

**AMENDMENT NO. 3 TO THE NASA RESEARCH ANNOUNCEMENT (NRA)  
ENTITLED “RESEARCH OPPORTUNITIES IN AERONAUTICS – 2023  
(ROA-2023),” NNH23ZEA001N, RELEASED NOVEMBER 15, 2022**

Changes are made to the following:

- Updated Table of Contents
- Table 5. Solicited Research Programs (in order of proposal due dates)
- Table 6. Solicited Research Programs (in order of Appendices A-D)
- Appendix A.8 – Advanced Air Vehicles Program (AAVP) Fellowship Opportunities

**TABLE 5. SOLICITED RESEARCH PROGRAMS (IN ORDER OF PROPOSAL DUE DATES)**

APPENDIX	PROGRAM	NOI DUE DATE	PROPOSAL DUE DATE
D.2	Transformational Tools and Technologies Project (TTT)	December 9, 2022	January 13, 2023, 5PM ET
D.6	Future Aviation Maintenance Technical Challenges	April 21, 2023	May 31, 2023
A.8	Advanced Air Vehicles Program (AAVP) Fellowship Opportunities	N/A	May 31, 2023, 5PM ET

**TABLE 6. SOLICITED RESEARCH PROGRAMS (IN ORDER OF APPENDICES A–D)**

APPENDIX	PROGRAM	NOI DUE DATE	PROPOSAL DUE DATE
A.8	Advanced Air Vehicles Program (AAVP) Fellowship Opportunities	N/A	May 31, 2023, 5PM ET
D.2	Transformational Tools and Technologies Project (TTT)	December 9, 2022	January 13, 2023, 5PM ET
D.6	Future Aviation Maintenance Technical Challenges	April 21, 2023	May 31, 2023

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## APPENDIX A: Advanced Air Vehicles Program

Advanced Air Vehicles Program (AAVP) goals and objectives are provided in [Research Opportunities in Aeronautics \(ROA\) 2023](#). A detailed description of Projects within AAVP can also be found in the document. Below is an amendment to the Appendix A focused on AAVP Fellowship Opportunities (Appendix A.8)

For more information, please see <http://www.aeronautics.nasa.gov/programs-aavp.htm>

### **A.8.1 AAVP Fellowship Overview**

This NASA Notice of Funding Opportunity (NOFO) is administered by Aeronautics Science Mission Directorate's (ARMD) Advanced Air Vehicles Program (AAVP) and titled the AAVP Fellowship Opportunities (also referred to as Fellowship Opportunity in the document) .

The AAVP Fellowship Opportunities includes the use of program elements, which allows greater flexibility in meeting the activity goals and objectives. Program elements are tied to projects or sub-projects within AAVP. Additional program elements may be added as new section to this Appendix to be issued later in the year. This approach provides flexibility, so that each program element has its unique expectations and selection criteria. Contingent upon available federal funding, AAVP will administer the fellowships until closeout, thereby fulfilling NASA's responsibilities to its Fellows.

The announcement solicits proposals from accredited U.S. institutions for research training grants to begin the academic year. This NOFO is designed to support independently-conceived research projects by highly qualified graduate students, in disciplines needed to help advance NASA's mission, thus affording these students the opportunity to directly contribute to advancements in STEM-related areas of study. AAVP Fellowship Opportunities are focused on innovation and the generation of measurable research results that contribute to NASA's current and future science and technology goals.

Unique to this research and development fellowship, the program structure establishes a Professional Learning Community (PLC) consisting of active Fellowship cohorts, institutional faculty advisors as the grant Principal Investigators (PIs), NASA researchers, scientists, and subject matter experts (SMEs). The PLC is designed to provide a network of mentors committed to the successful completion of the proposed research. This fellowship includes the following benefits and allowances: Stipend, Tuition Offset and Fees, Center Based Research Experience Allowance, Health Insurance Allowance, Faculty Advisor Allowance, and Fellow Professional Development Allowance.

## **A.8.2 Solicitation Overview**

### **A.8.2.1 Purpose of Fellowship**

The fellowship opportunity is designed to provide US academic institutions the ability to enhance graduate-level learning and development. Institutions are provided funds that support graduate students at a level that allows the students to fully concentrate on academic and research proficiency without the need to seek employment.

The goals are to:

- Enhance research and development capacity of institutions and promote greater diversity in addressing AAVP priorities;
- Recruit a diverse set of students through by partnering with academia, non-profit organizations, and institutions; and
- Expand connections with institutions by enhancing their research capabilities through NASA's unique people, facilities, and content.

### **A.8.2.2 Fellowship Description**

The fellowship opportunity provides financial awards to institutions to support development and training of graduate researchers. Furthermore, this activity leverages the capabilities of academic research at institutions of higher education and includes professional development components, designed to provide experiences that enhance the Fellows with NASA's best and promising practices for STEM workforce development.

#### **Proposed Research**

The candidate and the faculty advisor are encouraged to connect with the NASA Technical Advisor in advance to discuss the scope of proposed work. NASA Technical Advisor Points of Contact (POCs) are listed in the Program Elements of this NOFO. The institution's candidate will independently conceive a research hypothesis or an engineering design project concept in response to one of the graduate research opportunities listed in the NOFO. The institution's candidate, guided by a Faculty Advisor, shall develop a proposal in coordination with the NASA Technical Advisor in order to assure institutional capability and capacity, ensure relevance to AAVP priorities, and secure NASA's technical support for use of its unique facilities, content and/or subject matter experts (SMEs). The institution shall submit the proposal on behalf of a graduate student. If a NASA research training grant is awarded, the Faculty Advisor shall serve as the Principal Investigator (PI) under the awarded grant.

An institution may submit proposals on behalf of multiple candidates; however, each individual candidate is permitted to have only one proposal submitted on his or her behalf.

**NOTE: Entities shall not submit duplicate proposals. 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 forwarded for peer review.**

### On-Site Experience

If the proposal is selected and awarded a grant, the NASA Technical Advisor becomes an integral part of the team and an additional member of the research cohort. The NASA Technical Advisor 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 shall be mentored by the NASA Technical Advisor at a host NASA Center during an annual mandatory 10-week Center-Based Research Experience (CBRE). The CBRE occurs in the summer months, in order to benefit from the dynamic Federal research and development (R&D) environment and other related professional development activities. However, a possible unavailability of needed specific Center test facility and/or equipment due to its commitment to on-going NASA mission-related work may necessitate off-summer CBRE at the affected Center. Through the CBRE, Fellows will advance their STEM education through gaining relevant research experience, expanding their professional networks, learning best practices, developing and strengthening research ethics, and cultivating an understanding of specific research processes.

### Period of Performance and Optional One-Year Extension

The fellowship opportunity is a 2-year award for a Master's Fellow and a 4-year award for a Doctoral Fellow. Both are dispersed annually consistent with the renewal process. This NOFO is designed to provide an extension for an optional third year of funding for a Master's Fellow and an optional fifth year of funding for a Doctoral Fellow. Additional details regarding the renewals process can be found in Section A.8.7 of this NOFO. Details and instructions for applying for an additional year extension can be found in Section A.8.8 of this NOFO.

### Professional Networking Opportunity

NASA Fellows will be able to participate in annual prestigious conferences during which they will have the opportunity to network with their cohort of Fellows, meet prospective recruiters, and participate in professional development sessions.

### Requirement to Notify NASA of Other Funding Submissions/Selections

Each proposal shall clearly indicate if it is being submitted to more than one NASA office at the same time. For example, proposal submission to EONS (Engagement Opportunities in NASA STEM) and AAVP Fellowship Opportunities, this information shall be included in the program specific data section of the proposal. NASA will make appropriate determinations in the selection process if the same proposal is recommended for award to multiple NASA offices. In other words, the same proposal cannot be selected for an award to more than one NASA office.

### A.8.2.3 Relevance to NASA and AAVP

Each proposed research/engineering project is to be developed in response to one of the fellowship opportunities. A letter of support is required if NASA resources (such as laboratory equipment, computational hours, test facilities, etc.) are requested in the proposal and it needs to be coordinate in advance with the Technical Advisor listed in the solicitation. Additionally, the Technical Advisor's letter shall indicate concurrence from the Center's Office of STEM Engagement to support tasks associated with on-boarding and/or off-boarding the fellow. The NASA Technical Advisors are identified in the opportunities posted under Program Elements of

this NOFO. In addition, the NASA Technical Advisor shall document the agreed-upon collaboration, including a communication plan, specific equipment, and/or facility use and other investments. Both the Faculty Advisor and the NASA Technical Advisor's proposed collaboration shall be included, with areas of collaboration interests and potential outcomes clearly documented. Coordination with the potential NASA Technical Advisor is mandatory. The NASA Technical Advisor 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; and
- How the work will increase the capacity of executing cutting-edge research at the institution.

### **A.8.3 Award Information**

#### Type of Award

Research training grants.

#### Available Funding for the NOFO

Funding is subject to NASA's receipt of proposals of adequate merit and to the availability of Congressional appropriations in each FY. Please refer to the Program Elements for award details.

#### Projected Number of Awards

Awards are subject to NASA's receipt of proposals of adequate merit and to the availability of Congressional appropriations in each FY. Please refer to the Program Elements for award details.

#### Maximum Award Amount

Award amount varies by degree. Please refer to the Program Elements for award details.

#### Cancellation of Announcement

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

#### Anticipated Period of Performance

All awards are disbursed annually and may be renewed pending availability of Congressional funds and a successful annual review of the effort. Fellows shall justify extended third- and fifth-year requests (Master's and PhD, respectively). Annual 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 Advisor, and effective costing of the annual budget).

Requests for deferment of awards are not encouraged and will only be considered in emergency

situations. Approvals for deferments are not guaranteed. Institutions seeking renewals shall submit a Renewal Proposal Applications Package in May of each year. Specific details will be released to Fellowship awardees upon acceptance of the award.

Additional details regarding the renewals process can found in Section A.8.7 of this NOFO.

Funding Instrument Type(s)

The fellowship funding is issued to the awardee’s institution by NSSC in the form of a NASA research training grant.

Applications for renewal or supplementation of existing projects are handled separately from yearly release of the NOFO.

A.8.3.1 Funding Information

The fellowship will be awarded as a non-portable research training grant to accredited U.S. institutions on behalf of Fellows selected under this NOFO. As such, this award cannot be transferred to another institution. If a Fellow transfers to a different institution during the award’s period of performance, the Fellow shall reapply to the activity and follow the guidelines for a new Institution’s candidate, submit a new proposal, and compete for any future AAVP Fellowship Opportunity. If the PI transfers to another institution, the award remains with the institution that received the initial award funding, and not with the PI (or any other individual(s)). For each Fellow, their institution receives up to a \$64,000 annual award (\$59,000 for Master’s student and \$64,000 for Doctoral student), with the following annual maximums per budget category:

TYPE OF FUNDING	FUNDING AMOUNT
Fellowship Stipend	\$35,000 (Master’s) \$40,000 (Doctoral)
Tuition Offset and Fees	\$8,000
Center-Based Research Experience (CBRE) Allowance	\$6,000
Health Insurance Allowance	\$3,000
Faculty Advisor Allowance	\$5,000
Fellow Professional Development Allowance	\$2,000

Refer to Section A.8.3.2 for detailed information on each of the above funding categories.

NOTE: Institutions are allowed to transfer Tuition Offset and Fees funds to health insurance and professional development allowance, upon approval from the Fellowship program and the NASA Grants Officer. Students are exempt from paying any tuition differences (i.e., the difference



between the tuition and fees allowance and the actual tuition and fees.) A statement should be provided by the institution during acceptance of the award that the students are exempted from paying any tuition differences.

#### A.8.3.2 Allowances Explained

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

**Tuition Offset and Fees:** Permissible up to the maximum value. While the student is funded as a result of selection for the AAVP Fellowship Opportunity, the institution shall 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 Fellow in two incremental payments. The first payment shall be released within a month of the planned CBRE, and the last payment shall be released after the successful completion of the 5th week of the CBRE. In accordance with the NASA research training grants reporting process, all institutions shall submit receipts for all financial transactions to the Fellowship program.

**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 training grant's research goals. This allowance supports on-site visit(s) during the 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, attendance at technical and scientific conferences, and publication needs of the Fellow. This allowance may be used in concurrence with the Faculty Advisor Allowance to cover the Fellow's approved domestic travel to technical and scientific meetings. Each Fellow shall attend at least one technical conference (in person or virtual) to present the work he or she is conducting under the awarded research proposal. All technical conferences shall follow procedures for approval by the Fellowship program. Conferences are to be attended after the first year of the research training grant. Fellows presenting their research papers at conferences shall have advanced written approval to do so from their NASA Technical Advisors and NASA's export control office.

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

1. Registration Fees.
2. Accommodation - maximum three nights in a fire safe hotel\* per event (per diem 3 full

- days and two ½ days).
3. Travel costs to and from event.
  4. Publication costs for conference presentation materials, related research papers, thesis, and dissertation.
  5. Training for professional required skills such as software training, etc.

Details to fire safe hotels and property selection criteria and cost of travel can be found on U.S. General Services Administration rates. \*NOTE: Shared homes, including Airbnb are not included in the list of acceptable lodging.

NASA funds must not be used to purchase equipment such as computers, furniture, and non-related research equipment.

The NASA Fellowship supports graduate research training and development and does not provide funding for institutional overhead/indirect costs.

**Pre-award costs are not allowable.**

Tax questions should be directed to the Internal Revenue Service. Refer to IRS publications on “Scholarships and Fellowships.”

A.8.3.3 Transfer of Award

The PI and the institution’s AOR shall provide a timely statement to the fellowship management advising of any changes in the Fellow’s enrollment status. If the Fellow 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 will be subject to Technical Advisor’s concurrence.

A.8.3.4 Cost Sharing

NASA may consider voluntary cost sharing options, as deemed appropriate. Submitting institutions shall describe in their proposals any such cost-sharing that is offered.

**A.8.4 Eligibility Information**

A.8.4.1 Candidate Eligibility

Institutions are submitting research ideas on behalf of their respective candidates. To be eligible to apply for receipt of a fellowship, the candidate shall satisfy all of the following criteria:
Be a U.S. citizen or a U.S. national on the date of proposal submission. The term "national" refers to native residents of a possession of the United States such as American Samoa.

Hold a Bachelor's degree earned before August 31 of the academic year for the grant award.
Have a minimum GPA of 3.0 on a 4.0 scale on the most recent transcript. (All college level transcripts are required. Unofficial transcripts are acceptable at the time of proposal submission. However, once selected official transcripts shall be submitted.)
Be enrolled in a full-time Master's or Doctoral degree program in a STEM-related field no later than September 1 of the academic year for the grant award.
Have a projected degree plan for continuous full-time enrollment equating to the period of performance of the grant award. Candidates shall be no later than in the first academic year of their Master's degree program, or no later than in the second academic year of their doctoral degree program. (Students should not plan to graduate before the end of the period of performance of the grant award.)

A.8.4.2 Degree and/or Field of Study

Fellowships are awarded for graduate studies leading to research-based Master's and Doctoral degrees in a NASA-specific STEM discipline.

A.8.4.3 Institutional Eligibility

Accredited U.S. institutions of higher education, offering graduate level degrees in STEM fields, and having a physical campus located in the U.S. or its territories are eligible for this NOFO.

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

A.8.4.4 Faculty Advisor / PI Eligibility

The PI shall be a tenured or tenure-track faculty member at an eligible accredited U.S. institution (if a tenure system is established). Eligible institutions that do not have a tenure track instead shall submit a letter of commitment to comply with the rule that any proposed change to the PI under the agreement is subject to NASA's advance written 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. The PI shall be a U.S. citizen or a U.S. national on the date of proposal submission. The term "national" refers to native residents of a possession of the United States such as American Samoa.

**A.8.5 Proposal Submission**

The institution's candidate shall be the principal author of the submitted research proposal, except for the impact statement, which is written in collaboration with the faculty advisor. By submitting the proposal for consideration, the institution's candidate and the Faculty Advisor/PI certify that the institution's candidate is the principal author of the proposal.

The NASA civil servants listed in Program Elements of this NOFO as potential Technical Advisors, shall not assist in the development or any formal pre-submission review of specific proposals. This restriction begins on the release date of this NOFO. Additionally, any NASA civil servants who will serve as proposal reviewers for this NOFO shall not "pre-read" any

proposals nor provide letters of support (with exceptions being letters of support relating to the use of NASA resources, see Section A.8.2.3) to an entity/entity that plan(s) to submit a proposal. However, submitters shall contact the potential NASA Technical Advisors (as identified in Section A.8.2.3) for information regarding a review of the work currently being performed in the respective lab. The proposed research idea shall align with the research opportunity listed in the Program Elements and shall be approved by the NASA Technical Advisor for that specific research opportunity.

Proposals that do not comply with these requirements will be deemed ineligible for award.

#### A.8.5.1 Notice of Intent to Propose

Notices of Intent (NOIs) are not required for this solicitation.

#### A.8.5.2 Fellowship Proposal Submission Guidelines

Unless otherwise noted below, all proposals submitted in response to this solicitation shall be in accordance with Chapter 2 Proposal Preparation and Organization and Chapter 3 Proposal Submission of the NASA *Proposer's Guide, Edition: February 2023*. Proposals that do not follow the formatting requirement are subject to rejection during administrative screening.

All proposals shall be submitted via [NSPIRES](#) in electronic format by the institution's Authorized Organization Representative (AOR) by 5PM Eastern Time. Proposals received after this deadline are considered "LATE" and will be deemed ineligible for award. NASA does not pre-approve the submission of late proposals. If a late proposal is submitted, it is within NASA's sole decision to decide whether to accept it. If NSPIRES is available for proposal submissions, the site automatically captures the time the system received the proposal. Proposals submitted later than 5PM Eastern Time on the proposal due date are considered "LATE." The NSPIRES system may prevent the submission of proposals after the deadline. Extensions will not be given to accommodate late or partial submissions. No hard copy proposals will be accepted. Incomplete proposal packages will be deemed non-compliant and ineligible for further review.

Proposers are strongly encouraged to access the NSPIRES electronic proposal submitting system well in advance of the proposal due date. Proposers are also required to coordinate all submission steps with the institution's AOR to ensure timely proposal submissions.

Proposals shall include all the items listed below, appropriately labeled, in the exact order specified below:

1. Proposal Cover Page (including Project Summary, Program Specific Data and Data Management Plan)
2. Impact Statement
3. Faculty Advisor/PI Curriculum Vitae (CV)
4. Project Description
5. Candidate's Degree Program Schedule
6. Candidate's Curriculum Vitae (CV)

7. Personal Statement
8. Candidate’s Transcripts
9. Letters of Recommendation
10. Letter of Support for use of NASA resources

Proposals shall not include extraneous information nor materials that are not specifically requested or outlined in this NOFO. The proposal shall not include any additional information provided by way of links to web pages, 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:

- Standard 8.5" x 11" page size
- 12-point, Times New Roman font
- 10-point font may be used for citations, references, footnotes, figure captions, and text within figures
- 1" margins on all sides
- Single-spaced

A.8.5.3 Proposal Submission Requirements

Refer to Chapter IV Application and Submission Information of [Research Opportunities in Aeronautics \(ROA\) 2023](#).

A.8.5.4 Proposal Submission Checklist

Below is the proposal submission information and checklist.

		<b>Page Limit</b>
☐	<b>NSPIRES Registration Information:</b> The institution shall be registered with NSPIRES through the Electronic Business Point of Contact (EBPOC) listed in the <a href="#">System for Award Management (SAM)</a> database. Step-by-step instructions for proposal submission can be found in <a href="#">NSPIRES</a> in “Other Documents” under the NASA Fellowship Activity.	N/A
	<b>AOR</b> Each registered institution shall have a designated AOR, who shall submit the Institution’s proposal for graduate-level research support.	
	<b>PI</b> The Faculty Advisor (PI) shall be registered in NSPIRES and affiliated with the registered institution. (Please see “NOTE” below if the candidate has not been accepted or has not selected the institution of their choice yet and thus does not have a PI.)	
	<b>Institution’s Candidate</b> The institution’s candidate shall be registered in NSPIRES and activate his/her account.	

	<b>Deadline</b>	<b>Proposal Submission Deadline (See appropriate appendix for each specific program element)</b> Extensions will not be granted to accommodate late proposals or partial proposal submissions.	
<p><b>a). NSPIRES-generated Proposal Cover Page:</b> The cover page to be completed online includes a <b>Project Summary</b> to be titled in the proposal as “Project Summary.” This summary shall be a clear, concise, cohesive paragraph of approximately 1,000 characters. Also, this 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 and Data Management Plan.</p>			
<p>The following elements are not part of the NSPIRES Proposal Cover Page form and shall be combined into a <b>single PDF</b> document and uploaded on NSPIRES for submission.</p>			
	<b>Format</b>	<ul style="list-style-type: none"> <li>• Standard 8.5” x 11” page size</li> <li>• 12-point, Times New Roman font</li> <li>• 10-point font may be used for references, footnotes, figure captions, and text within figures</li> <li>• 1” margins on all sides</li> <li>• Single-spaced</li> </ul>	
<p><b>NOTE: The following elements (b – k) are not part of the NSPIRES Proposal Cover Page and shall be combined into a single PDF document and uploaded on NSPIRES for submission.</b></p> <p><b>b). Impact Statement:</b> This proposal section shall be titled “Impact Statement” and shall be jointly written by the Institution’s candidate and Faculty Advisor (PI).</p> <p>The Impact statement shall address the following:</p>			
	<b>Pages</b>	Shall not exceed two pages in length.	2
	<b>Content</b>	<ol style="list-style-type: none"> <li>1. State the research gap and identify how the candidate’s research proposal addresses the research gap within their STEM field in the scientific literature.</li> <li>2. Discuss the impact of NASA partnership on the institution’s capacity and capabilities.</li> <li>3. Explore the potential for commercialization – possible technology transfer.</li> <li>4. Consider scientific impact of the proposed effort on NASA and the larger scientific society, with a focus on the candidate’s specific field of study.</li> <li>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, the</li> </ol>	

		candidate shall state how their prior experience will enhance the proposed NASA research.	
<b>c). Faculty Advisor/PI Curriculum Vitae (CV)</b>			
	<b>PI</b>	<ul style="list-style-type: none"> <li>• The PI shall be a tenured or tenure-track faculty member at an eligible institution (if a tenure system is established).</li> <li>• Eligible institutions that do not have a tenure track shall submit a letter of commitment to comply with the rule that any proposed change to the PI under the agreement is subject to prior written NASA approval.</li> <li>• 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.</li> </ul>	
	<b>Pages</b>	Shall not exceed three pages in length.	3
	<b>Content</b>	<ol style="list-style-type: none"> <li>1) Name</li> <li>2) Current position</li> <li>3) Title</li> <li>4) Department</li> <li>5) Institution address</li> <li>6) Institution phone number</li> <li>7) Principal publications (within the last three years)</li> <li>8) Relevant career experience</li> <li>9) Research</li> <li>10) Awards</li> <li>11) Scholarships</li> <li>12) Other relevant accomplishments</li> </ol>	
<b>d). Project Description:</b> This proposal section shall be titled "Project Description." This Project Description shall provide a clear description of the candidate's proposed research and shall be written in response to a specific Research Opportunity listed under "Other Documents," and with the support of a NASA Technical Advisor. The Project Description follows the order below and shall contain all the following technical elements:			
	<b>Pages</b>	Shall not exceed six single-spaced pages in length	6
	<b>Content</b>	<ol style="list-style-type: none"> <li>1. Abstract</li> <li>2. A statement of the problem to be addressed</li> <li>3. A description of the science background and relevance to previous work in the field</li> <li>4. General methodology</li> <li>5. Project Schedule / Timeline</li> <li>6. Explanation of new or novel techniques</li> <li>7. Expected results and their significance or application</li> <li>8. Literature citations</li> </ol>	
<b>e). Candidate's Degree Program Schedule:</b> This section shall be titled "Degree Program Schedule," and shall include the following information:			
	<b>Pages</b>	Shall not exceed two pages in length.	2

	<b>Content</b>	1) Proposed start and completion dates. 2) Anticipated candidate degree program milestones, such as candidacy exams.	
<b>f). Candidate's Curriculum Vitae (CV)</b>			
	<b>Pages</b>	Shall not exceed two pages in length.	2
	<b>Content</b>	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	
<b>g). Candidate's Personal Statement:</b> How does graduate school prepare the candidate for a career contributing to the expansion of scientific understanding and the alignment of proposed research with NASA's mission?			
	<b>Pages</b>	Shall not exceed two pages in length.	2
	<b>Content</b>	1. Describe personal motivation to pursue advanced NASA- related STEM research. 2. Include specific examples of any relevant research, class project and/or professional activities in which the candidate has participated. 3. Chronicle STEM graduate school preparation activities and the results. 4. Describe the contributions of the candidate's activity to advancing knowledge in STEM fields, as well as the potential impacts to NASA Missions.	
<b>h). Candidate's Transcripts:</b> Include all undergraduate and graduate transcripts. The candidate shall have a minimum GPA of 3.0 on a 4.0 scale on his or her most recent official transcript. (All college-level transcripts are required, however, only the GPA from the most recent institution is required to be a minimum GPA of 3.0 on a 4.0 scale. While official and unofficial transcripts are acceptable at the time of the application, official transcripts will be required following selection.)			N/A
	<b>Format</b>	Shall be legible and unaltered.	
	<b>Note</b>	Redact the candidate's social security number and date of birth, if they appear on the transcript, prior to submission (These two redactions are the only permitted alterations to a transcript.)	
	<b>Foreign Transcripts</b>	Transcripts from institutions outside of the United States also have the option to be accompanied by an international credential evaluation from a third party, such as, but not limited to, the <a href="#">World Education Services (WES)</a> . Explanatory statements regarding transcripts are optional and shall be used to explain special cases, such as non-English Language transcripts. Adding a simple	



		reference/link to an institution's website in order to explain the credit allocation and conversion of grades to the U.S. system or websites that translate from foreign languages into English is not an explanatory statement since websites may not work. The necessary explanatory text shall be fully contained within the supplemental transcript explanation.	
<b>i). Letters of Recommendation</b>			
	<b>Content</b>	Each institution's candidate shall submit three current letters of recommendation as part of the proposal by the proposal due date on an organization's official letter head.	N/A
	<b>Restrictions</b>	Recommenders shall not be family members of the candidate. If a NASA civil servant or JPL employee provides a Letter of Recommendation for a proposal, then they <b>cannot</b> provide the Letter of Support for that proposal.	
	<b>Details</b>	Each letter shall contain the recommender's contact information. One letter shall be from (and signed by) the candidate's proposed Faculty Advisor/PI on official institution/organization letterhead. It shall include the following information: name and title of the letter writer, department, and institution or organization. <b>It shall include a statement indicating the level of assistance provided to the candidate during the preparation of the project description.</b> (NOTE: If a candidate has not yet been accepted into their institution of choice, then they shall submit a letter of recommendation from his or her current academic advisor.) *The identified PI is not permitted to be a family member. The other two letters shall be written by individuals (e.g., teachers, professors, STEM professionals, advisors, mentors, work supervisors) with detailed knowledge of the candidate's abilities.	
	<b>Requirement</b>	All letters of recommendation for the proposed candidate shall be submitted as part of the proposal by the proposal due date and the letters shall be on the organization's letter head with the recommender's name, title, organization, and contact information.	
<b>j). Letter of Support</b>			N/A
	<b>Technical Advisor</b>	The contributing NASA Technical Advisor shall: (1) be a NASA civil servant; and (2) provide a letter on the organization's letterhead stating his/her support relating to the use of NASA resources. Additionally, the Technical Advisor shall obtain concurrence of support from the Center's Office of STEM Engagement for tasks associated with onboarding and offboarding the fellows.	

	<b>Content</b>	A statement of support shall be included for any research expenses not covered by the research training grant and identified as an in-kind contribution from NASA.	
	<b>Restriction</b>	A NASA civil servant providing a Letter of Support for the proposal <b>cannot</b> also provide a Letter of Recommendation for the proposal. *The identified NASA Technical Advisor should not be related to any proposers on this effort.	

## **A.8.6 Proposal Review and Evaluation Information**

### **A.8.6.1 Proposal Review and Selection**

The evaluation criteria in Chapter IV and Appendix D of the NASA [\*Proposer's Guide\*](#), Edition: February 2023 are superseded by the following criteria.

All eligible proposals will be reviewed by NASA subject matter experts (SMEs) via online 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. The selection process will ensure that reviewers have no conflicts of interest with the submitting institution, the institution's candidate, and/or the proposal team. Reviewers shall be required to sign a nondisclosure/conflict of interest form prior to being granted access to the proposals. NASA technical experts will complete a technical review of proposals and submit their findings and results to the selection officials for final award decisions.

The following criteria shall be used to evaluate proposals: Academic Merit and Distinction, Broader Impact, and Scientific Merit. The weights and a description of these areas are provided below.

#### **Academic Merit and Distinction (30%)**

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 shall analyze the applicant's potential to conduct NASA relevant research based upon the following criteria:

1. The applicant's ability to synthesize and evaluate original thoughts into a clear and concise document;
2. The applicant's previous experiences conducting research and/or desire/potential to conduct research in an authentic lab setting; and
3. The applicant's intrinsic motivation and determination to complete an advanced degree.

#### **Broader Impact (10%)**

Based upon the review of the applicant's "Project Description," reviewers shall analyze the proposed research's potential to benefit society or advance desired societal outcomes. These include activities that are directly related to the specific research projects or activities that are supported by and are complimentary to the project. Examples include participation by an

underrepresented and/or underserved community, enhancement of STEM education and educator development, improved well-being of individuals, increased partnership between academia and industry, and improved national security.

### **Scientific Merit of the Proposed Research (60%)**

Based upon the review of the applicant's Project Description, reviewers shall analyze the quality of the proposed NASA relevant research based upon the following:

1. The proposal's ability to address research gap in the scientific literature;
2. The proposal's ability to clearly describe a collaborative approach to conducting research within NASA;
3. 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; and
4. The proposal's ability to clearly describe the uniqueness of their proposal against the goals described in the Fellowship solicitation.

### **A.8.7 Annual Renewal Process**

The Annual Renewal Process is contingent upon satisfactory progress, as reflected in the academic performance, research progress, recommendation by the faculty advisor, NASA Technical Advisor and the availability of funds. Fellows seeking renewal shall submit a Renewal Application Package to fellowship management and the grant management at the NASA Shared Services Center (NSSC) for each Academic Year. The Renewal Application Package includes the Annual Progress Report that is 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 the Fellow's research and/or degree progression. The submission of the Renewal Application Package is required before the Activity Grants Officer can release funding for additional years. The responsible parties for submitting the documentation for renewals are the Fellow and the PI; this documentation is submitted to fellowship 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.

Grant recipients shall comply with 2 CFR 180.335 and 2 CFR 180.350 of the reporting requirements. In addition to the annual progress report, recipients are also required to submit quarterly and final Federal Financial Reports (SF-425s) per the award terms and conditions (see [\*NASA Grant and Cooperative Agreement Manual\*](#), Appendix D, Section D6, pg. 59) via the HHS Payment Management System.

NOTE: Any changes in academic status shall be reported and submitted with the renewal application. It is the PI's responsibility to ensure that all documents are submitted prior to 5PM ET on June 30 of each Government fiscal year, which runs from October 1 to September 30. Failure to meet this deadline will result in non-renewal of the AAVP Fellowship. Annual

Progress Packages shall be sent to the following email address: [GRC-AAVP-Fellowships@mail.nasa.gov](mailto:GRC-AAVP-Fellowships@mail.nasa.gov)

The Annual Progress Package includes the following:

- Annual Progress Report, Faculty Advisor Evaluation and NASA Technical Advisor Evaluation Form (templates will be provided at least 30 days in advance of the due date);
- Certification of Compliance (PDF Form NF1206) completed by the AOR (Not required if a Certificate of Compliance has been completed at the time of proposal application submission);
- Budget Report (All budgeted items shall be fully justified)

### **A.8.8 Additional Year Extension Process**

Fellows may apply for a one-year extension during their final year of the period of performance, pending availability of Government funds. For Doctoral Fellows, the additional 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. For Master's Fellows, the additional year extension is an opportunity to receive consideration for a revised proposal that describes specific differences from the original proposal.

NOTE:

Those interested in an additional year extension should seek guidance at least 6 months in advance. Proposals based heavily on the need for more time to complete the initially proposed work or the Fellow's graduation date will not be considered.

### **A.8.9 Points of Contact for Further Information**

Please note that the following information is current at the time of publishing. See activity website for any updates to the points of contact.

Proposal Submission Assistance Contact:

NASA Research and Education Support Services (NRESS)

Email: [GRC-AAVP-Fellowships@mail.nasa.gov](mailto:GRC-AAVP-Fellowships@mail.nasa.gov)

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](mailto:nspires-help@nasaprs.com)

NASA Shared Service Center (NSSC):

NSSC Customer Contact Center

1-877-677-2123 (1-877-NSSC123)

Email: [nssc-contactcenter@nasa.gov](mailto:nssc-contactcenter@nasa.gov)

### **A.8.10 Summary of Key Information**

Expected annual program budget for new awards	Between \$0.4M - \$0.6M will be awarded in 2023
Number of new awards pending adequate proposals of merit	8 or more
Maximum duration of awards	2 years for Masters and 4 years for Doctoral student (with a possibility of a one year extension)
Due date for Notice of Intent to propose (NOI)	Not required
Due date for proposals	May 31, 2023, 5PM ET
Award announcement date	Approximately 2 months after the proposal due date
General information and overview of this solicitation	See the <i>Summary of Solicitation</i> in the ROA.
Detailed instructions for the preparation and submission of proposals	See the NASA <a href="#">Proposer's Guide, Edition: February 2023</a>
Page limit for the central Science-Technical-Management section of proposal	See Section 2.7 of the NASA <a href="#">Proposer's Guide, Edition: February 2023</a> and refer to Section A.8.5.4 of this document
Submission medium	Electronic proposal submission is required; no hard copy is required. See also Section IV in the <i>Summary of Solicitation</i> of the ROA and Chapter 3 of the NASA <a href="#">Proposer's Guide, Edition: February 2023</a> .
Web site for submission of proposal via NSPIRES	<a href="http://nspires.nasaprs.com/">http://nspires.nasaprs.com/</a> (help desk available at <a href="mailto:nspires-help@nasaprs.com">nspires-help@nasaprs.com</a> or (202) 479-9376)
Expected award type	Research Training Grant
Funding opportunity number	NNH23ZEA001N-AAVP
NASA technical point of contact concerning this program	Email questions to: <a href="mailto:GRC-AAVP-Fellowships@mail.nasa.gov">GRC-AAVP-Fellowships@mail.nasa.gov</a> Written responses will be provided individually via email, and posted online on NSPIRES Technical POC: Manan A. Vyas Fellowship POC: Tamra K. Ross
NASA Procurement point of contact concerning this program	Steven C. Linn Email: <a href="mailto:steven.c.linn@nasa.gov">steven.c.linn@nasa.gov</a>

**Element One – Advanced Air Transport Technology (AATT) Project**

Award Information

<b>Anticipated Type of Award</b>	Research Training Grant
<b>Number of Years of Support</b>	Proposals seeking Master’s support shall request at least 2 years of support (with a possibility of a one year extension);  Proposals seeking Doctoral support shall request at least 4 years of support (with a possibility of a one-year extension).
<b>Total Funding Estimated Number of Awards</b>	Approximately \$192,000 Fellowship Opportunity anticipates awarding 3 Graduate Research Fellows per fiscal year (FY) under this element, pending the availability of funds.  <b>NOTE:</b> If opportunities for cost sharing become available, this estimate may increase.

Fellowship Opportunities

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
AATT-GRC-001	Innovative Research to Advance the Development of Sustainable Subsonic Transport Aircraft	NASA seeks innovative research endeavors relevant to advancing the development of sustainable subsonic transport aircraft and technologies to meet the goal of the U.S. 2021 Aviation Climate Action Plan to achieve Net-Zero Greenhouse Gas Emissions from the U.S. Aviation Sector by 2050. This includes, but is not limited to, development of technologies in the areas of aerodynamics, propulsion, materials and structures, energy/thermal management, and alternative fuels. Additionally, development of methods and models for systems analysis and systems-of-systems/lifecycle analysis are	Master's/Ph.D.	Technical Advisor Eric Hendricks <a href="mailto:eric.hendricks@nasa.gov">eric.hendricks@nasa.gov</a> 216.433.6612  Co-Technical Advisor Ty Marien <a href="mailto:ty.marien@nasa.gov">ty.marien@nasa.gov</a> 757.864.6139

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		sought to enable evaluation of sustainable aircraft technologies and concepts.		
AATT-GRC-002	Innovative Research to Advance the Development of Engines for Subsonic Commercial Air Transport	NASA seeks innovative research endeavors relevant to the broad scope of enabling technologies for next generation engines for subsonic commercial transport. This includes, but is not limited to, the technical disciplines of Aerodynamics, Fluid Dynamics, and Heat Transfer for Internal Flows, Airbreathing Propulsion, Mathematical Modeling (characterizing the spatial and temporal domains) and associated Computational Fluid Dynamic algorithms (RANS and LES), Energy/Thermal Management, and Fluid-Structure Interactions. The intent is to address key engine technologies for sustainable subsonic commercial air travel.	Master's/Ph.D.	Technical Advisor Sameer Kulkarni <a href="mailto:Sameer.kulkarni@nasa.gov">Sameer.kulkarni@nasa.gov</a> 216.433.6504  Co-Technical Advisor Julia Stephens <a href="mailto:Julia.e.stephens@nasa.gov">Julia.e.stephens@nasa.gov</a> 216.433.8674
AATT-LaRC-003	Active Flow Control for Subsonic Aircraft	NASA seeks research endeavors that integrate active flow control (AFC) for improving the efficiency of commercial transports. To develop the next generation of ultra-efficient commercial vehicles, technologies such as AFC are needed to help in reducing fuel burn. Areas of interest include AFC actuator development, AFC design tool development, closed-loop AFC system development, and experimental and/or computational studies focused on novel AFC concepts for improving vehicle efficiency. This opportunity is recommended for students with an interest in fluid mechanics,	Master's/Ph.D.	Technical Advisor Latunia Melton <a href="mailto:Latunia.p.melton@nasa.gov">Latunia.p.melton@nasa.gov</a> 757.864.1618

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		experimental techniques, and computational fluid dynamics.		



**Element Two – Commercial Supersonic Technology (CST) Project**

Award Information

<b>Anticipated Type of Award</b>	Research Training Grant
<b>Number of Years of Support</b>	Proposals seeking Master’s support shall request at least 2 years of support (with a possibility of a one year extension);  Proposals seeking Doctoral support shall request at least 4 years of support (with a possibility of a one-year extension).
<b>Total Funding Estimated Number of Awards</b>	Approximately \$192,000 Fellowship Opportunity anticipates awarding 3 Graduate Research Fellows per fiscal year (FY) under this element, pending the availability of funds.  <b>NOTE:</b> If opportunities for cost sharing become available, this estimate may increase.

Fellowship Opportunities

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
CST-GRC-001	Innovations in Aeroacoustics for a Quiet Fast Future	NASA seeks innovative research endeavors relevant to aeroacoustics of high-speed aircraft. Predicting and mitigating the noise produced by fans and exhaust jets for high-powered propulsion involves the advanced disciplines of fluid mechanics and acoustics. Skills needed include applied mathematics, scale-resolving computational fluid dynamics including acoustic simulations, experimental techniques, and statistical modeling. Application of skills to real-world problems and ability to learn from prior work to propose creative new solutions is required.	Master's/Ph.D.	Technical Advisor James Bridges <a href="mailto:James.E.Bridges@nasa.gov">James.E.Bridges@nasa.gov</a> 216.433.2693  Co-Technical Advisor David Stephens <a href="mailto:david.stephens@nasa.gov">david.stephens@nasa.gov</a> 216.433.2355

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
CST - LaRC-002	Estimating Sonic Boom Exposure from Supersonic Aircraft Overflight	<p>This opportunity is for acoustics research on estimating sonic boom exposure from community overflight of supersonic aircraft. In order to enable the development of a new generation of civil supersonic aircraft, NASA is pursuing its Quesst mission to gather data on human responses to the sound generated from supersonic overflight, and to deliver that dataset to U.S. and international regulators. To aid in these efforts, research is sought to extend procedures to improve estimations of the sonic booms from new aircraft designs that produce non-traditional, low-noise signatures and to aid in planning of community tests with NASA's X-59 low-boom vehicle. Areas for improvement may include: acoustic propagation through real, complex atmospheres and clouds; noise in the region around the lateral extent of the boom carpet; noise in the focused boom region; and secondary sonic booms (initially propagated upward, but refracted downward by the atmosphere). Application of the improved methodology to the analysis of conceptual aircraft designs and to estimation of community noise exposure through fusing measurements and predictions, including assessment of noise metrics relevant to certification standards development, is also desired. Visualization of the</p>	Master's/Ph.D.	<p>Technical Advisor Alexandra Loubeau <a href="mailto:a.loubeau@nasa.gov">a.loubeau@nasa.gov</a> 757.864.2361</p> <p>Co-Technical Advisor Sriram Rallabhandi <a href="mailto:Sriram.Rallabhandi@nasa.gov">Sriram.Rallabhandi@nasa.gov</a> 757.864.9554</p>

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		phenomena and resulting ground sonic boom noise exposure 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 required.		
CST - LaRC-003	Innovative Research Toward Making Commercial Supersonic Flight a Reality	NASA seeks innovative research proposals to enable efficient and practical commercial supersonic flight. Currently the Commercial Supersonic Technology (CST) project is preparing the necessary tools and procedures to test, fly and collect sonic boom related data from the X-59 low boom flight demonstrator. Knowledge and data from this work will inform the efforts of both national and international regulatory organizations in the development of design and certification standards for future supersonic commercial aircraft. The research proposals being sought are in support of this critical commitment. The CST Project's current focus is on sonic boom prediction and reduction methods. The project's scope includes analysis and design tools for vehicles with low sonic boom and defines the necessary approaches and techniques for objectively assessing the levels of sonic boom acceptable to communities living in the vicinity of future commercial supersonic flight paths. The intent of this call is to	Master's/Ph.D.	<p>Technical Advisor Sriram Rallabhandi <a href="mailto:Sriram.Rallabhandi@nasa.gov">Sriram.Rallabhandi@nasa.gov</a> 757.864.9554</p> <p>Co-Technical Advisor Melissa Carter <a href="mailto:melissa.b.carter@nasa.gov">melissa.b.carter@nasa.gov</a> 757.864.8606</p>

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		<p>address several key aspects which are required to enable practical commercial supersonic flight that are complimentary to existing tools and build upon the research advances that have already been accomplished. These include: application of advanced numerical schemes for solving underlying mathematical models using efficient computational techniques; ability to understand complex mathematical models, develop computational tools and deliver solutions that can be integrated into existing models/tools; application of novel computational methods that can improve the efficiency and robustness of sonic boom prediction and mitigation; and leveraging existing research to propose creative alternate solutions/implementations to supersonic aircraft analysis/design.</p>		

**Element Three – Hypersonic Technology (HT) Project**

Award Information

<b>Anticipated Type of Award</b>	Research Training Grant
<b>Number of Years of Support</b>	Proposals seeking Master’s support shall request at least 2 years of support (with a possibility of a one year extension);  Proposals seeking Doctoral support shall request at least 4 years of support (with a possibility of a one-year extension).
<b>Total Funding Estimated Number of Awards</b>	Approximately \$128,000 Fellowship Opportunity anticipates awarding 2 Graduate Research Fellows per fiscal year (FY) under this element, pending the availability of funds.  <b>NOTE:</b> If opportunities for cost sharing become available, this estimate may increase.

Fellowship Opportunities

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
HTP-GRC-001	Development of High Temperature, Wear-Resistant Coatings for Seals and Thermal Barriers	Future high-speed vehicles will require high temperature, dynamic seals and thermal barriers around movable surfaces to minimize the ingestion of hot gases through sealed interfaces and protect underlying temperature-sensitive structures. The seals must operate in high heat flux, oxidizing environments and restrict the flow of hot gases at extreme temperatures that can exceed 2000 °F. They must be flexible enough to accommodate distorted sealing surfaces while remaining in contact with them to create an effective seal. In some locations, they may also have to limit applied	Master's/Ph.D.	Technical Advisor Patrick Dunlap <a href="mailto:patrick.h.dunlap@nasa.gov">patrick.h.dunlap@nasa.gov</a> 216.433.3017  Co-Technical Advisor Joshua Finkbeiner <a href="mailto:joshua.r.finkbeiner@nasa.gov">joshua.r.finkbeiner@nasa.gov</a> 216.433.6080

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		<p>loads against sealing surfaces that are fragile or covered with protective coatings. The seals must also be sufficiently durable to meet required life goals. They must resist damage as they are rubbed over rough, distorted sealing surfaces without incurring excessive increases in leakage due to wear. In some locations the seals may have to seal against rough thermal protection system (TPS) materials without sticking to their surfaces. High temperature seals and thermal barriers are often fabricated out of flexible, oxide-based ceramic fibers and fabrics, and previous testing has shown that coatings on those materials can improve seal durability. The objective of this opportunity is to identify and/or develop high temperature, wear-resistant coatings for seals and thermal barriers and evaluate their durability under representative operating conditions.</p>		
HTP-GRC-002	Development of High Temperature Elastomer for Use in Seal Applications at 700+°F	<p>Future high-speed vehicles will require high temperature, low leakage seals to minimize the ingestion of hot gases through sealed interfaces and protect underlying temperature-sensitive structures. Low leakage seals such as O-rings are often made of elastomers because these materials exhibit little plastic flow and rapid, nearly complete recovery from an extending or compressing force. However, even the most heat-resistant elastomers have</p>	Master's/Ph.D.	<p>Technical Advisor Patrick Dunlap <a href="mailto:patrick.h.dunlap@nasa.gov">patrick.h.dunlap@nasa.gov</a> 216.433.3017</p> <p>Co-Technical Advisor Joshua Finkbeiner <a href="mailto:joshua.r.finkbeiner@nasa.gov">joshua.r.finkbeiner@nasa.gov</a> 216.433.6080</p>

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		<p>maximum continuous use temperature limits of about 600°F. The objective of this opportunity is to identify and/or develop a high temperature elastomer that can be formed (e.g., molded, extruded) into various seal geometries for use at temperatures of 700°F or greater. Upon successful identification/development of the elastomer, test specimens will be fabricated and evaluated under representative operating conditions.</p>		
HTP-GRC-003	Packaging Materials for Reliable On-Chip Integrated Temperature Silicon Carbide Pressure Sensors	<p>NASA high speed vehicle technology development in hypersonic regime would require robust and reliable pressure and temperature sensors that would support ground and flight experimental tests. These sensors are to be used to validate the computational fluid dynamics codes that are used in the predictive modeling and future production of the flight vehicle. The validation of these codes, and subsequent improvements, would result in the reduction of cost-prohibitive and time-consuming iterative processes that characterize current production of vehicles and related components. NASA Glenn Research Center has demonstrated silicon carbide (SiC) pressure sensors with integrated temperature sensors operational at 800 oC. Further development is underway to extend operation to 1000 oC, which would allow the insertion of these device closer to</p>	Master's/Ph.D.	<p>Technical Advisor Robert Okojie <a href="mailto:robert.s.okojie@nasa.gov">robert.s.okojie@nasa.gov</a> 216.433.6522</p> <p>Co-Technical Advisor</p>

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		<p>the combustion chamber of the vehicle where the prediction models still have high uncertainties. To accomplish this goal, however, requires fundamental research in the following enabling areas: sensor packaging to quantify the level of tolerable parasitic resistance, ohmic contact metallization that is robust and stable at high temperature, and sensor sensitivity characterization to achieve high signal to noise ratio. Among the primary causes of failure is the residual stresses in the thin film metallization that can be observed as tensile or compressive stress driven delamination, cracks, or tears. In addition, temperature induced current conduction within the package also inhibits reliable device performance due to the introduction of undesirable parasitic current transmission paths. These problems are even more severe at the extremities of temperatures where these devices are designed to operate. Prospective candidates can be from electrical engineering, mechanical engineering, chemical engineering, materials science and engineering, applied math and physics, modeling and simulation, etc. Multidisciplinary knowledge in the above areas, and in micro- or nano-electromechanical systems are highly desired.</p>		



NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
HTP-GRC-004	High Temperature (>500 C) Integrated MEMS Temperature/Shear Stress Sensors	<p>Successful mode transitions from low- speed to hypersonic regime is greatly affected by shear forces, shock-shock interactions, and temperature/pressure transients. These states also impact vehicle health and survivability within the prescribed flight window. The quantification of these states by computational fluid dynamic (CFD) models is currently characterized by high degree of uncertainties, particularly at high Mach numbers (&gt;4) and high enthalpy (&gt;600 oC) flows. The lack of robust high temperature (&gt;500 oC) shear stress sensors technology to validate the accuracy of these models is categorized by the hypersonic research community as an existing technology gap. NASA Glenn Research Center has demonstrated MEMS-based 4H-SiC semiconductor piezoresistive pressure/temperature sensors operating at 800 C, thereby making it possible to insert the sensors further into higher temperature sections of test articles without the need for cooling. Similarly, a new boundary layer MEMS shear stress sensor is being actively developed for a wide range of flow speeds and enthalpies. This project is to simulate and implement a silicon carbide shear stress sensor concept that would provide high fidelity quantification of boundary layer frictional forces during ground and</p>	Master's/Ph.D.	<p>Technical Advisor Robert Okojie <a href="mailto:robert.s.okojie@nasa.gov">robert.s.okojie@nasa.gov</a> 216.433.6522</p> <p>Co-Technical Advisor</p>

NASA Center	Opportunity Title	Opportunity Description	Desired Student Academic Level	NASA Technical Advisor and Co-technical Advisor
		<p>flight test experiments. Prospective candidates can be from electrical engineering, mechanical engineering, chemical engineering, materials science and engineering, applied math and physics, modeling and simulation, etc. Multidisciplinary knowledge in the above areas, and in micro- or nano-electromechanical systems are highly desired.</p>		
HTP-LaRC-005	Boundary-layer transition physics relevant to hypersonic flight	<p>Complex flow physics phenomena relevant to boundary-layer transition on hypersonic vehicles (shock-boundary layer interaction, fluid-structure interaction, multi-mode boundary layer transition, receptivity, etc.) can have a negative influence on hypersonic vehicle performance via increased aeroheating, increased drag, boundary layer separation, and decreased control surface effectiveness. Furthermore, these phenomena can create harmful thermal and acoustic loads and increase the uncertainty in the predictions of boundary layer transition and separation. Proposals are invited for experimental investigations focusing on one or more elements of this subject, including a better understanding of the physical mechanisms behind the laminar-turbulent transition process and high-quality experimental measurements. Based on the findings of recent research, the impact of freestream disturbance environment on these phenomena</p>	Master's/Ph.D.	<p>Technical Advisor Rudolph King <a href="mailto:rudolph.a.king@nasa.gov">rudolph.a.king@nasa.gov</a> 757.864.5727</p> <p>Co-Technical Advisor Scott Berry <a href="mailto:scott.a.berry@nasa.gov">scott.a.berry@nasa.gov</a> 757.864.5231</p>

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		is a topic of particular interest. In general, the proposed experimental research should encompass several measurements for an appropriate geometry and setup, providing a comprehensive perspective on the dynamics of important flow features.		
HTP-LaRC-006	Efficient Cavity Flameholders for Ramjet, Dual Mode Scramjet, and Scramjet Applications	In high-speed propulsion applications, characterized by short combustion residence times, cavities are commonly used as flame holding devices that pilot the main combustor flow by supplying heat and species radicals which reduce the ignition delay time when mixed into the main combustor flow. An ideal cavity should be designed to burn robustly over a relevant range of main combustor flow conditions, while simultaneously be as small as possible to minimize combustor size and potentially high heat loads, which would require excessive cooling. The objective of the current opportunity is to identify various physical mechanisms that play a role in how a particular cavity design operates robustly and interacts with the main combustor flow to generate flame holding effect under relevant high-speed flow conditions, AND to utilize this information to propose an approach to the optimal design of a cavity.	Master's/Ph.D.	<p>Technical Advisor Andrew Norris <a href="mailto:Andrew.T.Norris@nasa.gov">Andrew.T.Norris@nasa.gov</a> 757.690.3179</p> <p>Co-Technical Advisor Tom Drozda <a href="mailto:tomasz.g.drozda@nasa.gov">tomasz.g.drozda@nasa.gov</a> 757.864.2298</p>
HTP-LaRC-007	Hypersonic Power and Thermal	Two anticipated challenges for reusable hypersonic vehicles include both thermal management	Master's/Ph.D.	Technical Advisor Erik Axdahl

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	Management Systems	<p>and power generation systems. First, extended duration and reusable hypersonic vehicles will require active thermal management of vehicle components including, but not limited to, the high-speed engine. Second, on board power will need to be generated for an extended period, and hypersonic aircraft may require the use of alternative power generation architectures to make up for the deficit of available power from any on board turbojet or turbofan systems during cruise. Power and thermal management architectures that address these challenges in a synergistic manner represent opportunities for improved system and vehicle efficiencies. The objective of the current activity is to identify novel and feasible approaches for hypersonic power and thermal management systems. Efforts including, but not limited to, fundamental trade studies of new cycles, evaluation and development of working fluids, and hardware demonstration are solicited under this opportunity.</p>		<p><a href="mailto:Erik.L.Axdahl@NASA.gov">Erik.L.Axdahl@NASA.gov</a> 757.864.8318</p>