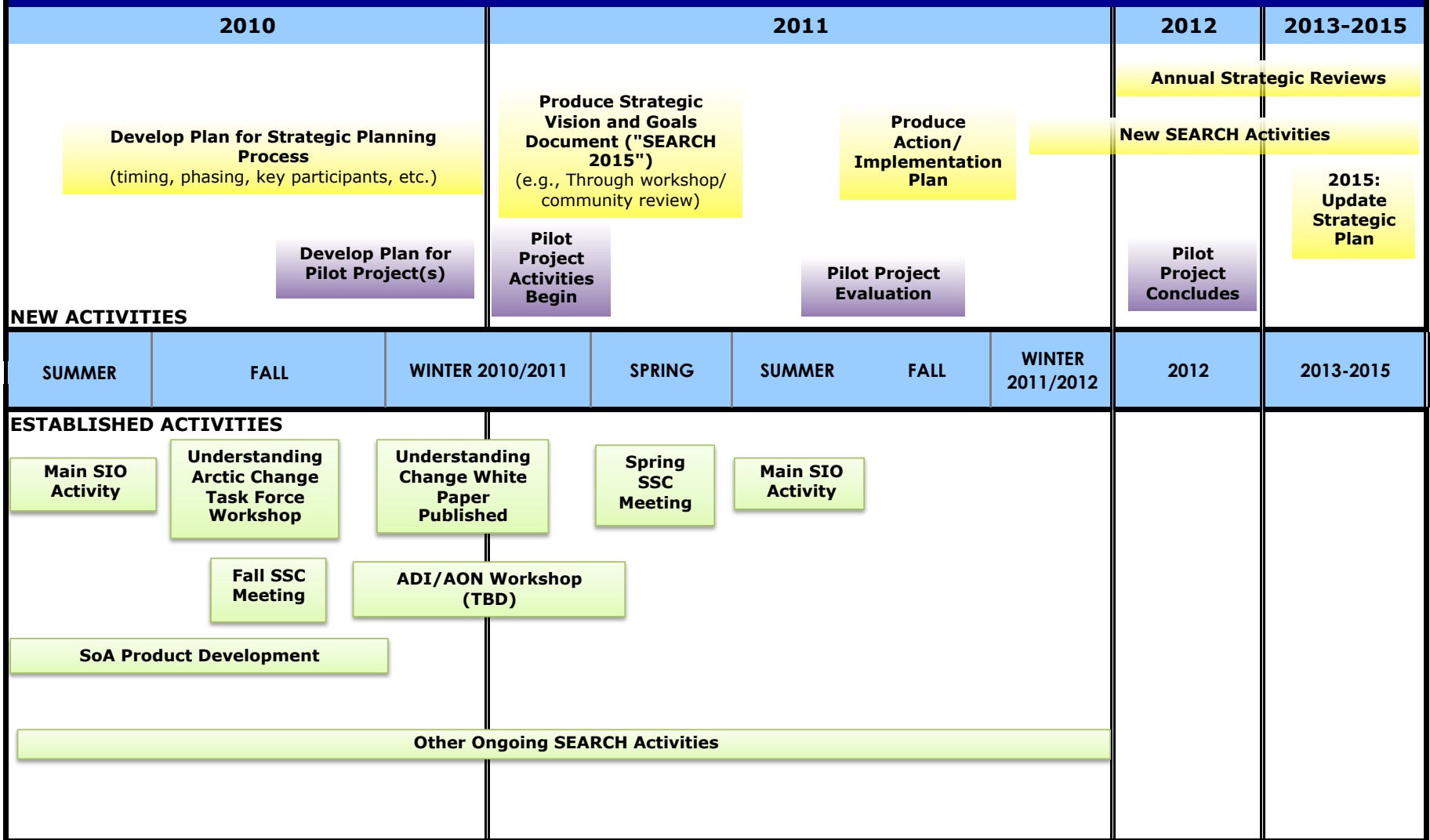
2009: SEARCH convened an *AON Design and Implementation (ADI)* effort and task force to provide guidance on how to achieve a well-designed, effective, and robust Arctic Observing System.

2009: AON PI Meeting and first ADI Workshop held to further facilitate a coordinated Arctic Observing System.

2009: SEARCH convened an *Understanding Arctic Change Task Force* to produce a white paper outlining approaches for the “Understanding Change” component of SEARCH.

2010: The *State of the Arctic Conference* provided a venue to present and discuss the latest science on arctic environmental change.

Appendix B: Example SEARCH Planning Timeline



Appendix C. Selected References and Resources

SEARCH SCIENCE PLANNING

SEARCH: Study of Environmental Arctic Change Science Plan, 2001. SEARCH SSC, Polar Science Center, Applied Physics Laboratory, University of Washington, Seattle, 89 pp.
<http://www.arcus.org/search/resources/otherreportsandscienceplans.php>

SEARCH: Study of Environmental Arctic Change, Implementation Strategy, Revision 1.0, 2003. SEARCH SSC and SEARCH IWG. Polar Science Center, Applied Physics Laboratory, University of Washington, Seattle, 53 pp.
<http://www.arcus.org/search/resources/otherreportsandscienceplans.php>

Proceedings of the SEARCH Open Science Meeting, 27–30 October 2003, Seattle, Washington. Study of Environmental Arctic Change (SEARCH). Fairbanks, Alaska: Arctic Research Consortium of the U.S. (ARCUS).
<http://www.arcus.org/search/resources/reportsandscienceplans.php>

Study of Environmental Arctic Change: Plans for Implementation During the International Polar Year and Beyond. Study of Environmental Change (SEARCH). 2005. Fairbanks, Alaska: Arctic Research Consortium of the United States (ARCUS). 104 pp.
<http://www.arcus.org/search/resources/reportsandscienceplans.php>

Message from the ARCSS Committee: ARCSS Committee Recommendations on Data Management. 2006.
http://www.arcus.org/arcss/message_112006.html

Message from the ARCSS Committee: Recommendations from Arctic System Synthesis Workshop: New Perspectives through Data Discovery and Modeling. (Call for an Arctic Synthesis Collaboratory). 2007.
http://www.arcus.org/arcss/message_050707.html

Arctic Observation Integration Workshops Report. 2008. Fairbanks, Alaska: SEARCH Project Office, Arctic Research Consortium of the United States (ARCUS). 63 pp.
<http://www.arcus.org/search/resources/reportsandscienceplans.php>

Arctic Observing Network (AON) Design and Implementation (ADI) Project Plan. 2009.
<http://www.arcus.org/search/aon/adi/plans/>

Arctic Observing Network (AON) Program Report and Highlights. Results from the Third AON Principal Investigators (PI) Meeting 30 November – 2 December, 2009. Boulder, CO.
<http://www.arcus.org/search/aon/>

Understanding Arctic Change Task Force: Background and Planned Activities. 2009.
<http://www.arcus.org/search/understanding>

Message from the ARCSS Committee: Recommendations for Successful Arctic System Science. 2010.
<http://www.arcus.org/arcss/message.html>

Draft State of the Arctic Conference Resolution. 2010. Currently in participant review.

STRATEGIC PLANNING AND ORGANIZATIONAL MANAGEMENT

Strategic Transformation Process: Toward Purpose, People, Process and Power. 2010. *Organization Management Journal* (2010) 7, 66–80. doi:10.1057/omj.2010.6
Elizabeth B. Davis, James Kee and Kathryn Newcomer

Managing. 2009. Henry Mintzberg. Berrett-Koehler Publishers. 288 pp.

Strategy Safari: A Guided Tour Through The Wilds of Strategic Management. 2005.
Henry Mintzberg, Joseph Lampel, and Bruce Ahlstrand. 2005. Free Press. 416 pp.

COLLABORATORIES AND VIRTUAL ORGANIZATIONS

Science of Collaboratories. University of Michigan and Howard University, Sponsored by the National Science Foundation:
<http://www.scienceofcollaboratories.org/AboutSOC/index.php?Mission>

Scientific Collaborations at a Distance. 2001. Teasley, S., & Wolensky, S. *Science*, 292, 2254-2255.

National Collaboratories: Applying Information Technology for Scientific Research. 1993. National Research Council. National Academy Press. Washington, D.C.

From Laboratories to Collaboratories: A New Organizational Form for Scientific Collaboration. 1997. Finholt, T. A., & Olson, G. M. *Psychological Science*. 8(1)

The Mutual Knowledge Problem and its Consequences for Dispersed Collaboration. 2001. Cramton, C. D. *Organization Science*, 12(3), 346-371.

From Shared Databases to Communities of Practice: A Taxonomy of Collaboratories. 2007. Bos, N., Zimmerman, A., Olson, J., Yew, J., Yerkie, J., Dahl, E., et al. *Journal of Computer-Mediated Communication*, 12(2), article 16. <http://jcmc.indiana.edu/vol12/issue2/bos.html>

Communication in a 'Network' Organization. 1991. Bush, J.B., Jr., and Frohman, A.L.
"Organizational Dynamics, 20(2), 23-36.

When is Virtual Virtuous? Organizing for Innovation. 1996. Chesbrough, H.W., and Teece, D.J. *Harvard Business Review*, 74(1), 65-73.

Trust and the Virtual Organization. 1995. Handy, C. *Harvard Business Review*, 73(3), 40-50.