NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

HEADQUARTERS

SPACE TECHNOLOGY MISSION DIRECTORATE

300 E Street, SW

Washington, DC 20546-0001

SPACE TECHNOLOGY RESEARCH GRANTS PROGRAM, SPACE TECHNOLOGY RESEARCH INSTITUTES APPENDIX

to

NASA Research Announcement (NRA): Space Technology – Research, Development, Demonstration, and Infusion 2018 (SpaceTech–REDDI–2018), 80HQTR18NOA01

APPENDIX NUMBER: 80HQTR18NOA01-18STRI-B3

Appendix Issued: *May 31, 2018*

Notices of Intent Due: *July 02, 2018*

Preliminary Proposals Due: *July 30, 2018 (5:00pm Eastern)*

Invited Full Proposals Due: *November 05, 2018 (5:00pm Eastern)*

Catalog of Federal Domestic Assistance (CFDA) Number 43.012

OMB Approval Number 2700-0092

Expires 4/30/19

Summary of Key Information

Appendix Name: Space Technology Research Institutes (STRI) - hereafter called "Appendix" - to the SpaceTech-REDDI-2018 NRA, hereafter called the "NRA"

Goal/Intent: University-led, sustained, multi-disciplinary space technology research focused in strategic areas for transformative impact to future NASA exploration and science.

Eligibility: Only accredited U.S. universities are eligible to submit proposals; teaming is required. See section 3.0 for full list of requirements.

Key Events:

Event	Date	Time
Formal Appendix Released	May 31, 2018	
Notices of Intent Due	July 02, 2018	
Preliminary Proposals Due (mandatory)	July 30, 2018	5 PM ET
Notification of Preliminary Proposal Evaluations	August 30, 2018 (target)	
Invited Full Proposals Due	November 05, 2018 (target)	5 PM ET
Selection Notification	February 2019 (target)	
Award Date	Spring 2019	

Proposal Submission & Selection Process: Two-step process (preliminary and full proposals); preliminary proposals are mandatory; full proposals by invitation only; subject matter expert and independent peer review.

Typical Technology Readiness Level (TRL): Low to mid TRL research; beginning TRL typically no higher than 2.

Award Details: The planned award duration is 5 years; the maximum annual award amount is $3M (total award amount may not exceed $15M). Up to two awards are anticipated under this Appendix.

Type of Instrument that may be used for awards: Grants

Selection Official: The Space Technology Mission Directorate (STMD) Associate Administrator or designee

Point of Contact: HQ-STMD-STRI@mail.nasa.gov

NOTE: The proposal submission process is complex and involves multiple steps and associated deadlines. Therefore, offerors are strongly encouraged to begin the process well in advance of each applicable deadline.

TABLE OF CONTENTS

Note: The organization and section numbering of this Appendix mirror the SpaceTech-REDDI-2018 NRA to facilitate cross-referencing content between the two documents.

80HQTR18NOA01-18STRI-B3

Space Technology Research Institutes

1.0 SOLICITED RESEARCH/TECHNOLOGY DESCRIPTION

1.1 Program Motivation and Introduction

Many of the country's greatest scientific and technological advances have come from our universities. They continue a tradition of scientific and technological excellence, and are uniquely positioned to bring together the best and brightest minds from many disciplines and from a broad range of institutions and perspectives to help solve the most complex technical challenges. University leadership is essential to producing graduates with the capability to lead the U.S. into the future.

The National Aeronautics and Space Administration (NASA) continually looks for ways to help advance the development of U.S. aerospace technology. NASA's Space Technology Mission Directorate (STMD) already features multiple programs engaged in ground-breaking work with university researchers, most notably the Space Technology Research Grants (STRG) Program. With this Space Technology Research Institutes (STRI or research institute) Appendix, STMD complements the individual research grants and project opportunities already offered in STMD programs with the addition of larger, multi-disciplinary, university-led research efforts.

The research institutes construct enables coordination of experts from a wide range of fields and organizations in a single distributed research structure. For research areas of overlapping interest, this approach could significantly increase partnerships between NASA, other government agencies, industry, and academia, enabling greater progress and benefit for all involved. The institute approach facilitates a more focused and coordinated set of research and development (R&D) efforts than typically arise from a series of separate solicitations and individual research grants. Because the research institute maintains its focus for several years, more effective and substantial research progress is envisioned for the selected high priority research areas identified in this Appendix. In addition, the research institutes have the potential to increase the cadre of STMD researchers by involving experts and/or organizations that do not typically work closely with NASA. The alternate perspectives and new approaches they bring could lead to exciting new solutions and advances.

1.2 STRI Goals/Objectives and Features

The goal of an STRI is to strengthen NASA's ties to the academic community through long-term, sustained investment in research and technology development critical to NASA's future. The STRIs will enhance and broaden the capabilities of the Nation's

universities to meet the needs of NASA's science and technology programs. These investments will also create, fortify, and nurture the talent base of highly skilled engineers, scientists, and technologists to improve America's technological and economic competitiveness.

An STRI is intended to research and exploit cutting-edge advances in technology with the potential for revolutionary impact on future aerospace capabilities. At the same time, it will expand the U.S. talent base in research and development. An STRI has the following key features:

- A guiding Vision with a resilient research strategy to systematically address and significantly advance one of the solicited research topics
- Specific research objectives with credible expected outcomes within five years
- A multi-disciplinary research program that promotes the synthesis of science, engineering and other disciplines with relevant contributions
- Leveraging of university expertise and state-of-the-art (SOA) capabilities, possibly developed through funding from NASA, other government agencies or industry partnerships
- Low to mid Technology Readiness Level (TRL) research; beginning TRL typically 1-2
- Innovative technical approaches that offer promise for accelerated progress
- Empowered leadership: the STRI leadership team will define and manage all research tasks to realize the research institute's Vision
- A talented, diverse, cross-disciplinary, and fully integrated team to execute the research program, including multi-university participation; participation from Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions (MSIs) is strongly encouraged
- The involvement of university students in the research teams
- Active, long-term, and mutually beneficial interactions with NASA Centers, industry, other government agencies, and non-profit laboratories to achieve infusion of the capabilities developed
- A supportive infrastructure and management system; adequate personnel commitments to manage the research program and interact with outside entities
- Peer-reviewed publications of and open source access to results wherever possible

Research products are expected in the conduct of the STRI Research Plan. The products developed over the course of the award should demonstrate a growing level of validation and integration. Integrated, multidisciplinary solutions are sought, as opposed to groups of loosely connected single-discipline solutions. Example products include design tools, models, databases and associated analysis tools, fabrication and characterization methods, or other technical advancements.

1.3 Topics

The research institutes resulting from this Appendix will focus on R&D within particular technology areas of strong interest to NASA, other government agencies, and the

commercial space sector. STMD is soliciting STRIs in the two technology areas described in this section: *Revolutionary Propulsion for Rapid Deep Space Transit* and *Smart Deep Space Habitats (SmartHabs)*. The topic area descriptions below are intended to identify the broad areas of interest to NASA; only proposals in these two topic areas will be considered. Offerors are encouraged to define as rich and bold a research program as possible to advance the goals of their chosen topic.

Topic 1 – Revolutionary Propulsion for Rapid Deep Space Transit

The objective of this solicitation topic is to form a multidisciplinary institute to advance the development of revolutionary space propulsion technologies that could substantially reduce mission trip times and fundamentally transform deep space transportation.

Background

Deep space missions using current space propulsion systems are constrained by trip time, payload mass and volume, and cost. Revolutionary improvements in space propulsion technologies are needed to significantly reduce transit times, increase delivered payload mass, and provide sustainable overall mission costs.

Conventional space transportation systems typically employ chemical or solar electric propulsion. Chemical propulsion systems have effectively reached the limit of their maximum performance potential, with further development activities focused mainly on improving reliability and reducing cost. Solar electric propulsion (SEP) is increasingly being utilized for station keeping, orbit transfer, and deep space propulsion. Whereas there is still substantial room for improvement in power, performance, and reliability, SEP systems are not sufficiently transformative to enable rapid interplanetary transit, let alone missions into interstellar space. NASA is currently performing technology risk reduction and analyses to assess the feasibility of low enriched uranium nuclear thermal propulsion as a candidate for crew transport to and from the Mars system, but at this point the overall system Technology Readiness Level (TRL) is 3.

Constraints on achievable mission transit time directly reflect the current performance limitations of space propulsion technologies. Recent mission concept studies indicate that the fastest trip time to Mars for a crewed conjunction-class (long stay) mission using NTP (assuming a specific impulse of about 900 sec) is 159 days. This requires five super heavy lift launches to assemble the transfer vehicle (including the liquid hydrogen propellant needed for the outbound and return trips) in orbit before departure. Concept studies for missions to the ice giants using chemical or solar electric propulsion indicate flight times of 6-12 years to Uranus and 8-13 years to Neptune, depending on the launch year, the space propulsion choice, and whether gravity assist maneuvers are utilized. A recent Pluto orbiter mission concept study showed that it would take about 14 years for a 1500 kg payload to reach the destination using low-power (about 10 kW) nuclear electric propulsion (NEP) as the primary space propulsion system.

NASA is interested in advancing the development of revolutionary propulsion technologies for rapid transit missions throughout the solar system and beyond. Technologies that can enable the goal of rapid transit solar system propulsion, while also representing key milestones on a credible development roadmap toward farther-term goals such as interstellar precursor missions or an interstellar probe, are of particular interest. Propellant-based concepts, for example, would combine high specific impulse to minimize the amount propellant needed for a required change in spacecraft velocity with high propulsion system thrust-to-weight (T/W) characteristics to minimize the trip time. Optimizing a space propulsion concept for a particular mission entails a trade-off between high specific impulse and high thrust-to-weight, so concepts that can vary the specific impulse and thrust during a mission may offer certain advantages.

Research Objectives

This solicitation specifically seeks proposals that articulate a vision and associated research plan for advancing the readiness of a rapid transit deep space propulsion system. Incremental improvements to current propulsion systems are not sought and will not be considered.

A successful research institute will have a multidisciplinary team that can contribute to addressing the major technical challenges of the proposed space propulsion system. The institute is expected to demonstrate the feasibility and scalability of the critical technologies for the proposed rapid transit deep space propulsion system. The institute is further expected to formulate roadmaps for evolving performance over time and, if applicable, for enabling interstellar precursors or true interstellar probes. The proposed propulsion system/technologies should be developed with mission applications in mind, such that the full-scale system minimizes the number of launches and is safe, affordable, and reliable for long-duration deep space missions.

The proposed system and technologies must have well-established theoretical credibility, and proposals must describe both the mission and performance targets that the propulsion system concept will meet or exceed. Proposing teams may use one or more of the following mission targets or may select and justify their own mission targets. The proposed system must be potentially scalable to accommodate payloads of 1000 kg or more.

- Traversing the distance between Earth orbit and Mars orbit in no more than 45 days.
- Traversing a distance of 5 AU in no more than one year. This is an average of about 24 km/s (including the time needed to get up to speed at the outset and to slow down at the destination). For reference, the average distance of Jupiter from the Sun is about 5.2 AU.
- Traversing a distance of 40 AU in no more than five years. This is an average of about 38 km/s. For reference, the average distance of Pluto from the Sun is about 39.5 AU.

- Traversing a distance of 125 AU in no more than ten years. This is an average of about 59 km/s. For reference, Voyager 1 was about 122 AU from the Sun when it reached interstellar space.

Proposals must:

- Include a detailed description of the proposed propulsion system and critical technologies, with key performance parameters and targets clearly specified;
- Describe the objectives of the institute and detail the planned investigative approach, including analyses and experiments, as well as special test equipment to be used or developed;
- Describe the key development challenges and how they will be addressed; and
- Define major milestones that can be used to measure progress.

The primary objective of the institute should be feasibility demonstration of the propulsion system concept to at least TRL 3, with one or more critical technologies advanced to at least TRL 4. If a significant increase in the TRL of the proposed concept is not feasible within the scope of the effort defined, the proposal should clearly indicate the value proposition of the proposed effort to maturing the candidate technologies in the context of an overall development plan for the propulsion system concept. It is expected that proposed research will be executed in the context of mission applications; a systems analysis component is welcome, but the emphasis of this institute must be on propulsion technology development and demonstration.

For reference, surveys of advanced space propulsion and power candidate technologies are included in the 2015 NASA Technology Roadmaps “TA02: In-Space Propulsion Technologies” and “TA03: Space Power and Energy Storage” (http://www.nasa.gov/offices/oct/home/roadmaps/index.html). Assessments of the state of the art and development challenges are summarized in these documents. Additionally, information on advanced propulsion system concepts studied under the NASA Innovative Advanced Concepts (NIAC) program is available at https://www.nasa.gov/directorates/spacetech/niac/NIAC_funded_studies.html

Revolutionary space propulsion concepts not addressed in the roadmap documents or previously studied under NIAC auspices are welcome if they are within the scope of this topic.

The use of NASA facilities is not expected in the conduct of this research; however, if the offeror deems that a NASA facility is appropriate for a demonstration, please see Section 3.2 – Other Eligibility Limitations for restrictions and instructions.

Please refer to Section 7 – Points of Contact for Further Information of this Appendix if you have technical questions pertaining to this topic.

Topic 2 – Smart Deep Space Habitats (SmartHabs)

The objective of this solicitation topic is to form a multidisciplinary institute to fundamentally change how deep space habitats are designed for resilient and autonomous operation.

Background

Future deep space habitats (both orbital and surface) will require a paradigm shift away from the concept of operations that is used with the International Space Station (ISS). The ISS is continuously crewed, requires astronauts to perform all maintenance activities, has an extensive onboard inventory of spares, is supported by a large mission control staff in real-time, and has nearly continuous data communications. Future deep space habitats, however, will have none of these attributes, yet will still need to provide a functional, hospitable, and safe environment for humans.

To enable Earth independence, future deep space habitats must be capable of long-term self-awareness and self-sufficiency to maintain habitable conditions even when humans are not present. Substantial innovation beyond current Integrated System Health Management principles is required to provide this level of self-sufficiency. Prior to consideration for incorporation into future deep space habitats, new approaches must be validated in a range of representative habitat analogs to demonstrate their capabilities and robustness.

NASA is beginning the development of a deep space “Lunar Orbital Platform-Gateway” (“Gateway”) that will provide a long-term, habitat in cis-lunar space. The Gateway will be significantly different from ISS and represents how future habitats will require more self-sufficiency. The Gateway will initially be crewed for only 30-60 days a year, have limited in-line redundancy for uncrewed periods (when no human maintenance is available), have limited on-board spares inventory, have significant support from mission control with moderate (up to 10 sec round-trip) communications delay, and have intermittent periods of limited data communications.

Mars habitats will have even greater self-sufficiency challenges due to increased distance, isolation, and uncrewed periods. In particular, future Mars orbital and surface habitats may need to function for 1-3 years between crews, will have very limited on-board spares (with resupply gaps of up to 900 days), restricted direct human intervention, limited support from mission control with limited communications bandwidth and high latency (between 6 to 44 min round-trip).

There is substantial government and industry investment in industrial automation, remote monitoring, on-demand (terrestrial and space) manufacturing, cyber-physical systems, smart homes, and smart cities. The technologies being developed can provide a starting point for the autonomy capabilities required to address the critical challenges faced by future deep space habitats.

The state of the art in smart home and office systems provides isolated (or small) autonomous device clusters, which focus on energy efficiency and human convenience. Current smart homes and offices do not provide equipment recovery or restoration of function without external human intervention. Technology development for autonomous systems is an active area of research supported by other government agency programs including the National Science Foundation's (NSF's) "Smart and Autonomous Systems" and "Cyber-Physical Systems."

The commercial energy industry has been developing smart electrical grids that incorporate real-time monitoring, remote operation, and automated intervention via built-in redundancy; however, rapid human intervention is required for full repair. Several industries (oil & gas, chemical process plants, manufacturing, etc.) utilize cognitive platforms to consolidate data from various sources to inform exploration, production, and predictive maintenance.

In order for future deep space habitats to be self-aware and self-sufficient, a variety of new autonomy capabilities need to be developed. For example, autonomous repair of a habitat - when spare parts are in very limited supply - may have to rely on repurposed replacement parts, or parts that are autonomously produced on demand. Additionally, future habitats may require autonomous robot intervention to restore habitability or function. To do this, future habitats may need to employ a decentralized agent architecture and ad-hoc incorporation of systems to ensure robust operation in the presence of failures. Future habitats may also need to autonomously perform fault management of highly complex, interdependent systems involving many thousands of telemetry data points.

A document listing bibliographic material related to this topic is provided on the NSPIRES page associated with the STRI Appendix.

Research Objectives

The Smart Deep Space Habitats (SmartHabs) institute should pursue technologies, at both the subsystem and system levels, to enable the design and operation of a resilient space habitat by making pervasive use of autonomy. A successful proposal will:

- Pursue the development of novel analytical methods, decision-making techniques, technology concepts, and experimental proof-of-concepts in the context of future deep space, human exploration missions.
- Outline groundbreaking research to develop new technology for a habitat to autonomously maintain habitability, even during lengthy periods between crew visits.
- Clearly articulate a vision for revolutionizing the design and operation of future habitats.

Proposals are expected to broadly involve researchers from multiple disciplines, describing research that balances development of basic principles and analysis with prototyping and experimentation to gather empirical data. The focus should be on the development and demonstration of new innovations (techniques, tools, and prototypes)

that can be applied to a wide range of future habitats as opposed to engineering or integrating point solutions. Proposals are expected to describe plans for widespread dissemination of raw analog data and research results (including open source release of developed data, constructs, methods, tools, and technologies).

It is expected that proposals will articulate a Vision to revolutionize how robust deep intervention occurs, how reliable intervention decisions are made, and how humans are still informed partners in highly autonomous deep space habitats. Only proposals that address all three of the following research areas will be considered.

Smart Habitat Intervention
New strategies and technologies are needed to enable intervention for maintenance (preventive and corrective), mitigating failures, and ensuring habitable conditions. Certain repairs may need to be performed without human involvement, making use of available resources or improvisation to restore (or partly restore) functionality.

Potential research topics include (but are not limited to):

- Intervention (autonomous planning, scheduling, and execution of tasks) by robots and habitat systems based on real-time needs and capabilities to improve robustness and reliability.
- Autonomous fault management, including repair or reconfiguration.
- Application of multiple agents, machine learning, and novel decision-making techniques to direct intervention activities.

Smart Architecture and Analysis
Habitats are created from a combination of many integrated, yet independent, subsystems and processes. Novel analytical methods and software systems are needed to address the complexity of highly interdependent subsystems, which have varying automation and autonomous capabilities, and humans (ground control and crew).

Potential research topics include (but are not limited to):

- Distributed software framework that supports communication, collaboration, and coordination. This includes sharing of data (raw and derived) between humans, robots, and habitat systems to maximize capability and resilience.
- Cradle-to-grave logistics planning and assessment that can estimate the long-term impact of cannibalizing spares to address unplanned events.
- Generation of data sets for simulation and validation of a habitat across its operational lifetime, including unexpected events, faults, and failures.

Smart Context and Situation Awareness
Given that crew will not always be present, that mission control will not always be available to provide remote support or be able to respond in a timely manner, and that not all contingencies can be foreseen in advance, technology is needed to facilitate acquisition and maintenance of context and situation awareness across a range of

configurations. In particular, new strategies, algorithms, and techniques are needed to ensure seamless integration and interoperability between humans and habitat systems during different mission phases.

Potential research topics include (but are not limited to):

- Modeling of human behavior in order to prevent inadvertent human disruption of critical autonomy functions. Adapting to support multiple users with different/conflicting behaviors.
- Context-based function allocation involving humans (crew and mission control), robots, and habitat systems during various mission phases, including nominal operations, transition to/from crewed state, contingency operations, and maintenance periods.
- Semantic interoperability including shared state awareness to accommodate a wide range of system configurations during nominal and off-nominal conditions.

Demonstrations

It may be possible to demonstrate some of the technologies developed by the SmartHabs institute on the Gateway. However, it is critical that the institute focus on research and development that will enable all future deep-space habitats to be self-aware and self-sufficient.

Proposals should describe how the research products will be demonstrated in existing analog space habitats (NASA or non-NASA) over the five-year period. At least three demonstrations, of increasing complexity and involving different analog habitats, are required to be performed, including a capstone demonstration in the final year. Each demonstration should leverage existing capabilities and infrastructure to the greatest extent possible, but may include any additional capabilities, such as sensors and simulated systems, to demonstrate habitat self-awareness and self-sufficiency. As institute algorithms, architectures and other technologies mature, NASA will work with institute personnel to facilitate testing in relevant NASA analog environments.

Please refer to Section 7 – Points of Contact for Further Information of this Appendix if you have technical questions pertaining to this topic.

2.0 AWARD INFORMATION

Funding and Period of Performance Information and Availability of Funds for Awards

NASA plans to make up to 2 awards as a result of this Appendix, likely one for each topic described in 1.3, subject to the receipt of meritorious proposals and the availability of appropriated funds from which payment can be made. The actual number of awards will depend on the quality of the proposals received; NASA reserves the right to make no awards, or more than 2 awards, under this Appendix. There is no guarantee that an

award will be made in each topic area, and NASA reserves the right to make more than one award under a topic.

NASA plans to make the full award to the institution (lead university) submitting the proposal; the lead institution is responsible for distributing funds to team member institutions via subawards. Please note that it is also permissible for team member institutions to issue further subawards.

The research institute will be incrementally funded; the proposed amount may not exceed $3M in an award year and may not exceed $15M over five years; five years is the maximum award duration. All amounts must be justified. As stated previously, STRI leadership will be empowered and expected to maintain high performance and technical excellence across all research efforts. Towards that end, the research institute is expected to implement its own review processes. NASA oversight will be achieved through quarterly progress reports and annual reviews outlined in 6.0, and possibly site visits. Continuation will be contingent on availability of funds and adequate technical progress, assessed through both the quarterly reports and annual reviews. Failure to demonstrate adequate technical progress may lead to discontinuation of funding.

The anticipated type of award instruments will be grants subject to the provisions of the 2 CFR (Code of Federal Regulations) 200, 2 CFR 1800, and the NASA Grant and Cooperative Agreement Manual (https://prod.nais.nasa.gov/pub/pub_library/srba/). Cost sharing is not required but it may be voluntarily offered and any proposed cost sharing should be described.

3.0 ELIGIBILITY INFORMATION

3.1 Limitation on Number of Proposals Per Organization

A university may be the lead on at most one proposal submitted under each topic described in 1.3 of this Appendix. However, a lead university can receive only one award through this Appendix.

An individual may serve as Principal Investigator (PI) on only one proposal and may not participate as PI or Co-Investigator (Co-I) on any other proposals submitted to this Appendix. The PI on the proposal – who serves as the Director of the research institute – will be responsible for the overall technical Vision and leadership of the STRI.

There is no limit on the number of STRI proposals in which a university may participate in a non-lead capacity.

A Co-I on one proposal may also participate in other proposals.

3.2 Other Eligibility Limitations

Only accredited U.S. universities are eligible to submit proposals to this solicitation. The PI on the proposal must be a tenured faculty member or untenured, tenure-track faculty member in an engineering or science department at the lead university.

Creative teaming arrangements (i.e., diverse, multidisciplinary, and multi-institutional teams) are sought. The lead university is encouraged to not only take advantage of existing partnerships but to establish new partnerships, keeping in mind that diversity of thinking and new approaches could lead to exciting new solutions and advances. Teaming among accredited U.S. universities is required, with a minimum of three participant universities (including the lead university), each receiving at least 15% of the overall research institute budget.

Other universities (i.e., with < 15% of the overall research institute budget), non-profit laboratories, and industry may be part of the overall STRI team to fill specific technical gaps in the organization of the STRI.

At least 70% of the overall budget must go to the *university* participants of the STRI over the course of the award.

Co-Investigators (Co-Is) from the participant organizations, who are responsible for leading and managing major elements of the Research Plan, are required. Co-Is from the lead university are permitted. A management Co-I is permitted, but is not specifically requested or required.

Research institute leadership or participation from HBCUs or other MSIs is strongly encouraged.

The lead university may not change after submission of the preliminary proposal. The participant universities may change after the submission of the preliminary proposal; however, NASA (see 7.0 of this Appendix) must be notified of any changes within one month of being invited to submit a full proposal.

Other government agencies and FFRDCs, except as prohibited below, may collaborate on the research but may not receive STRI funds directly or via subaward. As specified in Appendix B of the 2017 NASA Guidebook for Proposers (hereafter referred to as the *NASA Guidebook*), a collaborator is not critical to the proposal but is committed to providing a focused but unfunded contribution for a specific task. The Technical and Management Section of the proposal (see 4.0 of this Appendix for additional information) should document the nature and need for all collaborations. If research collaboration is a component of the proposal, it is presumed that the collaborator(s) have their own means of research support; that is, an STRI proposed budget may not include any expenses for the collaboration effort.

Collaboration by non-U.S. organizations in proposed efforts is permitted as specified in 3.3 of the NRA.

This STRI Appendix is seeking to fund the best research proposed to the solicited topics from outside of NASA. Therefore, **NASA civil servants and Jet Propulsion Laboratory (JPL) employees may not appear as collaborators (or in any other role) on submitted proposals**, and there can be no solicitation-related communications with NASA (including JPL) researchers and managers from the time this Appendix is released until proposal selections are final. NASA personnel may not be involved in any aspect of proposal writing. Note that, in limited instances and only under the conditions described in Section 1.3 – Topics, contact with NASA facility managers (https://nrpi.hq.nasa.gov/public/MFI-Index.cfm) to ascertain likely facility availability and to obtain a cost estimate for inclusion in the proposal, is permitted. Please note that existing collaborations with NASA are not required or advantageous for a successful STRI proposal.

4.0 PROPOSAL SUBMISSION INFORMATION

The following information supplements the information provided in Section 4.0 of the NRA.

4.1 Overall Process Description and High-Level Requirements

This Appendix uses a two-step process. Only offerors who submit a preliminary proposal and are invited to submit a full proposal are eligible to submit a full proposal. The submission of a preliminary proposal is not a commitment to submit a full proposal.

Offerors may submit preliminary proposals via NSPIRES or Grants.gov. Full proposals must be submitted via NSPIRES. See 4.3.1 of NRA and 4.3 and 4.4 of this Appendix for details. The proposal submission process is complex and involves multiple steps. Therefore, offerors are strongly encouraged to begin the submission process early, well in advance of the deadline.

In addition, this solicitation strongly encourages Notices of Intent (NOIs) to Propose. See 4.3.2 of the NRA and 4.2 of this Appendix for details.

The submission deadlines and mechanisms are as follows

Submission	Mechanism	Due Date	Time
Notices of Intent to Propose	NSPIRES	July 02, 2018	
Preliminary Proposals (mandatory)	NSPIRES or grants.gov	July 30, 2018	5 PM ET
Invited Full Proposals	NSPIRES	November 05, 2018 (target)*	5 PM ET

* This deadline may be shifted if there is a delay in NASA review of the preliminary proposals.

4.2 Notices of Intent to Propose

As stated in the NRA, NOIs are requested to facilitate the review process. The proposal number restrictions described in 3.0 of this Appendix do not apply to NOIs. However, due to the complex nature of the planned research institutes, prospective offerors are strongly encouraged to consider these restrictions as early in the proposal window as possible, ideally prior to the NOI submission due date, and focus efforts on those proposals they deem most likely to succeed. NASA is unable to provide feedback on NOIs.

The NOI should include the following information in a single pdf file:

- Title of the research institute
- Submitting accredited U.S. university
- Name and affiliation of PI who will serve as the Director of the research institute
- Name and affiliation of each anticipated institute Co-I
- Brief Synopsis (200-300 words) of the scope and approach of the research institute to be proposed; the intent is to permit sufficient understanding of the proposal for reviewer recruitment.

4.3 Preliminary Proposal Requirements

The preliminary proposal includes a Proposal Cover Page and proposal attachment. Note the following:

- The title given to the preliminary proposal must be descriptive of the proposed research.
- The preliminary proposal requires the completion of Program Specific Data (PSD) questions; see Section 4.3.4 of the NRA for NSPIRES and grants.gov instructions
- Letters of commitment, either through NSPIRES or otherwise, are not required for preliminary proposals, and only the research institute PI must be listed on the proposal cover page. Team members should be listed in the Technical and Management Section.

The **Preliminary Proposal attachment** must include the following, in the order listed*:*

Appendix Para #	***Proposal Section***	***Maximum Page Length***
PP-1	Summary/Overview Chart	1
PP-2	Technical and Management Section	5
PP-3	References and Citations	1

Reviewers will not consider any content in excess of the page limits specified in the table above; any excess material will be removed from the proposal prior to forwarding for evaluation.

PP-1 Summary/Overview Chart

This chart is different from the Proposal Summary Chart described in 4.3.4.1 of the NRA. The chart is intended to provide a quick sense of the proposed research institute and should stand alone. Invited full proposals are permitted to make minor changes to the summary/overview chart as described under FP-3 below. Follow the format in Figure 1. Note: The chart should not include any proprietary or sensitive data as NASA may use all or some of the information on the summary chart, including images, for communications about the final selections (e.g., press releases).

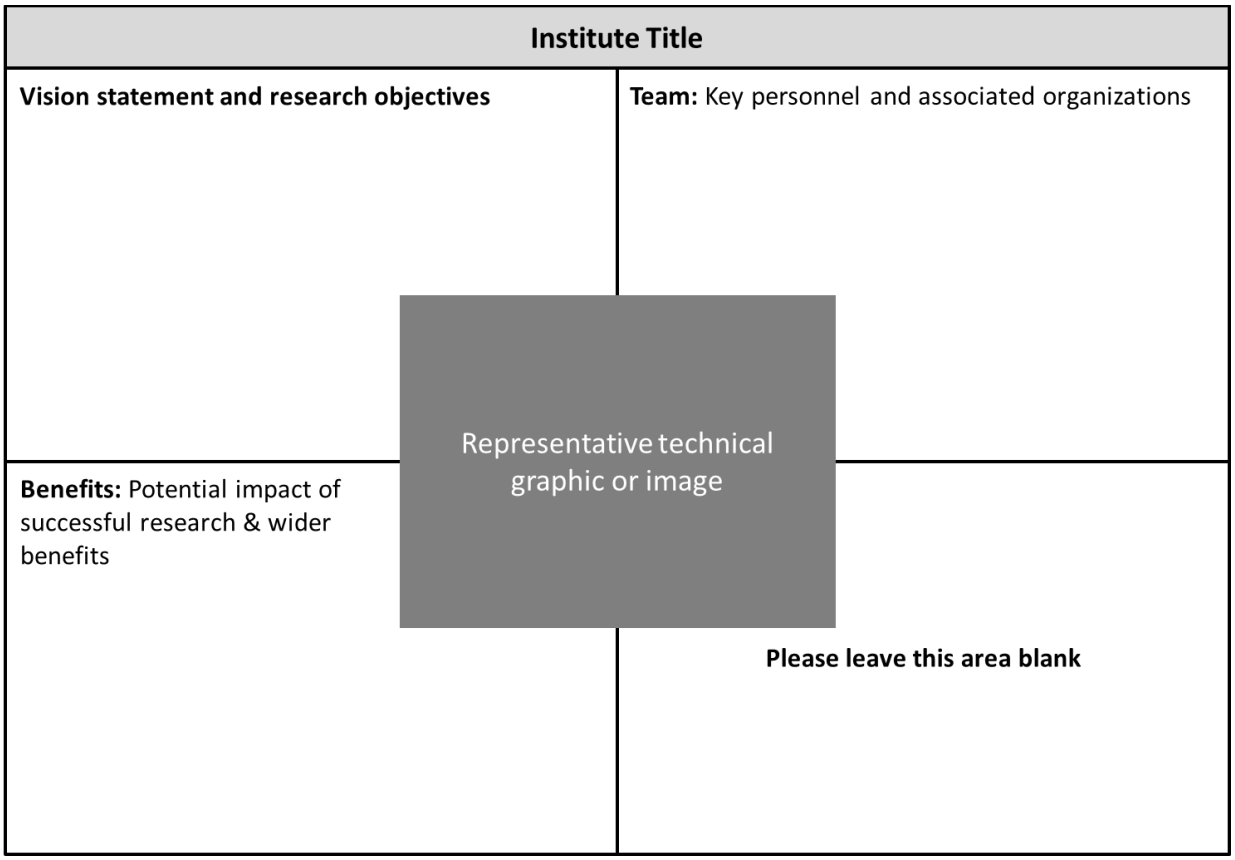

Figure 1 - Format for Required Summary/Overview Chart

PP-2 Technical and Management Section

Offerors are encouraged to read the Technical and Management Section requirements for the full proposal (FP-4 below) when preparing this section for the preliminary proposal.

- Introduce the STRI Vision
- Discuss relevance to NASA in the context of the selected topic (1.3 of this Appendix), and likely outcomes that NASA can incorporate or act upon to facilitate progress
- Discuss the multidisciplinary nature of the proposed research, and why the research institutes construct (1.2 of this Appendix) is vital to achieving the Vision
- Discuss how the proposed research is innovative

- Describe how the proposed research has a credible and strong basis in current and prior research programs
- Summarize the Research Plan, including interdependent research objectives, likely research products, and SOA advancement
- Introduce the STRI leadership team, including names and affiliations; list other participating institutions known as of preliminary proposal submission. It is not necessary to include biographical sketches in the preliminary proposal; however, please describe how the PI and the team meet the requirements in 3.2 of this Appendix (i.e., this information will be used for compliance review).

PP-3 References and Citations

All references and citations given in the *Technical and Management Section* must be provided using easily understood, standard abbreviations for journals and complete names for books. It is highly preferred but not required that these references include the full title of the cited paper or report. (Section 3.14 of the *NASA Guidebook*)

Please note the one-page limit; only the most relevant and impactful references should be referenced in the *Technical and Management Section* and provided in this section of the preliminary proposal.

4.4 Full Proposal Requirements

Full proposals may be submitted upon invitation only.

A full proposal consists of a Proposal Cover Page and a proposal attachment. Note the following:

- Full proposals must be submitted through NSPIRES. Full proposals may not be submitted through grants.gov.
- The NSPIRES system will guide proposers through submission of all required proposal information. Select “prior-phase proposal” when creating a full proposal. This will automatically transfer the proposal information from the preliminary proposal to the full proposal. (Preliminary proposals submitted through grants.gov are transcribed from grants.gov into NSPIRES.)
- The title on the Full Proposal must be the same as on the Preliminary Proposal, unless the offeror has formally requested and received (see 7.0 of this Appendix for contact information) permission to adjust the title.
- The Proposal Cover Page will be generated by NSPIRES. Proposal team members carried over from the preliminary proposal may need to login and re-confirm their affiliation and participation on the proposal.
- The full proposal requires the completion of PSD questions.
- The research institute PI *and all proposal team members, including collaborators*, must be listed on the Proposal Cover Page.

The **Full Proposal attachment** must include the following, in the order listed*:*

Appendix Para #	*Proposal Section*	*Maximum Page Length*
FP-1	Executive Summary	2
FP-2	Table of Contents	1
FP-3	Summary/Overview Chart	1
FP-4	Technical and Management Section	35
FP-5	Data Management Plan	2
FP-6	References and Citations	As needed
FP-7	Biographical Sketches for PI and Co-Is	2 pages for each
FP-8	Current and Pending Support	As needed
FP-9	Letters of Support	1 page each, if needed
FP-10	Proposal Budget with Budget Narrative and Budget Details	As needed
FP-11	Special Notifications and/or Certifications	As needed

Reviewers will not consider any content in excess of the page limits specified in the Table above; any excess material will be removed from the proposal prior to forwarding for evaluation.

FP-1 Executive Summary
The executive summary is limited to 2 pages and must include: Vision, background, research objectives, impact, and principal participants.

FP-2 Table of Contents
A brief table of contents as a guide to the organization and contents of the proposal.

FP-3 Summary/Overview Chart
The Summary Chart should be the same as that submitted as part of the preliminary proposal, although it is permissible to make minor updates or clarifications that do not substantively change the proposed research institute. If any changes to the preliminary proposal chart are made, this must be indicated by adding “Version 2” or “v.2” parenthetically after the research institute title at the top of the chart.

FP-4 Technical and Management Section

This is the main body of the proposal and must cover the following sub-sections in the order given. The *Technical and Management Section* is limited to 35 pages with standard (12 point) font, and the text must have 1 inch margins. This page limit includes illustrations, tables, figures, and all sub-sections.

Relevance to Solicitation Objectives

The Vision of the proposed STRI must be clearly articulated, and how it directly addresses one of the topics described in 1.3 of this Appendix must be explained, making a case with the following characteristics:

- Substantiate that the proposed Vision is best pursued or enabled by a research institute (rather than by individual grant awards).
- Describe why the Vision requires innovative, multidisciplinary research to enable the realization of transformative space technology capabilities and how it holds promise for significant improvements in the state of the art.
- Discuss how the proposed research program has a credible and strong basis in current and prior research programs at the STRI organizations. In addition, describe how the proposed STRI research leverages NASA, other government agency, or industry investments in related SOA activities.
- Clearly address the integration of emerging fundamental research and enabling technologies within the five-year period of the STRI, and explain how this will yield outcomes that NASA can incorporate or act upon to develop new capabilities and enable new missions.

Technical Approach

Discuss the overarching Research Plan in pursuit of the institute's Vision and research objectives, and how it will position the research institute to significantly advance the SOA:

- Summarize relevant SOA research and practice. Key gaps in knowledge and technology should be identified. Proposed activities that leverage available knowledge and technologies outside the STRI should be included to complement research institute capabilities, accelerate progress, and avoid duplication.
- Identify and characterize interdependent research objectives and activities that will comprise the research institute. Discuss each objective vis-à-vis the Vision of the STRI.
- For each objective, provide information on projected fundamental knowledge and technology products and on the gaps and barriers the objective will address in the context of the Research Plan. Discuss how the desired results constitute breakthroughs and are attainable in five years. Discuss the cross-disciplinary mix of expertise needed to achieve the objective.
- Describe at least three exemplar projects in depth, no more than one per objective, to allow judgment of the quality of the effort proposed, rather than superficially describing all projects.
- Describe plans for technical demonstrations as required by the applicable Appendix topic.
- Provide a five-year milestone chart (displayed in a font size that is readable) that illustrates the critical path, contributions from specific projects, and

interdependence of research activities and overarching research objectives consistent with the research institute's Vision. More clarity and specificity of milestones are expected for years 1 through 3.

- Provide metrics that measure milestones for critical-path activities that are specific, measurable, attainable, and relevant to the STRI Vision.
- Describe the expected research products and schedule for those products.
- Provide a clear assessment of the primary technical development risks and identify the mitigation strategies to address them.
- Discuss the laboratories, facilities, and equipment for the STRI, particularly those shared by STRI team members. Distinguish between existing facilities and equipment and any new infrastructure required for the conduct of the proposed STRI research.

Management Approach

Describe the proposed institutional configuration and justify it in the context of the Vision. Address the following points:

- Describe the management philosophy and structure, and detail the approach for actively managing the disparate set of participating institutions and activities. Discuss the composition and role(s) of each leadership team member (i.e., PI and all Co-Is).
- Discuss the value added by each STRI participant organization, whether paid through the STRI or collaborating. Diverse partnerships bring an abundance of talent and perspectives; however, each participating organization should have a meaningful role to best advance the STRI Vision and research objectives.
- Describe the approach for updating the Research Plan to keep activities, metrics, milestones, personnel, and resources aligned with progress towards the Vision. This should be resilient; it is anticipated that an STRI will periodically need to refine its implementation to focus on key advances, prune less compelling research institute components, and ensure the continued efficacy of its Research Plan.
- Discuss the role of an Institute Advisory Board (IAB). The IAB should be comprised of both outside technical experts and potential end users of the technologies being developed; it is not expected that NASA civil servants will serve on the IAB. The results of IAB interactions must be reported to NASA at the annual status reviews. *(Note: To prevent conflicts of interest, potential IAB members should not be contacted or even listed as potential members until an STRI selection decision is announced.)*
- Discuss the institutional commitment of the lead and partner organizations to the goals of the proposed STRI. Address how these organizations will assure that their policies and practices will support the research institute in achieving its goals. Include a discussion of tenure and mentoring policies in light of the cross-disciplinary structure of the STRI and its mission to go beyond a traditional research culture.
- Describe plans for student involvement. Discuss how highly qualified individuals will be recruited to this research program, and especially how opportunities for interdisciplinary study and research will be enabled.

- Discuss planned interactions with industry, other government agencies, non-profit laboratories, and even other non-STRI universities to enhance the overall research program and stimulate knowledge and technology transfer opportunities. The emphasis should be on innovative approaches to achieving the goals and objectives of the STRI.
- Discuss what intellectual property is expected to be made publicly available during and at the conclusion of the work. It is NASA's intent that all data, and as many research products as possible, associated with this work be made publicly available. In the context of the proposed research institute's intellectual property policy, describe the approach to making research products (design tools, models, analysis tools, fabrication and characterization methods, etc.) publicly available to ensure the impact and longevity of institute-derived findings. Any open access limitations must demonstrate a significant net benefit to NASA or may negatively impact evaluation of the proposal.

FP-5 Data Management Plan (DMP)
The DMP requirements may be found in 6.0 of this Appendix; topic-specific data management requirements may be found in 1.3 of this Appendix. Reasonable costs associated with the DMP (i.e., costs of sharing, preservation, etc.) may be included in the proposal budget.

FP-6 References and Citations
All references and citations given in the *Technical and Management Section* must be provided using easily understood, standard abbreviations for journals and complete names for books. It is highly preferred but not required that these references include the full title of the cited paper or report. (Section 3.14 of the *NASA Guidebook*)

FP-7 Biographical Sketches
The PI – the Director of the research institute – must include a biographical sketch (not to exceed two pages) that includes his/her professional experiences and positions and a bibliography of recent publications, especially those relevant to the proposed investigation. The PI's biographical sketch must clearly show how he/she meets the requirements specified in 3.2 of this Appendix. A one- to two-page sketch for each Co-I must also be included. For the PI and any Co-Is who are required to provide Current and Pending Support information (see FP-8), the biographical sketch must include a description of scientific, technical, and management performance on relevant prior research efforts. Those participants who will play critical management or technical roles in the proposed investigation should demonstrate that their qualifications, capabilities, and experience are appropriate to provide confidence that the proposed objectives will be achieved. (Section 3.15 of the *NASA Guidebook*)

FP-8 Current and Pending Support
Information must be provided for all ongoing and pending projects and proposals that involve the proposing PI and all Co-Is. All current project support must be listed, regardless of source (e.g., Federal, State, local, or foreign government agencies; public or private foundations; industrial or other commercial firms). This information must also

be provided for all pending proposals already submitted or being submitted concurrently to other possible sponsors. Do not include the current proposal on the list of pending proposals unless it has been submitted to another possible sponsor.

All projects or activities, current or pending, requiring a portion of the investigators' time during the period of the proposed effort must be included, regardless of salary support. For those investigators for whom it is required (see above), the proposal shall provide the following information for each current and pending project:

- Title of funded project or proposal;
- Name of PI on award or proposal;
- Program name (if appropriate) and sponsoring agency or organization, including a point of contact with their telephone number and email address;
- Performance period;
- Total amount received by that investigator (including indirect costs) or the amount per year if uniform (e.g., $50K/year); and
- Time commitment by the investigator for each year of the period of performance.

For pending research proposals involving substantially the same kind of research as that being proposed to NASA in this proposal, the proposing PI must notify the NASA Program Officer identified in 7.0 of this Appendix immediately of any successful proposals that are awarded any time between the proposal due date and the date that NASA notifies the offerors. (Section 3.16 of the *NASA Guidebook*)

FP-9 Letters of Support

Every Co-I and Collaborator identified as a participant on the proposal's cover page and/or in the proposal's *Technical and Management Section* must acknowledge their intended participation in the proposed effort. The NSPIRES proposal management system allows for participants named on the Proposal Cover Page to acknowledge a statement of commitment electronically. This STRI Appendix requires that statements of commitment should be acknowledged electronically through NSPIRES.

In addition, a letter of support is required from the owner of any facility or resource that is not under the direct control of a proposal team member, acknowledging that the facility or resource is available for the proposed use during the proposed period.

Letters of support do not include letters of affirmation (i.e., letters that endorse the value or merit of a proposal). NASA **neither solicits nor evaluates** such endorsements for proposals. The value of a proposal is determined by peer review. (Section 3.17 of the *NASA Guidebook*)

FP-10 Proposal Budget with Budget Narrative and Budget Details

Offerors must follow the budget format requirements provided in Section 3.18 of the *NASA Guidebook* and Section 4.3.5 of the NRA. This section may not include any information that belongs in the *Technical and Management Section*.

In addition, the following table which summarizes the budgeted funding per year for the lead university and all other involved organizations is requested:

	Year 1 ($ K)	Year 2 ($K)	Year 3 ($K)	Year 4 ($K)	Year 5 ($K)	Total ($K)
Lead University						
Involved Org 1						
Involved Org 2						
…. (*as needed*)						
Total / Year						

Proposal funding restrictions are detailed in 4.3.6 of the NRA. Additional restrictions for this STRI Appendix include:

- The maximum annual award value is detailed in 2.0 of this Appendix. All amounts must be justified. Additional funding restrictions/requirements are detailed in 3.0 of this Appendix.
- Funds may be used for student (undergraduate or graduate) and postdoctoral fellow support, provided these individuals are directly involved in the proposed research and any costs related to such individuals are allowable and allocable according to governing cost principles.
- Funds may be used for research expenses, such as costs incurred in experiments, purchase of equipment and/or supplies, computing, travel, etc.

If research collaboration is a component of the proposal, it is presumed that the collaborators have their own means of research support; that is, an STRI award may not include any expenses for the collaboration effort.

FP-11 Special Notifications and/or Certifications
See Section 3.21 of the *NASA Guidebook.*

5.0 PROPOSAL REVIEW INFORMATION

5.1 Administrative Review

(This Appendix adds no additional detail to umbrella NRA 80HQTR18NOA01 Section 5.1.)

5.2 Evaluation Criteria

The evaluation criteria for proposals received in response to this Appendix are described below. Evaluation criteria (with associated weights) for preliminary and full proposals are provided separately.

Preliminary Proposal Evaluation Criteria

Relevance to Solicitation Objectives (60%)

Extent to which the proposed research

- addresses one of the topics in 1.3 and the objectives of the solicitation
- demonstrates a compelling Vision that is best pursued or enabled by a multidisciplinary, multi-institutional, university-led research institute
- is innovative
- has a credible and strong basis in current and prior research programs
- is well structured to yield outcomes that NASA can incorporate or act upon to facilitate progress

NOTE: This Appendix includes a specific description of how it is relevant to the NASA Strategic Plan. Therefore, it is not necessary for a proposal to show relevance to NASA's broader goals and objectives.

Technical Approach (40%)
Extent to which the preliminary proposal

- introduces a comprehensive Research Plan, laying out interdependent research objectives with clear research products that are tied to the STRI Vision
- describes a Research Plan that is likely to lead to significant progress in overcoming well-defined, critical gaps and barriers in existing understanding
- demonstrates a sufficient understanding of the SOA and related activities and makes a case for significant advancement

Full Proposal Evaluation Criteria

Relevance to Solicitation Objectives (30%)
Extent to which the proposed research

- addresses one of the topics in 1.3 and the objectives of the solicitation
- demonstrates a compelling Vision that is best pursued or enabled by a multidisciplinary, multi-institutional, university-led research institute
- is innovative
- has a credible and strong basis in current and prior research programs
- is well structured to yield outcomes that NASA can incorporate or act upon to facilitate progress

NOTE: This Appendix includes a specific description of how it is relevant to the NASA Strategic Plan. Therefore, it is not necessary for a proposal to show relevance to NASA's broader goals and objectives.

Technical Approach (40%)
Extent to which the proposed research

- has a feasible and sound Research Plan, consisting of interdependent research objectives with clear research products that are tied to the Vision of the STRI. Each research objective must be well-defined, addressing gaps, barriers, anticipated breakthroughs, and the required cross-disciplinary expertise
- is likely to make significant progress within the five-year timeframe of the research institute

- demonstrates a clear understanding of the SOA and related activities, including appropriate leveraging of available knowledge and technologies outside of the STRI, and makes a case for significant SOA advancement
- describes at least three exemplar projects that support the institute's Vision and are indicative of a high quality Research Plan
- addresses the technical demonstration requirements of the selected topic
- has a milestone chart that is realistic and illustrates the critical path, contributions from research projects, interdependence of research activities, and research objectives consistent with the research institute's Vision
- has clear (specific, measurable and attainable) metrics for milestones associated with critical path activities
- has well-defined research products with an associated schedule of availability
- demonstrates a clear understanding of the primary technical development risks and identifies the mitigation strategies to address them
- has access to, or plans for, adequate laboratories, facilities, equipment, tools, and data for the conduct of the proposed research

Management Approach and Cost (30%)

Extent to which

- the research institute Director and Co-Is have the expertise and experience needed to successfully implement the proposed research program
- the proposed team assembles a broad, deep and diverse mix of expertise and talent to best advance the STRI Vision and research objectives and each participant adds value
- the management philosophy, structure and approach are appropriate and effective
- the proposal describes a resilient strategy for managing Research Plan updates, including an effective role for an Institute Advisory Board
- the proposal demonstrates the institutional commitment of the lead and partner organizations to the goals of the proposed STRI
- the proposal includes plans for effective student involvement and training of early career researchers
- the described interactions (with industry, other government agencies, non-profit laboratories, and even other non-STRI universities) are likely to stimulate knowledge and technology transfer opportunities
- the intellectual property policy and data management plan maximize the STRI knowledge, data, and research products that will be publicly available at the conclusion of the work, with sound rationale for any open access limitations
- the budget is realistic and reasonable for the scope of the proposed effort, and is within the solicitation funding profile

If any evaluation criteria in this Appendix conflict with any part of the NRA, the criteria identified in this Appendix take precedence.

5.3 Review and Selection Processes

Both Federal and non-Federal reviewers may be used, and submission of a proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution. Peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. The review process will be conducted in accordance with the STMD Organizational Conflict of Interest Mitigation Plan.

Preliminary proposals will undergo review by subject matter experts. Only the specific Technical Approach and Relevance sub-criteria listed in 5.2 under "*Preliminary Proposal Evaluation Criteria*" apply. Based on the review of preliminary proposals, NASA will invite offerors to submit full proposals. NASA will also notify the offerors who are not selected at the conclusion of the preliminary proposal phase. Preliminary proposal review findings for non-selected offerors will be available, upon request and via NSPIRES, after the full two-step proposal process has been completed.

Full proposals will undergo Subject Matter Expert panel reviews as per the criteria provided under "*Full Proposal Evaluation Criteria*" in 5.2.

SME panel results will be presented to the Selection Official. The Selection Official for this Appendix will be the NASA Space Technology Mission Directorate Associate Administrator or designee.

5.5 Selection Announcement and Award Dates

Selection notifications are anticipated on or about February of 2019. Each PI and submitting university Authorized Organizational Representative will receive notification via NSPIRES.

For those proposals being recommended for award, the notification should not be regarded as an authorization to commit or expend funds. Research grants are expected to be awarded as a result of this announcement. Assuming the availability of appropriated funds, awards are expected to be in place by the late spring of 2019. If selected, NASA expects the grantee to commence with the proposed research on or near the award date; deferrals will not be permitted.

Feedback to proposing teams will be provided upon written request; requests for feedback should be submitted as instructed in the notification letter and within 30 days of notification.

6.0 AWARD ADMINISTRATION INFORMATION

6.2 Award Reporting Requirements, Meetings and Research Products

The reporting requirements will be consistent with 2 CFR 1800.902 "Technical Publications and Reports" and Exhibit E - Required Publications and Reports of the

NASA Grant and Cooperative Agreement Manual. Grants require annual and final technical reports, financial reports, and final patent/new technology reports. Electronic copies of publications and presentations must also be submitted along with the technical reports.

The following additional requirements will be incorporated into the research institute awards:

- Research institute **kickoff meeting** at the beginning of the award and prior to the end of the first quarter of year 1.
- **Quarterly Status Reports** will be required to summarize technical progress, highlight notable accomplishments and completed milestones and discuss risks/issues. Quarterly reports must include an executive summary. Major reports can replace quarterly status reports when occurring in the same quarter.
- **Annual Reviews** will be conducted to assess performance and quality of work, relevance to the research institute's Vision, and future plans. These meetings will be held at an agreed-upon university or NASA Center location. The annual review team will be jointly selected by the research institute's leadership team and NASA. It is expected that the STRI team will brief the results of their institute-led review process for the year in review, including interactions with and feedback from the IAB.
- **Web Presence –** the research institute is required to establish and maintain a web presence to communicate technical and programmatic results down to the project level. The website must be 508 compliant and launched prior to the end of the second quarter of year 1.
- **Biannual Metrics Reports –** The research institute must record, track, and provide to NASA, in a NASA-provided template, biannual searchable reports containing institute-level metrics including, but not limited to, research accomplishments and impacts; publications; number and characteristics of STRI personnel; sources and amounts of non-NASA support; partnerships established; technology transfer (licenses, disclosures, patents, etc.) and impact; and listing of students supported and degrees granted to STRI-involved personnel. These reports will be due at the end of the first and third quarters of every award year.
- **Data management and public disclosure** - As a Federal Agency, NASA requires prompt public disclosure of the results of its sponsored research to generate knowledge that benefits the Nation. It is NASA's intent that all knowledge developed under awards resulting from this Appendix be shared broadly. STRI award recipients will be expected to publish their work in peer-reviewed, open literature publications to the greatest extent practical. In keeping with the NASA Plan: Increasing Access to the Results of Scientific Research (accessible from https://www.nasa.gov/open/researchaccess/public-access-results), new terms and conditions about making manuscripts and data publically accessible will be attached to awards that result from this Appendix. STRI proposals must include a Data Management Plan (see 4.0 of this Appendix).

- **Research Products** – Identified research products shall be delivered over the course of award execution or no later than 90 days after the grant end date.

7.0 POINTS OF CONTACT FOR FURTHER INFORMATION

Technical questions and comments and procurement questions and comments about this Appendix may be directed to HQ-STMD-STRI@mail.nasa.gov.

Questions of a general nature will be added to the Frequently Asked Questions (FAQs) document for this Appendix. The FAQs document will be located under “Other Documents” on the NSPIRES page for this Appendix.

All technical questions will be incorporated into one of the topic-specific Questions and Answers (Q&A) documents, also located under “Other Documents” on the NSPIRES page for this Appendix. When submitting a technical question, offerors are agreeing to have the question, and associated response, published in one of the Topic Q&A documents. Technical questions will be accepted through October 22, 2018; no technical questions will be accepted after this date.

8.0 ANCILLARY INFORMATION

(This Appendix adds no additional detail to umbrella NRA 80HQTR18NOA01 Section 8.0.)