

NASA Innovative Advanced Concepts Program explores ISRU concepts. R. Turner¹, J. Derleth,² M. Lapointe³, K. Reilly⁴, J. Nelson⁵ ¹Analytic Services Inc, Suite N-5000 5275 Leesburg Pike, Falls Church, VA 22041, ron.turner@anser.org ²NASA, NIAC / 6X53, 300 E Street SW, Washington, D.C., Jason.e.derleth@nasa.gov ³NASA, NIAC / 6X53, 300 E Street SW, Washington, D.C. michael.r.lapointe@nasa.gov , ⁴Bryce Space and Technology, Alexandria, VA 22314, katherine.reilly@nasa.gov, ⁵Bryce Space and Technology, Alexandria, VA 22314, john.c.nelson@nasa.gov

Introduction: The NASA Innovative Advanced Concepts (NIAC) Program [1, 2] nurtures visionary ideas that could transform future NASA missions with the creation of breakthroughs — radically better or entirely new aerospace concepts — while engaging America's innovators and entrepreneurs as partners in the journey. NIAC projects study innovative, technically credible, advanced concepts that could one day “Change the Possible” in aerospace. NIAC supports innovative research through two phases of study, both competitively awarded. The Phase I studies are for nine-month efforts to explore the overall viability of visionary concepts. Phase II studies further develop the most promising Phase I concepts for up to two years, and explore potential infusion options within NASA and beyond.

ISRU and NIAC: Since 2011, NIAC has funded 183 studies (131 Phase I and 52 Phase II). Twenty-five studies funded to date have been directly related to space resource utilization (19 Phase I, 6 Phase II) over a wide range of technologies and applications, including use of in situ resources for fuel, habitats, and life support.

NIAC Phase I process: NIAC studies are selected by merit as determined by a thorough peer review process. Anyone is eligible to submit a NIAC Phase I proposal (while NASA can fund only US organizations, foreign entities may propose but if selected the study will be conducted on a “no exchange of funds” basis). NIAC Phase I selection begins in August with the release of a call for proposals through the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) (<http://nspires.nasaprs.com>). Scope is a tricky subject for NIAC, so the Program Office uses a two-step process to avoid wasting the proposers, and subsequently the reviewers, time. Step A proposals are very brief descriptions of the concept. The NIAC Program Office reviews the Step A proposals to see if they are within scope as detailed in the call for proposals, and invites the most promising of the eligible concepts to submit a more thorough Step B proposal. Step B proposals are evaluated by peer reviewed technical panels.

NIAC study scope: A continuing challenge in the NIAC Program is to articulate the unique niche that NIAC fills: the opportunity to explore bold new ideas that may fundamentally change the way NASA em-

barks on future missions. NIAC studies must have an aerospace focus, be innovative with high potential impact, examining a mission context. This “mission context” requires some explanation. Since NIAC concepts are generally very early stage, it is important to be able to quantitatively explore benefits through an application. NIAC does not directly fund technology development. Rather, it gives the PI (also known as the NIAC Fellow) an opportunity to show why the technology is important and what benefits it provides. By focusing on a representative mission, a study can illustrate how the underlying innovation can significantly reduce costs, extend reliability or enable entirely new missions. Some fraction of the funding can be used to explore the feasibility of the technology, but that cannot be the focus of the effort.

NIAC Strategic Partnerships, Communications, and Outreach: NIAC is more than a granting organization: it aims to capture and inspire the ingenuity of visionaries to build the future of tomorrow. This exciting work allows NIAC to successfully engage a wide ranging, diverse global audience. NIAC's audience includes members of technical and scientific communities, independent researcher groups, government institutions, industry, academia, and the general public. NIAC has developed unique partnerships and collaborations with institutions around the U.S. that help the program expand its reach. NIAC engages educators and students with educational outreach that encourages a young audience to consider Science, Technology, Engineering, and Mathematics (STEM) careers through NIAC Fellows' innovative research. NIAC innovations have the potential to fuel economic growth, the creation of new industries, companies, jobs, products and services, and the global competitiveness of the U.S. NIAC's strategic partnerships, communications and outreach serves as a critical element of NASA's public and educational value to the nation.

References:

- [1] R. Turner, J. Falker, J. Derleth, K. Reilly, “NASA Innovative Advanced Concepts,” AIAA Space 2013 Conference and Exposition, AIAA 2013-5376, Sept 2013 [2] R. Turner, J. Derleth, A. Yew, K. Reilly, “NASA Innovative Advanced Concepts,” 47th International Conference on Environmental Systems, ICES-2017-14, July 2017.