NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
HEADQUARTERS
NASA Office of STEM Engagement
300 E. STREET, SW
WASHINGTON, D.C. 20546-0001

NASA Fellowship Activity
2019, 2020, 2021

NASA Research Announcement (NRA)

NNH19ZHA001N

CATALOG OF FEDERAL DOMESTIC ASSISTANCE (CFDA) NUMBER: 43.008
Important Information and Revisions

1. This is a multi-year solicitation covering fiscal years 2019, 2020, 2021.

2. Applications for specific fiscal years must be submitted by the dates listed below.

3. Applications are due at 5 pm ET, 4pm CT, and 2pm PT.

<table>
<thead>
<tr>
<th></th>
<th>2019 Deadline</th>
<th>2020 Deadline</th>
<th>2021 Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release Date</td>
<td>March 22, 2019</td>
<td>currently scheduled for October 18, 2019</td>
<td>currently scheduled for October 16, 2020</td>
</tr>
<tr>
<td>Proposal Due (Phase 1)</td>
<td>May 24, 2019 (60 days after the release date)</td>
<td>currently scheduled for January 2020</td>
<td>currently scheduled for January 2021</td>
</tr>
</tbody>
</table>

4. Pre-proposal teleconference

<table>
<thead>
<tr>
<th>Teleconference number: 1-844-467-6272 Passcode: 549325</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times will be announced on the NASA Fellowships Website: <a href="https://www.nasa.gov/education/fellowships-scholarships/index.html">https://www.nasa.gov/education/fellowships-scholarships/index.html</a></td>
<td>April 4, 2019</td>
<td>October 25, 2019</td>
<td>October 23, 2020</td>
</tr>
<tr>
<td>or NSPIRES: <a href="http://nspires.nasaprs.com">http://nspires.nasaprs.com</a></td>
<td>April 18, 2019</td>
<td>November 1, 2019</td>
<td>October 30, 2020</td>
</tr>
<tr>
<td></td>
<td>November 15, 2019</td>
<td>November 13, 2020</td>
<td>November 13, 2020</td>
</tr>
</tbody>
</table>

5. Awards will be announced approximately 6 months after the solicitation closes.

OMB Approval Number 2700-0092
Expires - 04/30/19
Appendix C: Eligible Graduate STEM Disciplines Degrees or Fields of Studies ......................................................... 40
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EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) journeys have propelled technological breakthroughs, pushed the frontiers of scientific research, and expanded our understanding of the universe. These accomplishments, and those to come, share a common genesis: education in science, technology, engineering, and mathematics (STEM).

NASA’s Office of STEM Engagement (OSE) seeks to leverage NASA’s unique mission activities to enhance and increase the capabilities, diversity, and size of the nation’s next generation STEM workforce needed to enable future NASA discoveries. Through its internal collaboration with NASA Mission Directorates (MD), NASA Centers and external STEM partners, OSE aims to bring unique opportunities to learners, educators, and institutions by providing access to NASA’s mission content, people, resources, and facilities.

This NASA Research Announcement (NRA), titled the NASA Fellowship Activity, solicits proposals from accredited U.S. institutions for research training grants to begin in the 2019-2020 Academic Year. The NRA is designed to support independently conceived research or senior designed projects by highly qualified graduate students, in disciplines needed to help advance NASA’s missions, thus affording students the opportunity to directly contribute to advancements in STEM-related areas of study. NASA Fellowship opportunities are focused on innovation and the generation of measurable research results, which contribute to NASA’s current and future science and technology goals. NASA strongly encourages the submission of applications from Minority-Serving Institutions, historically underrepresented groups and underserved populations, such as women, minorities, persons with disabilities, LGBTQ’s and veterans.

The NASA Fellowship Activity opportunity is administered by the Office of STEM Engagement (OSE). OSE’s Minority University Research and Education Program (MUREP) intends to award $1.6 million in training grants in 2019. MUREP investments enhance the research, academic, and technology capabilities of Minority Serving Institutions through multi-year awards. Awards assist faculty and students in research and provide authentic STEM engagement related to NASA missions. There may be additional awards provided by NASA Centers and the Jet Propulsion Laboratory (JPL) with projects funds associated with the Aeronautics Research Mission Directorate (ARMD), the Human Exploration and Operations Mission Directorate (HEOMD). The NASA Fellowship Activity NRA provides flexibility so that each funding source may have its unique expectations and selection criteria. The NRA demonstrates NASA’s commitment to an integrated, Agency approach of STEM Engagement activities. Contingent on available federal funding NASA will administer the Fellowship until closeout, thereby fulfilling NASA responsibilities to NASA Fellows.

Unique to this research and development Fellowship, OSE’s programmatic structure establishes a Professional Learning Community (PLC) consisting of active NASA Fellowship cohorts, institutional faculty advisors as the grant Primary Investigators (PIs), NASA researchers, scientists, program managers and Subject Matter Experts (SME) from industry and other Federal agencies. The PLC is designed to provide a network of mentors committed to the successful completion of the proposed research.
1. OVERVIEW OF SOLICITATION

1.1 Purpose of Fellowship
The NASA Fellowship Activity is designed to provide academic institutions the ability to enhance graduate-level learning and development. Graduate students are funded at a level that allows full concentration on academic and research proficiency without the need to seek employment.

The Fellowship Activity contributes to the following OSE objectives:

- Improve the nation’s future STEM workforce by developing the skills and competencies of graduates pursuing degrees in STEM disciplines, one student at a time.
- Provide opportunities for a diverse population to participate and contribute to NASA’s missions and projects.
- Use NASA’s unique mission content, workforce, and facilities in order to enhance and increase the capabilities, diversity, and size of the nation’s next generation workforce needed to enable future NASA discoveries.
- Build an intellectual network between NASA and higher education institutions by allowing faculty greater access and knowledge of NASA’s research opportunities.

1.2 NASA Fellowship Program Description

The NASA Fellowship Activity is an institutional award which provides financial support towards the development and training of graduate researchers. Leveraging the capabilities of academic research institutions, NASA SMEs, and incorporating a professional development component designed to provide experiences commonly available to early career individuals enhances the Fellowship with NASA’s best and promising practices for STEM workforce development. This includes the following:

Proposed Research
The Institution’s candidate independently conceives the research hypothesis or engineering design project concept in response to the NASA graduate research opportunities listed in the NRA (See Appendix E for NASA Research Opportunities). The Faculty Advisor and the Institution’s candidate develop the proposal in collaboration with the NASA Technical Adviser in order to assure institutional capability and capacity, ensure relevance to Mission Directorate priorities, and secure NASA’s technical support for use of its unique facilities, content and/or SMEs. The Institution submits the proposal for support of a graduate student. If a NASA Training Grant is awarded, the Faculty Advisor serves as the agreement’s PI.

On-Site Experience
If the proposal is selected and awarded as a grant, the NASA Technical Adviser becomes an integral part of the team and an additional member of the research cohort community. The NASA Technical Adviser promotes NASA’s innovation-oriented culture and provides entry into NASA-unique facilities; access to specialized equipment, and exposure to NASA’s partners and collaborators. NASA Fellows will be mentored by the NASA Technical Adviser at a host NASA Center or at JPL during an annual 10-week Center-Based Research Experience (CBRE). The CBRE occurs in the summer months, in order to receive exposure to the dynamic Federal R&D environment and additional professional development activities. The CBRE is a mandatory requirement since it offers exposure to a fluidity...
that isn’t easily replicated in academia. Through the CBRE, Fellows will advance their STEM education, gain relevant research experience, expand their professional network, learn best practices, develop and strengthen research ethics, and cultivate an understanding of specific research processes.

Possible Fourth-Year Extension
The NASA Fellowship Activity is a multiyear award designed to provide three years of support and an optional fourth year of funding for merit-based supplemental experience. Teams with a Fellow in a doctoral program are offered the prospect to expand their research allowing for a possible fourth year of funding. It is during this time that a team can build upon discoveries from previous years. The objective of the extension is to offer the most innovative investigators an extended opportunity to pursue enterprising opportunities in the same research field of study, not covered by the original/current proposal. Teams are encouraged to leverage the research/engineering experience gained from NASA’s original investment and embark upon entrepreneurial, technology advancement or technology transfer pathways. Directions for applying for a fourth-year extension can be found in Appendix I.

Professional Networking Opportunity
NASA Fellows may have the ability to participate in Southern Regional Education Board (SREB) prestigious conference each year, where they will have the opportunity to network with the Fellows, meet prospective recruiters, participate in professional development sessions and attend graduation ceremony.

1.3 Agency-wide Priorities
NASA engages the public and students in its mission through a portfolio of science, technology, engineering, and mathematics (STEM) programs and activities. The 2018 NASA Strategic Plan reinforces the Agency’s commitment to inspiring an informed society; engaging the public in science, technology, discovery and exploration; and providing unique STEM opportunities for diverse stakeholders. NASA’s investments in these areas are guided by Strategic Goal 3: Address national challenges and catalyze economic growth, and Strategic Objective 3.3 Inspire and Engage the Public in Aeronautics, Space, and Science.

TABLE 1.4 NASA’s Strategic Goals

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Discover</td>
<td>Expand new human knowledge through new scientific discoveries.</td>
</tr>
<tr>
<td>2. Explore</td>
<td>Extend human presence deeper into space and to the moon for sustainable long-term exploration and utilization.</td>
</tr>
<tr>
<td>3. Develop</td>
<td>Address national challenges and catalyze economic growth.</td>
</tr>
</tbody>
</table>
4. Enable

Optimize capabilities and operations.

More information on NASA’s strategic goals can be found in the 2018 NASA Strategic Plan (https://www.nasa.gov/sites/default/files/atoms/files/nasa_2018_strategic_plan.pdf)

**NASA Strategic Objective 3.3: Inspire and Engage the Public in Aeronautics, Space, and Science.**

Inspire, engage, educate, and employ the next generation of explorers through NASA-unique Science, Technology, Engineering and Mathematics learning opportunities.

In alignment with the 2018 NASA Strategic Plan, NASA has undertaken a rigorous process to prioritize STEM engagement investments. The process included a Business Services Assessment (BSA) to refocus NASA’s portfolio of STEM engagement investments and establish the NASA Office of STEM Engagement (OSE). NASA’s STEM engagement function will play a critical role in achieving Strategic Objective 3.3 by implementing activities within three focus areas: 1) Create unique opportunities for students and the public to contribute to NASA’s work in exploration and discovery; 2) Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA’s people, content and facilities; and 3) Strengthen public understanding by enabling powerful connections to NASA’s mission and work. The goals and objectives for NASA STEM Engagement are:

**Goal 1.0: Enabling contributions to NASA’s work**

- **Objective 1.1:** Students contribute to NASA’s endeavors in exploration and discovery.
- **Objective 1.2:** Research and development capacity of educational institutions is enhanced, enabling broad and diverse contributions that directly address NASA priorities.

**Goal 2.0: Building a Diverse, Skilled Future STEM Workforce.**

- **Objective 2.1:** A broad and diverse set of students are attracted to STEM through NASA opportunities.
- **Objective 2.2:** Students, including those from underrepresented and underserved communities, explore and pursue STEM pathways through authentic learning experiences and research opportunities with NASA’s people and work.
- **Objective 2.3:** The portfolio of NASA STEM engagement opportunities meets agency workforce requirements and serves the nation’s aerospace and relevant STEM needs.
- **Objective 2.4:** Strategic partnerships with industry, academia, non-profit organizations and educational institutions enhance and extend the impact of NASA’s efforts in STEM engagement.

**Goal 3.0: Strengthen Understanding of STEM through Powerful Connections to NASA.**

- **Objective 3.1:** Youth are introduced to STEM concepts and content through readily available NASA STEM engagement resources and content.
- **Objective 3.2:** Students gain exposure to STEM careers through direct and virtual experiences with NASA’s people and work.

NASA’s multi-year Performance Goals (PGs) and Annual Performance Indicators (APIs) are outlined in the NASA Volume of Integrated Performance (VIPer) report found on the NASA Budget website.
The NASA Fellowship Activity supports the following NASA STEM Engagement multi-year PG and API.

<table>
<thead>
<tr>
<th>PG#</th>
<th>Performance Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3.3</td>
<td>Provide opportunities for students to engage with NASA’s aeronautics, space, and</td>
</tr>
<tr>
<td></td>
<td>science people, content, and facilities in support of a diverse future NASA and</td>
</tr>
<tr>
<td></td>
<td>aerospace industry workforce.</td>
</tr>
<tr>
<td>3.3.3 STEM-19-1</td>
<td>Provide significant, direct student awards in higher education to (1) students</td>
</tr>
<tr>
<td></td>
<td>across all institutional categories and levels (as defined by the U.S. Department</td>
</tr>
<tr>
<td></td>
<td>of Education), (2) racially or ethnically underrepresented students (Hispanics</td>
</tr>
<tr>
<td></td>
<td>and Latinos, African Americans, American Indians, Alaska Native, Native Hawaiians</td>
</tr>
<tr>
<td></td>
<td>and Pacific Islanders), (3) women, and (4) persons with disabilities, at</td>
</tr>
<tr>
<td></td>
<td>percentages that meet or exceeded at the national percentages for the science</td>
</tr>
<tr>
<td></td>
<td>and engineering graduates, as determined by the most recent, publicly available</td>
</tr>
<tr>
<td></td>
<td>data from the U.S. Department of Education’s National Center for Education</td>
</tr>
<tr>
<td></td>
<td>Statistics for a minimum of two of the four categories.</td>
</tr>
</tbody>
</table>

1.5 Performance and Evaluation

NASA Office of STEM Engagement (OSE) completed a redesign of its Performance Assessment and Evaluation Strategy in 2018. As a means to advance annual performance reporting from an output-focus to an outcomes-focus, the OSE led an iterative, stakeholder engaged process resulting in the development of an OSE-specific learning agenda. The learning agenda included:

- Comprehensive performance assessment and evaluation strategy
- Internal and external performance measures that track progress toward the Agency’s strategic objectives and program goals
- Strategic assessment questions, success criteria and data collection processes, and tools supporting agency evaluation evidence-building capacity
- Processes for structuring independent studies conducted by third party vendors and for program-level evidence-based decision-making

NASA identifies evidence of effective practices in its STEM Engagement investments through program evaluation. Evidence is a key criterion in NASA’s competitive processes for allocating resources, ensuring that the most effective STEM engagement activities are supported. Program evaluations are planned studies using research methods to collect and analyze data to assess to what extent activities/programs are being implemented and what, if any, impact can be measured. Evaluations answer specific questions about performance and may focus on assessing activity/program process and outcomes. NASA utilizes the Office of Education Performance
Measurement System (OEPM) for analyzing performance data. To facilitate data input into the OEPM system, the NASA Fellowship Activity Program Manager will collect institutional data via required reports (see section 8. Reporting Requirements). NASA award recipients shall provide and verify performance data for the awarded activity with the NASA Fellowships Activity Program Manager. Award recipients may also be required to respond to data calls and/or participate in future program evaluation data collection efforts at NASA OSE’s request. The NASA Fellowship Activity Program Manager will provide additional communications and guidance regarding data calls, future program evaluation efforts and timelines.

1.6 NASA Relevance

Each proposed research/engineering project is developed in response to one of the NASA Fellowship Research Opportunities, and each proposal shall include a letter of support from a NASA Center researcher stating the Center’s or JPL’s support of the proposal and willingness to serve as a NASA Technical Adviser. In addition, the NASA Technical Adviser must document the agreed collaboration including a communication plan, specific equipment, and/or facility use and other investments. Both the Faculty Advisor and the NASA Technical Adviser’s proposed collaboration must be included identifying areas of interests for the collaboration and potential outcomes. Coordination with the potential NASA Technical Adviser is mandatory. If applicants have questions about a research opportunity, they should contact the NASA Technical Adviser identified in the opportunity. The NASA Technical Adviser associated with the opportunity will provide review and guidance on the activities in his or her lab. Also, proposals shall clearly and concisely describe:

- The relevance of the proposed work to NASA’s currently funded research priorities as described in the funding opportunity;
- The relevance of the proposed work to the interests and abilities of the Institution’s candidate;
- How the work will increase the capacity and integrity of executing cutting-edge research at the institution.

The following websites can also be used to access additional information about the NASA Mission Directorates:

- Aeronautics Research (http://www.aeronautics.nasa.gov/)
- Space Technology (http://www.nasa.gov/directorates/spacetech/home/index.html)
2. AWARD INFORMATION

TABLE 2.1 Award Information

<table>
<thead>
<tr>
<th>Anticipated Type of Award</th>
<th>Fellowship (Training Grant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Years of Support</td>
<td>3 to 4 years (3 years with a possibility of a fourth year for doctoral Fellows)</td>
</tr>
<tr>
<td></td>
<td>The Period of Performance for this award is for three years, pending availability of funds, extending to the fourth year depending on the nature of work proposed, the proposing organization and the program requirement.</td>
</tr>
<tr>
<td>Estimated Number of Awards</td>
<td>NASA Office of STEM Engagement anticipates to award approximately 12 Graduate Research Fellows per fiscal year under this program/solicitation pending availability of funds.</td>
</tr>
</tbody>
</table>

TABLE 2.2 Funding Information

The NASA Fellowship Activity will be awarded as a non-portable training grant to accredited U.S. institutions on behalf of Fellows selected under this NRA. This award cannot be transferred to another institution. If a Fellow transfers to a different institution during the award period, the Fellow shall reapply to the program and follow the guidelines for a new Institution's candidate, submit a proposal application, and compete for any future NASA Fellowship Activity awards. For each Fellow, their institution receives up to a $55,000 annual award, with the following annual maximums per budget category*:

<table>
<thead>
<tr>
<th>TYPE OF FUNDING</th>
<th>FUNDING AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellowship Stipend</td>
<td>$25,000 (Master’s)</td>
</tr>
<tr>
<td></td>
<td>$30,000 (Doctoral)</td>
</tr>
<tr>
<td>Tuition Offset and Fees</td>
<td>$8,000**</td>
</tr>
<tr>
<td>Center Based Research Experience (CBRE) Allowance</td>
<td>$8,000</td>
</tr>
<tr>
<td>Health Insurance Allowance</td>
<td>$3,000</td>
</tr>
<tr>
<td>Faculty Advisor Allowance</td>
<td>$4,500</td>
</tr>
<tr>
<td>Fellow Professional Development Allowance</td>
<td>$1,500</td>
</tr>
</tbody>
</table>

*Refer to Appendix A for detailed information on each of the above funding categories.
** allowing to increase the funding amount for health insurance or peer review publication costs in the professional development allowance
2.3 Funding Sources

NASA may elect to support some of the proposals submitted under this NRA through the use of internal NASA funding sources such as Minority University Research Education Projects (MUREP); and/or the following NASA Mission Directorates: Aeronautics Research, Human Exploration and Operations, and NASA Centers/JPL.

The NRA builds in flexibility so that each funding source may have its unique expectations and selection requirements. This NRA demonstrates NASA’s commitment to streamlining and consolidating activities. Funding will continue for established NASA Fellowships Activity until closeout, thereby fulfilling NASA responsibilities to NASA Fellows. However, this is contingent on available federal funding.
3. ELIGIBILITY REQUIREMENTS

TABLE 3.1 Eligibility Requirement

<table>
<thead>
<tr>
<th>To be eligible to receive a NASA Fellowship, the Institution’s candidate must:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be a U.S. citizen or a national at the time of proposal submission</td>
</tr>
<tr>
<td>Hold a Bachelor’s degree in a STEM field earned before August 31 of the fiscal year for the grant award</td>
</tr>
<tr>
<td>Have a minimum GPA of 3.0 on a 4.0 scale on official undergraduate transcripts and on official graduate transcripts at the time of the application (undergraduate and graduate transcripts)</td>
</tr>
<tr>
<td>Be enrolled in a full-time Master’s or Doctoral degree program no later than September 1 of the fiscal year</td>
</tr>
<tr>
<td>Intend to pursue a research-based Master’s or Doctoral program in a NASA STEM-relevant field (Refer to Appendix C for a list of accepted fields of study.)</td>
</tr>
<tr>
<td>Have a projected degree plan for continuous full-time enrollment equating to the Period of Performance of this award. (Students should not plan to graduate before the end of Period of Performance or request extensions based on graduation date.)</td>
</tr>
</tbody>
</table>

Refer to Appendix B for other details of eligibility requirements.

3.2 Degree and Field of Study

Fellowships are awarded for graduate studies leading to research-based Master’s and Doctoral degrees in a NASA-specific STEM discipline. Please refer to Appendix C for more information.

3.3 Institutional Eligibility

The institution shall be one of higher education with U.S. accreditation and a physical campus located in the United States or its territories.

The institution shall offer graduate level degrees in eligible STEM fields. Refer to Appendix B for more eligibility information.
4. PROPOSAL and SUBMISSION INFORMATION

No more than one proposal should be submitted to the NASA Fellowship Activity on behalf of a single Institution’s proposed candidate. If more than one proposal is submitted on behalf of an Institution’s candidate, then all proposals will be deemed ineligible for that student and will not be reviewed.

Each proposal shall address a NASA Fellowship Activity research opportunity and have a NASA Technical Adviser’s support.

____________________________________________________________________________________

4.1 Phases of Fellowship

The NASA Fellowship Activity proposal submission process may have two phases:

4.1.1. Phase I is the proposal submitted by the PI and/or the Authorizing Official Representative (AOR) on behalf of the Institution’s candidate.

The proposal includes the following:
1. Proposal cover page (including Project Summary)
2. Impact statement
3. Project description
4. Degree program schedule and timeline of research project proposal
5. Biographical sketch
6. Letters of recommendation
7. Letter of support
8. Official transcripts

NOTE: If an applicant has not yet been accepted or has not yet selected graduate institution at the time of application and thus does not have a PI or AOR associated with the academic institution for the Phase I submission, they can select the “NASA Fellowship Proposal Submission Office” as the applicant’s organization. If selected for a Phase II submission, the application will need to be re-linked with the current institution.

4.1.2. Phase II is only required for the selected Institutions that submitted their proposals using “NASA Fellowship Proposal Submission Office” in Phase I. A proposal application package shall be re-submitted by the AOR from the applicant’s graduate institution. Directions will be sent with Phase II notifications.

Detailed instructions for proposal submission can be found in NSPIRES in “Other Documents” on the NASA Fellowship Activity Page.

All information needed to apply to this solicitation is contained in the companion documents and the NASA Guidebook for Proposers – 2018 available at

A listing of available research opportunities throughout NASA is included in this solicitation (see Appendix E). Institutions and students must review the opportunities and discuss with the NASA Technical Adviser the viability and relevance of the applicant’s research concept to the selected opportunity of interest.*

*NASA civil servants assigned to Appendix E as the lead technical officers may only provide general information regarding the application guidelines for NASA Fellowship Activity, which includes general information about NASA or NASA assets.

### 4.2 Checklist for Proposal Submission

<table>
<thead>
<tr>
<th>NSPIRES Registration Information:</th>
<th>The Institution shall be registered with NSPIRES through the Electronic Business Point of Contact (EBPOC) listed in the System for Award Management (SAM) database (<a href="https://www.sam.gov/">https://www.sam.gov/</a>). Step-by-step instructions for Proposal Submission can be found in NSPIRES in “Other Documents” under the NASA Fellowship Activity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOR</td>
<td>Each registered institution shall have a designated AOR who shall submit the Institution’s application for graduate-level research support. (Please see “NOTE” below if you do not have an AOR.)</td>
</tr>
<tr>
<td>PI</td>
<td>The Faculty Advisor (PI) shall be registered with NSPIRES and affiliated with the registered institution. (Please see “NOTE” below if the submitter has not been accepted or has not selected the institution of their choice yet and thus does not have a PI.)</td>
</tr>
<tr>
<td>Institution’s Candidate</td>
<td>The Institution’s candidate must be registered with NSPIRES and activate his/her account.</td>
</tr>
<tr>
<td>Deadline</td>
<td>Phase I Proposal Submission Deadline is May 24, 2019. No extensions will be granted to accommodate late proposals or partial proposal submissions.</td>
</tr>
</tbody>
</table>

**NSPIRES-generated Proposal Cover Page:** The cover page to be completed online includes a Project Summary. This proposal section shall be titled “Project Summary.” The summary should be a clear, concise, cohesive paragraph of approximately 200 words. The summary shall be a complete synopsis of the proposed project description stating the purpose, methodology, findings and the conclusion or expected outcome of the project. The cover page also includes responses to the Program Specific Data Questions.
The following elements are not part of the NSPIRES Proposal Cover Page form and shall be combined into a **single PDF** document and uploaded on NSPIRES for submission.

<table>
<thead>
<tr>
<th>Format</th>
<th>Should not exceed two pages in length.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>1. State the research gap and identify how an individual’s research proposal addresses the research gap within their STEM field in the scientific literature.</td>
</tr>
<tr>
<td></td>
<td>2. Discuss the impact of NASA partnership on the institution’s capacity and capabilities.</td>
</tr>
<tr>
<td></td>
<td>3. Explore the potential for commercialization - possible technology transfer.</td>
</tr>
<tr>
<td></td>
<td>4. Consider scientific impact on NASA and the larger scientific society with a focus on the candidate’s specific field of study.</td>
</tr>
<tr>
<td></td>
<td>5. The statement shall have specific information on the need for NASA participation in the research due to NASA-unique facilities, personnel, and institutional knowledge. To expand on the impact statement, you should state how your prior research experience will enhance your current NASA research.</td>
</tr>
</tbody>
</table>

**Faculty Advisor/PI Curriculum Vitae (CV)**

<table>
<thead>
<tr>
<th>PI</th>
<th>The PI should be a tenured or tenure-track faculty member at an eligible institution (if a tenure system is established).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eligible institutions that do not have a tenure track will be required to submit a letter of commitment to comply with the rule that any proposed change to the PI under the agreement is subject to NASA approval.</td>
</tr>
<tr>
<td></td>
<td>The PI shall have a Ph.D. or equivalent in an engineering, computer science, technology, mathematics, or science discipline that is relevant to NASA’s research needs.</td>
</tr>
</tbody>
</table>
### Project Description

**Project Description**: This proposal section shall be titled “Project Description”. The Project Description shall provide a clear description of the Institution’s candidate’s proposed research and should be written in response to a specific Research Opportunity listed under “Other Documents” and with the support of a NASA Technical Adviser. The Project Description shall begin with a brief abstract summarizing the scientific problem to be addressed, the proposed research plan, methodology, and expected results.

The Project Description follows the order below and contain the following technical elements:

| Format | Should not exceed six single-spaced pages in length  
| 1. Name  
| 2. Current position  
| 3. Title  
| 4. Department  
| 5. Institution address  
| 6. Institution phone number  
| 7. Principal publications (within the last three years)  
| 8. Relevant career experience  
| 9. Research  
| 10. Awards  
| 11. Scholarships  
| 12. Other relevant accomplishments |

---

### Candidate’s Degree Program Schedule

**Candidate’s Degree Program Schedule**: This section shall be titled “Degree Program Schedule”. The schedule should include the following information:

| Format | Should not exceed two pages in length.  
| Content | 1. Proposed start and completion dates  
| 2. Anticipated milestones of the Institution’s candidate’s degree program, such as candidacy exams |
## Candidate’s Curriculum Vitae (CV)

<table>
<thead>
<tr>
<th>Format</th>
<th>Should not exceed two pages in length</th>
</tr>
</thead>
</table>
| Content  | 1. Name  
2. Current Academic Level  
3. Title  
4. Department  
5. Institution address  
6. Institution phone number  
7. Relevant career or Academic experience  
8. Research or Significant Projects  
9. Awards and Recognition  
10. Other relevant accomplishments |

### Institutional Candidate’s Personal Statement:

How do you envision graduate school will prepare you for a career that allows you to contribute to expanding scientific understanding and its application to NASA’s Missions?

<table>
<thead>
<tr>
<th>Format</th>
<th>Should not exceed two pages in length</th>
</tr>
</thead>
</table>
| Content  | 1. Describe your personal, educational and professional experiences that inspire and motivate your decision to pursue advanced studies in science, technology, engineering or mathematics (STEM) and in NASA-related research.  
2. Include specific examples of any relevant research and/or professional activities in which you have participated.  
3. Present a concise description of STEM preparation/activities, and highlight the results and discuss how these activities have prepared you to seek a graduate degree.  
4. Specify your role in the activity including the extent to which you worked independently and/or as part of a team.  
5. Describe the contributions of your activity to advancing knowledge in STEM fields, as well as the potential impacts in NASA Missions. |

### Candidate’s Transcripts:

Official Transcripts that cover the Institution’s candidate’s undergraduate and graduate years must be included.

<table>
<thead>
<tr>
<th>Format</th>
<th>Should be legible and unaltered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Redact the Institution’s candidate’s social security number and date of birth, if they appear on the transcript, prior to submission (These redactions are the only permitted alterations to a transcript.)</td>
</tr>
</tbody>
</table>

Letters of Recommendation
### Content
Each Institution’s candidate shall submit three current letters of recommendation as part of the proposal package by the proposal deadline on official letterhead.

### Restrictions
Recommenders should not be family members of the Institution’s candidate.

### Content
Each letter shall contain the recommender’s contact information.

### PI
One letter shall be from (and signed by) the Institution’s candidate’s proposed Faculty Advisor (PI) on official letterhead. It shall include the following information: name and title of the letter writer, department, and institution or organization. It shall include a statement indicating the level of assistance provided to the Institution’s candidate during the preparation of the project description.

(NOTE: If an Institution’s candidate has not yet been accepted into his or her institution of choice, then he or she shall submit a letter of recommendation from his or her current academic adviser.)

### Content
The other two letters should come from individuals (teachers, professors, STEM professionals, advisers, mentors, work supervisors, etc.) with detailed knowledge of the Institution’s candidate’s abilities.

### Restriction
If a NASA civil servant or JPL employee provides a Letter of Recommendation, then they cannot provide the Letter of Support for the proposal package.

### Requirement
All letters of recommendations shall be submitted as part of the proposal package by the proposal deadline.

### Letter of Support

#### Technical Adviser
The NASA Center to be utilized as part of the proposal effort shall provide a letter on official letterhead stating its support with the proposal and its willingness to serve as a NASA Technical Adviser (must be a NASA civil servant or JPL employee) for the Fellow if the proposal is awarded a training grant.

#### Content
A statement of support shall be included for any research expenses not covered by the training grant and identified as an in-kind contribution from NASA.

#### Restriction
If a NASA civil servant or JPL employee provides a Letter of Support, then they cannot provide the Letter of Recommendation for the proposal package.

### A. Principal Investigator (PI)

All proposals must have a Faculty Advisor identified (who will serve as the PI of the training grant) from the proposing institution. For applications submitted via Phase I only, PIs must meet
all of the following criteria at the time of submission. For applications submitted via Phase II, PIs must meet these criteria at the time the Phase II application is submitted. (See Section 4.D. for more information.)

- The PI shall be a tenured or tenure-track faculty member at an eligible institution (if a tenure system is established). Eligible institutions that do not have a tenure track will be required to submit a letter of commitment to comply with the rule that any proposed change to the PI under the agreement is subject to NASA approval. The PI shall have a Ph.D. or equivalent in an engineering, computer science, technology, mathematics, or science discipline that is relevant to NASA’s research needs.

- As part of the proposal package, the Faculty Advisor/PI shall provide a Curriculum Vitae (CV) that should not exceed three pages in length, which includes the following information:
  1. Name
  2. Current position
  3. Title
  4. Department
  5. Institution address
  6. Institution phone number
  7. Principal publications (within the last three years)
  8. Relevant career experience
  9. Research
  10. Awards
  11. Scholarships
  12. Other relevant accomplishments

B. NSPIRES Registration Information

- The Institution shall be registered with NSPIRES through the Electronic Business Point of Contact (EBPOC) listed in the System for Award Management (SAM) database (https://www.sam.gov/).

- Each registered institution shall have a designated AOR who shall submit the Institution’s candidate’s application. (Please see “NOTE” below if you do not have an AOR.)

- The Faculty Advisor (PI) shall be registered with NSPIRES and affiliated with the registered institution. (Please see “NOTE” below if the submitter has not been accepted or has not selected the institution of their choice yet and thus does not have a PI.)

- The Institution’s candidate shall be registered with NSPIRES and activate his/her account.

NOTE: Application tip for Institutions’ candidates not yet accepted into a graduate program and who do not have a PI or AOR: If an applicant has not yet been accepted into the institution of their choice and thus does not have a PI or AOR associated with the academic institution for the Phase I submission, please select the “NASA Fellowship Proposal Submission Office” as the applicant’s organization. If selected for a Phase II Submission, the application will need to be
relinked with the correct institution.

C. Application Procedures – Phase I

Institutions’ candidates and their respective PIs (Faculty Advisors) are urged to access the NSPIRES electronic proposal system well in advance of the proposal due date to familiarize themselves with its structure, register and activate their accounts, and to enter the requested information. See the submission instructions in NSPIRES for full details.

The Institution’s candidate is the principal author of the submitted Phase I research proposal. By submitting the proposal for consideration, the Institution’s candidate and the Faculty Advisor (PI) certify that the Institutions’ candidate is the principal author.

Civil servants listed in Appendix E as either POCs and/or potential Technical Adviser for future awards, should not assist in the development or any formal pre-submission review of specific proposals. This restriction begins on the release date of this solicitation. Additionally, the civil servants at NASA Headquarters who will serve as internal reviewers for this solicitation should not “pre-read” proposals or provide a letter of support or a letter of commitment to an entity that plans to apply. However, proposers may contact the potential NASA Technical Advisers (as identified in the Research Opportunities by Center Document in “Other Documents”) for information regarding a review of the work currently being performed in his or her lab.

All proposals shall be submitted via NSPIRES in electronic format only. No mailed-in materials or hard copies will be accepted. NASA Fellowship Activity proposals shall be submitted electronically by the AOR of the institution (see Appendix D in this NRA or Step-by-Step Submission Instructions under “Other Documents” in NSPIRES for more information) or using the “NASA Fellowship Proposal Submission Office” by the deadline listed. Phase I proposals MUST be received by 5 pm EST/4 pm CST/3 pm PST on the due dates listed on page 2. Proposals received after this deadline will not be accepted. (Note: Applications are due May 24 for the FY 2019).


   a) Click on “Solicitations”
   b) Click on “Open Solicitations”
   c) Use any keywords to select: NASA Fellowship Activity
   d) For submission instructions, select Phase I Proposal Submission Instructions under “Other Documents.”

Phase I proposals shall include ALL of the items listed below (a-j), appropriately labeled, in the exact order specified. Proposals should not include extraneous information or materials not specifically requested or outlined in this solicitation. No additional information shall be provided by links to web pages within the proposal, except as part of citations in the References Cited section. Images may be included in the page limits. Review of the proposal is based solely on those materials received by the proposal deadlines. The proposal shall be submitted using the following format:
2. Proposal Application Package:
   a) **NSPIRES-generated Proposal Cover Page**: The cover page to be completed online includes a *Project Summary*. This proposal section shall be titled “Project Summary.” The summary should be a clear, concise, cohesive paragraph of approximately 200 words. The summary shall be a complete synopsis of the proposed project description stating the purpose, methodology, findings and the conclusion or expected outcome of the project. The cover page also includes responses to the Program Specific Data Questions.

   **Please Note**: The following elements (b – j) are not part of the NSPIRES Proposal Cover Page form and shall be combined into a single PDF document and uploaded on NSPIRES for submission.

   b) **Impact Statement**: This proposal section shall be titled “Impact Statement” and shall be jointly written by the Institution’s candidate and Faculty Advisor (PI). It should not exceed two pages in length. The impact statement should address the following:

   1) State the research gap and identify how an individual’s research proposal addresses the research gap within their STEM field in the scientific literature;
   2) Discuss the impact of NASA partnership on the institution’s capacity and capabilities;
   3) Explore the potential for commercialization - possible technology transfer;
   4) Consider scientific impact on NASA and the larger scientific society with a focus on the candidate’s specific field of study.
   5) The statement shall have specific information on the need for NASA participation in the research due to NASA-unique facilities, personnel, and institutional knowledge. To expand on the impact statement, you should state how your prior research experience will enhance your current NASA research.

   c) **Faculty Advisor/PI Curriculum Vitae (CV)** with information identified in section: 4.2.A. It should not exceed three pages in length.

   d) **Project Description**: This proposal section shall be titled “Project Description” and should not exceed six single-spaced pages (using a 12-point font with at least 1” margins on all sides). The Project Description shall provide a clear description of the Institution’s candidate’s proposed research and should be written in response to a specific Research Opportunity listed under “Other Documents” and with the support of a NASA Technical
Adviser. The Project Description shall begin with a brief abstract summarizing the scientific problem to be addressed, the proposed science plan, your methodology, and expected results. The Project Description follows the order below and contain the following technical elements:

1) A statement of problem to be addressed
2) A description of the science background and relevance to previous work in the field
3) General methodology
4) Project Schedule / Timeline
5) Explanation of new or novel techniques
6) Expected results and their significance or application
7) Literature citations, where appropriate

e) Candidate’s Degree Program Schedule: This section shall be titled “Degree Program Schedule” and should not exceed two pages in length. The schedule shall state the proposed start and completion dates, expected course schedule, as well as anticipated milestones of the Institution’s candidate’s degree program, such as Candidacy Exams. There is no standard format for this section.

f) Candidate’s Curriculum Vitae (CV): (It should not exceed two pages in length.)

1) Name
2) Current Academic Level
3) Title
4) Department
5) Institution address
6) Institution phone number
7) Relevant career or Academic experience
8) Research or Significant Projects
9) Awards and Recognition
10) Other relevant accomplishments

g) Candidate’s Personal Statement: How do you envision graduate school preparing you for a career that allows you to contribute to expanding scientific understanding and its application to NASA’s Missions? (It should not exceed two pages in length.)

Describe your personal, educational and/or professional experiences that inspire and motivate your decision to pursue advanced studies in science, technology, engineering or mathematics (STEM) and in NASA-related research. Include specific examples of any research and/or professional activities in which you have participated. Present a concise description of the activities, highlight the results and discuss how these activities have prepared you to seek a graduate degree. Specify your role in the activity including the extent to which you worked independently and/or as part of a team. Describe the contributions of your activity to advancing knowledge in STEM fields, as well as the potential impacts in NASA Missions.
h) **Candidate’s Transcripts**: Official Transcripts that cover the Institution’s candidate’s undergraduate and graduate years must be included. These shall be legible and unaltered. Please redact the Institution’s candidate’s social security number and date of birth, if they appear on the transcript, prior to submission. These redactions are the only permitted alterations to a transcript.

i) **Letters of Recommendation**: Each Institution’s candidate shall submit three current letters of recommendation as part of the proposal package by the proposal deadline. Recommenders should not be family members of the Institution’s candidate. Each letter shall contain the recommender’s contact information.

1) One letter shall be from (and signed by) the Institution’s candidate’s proposed Faculty Advisor (PI) on official letterhead. It shall include the following information: name and title of the letter writer, department, and institution or organization. It shall include a statement indicating the level of assistance provided to the Institution’s candidate during the preparation of the project description. (NOTE: If an Institution’s candidate has not yet been accepted into his or her institution of choice, then he or she shall submit a letter of recommendation from his or her current academic advisor.)

2) The other two letters should come from individuals (teachers, professors, STEM professionals, advisors, mentors, work supervisors, etc.) with detailed knowledge of the Institution’s candidate’s abilities.

NOTES:

*A Letter of Recommendation from a NASA civil servant or Jet Propulsion Laboratory (JPL) employee is not required for a successful application. There may be instances where a Letter of Recommendation from a NASA civil servant or JPL employee is appropriate (i.e., the applicant completed an internship at a NASA Center or JPL); however, no more than one letter from a NASA civil servant or JPL employee will be permitted as part of the application package sent on for review. Moreover, NASA civil servants and JPL employees submitting Letters of Recommendation should not presume that they would be assigned as the student’s NASA Technical Adviser research collaborator.

**If a NASA civil servant or JPL employee provides a Letter of Recommendation, then they cannot provide the Letter of Support for the proposal package.

***All letters of recommendations shall be submitted as part of the proposal package by the proposal deadline.

j) **Letter of Support**: The NASA Center to be utilized as part of the proposal effort shall provide a letter stating its support with the proposal and its willingness to serve as a NASA Technical Adviser (must be a NASA civil servant or JPL employee) for the Fellow if the proposal is awarded a training grant. A statement of support shall be included for
any research expenses not covered by the training grant and identified as an in-kind contribution from NASA.

NOTE:

*If a NASA civil servant or JPL employee provides a Letter of Support, then they cannot provide the Letter of Recommendation for the proposal package.

Proposals not meeting the requirements as outlined in sections 2.a through 2.j will be deemed non-compliant and eliminated from award consideration.

**Phase I Proposal Submission Deadline is May 24, 2019**
No extensions will be granted to accommodate late proposals or partial proposal submissions. Step-by-step instructions for Proposal Submission can be found in NSPIRES in “Other Documents” under the NASA Fellowship Activity.

**D. Application Procedures – Phase II (if required)**

The institution and Institution’s candidate may be required to submit a Phase II application if an award offer is extended after Phase I Proposal Evaluation. If the Phase I Proposal Application Package was submitted using “NASA Fellowship Proposal Submission Office” as the submitting AOR, a follow-up will be necessary to update the Institution’s candidate’s institutional AOR. In such cases, Phase II is required for a proposal to move forward through the evaluation process. This section provides an outline of the required Phase II elements. Detailed instructions will be released, via NSPIRES, concurrent with the Phase I selection announcement.

Phase II of this solicitation will require re-submission of a proposal application package, via NSPIRES, by an identified Faculty Advisor serving as a PI and a graduate institution’s AOR. The PI on the training grant award will be the Faculty Advisor. The Faculty Advisor will also have a role in the submission of the Phase II package. The selected Institution’s candidate shall work with the Faculty Advisor and AOR to ensure that all of the following components are submitted by the Phase II deadline (currently June 30th of the year for which the candidate is applying for).

1. NSPIRES Proposal Cover Page (with the Faculty Advisor as PI and additional Program Specific Data Questions)

2. Unrevised, except as specified below, components (b) through (g) of the Phase I submission:
   a) The Phase I-submitted Impact Statement
   b) The Phase I-submitted Project Description
   c) The Phase I-submitted Degree Program Schedule
   d) The Phase I-submitted Biographical Sketches
   e) The selected Institution’s candidate’s transcripts, with updates as available

3. Curriculum Vitae (CV) for the Faculty Advisor, see Section: 4.2.A. Principal Investigator.
4. Statement from the Faculty Advisor on the planned use of funds outlined in budget categories funded in TABLE 2.1, and a brief description of any ongoing or pending research awards from NASA that are related to the selected Institution’s candidate’s proposal.

By submitting the Phase II package, the proposer accepts the Terms and Conditions specified in Phase I. NASA will examine the Phase II packages for completeness (i.e., all components have been submitted and are correct). Incomplete packages will be deemed non-compliant.

E. Pre-proposal Questions and Answers

<table>
<thead>
<tr>
<th>Teleconference number: 1-844-467-6272 Passcode: 549325</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times will be announced on the NASA Fellowships Website:</td>
<td>April 4, 2019</td>
<td>October 25, 2020</td>
<td>October 23, 2020</td>
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<tr>
<td><a href="https://www.nasa.gov/education/fellowships-scholarships/index.html">https://www.nasa.gov/education/fellowships-scholarships/index.html</a></td>
<td>April 18, 2019</td>
<td>October 1, 2019</td>
<td>November 13, 2020</td>
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<td>November 15, 2019</td>
<td>November 13, 2020</td>
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Pre-proposal teleconference will outline critical deadlines, eligibility requirements, frequently asked questions, and other details of the Fellowship program. Institutions’ candidates and Faculty Advisors (PI) are encouraged to attend. Refer to the NASA Fellowship Activity on NSPIRES for connection details.

For clarifications related to Fellowship program, prospective Institutions’ candidates and Faculty Advisors are asked to submit their questions in writing to the NASA Fellowship Program Manager, Brenda Collins at NASA.Fellowships@nasaprs.com. Every attempt will be made to provide responses to the submitted questions during next scheduled teleconference. Responses to the submitted questions will also be posted on NSPIRES as FAQ under “Other Documents” section. The list will be updated periodically during the open period of the opportunity.
5. APPLICATION REVIEW AND EVALUATION INFORMATION

A. Proposal Review and Selection

All eligible proposals will be reviewed by subject matter experts (SME’s) using virtual and panel reviews. These reviewers will be identified by NASA ensuring they are experts in the STEM subjects closely related to the candidate’s field of study (See Appendix C). In the selection process, the program will ensure that panel reviewers have no conflict of interest with the applicant and/or the proposal team.

The following criteria will be used to evaluate the Institution’s candidate’s proposal application:

1. Academic Merit and Distinction. Based upon the review of the Institution’s candidate’s transcripts, degree program schedule, personal statement, impact statement, letters of recommendation and candidate’s CV, reviewers will analyze the applicant’s potential to conduct NASA relevant research based upon the following criteria:
   
   a. The applicant’s ability to synthesize and evaluate original thoughts into a clear and concise document;
   
   b. The applicant’s previous experiences conducting research and/or desire/potential to conduct research in an authentic lab setting; and
   
   c. The applicant’s intrinsic motivation and determination to complete an advanced degree at the academic institution of choice.

2. Broader Impact. Based upon the review of the applicant’s “Project Description”, reviewers will analyze the proposed research’s potential to benefit society or advance desired societal outcomes. This includes activities that are directly related to the specific research projects or activities that are supported by, however complimentary to the project. For instance, participation by the under-represented and underserved community, enhancement of STEM education and educator development, improved well-being of the human beings, increased partnership between the academia, industry and improved national security.

3. Scientific Merit of the Proposed Research. Based upon the review of the applicant’s Project Description, reviewers will analyze the quality of the proposed NASA relevant research based upon the following criteria:

   a. The proposal ability to address research gap in the scientific literature;
   
   b. The proposal’s ability to clearly describe a collaborative approach to conducting research within NASA; and
   
   c. The proposal’s ability to clearly describe the connection between the proposed research area and the academic discipline that the Institution’s candidate is pursuing.
   
   d. The proposal’s ability to clearly describe the uniqueness of their proposal vs. the opportunity provided in the Fellowship solicitation.
After the panel review of Phase I proposals, NASA technical experts and program managers will complete a technical review of proposals and make final selections for participation in this program. Selections will be based on the results of the panel review, technical review, the NASA Center’s selection, unique programmatic requirements, and approval of the NASA Office of STEM Engagement Funding Managers. For NASA Fellowship Activity proposals, the stated impact on the Institution’s candidate and the institution will also be taken into consideration.

B. Review of Applicants in the Federal Awardee Performance and Integrity Information System (FAPIIS)

Before making a Federal award with a total amount of Federal funding greater than the simplified acquisition threshold, NASA is required to review and consider any information about the applicant that is in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System—FAPIIS) accessible through the System for Award Management (SAM, https://www.sam.gov) (see 41 U.S.C. 2313).

An applicant, at their option, may review information in FAPIIS and comment on any information about itself that a Federal awarding agency previously entered and is currently in FAPIIS.

NASA will consider any comments by the applicant, in addition to the other information in FAPIIS, 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 2 CFR 200.205, Federal awarding agency review of risk posed by applicants.
6. AWARD ADMINISTRATION INFORMATION

A. Anticipated Type of Award

The NASA Fellowship funding is issued to the awardee’s institution by NASA Shared Services Center (NSSC) in the form of a NASA Training Grant. Cooperative agreements and contracts will not be awarded.

B. Estimated Number of Awards

Awards are subject to Congressional appropriation in Fiscal Years 2019 and beyond and NASA’s receipt of proposals of adequate merit. NASA expects to select a minimum of 9 proposals for award. Total award values will range from $50,000 to $55,000 each year for a total award value of $150,000 to $165,000, with a period of performance of up to four years. NASA may elect to support some of the proposals submitted under this NRA through the use of non-NASA funds if funds are available from non-NASA sources.

C. Cancellation of Announcement

NASA reserves the right to not make any awards under this NRA and to cancel any or all aspects of this NRA at any time. NASA assumes no liability (including proposal preparation costs) for canceling the NRA or for an entity’s failure to receive an actual notice of cancellation.

D. Period of Performance

All awards are made for a one-year period and may be renewed annually for up to four total years in total of financial support, pending availability of federal funds and a successful annual review of the effort. However, only doctoral fellows may seek a fourth year of funding and are required to provide justification as to why period of performance should be extended to a fourth year. Renewals are contingent upon NASA’s acceptance of the renewal application, which includes satisfactory progress (as reflected in the Fellow’s academic performance and research progress, recommendation by the Faculty Advisor, recommendation by the NASA Technical Adviser, and effective costing of the annual budget).

Requests for deferment of awards will not be approved.

Institutions seeking renewal shall submit a Renewal Proposal Applications Package to program management in May of each fiscal year. Specific details will be released to Fellowship awardees upon acceptance of the award.

E. Transfer of Award

1. The PI and the institution’s AOR shall provide a timely statement to NASA Program Management advising of any changes in the fellow’s enrollment status.
2. If the graduate student withdraws within the first half of the award year, the institution may submit a request for replacement of a graduate student with similar achievement and research objectives to complete the remaining months of the current award. Since this is a
highly competitive program, replacement Fellows may be recommended from NASA’s current database of alternative applicants who have passed a review process and met all the requirements for the award. However, replacement Fellows are not considered as renewals for subsequent awards. Upon expiration of the replacement award, the replacement Fellow shall follow the guidelines for a new Institution’s candidate, submit a proposal application and compete for future NASA Fellowships Activity awards.

3. This award cannot be transferred to another institution. If a Fellow transfers to a different institution during the award period, the Fellow shall reapply to the program and follow the guidelines for a new Institution’s candidate, submit a proposal application, and compete for any future NASA Fellowship Activity awards.

F. Administrative and National Policy Requirements

All administrative and national policy requirements can be found in section: 2 CFR 200, 2 CFR 1800 and the NASA Grant and Cooperative Agreement Manual (GCAM) (https://prod.nais.nasa.gov/pub/pub_library/grantnotices/GrantNotices.html).

G. Access to NASA Facilities

Award recipients that have individuals working under the award who require access to NASA facilities and/or systems shall promptly work with NASA program staff to ensure proper credentialing. Such individuals include U.S. citizens, lawful permanent residents (“green card” holders), and foreign nationals (those who are neither U.S. citizens nor permanent residents).
7. PROGRAMMATIC REQUIREMENTS

The outcome of the NASA Fellowship activity is to foster the new generation of highly skilled scientists and engineers in the critically important area of STEM research in core competencies of NASA missions. Students are required to participate in these program activities designed to help the student grow professionally:

1. The Fellow shall participate in the Professional Development activities listed in Appendix F. If a Fellow does not opt to participate in these activities, the Fellowship will not be renewed.

2. The Fellow will submit a detailed research report compiled at the end of each academic year.

3. The Center Based Research Experience (CBRE) is a mandatory requirement of the program. If a Fellow does not participate in the CBRE, the Fellowship will not be renewed, and the stipend for the CBRE will be withheld.

4. The Fellow must receive a positive CBRE evaluation indicating successful completion of research activities during the ten week period from the NASA Technical Adviser. If not, the Fellowship will not be renewed for the next year.

5. Each Fellow shall publish one peer reviewed paper by the end of the training grant’s performance period. Presentation at a scientific conference will also be encouraged depending on the outcome of the research effort.
8. REPORTING REQUIREMENTS

All reports are vital to program management and evaluation. It is the responsibility of the Faculty Advisor (the PI), the Fellow, and the institution receiving a NASA Fellowship Activity award to ensure prompt submission of all required reports. A listing of midterm and final reports is included in the official training grant that will be sent to the Fellow’s host institution upon issuance of the award (see 2 CFR 1800.902 and Exhibit E of the GCAM). A summary of these reports is provided below:

| AGO = ADMINISTRATIVE GRANT OFFICER | TO = TECHNICAL OFFICER |
| IPO = INDUSTRIAL PROPERTY OFFICER | GO = NASA GRANT OFFICER |
| CASI = CENTER FOR AEROSPACE INFORMATION | UAO = UNIVERSITY AFFAIRS OFFICER |
| NTO = NEW TECHNOLOGY OFFICE | HHS/PMS = HEALTH AND HUMAN SERVICES |
| CC = CLOSEOUT CONTRACTOR | PAYMENT MANAGEMENT SYSTEM |
| PO = PATENT COUNSEL OFFICE | STIO = SCIENTIFIC & TECHNICAL INFORMATION |
| FMO = FINANCIAL MANAGEMENT OFFICE | OFFICE |

### Interim Reports

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<th>Report</th>
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<tr>
<td><strong>Quarterly Federal Cash Transactions Report</strong> (SF 425) This report is submitted by the University Sponsored Research Office and is required within 30 working days following the end of each quarter of the Federal fiscal year for all Grants and Cooperative Agreements (Ref. 2 CFR Part 1800.906). Submit to HHS/PMS. The address will be on the Training Grant.</td>
<td>HHS/PMS</td>
</tr>
<tr>
<td><strong>Annual Progress Reports</strong> <em>(Required for all Grants and Cooperative Agreements.)</em> <em>(Not required if performance period is less than one year.)</em> Submit with annual NASA Fellowship Activity renewal report. Official transcripts are requested by the Institution’s candidate and sent as part of the annual progress report. Submit to the Program Manager by the due date on the notice of award document. Report Due: Annually, 60 days prior to the anniversary date of the grant/cooperative agreement (except final year). <em>(Ref. 1800.902)</em> Submit to the Program Manager and Grants Officer.</td>
<td>TO, GO, NTO, NRESS</td>
</tr>
<tr>
<td><strong>Midterm / Quarterly Progress Reports</strong> <em>(Required for all Grants and Cooperative Agreements.)</em> <em>(Not required if performance period is less than one year.)</em> Unofficial transcripts are requested by the Institution’s candidate and sent as part of the mid term progress report. Submit to the Program Manager and NRESS by the due date of announcement.</td>
<td>PO, TO, NRESS</td>
</tr>
<tr>
<td><strong>Notification of Decision to Forego Patent Protection</strong> <em>(Required for all Grants and Cooperative Agreements.)</em> Report Due: As applicable, not less than 30 days before the expiration of the response period required by the relevant patent office. <em>(Ref. 1800.908)</em></td>
<td>PO, TO, GO</td>
</tr>
<tr>
<td><strong>Election of Title to a Subject Invention:</strong> <em>(Required for all Grants and Cooperative Agreements.)</em> Report Due: Within 2 years of disclosure of a subject invention being elected, except in any case where publication, on sale or public use of the subject invention being elected, has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, at least, 60 days prior to the end of the statutory period. <em>(Ref. 1800.908)</em> Submit to the Program Manager and Grants Officer.</td>
<td>PO, TO, GO</td>
</tr>
<tr>
<td>Annual Inventory Report of Federally Owned Property in Custody of the Recipient</td>
<td>FMO, IPO</td>
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<td><em>(Required for all Grants and Cooperative Agreements, except grants and agreements with commercial organizations.)</em></td>
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<tr>
<td><strong>Report Due:</strong> No later than October 15 of each year. <strong>NOTE:</strong> Negative reports are not required. <em>(Ref. 1800.907)</em></td>
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<tr>
<th>Final Reports</th>
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<tbody>
<tr>
<td>Properly Certified Final Federal Cash Transaction Report, SF 425 <em>(Required for all Grants and Cooperative Agreements)</em></td>
<td>FMO, GO</td>
</tr>
<tr>
<td><strong>Report Due:</strong> Within 90 days after the expiration date of the grant/cooperative agreement. <em>(Ref. 1800.906)</em> Submit to the Project Manager and Grants Officer.</td>
<td></td>
</tr>
<tr>
<td>Summary of Research <em>(Required for NASA Fellowship Activity Training Grants)</em>. <strong>Report Due:</strong> Within 90 days after the expiration date of the grant/cooperative agreement. <em>(Ref. 1800.902)</em> For research-related training program grants, the Fellows complete the summary of the research report. Submit to the Project Manager and Grants Officer.</td>
<td>CASI, TO, GO, NTO, STIO</td>
</tr>
</tbody>
</table>

Award recipients may also be subject to reporting requirements under the NASA Plan for Increasing Access to Results of Federally Funded Research. Any such requirements will be identified in the Notice of Award.
9. INTELLECTUAL PROPERTY

   a. Data Rights

      Recipients may copyright any work that is subject to copyright and was developed under a NASA award. NASA reserves a royalty-free, non-exclusive and irrevocable right to reproduce, publish, or otherwise use the work for Federal purposes, and to authorize others to do so.

   b. Invention Rights

      Recipients are subject to applicable regulations governing patent and inventions, including government-wide regulations issued by the Department of Commerce at 37 Part 401, “Rights to Inventions Made by Nonprofits Organizations and Small Business Firms Under Government Awards, Contract, and Cooperative Agreements.”
10. NASA’s SAFETY POLICY

All proposals shall take into consideration NASA’s priority emphasis on safety.

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: (1) the public, (2) astronauts and pilots, (3) the NASA workforce (including employees working under NASA award instruments), and (4) high-value equipment and property.

Proposers shall have a written safety policy. Fellowship awardees shall notify the NASA Shared Services Center (NSSC) of any mishaps and close calls related to award implementation within two business days of the occurrence of the close call or mishap. The following NASA procedural requirement applies to NASA entities and may be useful to non-NASA entities for benchmarking purposes:

NPR 8621.1C: NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping:  
https://nodis3.gsfc.nasa.gov/npg_img/N_PR_8621_001C_/N_PR_8621_001C_.pdf

Responsible Office: Office of Safety and Mission Assurance  
http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8621&s=1C

For additional information on the NASA Safety and Mission Assurance Program see:  
http://sma.nasa.gov
11. NASA CONTACTS
(Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.)

A. Cognizant Program Officer(s):
• Vandhana Lal
  Program Activity Manager
  NASA Ames Research Center
  Office of STEM Engagement
  Mountain View, CA 94035
  650-604-4709
  Email: Vandhana.lal@nasa.gov

B. Proposal Submission Assistance Contact:
• Beata Kozak
  NASA Research and Education Support Services (NRESS)
  2345 Crystal Drive, Suite 500
  Arlington, VA 22202
  202-479-9030 x413
  Email: NASA.Fellowships@nasaprs.com

C. Program Manager – Technical Officer:
• Brenda Collins
  Education Director / Acting Program Manager
  Ames Research Center
  Human Education Capital Directorate
  Mountain View, CA 94035
  Email: NASA.Fellowships@nasaprs.com

D. Director, NASA Internships and Fellowships
• Carolyn Knowles
  Director, NASA Internships and Fellowships
  NASA Headquarters Washington, DC 20546
  Email: NASA.Fellowships@nasaprs.com

E. Proposal Submission Help Desk (NSPIRES):
• NSPIRES Help Desk
  202-479-9376 from 8 am to 6 pm Eastern Time, Monday to Friday (except on federal holidays).
  Email: nspires-help@nasaprs.com

F. NASA Shared Service Center (NSSC)
• NSSC Customer Contact Center
  1-877-677-2123 (1-877-NSSC123)
  Email: nssc-contactcenter@nasa.gov
Appendix A: Summary of Key Information

| Total ESTIMATED annual budget for each NASA Fellowship Activity | $50K (Master’s)  
| $55K (Doctoral) |
| Number of new awards | Pending adequate proposals of merit and available funding |
| Start date of award (estimated) | August 19, 2019 |
| Duration of awards | Up to 4 years |
| Award type | Training Grant |
| Solicitation Release Date | March 22, 2019 |
| Pre-proposal Teleconference: To join the meeting via the web: TBD | April 4, 2019  
| April 18, 2019 | 5pm ET, 2pm CT, 3pm PT |
| Due date for Phase I Proposals | May 24, 2019 |
| Due date Phase II Applications | TBD |
| Public announcement of awards | Estimate six months after solicitation closes |
| Submission medium | Electronic proposal submission is required via NSPIRES; no hard copy will be accepted. See Chapter 4 of the NASA Guidebook for Proposers (available at http://www.hq.nasa.gov/office/procurement/nraguidebook/). |
| Website for submission of proposal via NSPIRES | http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376 from 8 am to 6 pm Eastern Time, Monday to Friday (except on federal holidays). |
| Selection Officials | Carolyn Knowles  
| Director, NASA Internships and Fellowships  
| NASA Office of STEM Engagement - NASA Headquarters |
| Brenda Collins  
| Program Manager – Technical Officer  
| NASA Ames Research Center |
| Program Management | Brenda Collins  
| Program Manager – Technical Officer  
| NASA Ames Research Center  
| Office of STEM Engagement  
| Human Education Capital Directorate  
| NASA Ames Research Center  
| brenda.j.collins@nasa.gov |
| Vandhana Lal  
| Program Activity Manager  
| NASA Ames Research Center  
| Office of STEM Engagement  
| Mountain View, CA 94035  
| 650-604-4709  
| vandhana.lal@nasa.gov |
Appendix B: Eligibility Information

Described in detail below are the eligibility requirements for the NASA Fellowship Activity.

To be eligible to receive a NASA Fellowship, the candidate shall meet the following requirements:

- Be a U.S. citizen or national at the time of proposal submission
- Hold a Bachelor’s degree in a STEM field earned before August 31 of each fiscal year
- Have a minimum GPA of 3.0 on a 4.0 scale on official undergraduate transcripts and official graduate transcripts
- Be enrolled in a Master’s or Doctoral degree program no later than September 1 of the academic year for which the award is granted
- Intend to pursue a research-based Master’s or Doctoral program in a NASA STEM relevant field (see Appendix C for additional information)
- Have a projected degree plan for continuous full-time enrollment up to the end of the Period of Performance

### Degree Programs

#### Academic Eligibility Requirements Chart

<table>
<thead>
<tr>
<th>Degree Program</th>
<th>Number of graduate credits earned by May 31, 2019</th>
<th>The student’s degree plan is continuous and full-time for a minimum of 2 years after September 1, 2019.</th>
<th>Is the student eligible for an award?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s</td>
<td>≤ 24 credits or 36 quarter credits</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>Master’s</td>
<td>≤ 24 credits or 36 quarter credits</td>
<td>NO</td>
<td>❌</td>
</tr>
<tr>
<td>Master’s</td>
<td>&gt; 24 credits or 36 quarter credits</td>
<td>NO</td>
<td>❌</td>
</tr>
<tr>
<td>Master’s</td>
<td>&gt; 24 credits or 36 quarter credits</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>* Dual</td>
<td>≤ 24 credits or 36 quarter credits</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>* Dual</td>
<td>&gt; 24 credits or 36 quarter credits but before a Master’s degree is confirmed</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>* Dual</td>
<td>&gt; 24 credits or 36 quarter credits but after a Master’s degree is confirmed</td>
<td>YES</td>
<td>❌</td>
</tr>
<tr>
<td>* Doctoral</td>
<td>≤ 24 credits or 36 quarter credits beyond a Master’s degree</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>* Doctoral</td>
<td>&gt; 24 credits or 36 quarter credits beyond a Master’s degree</td>
<td>YES</td>
<td>❌</td>
</tr>
<tr>
<td>* Direct Doctoral</td>
<td>≤ 48 credits or 72 quarter credits</td>
<td>YES</td>
<td>✅</td>
</tr>
<tr>
<td>* Direct Doctoral</td>
<td>&gt; 48 credits or 72 quarter credits</td>
<td>YES</td>
<td>❌</td>
</tr>
</tbody>
</table>

* All credits including research credits are included in the overall credit count.

- A Dual degree program is defined as a program where a student works towards satisfying the academic requirements for two distinct degree types, a Master’s and Doctoral, in an integrated fashion.
- A Doctoral degree program is defined as a program where a Master’s confirmed student enters a Doctoral program.
• A Direct Doctoral degree program is defined as a program where a bachelor’s degree student enters a Doctoral program without enrolling in a Master’s program and will only be confirmed a Ph.D.
• Students are not eligible to apply if they have been awarded a Doctoral Degree in a STEM field.
• Students are eligible to apply if they have been awarded a Master’s in a non-STEM degree, such as an M.A., M.Ed., or M.B.A.
• Students are eligible to apply if they have been awarded a Doctoral Degree in a non-STEM degree, such as Ed.D., D.M.A., or J.D.
Appendix C: Eligible Graduate STEM Disciplines Degrees or Fields of Studies

CHEMISTRY
- Chemical Catalysis
- Chemical Measurement and Imaging
- Chemical Structure, Dynamics, and Mechanism
- Chemical Synthesis
- Chemical Theory, Models and Computational Methods
- Chemistry of Life Processes
- Environmental Chemical Systems
- Macromolecular, Supramolecular, and Nanochemistry
- Sustainable Chemistry
- Chemistry, other (specify)

COMPUTER AND INFORMATION SCIENCE AND ENGINEERING (CISE)
- Algorithms and Theoretical Foundations
- Bioinformatics and other Informatics
- Communication and Information Theory
- Computational Science and Engineering
- Computer Architecture
- Computer Networks
- Computer Security and Privacy
- Computer Systems and Embedded Systems
- Databases
- Data Mining and Information Retrieval
- Formal Methods, Verification, and Programming Languages
- Graphics and Visualization
- Human-Computer Interaction
- Machine Learning
- Natural Language Processing
- Robotics and Computer Vision
- Software Engineering
- CISE, other (specify)

ENGINEERING
- Aeronautical and Aerospace Bioengineering
- Biomedical
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical and Electronic Energy
- Environmental Engineering
- Industrial Engineering & Operations Research
- Materials Engineering
- Mechanical Engineering
- Nuclear Engineering
- Ocean Engineering
- Optical Engineering
- Polymer Engineering
- Systems Engineering
- Engineering, other (specify)

GEOSCIENCES
- Atmospheric Chemistry
- Aeronomy
- Biogeochemistry
- Biological Oceanography
- Chemical Oceanography
- Climate and Large-Scale Atmospheric Dynamics
- Geo-biology
- Geochemistry
- Geomorphology
- Geodynamics
- Geophysics
- Glaciology
- Hydrology
- Magnetospheric Physics
- Marine Biology

**GEOSCIENCES**
- Marine Geology and Geophysics
- Paleoclimate
- Paleontology and Paleobiology
- Petrology
- Physical and Dynamic Meteorology
- Physical Oceanography
- Planetary Science
- Sedimentary Geology
- Solar Physics
- Tectonics
- Geosciences, other (specify)

**LIFE SCIENCES**
- Biochemistry
- Bioinformatics and Computational Biology
- Biophysics
- Cell Biology
- Developmental Biology
- Ecology
- Environmental Biology
- Evolutionary Biology
- Genetics
- Genomics
- Microbial Biology
- Neurosciences
- Organismal Biology
- Physiology
- Proteomics
- Structural Biology
- Systematics and Biodiversity
- Systems and Molecular Biology
- Life Sciences, other (specify)

**MATERIALS RESEARCH**
- Biomaterials
- Ceramics
- Chemistry of materials
- Electronic materials
- Materials theory
- Metallic materials
- Photonic materials
- Physics of materials
- Polymers
- Materials Research, other (specify)

**MATHEMATICAL SCIENCES**
- Algebra, Number Theory, and Combinatorics
- Analysis
- Applied Mathematics
- Biostatistics
- Computational and Data-enabled Science
- Computational Mathematics
- Computational Statistics
- Geometric Analysis
- Logic or Foundations of Mathematics
- Mathematical Biology
- Probability
- Statistics
- Topology
- Mathematics, other (specify)

**PHYSICS AND ASTRONOMY**
- Astronomy and Astrophysics
- Atomic, Molecular and Optical Physics
- Condensed Matter Physics
- Nuclear
- Particle Physics
- Physics of Living Systems
- Plasma
- Solid State-Theoretical Physics
- Physics, other (specify)

*Note:* The following programs and areas of study are **not eligible:**

- Practice-oriented, professional degree programs (MBA, MSW, MPH, ED, etc.)
- Joint science-professional degree programs (MD/Ph.D., JD/Ph.D., etc.)
- Business administration or management
- Social work/sciences
- History (except for history of science)
- Public health programs
- Medical programs
- Dental programs
- Counseling programs
- Research with disease-related goals, including the etiology, diagnosis or treatment of physical or mental disease, abnormality or malfunction
- Clinical areas of study including programs that are patient-oriented research; epidemiological and behavioral studies; outcomes research; and health services
- Research in pharmacologic, non-pharmacologic, and behavioral interventions for disease prevention, prophylaxis, diagnosis, or therapy; and community and other population-based intervention trials
Appendix D: Step-by-Step Instructions for Proposal Submission

Important Notes to Review Prior to Initiating Proposal Submission:

**Warning vs. Error.** In NSPIRES, errors indicate problems that will *preclude* proposal submission to NASA. Errors must be corrected in order to submit a proposal. Warnings are meant to be used as guidelines for checking a proposal prior to submission to NASA. They indicate potential discrepancies, based on typical proposal requirements. Submitters are solely responsible for any actions they take in response to warnings.

Please consult the NASA Fellowship Activity announcement for specific requirements. In particular, the posted opportunity under “Other Documents” of the solicitation describes the research opportunities available for the Institution’s candidate proposals. One of these opportunities must be selected during the proposal creation process described below. Please ensure that the correct “Option for Proposal Submission” is selected.

**STEP-BY-STEP SUBMISSION INSTRUCTIONS for Phase I Submission:**

**Step 1**
1. The Institution shall be registered with NASA NSPIRES through the Electronic Business Point of Contact (EBPOC) listed in the System for Award Management (SAM) database ([https://www.sam.gov/](https://www.sam.gov/)). Each registered institution will have a designated Authorizing Official Representative (AOR) who will be responsible for submitting the Institution’s candidate’s application. (Please see “NOTE” below if you do not have an AOR or cannot locate your AOR.)

2. The Faculty Advisor (PI) shall be registered with NSPIRES and affiliated with the registered institution. (Please see “NOTE” below if you have not been accepted into the Institution of your Choice yet and thus do not have a PI.)

3. The Institution’s candidate must be registered with NSPIRES and activate his/her account.

**NOTES:**

*Application tip for Institutions’ candidates not yet accepted into a graduate program and do not have a PI or AOR:* If you have not yet been accepted into the institution of your choice and thus, do not have a PI or AOR associated with the academic institution for your Phase I submission, please select the “NASA Fellowship Proposal Submission Office” as your organization. If selected for a Phase II Submission, your application will need to be relinked with the correct institution. More details will be provided at that time.

**Application tip for Institutions’ candidates who have been accepted into a graduate program who cannot find their AOR:** Ask your Faculty Advisor for assistance first. If your Faculty Advisor does not know, you can contact the NSPIRES helpdesk for assistance in locating the contact information for your institution’s designated AOR.

**Step 2**
1. The Faculty Advisor MUST initiate the proposal in NSPIRES for the Institution’s candidate, following these steps:
   a. Faculty Advisor logs into NSPIRES
   b. Select “Proposals” link
   c. Click “Create Proposal” button on right side
      1) Select “Solicitation” and click “Continue”
      2) Select “NASA Fellowship Activity” and click “Continue”
      3) Create “Proposal Title” (Note: The title must be entered at this point, and only the Faculty Advisor should edit the proposal title), and click “Continue”
      4) Link the proposal to the submitting organization, and click “Continue”
      5) The system will display “Submitting Organization Information” for verification. Click “Continue”
      6) Click “Save”
   d. On “View Proposal” page (the Faculty Advisor is identified as the PI for the proposal)
      1) Select “Business Data” link in “Proposal Cover Page”
      2) Click “Edit” to complete information in each field and click “Save”
      3) Click “OK”
      4) On “View Proposal” page, select “Proposal Team” link
         a) Click “Add Team Member”
         b) Enter Institution’s candidate’s name and click “Search” for the Member (Institution’s candidate) – system will display search results.
         c) Select the correct Institution’s candidate and click “Continue”
         d) On “Team Member” page, Assign Role/Privileges
         e) Select “Graduate/Undergraduate Role” from the pull-down menu
         f) Grant Institution’s candidate “Edit” privileges by selecting:
            • “Proposal Summary”
            • “Program Specific Data”
            • “Proposal Attachments”
   2. Select “No” to the two questions that follow the section entitled “U.S. Government Agency & International Participation”
   3. Click “Save”
   4. Click “OK”
   5. Faculty Advisor MUST Logout of NSPIRES
Step 3a

1. NOTE: This step is ONLY for candidates that do not have a PI or AOR associated with the academic institution for your Phase I submission
2. Institution’s candidate logs into NSPIRES. If this section applies to the candidate, follow these steps:
3. Under “NSPIRES Options,” click “Account Management”
5. To add an affiliation, click “Add Affiliation”
6. In the search box, type “NASA Fellowship Proposal Submission Office,” then click Submit
7. Follow steps to adding the affiliation
8. Before the candidate can submit the proposal, the candidate will receive an email from NSPIRES confirming the affiliation request
9. Once email is received then the candidate can move to Step 3b

Step 3b

1. Institution’s candidate logs into NSPIRES. At initial log on, the Institution’s candidate must follow these steps:
   a. Under “Reminders/Notifications,” click “Need Graduate/Undergraduate”
   b. Institution’s candidate Confirmation for Proposal: [proposal title] for Solicitation NASA Fellowship Activity Fellowships” link
   c. On “Team Member: Participation Confirmation” page, Institution’s candidate should read and click “Continue”
   d. On “Team Member Profile” page, click “Link Relationship”
   e. On “Team Member: Organizational Relationship” page, go to “Link Proposal to a Non-SAM Organization” and enter your institution name, click button, and click “Save”
   f. On “Team Member Profile” page, verify information and click “Continue,” which will take you to “View Proposal” page. On “View Proposal” page:
      1) Select “Proposal Summary” link
         a) Select “Edit”
         b) Type or cut and paste the proposal summary into the “Proposal Summary” text box
         c) Click “Save,” and click “OK”
      2) Select “Program Specific Data” link (Note: Required for the proposal to be considered.)
         a) Select “Edit”
         b) Respond to the 49 questions listed
c) Click “Confirm” at the end of the questions, and click “OK”

3) Proposal Attachments
   a) Click “Add”
   b) Select “Proposal Document” as “Attachment Type” from the drop-down list
   c) Browse and select your proposal document (see Note 1)
   d) Click “Upload” and click “OK”

4) Institution’s candidate MUST Logout of NSPIRES

**Note 1:** All required proposal elements that are not part of the NSPIRES cover page must be combined into a single pdf document and uploaded on NSPIRES for submission. The document must include:

<table>
<thead>
<tr>
<th>Components</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Impact Statement</td>
<td>2 pages</td>
</tr>
<tr>
<td>• Faculty Advisor/PI Curriculum Vitae (CV)</td>
<td>3 pages</td>
</tr>
<tr>
<td>• Project Description</td>
<td>6 pages</td>
</tr>
<tr>
<td>• Degree Program Schedule</td>
<td>2 pages</td>
</tr>
<tr>
<td>• Candidate’s Curriculum Vitae (CV)</td>
<td>2 pages</td>
</tr>
<tr>
<td>• Personal Statement</td>
<td>2 pages</td>
</tr>
<tr>
<td>• Transcripts</td>
<td>N/A</td>
</tr>
<tr>
<td>• Letters of Recommendation (3)</td>
<td>N/A</td>
</tr>
<tr>
<td>• Letter of Support – NASA</td>
<td>1 page</td>
</tr>
</tbody>
</table>

**NOTE:** In “Complete Proposal” section, the “Generate” button enables you to review your proposal in the draft prior to submission. However, this option is independent of the submission process. If the proposal fails to generate, you should still proceed with your submission.

**Step 4**

1. Institution’s candidate MUST now coordinate with his or her Faculty Advisor to RELEASE the full proposal to the organization.
   a. The Faculty Advisor logs into NSPIRES
   b. Select “Proposals” link
   c. On “Current Proposals/NOIs” page:
      a) Select the “Proposal Title” to be released
      b) On “View Proposal” page
      c) Click “Release to Org” button
      d) Click “Release”
      e) Click “OK” [If the Faculty Advisor has additional Fellowship proposals to release, repeat process.]
      f) If the Faculty Advisor has no additional Fellowship proposals to release, logout of NSPIRES.
2. The Faculty Advisor MUST now coordinate with the Authorized Organizational Representative (AOR), who will SUBMIT the full proposal through NSPIRES. The Faculty Advisor will know that the proposal has been successfully submitted when he/she receives an E-mail from NSPIRES stating that it has been submitted and includes a proposal number.

For assistance, you may contact the NSPIRES Help Desk:
Phone: (202) 479-9376 or
E-mail: nspires-help@nasaprs.com The Help Desk is staffed Monday through Friday (except for federal holidays) from 8:00 AM to 6:00 PM ET.
Appendix E: NASA Fellowship Opportunities by Center
Updated 03/12/2019

-----------------------------------------------Ames Research Center (ARC)-----------------------------------------------
If you have questions about any of the following opportunities at Ames Research Center, please contact Vandhana Lal at vandhana.lal@nasa.gov or 650-604-4709.

-----------------------------------------------Glenn Research Center (GRC)-----------------------------------------------
If you have questions about any of the following opportunities at Glenn Research Center, please contact Mark D. Kankam Ph.D. at Mark.D.Kankam@nasa.gov or 216-433-6143.

-----------------------------------------------Goddard Space Flight Center (GSFC)-----------------------------------------------
If you have questions about any of the following opportunities at Goddard Space Flight Center, please contact Raquel Marshall at Raquel.H.Marshall@nasa.gov or 301-286-1976.

-----------------------------------------------Johnson Space Center (JSC)-----------------------------------------------
If you have any questions about the following opportunities at Johnson Space Center, please contact Veronica Seyl at veronica.l.seyl@nasa.gov or 281.483.5110.

-----------------------------------------------Langley Research Center (LaRC)-----------------------------------------------
If you have questions about any of the following opportunities at Langley Research Center, please contact Kimberly Brush at kimberly.m.brush@nasa.gov or 757.864.6454.
<table>
<thead>
<tr>
<th>NASA Center Code</th>
<th>Opportunity Title</th>
<th>Opportunity Description/Objective (Specific student assigned)</th>
<th>Desired Student Academic Level</th>
<th>Technical Advisor</th>
<th>Technical Advisor's Email and Phone Number</th>
<th>Co-Technical Advisor</th>
<th>Co-Technical Advisor's Email and Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC-001 SMD</td>
<td>Biomaterial Fabrication and Testing</td>
<td>Soliciting independently conceived research projects in the area of design, fabrication, and engineering of biogenic or partially (hybrid) biogenic materials. The primary focus of this research topic is materials which incorporate living cells or in situ biological production, rather than tissue engineering or production of raw feedstock for post-processing (e.g., bioplastics). The goals of interest are novel structural materials, self-diagnosing or self-healing materials, and reactive/tunable materials; however, proposals may focus primarily on design/fabrication technique development within this context. Examples of current areas of research include using 3D cell printing to enable microscale control of material production, fabrication of tunable biocompatible substrates, and using protein design to enhance protein/substrate interactivity.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Diana Gentry</td>
<td><a href="mailto:diana.gentry@nasa.gov">diana.gentry@nasa.gov</a> 650-004-5441</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARC-002 STMD</td>
<td>Circuit and system design for self-healing electronics</td>
<td>The radiation-induced failure in electronics aboard a satellite and spacecraft can lead not only to mission failure but also to the debrief plan. In order to mitigate such risks, self-sustaining and self-healing electronics system have been proposed, conceptually similar to the human immune system. In this project, the candidate would design ASIC circuit, which would monitor the aging/degradation activity and time self-heal any radiation-induced damage appropriately, with no increase in size or footprint and negligible increase in weight. The proposed technology can benefit other spacecraft electronics programs including larger class of satellites. The component should include integrated heater, temperature monitor, device aging monitor, healing controller. The successful candidate may offer not only the ground test but also a flight test.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Jin-Woo Han</td>
<td><a href="mailto:jin-woo.chung@nasa.gov">jin-woo.chung@nasa.gov</a> 650-004-3965</td>
<td>M. Meyyappan</td>
<td><a href="mailto:m.meyyappan@nasa.gov">m.meyyappan@nasa.gov</a> 650-004-2616</td>
</tr>
<tr>
<td>ARC-003 SMD, NMD, STMD</td>
<td>Development of an automated decision support system for space missions operating in harsh and uncertain environments</td>
<td>Future NASA space exploration missions, both manned and unmanned, will often operate in harsh, dangerous, and uncertain environments. Adding to the challenges, communication delays may make it difficult to rely on Earth-based controllers and engineering analysis teams for operational support. System Health Enabled Real-time Planning Advisor (SHERPA) is an automated decision support system being developed to provide optimized real-time action recommendations for such missions. SHERPA is adaptable to different mission types and use cases within missions (such as planetary rover traverse planning or under science activity sequencing). It is based on the latest methods in the field of decision making under uncertainty, in particular making use of advanced solvers for partially observable Markov decision processes. Under the proposed research opportunity, students will extend SHERPA's current capabilities. Examples of specific projects include (but not limited to): (1) development of additional use cases (such as mission design optimization, vehicle design optimization, or landing site selection), (2) development of methods for automated result explanation, (3) development of methods for real-time model learning and/or refinement; (4) development of multi-agent and decentralized solution approaches. Students attending academic institutions in the San Francisco Bay Area are preferred. US citizens or permanent residents only.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Edward Dalhaban</td>
<td><a href="mailto:edward.dalhaban@nasa.gov">edward.dalhaban@nasa.gov</a> 650-004-5655</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASA Center Code</td>
<td>Opportunity Title</td>
<td>Opportunity Description/Objectives (Specific student assigned)</td>
<td>Desired Student Academic Level</td>
<td>Technical Advisor</td>
<td>Technical Advisor's Email and Phone Number</td>
<td>Co-Technical Advisor</td>
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<td>ARC-006 STMD</td>
<td>Injettable, printable, organic infrared photosensor</td>
<td>This project aims to advance a printable shortwave infrared photosensor by using a new generation of narrow bandgap conjugated polymers. The polymer semiconductors are processed by solution processing techniques and allow printing deposition to bypass the limitations of die transfer and bonding in conventional devices, which are not scalable and prohibitively expensive for wide-area deployment. The proposed research will involve fabrication of photosensors and device characterization to identify the fundamental constraints in the electron dissociation and charge collection processes as polymer bandgaps are reduced. The resulting knowledge will be essential to theoretical efforts to rapidly predict better photovoltaic polymers and is applicable not only to infrared sensing applications but also to other areas including photovoltaics, with the advantages of lightweight, large-area coverage, and on-demand fabrication for space applications. If successful, the proposed research will provide understandings of the fundamental properties necessary to pioneer the utility of organic into the shortwave infrared spectrum now completely dominated by inorganic materials.</td>
<td>Pursuing Ph.D. Jin-Woo Han</td>
<td><a href="mailto:m.meyyappan@nasa.gov">m.meyyappan@nasa.gov</a></td>
<td>650-604-3985</td>
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<td>650-604-2516</td>
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<td>ARC-005 SMD</td>
<td>Fog/Cloud Water Aerobiological Investigations</td>
<td>Soliciting independently conceived research proposals in the topical area of the microbiology of fog water, cloud water, aerosols and the atmosphere. Student focus may be direct biological study (e.g., population identification), the relevant environment (e.g., biochemical energy availability, origin tracking by dust mineral identification), or supporting instrumentation (e.g., low-cost sterile sample collection), but proposals are encouraged to address all three sub-areas. Proposals should include at least some planned work with samples collected from above ground level (~10 m). Current areas of active research include coastal California fog population identification, testing sample collection from UAVs, and balloon flights exploring the effects of high-altitude radiation on microbial survival.</td>
<td>Pursuing Ph.D. Diana Gentry</td>
<td><a href="mailto:diana.gentry@nasa.gov">diana.gentry@nasa.gov</a></td>
<td>650-604-541</td>
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<td>ARC-004 SMD</td>
<td>Experimental and Directed Evolution: Top-Down Astrobiology and Bioengineering</td>
<td>Soliciting independently conceived research proposals using experimental and/or directed evolution to address questions in astrobiology, space biology, or related ecology-environment interactivity areas. Potential goals include identifying mechanisms of surviving or thriving in extreme environments, improving performance of bio-assisted resource extraction or recycling, and automating the simulation and measurement of microbe/microenvironment interactions. Student areas of focus may be traditional micro- and molecular biology or traditional mechanical/electrical/chemical engineering, but preference will be given to proposals incorporating background or experience in both. Current areas of active research include baseline bioassay experiments (microbial survival assays, sequencing), development of automated culture and exposure systems (sensor selection, fluids fabrication, software control, experimental interface design), and design and implementation of biogeochemical experiments (UV irradiation, thermal stress, heat shock, freeze/thaw cycles, peroxide/pH exposure).</td>
<td>Pursuing Master's/Ph.D. Diana Gentry</td>
<td><a href="mailto:diana.gentry@nasa.gov">diana.gentry@nasa.gov</a></td>
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<td>ARC-007</td>
<td>HEDMD</td>
<td>Multimaterial InSpace Design and Manufacturing</td>
<td>The long lead times and costs associated with resupply in human exploration missions creates a powerful incentive for InSpace Manufacturing (ISM). NASA-funded research has demonstrated in-space fabrication of more than 20 different designs, using a single material: Acrylonitrile butadiene styrene (ABS). The proposed research opportunity will expand on this compelling work by developing Additive Manufacturing tools (3D printers) with multi-material, electromechanical fabrication capabilities that will enable complete, working, assembly-free electromechanical devices to be directly fabricated in a 3D printer. Additionally, this work will support the development of new software tools that will aid or automate the mechanical design of multi-material 3D models. This research will benefit human spaceflight missions by enabling users who are not 3D-printing subject matter experts to quickly specify designs for electromechanical parts and fabricate them in situ. The specific anticipated tasks include, but are not limited to: 1) Design and fabrication of a multimaterial additive manufacturing platform capable of simulating deposition of a wide variety of materials, including plastics, liquids, pastes, solid objects, etc. 2) Design and synthesis of the materials for this multi-material 3D printer, including high performance solid and flexible materials, conductors, semiconductors, electromechanical transducers, etc. 3) Creation of design automation tools that accelerate the development of design files for multi-material 3D printers. These tools should allow non-experts to provide loose “desirements” to the software, and the software will guide the user toward an actual design that solves their problem, including designs that conform to the capabilities of the 3D printer that will be used to fabricate the design.</td>
<td>Pursuing Ph.D.</td>
<td>Daniel Cellucci</td>
<td><a href="mailto:daniel.w.cellucci@nasa.gov">daniel.w.cellucci@nasa.gov</a></td>
<td>Alex Matthew</td>
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<td>ARC-008</td>
<td>STMD</td>
<td>Nanoelectronics, Printed Electronics and Sensors: Fabrication, Testing, and Device Physics</td>
<td>Our group has been conducting research in the areas of vacuum electronics, nanoelectronics, and printed electronics including chem/bio/radiation sensors, energy scavenging and storage devices, and others. The efforts include fabrication and testing of devices, device physics and design, and modeling to meet the needs of high performance, low power, and lightweight devices. Vacuum electronics deals with making vacuum tubes nanoscale using entirely IC manufacturing techniques. Electron transport is the fastest in vacuum compared to semiconductors, and vacuum devices are radiation immune. These are ideal for future space missions. Our current nanoelectronics work includes self-healing electronics, neuromorphic devices and quantum devices. Printed electronics activity is focused on device fabrication on flexible substrates towards meeting the goals of InSpace Manufacturing, seeking printing various components on demand. PhD candidates in the areas of electrical engineering, physics, material science, chemistry, mechanical engineering and chemical engineering would be ideal to work on various aspects of the above ongoing projects.</td>
<td>Pursuing Ph.D.</td>
<td>Meryah Meyyappan</td>
<td><a href="mailto:m.meyyappan@nasa.gov">m.meyyappan@nasa.gov</a></td>
<td>Jinwoo Han</td>
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<td>ARC-000</td>
<td>HEO-SES</td>
<td>NASA Ames SIFERS/Astrobot Facility</td>
<td>The NASA Ames SIFERS/Astrobot Facility supports Assistive-Free-Flyer (AFF) technology to enhance the capabilities and performance of small, free-flying robots that assist humans. AFF’s can complement astronauts in space by performing tasks that are tedious, highly repetitive, dangerous, or long-duration. AFF’s can also provide side-by-side assistance to astronauts by carrying tools/materials, providing procedure support, etc. AFF’s can potentially be applied to a wide variety of tasks including in-flight maintenance, spacecraft health-management, environmental monitoring surveys (air quality, radiation, lightning, sound levels, etc.), and automated logistics management (inventory, inspection, etc.). AFF’s can also be used when humans are present to offload routine work, to increase human productivity, and to handle contingencies. AFF’s can also be used when humans are not present such as during “pre-deployment” and “quarantine” periods, to perform spacecraft caretaking. In particular, AFF’s could be used to enable mobile monitoring, maintenance, and repair of spacecraft before, and between, crews. The objective of a successful proposal would be to develop technology (hardware or software) that can be integrated as payloads on assistive-free-fliers (AFF). A key characteristic of AFF’s is that they can perform assistive tasks while co-located in human environments. On the International Space Station (ISS), for example, the SIFERS robot has shown how AFF’s can perform environment surveys, inspection, and crew support. During 2023-2028, NASA will develop a new AFF as part of the Human Exploration Robot (HER) project. This new robot will carry out inventory, sound monitoring, and other routine tasks on the ISS. Proposals are sought to create AFF payloads that can be integrated for application-specific functions, or that can provide general capability enhancements in several areas.</td>
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<td>Senor Payloads - Compact sensors that can be used for environment monitoring, including detection of combustibles, air quality (CO2 levels), illumination (light spectrum), radiation, etc.</td>
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<td>Openings - Mechanisms that can be used for docking/sealing, probing/pushing, etc. This includes deployable structures and universal end-effectors (e.g., Jamming grapple arm).</td>
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<td>Algorithms - GNC software that can improve performance and robustness to unknown conditions. This can include on-the-fly path planning or optimization in response to changing environmental conditions.</td>
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<td>ARC010</td>
<td>SMD</td>
<td>Observations and data analysis of transiting planets with the James Webb Space Telescope</td>
<td>Planets that transit their host stars are amenable to characterization of their atmospheres via transmission or emission spectroscopy. Observations with the James Webb Space Telescope (JWST) will be able to determine the temperatures, compositions, chemical abundances, and cloud properties of exoplanets with much better precision than ones characterized to date with the Hubble and Spitzer Space Telescopes. We are seeking a researcher to reduce and analyze JWST guaranteed time observations of the infrared spectra of several warm transiting exoplanets that mostly have masses between Neptune and Jupiter.</td>
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<td>Pursuing Ph.D. Tom Greene</td>
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<td>ARC011</td>
<td>STMD</td>
<td>Rad-Hard neuromorphic device and circuit</td>
<td>Ultra-low power neuromorphic device and circuit using emerging device element such as memristor is called. The device models for 'neuron' and 'synapse' can operate ultra low voltage result in small computation energy in space application. Complementing with charge-based devices like CMOS, for large-scale networks of emerging devices can be suitable for different applications like, analog-data-sensing, dataconversion, cognitive-computing, associative memory, programmable-logic, and neuromorphic computing. The proposed device and design would achieve 1,900x lower computation energy for these applications as compared to CMOS-only design. However, in order to infuse the technology into space, the rad-hard tolerance should be considered. In this opportunity, the inherently radiation tolerant emerging device and the design are solicited.</td>
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<td>Pursuing Ph.D. Jin-Woo Han</td>
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<td>ARC012</td>
<td>SMD</td>
<td>Studying protostars and brown dwarfs with the James Webb Space Telescope</td>
<td>JWST observations will determine or constrain the temperatures, surface gravities, compositions, and chemical abundances of the most embedded protostars and the coldest, least-massive brown dwarfs that have ever been observed. We are seeking a student researcher to participate in the reduction, information retrieval, and analysis of JWST observations of the infrared spectra of several protostars and brown dwarfs. Experience in data reduction and analysis of stellar, brown dwarf, protostellar, or other similar infrared spectra would be beneficial. This should include experience in applying statistical Bayesian analysis techniques to astronomical spectra. The successful candidate will be able to produce results quickly and efficiently and will be able to work effectively in a modest-sized team that is distributed in the US and Europe. There will be opportunities for independent research in addition to working as part of a well-organized GTO team or scientific experts.</td>
<td>Pursuing Ph.D.</td>
<td>Thomas Greene</td>
<td><a href="mailto:tjrn.greene@nasa.gov">tjrn.greene@nasa.gov</a></td>
<td>Mark Marley</td>
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<td>NASA Center</td>
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<td>GRC-001</td>
<td>ARMD</td>
<td>Airframe and Engine Icing Physics</td>
<td>Airframe and engine icing research at NASA is supported under Aeronautics Research Mission Directorate (ARMD) programs. A key goal for both airframe and engine icing is to develop improved computational and experimental simulation tools for civil transport airplane airframes and engines operating in atmospheric icing including freezing drizzle, freezing rain, mixed-phase conditions and ice-crystal icing. The objective of this research is to develop improved models for the multiphase, multiscale physical phenomena associated with surface water transport; ice-roughness heat transfer; two-way air and water coupling; ice erosion; ice adhesion and shedding that occur during ice build-up. Experimental and computational studies are needed to further elucidate these complex phenomena and contribute to the current modeling efforts.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Andy Broeren</td>
<td><a href="mailto:astroenn@nasa.gov">astroenn@nasa.gov</a></td>
<td>Mark Potapozuk</td>
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<td>GRC-002</td>
<td>ARMD/STMD</td>
<td>Artificial Intelligence Aerospace System Design Tool</td>
<td>PeTal (Periodic Table of Life) is an open source artificial intelligence (AI) design tool to enable researchers to design novel systems by leveraging data from nature and technology. We are looking for data science proposals to enhance the core capabilities of the software including an ontology, unstructured database, topic modeling and computer vision. The focus of computer vision is to identify pattern/function/structure-function relationships by leveraging digitized (CT-scans, images) collections.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Dr. Vikram Shyam</td>
<td><a href="mailto:vikram.shyam@nasa.gov">vikram.shyam@nasa.gov</a></td>
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<td>GRC-003</td>
<td>ARMD/STMD</td>
<td>Controls and Instrumentation of Solid-State Shape Memory Alloy Actuators</td>
<td>Shape memory alloys (SMAs) offer a practical potential for actuator applications with high-energy capability in a wide range of temperatures. However, the high energy density is often overshadowed by the slow actuation rates associated with thermally activated SMAs. This is particularly critical for large actuators such as torque tubes or large beams. The goal of this fellowship is to design an SMA control law with instrumentation to advance the state-of-the-art SMA controls. The objectives are two-fold: (1) develop a control law with multiple schedules (e.g., Bang Bang, PID, PID2) to assess SMA actuation without overshoots/undershoots. Such control scheme can be applied to most SMA platforms and sizes, be tied to a material response to accommodate stress-temperature shift as typically observed in SMAs; and accomplish an actuation time of seconds and not minutes. (2) Develop an instrumentation package for use with a variety of SMA systems comprised of sensors (angle, displacement, thermocouples, load/torque, strain gauges...), wire management systems, and data acquisition systems. Each sub-system can be a standalone and modular. Finally, the control architecture and the instrumentation needs to be compact and power lean to be integrated and used in energy scarce aircraft platform models.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Othmane Benahm</td>
<td><a href="mailto:otmane.benahn@nasa.gov">otmane.benahn@nasa.gov</a></td>
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<td>NASA Center</td>
<td>STMD</td>
<td>Microgravity and Biomedical Technologies</td>
<td>Opportunity Description/Objective (specific student assigned)</td>
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<td>GRC-004</td>
<td>Microgravity and Biomedical Technologies</td>
<td>This opportunity pertains to Microgravity environment investigations to conduct fundamental research and to develop technologies enabling human space exploration in the areas of combustion science, fluid physics, biological and medical systems research. NASA Glenn Research Center has a world-class and unique suite of ground-based microgravity research facilities that include: a 1.2-second drop tower, a 5-second zero-gravity facility, access to reduced-gravity aircraft and a vibration isolated zero-gravity locomotion simulator. These facilities are utilized for: 1) developing longer-duration space flight experiments to be conducted on the International Space Station, and 2) conducting ground-based research. Research investigations are in the specific areas of fluid physics, combustion science, spacecraft fire safety, advanced life support systems, and space physiology. Research is conducted to develop compact, robust, multi-function biomedical sensors to monitor astronaut health and reduce levels of risk in NASA's exploration missions. Well-equipped state-of-the-art laboratories are used to develop new diagnostic techniques/instruments especially suited for use in space and microgravity environments. Computational modeling is used to research the effects of space environment on human physiology and to predict astronaut performance capabilities and medical needs. The investigations provide new knowledge that is used to improve processes and equipment (energy, environment, manufacturing, countermeasures and medical) used for the exploration of space both robotically and by long-duration manned missions.</td>
<td>Pursuing Masters/Ph.D</td>
<td>John D. McQuillen</td>
<td><a href="mailto:john.d.mcquillen@nasa.gov">john.d.mcquillen@nasa.gov</a></td>
<td>Beth Lewandowski</td>
<td><a href="mailto:beth.e.lewandowski@nasa.gov">beth.e.lewandowski@nasa.gov</a></td>
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<td>GRC-005</td>
<td>ARMD</td>
<td>Multifunctional Thermal Management Systems for Aerospace</td>
<td>Sought after are research proposals that involve innovative use of lightweight thermal management systems for aerospace. Proposals that involve machine learning and data mining to assist with topology optimization, topology identification and structure optimization for additive manufacturing are also welcome. Emphasis is on unique methods or ideas. We are also looking for ways to generate large volumes of data to train machine learning algorithms that can help in system design.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Dr. Vivek Shyam</td>
<td><a href="mailto:vikram.shyam-1@nasa.gov">vikram.shyam-1@nasa.gov</a></td>
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<td>GRC-006</td>
<td>ARMD</td>
<td>Simulation of High-Speed Internal Shock Wave / Boundary-Layer Interactions</td>
<td>The research opportunity seeks to improve the computational simulation of high-speed, turbulent internal flows with shock wave / boundary-layer interactions involving both oblique and normal shock waves. Applications of interest include inlets for Mach 2.5 to 5.0 freestream that accommodate internal flow to subsonic conditions for a turbine engine or decelerate flow to low supersonic conditions through an isolator. The simulation of the unsteady features of such flow may be critical. A primary objective of such simulations would be the calculation of performance metrics (total pressure recovery, kinetic energy efficiency, distortion) of the flow at the exit of the inlet/isolator. As part of the simulations, it would be beneficial to quantify the levels of uncertainties of the computed performance metrics so as to provide quality estimates for experimental and flight conditions. The computational methods of interest include Reynolds-averaged Navier-Stokes (RANS), but large-eddy simulation (LES) and hybrid RANS/LES methods are preferred due to their potential increased accuracy and predictive superiority.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Dr. John W Skrater</td>
<td><a href="mailto:John.W.Skrater@nasa.gov">John.W.Skrater@nasa.gov</a></td>
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<td>NASA Center</td>
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<td>GRC 007</td>
<td>ARMMD</td>
<td>Stress Characterization of Multilayer Thin Films on Silicon Carbide Semiconductor</td>
<td>NASA exploratory science missions to small and giant bodies that are characterized by their extreme environments (high temperature, extreme cold, high radiation, and extreme chemical media). Semiconductor electronic and sensing devices that are developed for these environments must maintain a high degree of robustness and reliability in order to collect and transmit critical data accurately and uncorrupted. A key enabling requirement for stable device operation is the thin film metallization that functions to allow stable electrical voltage and current conduction into and out of these devices. Typically, the failures in the metallization are manifested in the form of device output instability and unreliable measurement. Among the primary causes of the failure is the residual stresses in the thin film metallization that can be observed as tensile or compressive stress driven delamination, cracks, or tears. This problem becomes even more severe at the extremities of temperatures where these devices are meant to operate. As the operating temperature of these devices were extended beyond the capability of conventional semiconductors such as silicon, the use of semiconductor silicon carbide (SiC) becomes imperative. This is due to its superior thermomechanical and electrical properties over that of silicon at temperatures beyond 300 C. The characterization of thin film metallization on SiC is required in order to develop multilayer films that are optimally stress-free. This is with the goal of implementing SiC sensors and electronics that would operate reliably in the above mentioned extreme environments.</td>
<td>Pursuing Master’s</td>
<td>Robert J. Okoje</td>
<td><a href="mailto:Robert.J.Okoje@nasa.gov">Robert.J.Okoje@nasa.gov</a></td>
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<td>GSFC-001</td>
<td>Low-resource particle telescope for measurements of incident vectors of relativistic electrons in space</td>
<td>Understanding the physics of space plasmas in near-Earth space is crucial to protecting Earth's space-borne assets, including human activity. Perhaps more importantly, Earth's radiation belts provide a window to the unknown physics of space plasmas right in Earth's backyard. However, measuring the incident direction of entering particles is challenging, and currently requires either multiple instrument heads and/or a spinning platform. The community is in desperate need for a single telescope head that can measure incident direction with good resolution, particularly for relativistic electrons. Additionally, with the increasing role of small spacecraft, a miniaturized telescope that can be accommodated by CubeSat is desired. This research opportunity requires the maturation of a miniaturized telescope design that can determine both the incident energy and angle of relativistic electrons. The successful candidate should be proficient with particle-matter interaction modeling software, such as GEANT4, have a strong understanding of both aerospace engineering and space plasma physics, and be familiar with the balance between scientific return and engineering limitations.</td>
<td>Pursuing Ph.D</td>
<td>Quintin Schiller</td>
<td><a href="mailto:quintin.schiller@nasa.gov">quintin.schiller@nasa.gov</a></td>
<td><a href="mailto:lauren.w.blum@nasa.gov">lauren.w.blum@nasa.gov</a></td>
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<td>GSFC-002</td>
<td>Astrophysics</td>
<td>The Astrophysics Science Division at NASA Goddard Space Flight Center conducts a broad program of research in astronomy, astrophysics, and fundamental physics. Individual investigations address issues such as the nature of dark matter and dark energy, which planets outside our solar system may harbor life, and the nature of space, time, and matter at the edges of black holes. Observing photons, particles, and gravitational waves enables researchers to probe astrophysical objects and processes. Researchers develop theoretical models, design experiments and hardware to test theories, interpret and evaluate the data, archive and disseminate the data, provide expert user support to the scientific community, and publish conclusions drawn from research. Applicant should work with their campus PI to identify a specific research area and NASA GSFC scientist of interest from <a href="https://science.gsfc.nasa.gov">https://science.gsfc.nasa.gov</a> (for general questions email: <a href="mailto:gsfc-education@mail.nasa.gov">gsfc-education@mail.nasa.gov</a>)</td>
<td>Pursuing Masters/Ph.D</td>
<td>Dr. Blanche Meeson</td>
<td><a href="mailto:blanche.w.meeson@nasa.gov">blanche.w.meeson@nasa.gov</a></td>
<td><a href="mailto:raquel.h.marrin@nasa.gov">raquel.h.marrin@nasa.gov</a></td>
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<td>GSFC-003</td>
<td>Computational and Information Sciences and Technology</td>
<td>The Computational and Information Sciences and Technology Office (CISTO) at NASA Goddard Space Flight Center provides applied information system research and services to support the research programs of the Science and Exploration Directorate (SED). The office provides high performance computing and networking, mass storage and information systems technologies, computational science expertise, software engineering and performance optimization services, information technology (IT) security services, scientific visualization services, and research in information science and technology. Applicant should work with their campus PI to identify a specific research area and NASA GSFC scientist of interest from <a href="https://science.gsfc.nasa.gov">https://science.gsfc.nasa.gov</a> (for general questions email: <a href="mailto:gsfc-education@mail.nasa.gov">gsfc-education@mail.nasa.gov</a>)</td>
<td>Pursuing Masters/Ph.D</td>
<td>Dr. Blanche Meeson</td>
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<td>GSCF-004</td>
<td>SMD</td>
<td>Earth Science</td>
<td>The Earth Sciences Division at NASA Goddard Space Flight Center plans, organizes, evaluates, and implements a broad program of research on our planet’s natural systems and processes. Major focus areas include climate change, severe weather, the atmosphere, the oceans, sea ice and glaciers, and the land surface. To study the planet from the unique perspective of space, the Earth Science Division develops and operates remote-sensing satellites and instruments. We analyze observational data from these spacecraft and make it available to the world’s scientists. Applicant should work with their campus PI to identify a specific research area and NASA GSFC scientist of interest from <a href="https://science.gsfc.nasa.gov">https://science.gsfc.nasa.gov</a> (for general questions email: <a href="mailto:gsfc-education@mail.nasa.gov">gsfc-education@mail.nasa.gov</a>)</td>
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<td>GSCF-005</td>
<td>SMD</td>
<td>Heliophysics</td>
<td>The Heliophysics Science Division at NASA Goddard Space Flight Center conducts research on the Sun, its extended solar-system environment (the heliosphere), and interactions of Earth, other planets, small bodies, and interstellar gas with the heliosphere. Division research also encompasses geospace – Earth’s uppermost atmosphere, the ionosphere, and the magnetosphere – and the changing environmental conditions throughout the coupled heliosphere (solar system weather). Scientists in the Heliophysics Science Division develop models, spacecraft missions and instruments, and systems to manage and disseminate heliophysical data. They interpret and evaluate data gathered from instruments, draw comparisons with computer simulations and theoretical models, and publish the results. Applicant should work with their campus PI to identify a specific research area and NASA GSFC scientist of interest from <a href="https://science.gsfc.nasa.gov">https://science.gsfc.nasa.gov</a> (for general questions email: <a href="mailto:gsfc-education@mail.nasa.gov">gsfc-education@mail.nasa.gov</a>)</td>
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<td>GSCF-006</td>
<td>SMD</td>
<td>Solar System</td>
<td>The Solar System Exploration Division at NASA Goddard Space Flight Center conducts theoretical and experimental research to explore the solar system and understand the formation and evolution of planetary systems. Laboratories within the Division investigate areas as diverse as astrochemistry, planetary atmospheres, geochemistry, geophysics, geodynamics, space geodesy, extrasolar planetary systems, and comparative planetary studies. To study how planetary systems form and evolve, Division scientists develop theoretical models as well as the investigations and space instruments to test them. The researchers participate in missions; collect, interpret, and evaluate measurements; and publish conclusions based on this research. The Division archives and disseminates the data, and provides expert user support. Applicant should work with their campus PI to identify a specific research area and NASA GSFC scientist of interest from <a href="https://science.gsfc.nasa.gov">https://science.gsfc.nasa.gov</a> (for general questions email: <a href="mailto:gsfc-education@mail.nasa.gov">gsfc-education@mail.nasa.gov</a>)</td>
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<td>GSFC-007</td>
<td>SMD</td>
<td>Understanding radiation belt dynamics via multi-point observations</td>
<td>Earth's radiation belts, two toroidal-shaped regions of trapped high energy electrons and ions, are a highly dynamic region of the magnetosphere, with often-unpredictable variations in intensity and spatial range. Radiation belt studies have implications for both operational space weather-driven needs as well as understanding fundamental plasma physics principles at work. To disentangle the spatial and temporal variations of the high energy electron population in the outer radiation belt, multi-point measurements are critical. There currently exists an extensive network of spacecraft measuring energetic particles from a variety of orbits, including GPS satellites, NASA's Van Allen Probes, NOAA's POES constellation, and a growing number of CubeSat missions. In this project, we aim to combine measurements from these platforms to better understand and quantify the rapid spatial and temporal variability of Earth's outer radiation belt.</td>
<td>Masters/Ph.D.</td>
<td>Dr. Lauren Blum</td>
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<td>JSC-001</td>
<td>STMD</td>
<td>3D Printing Space Hardware using Thermoset Resins</td>
<td>New materials and cost-effective manufacturing techniques are needed for future spacecraft and spacecrafts to support NASA's Exploration goals. Highly filled thermoset resin mixtures are a class of materials that can be used to produce thermal protection for spacecraft or other spacecraft components. The objective of this research is to investigate and select several thermoset resin mixtures for selected applications and to demonstrate the capability to 3D print and cure these parts. The tasks associated with this effort would include: 1) Based upon application requirements, investigate the thermoset resin and filler options; 2) Investigate additives to aid in printing the mixtures and controlling material properties such as thermal expansion and modulus; 3) Design, fabricate and demonstrate system to extrude the selected mixtures; 4) Design systems to feed and mix the raw materials upstream of the extruder; 5) Investigate options for curing the materials after deposited.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Stan Boulog</td>
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<td>Emily Hacopian</td>
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<tr>
<td>JSC-002</td>
<td>STMD</td>
<td>Feature Recognition on Autonomous Rendezvous &amp; Docking</td>
<td>A challenge of performing an autonomous rendezvous and docking with a known body is to reliably and automatically select and identify known features in the presence of uncertain and varying lighting conditions. The harsh lighting environment in space presents challenges not faced in applications on Earth where lighting is more benign. These challenges are accentuated by the stringent CPU loading requirements associated with limited on-orbit processing capability. This research will greatly benefit future crewed and uncrewed exploration missions where rendezvous is an essential element for success. In particular, this research will focus on (1) developing algorithms selecting and identifying features on target vehicles, (2) ensuring that these algorithms are either insensitive to or account for uncertain and varying lighting conditions and (3) have a small enough computational footprint to make an implementation on a flight processor feasible.</td>
<td>Pursuing Ph.D</td>
<td>Chris O'Souza</td>
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<td>Shane Robinson</td>
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<tr>
<td>JSC-003</td>
<td>HEOMD</td>
<td>Heads-Up Display (HUD) Development for EVA</td>
<td>Future spacewalks would benefit greatly from a more robust way to display information to the crewmember. In future missions, a time delay during dynamic events (such as a spacewalk) will be much more significant. Also, crew resource loading will often not allow a member of the crew to support a spacewalk from inside the habitat. Furthermore, in preparation for Mars missions beyond what would make a two-way conversation practical, we will need to already know how to perform smoothly without ground personnel support. Training for specific EVA tasks will have a longer lead-time from when an EVA is performed. Tasks will be more generalized and unpredictable, which is the opposite of what you need for on-demand-based training. All of these needs point toward enhancing the ability for a crewmember to visually process information. Augmented reality (AR) applications have massive potential in the field of human spaceflight. The role of an astronaut involves a multitude of complex tasks. Currently astronauts utilize audio for communication with Mission Control, and a notebook-like checklist for emergency protocol. As an aid, a heads-up display (HUD) could feasibly portray information while minimizing attentional loss. This application of an AR platform as a means of information visualization could optimize cognitive efficiency, mission success, as well as crew performance, health, and safety. The research aims of interest include: 1) researching the feasibility and development of heads-up-display technology via hardware, optics, and software prototyping, and 2) testing via human systems evaluations. There is a significant need for maturation of AR hardware in parallel with further human systems integration (HSI). A HUD is comprised of the projection system, transparent display apparatus, and visual optics. However, implementing a new display system within a spacewalk introduces considerations including helmet geometry, crewmember anthropometry, soft Rf, eye relief distance, eye box size, field of view, safety design constraints, and incorporating electronics within a pure oxygen environment. There currently no commercially available technology to meet both sets of design challenges, so a concerted effort to research the proper HSD elements while discovering technology candidates necessary and will answer significant questions in the field of AR and its novel, space-related applications.</td>
<td>Pursuing Master's</td>
<td>Chris Gerty</td>
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<td>Cory Simon</td>
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<td>JSC-004</td>
<td>HECMD</td>
<td>Safe, High Power Battery Design Guidelines</td>
<td>Numerous manned spacecraft applications, along with Navy submarine applications, need multi-cell batteries in which thermal runaway (TR) in a single cell will not propagate to any other cells in the battery. Such batteries are also required to have high performance (&gt;160 Wh/kg, &gt;200 Wh/l at the battery level) with good cycle and shelf life. Developing such batteries will require investigation of new design features, such as vaporizing interstitial heat sinks between cells, short lead tubes to protect the vulnerable spin grooves area of cylindrical cells, and advanced blast shields and porous flame arrestors. Investigations must involve assembling these features into prototype batteries and testing them under a range of conditions. Investigations will also include TR calorimetry, required to quantify total heat output and fractions transferred through the cell walls vs ejected from the cell enclosure, abuse testing and CT imaging of new advanced cell designs, and destructive physical analyses to assess design and manufacturing quality.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Eric Darcy</td>
<td><a href="mailto:eric.c.darcy@nasa.gov">eric.c.darcy@nasa.gov</a></td>
<td>John K. Scott</td>
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<tr>
<td>JSC-005</td>
<td>HECMD</td>
<td>Trajectory and Transfer Design for Gateway and Lunar Surface Access</td>
<td>Recent plans by NASA to send humans missions to and around the Earth-Moon multi-body dynamical regime require new approaches to the design of optimal transfer trajectories. The work resulting from this proposed research opportunity will be vital to the success of the planned future operations in the cis-lunar environment, specifically in the application to a Near Rectilinear Halo Orbit (NRHO). This research could potentially benefit future Gateway and lunar surface missions. The proposed research opportunity will focus on trajectory design for NRHO arrival, departure, and excursion applications. This also includes investigating transfers, both high and low thrust, between cis-lunar orbits, to/from the Gateway in an NRHO, and to/from low Lunar Orbit and the Lunar surface. Orbit maintenance techniques while in quasi-stable cis-lunar orbits is also of interest.</td>
<td>Pursuing Masters</td>
<td>Jeffrey Gutowski</td>
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<td>Jerry Cordon</td>
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<td>LARC-001</td>
<td>ARMD</td>
<td>Aeronautics</td>
<td>Develop innovative, multi-disciplinary, multi-fidelity analysis and design methodologies for advanced aircraft concepts and technologies that improve the fuel efficiency and environmental impact of future aircraft. Analysis methods and design processes intelligently balance the desire for accuracy and detail with the need to quickly evaluate many different design options during conceptual design. New methods replace traditional empirical correlations of existing aircraft with more physics-based analysis, improving the validity for unconventional aircraft concepts and technologies. Example research areas currently being pursued by NASA include: hybrid-electric propulsion, structural batteries, distributed electric propulsion, dynamic aerelastic optimization, non-traditional and/or autonomous missions, hybrid wing-bodies, truss-braced wings, and design of aircraft using active control systems. Innovative ideas in other aspects of aircraft analysis and design are welcome, as well.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Erik Olson</td>
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<tr>
<td>LARC-002</td>
<td>SMD</td>
<td>Aerosol-Cloud</td>
<td>The NASA Langley Aerosol Research Group (LARGE; <a href="https://science.larc.nasa.gov/large/">https://science.larc.nasa.gov/large/</a>) seeks a current graduate student pursuing a doctorate in a STEM-related field to carry out measurements and analyses of aerosol-cloud interactions. Aerosol-cloud interactions are one of most important but poorly understood components of Earth’s climate system. The student would primarily support measurement/analysis activities using data obtained during the recently-selected 5-year, NASA Activate campaign whose measurement period is scheduled to commence in Spring, 2020. The specific tasks may include (and not limited to): 1) Assist LARGE group members with in-flight instrument operation (as needed) and data quality assurance/quality control (QA/QC); 2) Conduct scientific studies and data analyses to examine the relationships between aerosol and cloud properties; 3) Use combined satellite, model, and airborne data products to advance algorithm and/or model development activities; 4) Present results in peer-reviewed journal articles, at project science team meetings, and at scientific conferences.</td>
<td>Pursuing Ph.D</td>
<td>Richard Moore</td>
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<td>Luke Ziembta @nasa.gov</td>
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<td>LARC-003</td>
<td>HEOMD</td>
<td>Benchmarking the</td>
<td>While comparisons of the NASA space radiation code OLTARIS to other solution methods have been performed in the past, an in-depth benchmarking of OLTARIS has never been performed. The benchmark code used will be MCNP6. First, the student will manipulate MCNP6 to mimic the known assumptions used in OLTARIS to obtain results as close as possible to what OLTARIS generates as possible. The student will then relax the assumptions placed into MCNP6 and record the differences. The response function will be the whole body effective dose equivalent per NCRP 142 for a Galactic Cosmic Ray boundary condition. This is a standard model in OLTARIS and it appears that only MCNP6 can be used to mimic what OLTARIS does closely enough to be of benchmark quality. This will include issues like understanding materials in OLTARIS and MCNP6, ray trace details used in OLTARIS like ray number, direction, and origin placement used in a 3D model input to OLTARIS. Once OLTARIS results are benchmarked against MCNP6 results, quantitative uncertainties can be attributed to OLTARIS' assumptions.</td>
<td>Pursuing Ph.D</td>
<td>Robert Singletary</td>
<td><a href="mailto:robert.singletary@nasa.gov">robert.singletary@nasa.gov</a></td>
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<td>LARC-004</td>
<td>SMD</td>
<td>Cloud ice particle equivalent water content and microphysical parameters</td>
<td>One critical need for determining the impact of clouds on climate and weather is to determine the amount of equivalent water in the ensemble of ice particles that form a cloud. Retrievals of ice particle size distributions on a global scale are not possible from satellites. Complex ice particle habits complicate the determination of equivalent cloud water (IWC) in the particles. IWC is needed as input to radiative transfer models so that the radiative impact of clouds can be accurately characterized. Recently there have been several aircraft field campaigns to measure cloud IWC and to observe corresponding ice particle habits. The data from these field campaigns can be used to improve the IWC estimated from both active and passive sensors in space. The specific tasks for this project include (and not limited to): 1) Development of a database of aircraft measurements of ice particles; 2) Comparison of passive and active retrieved and in-situ measured cloud ice water content and effective diameters; 3) Characterization of ice particle habit impact on retrieved effective diameters and ice water content parameters.</td>
<td>Pursuing Master's</td>
<td>Melody Avery</td>
<td><a href="mailto:melody.a.avery@nasa.gov">melody.a.avery@nasa.gov</a></td>
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<td>LARC005</td>
<td>ARMD</td>
<td>Human perception of sonic boom noise from supersonic aircraft</td>
<td>This opportunity is for acoustics research on the perception of sonic boom noise from supersonic aircraft. In order to enable the development of a new generation of civil supersonic aircraft, NASA is researching approaches to minimizing sonic boom noise, and is participating in development of a new certification standard for permissible overland supersonic flight. Research is sought on human perception of these non-traditional, low-noise signatures to aid in planning of community response tests with a supersonic vehicle (NASA’s X-59 QueSST demonstrator aircraft). Areas of research may include but are not limited to: laboratory studies on atmospheric turbulence effects on sonic boom perception, noise metrics analysis studies for determining best metrics, and statistical analyses of community response data. Recommended for students with an interest in acoustics, psychoacoustics, and statistics.</td>
<td>Pursuing Masters/Ph.D</td>
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<td>LARC006</td>
<td>ARM/STM</td>
<td>Launch Vehicle Control Design on a Quadcopter Testbed</td>
<td>Next generation space exploration requires increased payload capability and reliability to safely carry humans beyond the Earth-Moon systems. Prior analysis has shown that up to 41% of recent flight anomalies could be prevented through advanced Guidance Navigation and Control (GN&amp;C) techniques. While novel GN&amp;C methods are attractive, the high cost and risk of full-scale flight tests limits their development. For example, testing the Space Launch System’s Adaptive Augmenting controller (SL5 AAC) on an F/A-18 aircraft cost more than $10 million. There is a need for an inexpensive physical testbed for GN&amp;C software development for high-profile NASA flight projects. This opportunity addresses that void. The objective is to develop a Quadcopter Inverted Pendulum system (QIDP) at the NASA Langley’s Automation Incubator. The intrinsic dynamics of the QUP system is similar to many aerospace vehicles including NASA’s SLS rocket or a lunar lander configuration. Upon successful completion of the setup, the next step would be to implement and test potential novel GN&amp;C algorithms associated with these high-profile missions.</td>
<td>Pursuing Masters</td>
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<td>LARC007</td>
<td>ARMD</td>
<td>Fluid Structure Interactions (FSI) and Conjugate Heat Transfer (CHT) are two important research areas in their own right. However, combining and leveraging existing capabilities in these areas for use in engineering applications where high heating rates introduce thermally-induced structural growth and distortions has become a critical need for supersonic combustion ramjet ( scramjet) designers. These structural changes, and the resulting impact on the flow, alter the expected behavior of the scramjet engine and may lead to significant loss of performance. The objective of the current opportunity is to survey existing capabilities for FSI and CHT, identify and address physics-based challenges associated with coupling these technologies, and develop effective strategies for implementing and/or interfacing various capabilities with existing computational fluid dynamic (CFD) solvers. The research should be focused on the fully coupled problem rather than the development of the individual software tool components, although some software development is expected when embedding the multi-physics solvers within a CFD framework that can enable high-performance computations of the coupled problem. The successful research will pave the way towards allowing fully coupled FSI/CHT/CFD analysis to be performed at a much higher level of fidelity than is currently practical.</td>
<td>Pursuing Ph.D</td>
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<td>757-864-9016</td>
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<td>LARC-008</td>
<td>ARMD</td>
<td>Modelling sonic boom propagation from supersonic aircraft</td>
<td>This opportunity is for acoustics research on modelling sonic boom propagation from supersonic aircraft. In order to enable the development of a new generation of civil supersonic aircraft, NASA is researching approaches to minimizing sonic boom noise and is participating in development of a new certification standard for permissible overland supersonic flight. To aid in these efforts, research is sought to extend existing acoustic propagation codes to improve predictions of the sonic boom from new aircraft designs that produce non-traditional, low-noise signatures. Areas for improvement may include propagation through real, complex atmospheres; noise in the region around the lateral extent of the boom cassette; secondary sonic booms (initially propagated upward, but refracted downward by the atmosphere); and parameter sensitivities associated with Mach cutoff operations (acoustic refraction at low Mach numbers, resulting in the signature not reaching the ground). Application of the improved methodology to the analysis of conceptual aircraft designs, including assessment of noise metrics relevant to certification standards development, is also desired. Visualization of the phenomena and resulting ground sonic boom noise could be an additional component of the research. Recommended for students with an interest in nonlinear acoustics and meteorological effects on acoustic propagation. Computer programming skills in Fortran and/or Matlab required. Familiarity with LaTeX documentation is a plus.</td>
<td>Pursuing Ph.D.</td>
<td>Alexandre Loubeau</td>
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<td>LARC-009</td>
<td>HEOMD/S TMD</td>
<td>Rapid-sizing methodology to design adhesively bonded joints for composite spacecraft and launch vehicle components</td>
<td>Efficient adhesively bonded joint analysis methods for rapidly and accurately predicting the response of composite structural joints are needed to identify the behavior of statically-loaded spacecraft and launch vehicle structural concepts. Designing lightweight, efficient structural components are often negatively impacted by inadequate joint analyses or empirical methods that are too conservative. The proposed research and development topic will focus on improving existing analysis methods, verifying those methods using existing numerical analysis methods (FEA), and investigating the impact of key joint features and loading, e.g. laminate anisotropy, substructure interaction, combined mechanical and thermal loading, influences material response, manufacturing defects, and impact damage. Validation of promising design methodologies will be conducted by fabricating and testing candidate structural concepts with an emphasis on those that exhibit structural tailoring.</td>
<td>Pursuing Masters/Ph.D.</td>
<td>Stanley Smetzer</td>
<td><a href="mailto:ssmezer@nasa.gov">ssmezer@nasa.gov</a></td>
<td>arunkumar <a href="mailto:satyanarayana@nasa.gov">satyanarayana@nasa.gov</a></td>
<td>757-864-3130</td>
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<tr>
<td>LARC-010</td>
<td>ARMD</td>
<td>Robust and Efficient High-Order Discontinuous Galerkin Schemes for High-Speed, High-Reynolds Number Flows with Purely Simplex Elements</td>
<td>A critical aspect for determining the environment of high-speed vehicles with complex configurations is an accurate prediction of solution gradients, such as shear stresses, heat fluxes, pressure gradients, and density gradients. These quantities are required in reducing uncertainties impending turbulent flows, separation and reattachment points, and surface heat fluxes of spacecraft and hypersonic vehicles, to name a few. Furthermore, analysis of boundary layer instabilities also requires a near-pristine set of solution gradients. The vehicle geometrical complexities such as wings, protuberances, cavities, thermal protection systems, compression, blunt, reaction control surfaces, as well as complexities in the flowfield such as shocks, shock-boundary layer interactions, shock-shock interactions, separations, and vortices are the main reasons for using purely simplexes (triangles and tetrahedrons) elements. The high-order discontinuous Galerkin method is one of the attractive high-order schemes that is mathematically sound, and combines the benefits of both finite-volume and finite-elements schemes. In addition, DG schemes are suitable for h/p adaptation, and can be numerically very efficient and scalable due to its compact stencil. The research opportunity tests an independent original approach to developing a nonoscillatory DG scheme for energetic flows using purely simplex elements. The specific tasks may include but are not limited to: j) development of a robust, high-order discontinuity capturing j) development of a robust discontinuity-fitting technique. j) development of DG schemes with hyper-polynomial-nonpolynomial basis functions to capture different parts of the flow fields, such as shocks, boundary layer, and separated flows, particularly where the grid is relatively coarse to capture the specific physics with polynomial basis, and d) development of robust entropy consistent DG schemes to investigate their effects in the predicted solution and solution gradients.</td>
<td>Pursuing Masters/Ph.D.</td>
<td>Aifone Mazehi D3065</td>
<td><a href="mailto:amazehi@nasa.gov">amazehi@nasa.gov</a></td>
<td>757-864-7013</td>
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<td>NASA Center Code</td>
<td>Center Code</td>
<td>Opportunity Title</td>
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<td>Desired Student Academic Level</td>
<td>Technical Advisor</td>
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<td>LARC-011</td>
<td>SMD</td>
<td>Tropospheric ozone lidar data analysis in coastal region for model improvement and satellite comparisons</td>
<td>Tropospheric ozone is one of the major pollutants in the continental US. It impacts large populated areas, has adverse effects on health, and is heavily regulated. To better prevent O3 exceedances, it is necessary to better understand the sources of O3, which are both from local chemical processes or transport from other states or even the stratosphere. The problem of monitoring and alerting on air quality is notably done by models and complex satellite observations (such as the forthcoming TEMPO instrument); however, those lack the fine detail, and can be missing some air quality events, and therefore require ground monitoring stations. In order to improve the models and to make a better interpretation and validation of satellite data, it is necessary to make measurements with a high resolution and a high temporal rate. Tropospheric lidars, such as the Langley Mobile Ozone Lidar, LMOL, have been developed to tackle this problem. In the past couple years, the LMOL lidar has been participating in the OWALETs 1.62 and the LISTOS campaigns, acquiring over 600h of data in the coastal regions, which are notable for large O3 gradients that are poorly captured by models and satellites (such as TROPOMI). The proposed research is to analyze the data acquired during these campaigns and compare them with the models and available satellite products to better understand where the current limitations come from, and to work with the different teams to improve the models/data products. There will be opportunities for the collection of additional measurements using LMOL.</td>
<td>Pursuing Masters/Ph.D</td>
<td>Guillaume Geronoff</td>
<td><a href="mailto:geronoff@larc.nasa.gov">geronoff@larc.nasa.gov</a></td>
<td>Timothy Benoff</td>
<td><a href="mailto:timothy.benoff@larc.nasa.gov">timothy.benoff@larc.nasa.gov</a></td>
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<tr>
<td>LARC-012</td>
<td>SMD</td>
<td>Tunable, High-Resolution Mid-Infrared Focal Plane Arrays for Hyperspectral Imaging and IR Spectroscopy</td>
<td>The mid-infrared spectral regime is of critical importance to the fields of environmental science and astronomy, as it contains the fingerprint of many chemical species including greenhouse gases, as well as thermal signatures of flight vehicles and deep space objects. The Clouds and the Earth's Radiant Energy System (CERES)—one of NASA’s highest priority scientific satellites—is the current approach to monitor these critical parameters. However, with three independent and cumbersome sensors, CERES is not sufficient for next-generation active atmospheric monitoring. As a result, the development of a single, cost-effective, high-resolution, and tunable monitoring system (sensor) is in the mid-infrared is now paramount. The proposed research opportunity is to develop a novel mid-infrared focal plane array sensor that is tunable, high resolution, and cost-efficient, by utilizing a combination of fundamentals and cutting-edge science and technology. It is intended to be a single device that can replace the independent devices commonly used in systems like CERES. Once a device has been demonstrated, it will be implemented into and tested in a system that is working spectroscopy system. This research will greatly benefit the overall future of atmospheric sensing and monitoring, climate change research, and numerous other biological and chemical sensing applications, as well as hyperspectral imaging of thermally radiating objects such as planetary surfaces. The specific tasks include but are not limited to: 1) Design of various types of tunable mid-infrared sensors from first-principles physics; 2) Numerical simulation and optimization of aforementioned mid-infrared sensor devices; 3) Fabrication process optimization and characterization of fabricated devices; 4) Testing performance of fabricated devices in a spectroscopy system and/or hyperspectral imaging system.</td>
<td>Pursuing Ph.D</td>
<td>William Humphreys</td>
<td><a href="mailto:whumphreys@larc.nasa.gov">whumphreys@larc.nasa.gov</a></td>
<td>Hyun Jung Kim</td>
<td><a href="mailto:hyunjang.kim@larc.nasa.gov">hyunjang.kim@larc.nasa.gov</a></td>
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<td>Desired Student Academic Level</td>
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<tr>
<td>LARC-013</td>
<td>SMD</td>
<td>Using NASA data to constrain climate effect of desert dust</td>
<td>Does desert dust cool or warm the climate system? The answer to this question is critical in using observations of past climate changes to constrain the climate sensitivity of the Earth system. Dust affects estimates of climate sensitivity because dust has changed substantially over both the observational (past ~100-200 years) and the geological record (past ~500,000 years). If dust net cools the planet, then the decreases in dust that have coincided with transitions from glacial to warmer interglacial periods have warmed the climate, thus requiring a lower climate sensitivity to greenhouse gas warming. Conversely, if dust warms the planet, then the climate sensitivity would have to be higher to be consistent with the geological record. Traditionally, dust has been considered a cooling agent. However, recent evidence indicates that atmospheric dust is much coarser than previously believed. Since coarse dust warms the climate by absorbing shortwave and longwave radiation, this finding raises the possibility that dust actually net warms the climate system. The student will use NASA satellite data to constrain the abundance of dust in the atmosphere, and then use that to estimate the impact of dust on the global climate system. For instance, data from MODIS, MISR, SeaWiFS, and CALIPSO can be used to estimate the 3D distribution of dust, and a radiative transfer model could be used to estimate the resulting radiative effects due to dust interactions with radiation.</td>
<td>Pursuing Ph.D</td>
<td>Ali H. Omar</td>
<td><a href="mailto:all.h.omar@nasa.gov">all.h.omar@nasa.gov</a></td>
<td></td>
<td>757-864-5123</td>
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Appendix F: Professional Development Requirements

The goal of the Professional Development activities is to broaden the Fellow’s skills and prepare for the workforce. These include skills, beyond core research skills, that will position the student for success in a variety of career paths. Knowledge about career options, educational requirements, and advanced professional skills and soft skills significantly enhance the likelihood of successfully navigating and job into the STEM workforce. The Professional Development activities are designed to develop skills in areas such as research and career planning, communication, presentation, project management, and leadership.

I. Fellow Professional Development Allowance

This allowance ($1,500) may be used in direct support of training, research, technical, scientific, and publication needs of the Fellow. This allowance can be used in concurrence with the Faculty Advisor Allowance to cover approved Fellow domestic travel to technical and scientific meetings. Each Fellow is expected to attend at least one technical conference to present the work he or she is conducting under the awarded research proposal. All technical conferences shall be led by the PI and follow procedures for approval by the NASA Fellowships Manager. The cost of travel is on U.S. General Services Administration rates ([https://www.gsa.gov/travel/plan-book/per-diem-rates](https://www.gsa.gov/travel/plan-book/per-diem-rates)).

A. Allowable expense for attending professional research, and graduate student conferences, symposia, and workshops.
   1. Registration Fees
   2. Maximum three nights in a hotel per event (Home rentals, such as Airbnb, are not included)
   3. Per diem of three full days and two half days
   4. Travel costs to and from event

B. Publication costs for conference presentation material, related research papers, thesis, and dissertation.

C. Professional training for required skills, such as software training.

II. Individual Development Plan (IDP)

The Fellow will create and maintain an individual development plan (IDP) at [http://myidp.sciencecareers.org/](http://myidp.sciencecareers.org/). The goal of an Individual Development Plan (IDP) is to help you evaluate progress toward both short-term and long-term career goals and to identify areas that require additional attention and effort. An IDP is a living document that can serve as a guiding document for mentor/mentee discussions. Importantly, an IDP should be a roadmap for developing new skills and address concrete steps for the transition to the next stage of an individual’s career.

III. Professional Development Activities

A. Fellowship Program Year 1

   September – conference call
   - The Fellows and the Faculty Advisor (PI) are required to participate in a conference call with the program management to review the grant requirements, funding requirements, and to
answer questions that they might have. In addition, the call is to better understand the roles and responsibilities of the PI, NASA Fellows, Program Manager and the Activity Manager.

October – webinar
- Pre-planning for the Center Based Research Experience (CBRE)
- Fall/Winter phone meeting with the NASA Technical Adviser
- Summer research plan requirements
- Answer any additional questions that have arisen

November – webinar
- Research Ethics and Integrity Lecture Series by Professor Janet D. Stemwedel from San Jose State University. This session focuses on different aspects of the responsibilities and ethics in the conduct of research, such as recognizing and approaching ethical problems, mentoring, conflicts of interest and commitment, avoiding plagiarism, intellectual property, research misconduct, human subject research, and animal research and lab safety.

December – webinar
- Driving Your Success - Don't assume that a profession anchored in technical excellence will advance your career. Mastery of a discipline only accounts for 15% of what is needed to excel in the workforce. What accounts for the other 85%? This discussion provides an overview of soft skills and why they are essential to your professional and personal life.


January – webinar
- NASA Onboarding and the CBRE – Review the process for onboarding and the preparation for the CBRE.
- Conference Travel Requirements – Review the process for travel fund requests and expectations from NASA Fellows and the PI’s.

February – webinar
- Successfully Navigating your Career Path: Missing the Pitfalls, Obstacles, and Barriers - Your career path may have obstacles and barriers that may derail, distract or delay your journey. This workshop provides strategies and tools to navigate your environment both professionally and personally.

March – webinar
- The Fellowship Renewal Process – This session explains Fellowship Renewal process that is required for each year. (The Annual Renewal Process can be found in Appendix H.)

April – webinar
- Networking for Personal and Professional Development: managing your future in a Social Networking World
May - webinar
- **The NASA Way – NASA Project Management:** This session is a high-level overview of NASA program and project management and the life cycle of the process.

June – August
- **Center Based Research Experience (CBRE):** Fellows participation is required. The Fellow is expected to participate fully in the NASA Center’s summer program. The Fellow is required to submit their summer deliverable to program management by August 31st.

**B. Fellowship Program Year 2**

September – conference call
- The Fellows and the Faculty Advisor (PI) are required to participate in a conference call with the program management to revisit and review the grant requirements, funding requirements, and to answer questions that they might have.
- The Fellow is expected to attend a professional conference during the academic years.

October – webinar
- **Made to Stick: Keys to Giving Effective Presentations:** This session will provide insights on how to give a powerful presentation and how to avoid common mistakes.

November – webinar
- **Center Based Research Experience Presentations:** In this session, Fellows will present their research from the summer experience to the cohort.

December – webinar
- **Mapping Career Path to Success - Planning and Organizing Your Research:** This session is about how to narrow your project’s topic, focus your research goals, and how to effectively manage your research notes to enable success.

January – webinar
- **Writing a Dissertation or Thesis: Getting Started - Getting Done:** This session will provide you with the tools needed to get started or to make more efficient progress and get done. We will discuss practical strategies for writing your dissertation/thesis including tactics for time management and organization, stages in the writing process, strategies for integrating material from sources, and techniques of maintaining momentum and a positive attitude.

February – webinar
- **Quick Review - NASA Onboarding the CBRE: Year 2**
- **Publishing - Getting Started to Getting Done Part 1:** This session will provide you with the tools needed to publish, including tactics for time management and organization, stages in the writing process, strategies for integrating material from sources, and techniques of maintaining momentum and a positive attitude.
March – webinar
- Quick Review - The Fellowship Renewal Process - Year 2 (The Annual Renewal Process can be found in Appendix H.)
- Publishing - Getting Started to Getting Done Part 2: This session will provide you with the information about the legal issues related to publishing and processing a document through the NASA Center ITAR and Center’s Export Compliance Office.

April – webinar
- Responsible Conduct of Research: This session is a high-level overview of the Responsible Conduct of Research (RCR) defined as "the practice of scientific investigation with integrity." It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research.

May - webinar
- The Individual Development Plan (IDP) Step 3 http://myidp.sciencecareers.org/ The NASA Way – NASA Project Management Going Further: This session is about developing strong project management skills to complete your training and achieve your career goals.

June – August
- Center Based Research Experience (CBRE): Fellows participation is required. The Fellow is expected to participate fully in the NASA Center’s summer program. The Fellow is required to submit their summer deliverable to program management by August 31st.

C. Fellowship Program Year 3

September – conference call
- The Fellows and the Faculty Advisor (PI) are required to participate in a conference call with the program management to revisit and review the grant requirements, funding requirements, and to answer questions that they might have.
- The Fellow is expected to present their research at a professional conference during the academic years.
- Leaders for the Future: This session will provide information on training in leadership and business communication skills.

October – webinar
- The Individual Development Plan (IDP) Step 4 http://myidp.sciencecareers.org/
- The Job Search – USA Jobs, The Federal Pathways Program, C.A.R. Resume and Cover Letter: This session will provide information on the process to hunting down a Federal employment.

November – webinar
- Finding the Money: This session will provide information on the Federal solicitation cycle, the funding search, and application process.

December – webinar
The Peer Reviewer - Peer-Review Techniques for Novices: This session will provide information on the role of a Peer Reviewer and successful techniques in this role.

January and February – webinar
- **Becoming an Entrepreneur:** This two-part session introduces the student to the core concepts and resources of entrepreneurship. Topics include recognizing the need for innovation, how to develop a business plan, building an effective team, intellectual property, patent and trademark strategy, marketing strategy and cultivating funding sources.

March, April, and May – webinar
- **The Fellowship Closeout Process - Year 3:**
- **Plan for STEM Outreach – Giving Back Program:** The Fellow must participate in a STEM outreach activity such as talking to school children about STEM careers, judging a STEM competition, etc.

June – August
- **CBRE participation is required.** The Fellow is expected to participate fully in the NASA Center’s summer program. The Fellow is required to submit their summer deliverable to program management by August 31st.
Appendix G: Fellowship Travel Funds Procedure

All travel funds shall be used in support of a grant awarded by NASA for the Fellowship program. All steps shall be completed before approval for travel will be given. Travel funds are for domestic travel only. Federal civilian employees and others authorized to travel at the government’s expense must follow the policies defined in the Federal Travel Regulation (FTR). Funds are to be ONLY used for professional purposes. The Travel Request is completed by the PI with the Fellow’s assistance. The NASA Training Grant is awarded to the institution; therefore, NASA does not provide direct support awards to Fellows. The Fellow is expected work with the PI to understand the norms of performing research for a government agency and how to manage a budget.

Before Travel:

1. A written statement and request must be submitted by the Fellow’s PI that includes the following documents:
   a. Fellow’s Name
   b. Fellow’s Institution
   c. Grant Number
   d. Principal Investigator
   e. NASA Technical Adviser/Mentor’s Name
   f. NASA Center
   g. Professional Development Opportunity or Conference Title
   h. Venue
   i. Dates attended
   j. The goals of attendance
   k. Expected impact on the fellow
      - If the Fellow is presenting at the conference, provide a copy of the submitted abstract to the conference administrators
      - A copy of the invitation to present from the conference administrators
   2. Complete the NASA Fellowship Travel Request Budget Form.
   3. If the Fellow is presenting research (presentation, research paper, and or poster) at the conference, then an International Traffic in Arms Regulations (ITAR) review must be completed with the assistance of the NASA Technical Adviser:
      a. If the presentation, research paper, and or poster does not require an ITAR review, an email from the NASA Technical Adviser shall be submitted with the request.
      b. If the NASA Technical Adviser determines the presentation, research paper, and or poster needs to be reviewed by the Center’s Export Compliance Office, then the NASA Technical Adviser will assist in completing the review at the NASA Center. The approval document shall be submitted.
   4. Submit approval documents to Fellowship Program Management.
   5. Fellows must show at least 12 months of work conducted under this research award in order to be eligible for travel reimbursements.

After Travel:

1. The Fellow shall complete a Travel Follow-up Report within two weeks of the end of travel. The report shall include the following:
   A. Fellow and Development Opportunity or Conference Information:
      1) Fellow’s Name
2) Fellow’s Institution
3) Grant Number
4) Principal Investigator
5) NASA Technical Adviser/Mentor’s Name
6) NASA Center
7) Development Opportunity or Conference Title
8) Venue
9) Dates attended

B. If the Fellow presented a poster or presentation:
   1) Title of Presentation/Poster
   2) Short summary of audience response
   3) Lessons Learned

C. Development Opportunity or Conference Events Attended:
   1) List of attended events
      a) Oral presentations
      b) Poster presentations
      c) Workshops
      d) Professional networking events
   2) Goals of Attendance at the Development Opportunity or Conference:
      a) Pre-conference Goals
      b) Outcomes of the Development Opportunity or Conference:
         i. Were the goals met?
         ii. Unexpected outcomes
Appendix H: Annual Renewal Process

NASA Fellowship Activity awards are made initially for a one-year period of performance and may be renewed for an additional three years for doctoral Fellows and up to two years for all other graduate students contingent upon satisfactory progress, as reflected in the academic performance, research progress, recommendation by the faculty advisor, NASA Technical Adviser and the availability of funds. Fellows seeking renewal shall submit a Renewal Proposal Applications Package to program management and the grant management (NSCC) for each Academic Year. The Renewal Proposal Application Package includes the Annual Progress Reports that are a comprehensive summary of significant accomplishments during the reporting period or for the duration of the grant. The purpose of the Annual Report is to provide an update on the progress of your research and/or degree progression. The submission of the Renewal Proposal Applications Package is required before the Program Officers can release funding for additional years. The responsible parties for submitting the documentation for renewal are the Fellow and the Faculty PI to program management.

Annual Progress Report for Renewal:
The NASA Grant and Cooperative Agreement Manual (GCAM) - Exhibit E, identifies the publications and reports required for submission. Technical Publications and Reports should be submitted in accordance with the terms and conditions at 2 CFR 1800.902.

Note: Any change in academic status should be reported and submitted with your renewal application.

It is the responsibility of the PI to ensure all documents are submitted prior to 5 pm EST/4 pm CST/2 pm PST on June 30, 2019. Failure to meet the deadline will result in non-renewal of the NASA Fellowship.

Annual Progress Package includes the following: (template will be provided)

- Annual Progress Report (template will be provided)
- Official Transcripts
- Certification of Compliance: [PDF Form NF1206] completed by AOR
- Letter of Recommendation from PI on institutional letterhead
- NASA Technical Adviser Evaluation form

Email the Annual Progress Package to the following email addresses: NASA.Fellowships@nasaprs.com and Vandhana.lal@nasa.gov.

Annual Progress Report shall include the following cover page (template will be provided):

a. NASA Grant Number;

b. Name of NASA Fellowship Activity;

c. NASA Office of STEM Engagement Line of Business;

d. Type of report (Annual, Final or Midterm);

e. Name of the PI and signature;

f. Fellow’s Name and signature;

g. Period of Performance covered by the report; and

h. Name and address of the recipient’s institution.

2. Annual Progress Report shall include the following on the second page:

a. Accomplishments: Start by reminding us what were your major academic goals and
objectives for the academic year and what you did to achieve those goals. For example, mention participation in any educational activities or programs outside classes, describe major activities, projects or research completed or attendance of any conferences or academic/professional meetings.

b. Resolutions: Did you have goals and objectives that were difficult to meet or not met? How did you resolve the problem or attempt to resolve the problem?

c. Results: How have the results been disseminated? For example, include a list of publications that have appeared as a result of the award.

d. Future plans: What are you planning to do next in order to develop academically professionally? Be sure to include:
   i. An updated schedule for completing the degree program;
   ii. Professional development plans for the upcoming year, such as conferences; and
   iii. The budget proposal for next year.

3. **Itemized Estimated Fellowship Budget**: (template will be provided)
   The goal of the Estimated Fellowship Budget is to ensure that all funding is spent yearly and that no funds are left on the NASA Training Grants at the end of the period of performance.

   a. A budget is a blueprint for spending the project’s funds. An effective proposal budget outlines the proposed project in fiscal terms and helps reviewers to determine how the project will be conducted.
   b. The budget plan must depict how all the funds will be utilized within the yearly period of performance.
   c. The proposed budget must give an accurate assessment of all cost items and cost amounts that are deemed necessary and reasonable. It should be complete and within the program's allowances; that is, it should include all the costs of any personnel, supplies, and activities required by the project.
   d. Justify budgeted items.

**The Annual Progress Package is due to the Program Management by email:**

- Annual Progress Report (template will be provided)
- Official Transcripts
- Certification of Compliance: (PDF Form NF1206) completed by AOR
- Letter of Recommendation from PI on institutional letterhead
- NASA Technical Adviser Evaluation form

**Email the Annual Progress Package to the following email addresses:** NASA.Fellowships@nasaprs.com and Vandhana.lal@nasa.gov.

**Annual Progress Package Checklist**

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<tr>
<td>Format</td>
<td>Annual Reports shall be submitted by the PI in PDF files via email to: <a href="mailto:NASA.Fellowships@nasaprs.com">NASA.Fellowships@nasaprs.com</a> and <a href="mailto:Vandhana.lal@nasa.gov">Vandhana.lal@nasa.gov</a>.</td>
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<td>Format</td>
<td>Should not exceed three pages in length</td>
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**Annual Progress Report** shall include the following cover page (template will be provided):

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<th>Content</th>
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<td>Fellow’s Name and signature</td>
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<td>Period of Performance covered by the report</td>
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| Content | **Accomplishments**: Start by reminding us what were your major academic goals and objectives for the academic year and what you did to achieve those goals. For example, mention participation in any educational activities or programs outside classes, describe major activities, projects or research completed or attendance of any conferences or academic/professional meetings. |

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<th>Resolutions: Did you have goals and objectives that were difficult to meet or not met? How did you resolve the problem or attempt to resolve the problem?</th>
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</thead>
<tbody>
<tr>
<td>Content</td>
<td>Results: How have the results been disseminated? For example, include a list of publications that have appeared as a result of the award.</td>
</tr>
</tbody>
</table>
| Content | Future plans: What are you planning to do next to develop academically and professionally? Be sure to include:  
1. An updated schedule for completing the degree program;  
2. Professional development plans for the upcoming year, such as conferences; and  
3. The budget proposal for next year. |

**Itemized Estimated Fellowship Budget:** (template will be provided)

The goal of the Estimated Fellowship Budget is to ensure that all funding is spent yearly and that no funds are left on the NASA Training Grant’s at the end of the period of performance.

<table>
<thead>
<tr>
<th>Content</th>
<th>The budget plan must depict how all the funds will be utilized within the yearly period of performance.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>A budget is a blueprint for spending the project’s funds. An effective proposal budget outlines the proposed project in fiscal terms and helps reviewers to determine how the project will be conducted.</td>
</tr>
<tr>
<td>Content</td>
<td>The proposed budget must give an accurate assessment of all cost items and cost amounts that are deemed necessary and reasonable. It should be <strong>complete and within the program’s allowances</strong>; that is, it should include all the costs of any personnel, supplies, and activities required by the project.</td>
</tr>
<tr>
<td>Purpose</td>
<td>Justify budgeted items.</td>
</tr>
</tbody>
</table>
Appendix I: Fourth-Year Extension Process

Fellows in Doctoral programs are invited to apply for a fourth-year extension during their third year of the period of performance, pending availability of funds. The fourth-year extension is an opportunity to ask creative questions related to research from the previous years. It is intended to provide teams with the chance to apply their findings in new settings or build upon discoveries not previously outlined in the original proposal.

Note:
Extension proposals based significantly on the need for more time to complete the initially-proposed work or graduation date will be considered as non-responsive and returned without review.

In order to be considered for this extension, the following will need to be submitted to the Office of STEM Engagement:

Project Description: This proposal section shall be titled “Project Description” and shall not exceed six single-spaced pages (using a 12-point font with at least 1” margins on all sides). The Project Description shall provide a clear description of the Fellow’s intended research. The Project Description shall begin with a brief abstract summarizing the scientific problem to be addressed, the proposed science plan, your methodology, and expected results. The Project Description follows the order below and contain the following technical elements:

1. A statement of problem to be addressed
2. A description of the science background and relevance to previous work in the field
3. General methodology
4. Project Schedule / Timeline (State specific targeted, identifiable goals that will be accomplished in the one year period of extension)
5. Explanation of new or novel techniques
6. Expected results and their significance or application
7. Literature citations, where appropriate

Itemized Estimated Fellowship Budget: The goal of the Estimated Fellowship Budget is to ensure that all funding is spent yearly and that no funds are left on the NASA Training Grant’s at the end of the period of performance.

- A budget is a blueprint for spending the project’s funds. An effective proposal budget outlines the proposed project in fiscal terms and helps reviewers to determine how the project will be conducted.
- The budget plan must depict how all the funds will be utilized within the yearly period of performance.
- The proposed budget must give an accurate assessment of all cost items and cost amounts that are deemed necessary and reasonable. It should be complete and within the program’s allowances; that is, it should include all the costs of any personnel, supplies, and activities required by the project.
- Justify budgeted items.

Impact: To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?

Letter of Continued Support: The NASA Center to be utilized as part of the extension effort shall provide a letter stating its support with the extension of research and its willingness to continue serving as a NASA
Technical Adviser. To ensure there is no conflict of interest, a letter of support must be included from a second NASA civil servant who is familiar with the research proposal.

**Letter of Recommendation:** The NASA Center to be utilized as part of the extension effort shall provide a letter stating its recommendation with the extension of research. A member of the Center should consider whether the extension is mission-aligned and extends current research.

**Evaluation:** Proposals for extensions will be peer-reviewed by the virtual and subject matter experts.
Appendix J: Allowances Explained

**Fellowship Stipend**: A stipend offsets the Fellow’s living expenses. Stipend payments should be prorated evenly across a ten-month academic school year.

**Tuition and Fees Allowance**: Permissible up to the maximum value. While the student is funded as a result of selection from the NASA Fellowship Activity solicitation, the institution must exempt the student from paying the difference between the tuition and fees allowance and the actual tuition and fees.

**Center Based Research Experience (CBRE) Allowance**: This allowance is to be used to support travel and other expenses associated with the CBRE experience. CBRE funds are to be released from the institution to the NASA Fellow in two incremental payments. The first payment should be released within a month of the planned CBRE, and the last payment should be released after the successful completion of the 5\(^{th}\) week of the CBRE. The NASA Training Grants reporting process requires institutions to submit receipts for all financial transactions and organizations should require receipts for all travel-related expenses.

**Health Insurance Allowance**: Permissible up to a maximum value, only to the level of the actual expected cost.

**Faculty Advisor Allowance**: This allowance is designated to support and facilitate a collaborative research team. Faculty Advisors are significant contributors to the execution of the NASA Training Grant’s research goals. This allowance supports on-site visit(s) during the NASA Fellow’s CBRE to discuss various research-related topics with the team and to explore additional research opportunities with NASA.

**Fellow Professional Development Allowance**: This allowance may be used in direct support of training, attending technical and scientific conferences, and publication needs of the Fellow. This allowance can be used in concurrence with the Faculty Advisor Allowance to cover the Fellow’s approved domestic travel to technical and scientific meetings. Each Fellow is expected to attend at least one technical conference to present the work he or she is conducting under the awarded research proposal. All technical conferences shall follow procedures for approval by the NASA Fellowships Manager. Conferences are to be attended after the first year of the training grant. Fellows presenting their research posters at the conference must have approval from their NASA Technical Advisers and NASA’s export control.

Allowable expense details for attending professional research, conferences, symposiums, and workshops:

a) Registration Fees
b) Accommodation - maximum three nights in a fire safe hotel* per event (per diem 3 full days and two ½ days)
c) Travel cost to and from event
d) Publication costs for conference presentation materials, related research papers, thesis, and dissertation
e) Training for professional required skills such as software training, etc.


Property Selection Criteria can be found on https://www.gsa.gov/travel/plan-book/per-diem-rates/factors-influencing-lodging-rates. Shared homes, including Airbnb, are not included in the list of acceptable lodging.

*Details related to fire safe hotels can be found at https://www.gsa.gov/travel/plan-book/per-diem-rates/fire-safe-hotels.
NASA Funds should not be used to purchase equipment such as computers, furniture, non-related research equipment or research equipment that is not directly related to the research.

Throughout the duration of this award, Fellows are prohibited from concurrently receiving any other Federal fellowships, scholarships, traineeships, apprenticeships, internships, or any other federal funding. The NASA Fellowship Activity is a fellowship to support graduate training and development and does not provide funding for institutional overhead/indirect costs.

Tax questions should be directed to the Internal Revenue Service. Refer to IRS publications on “Scholarships and Fellowships.” (http://www.irs.gov/)