NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
HEADQUARTERS

SPACE TECHNOLOGY MISSION DIRECTORATE
300 E Street, SW
Washington, DC 20546-0001

NASA INNOVATIVE ADVANCED CONCEPTS (NIAC)

PHASE I

APPENDIX to

NASA Research Announcement (NRA): Space Technology REsearch, Development, Demonstration, and Infusion – 2016 (SpaceTech–REDDI–2016), NNH16ZOA001N

APPENDIX NUMBER: NNH16ZOA001N-17NIAC-A1

Appendix Issued: *August 2, 2016*
Due: *September 15, 2016* (5:00 pm Eastern)

Catalog of Federal Domestic Assistance (CFDA) Number 43.012
OMB Approval Number 2700-0087

Key Information

Appendix Name: NASA Innovative Advanced Concepts (NIAC), Phase I, hereafter called "Appendix" to the SpaceTech-REDDI-2016 NRA, hereafter called "the NRA"

Usage: Compliance with this Appendix ensures compliance with the NRA, but NASA recommends that proposers read the full NRA.

Goal/Intent: Early studies of visionary aerospace architecture or mission concept

Eligibility: All categories of U.S organizations may apply. Non-U.S. organizations may partner in, or lead, NIAC studies on a no-exchange of funds basis, and subject to NASA's policy on foreign participation

Key Dates:

Release: August 2, 2016
NIAC Virtual Q&A Forum: August 18, 2016
Step A Proposal Due: September 15, 2016
Step B Invitations Issued: October 18, 2016 (Target)
Step B Proposal Due: November 17, 2016 (Target)
Selection Announcement: March 28, 2017 (Target)
Award: May 9, 2017 (Target)

Proposal Submission & Selection Process: Two-step Process; Step A is fully-open; Step B by Invitation only; Independent Peer Review

Technology Readiness Level (TRL): TRL 2 or lower at start of award

Award Details:

Approximate Award Duration: 9 Months
Expected Award Amount: Not to exceed $125K
Expected Number of Awards: 12-16

Funding vehicles for awards: With the exception of federal agencies and NASA centers that will receive inter/intra-agency transfers or contracts, all awardees can expect to receive grants. No profits or fees are allowed

Selection Official: The Space Technology Mission Directorate (STMD) Associate Administrator, or designee, will make NIAC award decisions.

Point of Contact:

Jason Derleth
NIAC Program Executive
Space Technology Mission Directorate, NASA Headquarters
hq-niac@mail.nasa.gov

Questions of a general nature will be added to a NIAC FAQ. This FAQ will be located under "Other Documents" on the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) page for this Appendix.

Referenced Documents: See Section 7.

Table of Contents

Offerors are reminded:

Per Section 4.3.1 of the umbrella NRA solicitation NNH16ZOA001N, all proposals submitted via email or any means other than NSPIRES will not be accepted. Additionally, this section states:

"All proposals submitted in response to this solicitation must be submitted in electronic form by the **Authorized Organizational Representative** (**AOR)** at the proposing principal investigator's (PIs) organization who is authorized to make such a submission; electronic submission of the proposal by the AOR serves as the required original signature by an authorized official of the proposing organization. No hard copy of the proposal will be accepted.

The proposal submission process is complex and involves multiple steps to be carried out by all participants in the proposal. Therefore, offerors are strongly encouraged to familiarize themselves with the system and begin the submittal process early, well in advance of the deadline. While every effort is made to ensure the reliability and accessibility of submission systems and to provide a help center via e-mail and telephone, difficulties may arise at any point, including the user's own equipment. Difficulty in registering or using NSPIRES is not a sufficient reason for NASA to consider a proposal submitted after the deadline."

NIAC Virtual Question and Answer Forum

NASA will host a virtual forum that will address key aspects of this Appendix. The tentative date for this forum is Thursday, August 18, 2016. Updates to this date will be posted on the NSPIRES NIAC solicitation page. Specific details for the forum will be posted on the following website: http://www.nasa.gov/niac. Offerors should refer to these websites for updates and other information relevant to this Appendix. Although this will be a live forum, offerors are encouraged to pre-submit questions, preferably a week in advance, to hq-niac@mail.nasa.gov with the subject title "NIAC Virtual Forum."

NASA Innovative Advanced Concepts (NIAC) Phase I

1. Introduction

This appendix solicits proposals for studying visionary, yet credible, advanced concepts in the NASA Innovative Advanced Concepts (NIAC) Program. NIAC's goal is to "Change the Possible" in aerospace and aeronautics missions. This Appendix is the primary document for information about NIAC Phase I awards. There are changes to this Appendix over previous NIAC Appendices that clarify the evaluation criteria and the required content of the proposal.

1.1. Program Overview

The NIAC Program focuses on early studies of visionary concepts that address NASA's or the nation's goals but also offer radically different approaches or leapfrog innovations to enable new missions or greatly enhance previous ones. A concept typically includes new technology and must be framed in a mission context. NIAC concepts are often high risk or far term, but worth studying now to inform NASA's investments and planning. The entry Technology Readiness Level (TRL) for Phase I concepts should be TRL 2 or lower.

Proposed concepts must demonstrate innovation and have a clear potential impact in transforming future missions. The proposed study must employ an appropriate technical approach and demonstrate other non-technical benefits.

The NIAC Program supports innovative research through Phase I and Phase II awards. This Appendix focuses only on Phase I, and provides award information and proposal requirements. There are two steps to the Phase I proposal process; a brief Step A proposal open to all applicants, and an expanded Step B for those that are invited. This Appendix describes both. NIAC will release a separate REsearch, Development, Demonstration, and Infusion (REDDI) Appendix soliciting Phase II proposals at a later date, with sufficient time for eligible Phase I Fellows awarded in this solicitation to apply for follow-on support of up to two more years of study and development.

2. Award Information

2.1. Award Information

NIAC Phase I awards will be up to $125,000 (including civil servant labor costs), for a typical duration of up to nine months. Proposers may request smaller amounts and/or shorter durations, and must provide justification for funding that is commensurate with the proposed work.

In all cases, NASA intends to initiate new awards 30 to 60 days after the selection of proposals is announced. However, it sometimes takes longer due to factors such as the number of proposals received, the availability of appropriated funds, and post-selection negotiations with the proposing organizations.

2.2. Award Reporting Requirements

In addition to executing the work plan, the Phase I Fellow (i.e., award recipient, Principal Investigator) or designee will submit the following reporting deliverables and attend mandatory meetings during the performance period:

- **Brief written status reports** emailed to the NIAC Program Office every quarter where no other reporting is performed. Nominally, this will comprise of one report during the performance period approximately in November or December. This report is not publically-released.
- **A final written technical report** at the conclusion of the effort will be the primary outcome of the study. Since only a limited number of Phase I studies will progress to Phase II, the final report should be written in a way that provides a record of the concept for future reference. It must be *suitable for public release*, to include:
    - Detailed description of the concept and the benefits it offers
    - One or more detailed mission analysis
    - The approach used to evaluate the concept
    - Technical details supporting the findings with regard to the concept's technical feasibility
    - Technical challenges that remain to be addressed
    - Proprietary information may be included in a separate appendix that will not be included in the public release. However, this should be a limited addition to the report, and the publically releasable portion should be adequate to communicate the study findings
- **Mandatory attendance at two program meetings**. NIAC strongly encourages collaboration between Fellows and with the public. This is fostered in part by two meetings. The first will be a two-day, *Orientation Meeting* for the Fellows in the Washington, DC area. The Fellows will be provided with an introduction to NIAC, and also introduce their concepts to the NIAC community. The second meeting will allow Fellows to present their status and preliminary findings at a public, three-day *NIAC Symposium* with the location to be determined in the continental United States. In the proposal budget, please include travel for the PI to attend the entirety of both meetings; teammates are welcome at the symposium if the budget can support their travel.

NIAC Fellows must send all reports in electronic PDF format (typically email attachments) to the NIAC Program Executive and Program Manager. The final report (minus a limited proprietary appendix if necessary) and the Symposium presentations **must be suitable for public release**: submitted work must be unclassified and approved for public release by the appropriate company and/or government agencies. Please allot time for this authorization process. Government employees are expected to complete Document Availability Authorization (DAA) paperwork. The submission must be original work from the author without any portion of the material infringing on any copyright.

3. Eligibility

This is an Open Announcement. All categories of U.S organizations may apply. Non-U.S. organizations may partner in, or lead, NIAC studies on a no-exchange of funds basis, and subject to NASA's policy on foreign participation.

Proposers and Co-Investigators must register in the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) (http://nspires.nasaprs.com). Proposers with limited aerospace technology experience should familiarize themselves with the documents listed in Section 7, but note that these are not intended to be comprehensive, nor in any way to limit topics for NIAC consideration. Businesses must be pre-registered in the System for Award Management (SAM) at www.sam.gov.

4. Proposal Submission Process and Instructions

All information needed to apply to this Appendix is contained herein. As stated earlier, it is not necessary to read the entire REDDI NRA to ensure compliance with this Appendix, only the explicitly referenced subsections below. However, NASA encourages proposers to obtain the NRA and review it for additional useful information, especially in case of questions. This section describes the process for submitting a proposal and the requirements associated with those steps.

4.1. Process and Overall Requirements

This is a two-step process. Proposers must submit a Step A proposal for evaluation through NSPIRES. A Notice of Intent is not requested. If invited, proposers may submit a Step B proposal through NSPIRES. Technical panels will review Step B submissions and provide feedback for the selection official. All evaluations and award selections will be announced via NSPIRES.

Step A and Step B proposals consist of the electronic cover page that is automatically generated in NSPIRES, (see Section 4.3.4 of the NRA for more detail), along with the proposal attachment (e.g., technical, budget, biographical sketches, etc.) that should not exceed 10MB.

Page limits are defined for 8.5"x11" paper. Reviewers will not consider any content in excess of the page limits specified. Font style should be standard (e.g., Arial), size should be legible (12-point for the text, and no less than 10-point for figure captions), line spacing should be no less than single-spaced, and margins should be reasonable (1" or greater).

4.2. Step A Proposal Requirements

The Step A proposal requirements are comprised of the following, in the order listed: the proposal cover page (automatically generated by NSPIRES during submission); an overview chart (1 page); the technical and management sections of the proposal (3 pages maximum); and references (pages as needed).

4.2.1. Proposal Cover Page

Section 4.3.4 of the NRA discusses the NSPIRES Proposal Cover Page. In NSPIRES, please fill in the organizational information requested. In Step A, neither the Budget nor Proposed Team may be included. This information is requested only if invited to Step B.

4.2.2. Overview Chart (One page in landscape format)

Please follow the template in Figure 1. This chart must be in landscape format with a readable font size. Please do not include sensitive or confidential data not approved for public release. NASA may use information on Overview Charts for content including press releases and images, if the proposal is awarded. If a proper summary cannot avoid sensitive info, please notify the NIAC Program Executive and label the summary chart "Sensitive." This information is different from the Proposal Summary described in Section 4.3.4.1 of the NRA. The chart should be a stand-alone item (i.e., no terms or fragments requiring further reading in other parts of the proposal for aerospace reviewers to understand).

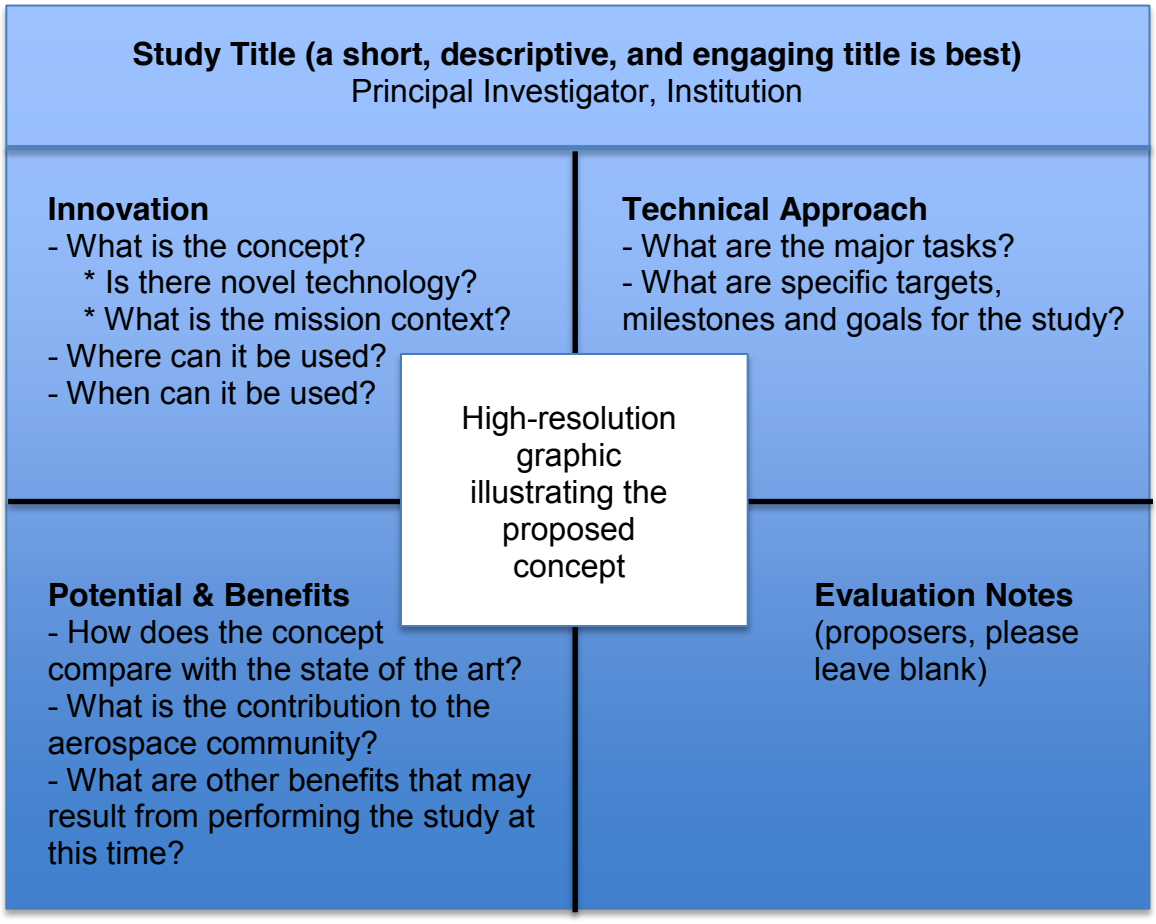

Figure 1: Required Template for Overview Chart

4.2.3. Technical and Management Section (Three pages maximum)

Essentially, the Step A proposal embodies Evaluation Criteria #1 and #2 in the Step B proposal (refer to Section 5.1). A discussion of the technical approach, e.g., work plan, budget, team, etc. is only requested in the Step B and NOT required for the Step A.

4.2.3.1. Step A Required Criteria

Concepts proposed in Step A must satisfy the following criteria in order to qualify as candidates for a NIAC Phase I study. The proposed concept must be:

- An Aerospace Architecture
  - *Aerospace* includes activities related to space and aeronautics
  - An *architecture* includes multiple systems, and a concept of how they are used together to achieve mission goals
- Proposed in a Mission Context
  - A *mission* is a plan to achieve one or more clear objectives (e.g., advancing exploration, science, aerospace operations), to benefit NASA or the larger aerospace community. A description of where the mission is applicable should be included.
  - NIAC proposers must examine at least one potential mission to contextualize the innovation for development and analysis
  - To highlight the innovation and its potential, proposers must provide rudimentary comparison with alternative approaches within the proposal, and outline more extensive study in the work plan
  - The mission context need not be a current or planned NASA mission. Any aerospace mission (previously considered or hypothetical) may be selected.
- Innovative and Offer High Potential Impact
  - Enables an entirely new mission or greatly improved execution, or offers a great leap in capabilities
  - There are benefits to conducting the study now, even if the ultimate vision is far-term or high risk
  - Breaks new ground, changing the conversation about future possibilities or significantly contributing to science and understanding
  - Generally a NIAC concept is based on new technology, but it could be based on existing technology applied to a mission in significantly new and innovative ways
- Credible and Reasonable
  - Technically sound – based on solid scientific/engineering principles
  - Plausibly implementable – at least one reasonable path for further development and eventual implementation must be described

4.2.3.2. Step A Elimination Criteria

This solicitation does NOT explicitly solicit proposals for any of the eliminating criteria in the list below. Step A proposals that substantially exhibit any of the elimination criteria will be out-of-scope and will NOT be invited for a Step B proposal. Also, NIAC proposals should not request resources for writing Phase II proposals or other opportunities.

1. Not an aerospace architecture. Fails to sufficiently address NASA goals or potential space or aeronautics benefits.
2. Proposed concept is unclear or not adequately articulated. It fails to identify or propose to study a specific innovative concept. NIAC does not fund studies that identify a difficult challenge coupled with a plan for a thorough literature search or trade off study of known alternative concepts.
3. No mission context. The mission context is missing or insufficiently described.
4. Previously explored. Does not identify a new factor that substantially differentiates the proposal from prior efforts.
5. Incremental. Proposes typical next steps or aims at only modest improvement, rather than investigating far-term or high-risk "breakthrough" concepts.
6. Not technically credible. Conflicts with established physics or engineering principles, without acknowledging this and offering a sufficiently plausible defense.
7. Not programmatically credible. No reasonable path to implementation, without acknowledging the barriers (e.g., requiring unrealistic budgets or policy changes) and offering a sufficiently plausible approach.
8. The proposal is too narrowly focused on technology or subsystems development of smaller scope (e.g., components, instruments, materials) without sufficient evidence of incorporation into a mission context. While some focused work may be appropriate to establish the credibility of the underlying technology, a NIAC study must also include a detailed mission analysis.
9. The proposal is too narrowly focused on science experiments (e.g., laboratory characterization, field work) without sufficient evidence of incorporation into a mission context. While a NIAC study may involve such efforts, it must also include a detailed mission analysis.
10. The proposal is too narrowly focused on the development of tools or processes (e.g., improve design, decision-making, algorithm development) without sufficient evidence of incorporation into a mission context. While these are often beneficial products of a study, a NIAC study must also include a detailed mission analysis.

4.2.4. References and Citations (optional, pages as needed)

Any references and citations must use standard formats, with standard abbreviations for journals or complete names for books. References are optional. Some reviewers may choose to read them, but this should not be an expectation.

4.3. Step B Proposal Requirements

If invited to submit a Step B proposal, it must include the items below. Step B must retain and build upon Step A contents. As is the case with the Step A submission, the **Proposal Cover Page** is automatically generated in NSPIRES (see Section 4.3.4 of the NRA for more detail). The Proposal Attachment must include the following, in the order listed:

Appendix Reference	***Step B Proposal Section***	***Maximum Page Length***
3.3.1.	Table of Contents	As needed
3.3.2.	Overview Chart	1 page (landscape format)
3.3.3.	Compliance Table	1 page (follow format in Section 5.1)
3.3.4.	Technical and Management Section	8 pages
3.3.5.	References and Citations	Optional (Not counted in page limit)
3.3.6.	Biographical Sketches	2 pages per biographical sketch
3.3.7.	Letters of Support	As needed
3.3.8.	Budget Justification	As needed

4.3.1. Table of Contents (pages as needed)

A Table of Contents helps reviewers find specific proposal content. NASA prefers one page, but permits longer if needed.

4.3.2. Overview Chart (1 page in landscape format)

This should be identical to that submitted for Step A, although it is permitted to make minor corrections or clarifications that do not substantively change the proposed study. If there are any deviations in the chart submitted in Step A, this must be indicated by adding “Version 2” or “v.2” to the title line of the chart.

4.3.3. Compliance Table (1 page maximum)

The Compliance Table helps reviewers locate critical information during the evaluation process. It must be one page long, and include each element of the evaluation criteria as noted in Section 5.1 and denote the section and page number that addresses it, or note that the information is not present.

4.3.4. Technical and Management Section (8 pages maximum)

This is the primary description of the concept innovation, potential impact, technical work plan, and other benefits. This section should expand on the proposal submitted in Step A and retain its requirements. Ensure that the Step B proposal addresses each of the evaluation criteria in Section 5.1. As with the Step A proposals, any Step B proposal that is considered out-of-scope, according to the list in 4.2.3.2, will NOT be considered for selection.

4.3.5. References and Citations (pages as needed)

See description for References and Citations in Step A instructions.

4.3.6. Biographical Sketches (2 pages maximum per biographical sketch)

A biographical sketch outlining professional experiences and positions and recent publications must be included for any team member listed on the cover page. Any additional biographical sketches are optional. Key personnel should demonstrate that their qualifications, capabilities, and experience are adequate to ensure that the proposed objectives will be achieved. However, early career PIs are also encouraged to submit proposals.

4.3.7. Letters of Support (pages as needed)

NASA requires a Letter of Support from the owner of any facility or resource not under the PI's direct control, acknowledging its availability for the proposed use during the proposed period. For Government facilities, the availability of the facility to users is often stated in the facilities documentation or web page. Where the availability is not publicly stated, or where the proposed use goes beyond the publicly stated availability, a statement signed by the appropriate Government official at the facility, verifying its availability for the effort, is required.

Team members identified on the proposal cover page must acknowledge their intent to participate in the proposed effort. This Statement of Commitment is implied by virtue of electronically confirming participation through NSPIRES. Thus, a separate commitment letter is not required. Also, NASA neither solicits nor evaluates letters of affirmation (i.e., letters that endorse the value or merit of a proposal). If letters of affirmation are submitted nonetheless, they will count against the proposal page limit for the Technical and Management section. Again, reviewers are not asked to consider them.

4.3.8. Budget Justification

A justification for the proposed expenditures must be included in the Step B proposal. It must substantiate the overall budget request as provided in the proposal cover page, and comply with the instructions in Section 4.3 of the NRA, especially 4.3.5.

Budget data in the NSPIRES forms and in the budget justification will be made available to peer reviewers in the Step B evaluation process. Proposers should familiarize themselves with the appropriate award instrument and include all relevant details for evaluation. With the exception of federal agencies and NASA centers that will receive inter/intra-agency transfers or contracts, all awardees can expect to receive grants. No profits or fees are allowed.

5. Award Selection

This section provides an overview of how Step B proposals are evaluated, reviewed, and selected for funding.

5.1. Step B Evaluation Criteria

After eliminating out-of-scope Step A proposals, NASA will determine those most competitive to invite for a Step B submission. As with the Step A proposals, any Step B proposal that is considered out-of-scope, according to the list in 4.2.3.2, will not be considered for selection.

The following criteria will be used to evaluate Step B proposals and inform selections. The requirement to address each item does not imply that they are of equal weight, or deserve equal space in the proposal. Please give each the attention needed to make the most compelling case for the proposed concept.

	Evaluation Criteria	***Weight***
#1	**Innovation**	**25%**
a.	The concept is unexplored or provides sufficiently new approaches to successfully execute the proposed mission.	
b.	The underlying architecture is technically sound, with at least one plausible implementation path.	
c.	Preliminary justification and “back of the envelope” approximations show credibility. However, unknowns remain that are not readily determined, thereby warranting further study.	
d.	The concept must thoroughly describe a mission and its architecture. Novel capabilities should be included and must be contextualized by a mission to show where and how it can be implemented.	
#2	**Potential Impact of the Concept**	**30%**
a.	If successful, the concept will enable wholly new missions, offer a significant advantage to previously studied work, or provide a great leap in capabilities for NASA or the greater aerospace community.	
b.	The concept has the potential to generate enthusiasm for a mission and potential to build advocacy to support it within NASA or in the greater aerospace community.	
#3	**Technical Approach**	**25%**
a.	Work plan demonstrates understanding of major issues, proposing a logical, strategic, and judicious course of study to address significant unknowns, barriers, and necessary technology development.	
b.	There is a plan to evaluate alternative approaches to the concept and how new factors substantially differentiate it from prior efforts.	
c.	Work plan includes analysis in one specific mission that involves the development of its architecture and system trade considerations.	
d.	Team members are sufficiently qualified and adequate resources are identified to complete the study as proposed.	

e.	The study timeline is commensurate with the scope of the proposed budget. There is sufficient budget for labor, materials and supplies, mandatory travel, etc. to complete the study.	
#4	**Other Benefits of the Study**	**20%**
a.	As a result of performing the study, there are notable scientific, engineering, or creative benefits that contribute to its specific field, even if the concept is shown infeasible.	
b.	There are wider benefits of the study. For example but not limited to, engaging the public, making a contribution to the national economy, or producing potential non-aerospace spinoffs.	

5.2. Review Process

The review process is in accordance with the STMD Organizational Conflict of Interest (OCI) Mitigation Plan. The review process consists of four main steps:

1. **Step A Proposal Review**. Step A proposals that are within scope (i.e., do not violate any of the eliminating criteria), technically compliant, credible, and competitive will be considered for invitation to Step B.
2. **Panel Peer Review**. Step B proposals will be assigned to one of several Technical Review Panels of independent subject matter experts to evaluate proposals against the evaluation criteria in Section 5.1.
3. **Prioritized Recommendation**. The most competitive proposals identified by the Technical Review Panels will be reviewed by an Integration Panel and the responsible NASA officials will prepare a prioritized recommendation for the Selecting Official.
4. **Selection**. The Selecting Official will make the final selection of Step B proposals to be negotiated for award, based on the technical reviews, prioritized recommendations, feedback from NASA Mission Directorates, and considerations of programmatic balance.

6. Debriefings

Proposers have the right to learn the major factor(s) that lead to the acceptance or rejection of any proposal. NASA provides only written debriefings for NIAC proposals, due to the large number of proposals typically received. All proposers not invited to Step B are notified of the reasons in the NSPIRES letter response to their Step A submissions. Proposers who are invited to Step B and submit proposals automatically receive a copy of the full peer review panel evaluation, via the NSPIRES system, which serves as their written debrief.

7. References

NASA Strategic Plan:
http://www.nasa.gov/about/budget/index.html

NASA's Space Technology Roadmaps:
http://www.nasa.gov/offices/oct/home/roadmaps/index.html

The National Aeronautics Research and Development Plan – Biennial Update 2010:
http://www.whitehouse.gov/sites/default/files/microsites/ostp/aero-rdplan-2010.pdf

National Research Council (NRC) Review of the Space Technology Roadmap:
http://www.nap.edu/catalog.php?record_id=13354

NASA's Strategic Space Technology Investment Plan (Draft):
http://www.nasa.gov/pdf/674740main_07-17_12DRAFT_Strategic_Space_Tech_plan.pdf

Guidebook for Proposers Responding to a NASA Research Announcement (NRA) or Cooperative Agreement Notice (CAN), 2015 Edition is available online at the following address:
http://www.hq.nasa.gov/office/procurement/nraguidebook/

Federal Acquisition Regulation (FAR) is available online at the following address:
http://www.acquisition.gov/far/index.html or http://farsite.hill.af.mil/

NASA Federal Acquisition Regulations Supplement (NFS) is available online at the following address:
http://www.hq.nasa.gov/office/procurement/regs/nfstocA.htm

NFS provision 1852.235-72, Instructions for Responding to NASA Research Announcements is available online at the following address:
http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm