NASA RESEARCH ANNOUNCEMENT (NRA):
80HQTR20NOA01

Space Technology Research, Development, Demonstration, and Infusion-2020 (SpaceTech-REDDI-2020)

Effective: October 1, 2019 – September 30, 2020

REFER TO APPENDICES FOR PROPOSAL DUE DATES

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EXECUTIVE SUMMARY

This NASA Research Announcement (NRA), entitled “Space Technology Research, Development, Demonstration, and Infusion-2020 (SpaceTech-REDDI-2020)” is the NASA Space Technology Mission Directorate (STMD) umbrella solicitation.

STMD seeks aggressive technology development efforts that may require undertaking significant technical challenges and risk to achieve a higher potential payoff. The focus of this umbrella NRA is to identify the best ideas and talents from all sectors of the aerospace enterprise to solve future technology needs while maximizing the value of the Nation’s investment. Investing in space technology invests in the future of NASA, the U.S. space program, and the Nation. These STMD space technology investments will be consistent with the NASA Strategic Plan. Proposed efforts under the SpaceTech-REDDI-20 umbrella NRA are intended to align with the Strategic Goal: Address National Challenges and Catalyze Economic Growth and the Strategic Objective: Develop and Transfer Revolutionary Technologies to Enable Exploration Capabilities for NASA and the Nation. These strategic investments will focus on future exploration with emphasis on the Moon, while keeping an eye towards Mars and beyond.

Proposals for space technology research, development, and demonstration in support of STMD will be solicited through Appendices under this umbrella solicitation as technology topics are defined and funding is made available for new opportunities. For informational purposes, Appendix target release dates have been included on page 5. The Appendices will provide key information including: specific scope of the work solicited, notice of intent and proposal due dates, specific instructions about proposal content and evaluation criteria, anticipated budget for new awards, and number of awards anticipated. The provisions in any Appendix will apply to that specific solicitation opportunity and will supersede any conflicting provisions in this umbrella solicitation or in the Guidebook for Proposers Responding to a NASA Funding Announcement (FA) (see Section 9.0 in this solicitation).

There is the possibility that additional information will become available or programmatic changes may affect this umbrella solicitation or any of the opportunities offered under its Appendices prior to a proposal submission deadline. If so, such information will be added as a formal amendment to this umbrella solicitation and posted on the following webpage: http://nspires.nasaprs.com. Clarifications or questions and answers that are published will also be posted on this website or included in an amendment. Each prospective offeror has the responsibility to check this webpage for updates concerning the programs and solicitations of interest.

To the greatest extent practicable, participation will be open to all categories of organizations, domestic and foreign, including industry, educational institutions, nonprofit organizations, NASA centers, and other Government agencies. Foreign entities may also partner with U.S. proposers, but only without an exchange of funding.
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*Release of Appendices is subject to availability of appropriated funds and may change. Additional Appendices may be issued throughout the year as needed.*
NOTE TO THE PROPOSAL COMMUNITY: The next STMD Announcement of Collaboration Opportunity (ACO) (not a REDDI NRA Appendix release) is planned for release in the second quarter of FY20, and it is anticipated that awards will result in non-reimbursable Space Act Agreements between NASA and U.S. industry. For more information on the ACO, please refer to previous announcement information available on NSPIRES: https://nspires.nasaprs.com/ under “Solicitations,” “Closed.”

The ACO announcement is a stand-alone announcement and will not be released under this STMD umbrella NRA. ACO is anticipated to be released every year.
1.0 FUNDING OPPORTUNITY PROGRAM DESCRIPTION

The Nation’s investments in space technology enable NASA to make a difference in the world around us. The Space Technology Mission Directorate (STMD) is responsible for developing the pioneering, new technologies and capabilities needed by the Agency to achieve its current and future missions. STMD rapidly develops, demonstrates, and infuses revolutionary, high-payoff technologies through transparent, collaborative partnerships, expanding the boundaries of the aerospace enterprise. STMD seeks aggressive technology development efforts that may require undertaking significant technical challenges and risk to achieve a higher potential payoff. The focus of this umbrella NRA is to identify the best ideas and talents from all sectors of the aerospace enterprise to solve future technology needs while maximizing the value of the Nation’s investment. These STMD space technology investments will be consistent with the NASA Strategic Plan. Proposed efforts under the SpaceTech-REDDI-20 umbrella NRA are intended to align with the Strategic Goal: Address National Challenges and Catalyze Economic Growth and the Strategic Objective: Develop and Transfer Revolutionary Technologies to Enable Exploration Capabilities for NASA and the Nation. These strategic investments will focus on future exploration with emphasis on the Moon, while keeping an eye towards Mars and beyond.

NASA’s Vision, Mission, and Strategic Goals and Objectives can be found in the NASA Strategic Plan:

STMD employs a merit-based competition model with a portfolio approach, spanning a range of discipline areas and Technology Readiness Levels (TRL). The STMD portfolio supports a range of TRL efforts. NASA TRL definitions are provided in Attachment 2: “Technology Readiness Level Descriptions”.

If proposed activities are described or understood to be a type of education, proposers are also responsible for submitting proposals relevant to the Federal STEM Education Five-Year Strategic Plan; a report from the Committee on STEM (Co-STEM) Education National Science and Technology Council, May 2013. (see https://www.aip.org/fyi/2013/national-science-and-technology-councils-committee-stem-education-releases-5-year-strategic).

NASA’s Space Technology Mission Directorate’s Technology and Development Programs: STMD programs are responsible for developing pioneering technologies and capabilities needed by the Agency to achieve its current and future missions.

Additional information about STMD programs and other activities is available at: http://www.nasa.gov/directorates/spacetech/home/. As program requirements are defined and funding is made available, specific research and technology development and demonstration opportunities will be defined and issued as Appendices to this
solicitation. The Appendices will provide key information including: specific scope of work solicited, notice of intent and proposal due dates, specific instructions about proposal content and evaluation criteria, anticipated budget, and number of awards. However, not all STMD programs will release Appendices each year. Please refer to the Table above for the Appendices that are anticipated for release.

Space technology efforts will improve the Nation's leadership in key technology development areas, enable far-term capabilities, and motivate disruptive innovations that make space exploration more effective, affordable, reliable, and sustainable. These efforts will also provide a more robust national capability for aerospace activities, thereby improving our competitive posture in the international marketplace, enabling new industries, and contributing to economic growth. NASA’s pursuit of a suite of revolutionary discoveries will also lead to major breakthroughs that are needed to address energy, health, transportation, and environmental challenges. Investing in space technology invests in the future of NASA, the U.S. space program, and the Nation.

STMD engages and inspires thousands of technologists and innovators, creating a community of our best and brightest working on the Nation’s toughest challenges facing the exploration of Moon, Mars, and beyond. By pushing the boundaries of technology and innovation, STMD allows NASA and our nation to remain at the cutting edge. After all, technology drives exploration.

**NASA Technology Roadmaps**

STMD programs described above are aligned with the Agency’s Technology Roadmaps available at [http://www.nasa.gov/offices/oct/home/roadmaps/index.html](http://www.nasa.gov/offices/oct/home/roadmaps/index.html)

NASA developed the Technology Roadmaps in order to facilitate the development and demonstration of space technologies that address the needs of NASA’s exploration systems, Earth and space science, and space operations mission areas, as well as those that contribute to critical national and commercial needs in advanced space technology. Each of these roadmaps focuses on a technology area. The roadmaps were initially drafted by NASA and subsequently independently reviewed by the National Research Council (NRC). The NRC’s review ([https://www.nap.edu/catalog/13354/nasa-space-technology-roadmaps-and-priorities-restoring-nasas-technological-edge](https://www.nap.edu/catalog/13354/nasa-space-technology-roadmaps-and-priorities-restoring-nasas-technological-edge)) resulted in findings, recommendations, and priorities – within and across the technology areas – intended to inform NASA’s space technology investments. Proposers may refer to the roadmaps and the NRC final report for additional context.

Finally, topic areas solicited under this solicitation are consistent with the NASA Strategic Space Technology Investment Plan: [https://www.nasa.gov/sites/default/files/atoms/files/2017-8-1_stip_final-508ed.pdf](https://www.nasa.gov/sites/default/files/atoms/files/2017-8-1_stip_final-508ed.pdf)
NASA Safety Policy

Safety is the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. NASA’s safety priority is to protect the following: (1) the public, (2) astronauts and pilots, (3) the NASA workforce (including contractor employees working on NASA contracts), and (4) high-value equipment and property.

Diversity and Inclusion

The diversity definition is as follows:

The Agency’s definitions for diversity and inclusion are intended to establish a shared understanding of the meaning of these terms. We have, therefore, sought to define these terms in the simplest, most straightforward manner possible. Diversity is the similarities and differences in the individual and organizational characteristics that shape our workplace. Inclusion is the means by which we optimize the benefits to the mission inherent in our diversity, for example, the policies, procedures, and practices that an organization puts in place to create more inclusive work environments. NASA is deeply committed to promoting diversity and inclusion in all forms.

NASA recognizes and supports the benefits of having diverse and inclusive scientific, engineering, and technology communities and fully expects that such values will be reflected in the composition of all panels and teams, including peer review panels, proposal teams, science definition teams and mission and instrumental teams. In accordance with Federal statutes and NASA policy, no eligible applicant shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NASA on the grounds of their race, color, creed, age, sex, national origin, or disability. NASA welcomes proposals in response to its research FAs from all qualified and eligible sources, and especially encourages proposals from Historically Black Colleges and Universities (HBCUs), Other Minority Universities (OMUs), small disadvantaged businesses (SDBs), veteran-owned small businesses, service disabled veteran-owned small businesses (SDVOSBs), HUBZone small businesses, and women-owned small businesses (WOSBs), as eligibility requirements apply.

2.0 FEDERAL AWARD INFORMATION

Awards are authorized by The National Aeronautics and Space Act of 1958, 51 U.S.C. § 20113(e), as amended, which includes “the preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere.”
2.1 Funding and Period of Performance Information

The Summary of Key Information section in each Appendix will provide the anticipated total amount of funds available, any funding limitations, potential number of proposal awards for each topic area and period of performance (duration) for awards. While the Summary of Key Information will provide estimates for funding and the number of awards, these amounts may vary depending on the merit of proposals submitted and the funding available at the time of selections.

The period of performance (duration) can range from one year for activities of limited scope to multiple years for extensive, comprehensive activities. Proposers shall justify proposed period of performance in their proposals. The appropriateness of the proposed period of performance will be evaluated by peer review. NASA may select proposals for shorter award durations than proposed.

For proposals that include NASA civil servant participation, proposer’s total cost of the effort will include the proposal amount plus all NASA civil servant fully burdened costs (per standard NASA accounting practices for the work-years proposed). The total cost of the effort will be compared to the amount of funds available per award. For example: if the proposer’s proposed cost is $100K and the NASA civil servant cost is $15K, then the total cost of the effort is $115K.

STMD’s goal is to initiate new awards as quickly as possible after the selection of proposals is announced. However, NASA may take longer to make the awards, based on workload, availability of appropriated funds, and any necessary post-selection negotiations with the proposing organizations. To help expedite the processing of awards, proposers are reminded to submit all required information, including full and detailed explanations for the requested budget should their proposal be selected. Awards made through this solicitation may be in the form of grants, cooperative agreements, or contracts depending on the specific requirements for award as set forth in the Appendices and the nature of the proposing organization. Appendices may specify a particular type of instrument for award. Inter-agency and intra-agency actions may be used to fund selected proposals from other federal agencies or NASA Centers. The type of award to be negotiated with selected proposers will generally follow the policies in Appendix A of the Guidebook for Proposers, although in a few cases, only one type of award may be offered, as specified in the Appendix.

A NASA Award Officer will determine the appropriate award instrument for the selections resulting from this solicitation. Grants and cooperative agreements will be subject to the policies and provisions identified in the regulations at 2 CFR 200 and 1800, 14 CFR 1274, NASA GCAM, and Appendix A of the Guidebook for Proposers. In the case of any conflict, the regulations at 2 CFR 200 and 1800 and the GCAM takes precedence over the Guidebook for Proposers. If it is anticipated that cooperative agreements are to be awarded, the relevant Appendix will describe the anticipated NASA involvement. Contract awards will be subject to the provisions of the Federal Acquisition Regulations (FAR) http://www.acquisition.gov/far/index.html and the NASA
2.2 Availability of Funds for Awards

There is no funding associated with this umbrella solicitation. All funding will be associated with each relevant Appendix. The Government’s ability to make awards is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this solicitation.

NASA reserves the right to select for award all, some, or none of the proposals in response to an Appendix call for proposals. NASA provides no funding for reimbursement of proposal development costs. Technical and cost proposals (or any other material) submitted in response to this solicitation will not be returned. It is the policy of NASA to treat all proposals as competition-sensitive information and to disclose their contents only for the purpose of evaluation.

2.3 Successor Proposals and Resubmissions

Generally, award recipients holding previous awards selected through any of the opportunities offered through earlier solicitations are welcome to submit “successor” proposals that seek to continue a previously funded line of research (see Guidebook for Proposers, Section 3.5). However, to ensure equitable treatment of all submitted proposals, NASA does not extend any special consideration to such successor proposals in terms of preferential handling, review, or priority for selection. Therefore, all proposals in response to a FA are considered new, in that they will be reviewed on an equal basis with all other proposals submitted to the FA.

Proposals that were submitted but not selected for any previous NASA solicitation may be submitted either in a revised or original form but must conform to the requirements of the relevant Appendix. Such submissions will be treated as new proposals and will be subjected to a full peer review.

Funds provided through instruments awarded under this solicitation cannot be applied as contributions to Space Act Agreements or other NASA awards.

2.4 Use and Disclosure of Research Resulting From Awards

As a Federal Agency, NASA requires prompt public disclosure of the results of its sponsored research to generate knowledge that benefits the Nation. Thus, it is NASA’s intent that all knowledge developed under awards resulting from this solicitation be shared broadly. In certain STMD programs, award recipients will be expected to publish their work in peer-reviewed, open literature publications to the greatest extent practical.
NASA recognizes that there are cases when data cannot be disclosed to the public (e.g., export-controlled data). Even in these cases, proposers are expected to publish data to the greatest extent possible (e.g., use normalized data or at least discuss new methodologies used with clean “test cases”). NASA also understands that proposers may have legitimate proprietary interests in the technology or data they have produced at their own expense. If results must include proprietary or restricted information, that information should be appropriately marked and segregated into a separate Appendix that will not be publicly disseminated. A publicly releasable version of the final report and other deliverables shall be otherwise complete and comprehensive.

**Data Management Plan (DMP):** In keeping with the NASA Plan for Increasing Access to Results of Federally Funded Research ([https://www.nasa.gov/sites/default/files/files/NASA_Data_Plan.pdf](https://www.nasa.gov/sites/default/files/files/NASA_Data_Plan.pdf)), new terms and conditions about making manuscripts and data publically accessible may be attached to awards issued under this FA. Proposals for work that will not generate any data or qualify for an exemption, as defined in the NASA Plan, must demonstrate this in the DMP. If a DMP is required, the applicable FA (Appendix) will specify the specific DMP requirements.

### 2.5 Intellectual Property

#### 2.5.1 Data Rights

NASA wishes to disseminate data and material produced under this awards as broadly as possible with minimal restrictions. While recipients are not restricted in their own use and distribution of data first produced in performance of an award, NASA’s goal is to reduce restrictions on dissemination and use of data to the greatest extent possible, consistent with the terms and conditions of the award. Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

“Limited Rights Data”: The U.S. Government will not normally require delivery of confidential or trade-secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government Rights in Technical Data Produced under Awards: The U.S. Government normally retains unlimited rights in technical data produced under awards, including the right to distribute to the public. However, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

#### 2.5.2 Invention Rights

Recipients that are Small Businesses or nonprofit organizations may elect to retain title to their inventions pursuant to the Bayh-Dole Act (35 U.S.C. § 202). Large business recipients are subject to section 20135 of the National Aeronautics and Space Act (51
U.S.C. § 20135) relating to property rights in inventions. Title to inventions made under an award by a large business recipient initially vests with NASA. However, these recipients may request a waiver to obtain title to inventions made under the award. Such a request may be made in advance of the award or within 30 days thereafter. Even if a waiver request is not made, or is denied, a large business recipient may request a waiver on individual inventions made during the course of the award. In the case of contract awards, intellectual property provisions (patent and data rights) are subject to FAR and NFS.

In the case of grants and cooperative agreements, intellectual property provisions are subject to the terms and conditions in 2 CFR 200, 2 CFR 1800, and 14 CFR 1274. For all recipients, the patent rights provision in a resulting award will require the disclosure to NASA of all subject inventions made under the contract. NASA considers the reporting of inventions an important metric that will be used to measure whether new technologies are being developed. Reporting of inventions also protects a recipient’s ownership to such inventions since NASA has the right to obtain title in unreported inventions.

2.5.3 NASA Intellectual Property (IP)

Proposers are encouraged to consider utilizing technology developed by NASA, including NASA-owned patents and/or computer software. Proposers should identify any NASA inventions or software that they would like to use in the course of work under an award. Note that any commercial use of NASA technology will require a Patent License Agreement or Software Usage Agreement from NASA. Available NASA IP, including a software catalog and searchable patent library, can be found via the NASA Technology Transfer Portal (http://technology.nasa.gov).

3.0 ELIGIBILITY INFORMATION

To the greatest extent practicable, participation will be open to all categories of U.S. and non-U.S. organizations, including educational, industry, nonprofit institutions, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), NASA Centers, the Jet Propulsion Laboratory (JPL), and other Government agencies. Historically Black Colleges and Universities (HBCUs), other minority universities (OMUs), small disadvantaged businesses (SDBs), veteran-owned small businesses, service-disabled-veteran-owned small businesses, HUBZone small businesses, and women-owned small businesses (WOSBs) are encouraged to apply. However, individual Appendices may identify specific eligibility limitations that apply to that relevant opportunity.

3.1 Limitation on Number of Proposals per Organization

Unless Appendices specify additional information or provide limitations on the number of proposals that may be submitted by an organization, there is no restriction on the number of proposals that an organization may submit in response to an Appendix or on
teaming arrangements for any one proposal. Each proposal must be a separate, stand-alone, complete document for evaluation purposes.

3.2 Other Eligibility Limitations

Proposing to more than one Appendix simultaneously or with overlapping timeframes is permitted, provided the proposed efforts are appropriate for the solicitations and the offeror can carry out all proposed efforts, if selected. Appendices may also identify other eligibility restrictions such as limitations on the number of proposals that a Principal Investigator (PI) or key participant may submit.

3.3 Proposals Involving Non-U.S. Organizations

NASA does not normally fund foreign research proposals from foreign organizations, nor research efforts by individuals at foreign organizations as part of U.S. research proposals. This includes subawards from U.S. organizations to investigators at foreign organizations and also travel by individuals at foreign organizations to conduct research, fieldwork, and present at conferences. Rather, each country agrees to bear the cost of discharging their respective responsibilities (i.e., the work to be done by team members affiliated with organizations in their country). The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted.

NASA welcomes proposals from non-U.S. organizations and proposals that include the participation of non-U.S. organizations, except as set forth in the certification regarding restriction on doing business with China. Proposals that propose research to be performed by a non-U.S. organization or with a non-U.S. organization as part of a proposal submitted by a U.S. organization are normally supported through a non-exchange of funds agreement. (see NPD 1360.2B, Initiation and Development of International Cooperation in Space and Aeronautics Programs, [http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=1360&s=2B](http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=1360&s=2B)). This policy also applies to research performed by non-U.S. organizations as part of a proposal submitted by a U.S. organization. This policy pertains to the nature of the proposing organization, and not the nationality or citizenship of the individuals listed in the proposal. If a proposal with a non-U.S. partner is selected, NASA will determine whether such participation should be covered by and implemented through an international agreement between NASA and the sponsoring foreign agency or funding/sponsoring institution under which the parties agree to each bear the cost of discharging their respective responsibilities.

Proposals involving bilateral participation, collaboration, or coordination in any way with China or any Chinese-owned company, whether funded or performed under a no-exchange-of-funds arrangement, may be ineligible for an award.

The proposal must contain a certification that a sponsoring foreign government agency or foreign institution commits to bear the cost of the research proposed to be performed
by the non-U.S. organization should the proposal be selected by NASA. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA’s Office of International and Interagency Relations (OIIR) will arrange with the sponsoring foreign agency or funding/sponsoring institution for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding/sponsoring institution will each bear the cost of discharging their respective responsibilities.

Although Co-Investigators (Co-Is) or collaborators employed by non-U.S. organizations may be identified as part of a proposal submitted by a U.S. organization, NASA funding may not support research efforts by non-U.S. organizations, collaborators or subcontracts at any level, including travel by foreign investigators.

For grants and cooperative agreements, NASA policy on research with foreign organizations is covered in 2 CFR 1800.3.

For contracts, NASA policy on research with foreign organizations is covered in paragraph (l) of 48 CFR 1852.235-72 found at: https://www.ecfr.gov/cgi-bin/text-idx?SID=406e676673b2f2ddf3520d74f5f4192d&node=pt48.6.1852&rgn=div5%23se48.6.1852_1235_672%23se48.6.1852_1235_672#se48.6.1852_1235_672

3.4 Export Control


The following important provision may apply to proposals that involve the participation of non-U.S. organizations, as well as proposals that involve personnel who are not U.S. citizens and do not have status as legally permanent U.S. residents.

3.4.1 Export-Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation

Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not be limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at the U.S. Department of State and through the U.S. Department of Commerce’s Bureau of Industry and Security Web site at http://www.bis.doc.gov. Proposers are advised that
under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

Because of these legal provisions and requirements, proposers and institutions whose proposals involve non-U.S. participants should be aware that such participation can add to management complexity and risk, and, therefore, proposers should limit such cooperative arrangements to those offering significant benefits while maintaining the clearest and simplest possible technical and management interfaces.

3.4.2 Export-Controlled Material in Proposals

While explicit inclusion of export-controlled material in proposals is not prohibited, NASA advises proposers that, under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts may be considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130. Other items or information may be subject to the Export Administration Regulations (EAR), 15 CFR Parts 730 – 774. This may, in some circumstances, complicate NASA's ability to evaluate the proposal, since occasionally NASA may use the services of foreign nationals who are neither U.S. citizens nor lawful permanent residents of the U.S. to review proposals submitted in response to this FA.

Proposers to FAs are strongly encouraged not to include export-controlled material in their proposals, although the effort being proposed may itself be export controlled (ref. websites noted above in 3.4.1). If it is essential to include any export-controlled information in a proposal, a notice to that effect must be prominently displayed on the first pages of the proposal and shall state:

"The information (data) contained in [insert page numbers or other identification] of this proposal is (are) subject to U.S. export control laws and regulations. It is furnished to the Government with the understanding that it will not be exported without the prior approval of the Proposer under the terms of an applicable export license or technical assistance agreement."

Reference the following URL for guidance on NASA’s Export Control Program and NASA Center Points of Contact:
http://www.hq.nasa.gov/office/oer/nasaecp/contacts.html

For the purposes of proposals submitted via NSPIRES or Grants.gov these first pages listing export-controlled information should precede the table of contents, do not count against the page limits, and may also be used to provide the proprietary notification, if applicable. It is the responsibility of the proposer to determine whether any proposal information is subject to export-control regulations.
3.5 Restriction on the use of Classified Material

It is NASA policy that proposals should not contain security-classified material. However, should the proposed approach require access to classified information, or should the result of the project generate such material, the proposer shall comply with all Government security regulations.

3.6 Cost Sharing or Matching

For contracts, criteria and procedures for the allowability and allocability of cash and non-cash contributions shall be governed by FAR Parts 30 and 31, and NFS Parts 1830 and 1831.

Under a grant or cooperative agreement, cost share is only required if so stated in the FA. NASA may accept cost sharing from any type of organization if it is voluntarily offered (reference 2 CFR 200.306). The regulations at 2 CFR 200.306, 2 CFR 1800.306 and 2 CFR 1800.922 describe cost sharing and allowability for awards. If a commercial organization is awarded a grant or cooperative agreement, cost sharing is usually required unless the commercial organization can demonstrate that it does not expect to receive compensating benefits through sales to non-Federal entities for performance of the work. If this demonstration is made, cost sharing is not required but may be offered voluntarily. Reference 2 CFR 1800.922 and 14 CFR 1274.204, (Costs and Payments), paragraph (b), Cost Sharing. When cost sharing is used, the Grant Officer shall insert a term substantially as shown in 2 CFR 1800.924, Cost Sharing. See 14 CFR Part 1274.204(b) for grants and cooperative agreements with commercial organizations involving cost sharing.

For an institution of higher education, hospital, or other non-profit organization seeking to receive a grant or cooperative agreement, cost sharing is not required; however, NASA can accept cost sharing if it is voluntarily offered. See CFR 200.306, 2 CFR 1800.306 and 2 CFR 1800.922 for more information on Cost Sharing.

4.0 APPLICATION AND SUBMISSION INFORMATION

Some programs will use a one-step submission process while others may use a two-step (or more) submission process. Each Appendix will identify whether proposals will be requested, evaluated, and selected through a one-step or two-step process and whether the resulting award will involve phases in accordance with NFS 1817.70, Phased Acquisition.

4.1 Introduction

All information needed to respond to Appendices issued in accordance with this solicitation is contained in this solicitation, the relevant Appendices and in the Guidebook for Proposers March 2018, located at http://www.hq.nasa.gov/office/procurement/nraguidebook/. Proposers are responsible
for understanding and complying with the procedures in this Guidebook before preparing and submitting proposals. Proposals that do not conform to the standards outlined may be declared non-compliant and rejected without review. Where this solicitation and the Guidebook for Proposers are in conflict, this solicitation takes precedence. In addition, the provisions in any Appendix will apply to that specific opportunity and will supersede any conflicting provisions in this solicitation or in the Guidebook for Proposers.

4.1.1 Proposals Rejected Without Review

NASA reserves the right to reject a proposal without review for the following reasons:

- The proposal is clearly nonresponsive to the objectives and/or provisions of the FA;
- The proposal does not meet the requirements for proposal format, content, and organization as specified in this Guidebook and/or the FA itself;
- The proposal is not submitted by the submission due date/time;
- The proposals consist of PDF files that do not meet NASA requirements or otherwise cannot be ingested by the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES);
- The proposal is submitted through Grants.gov but the proposer fails to register in NSPIRES by the proposal due date.

4.2 Registration

In order to submit a proposal, all team members and their institutions must be registered in NASA's proposal data system: NSPIRES (http://nspires.nasaprs.com). Therefore, every organization (including Co-I organizations, educational institutions, industry, not-for-profit institutions, the Jet Propulsion Laboratory, NASA Centers and other U.S. Government agencies) that intends to submit a proposal to NASA in response to this solicitation, whether submitting through Grants.gov or the NSPIRES system, must also be registered in NSPIRES. Every organization that intends to submit a proposal through Grants.gov must be registered in both Grants.gov and NSPIRES. Because NASA requires that an organization (to include sole proprietorships) submit proposals, rather than a PI, proposers should use the NSPIRES registration module to affiliate with an organization. Affiliation is a two-way relationship that requires the approval of the targeted organization. Organizations may take some time to respond to requests for affiliations. This may introduce extra time into the proposal preparation and submission cycle. Note: NASA will not evaluate proposals submitted via Grants.gov if the submitting organization is not registered in NSPIRES.

A prerequisite for registering an organization in NSPIRES is registration in System for Award Management (SAM). Note that if the submitting organization is not registered in SAM, it may take 15 business days or more to complete the registration, so proposers are advised to start the SAM and NSPIRES registration processes well in advance of
the proposal deadline in order to complete organization registration in SAM and then complete organization registration and proposer affiliation in NSPIRES before the proposal due date. In general, the process to register an organization in NSPIRES requires the following steps:

1) An Employer Identification Number (EIN) for the organization. The EIN number is also commonly called the Tax Identification Number (TIN). The TIN/EIN can be obtained from the IRS website.

2) A Data Universal Numbering System (DUNS) number: Information regarding obtaining a DUNS number may be found at http://www.dnb.com/.

3) If the organization is a non-U.S. organization, a valid NATO Commercial and Government Entity (NCAGE) code: Information regarding obtaining an NCAGE number may be found at https://eportal.nspa.nato.int/AC135Public/scage/CageList.aspx

4) A valid login.gov account: Information regarding login.gov may be found at https://login.gov/.

5) A valid registration with the SAM: Information regarding SAM may be found at https://www.sam.gov/. As part of SAM registration, U.S. organizations will receive a Commercial and Government Entity (CAGE) code.

6) A valid registration with NSPIRES.

Registration for either proposal submittal system, i.e., NSPIRES or Grants.gov, must be performed by an organization’s Authorized Organizational Representative (AOR). To identify the AOR, the PI should contact his or her Sponsored Research Office (SRO) or Electronic Business Point of Contact (E-Biz POC). If an institution is not registered in the SAM database, then the point of contact from the SRO or the E-Biz POC shall register it on the SAM webpage (https://www.sam.gov/).

The Federal awarding agency may not make a Federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time the Federal awarding agency is ready to make a Federal award, the Federal awarding agency may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

4.3 Content and Form of Application Submission

4.3.1 Electronic Proposal Submission

All proposals submitted in response to this solicitation must be submitted in electronic form by the AOR at the proposing PI’s organization who is authorized, and identified within NSPIRES with this role, 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. Proposals submitted via email or any means other than NSPIRES or Grants.gov will not be accepted.
Appendices to this solicitation will indicate whether proposers may submit proposals via NSPIRES (http://nspires.nasaprs.com) only, or either NSPIRES or Grants.gov (http://www.grants.gov). Proposers must not submit the same proposal to both NSPIRES and Grants.gov.

Tutorials and other NSPIRES help topics can be accessed through the NSPIRES online help site at http://nspires.nasaprs.com/external/help.do. For any questions that cannot be resolved with the available on-line help menus, requests for assistance may be directed to the NSPIRES Help Desk by email to nspires-help@nasaprs.com or by telephone to (202) 479-9376, Monday through Friday, 8:00 a.m. – 6:00 p.m. Eastern Time.

Instructions for the use of Grants.gov may be found in the Grants.gov User Guide at http://www.grants.gov/ and searching under Site Content for User Guide. Grants.gov has tutorials on the use of the website on the “Application Training” page under Applicants menu. Instructions for NASA-specific forms and NASA program-specific data forms may be found in the application instruction package.

Proposers submitting through Grants.gov must register in NSPIRES in order for proposals to be transferred by NASA to the NSPIRES system for review; see Guidebook for Proposers Section 4.3 for more information.

**IMPORTANT:** Proposers choosing to submit via Grants.gov are informed that the relevant Appendix stated closing date and time takes precedence over any system capabilities of Grants.gov. Therefore, any proposal submitted after the closing date and time provided in the relevant Appendix may be considered LATE.

Note carefully the following requirements for submission of a proposal regardless of the intent to submit via NSPIRES or Grants.gov.

- Any organization requesting NASA funds through the proposed project must be listed on the Proposal Cover Page. NASA will not fund organizations that do not appear on the Proposal Cover Page.
- Each individual team member (e.g., PI, Co-Is, collaborators), including all personnel named on the proposal’s electronic cover page, must be individually registered and affiliated with their organization in NSPIRES. This registration requirement applies equally for proposals submitted via Grants.gov. Such individuals must perform the registration themselves; no individual may register a second party, not even the PI of the proposal. Proposals that are submitted through Grants.gov may be deemed non-compliant and rejected without review if the above NSPIRES registration requirements are not completed prior to the proposal submission deadline identified in the relevant Appendix.
- Each individual team member (e.g., PI, Co-Is, collaborators), including all personnel named on the proposal’s electronic cover page, must specify an
organizational affiliation. The organizational affiliation specified on the cover page must be the organization through which the team member would work and receive funding while participating in the proposed effort. If the individual has multiple affiliations, then this organization may be different from the individual’s primary employer or preferred mailing address. Team members are asked to ensure that their contact information in NSPIRES is up-to-date. Changes can be made using the "Account Management" link on the "NSPIRES Options" page.

Submission of proposals via either NSPIRES or Grants.gov requires action by both the PI and the AOR. First, the PI must complete all required electronic forms, and upload the required PDF file(s). Second, the AOR must submit the electronic proposal on behalf of the PI. Coordination between the PI and the AOR on the final editing and submission of the proposal materials is facilitated through their respective accounts in NSPIRES and/or Grants.gov. Note that if one individual is acting in both the PI and AOR roles and are identified within NSPIRES as both a PI and AOR, they must ensure that all steps in the process are taken, including the AOR submitting the proposal from the organization.

Proposers should be sure to allow adequate time for coordination between the PI and AOR. Depending on the organization and its internal review process, this can take several days. The PIs are encouraged to begin this coordination at the outset of the proposal preparation.

The proposal submission process is complex and involves multiple steps to be carried out by all participants in the proposal. Therefore, proposers 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 email and telephone, difficulties may arise at any point, including the user’s own equipment. Difficulty in registering or using proposal submission systems (either NSPIRES or Grants.gov) is not a sufficient reason for NASA to consider a proposal submitted after the deadline.

4.3.2 Notice of Intent to Propose

Appendices will indicate whether a Notice of Intent (NOI) to propose is required for a particular opportunity. The information contained in an NOI is used to expedite the proposal review activities and is, therefore, of value to both NASA and the offeror. Grants.gov does not provide NOI capability; therefore, an NOI must be submitted via NSPIRES regardless of whether the proposal will be submitted via NSPIRES or Grants.gov. Interested proposers must register with NSPIRES before they can prepare an NOI. An NOI is submitted by logging into NSPIRES at http://nspires.nasaprs.com. Once logged in proposers will choose the FA for which the NOI will be submitted, and then access the "Proposals/NOIs" module and select “Create an NOI.”
To be of maximum value, NOIs should be submitted to NSPIRES by the date given in each Appendix. Note that NOIs may be submitted within NSPIRES directly by the PI; no action by an organization’s AOR is required to submit an NOI.

Within NSPIRES, space is provided for the PI to provide the following information:

- A Short Title of the anticipated proposal (50 characters or less);

- A Full Title of the anticipated proposal (which should not exceed 254 characters and is of a nature that is understandable by a scientifically trained person);

- A brief description of the primary research area(s) and objective(s) of the anticipated work (Note: the information in this item does not constrain in any way the Proposal Summary that must be submitted with the final proposal); and

- The names of any Co-Is and/or Collaborators as known at the time the NOI is submitted. In order to enter these names those team members must have previously accessed and registered in NSPIRES themselves; a PI cannot do this for them.

After completing the indicated fields, the NOI is then submitted electronically.

**Note:** In some cases NASA requires the NOI be submitted and approved before a proposer may submit a complete proposal. In this case failure to submit the NOI by the specified time may result in non-acceptance of the NOI and any subsequent proposal.

4.3.3 Proposal Format and Contents

All proposals submitted in response to this solicitation must include the appropriate required electronic forms available through either of the two proposal submission systems, NSPIRES or Grants.gov.

The required sections of the proposal must be submitted as one searchable, unlocked PDF file that is attached to the electronic submission using one of the proposal submission systems. Proposers must comply with the format and page limit requirements specified in the Appendices. **The provisions in each Appendix will apply to that specific opportunity and will supersede any conflicting provisions in this solicitation.**

**Important note on creating PDF files for upload:** It is essential that all PDF files generated and submitted by the offeror meet NASA requirements. This will ensure that the submitted files can be ingested by NSPIRES regardless of whether the proposal is submitted via NSPIRES or Grants.gov. At a minimum, it is the responsibility of the proposers to: (1) ensure that all PDF files are unlocked and that edit permission is
enabled – this is necessary to allow NSPIRES to link together the submitted files into a single PDF document; and (2) ensure that all fonts are embedded in the PDF file and that only Type 1 or TrueType fonts are used. In addition, any offeror who creates files using TeX or LaTeX is required to first create a DVI file and then convert the DVI file to Postscript and then to PDF. See http://nspires.nasaprs.com/tutorials/PDF_Guidelines.pdf for more information on creating PDF documents that are compliant with NSPIRES. PDF files that do not meet NASA requirements may be declared non-compliant and may not be evaluated.

It is each proposer’s responsibility to verify the accuracy and completeness of his/her proposal, including all text, figures, tables, and required forms. NSPIRES allows applicants to verify before submission that all information contained in proposal PDF file(s) being provided to NSPIRES is complete and accurate.

There is a 20MB file size limit for proposals (Section 3.23 of the Guidebook for Proposers). In order to meet the 20MB file size limit, you should crop and compress any embedded photos and graphic files to an appropriate size and resolution. Only attachments that are specifically requested either in this solicitation or in Appendices to this solicitation should be submitted.

Requirements in the Appendices supersede any requirements in the Guidebook for Proposers or in this solicitation.

4.3.4 Proposal Cover Page

Each proposal shall include a Proposal Cover Page. Instructions for completing the Proposal Cover Page are specific to the electronic proposal submission system used by the offeror (NSPIRES or Grants.gov).

Additional information for completing the Proposal Cover Page:

Proposal Summary (Abstract):
Both electronic systems require a Proposal Summary suitable for release through a publicly accessible archive should the proposal be selected. The Proposal Summary should be concise, should not exceed 4,000 characters in length, and should not contain any special characters, graphics or formatting (use text only). Note that while Grants.gov does not impose a limit on the length of the proposal summary, it will be truncated to 4,000 characters when the proposal is transmitted from Grants.gov to NSPIRES. Grants.gov users must use a writeable pdf form (downloadable from Grants.gov) named ProposalSummary.pdf. This form restricts the Proposal Summary document to 4,000 characters or less.

Budget:
If the budget form within the electronic systems is used, the budget figures are required to be entered on the Proposal Cover Page. If the Appendix specifies a separate budget form, then this is not required (see relevant Appendix for budget form instruction).
Proposers need to include budget figures for all years of the proposed project on the Proposal Cover Page, including sub-awards and NASA team member costs. Proposers should refer to Appendix C of the Guidebook for Proposers and additional budget instructions provided in the relevant Appendix.

Program Specific Data (PSD):
This section consists of questions specific to the relevant Appendix. Responses to the PSD questions are required regardless of whether the proposal is submitted through NSPIRES or Grants.gov. NSPIRES will automatically prompt the offeror to answer the PSD questions prior to submission. Grants.gov submissions are required to include the NASA Program Specific Data (PSD) form. Grants.gov submissions that do not include the NASA PSD form may be deemed non-compliant and rejected without review.

Proposal Team:
Each team member (e.g., PI, Co-Is, collaborators, consultants, and subcontractors) must register him/herself or their company in NSPIRES and complete all the required information. Each individual team member must also be included on the proposal’s electronic cover page. The organizational affiliation specified on the cover page must be the organization through which the team member would work and receive funding while participating in the proposed effort. If the individual has multiple affiliations, then this organization may be different from the individual’s primary employer or preferred mailing address. Team members are asked to ensure that their contact information in NSPIRES is up-to-date. Changes can be made using the "Account Management" link on the "NSPIRES Options" page. For proposals submitted through Grants.gov, note the special requirement for statements of commitment from team members described in Section 3.17 of the Guidebook for Proposers. For proposals submitted through NSPIRES, statements of commitment from team members are not needed, since the acknowledgement of participation in the proposal is performed as part of completing the Cover Page.

Required Certifications, Assurances and Representations:
As authorized by 2 CFR 200.208, NASA has a number of certifications, assurances and agreements that must be completed as part of the proposal submission. Go to NSPIRES for the updated list. Note: Certifications, assurances, and representations (also provided in the GCAM, Appendix C) must be less than one year old at time of award. Procurement personnel will obtain updates at time of award if needed. In order to submit a proposal, the AOR of the proposing organization must read the “Certification of Compliance with Applicable Executive Orders and U.S. Code” and click the checkbox to accept the certifications. The AOR’s signature on the Proposal Cover Page automatically certifies that the proposing organization has read and is in compliance with all the certifications.

Proposal Quad Chart/Summary Chart:
Appendices will indicate whether a Proposal Quad Chart is required for a particular opportunity. If required, provide a single 8.5 x 11 page summary chart which will be used to represent your proposal during the review process. This required summary
chart does not normally count against the Technical and Management Section page limit stated in the Appendix. The Quad Chart/Summary Chart format will be specified in each relevant Appendix.

The chart is intended to provide a quick sense of the proposed effort and should stand alone (i.e., not require the full proposal to be understood). It should not include any proprietary or sensitive data as NASA may make it available to the public after awards are announced.

4.3.5 Proposal

Proposers must follow the instructions in each Appendix regarding proposal organization, proposal sections, required content, and page limits. In some cases, not all sections listed in the Guidebook for Proposers, Section 3.7, will be required and there may be additional unique requirements.

4.3.6 Additional Cost Proposal/Budget Guidelines

During the evaluation of proposals submitted under this solicitation, NASA will show all of the proposal data, including cost data, to peer reviewers. Peer reviewers may be from within or outside the Government, but will be required to certify that they have no financial interest in the outcome of the review – no conflicts of interest.

Proposals with NASA civil servants: Regardless of whether functioning as a team lead or as a team member, personnel from NASA Centers must propose budgets based on full-cost accounting. Proposal budgets from NASA Centers must include all costs that will be paid out of the resulting award. Costs which will not be paid out of the resulting award, but are paid from a separate NASA budget (e.g., Center Management and Operations, CM&O) and are not based on the success of this specific award, should not be included in the proposal budget. For example, CM&O should not be included in the proposal budget while direct civil service labor, travel, service pools, and other charges to the proposed research task should be included. Proposers are required to enter the NASA civil servant team member names and fraction of full-time equivalent (FTE) involvement. The funds requested for each NASA civil servant team member should include salary, fringe, materials, travel, etc., and include a Total Requested Funds for the NASA civil servant team members. This budget entry should be made for each NASA civil servant involved, and is in addition to the agency identification on the Proposal Cover Page under the Team Member Information (Section VI) and the NASA civil servant FTE designation under the NASA Civil Servant Project Personnel information (Section VIII). NOTE: Proposal budgets from NASA Centers must include all costs that will be paid out of resulting awards.

Proposals submitted by NASA Centers (except JPL) should begin the budget section of the proposal with a breakdown of funding by NASA Center and by fiscal year. Principal Investigators from JPL should not include the JPL fixed fee in the total requested amount, nor should the budgets of JPL Co-Investigators on proposals from...
other institutions include the JPL fixed fee in their total requested amount. The total requested amount is the amount that shows on the NSPIRES online (cover page) budget form or the Grants.gov standard budget form. JPL fixed fees are paid for and accounted for by a different mechanism than the mechanism used to fund research projects. JPL proposers and Co-Investigators may include the fixed fee for informational purposes in their budget narratives and detailed budgets.

Non-NASA U.S. Government organizations proposing as team members should propose based on full-cost accounting unless no such standards are in effect; in that case such proposers should follow the Managerial Cost Accounting Standards for the Federal Government, as recommended by the Federal Accounting Standards Advisory Board (for further information, see [http://www.hq.nasa.gov/fullcost](http://www.hq.nasa.gov/fullcost)). Proposal budgets must include all costs that will be paid through the resulting award. Allowable costs for contract awards are covered in Part 31 of the FAR, located at https://www.acquisition.gov/far/index.html and part 1831 of the NFS, located at [https://www.hq.nasa.gov/office/procurement/regs/NFS.pdf](https://www.hq.nasa.gov/office/procurement/regs/NFS.pdf). Pre-contract costs are covered in FAR 31.109, and NFS 1852.231-70.

Certified Cost or Pricing Data: Certificate of Current Cost or Pricing Data (FAR 15.406-2) will be required after negotiations and before award of a contract when the cost proposal exceeds $750,000. The requirements for certified cost or pricing data will be in accordance with FAR 15.403-4.

Allowable costs for grant and cooperative agreement awards with universities, hospitals, and other nonprofit organizations and awards with commercial firms that do not involve cost sharing are covered in 2 CFR 200 Subpart E – Cost Principles. Pre-award costs are covered in 2 CFR 200.209 and 2 CFR 1800.209.

Allowable costs for grant and cooperative agreement awards with commercial firms involving cost sharing are covered in 14 CFR 1274.204. Pre-award costs are covered in FAR 31.109 and NFS 1831.205-32 for contracts.

4.3.7 Proposal Funding Restrictions

In addition to the funding restrictions and requirements given in 2 CFR 200, 2 CFR 1800, 14 CFR 1274 and the GCAM, the following restrictions are applicable to this solicitation:

- The estimated funding and number of proposals anticipated to be funded are subject to the availability of appropriated funds, as well as the submission of a sufficient number of proposals of adequate merit.

- It is not anticipated that this solicitation will require the construction of facilities (i.e., buildings, structures, or other real property). However, if new or modified facilities are required to further the technology, the proposers shall clearly state the rationale. For further information on allowable costs, refer to the cost...
principles cited 2 CFR 200 Subpart E – Cost Principles or FAR Part 31 and NFS Part 1831 depending on whether a grant/cooperative agreement or contract will be the resulting award instrument.

- U.S. award recipients may directly purchase supplies and/or services that do not constitute research from non-U.S. sources, but award funds may not be used to fund research carried out by non-U.S. organizations.

- Typically travel, including foreign travel, is allowed as may be necessary for the meaningful completion of the proposed investigation, as well as for publicizing its results at appropriate professional meetings.

- Pre-award costs: For grants or cooperative agreements, expenses incurred within the 90-day period preceding the effective date of the award may be authorized, but such expenses are made at the recipient’s risk. NASA will not pay any pre-award costs incurred for unfunded proposals.

- Grant and cooperative agreement awards made under NASA Fellowship and Scholarship funding opportunities shall not provide for the payment of Facilities and Administration (F&A), overhead or indirect costs.

- Grants and cooperative agreements shall not provide for the payment of fee or profit to the recipient.

- For grants and cooperative agreements, unless otherwise directed in 2 CFR 200, for changes to the negotiated indirect cost rate that occur throughout the project period, you must apply the rate negotiated for that year, whether higher or lower than at the time the budget and application was awarded.

- Proposals involving bilateral participation, collaboration, or coordination in any way with China or any Chinese-owned company, whether funded or performed under a no-exchange-of-funds arrangement, may be ineligible for award.
- Any funds used for match or cost sharing must be allowable under 2 CFR 200.

- The non-Federal entity must use one of the methods of procurement as prescribed in 2 CFR 200.320. As defined in 2 CFR 200.67, the micro-purchase threshold for acquisitions of supplies or services made under grant and cooperative agreement awards issued to institutions of higher education, or related or affiliated nonprofit entities, or to nonprofit research organizations, or independent research institutes, is $10,000 or such higher threshold as determined appropriate by the head of the relevant executive agency and consistent with audit findings under chapter 75 of Title 31, United States Code, internal institutional risk assessment, or State law.
• All proposed funds must be allowable, allocable, and reasonable. Funds may only be used for the project. All activities charged under indirect cost must be allowed under 2 CFR 200 cost principles.

4.3.8 International Space Station (ISS) Research, Development, Demonstration Opportunities

The International Space Station (ISS) provides proposers with a national laboratory resource with unique environments for the development of space technologies. Although ISS utilization is not required in this solicitation, if the offeror intends to use ISS, the following guidance is provided. The ISS program provides transportation to and from the ISS and standard experiment integration activities free of charge to approved, sponsored technology development investigations. Research, development, and demonstration opportunities include accommodation inside the pressurized habitable volume of the station, on external platforms outside the station, and accommodation within resupply/cargo vehicle pressurized and unpressurized volumes. Deployable options are also available.

More information on accommodations for ISS research, development, and demonstration can be found in the ISS Utilization Reference Guide as well as in the series of Researcher’s Guide publications.

http://www.nasa.gov/mission_pages/station/research/researcher_guide

For submissions proposing to utilize the ISS or its commercial launch assets, please contact the ISS Research Integration Office to obtain a letter of feasibility well in advance of your proposal submission. For STMD and other NASA-funded efforts including both scientific and general engineering research, development, or demonstration proposals, the ISS point of contact is:

Dr. George C. Nelson: Manager, ISS Technology and Science Research Office, 281.244.8514, george.nelson-1@nasa.gov.

4.4 Proposal Submission Dates, Time, and Location

For each opportunity described in the Appendices to this solicitation, the electronic proposal must be submitted in its entirety by an AOR, no later than 5:00 p.m. Eastern Time on the appropriate proposal due date given in the respective Appendix. During the final hours before the submission deadline, proposers may experience server/connection congestion. Therefore, proposers are urged to familiarize themselves with the submission system(s), ensure they are registered in NSPIRES (even if proposers are submitting through Grants.gov), and begin the submission process early. Proposers are strongly encouraged to submit proposals at least 48 hours in advance of submission deadline.
Proposals submitted after the proposal deadline on the proposal due date will be considered late and may be rejected without review. Late proposals will be handled in accordance with NASA’s policy given in section (g) of NFS clause 1852.235-72 “Instructions for Responding to NASA Research Announcements.” Proposers should also keep in mind that the NSPIRES Help Desk is not staffed after 6:00 p.m. Eastern Time.

4.4.1 Proposal Receipt

The PI and AOR will both receive an email from the NSPIRES system indicating that a proposal has been successfully submitted. This email is sent shortly after the submission activity. Proposers not receiving such an email should contact the NSPIRES Help Desk. Proposers can also verify that their proposals were submitted by logging into NSPIRES, and verifying that the proposal record appears in the "Submitted Proposals/NOIs" (versus "Unsubmitted Proposals/NOIs") part of their accounts.

4.5 Conflict of Interest Check Information

The integrity of the peer review process is of utmost importance to STMD. The peer review process will be conducted in accordance with STMD’s Organizational Conflict of Interest (OCI) Mitigation Plan and Appendix D of the Guidebook for Proposers. In order to ensure that all proposal evaluations are conducted as fairly and equitably as possible, it is important to ascertain whether prospective reviewers may have conflicts of interest that might affect their impartiality.

To facilitate the process of identifying potential conflicts of interest, it is necessary to collect information about the organizations participating in each proposal. Information provided in the NSPIRES Proposal Cover Page will be used to collect this information. Proposers using Grants.gov should ensure that all information requested in the Grants.gov response structure is provided. Failure to submit the required information may result in the proposal being deemed nonresponsive to the solicitation.

4.6 Collection of Demographic Information

NASA is implementing a process to collect demographic data from grant applicants for the purpose of analyzing demographic differences associated with its award processes. Information collected will include name, gender, race, ethnicity, disability status, and citizenship status. Submission of the information is voluntary and is not a precondition of award.

5.0 PROPOSAL REVIEW AND SELECTION

5.1 Administrative Review

NASA will prescreen all proposals for compliance with requirements of this solicitation and relevant Appendix. This includes:
• Submission of a complete proposal with all required elements.
• Submission of a proposal from an eligible offeror as specified in the Eligibility Information in this solicitation and relevant Appendix.
• Submission of a proposal that is consistent with the page limitations and formatting guidelines specified in this NRA and the relevant Appendix.

Non-compliant proposals may not be further considered.

If a proposal passes the administrative review and is later determined to be out of scope by the peer review panel, NASA reserves the right to eliminate the proposal from further review. All proposals determined to be out of scope will be communicated with the proposer after the selection process is complete.

5.2 Technical and Programmatic Review

STMD typically uses the evaluation criteria described below. These evaluation criteria supersede the criteria defined in the *Guidebook for Proposers, Appendix D*.

• Relevance to NASA’s Objectives
• Technical Approach
• Management Approach
• Cost

The Appendices will provide additional information regarding the evaluation criteria and may contain additional or tailored evaluation criteria. The relative weightings for each evaluation criterion will also be provided in the Appendices. If any criteria in the Appendices conflict with any other part of this umbrella solicitation, the criteria identified in the Appendices will take precedence.

Proposers are cautioned that their proposals will be evaluated based upon the contents of their proposal, and the proposal must stand alone and must be responsive to the requirements for proposal submission set forth in Section 4 above and in the relevant Appendix. Proposals should not reference URLs or other documents, as they cannot be considered in the evaluation. Proposals must be self-sufficient.

A panel of subject matter experts (SMEs) will be used to assess each proposal against the evaluation criteria. This panel of experts may include NASA, non-NASA, other Government, and other non-Government personnel. Unless otherwise specified in the relevant Appendix, selection procedures will be consistent with the procedures identified in Appendix D of the *Guidebook for Proposers*.

Evaluation of the proposed cost may also include the realism and reasonableness of the proposed cost and comparison to available funds. Proposers must follow the budget format requirements provided in Appendix C and Sections 3.18 and 3.19 of the *Guidebook for Proposers*, as well as any additional budget format requirements provided in the relevant Appendix.
Unless otherwise specified in the relevant Appendix, the STMD Associate Administrator will be the Selection Official. The Selection Official may take portfolio balance and other programmatic considerations into account when making final selections. Cost-sharing is generally not considered a part of the evaluation. Specific Appendices will state if Cost-sharing is considered in the evaluation. However, funding contribution may become a factor at the time of selection when deciding between proposals of otherwise equal technical merit.

5.3 Selection Announcement and Award Dates

NASA’s goal is to announce selections as soon as possible. However, NASA does not usually announce new selections until the funds needed for those awards are approved through the Federal budget process. Therefore, a delay in the budget process for NASA usually results in a delay of the selection announcement. By submitting a proposal, the offeror acknowledges that the proposal is valid for no less than six months from submission.

If selected for funding, the responsible NASA Procurement Office will work with the appropriate personnel to initiate negotiations for potential award. Only the Grant/Award Officer may obligate the Federal funds and make an award. Note: Until an award is made, there is no guarantee that the recommended financial resources will be available.

Note: Awards are made to the proposing organization and not directly to the Principal Investigator.

All proposers will be notified via email sent by NSPIRES and offered a written debriefing that is consistent with the information in the relevant Appendix, if applicable. The written debriefing will be available for download in NSPIRES.

5.4 Partial Selections

NASA may elect to fund only a portion of a proposal. Partial selections also may offer tentative selections in which NASA requests investigators to team in a joint investigation. In such a case, the proposer will be given the opportunity to accept or decline such selection. If the proposer accepts such an offer, a revised budget and statement of work may be required from the proposer should this reduction be greater than 20 percent of that originally proposed. However, as a general rule, if the reduction is less than 20 percent of the originally proposed budget, the adjustment to the budget and statement of work can be extracted from the original proposal and no further submission would be required.

If a proposal is partially selected by NASA, the proposer may be given the opportunity to modify the proposal summary so that it correctly describes the funded research.
If the proposer declines the offer of a partial selection, or participation in a joint investigation, the offer of selection may be withdrawn in its entirety by NASA.

5.5 Budget, Cost Analysis and Financial Capability Reviews

Following the technical review and selection process, proposal documents are submitted to the Grant/Award Officer for a review to determine if proposed costs are allowable, allocable and reasonable for the proposed work. Additionally, for grants and cooperative agreements, the Grant/Award Officer will review the risk posed by applicants as required in 2 CFR 200.205. In order to complete the required reviews applicants may be requested to submit additional documentation.

5.6 Risk Analysis

The NASA Grant Officer will conduct a pre-award review of risk associated with the proposer as required by 2 CFR 200.205. For all proposals selected for a grant or cooperative agreement award, the Grant Officer will review the submitting organization’s information available through the Federal Awardee Performance and Integrity Information System (FAPIIS) and SAM to include checks on entity core data, registration expiration date, active exclusions, and delinquent federal debt.

5.6.1 Risk Review

If the Federal awarding agency anticipates that the total Federal share, awarded under a funding opportunity, will be greater than the simplified acquisition threshold during the course of the period of performance (see §200.88 Simplified Acquisition Threshold), the applicant is informed of the following:

   i. That the Federal awarding agency, prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313);

   ii. That an applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM;

   iii. That the Federal awarding agency will consider any comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in §200.205 Federal awarding agency review of risk posed by applicants.
5.7 Process for Appeals

5.7.1 Ombudsman Review Process

The NASA Procurement Ombudsman Program is available under NRAs as a procedure for addressing concerns and disagreements. The clause at NFS 1852.215-84, Ombudsman, is incorporated into NRAs by reference. The cognizant Ombudsman is as follows:

William Roets  
Deputy Assistant Administrator for Procurement  
Office of Procurement  
NASA Headquarters  
Washington, DC 20546  
Telephone: 202-358-4483  
Facsimile: 202-358-3082  
Email: agency-procurementombudsman@nasa.gov

5.7.2 Protest Process – Contracts Only

Only prospective proposers seeking contract awards (not grant and/or cooperative agreement awards) under NRAs have the right to file a protest either with the Government Accountability Office (GAO) or with the Agency, as defined in FAR 33.101. The provisions at FAR 52.233-2, Service of Protest, FAR 52.233-3, Protest after Award, and NFS 1852.233-70, Protests to NASA, are incorporated into NRAs by reference. The designated official for receipt of protests to the Agency and copies of protests filed with the GAO is as follows:

Monica Manning  
Assistant Administrator for Procurement  
Office of Procurement  
NASA Headquarters  
Washington, DC 20546.  
Telephone: 202-358-1050  
Facsimile: 202-358-3082  
Email: monica.y.manning@nasa.gov

6.0 FEDERAL AWARD ADMINISTRATION INFORMATION

6.1 Federal Award Notice

Notification of both the selected, as well as the non-selected proposals will be consistent with the policy given in the Section 6 of the Guidebook for Proposers. For selected proposals, a NASA Award Officer, who is the only official authorized to obligate the Government, will contact the proposer’s business office.
All grant or cooperative agreement awards are subject to the terms and conditions, cost principles, and other considerations described in the 2 CFR 200, 2 CFR 1800, and the NASA GCAM. Any costs incurred by the offeror in anticipation of an award will be subject to 2 CFR 1800.209 “Pre-award Costs.”

6.2 Award Reporting Requirements

Required reports for contract awards will be negotiated with the offeror and be subject to the FAR and NASA FAR Supplement.

Required reports for grants and cooperative agreements are covered in 2 CFR 1800.902 “Technical Publications and Reports” and the GCAM, Exhibit E “Required Publications and Reports.” 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.

Awards from this funding announcement that are issued under 2 CFR 1800 are subject to the Federal Research Terms and Conditions (RTC) located at [http://www.nsf.gov/awards/managing/rtc.jsp](http://www.nsf.gov/awards/managing/rtc.jsp). In addition to the RTC and NASA-specific guidance, three companion resources can also be found on the website: Appendix A—Prior Approval Matrix, Appendix B—Subaward Requirements Matrix, and Appendix C—National Policy Requirements Matrix.

6.3 Security Requirements - Access to NASA Facilities/Systems

Requirement for Grant and Cooperative Agreement awards

(a) Recipients needing access to a NASA Center, facility, or computer system, or to NASA technical information shall comply with agency personal identity verification procedures identified in the award that implement Homeland Security Presidential Directive-12 (HSPD-12), Office of Management and Budget (OMB) guidance M-05-24 and Federal Information Processing Standards Publication (FIPS PUB) Number 201.

(b) The Recipient shall account for all forms of Government-provided identification issued to the Recipient employees in connection with performance under this contract. The Recipient shall return such identification to the issuing agency at the earliest of any of the following, unless otherwise determined by the Government:
   (1) When no longer needed for grant performance.
   (2) Upon completion of the Recipient’s employee’s employment.
   (3) Upon grant completion or termination.

(c) The Grant Officer may delay final payment under a grant if the Recipient fails to comply with these requirements.
(d) The Recipient shall insert the substance of this clause, including this paragraph (d),
in all subcontracts or sub-agreements when their employees are required to have
routine physical access to a Federally-controlled facility and/or routine access to a
Federally-controlled information system. It shall be the responsibility of the Recipient
to return such identification to the issuing agency in accordance with the terms set
forth in paragraph (b) of this section, unless otherwise approved in writing by the
Grant Officer.

Requirement for Contract awards

PIV Card Issuance Procedures in accordance with FAR Clause 52.204-9, Personal
Identity Verification of Contractor Personnel (Jan. 2011)

(a) The Contractor shall comply with agency personal identity verification procedures
identified in the contract that implement Homeland Security Presidential Directive-12
(HSPD-12), Office of Management and Budget (OMB) guidance M-05-24 and Federal
Information Processing Standards Publication (FIPS PUB) Number 201.

(b) The Contractor shall account for all forms of Government-provided identification
issued to the Contractor employees in connection with performance under this contract.
The Contractor shall return such identification to the issuing agency at the earliest of
any of the following, unless otherwise determined by the Government:
(1) When no longer needed for contract performance.
(2) Upon completion of the Contractor employee’s employment.
(3) Upon contract completion or termination.
(c) The Contracting Officer may delay final payment under a contract if the Contractor
fails to comply with these requirements.
(d) The Contractor shall insert the substance of this clause, including this paragraph (d),
in all subcontracts when the subcontractor’s employees are required to have routine
physical access to a Federally-controlled facility and/or routine access to a Federally-
controlled information system. It shall be the responsibility of the prime Contractor to
return such identification to the issuing agency in accordance with the terms set forth in
paragraph (b) of this section, unless otherwise approved in writing by the Contracting
Officer.

6.4 Limited Release of Proposers Confidential Business Information (CBI)

Except as provided below, information contained in proposals is used for evaluation
purposes only and will be protected to the extent permitted by law. In order to maximize
protection of trade secrets or other information that are confidential or privileged,
proposers should identify such information in their proposals (see NFS 1852.235-
72(c)(2)).

For proposal evaluation and other administrative processing NASA may find it
necessary to release information submitted by the proposer to individuals not employed
by NASA. Business information that would ordinarily be entitled to confidential treatment
may be included in the information released to these individuals. Accordingly, by
submission of this proposal the proposer hereby consents to a limited release of its confidential business information (CBI). Except where otherwise provided by law, NASA will permit the limited release of CBI only pursuant to non-disclosure agreements signed by the assisting contractor or subcontractor, and their individual employees who may require access to the CBI to perform the assisting contract.

For selected proposals, NASA requires the Proposal Title, the Principal Investigator's name and organization, the Proposal Summary and the one-page summary/overview chart to be publishable and submission of a proposal constitutes consent to publication of that information on an appropriate publicly accessible location. Proposers should draft their Proposal Summaries and one-page summary/overview charts in anticipation of public disclosure. Proposers are free, but not required by NASA, to release any additional information about their proposals. NASA considers other sections of proposals to be proprietary and, therefore, does not release these sections of successful proposals to the public without prior consultation with the proposers.

6.5 FAR Clause 52.204-23 Prohibition on Contracting for Hardware, Software, and Services Developed or Provided by Kaspersky Lab and Other Covered Entities (JUL 2018)

The following clause will be incorporated into any resultant contracts:

52.204-23-Prohibition on Contracting for Hardware, Software, and Services Developed or Provided by Kaspersky Lab and Other Covered Entities (JUL 2018)

(a) Definitions. As used in this clause--
Covered article means any hardware, software, or service that—(1) Is developed or provided by a covered entity; (2) Includes any hardware, software, or service developed or provided in whole or in part by a covered entity; or (3) Contains components using any hardware or software developed in whole or in part by a covered entity. Covered entity means—(1) Kaspersky Lab; (2) Any successor entity to Kaspersky Lab; (3) Any entity that controls, is controlled by, or is under common control with Kaspersky Lab; or (4) Any entity of which Kaspersky Lab has a majority ownership. (b) Prohibition. Section 1634 of Division A of the National Defense Authorization Act for Fiscal Year 2018 (Pub. L. 115-91) prohibits Government use of any covered article. The Contractor is prohibited from—(1) Providing any covered article that the Government will use on or after October 1, 2018; and (2) Using any covered article on or after October 1, 2018, in the development of data or deliverables first produced in the performance of the contract. (c) Reporting requirement. (1) In the event the Contractor identifies a covered article provided to the Government during contract performance, or the Contractor is notified of such by a subcontractor at any tier or any other source, the Contractor shall report, in writing, to the Contracting Officer or, in the case of the Department of Defense, to the website at https://dibnet.dod.mil/. For indefinite delivery contracts, the Contractor shall report to the Contracting Officer for the indefinite delivery contract and the Contracting Officer(s) for any affected order or, in the case of the Department of Defense, identify both the indefinite delivery contract and any affected orders in the report provided at https://dibnet.dod.mil/. (2) The Contractor shall report the following
information pursuant to paragraph (c)(1) of this clause: (i) Within 1 business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; brand; model number (Original Equipment Manufacturer (OEM) number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended. (ii) Within 10 business days of submitting the report pursuant to paragraph (c)(1) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of a covered article, any reasons that led to the use or submission of the covered article, and any additional efforts that will be incorporated to prevent future use or submission of covered articles. (d) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (d), in all subcontracts, including subcontracts for the acquisition of commercial items.

6.6 FAR Provision 52.204–24, Representation Regarding Certain Telecommunications and Video Surveillance Services or Equipment

FAR 52.204-24, as prescribed in 4.2105(a) is hereby incorporated. Additionally, FAR Clause 52.204–25 Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment as prescribed in 4.2105(b) will be incorporated into any resultant contract.

7.0 POINTS OF CONTACT FOR FURTHER INFORMATION

General questions and comments about this solicitation may be directed in writing to:

Space Technology Mission Directorate
NASA Headquarters
Email: HQ-STMD-SpaceTech-REDDI@mail.nasa.gov

Note: Proposals shall not be submitted to this email address or to the point of contact. Proposals shall be submitted electronically as described in Section 4.0 above and in the relevant Appendix.

Specific questions about a given Appendix should be directed to the specific point(s) of contact designated in the relevant Appendix.

No communication concerning this solicitation may be made to any NASA official other than those specifically listed in this solicitation and in the Appendices. All questions shall be submitted via email as indicated above. Telephone requests will not be accepted.

Inquiries about accessing or using the NASA proposal system located at http://nspires.nasaprs.com should be submitted via an email message that includes a telephone number to nspires-help@nasaprs.com or by calling (202) 479-9376. This Help Center is staffed Monday through Friday, 8:00 a.m. – 6:00 p.m. Eastern Time.
Inquiries about accessing or using Grants.gov located at http://www.grants.gov should be directed by an email to support@grants.gov or by calling (800) 518-4726.

| HQ Office of General Counsel Point of Contact for STMD | Alex Bakos, or designated representative |
| HQ Procurement Point of Contact for STMD | Andre Sheppard, or designated representative |

8.0 ANCILLARY INFORMATION

8.1 Announcement of Updates/Amendments to Solicitation

Amendments will be posted on the SpaceTech-REDDI-2020 NSPIRES page, which can be found at http://nspires.nasaprs.com (select "Solicitation Announcements," then "Open Solicitations," then "80HQTR20NOA01"). NASA STMD will also send an electronic notification of any such amendments to all subscribers of its electronic notification system (see Section 8.2 below). It is the responsibility of the prospective offeror to check this solicitation's NSPIRES page for updates concerning the program(s) of interest.

Any clarifications or questions and answers that are published will be posted on the relevant program’s Appendix NSPIRES page at http://nspires.nasaprs.com (select "Solicitation Announcements," then "Open Solicitations," then "80HQTR20NOA01," then "List of Open Program Elements," and finally the relevant Appendix).

8.2 Electronic Notification of NASA Solicitations

NASA Headquarters maintains an electronic notification system to alert interested parties of program announcements. Subscription to this service is free to all registered users of the NASA proposal database system at http://nspires.nasaprs.com/. To add or change a subscription to the electronic notification system, users should login to the database system and select “Account Management,” then “Email Subscriptions.” This email service will notify all subscribers of:

(1) All NASA Headquarters research program solicitations (within a given Directorate or program)
(2) Notable amendments to those solicitations
(3) Special information that NASA Headquarters wishes to communicate to those interested in proposing.

Regardless of whether or not this service is used, all NASA Headquarters research announcements and amendments may be accessed at http://nspires.nasaprs.com/ (select “Solicitations,” then “Open Solicitations”) as soon as they are posted.
9.0 REFERENCES


Guidebook for Proposers Responding to a NASA Funding Announcement, dated March 2018, 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.

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

48 CFR 1852.235-72, Instructions for Responding to NASA Research Announcements is available online at the following address: https://www.ecfr.gov/cgi-bin/text-idx?SID=406e676673b2f2ddf3520d74f5f4192d&node=pt48.6.1852&rgn=div5%23se48.6.1852_1235_672%23se48.6.1852_1235_672#se48.6.1852_1235_672

NASA Grants and Cooperative Agreement Manual (GCAM) is available online at the following address: https://prod.nais.nasa.gov/pub/pub_library/srba/documents/Grant_and_CooperativeAgreementManual.doc

NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), is available online at the following address: http://nspires.nasaprs.com.

Grants.gov electronic proposal submission system is available online at the following address: http://grants.gov.
## Attachment 1 - Acronym List

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRC</td>
<td>NASA Armstrong Flight Research Center, Edwards, CA</td>
</tr>
<tr>
<td>ACO</td>
<td>Announcement of Collaboration Opportunity</td>
</tr>
<tr>
<td>AOR</td>
<td>Authorized Organizational Representative</td>
</tr>
<tr>
<td>ARC</td>
<td>NASA Ames Research Center, Moffett Field, CA</td>
</tr>
<tr>
<td>ATP</td>
<td>Authority to Proceed</td>
</tr>
<tr>
<td>BAA</td>
<td>Broad Agency Announcement</td>
</tr>
<tr>
<td>CAGE</td>
<td>Commercial and Government Entity</td>
</tr>
<tr>
<td>CBI</td>
<td>Confidential Business Information</td>
</tr>
<tr>
<td>CFDA</td>
<td>Catalog of Federal Domestic Assistance</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CIF</td>
<td>Center Innovation Fund</td>
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<tr>
<td>CM&amp;O</td>
<td>Center Management and Operations</td>
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<tr>
<td>CO</td>
<td>Contracting Officer</td>
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<tr>
<td>Co-I</td>
<td>Co-Investigator</td>
</tr>
<tr>
<td>COM</td>
<td>Cost of Money</td>
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<tr>
<td>DoD</td>
<td>Department of Defense</td>
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<tr>
<td>DUNS</td>
<td>Data Universal Numbering System</td>
</tr>
<tr>
<td>DVI</td>
<td>Device Independent file format</td>
</tr>
<tr>
<td>EAR</td>
<td>Export Administration Regulations</td>
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<tr>
<td>ECF</td>
<td>Early Career Faculty</td>
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<tr>
<td>EEE</td>
<td>Electrical, Electronic, and Electromechanical</td>
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<tr>
<td>EIN</td>
<td>Employer Identification Number</td>
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<tr>
<td>EMI/EMC</td>
<td>Electromagnetic Interference/Electromagnetic Compatibility</td>
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<td>ESI</td>
<td>Early Stage Innovations</td>
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<td>F&amp;A</td>
<td>Facilities and Administration</td>
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<td>FA</td>
<td>Funding Announcement</td>
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<td>FAPIIS</td>
<td>Federal Awardee Performance and Integrity Information System</td>
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<td>FAR</td>
<td>Federal Acquisition Regulations</td>
</tr>
<tr>
<td>FFRDC</td>
<td>Federally Funded Research and Development Center</td>
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<tr>
<td>FIPS PUB</td>
<td>Federal Information Processing Standards Publication</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>FO</td>
<td>Flight Opportunities</td>
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<tr>
<td>FRR</td>
<td>Flight Readiness Review</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>FY</td>
<td>Fiscal Year (October to September)</td>
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<tr>
<td>G&amp;A</td>
<td>General and Administrative</td>
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<tr>
<td>GAO</td>
<td>Government Accountability Office</td>
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<tr>
<td>GCAM</td>
<td>Grants and Cooperative Agreements Manual</td>
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<tr>
<td>GCD</td>
<td>Game Changing Development</td>
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<tr>
<td>GOLD</td>
<td>Governance of Labor Distribution</td>
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<tr>
<td>GRC</td>
<td>NASA Glenn Research Center, Cleveland, OH</td>
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<tr>
<td>GSFC</td>
<td>NASA Goddard Space Flight Center, Greenbelt, MD</td>
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<tr>
<td>HBCU</td>
<td>Historically Black Colleges and Universities</td>
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<tr>
<td>HSPD</td>
<td>Homeland Security Presidential Directive</td>
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<tr>
<td>H/W</td>
<td>Hardware</td>
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<tr>
<td>I&amp;T</td>
<td>Integration and Test</td>
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<tr>
<td>IP</td>
<td>Intellectual Property</td>
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<tr>
<td>IRS</td>
<td>Internal Revenue Service</td>
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<td>ISP</td>
<td>Specific Impulse</td>
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<tr>
<td>ISS</td>
<td>International Space Station</td>
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<tr>
<td>ITAR</td>
<td>International Traffic in Arms Regulations</td>
</tr>
<tr>
<td>IV&amp;V</td>
<td>Independent Verification and Validation</td>
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<tr>
<td>JPL</td>
<td>NASA Jet Propulsion Laboratory, Pasadena, CA</td>
</tr>
<tr>
<td>JSC</td>
<td>NASA Johnson Space Center, Houston, TX</td>
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<tr>
<td>KSC</td>
<td>NASA Kennedy Space Center, FL</td>
</tr>
<tr>
<td>LaRC</td>
<td>NASA Langley Research Center, Hampton, VA</td>
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<tr>
<td>LaTeX</td>
<td>Lamport TeX</td>
</tr>
<tr>
<td>LLIL</td>
<td>Limited Life Items List</td>
</tr>
<tr>
<td>MCR</td>
<td>Mission Concept Review</td>
</tr>
<tr>
<td>MDR</td>
<td>Mission Definition Review</td>
</tr>
<tr>
<td>MSFC</td>
<td>NASA Marshall Space Flight Center, Huntsville AL</td>
</tr>
<tr>
<td>NAICS</td>
<td>North American Industry Classification System</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NCAGE</td>
<td>NATO Commercial and Government Entity</td>
</tr>
<tr>
<td>NIAC</td>
<td>NASA Innovative Advanced Concepts</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>NID</td>
<td>NASA Interim Directive</td>
</tr>
<tr>
<td>NFS</td>
<td>NASA FAR Supplement</td>
</tr>
<tr>
<td>NOI</td>
<td>Notice of Intent</td>
</tr>
<tr>
<td>NPD</td>
<td>NASA Policy Directive</td>
</tr>
<tr>
<td>NPR</td>
<td>NASA Procedural Requirements</td>
</tr>
<tr>
<td>NRA</td>
<td>NASA Research Announcement</td>
</tr>
<tr>
<td>NRC</td>
<td>National Research Council</td>
</tr>
<tr>
<td>NSPIRES</td>
<td>NASA Solicitation and Proposal Integrated Review and Evaluation System</td>
</tr>
<tr>
<td>OCI</td>
<td>Organizational Conflict of Interest</td>
</tr>
<tr>
<td>OCT</td>
<td>Office of the Chief Technologist</td>
</tr>
<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>OIIR</td>
<td>Office of International and Interagency Relations</td>
</tr>
<tr>
<td>OMB</td>
<td>Office of Management and Budget</td>
</tr>
<tr>
<td>OMU</td>
<td>Other Minority University</td>
</tr>
<tr>
<td>ORR</td>
<td>Operational Readiness Review</td>
</tr>
<tr>
<td>PDF</td>
<td>Portable Document Format</td>
</tr>
<tr>
<td>PDR</td>
<td>Preliminary Design Review</td>
</tr>
<tr>
<td>PI</td>
<td>Principal Investigator</td>
</tr>
<tr>
<td>PIV</td>
<td>Personal Identify Verification</td>
</tr>
<tr>
<td>PM</td>
<td>Project Manager</td>
</tr>
<tr>
<td>POC</td>
<td>Point of Contact</td>
</tr>
<tr>
<td>PRA</td>
<td>Probabilistic Risk Assessment</td>
</tr>
<tr>
<td>PSD</td>
<td>Program Specific Data</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
<tr>
<td>REC</td>
<td>Record of Environmental Consideration</td>
</tr>
<tr>
<td>RCS</td>
<td>Reaction Control System</td>
</tr>
<tr>
<td>RFA</td>
<td>Requests for Action</td>
</tr>
<tr>
<td>RID</td>
<td>Review Item Discrepancy</td>
</tr>
<tr>
<td>RTC</td>
<td>Research Terms and Conditions</td>
</tr>
<tr>
<td>SAM</td>
<td>System for Award Management</td>
</tr>
<tr>
<td>SBIR/STTR</td>
<td>Small Business Innovative Research (SBIR)/Small Business Technology Transfer (STTR)</td>
</tr>
<tr>
<td>SDB</td>
<td>Small Disadvantaged Business</td>
</tr>
<tr>
<td>S&amp;MA</td>
<td>Safety and Mission Assurance</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>--------------</td>
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</tr>
<tr>
<td>S/W</td>
<td>Software</td>
</tr>
<tr>
<td>SDP</td>
<td>Software Development Plan</td>
</tr>
<tr>
<td>SDR</td>
<td>System Definition Review</td>
</tr>
<tr>
<td>SDVOSB</td>
<td>Service-Disabled-Veteran-Owned Small Business</td>
</tr>
<tr>
<td>SME</td>
<td>Subject Matter Expert</td>
</tr>
<tr>
<td>SI</td>
<td>International System of Units</td>
</tr>
<tr>
<td>SOW</td>
<td>Statement of Work</td>
</tr>
<tr>
<td>SRO</td>
<td>Sponsored Research Office</td>
</tr>
<tr>
<td>SST</td>
<td>Small Spacecraft Technology</td>
</tr>
<tr>
<td>STEM</td>
<td>Science, Technology, Engineering, and Mathematics</td>
</tr>
<tr>
<td>STMD</td>
<td>Space Technology Mission Directorate</td>
</tr>
<tr>
<td>STRG</td>
<td>Space Technology Research Grants</td>
</tr>
<tr>
<td>TeX</td>
<td>τεχνη (typesetting/formatting system)</td>
</tr>
<tr>
<td>TDM</td>
<td>Technology Demonstration Missions</td>
</tr>
<tr>
<td>TIN</td>
<td>Tax Identification Number</td>
</tr>
<tr>
<td>TRL</td>
<td>Technology Readiness Level</td>
</tr>
<tr>
<td>UARC</td>
<td>University Affiliated Research Center</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
</tr>
<tr>
<td>V&amp;V</td>
<td>Verification and Validation</td>
</tr>
<tr>
<td>WBS</td>
<td>Work Breakdown Structure</td>
</tr>
<tr>
<td>WOSB</td>
<td>Woman Owned Small Business</td>
</tr>
</tbody>
</table>
Attachment 2 - Technology Readiness Level (TRL) Descriptions

The Technology Readiness Level describes the stage of maturity in the development process from observation of basic principles through final product operation. The exit criteria for each level documents that principles, concepts, applications or performance have been satisfactorily demonstrated in the appropriate environment required for that level.

<table>
<thead>
<tr>
<th>TRL</th>
<th>Definition</th>
<th>Hardware Description</th>
<th>Software Description</th>
<th>Exit Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic principles observed and reported</td>
<td>Scientific knowledge generated underpinning hardware technology concepts/applications.</td>
<td>Scientific knowledge generated underpinning basic properties of software architecture and mathematical formulation.</td>
<td>Peer reviewed publication of research underlyng the proposed concept/application.</td>
</tr>
<tr>
<td>2</td>
<td>Technology concept and/or application formulated</td>
<td>Invention begins, practical applications is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture.</td>
<td>Practical application is identified but is speculative; no experimental proof or detailed analysis is available to support the conjecture. Basic properties of algorithms, representations, and concepts defined. Basic principles coded. Experiments performed with synthetic data.</td>
<td>Documented description of the application/concept that addresses feasibility and benefit.</td>
</tr>
<tr>
<td>3</td>
<td>Analytical and experimental critical function and/or characteristic proof-of-concept</td>
<td>Analytical studies place the technology in an appropriate context and laboratory demonstrations, modeling and simulation validate analytical prediction.</td>
<td>Development of limited functionality to validate critical properties and predictions using non-integrated software components.</td>
<td>Documented analytical/experimental results validating predictions of key parameters.</td>
</tr>
<tr>
<td>4</td>
<td>Component and/or breadboard validation in laboratory environment.</td>
<td>A low fidelity system/component breadboard is built and operated to demonstrate basic functionality and critical test environments, and associated performance predictions are defined relative to final operating environment.</td>
<td>Key, functionality critical software components are integrated and functionally validated to establish interoperability and begin architecture development. Relevant environments defined and performance in the environment predicted.</td>
<td>Documented test performance demonstrating agreement with analytical predictions. Documented definition of relevant environment.</td>
</tr>
<tr>
<td></td>
<td>Component and/or breadboard validation in relevant environment.</td>
<td>A medium fidelity system/component brassboard is built and operated to demonstrate overall performance in a simulated operational environment with realistic support elements that demonstrate overall performance in critical areas. Performance predictions are made for subsequent development phases.</td>
<td>End-to-end software elements implemented and interfaced with existing systems/simulations conforming to target environment. End-to-end software system tested in relevant environment, meeting predicted performance. Operational environment performance predicted. Prototype implementations developed.</td>
<td>Documented test performance demonstrating agreement with analytical predictions. Documented definition of scaling requirements.</td>
</tr>
<tr>
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</tr>
<tr>
<td>6</td>
<td>System/sub-system model or prototype demonstration in a relevant environment.</td>
<td>A high fidelity system/component prototype that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate operations under critical environmental conditions.</td>
<td>Prototype implementations of the software demonstrated on full-scale, realistic problems. Partially integrated with existing hardware/software systems. Limited documentation available. Engineering feasibility fully demonstrated.</td>
<td>Documented test performance demonstrating agreement with analytical predictions.</td>
</tr>
<tr>
<td>7</td>
<td>System prototype demonstration in an operational environment.</td>
<td>A high fidelity engineering unit that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate performance in the actual operational environment and platform (ground, airborne, or space).</td>
<td>Prototype software exists having all key functionality available for demonstration and test. Well integrated with operational hardware/software systems demonstrating operational feasibility. Most software bugs removed. Limited documentation available.</td>
<td>Documented test performance demonstrating agreement with analytical predictions.</td>
</tr>
<tr>
<td>8</td>
<td>Actual system completed and &quot;flight qualified&quot; through test and demonstration.</td>
<td>The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform (ground, airborne, or space).</td>
<td>All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All user documentation, training documentation, and maintenance documentation completed. All functionality successfully demonstrated in simulated operational scenarios. Verification and validation completed.</td>
<td>Documented test performance verifying analytical predictions.</td>
</tr>
<tr>
<td>9</td>
<td>Actual system flight proven through successful mission operations.</td>
<td>The final product is successfully operated in an actual mission.</td>
<td>All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All documentation has been completed. Sustaining software support is in place. System has been successfully operated in the operational environment.</td>
<td>Documented mission operational results.</td>
</tr>
</tbody>
</table>

In any case of conflict between NASA directives concerning TRL definitions, NPR 7123.1, link provided below, will take precedence.  
https://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_7123_001B_&page_name=AppendixE