



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
HEADQUARTERS
SPACE TECHNOLOGY MISSION DIRECTORATE
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**SPACE TECHNOLOGY RESEARCH GRANTS PROGRAM,
NASA SPACE TECHNOLOGY GRADUATE RESEARCH OPPORTUNITIES –
FALL 2020 (NSTGRO20)**

APPENDIX

to

NASA Research Announcement (NRA): Space Technology –
Research, Development, Demonstration, and Infusion 2019
(SpaceTech–REDDI–2019), 80HQTR19NOA01

APPENDIX NUMBER: 80HQTR19NOA01-20NSTGRO-B4

Appendix Issued: September 5, 2019
Proposals Due: November 5, 2019 (6 PM Eastern, 3 PM Pacific)

Catalog of Federal Domestic Assistance (CFDA) Number 43.012

OMB Approval Number 2700-0092

Summary of Key Information

Appendix Name: NASA Space Technology Graduate Research Opportunities – Fall 2020 (NSTGRO20)

Goal/Intent: NSTGRO is focused on graduate student research and development of advanced and innovative space technologies critical for our Nation to meet its goals to explore and understand the Earth, our solar system, and the universe.

Key Dates:

Event	Date
Solicitation release	September 5, 2019
Deadline for submission of proposal	November 5, 2019 at 6 PM ET, 3 PM PT
Selection notification	April 6, 2020 (target)
Deadline for intent to accept	April 27, 2020 (target)
Deadline for submission, by university, of budget with justification and PI CV	May 11, 2020 (target)
Award start date	August 1, 2020 (target)

Points of Contact: See Section 8 – Points of Contact for Inquiries

Summary of Significant Changes:

1. This solicitation – which funds student-developed space technology research projects – replaces the NASA Space Technology Research Fellowships (NSTRF) solicitation. The solicitation has been changed to more accurately reflect the purpose of the resulting grant awards.
2. As an important component of the Agency’s overall space technology portfolio, this annual solicitation is now included as an Appendix to the Space Technology Mission Directorate’s Space Technology Research, Development, Demonstration, and Infusion (SpaceTech–REDDI) solicitation.
3. NSTGRO20 requires university submission of proposals; this is an important change from previous years and requires coordination with both a faculty advisor (who will serve as Principal Investigator on the grant) and an Authorized Organizational Representative of the submitting university. Please see Section 4 – Eligibility Requirements for special instructions for undergraduate students and those not currently in graduate school (i.e., who do not yet know the university where they will be pursuing their graduate studies in fall of 2020).
4. Letters of Recommendation must be included in the single PDF file that is uploaded by the prospective graduate researcher. As a result, Letters of Recommendation are required *at the same* time as all other proposal components; this is a change from NSTRF19. Letters of Recommendation will not be accepted via email and proposal updates to accommodate late letters will not be permitted.
5. GRE reports/scores are not requested and will not be accepted.
6. The ordering of sections has been changed to more closely align with the requirements of the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 CFR 200, Appendix I.

**NASA SPACE TECHNOLOGY GRADUATE RESEARCH OPPORTUNITIES –
Fall 2020 (NSTGRO20)**

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1. Introduction

For the tenth consecutive year, NASA's Space Technology Mission Directorate (STMD) seeks to sponsor U.S. citizen, U.S. national and permanent resident graduate student research that has significant potential to contribute to NASA's goal of creating innovative new space technologies for our Nation's science, exploration, and economic future. The development of advanced and innovative space technologies is critical for our Nation to meet its goals to explore and understand the Earth, our solar system, and the universe. Space technology efforts will improve the Nation's leadership in key research areas, enable far-term capabilities, and motivate disruptive innovations that make science, space travel, space exploration and commercial space more effective, affordable, and sustainable. NASA's pursuit of a suite of revolutionary discoveries will also lead to major breakthroughs that are needed to address energy, health, transportation, and environmental challenges.

This call for graduate student space technology research proposals, titled *NASA Space Technology Graduate Research Opportunities – Fall 2020 (NSTGRO20)*, solicits proposals on behalf individuals pursuing or planning to pursue master's or doctoral (Ph.D.) degrees in relevant space technology disciplines at accredited U.S. universities. NASA Space Technology Graduate Researchers will perform innovative space technology research and will improve America's technological competitiveness by providing the Nation with a pipeline of innovative space technologies.

NASA Space Technology Graduate Researchers will perform research at their respective campuses and at NASA Centers. In addition to their faculty advisor, each recipient will be matched with a technically relevant and community-engaged NASA researcher who will serve as the research collaborator on the award. Through this collaboration, graduate students will be able to take advantage of broader and/or deeper space technology research opportunities directly related to their academic and career objectives, acquire a more detailed understanding of the potential end applications of their space technology efforts, and directly disseminate their research results within the NASA community.

Awards resulting from this solicitation will be made in the form of grants to accredited U.S. universities with the faculty advisor as the Principal Investigator (PI).

The financial and programmatic support for NSTGRO comes from STMD. These awards are a component of the Space Technology Research Grants (STRG) Program (<https://www.nasa.gov/strg#.VQb6T0jJzyE>). STRG seeks to engage the entire spectrum of academic researchers, including graduate students, through four competitive solicitations: NASA Space Technology Graduate Research Opportunities, Early Career Faculty, Early Stage Innovations and Space Technology Research Institutes. The NSTGRO awards, which fund graduate student space technology research, are an integral component of NASA's overall space technology portfolio.

Material further describing STMD and its programs is available at <http://www.nasa.gov/directorates/spacetech/home/index.html>.

Awards are authorized by The National Aeronautics and Space Act of 1958, 51 U.S.C. § 20113(e), as amended, which includes "the preservation of the role of the United States as a leader in aeronautical

and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere.”

2. Program Description - Space Technology Areas of Support

STMD efforts are consistent with NASA’s Mission:

Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and bring new knowledge and opportunities back to Earth. Support growth of the Nation’s economy in space and aeronautics, increase understanding of the universe and our place in it, work with industry to improve America’s aerospace technologies, and advance American leadership.

More specifically, NASA’s space technology efforts can be defined as the orderly pursuit of the following objective:

Develop and transfer revolutionary technologies to enable exploration capabilities for NASA and the Nation.

(NASA’s Vision, Mission and Strategic Goals and Objectives can be found in the 2018 NASA Strategic Plan, available at https://www.nasa.gov/sites/default/files/atoms/files/nasa_2018_strategic_plan.pdf.)

In support of this goal, STMD is interested in attracting outstanding graduate student researchers who are committed to developing **innovative technologies** for the aerospace sector and to being part of the Nation’s technological future by working on high-priority technologies to sustainably explore space.

With this solicitation, NASA is seeking to support low TRL **space technology** research and development; TRL definitions may be found here:

https://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_7123_001B_&page_name=AppendixE. It should be noted that NSTGRO is specifically aimed at **space technology** and is intended to complement other NASA opportunities (e.g., the Science Mission Directorate’s opportunity for graduate student researchers). **This solicitation does not seek Project Narratives focused on space or biological science. Project Narratives must be specifically focused on low TRL space technology; Project Narratives which are focused on science investigations to inform technology development or the use of existing technologies to conduct science investigations will be deemed non-compliant and will not be submitted for review.**

NASA has developed a set of Technology Roadmaps in order to facilitate the development and demonstration of space technologies that address the needs of exploration systems, Earth and space science, and space operations mission areas, as well as those that contribute to critical national and commercial needs (<http://www.nasa.gov/offices/oct/home/roadmaps/index.html>). Each of these roadmaps focuses on a technology area.

Note: There are banners on every Technology Roadmap page referring to a Technology Taxonomy which NASA has developed. Links to this taxonomy will be activated on October 1, 2019. For the purposes of

this solicitation, any references to or links associated with the taxonomy *should be ignored*. Proposals submitted to the NSTGRO20 solicitation are *required* to use the 2015 Technology Roadmaps.

The proposed space technology must be responsive to one of the 2015 Technology Roadmap documents listed below by title. Please note that TA15 (Aeronautics) is not included in this solicitation.

- TA01 Launch Propulsion Systems
- TA02 In-Space Propulsion Technologies
- TA03 Space Power and Energy Storage
- TA04 Robotics and Autonomous Systems
- TA05 Communication, Navigation, and Orbital Debris Tracking and Characterization Systems
- TA06 Human Health, Life Support, and Habitation Systems
Note: Students responding to sections of this roadmap are reminded that the focus of the Project Narrative must be space technology development.
- TA07 Human Exploration Destination Systems
- TA08 Science Instruments, Observatories, and Sensor Systems
Note: Students responding to sections of this roadmap are reminded that the focus of the Project Narrative must be space technology development.
- TA09 Entry, Descent, and Landing Systems
- TA10 Nanotechnology
- TA11 Modeling, Simulation, Information Technology and Processing
- TA12 Materials, Structures, Mechanical Systems, and Manufacturing
- TA13 Ground and Launch Systems
- TA14 Thermal Management Systems

The technology roadmaps have an accompanying Technology Area Breakdown Structure (TABS). The TABS, down to three levels and the links to all roadmap documents are provided in the *NSTGRO20 TABS.pdf* file under “Other Documents” on the NSPIRES (NASA Solicitation and Proposal Integrated Review and Evaluation System) webpage associated with the NSTGRO20 solicitation. Each proposal is required to identify, in response to Program Specific Data Question #1, the TABS element, at the second level (level 2), the student deems is most closely associated with the research project described in the Project Narrative. The proposal will also be required to provide justification for the level 2 TABS selection (Program Specific Data Question #2). **The TABS element title alone may be insufficient to understand the scope of a level 2 area**; each TABS must be considered within the context of its associated overall roadmap. Note that although certain technologies described in the roadmaps are not linked to any current NASA design reference missions, they are not excluded from NSTGRO20 due to the low TRL nature of the solicitation.

3. Federal Award Information

Awards resulting from this solicitation are planned to coincide with the start of the 2020 academic year and are subject to the availability of appropriated funds. Under the predecessor NASA Space Technology Research Fellowships (NSTRF) solicitation, NASA made 65, 56 and 64 new grant awards as a result of the

last three solicitation cycles (NSTRF19, NSTRF18 and NSTRF17, respectively). NASA expects to make a similar number of new NSTGRO awards, pending the receipt of highly meritorious proposals.

A NASA Space Technology Graduate Researcher is expected to engage in grant activities full-time. NSTGRO awards are multi-year awards and may be continued as follows:

- A graduate researcher receiving master's degree support (see Master's Support profile in Section 4 – Eligibility Requirements) may be continued for no more than one additional year. Please see applicable considerations below.
- A graduate researcher receiving doctoral degree support (see various profile options in Section 4 – Eligibility Requirements) may be continued for no more than three additional years, provided that none of the special considerations specified below applies.

Continuations are contingent upon satisfactory progress (as reflected in academic performance, research progress, recommendation by the faculty advisor (PI on the grant), and recommendation by the NASA Center research collaborator) and the availability of funds. This solicitation covers only proposals for new awards; continuations of existing awards are handled separately.

Special consideration 1: Four years is the maximum amount of time a student may receive support from NSTGRO/NSTRF. A student who received or is receiving master's degree support as a NASA Space Technology Research Fellow may formally (i.e., not via the continuation process) have a proposal submitted on their behalf, if eligible, to the NSTGRO20 solicitation for doctoral support; however, the maximum number of years of doctoral support will be adjusted by the year(s) of NSTRF master's support already received.

Special consideration 2: Proposals seeking master's degree support must request either 1, 1.5, or 2 years of support, *starting* with the fall of 2020. Therefore, students must be supported by the NSTGRO grant through at least July of 2021, and the visiting technologist experience (see below) must be addressed.

Special consideration 3: Proposals seeking doctoral support must request at least 2 years of support (i.e., graduation on or after August of 2022); proposals requesting fewer than 2 years of doctoral support will not be considered.

Special consideration 4: Since NSTGRO awards are considered full-time and provide allowances for stipend, conference attendance, laboratory supplies, tuition and fees, etc., students who are current or former recipients of a graduate federal fellowship or scholarship may not be eligible for the full years of support generally associated with NSTGRO. Specifically, if the proposal is selected, the maximum number of years of federal fellowship or scholarship support plus the *requested* years of NSTGRO support may total no more than five. Program Specific Data Questions #7 and #8 request information related to ongoing or previous federal fellowship/scholarship support.

Note: Graduate Researchers may request an *unpaid* leave of absence (LOA) for the purpose of incorporating professional development opportunities into their graduate programs. The maximum duration of an LOA period is 3 months; up to two LOA periods may be requested over the course of the NSTGRO award. An LOA may not be requested during the first year of the award. An LOA opportunity

must be in direct furtherance of the Graduate Researcher's research and career goals, and the request must be submitted with the concurrence of the faculty advisor (PI on the grant). The LOA request and a revised budget that reflects the LOA period must be approved by NASA; time spent on an LOA may be added to the regular end date of the overall award.

Visiting Technologist Experience - NASA Space Technology Graduate Researchers will perform research at their respective campuses and at NASA Centers. The visiting technologist experience is an integral component of an NSTGRO award. Through this experience, NSTGRO graduate researchers will have the opportunity to work collaboratively with leading engineers and scientists in their chosen area of research; they will be able to take advantage of broader and/or deeper space technology research opportunities directly related to their academic and career objectives, acquire a more detailed understanding of the potential end applications of their space technology efforts, and directly disseminate their research results within the NASA technical community.

Ten weeks per year is the target duration, though the actual weeks chosen (number and timeframe during the year) will depend upon the student, their faculty advisor, and the NASA research collaborator. The visiting technologist experience must be in direct furtherance of the graduate student's research and career objectives. Because experts in a specific technology area are typically located at multiple NASA Centers, multi-year NASA Space Technology Graduate Researchers are permitted to conduct visiting technologist experiences at multiple locations. Visiting technologist experiences are coordinated with the NASA research collaborator and approved by the Program; visiting technologist experiences at non-profit R&D laboratories and other government agencies are possible with prior Program approval. It is the Program's intent to offer maximum flexibility in the execution of this grant requirement.

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

Research Collaborator - A single research collaborator will be assigned to each award for the duration of the grant; this research collaborator will serve as the conduit into the broader technical community associated with the NASA Space Technology Graduate Researcher's research. The Graduate Researcher will have the opportunity to conduct visiting technologists experiences co-located with their research collaborator and at other NASA Centers.

Successful NSTGRO20 proposals will result in grant awards. The maximum amount of an NSTGRO grant issued as a result of this solicitation will be \$80,000 per year. Not-to-exceed values in each category are provided in the table below. Not all awards will require the maximum amount per year.

Table 1. NSTGRO20 Budget Categories

Category	Maximum value (annual)
Student Stipend	\$36,000
Faculty Advisor Allowance	\$11,000
Visiting Technologist Experience Allowance	\$10,000
Health Insurance Allowance	\$2,500
Tuition and Fees Allowance	\$20,500
TOTAL	\$80,000

The NSTGRO budget categories are explained below.

1. **Student Stipend:** It is expected that the student will receive the maximum value, without deductions. Stipend payments may not be reduced by items that the university would normally consider indirect costs or fringe benefits. Stipends are assumed to be for student personal expenses and are not intended for supporting research expenses. The stipend value assumes a 12-month tenure and should be prorated for shorter periods.
2. **Faculty Advisor Allowance:** To be used to directly enhance the Graduate Researcher's experience. May be used to cover student travel to technical and scientific meetings; it is expected that the Graduate Researcher will attend at least one technical conference annually for presentation of the work being conducted under the grant. Other permissible charges in this category include expendable laboratory supplies, lab books, page charges for journal articles, printing of a thesis, and similar charges. Faculty advisor time and travel in direct support of the NASA Space Technology Graduate Researcher are permitted. This allowance may not be used to supplement the student stipend.
3. **Visiting Technologist Experience Allowance:** This allowance is to allay costs associated with temporarily relocating to a NASA Center (or, with prior Program approval, a nonprofit R&D laboratory location) that represents a strong technical fit with the research being performed on the grant. It may be used ONLY in preparation for the experience (e.g., trips prior to and in preparation for the actual visiting technologist experience) and the student's relocation and living expenses associated with the actual experience.
4. **Health Insurance Allowance:** Permissible up to maximum value, only to the level of the expected actual premium amount.
5. **Tuition and Fees Allowance:** Permissible up to maximum value. While the student is a NASA Space Technology Graduate Researcher, the university must exempt the student from paying the difference between the tuition and fees allowance and the actual tuition and fees.

The NSTGRO grant does not provide university overhead. As per 2 CFR 200.75, NASA does not permit indirect costs on participant support costs such as stipends or subsistence allowances, travel allowances, registration fees, etc.

Equipment, including computers, may NOT be purchased with NSTGRO funds.

The transfer of funds between budget categories is not permitted, except in limited instances. For example, a portion of the Faculty Advisor Allowance may be used to supplement health insurance or tuition and fees, provided that the requirements of the Faculty Advisor Allowance have been met.

A grant start date between August 1, 2020, and September 15, 2020, is required; pre-award costs (i.e., expenses prior to the grant start date) are not authorized. The specific start date should be requested as part of the NSPIRES Proposal Cover Pages. The start date should reflect the desired start date, within the window provided, that best aligns with the university's academic calendar. The end date is the date the student expects to complete their degree program (i.e., end of NSTGRO funding), subject to the maximum year limitations specified above.

4. Eligibility Requirements

This NSTGRO call for graduate research proposals seeks to fund space technology research projects from students pursuing (or planning to pursue) master's or doctoral degrees relevant to space technology. A proposal which fails to meet one or more of the requirements described in this solicitation will be deemed non-compliant and not be sent on for review.

Only one proposal may be submitted on behalf of a student in response to this solicitation. The proposal must be submitted by an accredited U.S. university unless one of the following two conditions applies. If the individual seeking support (1) is currently an undergraduate and does not know which accredited U.S. university they will be attending in the fall of 2020 *or* (2) is currently not enrolled as either an undergraduate or graduate student and does not know which accredited U.S. university they will be attending in the fall of 2020, the NSTGRO Proposal Submission Office will submit the proposal on their behalf (see Section 5 – Proposal Procedures). In the event that the proposal is selected, the proposal will be transferred, in NSPIRES, to their chosen graduate university. Justification for proposal submission by the NSTGRO Proposal Submission Office must be provided in response to Program Specific Data Question #11; failure to provide adequate justification may result in the proposal being deemed non-compliant and not being sent on for review. If the individual seeking support is currently enrolled in graduate school and is planning to change universities, it is expected that the fall 2020 university will submit the proposal on the student's behalf; the student should contact the Program (see Section 8 - Points of Contact for Inquiries) if this is not possible.

There is no limit on the number of proposals that may be submitted by an accredited U.S. university, and more than one proposal may be submitted to this solicitation with the same PI. Duplicate proposals (i.e., the same or very similar project description but different graduate student researchers) is in

violation of the requirements of the solicitation (see Section 5 – Proposal Procedures); all such proposals will be deemed non-compliant and will not be sent on for review.

This solicitation seeks proposals on behalf of students who meet the following eligibility requirements:

- Pursuing or seeking to pursue advanced degrees directly related to space technology -- only technical degrees are permitted (i.e., not degrees in policy or management). Students who are or will be enrolled in a joint or dual professional degree/PhD program are not eligible nor are students who are on leave from such a program or a professional degree program.
- U.S. citizens, U.S. nationals or permanent resident aliens of the U.S. (at the time of proposal submission). The term "nationals" refers to native residents of a possession of the United States such as American Samoa.
- Have or will have a bachelor's degree prior to the fall 2020 term
- Are or will be enrolled in a full-time master's or doctoral degree program at an accredited U.S. university – which, in general, is also the university submitting the proposal (specific exceptions are identified above) – in fall 2020 (awards may not be deferred)
- Meet one of the eligibility profiles described in *Table 2. NSTGRO20 Eligibility Profiles* below
- If seeking support in pursuit of a master's degree, require at least 1 full year of support from fall 2020 (see special consideration #2 in Section 3 – Federal Award Information)
- If seeking support in pursuit of a doctoral degree, require at least 2 full years of support from fall 2020 (see special consideration #3 in Section 3 – Federal Award Information)

Students with disabilities and/or from underrepresented minority groups are urged to have proposals submitted on their behalf. No student shall be denied consideration as a NASA Space Technology Graduate Researcher on the grounds of race, color, age, ethnicity, religion, sexual orientation, gender identity, sex, marital status, disability or status as a U.S. veteran.

The above requirements (including the table of eligibility profiles) reflect NASA's desire to maximize the potential for infusion of the university-developed space technology through sustained interaction with the graduate researcher and the faculty advisor (PI on the grant). In general, students seeking master's support who have completed any technical graduate terms and students seeking doctoral support who have completed three or more years of graduate studies (as of October 1, 2019) are not eligible to propose. As part of the Program Specific Data Questions (#24 - #27), students will be asked to identify and justify their eligibility in terms of one of the following seven profiles (see *Table 2. NSTGRO20 Eligibility Profiles*):

Table 2. NSTGRO20 Eligibility Profiles

Profile Title	Description
Master's Support	<ul style="list-style-type: none"> Seeking support for a master's degree Will have completed one year or less of graduate studies by the start of the fall 2020 term Holds no technical graduate degree
<p>Note: Eligible students who have the goal of receiving a doctoral degree should request "Doctoral" support, even if their university requires them to obtain a master's degree first; the proposal submitted must cover the entire intended period of study with a single, continuous research topic.</p>	
Doctoral Support 1	<ul style="list-style-type: none"> Seeking support for a doctoral degree Is currently an undergraduate
Doctoral Support 2	<ul style="list-style-type: none"> Seeking support for a doctoral degree Holds a bachelor's degree Holds no technical graduate degree as of October 1, 2019 Has completed less than one year of technical graduate studies as of October 1, 2019
Doctoral Support 3	<ul style="list-style-type: none"> Seeking support for a doctoral degree Holds no technical graduate degree as of October 1, 2019 Will be receiving master's degree prior to the fall 2020 term (fall 2019 or spring 2020) Will have spent less than 2.5 years in pursuit of the master's degree Proposed doctoral research topic is <u>substantially different</u> from master's research <p>Note: Research extensions (e.g., computational work to complement experimental work) are not considered "substantially different." Research topic changes are often accompanied by academic department changes, although this is not required. Failure to provide a clear justification may render the student ineligible. For cases where the master's degree is simply a milestone in a doctoral program, please refer to Doctoral Support 6.</p>
Doctoral Support 4	<ul style="list-style-type: none"> Seeking support for a doctoral degree Holds a joint BS/MS degree which is clearly indicated on transcript Has completed less than two years of post BS/MS degree graduate studies as of October 1, 2019
Doctoral Support 5	<ul style="list-style-type: none"> Seeking support for a doctoral degree Holds one technical graduate degree (at the master's level) as of October 1, 2019 Transcript clearly indicates that a master's degree has been conferred Spent less than 2.5 years in pursuit of the master's degree Has completed less than one year of graduate studies beyond the master's degree as of October 1, 2019, OR, if the student had one year or more hiatus from graduate studies since completion of the master's degree, will have completed two years or less of post-master's graduate studies by the start of the fall 2020 term Doctoral research topic is <u>substantially different</u> from master's research <p>Note: Research extensions (e.g., computational work to complement experimental work) are not considered "substantially different." Research topic changes are often accompanied by academic department changes, although this is not required. Failure to provide a clear justification may render the student ineligible. For cases where the master's degree was simply a milestone in a doctoral program, please refer to Doctoral Support 6.</p>
Doctoral Support 6	<ul style="list-style-type: none"> Seeking support for a doctoral degree Holds no technical graduate degree as of October 1, 2019 Has completed less than three years of graduate studies as of October 1, 2019 <p>Note: This profile is intended for cases where the student has been in steady pursuit of a doctoral degree and this represents their only graduate studies since receiving a bachelor's degree. Students holding a joint BS/MS degree are not eligible under this Profile.</p>

Notes for all profiles:

1. All post-bachelor's degree studies must be counted.

2. Time spent away from campus participating in technical internships must be included in the time spent in graduate school.
3. The student's specific classification by the university (e.g., master's student or doctoral student) is not relevant to eligibility determination.
4. It is not necessary for the student to have commenced with graduate studies immediately following the receipt of the bachelor's degree.

Students who have participated or are participating in joint BS/MS programs may be eligible to have proposals submitted on their behalf. Please note that the joint BS/MS degree must be conferred prior to the fall 2020 term. Proposals in this category may not request master's degree support and, if eligible, may only propose under Profile 3 or Profile 4.

Students who have been or are enrolled on a part-time basis may also be eligible to have proposals submitted on their behalf; the justification provided in the response to Program Specific Data Question #25 should compare their progress to-date with typical graduate student progress in the time interval cited in the selected profile. For example, students who have completed three courses over three years, following the receipt of a master's degree (in a substantially different research area), meet the requirements of the Doctoral Support 5 profile since they have completed less than the equivalent of one year of graduate studies beyond the master's degree.

Proposals requesting doctoral support under NSTGRO20 will not be considered compliant if the student requested doctoral support under two NSTRF solicitations; this restriction is addressed by Program Specific Data Question #12. The restriction is relaxed if one of the proposals for doctoral support was made while the student was an undergraduate; in those cases, if the student is otherwise eligible, doctoral support may be requested a third time under this NSTGRO solicitation. Students holding joint BS/MS degrees may propose, provided they are eligible and proposed to no more than one NSTRF solicitation.

An NSTGRO recipient is expected to engage in their grant activities full-time. A NASA Space Technology Graduate Researcher may not concurrently be supported by an NSTGRO award and also be the recipient of a federal graduate fellowship (see Section 3 – Federal Award Information). In addition, if selected under NSTGRO, students who are or were recipients of a federal fellowship or scholarship may be supported by an NSTGRO grant for the number of years that brings the total number of years of support to no more than five.

Students who are currently participating in the NASA Pathways Program are eligible to have proposals submitted on their behalf. If the proposal is selected, both Pathways and NSTGRO approval are required (i.e., must demonstrate the ability to meet the requirements of both) prior to accepting NSTGRO. Note that, for current Pathways participants, the Project Narrative must be distinct from the Pathways assignment(s).

5. Proposal Procedures

All proposals must be electronically submitted via NSPIRES by an Authorized Organizational Representative (AOR) of the university where the student will be enrolled in the fall of 2020, unless the university is unknown (i.e., the individual seeking support is currently an undergraduate and does not know which accredited U.S. university they will be attending in the fall of 2020 or is currently not enrolled as either an undergraduate or graduate student and does not know which accredited U.S. university they will be attending in the fall of 2020 – See Section 4 – Eligibility Requirements). If the fall 2020 university is unknown, the individual may request that the NSTGRO Proposal Submission Office submit a proposal on their behalf.

The prospective NASA Space Technology Graduate Researcher must be the primary architect and author of the submitted proposal, with minimal assistance from other researchers such as current/prospective faculty advisors, mentors, or collaborators. By having the proposal submitted for consideration, the student and PI, if applicable, certify that the student was the principal author of the proposal.

A proposal that is so similar to one previously submitted as to indicate a lack of originality (unless it is submitted on behalf of a student who proposed to a previous solicitation and is still eligible and prepared a revision of their own previously submitted proposal), may be deemed non-compliant.

No mail-in materials will be accepted. Detailed instructions for submitting electronic proposals are located at <http://nspires.nasaprs.com>:

1. Click on “Solicitations,”
2. Click on “Open Solicitations,”
3. Select the **NASA Space Technology Graduate Research Opportunities - Fall 2020 (NSTGRO20)** announcement, and
4. Then select *NSTGRO20 Proposal Submission Instructions.pdf* under “Other Documents.”

Proposal Submission Deadline: 6 PM ET (3 PM PT), November 5, 2019. Please note that no extensions will be granted to accommodate either late or partial submissions. Except in limited circumstances (see above and Section 4 – Eligibility Requirements, paragraph 2), proposal submission by a university AOR is required. Note that NSPIRES submission requires appropriate registration by the submitting organization. For detailed information, please see Section 4.2 of the SpaceTech-REDDI-2019 NASA Research Announcement (accessible from the NSTGRO20 NSPIRES webpage).

Prospective Graduate Researchers and their faculty advisors (PIs on the grants) are urged to access the NSPIRES electronic proposal system well in advance of the proposal due date to familiarize themselves with its structure and to enter the requested information. In addition, they are responsible for ensuring AOR availability prior to the deadline indicated above. See submission instructions for full details.

Proposals must include items 1-7 described below, appropriately labeled and in the exact order specified. A summary table follows; please use the checklist in the *NSTGRO20 Proposal Submission Instructions* to ensure that all of the required components have been assembled/submitted per the

requirements of the solicitation. Only the items in Table 3 below will be considered. Non-compliant proposals will not be submitted for review. *Please note the page limits – pages in excess of the published limits will be removed prior to proposal review.*

Table 3. Summary of Proposal Components

Component	Page Limit	Notes
Submitted by student via NSPIRES		
1 – Proposal Cover Pages (which includes responses to the Program Specific Data Questions)	N/A	Completed online (pages are generated by NSPIRES once responses have been completed)
2 – Personal Statement	2 pages	Part of single PDF
3 – Project Narrative	5 pages – graphics/tables/figures included in limit – references not included in limit	Part of single PDF
4 – Degree Program Schedule	1 page	Part of single PDF
5 – Curriculum Vitae (CV) of the student	2 pages (see note below regarding publications/ presentations)	Part of single PDF
6 – Transcripts	N/A	Part of single PDF
7 – Three Letters of Recommendation	2 pages per Letter	Part of single PDF

1. **Proposal Cover Pages** (NSPIRES-generated). The Cover Pages, to be completed online, include a proposal summary/abstract and responses to the NSTGRO20 Program Specific Data Questions; these questions are provided, for informational purposes, in the Appendix. The proposal summary should be 100-300 words long, focused on the Project Narrative, and understandable to a non-expert. The Proposal Cover Pages are part of the proposal and must be completed by the proposal deadline.

Due to the number of questions and the level of detail required for some answers, it is recommended that the student and PI (Proposal Specific Data Question #4) complete the Program Specific Data Questions well in advance of the proposal deadline.

Please Note: The following required proposal elements (2-7) are not part of the NSPIRES Proposal Cover Pages and must be combined into a single PDF document and uploaded to the NSPIRES site for submission.

2. **Personal Statement.** The student should use the Personal Statement to explain their academic, research, and career goals as they relate to space technology. The Personal Statement may not exceed two pages in length (using 12-point font with at least 1-inch margins on all sides). This section of the proposal must be clearly labeled as “Personal Statement.”

The Personal Statement should

- Describe how the proposed course of study and research will help in achieving their academic, research, and career goals as they relate to space technology. Discuss the rationale for attending their graduate university or, if undecided, the rationale for applying to the universities given in response to Program Specific Data Questions #31-#33.
 - Speak to their leadership and collaborative potential, ability to communicate, and potential for investigation and engagement in space technology problems and their solutions.
 - Include any background information the student believes is pertinent and provides insight into why they have chosen the project goals set forth in this proposal; the origin of, the student’s connection to, and the motivation for the research project proposed in the Project Narrative should be made clear.
 - If applicable, provide explanations for poor grades that may appear on the submitted transcript(s); all graduate grades of B- or lower must be addressed. Note: It is also permissible for poor grades in key courses (graduate and/or undergraduate) to be addressed in a Letter of Recommendation.
3. **Project Narrative.** This section of the proposal must be titled “Project Narrative: <Proposal Title>” and may total no more than **five single-spaced pages** (using 12-point font with at least 1-inch margins on all sides), not including the references or bibliography. Graphics/figures/tables are permitted/encouraged and count towards the five-page limit; figure captions (which may use 8- or 10-point font) must include the citation unless depicting the student’s own unpublished work. The Project Narrative should reflect the student’s ability to think independently and creatively, as well as their ability to write about research plans accurately, thoughtfully, and concisely. The level of specificity provided in this section is expected to vary with the student’s current educational level and degree for which they are seeking NSTGRO support (as described in *Table 2. NSTGRO20 Eligibility Profiles* in Section 4 – Eligibility Requirements). A student who has already completed two or more years of graduate study is expected to provide a more detailed research plan than a student who is currently an undergraduate or first year graduate student.

The Project Narrative must provide a description of the student’s research plans. It is understood that a student’s research objectives may evolve as they progress in their graduate research (this is

the nature of low TRL research), particularly for students in the early stages of their graduate careers. However, each NASA Space Technology Graduate Researcher is expected to pursue the space technology research described in the submitted Project Narrative. The Project Narrative should identify and discuss the innovation of the proposed research and the relevance of the proposed research to space technology and to the TABS element selected, citing the Technology Roadmaps, as appropriate.

The research should be discussed in sufficient detail for an expert who is technically competent in the appropriate technology area to judge the student's understanding, relative to their educational level, of the questions to be addressed. Appropriate detail includes a well-defined problem with justification, approaches to be employed in answering the questions, space technology relevance and benefits of the proposed research, and anticipated accomplishments and major milestones commensurate with the years of support requested. Students requesting support under Doctoral Support 6, in particular, should provide detail on their dissertation topic and expected results of their research; these students should demonstrate a clear understanding of how their proposed project relates to key research on their chosen topic.

The Program is seeking the best low TRL space technology research ideas from graduate student researchers; **this solicitation does not seek NASA-developed ideas for space technology research projects.** Projects that are inspired by and extend NASA-developed ideas must clearly articulate how the proposed work differs from the NASA research.

A pre-existing collaboration with a NASA Center (including JPL) is not required or expected for a successful proposal. In cases where an existing NASA collaboration exists, the proposal must articulate how the proposed effort differs from the ongoing work, and the student's unique contributions must be clear.

In cases where the student is (or will be) a member of a research team, either at their university and/or involving multiple universities and/or other entities, they should precisely articulate their planned contributions to the overall project.

Finally, the Project Narrative must discuss why the visiting technologist experience would be an important component of the student's plans. The student may, but is not required to, indicate a specific NASA Center for consideration by the Program (based on research interests, and with contact information if available/desired). Students may not assume the availability of NASA facilities in the conduct of their research.

Please note that research collaborator identification and assignment are separate internal NASA processes that are performed outside of this solicitation. In fact, **the student should not pre-arrange a research collaborator or visiting technologist experiences.** The NASA Space Technology Research Grants Program will consider existing/ongoing collaborations during the research collaborator selection process, but cannot be bound by them. NSTGRO grants are not intended to serve as additional sources of funding for existing collaborations.

4. ***Degree Program Schedule.*** This section of the proposal is a year-by-year schedule stating the proposed start and completion dates and anticipated *academic degree program* and *research milestones*; research milestones should be discussed as part of the Project Narrative. It should include planned coursework; coursework is considered to be a means of acquiring the expertise necessary to conduct the proposed space technology research project. This section must be entitled “Degree Program Schedule” and may not exceed one page (there is no standard format).

5. ***Curriculum Vitae (CV) of the student.*** The CV may be up to two pages, plus an optional publications/presentations page, and should address the following:
 - Academic degree(s) they have received or expect to receive in the near future, including the dates, discipline(s), and institution(s).
 - Relevant (to this proposal) experiences with dates and a short description of responsibilities, listing the most recent positions first and the name and city/state of each employer. These relevant experiences could include, but are not limited to, paid employment, military service, research assistantships, internships, special studies, volunteer work, etc.
 - Honors and awards
 - Technical/scientific publications and presentations, if any.
 - If the student has no relevant publications or presentations, that should be stated.
 - Presentations should include the title, date of presentation, type of presentation (e.g., oral or poster), and name of meeting or conference.
 - If publications and presentations are numerous, a third page is permissible. Only technical/scientific publications and presentations may appear on the third page of the CV.

6. ***Transcripts.*** Electronic versions of *up-to-date* official or unofficial transcripts that cover the student’s entire college career, undergraduate and graduate, should be included as part of the single pdf file; scanned versions of paper copies (official and unofficial) are also permitted. Transcripts must show courses grouped by term/semester. Transcripts should be legible and clearly unaltered. The name of the university must appear on the transcript. If all or part of the student’s social security number and/or complete date of birth appear on the transcript, these items must be blocked out prior to submission. These are the only alterations permitted to a transcript. Note that degree audit reports or similar documents will not be accepted.

7. ***Letters of Recommendation.*** The Letters of Recommendation constitute a critical component of the proposal. They should come from individuals (professors, undergraduate/graduate advisors, mentors, internship or work supervisors, etc.) with detailed knowledge of the student’s academic and research abilities. Letters from family members are not permitted.

Each student must arrange for inclusion of three current Letters of Recommendation. Failure to submit three Letters of Recommendation may negatively affect the evaluation of the proposal (see Section 6 – Proposal Review Information). Proposals with fewer than two Letters of Recommendation will be deemed non-compliant and not sent on for review.

NOTE: For students who have submitted proposals to recent NSTRF solicitations, please note that the Letters must now be included as part of single PDF file. This means that LORs must be collected, by the student, well in advance of the proposal submission deadline to allow time for inclusion in the single PDF file. Proposals may not be updated after the submission deadline to include late Letters. NASA will not accept LORs via email.

If the student has an advisor for their current graduate program, one of the Letters of Recommendation is expected to come from that individual.

The student is strongly advised to provide the guidelines below to each individual writing a Letter. These guidelines, and also some background information, are provided in a PDF file (*NSTGRO20 LOR Guidelines.pdf*) under “Other Documents” on the NSPIRES webpage associated with the NSTGRO20 solicitation. Letters shall not be written by the student. Letter Writers should be approached early in the proposal process (i.e., well in advance of the deadline) and reminded periodically.

Instructions for Writing NSTGRO20 Letters of Recommendation:

Note: A Letter of Recommendation from a NASA civil servant or Jet Propulsion Laboratory (JPL) employee is not required or expected for a successful proposal. There may be instances where a Letter of Recommendation from a NASA civil servant, JPL employee, or on- or near-site NASA contractor is appropriate (i.e., the student completed an internship at a NASA Center); however, no more than one letter from a NASA civil servant, JPL employee, or on- or near-site NASA contractor will be permitted as part of the proposal package sent on for review. In addition, Letters of Recommendation from NASA civil servants or JPL employees may not serve as requests to serve in the research collaborator role, should the proposal be selected.

- a. Letters of Recommendation are NOT intended to endorse the proposed space technology research. The Letter should be about the qualifications of the student.
- b. The Letter should include details explaining the nature of the Writer’s relationship to the student.
- c. The Letter should provide insight into the student’s:
 - scientific acumen and creativity
 - motivation for space technology-related study
 - demonstrated or potential for academic excellence in coursework
 - potential for success, including in a research environment
 - leadership potential, including ability to collaborate
 - communication skills, including ability to disseminate research results and information
- d. The Letter must be written on official letterhead, when permitted
- e. The Letter may not exceed two pages in length.
- f. The Letter itself must include the student’s full name (as opposed to nicknames or shortened names).
- g. Letters of Recommendation that appear to be mass produced do not generally lead to high scores from the reviewers.

The general conditions described in the NASA Federal Acquisition Regulation Supplement Part 1852.235-72 are applicable, except for the NSTGRO20 solicitation-specific instructions (e.g., evaluation criterion, page limit for description of the proposed research, maximum award amount, supporting documents, etc.).

Note: In an effort to reduce the administrative burden on the proposing organization, a budget with justification and a CV for the faculty advisor (PI) are *not* required proposal elements and will not be accepted. For selected proposals with students intending to pursue the NSTGRO award (i.e., the student plans to attend graduate school *and* pursue the research proposed in the Project Narrative), the university will be required to upload, post-selection and via NSPIRES, a budget with justification and PI CV.

Note: Collection of Demographic Information – NASA requests and collects demographic data from proposal participants (PIs and students) via NSPIRES. Information collected will include gender, race, ethnicity and disability status. Submission of the information is voluntary, confidential and is not a precondition of award.

6. Proposal Review Information

All eligible proposals will undergo a review by technical experts; electronic and/or panel reviews will be employed. The following two equally weighted criteria will be used; reviewers will be instructed to consider the student's educational level as specified in their profile declaration.

1. **Academic excellence, potential, and commitment to space technology.** Reviewers will be asked to consider the following elements:
 - Organizational, analytical, and written skills;
 - Scientific curiosity, creativity, acumen, and potential for success in research environment as indicated in their planned course of study;
 - Excellence in coursework and potential for success in attaining an advanced degree in a space technology-related field; and
 - Demonstrated commitment to space technology – the degree to which the motivation for the proposed research is clear and the student's potential for making contributions to space technology.

All aspects of the proposal will be considered: the Personal Statement, the Project Narrative, the Degree Program Schedule, the Letters of Recommendation, the CV, and undergraduate and graduate (if applicable) transcripts.

2. **Relevance and technical merit of the Project Narrative.** Reviewers will be asked to consider the following elements:
 - The technical merit of the space technology research area description and knowledge of relevant research literature;
 - The extent to which relevance to space technology applications is clearly articulated;
 - The extent to which the proposed activity represents an innovative space technology idea;

- The extent to which the role of the student in the proposed space technology research is clear and substantial;
- The extent to which the student understands and articulates the potential impact of the visiting technologist experience on their academic/research plans;
- The appropriateness of the choice(s) of institution(s) relative to the proposed plan for graduate study.

Aspects of the Personal Statement and Program Specific Data Question responses will also be taken into consideration.

Subsequent to the review, highly rated proposals will be submitted to the Space Technology Mission Directorate at NASA Headquarters for final programmatic consideration and selection. Balance within and across technology areas and other programmatic considerations may be taken into account.

7. Federal Award Administration Information

All awards are subject to the terms and conditions, cost principles, and other considerations described in 2 CFR 200, 2 CFR 1800, and the *NASA Grants and Cooperative Agreement Manual* (GCAM, accessible from https://prod.nais.nasa.gov/cgibin/nais/nasa_ref.cgi).

7.1 Federal Award Notices

The target date to announce the selections is on or about April 6, 2020. Notification letters will be made available via the NSPIRES system; proposal students, PIs and AORs will be informed (via email) when the notification letters are available for download. The student to be supported under each selected proposal will be asked to verify their intention to accept the award within twenty-one days of notification (on or about April 27, 2020). If the student did not know their graduate university at the time of proposal submission (i.e., the NSTGRO Proposal Submission Office served as AOR) the student will also be required to provide their chosen graduate university and the name of their faculty advisor (PI on the grant). The proposal will then be transferred, in NSPIRES, to their selected university.

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

For each selected proposal, the university will be required to upload a budget with justification and a CV of the faculty advisor (PI) via the NSPIRES site no later than May 11, 2020 (target date); instructions will be provided in the selection letter.

Unless otherwise requested on the Proposal Cover Pages, the planned start date for awards resulting from this solicitation is August 1, 2020. A grant start date between August 1, 2020, and September 15, 2020, is required; expenses may not be incurred prior to the grant start date.

NASA Space Technology Graduate Research awards are grants to accredited U.S. universities. NASA will examine the proposals, with budgets and PI CVs uploaded by the university to NSPIRES post-selection, for completeness (i.e., all components submitted and correct). A grant can be awarded only after all of the required components are complete. Note that negotiations with the university may be required

prior to the award of the grant; in such cases, the grant award is contingent upon successful negotiations between NASA and the university.

7.2 Administrative and National Policy Requirements

A NASA grant officer will conduct a pre-award review of risk associated with the proposer (i.e., submitting university) as required by 2 CFR 200.205. The grant officer will review the submitting university's information available through the Federal Awardee Performance and Integrity Information System (FAPIS) and the System for Award Management (SAM) to include checks on entity core data, registration expiration date, active exclusions, and delinquent federal debt.

Prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold (currently \$250,000), NASA is required to review and consider any information about the proposer that is in the designated integrity and performance system (currently FAPIS) accessible through SAM (<https://www.sam.gov>) (see 41 U.S.C. 2313). A proposer, at its option, may review information in FAPIS and comment on any information about itself that NASA previously entered and is currently in FAPIS. NASA will consider any comments by the proposer, in addition to the other information in FAPIS, in making a judgment about the proposer's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by proposers as described in 2 CFR 200.205.

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

7.3 Reporting Requirements and Intellectual Property

The grant reporting requirements that will be specified by the award document sent to the student's host university upon issuance of the award will consist of relevant aspects of Exhibit E – Required Publications and Reports in the GCAM plus the following additional technical reporting requirements:

1. A research training plan at the conclusion of the first academic term (semester or quarter) of the award. The research training plan will be based on the proposal and will more specifically tie the student's research being performed on campus with the research to be conducted at a NASA Center. Research Training Plans are updated annually.
2. Quarterly progress reports covering activities and accomplishments, plans, dissemination of results and issues/concerns (if applicable). One of these progress reports will be replaced by a continuation package which includes an annual (i.e., since the last continuation) progress report, assessment by

the faculty advisor (PI on the award), evidence of satisfactory academic progress and a budget, with justification, for the following grant year.

Additionally, one of NASA's missions is to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof. Therefore, it is NASA's intent that all knowledge developed under this solicitation be shared broadly through publication of the results of the Graduate Researcher's research. Award recipients may be subject to reporting requirements under the *NASA Plan for Increasing Access to the Results of Scientific Research*, including submitting peer-reviewed manuscripts and metadata to a designated repository (currently PubMed Central) and reporting publications with progress reports. For more details on public access to scientific publications and digital scientific data resulting from NASA-funded research and the above-mentioned plan, please see: <https://www.nasa.gov/open/researchaccess/public-access-results>. Any such requirements will be identified in the award document.

For information about data rights, and other aspects of intellectual property such as invention rights resulting from awards, see the file entitled "Award and Intellectual Property Information" under the section called "Grant and Cooperative Agreement Guidance" at https://prod.nais.nasa.gov/pub/pub_library/srba/.

8. Points of Contact for Inquiries

Inquiries regarding this solicitation should be submitted via email to hq-nstgro-call@mail.nasa.gov. An NSTGRO20 Frequently Asked Questions (FAQ) document is available and will be maintained on NSPIRES (under "Other Documents").

For assistance with NSPIRES, you may contact the NSPIRES Help Desk at nspires-help@nasaprs.com or (202) 479-9376. The Help Desk is staffed, Monday through Friday, from 8 AM to 6 PM ET.

Appendix - Program Specific Data Questions

As stated in Section 5 - Proposal Procedures, the Program Specific Data Questions are part of the NSPIRES proposal submission process. The questions, and associated answers, constitute part of the Cover Pages of a submitted proposal. NSTGRO20 includes 33 Program Specific Data Questions; they are repeated here to facilitate the proposal preparation process. All questions must be answered for successful submission of the proposal. Please note that this Appendix is for informational purposes only. If this Appendix and an NSPIRES Program Specific Data Question differ, the NSPIRES Program Specific Data Question takes precedence. Actual pull-down menus and text boxes are not included in this Appendix.

Selection of TABS element: Questions 1 and 2 allow you to specify and explain the level 2 TABS element(s) most closely associated with your proposal. Question 2 requires a thorough justification for your selection in response to Question 1. Please refer to the actual roadmap documents to gain an understanding of what each level 2 element is seeking; do not rely on the level 2 TABS titles. The complete TABS, including all level 1, 2 and 3 elements, may be found in NSTGRO20 TABS.pdf. This document includes notes on several level 3 TABS elements that were impacted during the 2015 update of the roadmaps; these notes are intended to summarize, at a high level, possible changes in scope of the associated level 2 TABS elements. Your input may be considered during the proposal evaluation process.

Recall the following: TA01 - Launch Propulsion Systems; TA02 - In-Space Propulsion Technologies; TA03 - Space Power and Energy Storage; TA04 - Robotics and Autonomous Systems; TA05 - Communications, Navigation, and Orbital Debris Tracking and Characterization Systems; TA06 - Human Health, Life Support, and Habitation Systems; TA07 - Human Exploration Destination Systems; TA08 - Science Instruments, Observatories, and Sensor Systems; TA09 - Entry, Descent, and Landing Systems; TA10 - Nanotechnology; TA11 - Modeling, Simulation, Information Technology and Processing; TA12 - Materials, Structures, Mechanical Systems and Manufacturing; TA13 - Ground and Launch Systems; TA14 - Thermal Management Systems.

1. Please select the level 2 TABS element most closely associated with your proposal.
Please select via pull-down menu.
2. Please provide a thorough justification for your selection in Question 1. Whenever possible, please specify the appropriate level 3 TABS element in response to this question. It is permissible to specify other relevant TABS elements in the roadmap documents; however, you are encouraged to spend your time identifying the best match, rather than declaring widespread applicability. Note: Project Narratives must be specifically focused on low TRL space technology; Project Narratives which are focused on science investigations to inform technology development or the use of existing technologies to conduct science investigations will be deemed non-compliant and not be submitted for review. (you can enter up to 4000 characters)
Please type your answer in the text box.
3. Has something similar been proposed to another NASA solicitation in the last two years? If yes, provide specific solicitation information and whether or not the proposal was successful. (you can enter up to 4000 characters)
Please type your answer in the text box.
4. Please briefly provide Project Narrative-relevant current and pending support of the faculty advisor (proposal PI). If this proposal is not being submitted by an accredited U.S. university, please enter N/A. (you can enter up to 4000 characters)

Please type your answer in the text box.

Eligibility and Years of Support Sought

5. Are you a U.S. citizen or permanent resident alien of the U.S.?
 - I am a U.S. citizen
 - I am a permanent resident alien of the U.S.
 - I am neither a U.S. citizen nor a permanent resident alien of the U.S.

6. If you are not a U.S. citizen, please provide your country of citizenship.
Please select via pull-down menu.

7. Are you the current or past recipient of a federal graduate fellowship or scholarship?
 - Yes
 - No

8. If your answer to Question 7 is Yes, please identify the graduate fellowship or scholarship (name of sponsoring federal agency and name of fellowship) and provide the number of years of support that you will have received prior to the fall 2020 term. If your answer to Question 7 is No, type N/A. (you can enter up to 1000 characters)
Please type your answer in the text box.

9. Are you currently part of or have you applied to the NASA Pathways Program?
 - I have been accepted into the Pathways Program
 - I have applied to the Pathways Program but have not been notified
 - No (i.e., I have never applied or my application was unsuccessful)

10. If your answer to Question 9 is one of the first two options, please provide a specific explanation. If your answer to Question 9 is No, please type N/A. (you can enter up to 1000 characters)
Please type your answer in the text box.

11. In general, proposals submitted in response to the NSTGRO20 solicitation must be submitted by an accredited U.S. university. Exceptions are discussed in Sections 4 – Eligibility Requirements and Section 5 – Proposal Procedures of the solicitation. If you requested proposal submission by the NSTGRO Proposal Submission Office, please provide justification. If a university is submitting your proposal, type N/A. (you can enter up to 1000 characters)
Please type your answer in the text box.

12. Did you propose to a NASA Space Technology Research Fellowship solicitation? If so, please select the appropriate solicitation(s) from the list below. Note: a student requesting doctoral support under NSTGRO20 will not be eligible if they have requested doctoral support under two NSTRF solicitations, unless they were an undergraduate student at the time of a previous proposal submission (see Section 4 – Eligibility Requirements). If you never requested support under a NASA Space Technology Research Fellowship, select N/A.
Please select all that apply.
 - N/A
 - NSTRF19 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2019
 - NSTRF18 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2018

- NSTRF17 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2017
 - NSTRF16 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2016
 - NSTRF15 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2015
 - NSTRF14 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2014
 - NSTRF13 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2013
 - NSTRF12 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2012
 - NSTRF11 - NASA Space Technology Research Fellowships (NSTRF) - Fall 2011
13. Are you currently an undergraduate student?
- Yes
 - No
14. Month that your bachelor's degree was, or is expected to be, received.
Please select via pull-down menu.
15. Year that your bachelor's degree was, or is expected to be, received.
Please select via pull-down menu.
16. Month that you began any graduate studies. Select N/A if you are currently an undergraduate or have not yet commenced any technical graduate studies.
Please select via pull-down menu.
17. Year that you began any graduate studies. Select N/A if you are currently an undergraduate or have not yet commenced any technical graduate studies.
Please select via pull-down menu.
18. Month that you received a technical master's degree. Select N/A if you do not have a technical master's degree.
Please select via pull-down menu.
19. Year that you received a technical master's degree. Select N/A if you do not have a technical master's degree.
Please select via pull-down menu.
20. Degree which you are seeking under this solicitation. Note: students who have the goal of receiving a doctoral degree should select "Doctoral" below even if their university requires them to obtain a master's degree first. The proposal submitted must cover the entire intended period of study (with a single, continuous research plan).
- Master's
 - Doctoral
21. Total number of years of NSTGRO support sought (partial years are permitted). Please read Section 3 – Federal Award Information of the NSTGRO20 solicitation carefully for clarification and special considerations for master's and doctoral support.
Please select via pull-down menu. Select the number that most closely matches your plans.
22. Month that you expect to receive the degree for which you are seeking support under NSTGRO20.
Please select via pull-down menu.

23. Year that you expect to receive the degree for which you are seeking support under NSTGRO20.
Please select via pull-down menu.
24. Please select your eligibility profile. You must carefully consider the profile definitions provided in Section 4 – Eligibility Requirements of the NSTGRO20 solicitation.
- Master’s Support
 - Doctoral Support 1
 - Doctoral Support 2
 - Doctoral Support 3
 - Doctoral Support 4
 - Doctoral Support 5
 - Doctoral Support 6
25. Please point to specific data in your proposal (cite details) to substantiate your profile declaration in Question 24. Your transcript must clearly show that a master’s degree (or joint BS/MS degree) has been conferred if you select Doctoral Support 4 or Doctoral Support 5. (you can enter up to 4000 characters)
Please type your answer in the text box. If you are currently an undergraduate student, enter "I am currently an undergraduate student."
26. If your response to Question 24 was Doctoral Support 3 or Doctoral Support 5, will you have spent or did you spend less than 2.5 years in pursuit of your master’s degree? Please select N/A if you declared another profile.
- N/A
 - Yes
 - No
27. If your response to Question 24 was Doctoral Support 3 or Doctoral Support 5, please describe how your doctoral research topic is substantially different from your master’s research. Note that research extensions (e.g., computational work to complement experimental work) are not considered “substantially different.” Research topic changes are often accompanied by academic department changes, although this is not required. Failure to provide a clear justification may render you ineligible. (you can enter up to 4000 characters)
Please type your answer in the text box. If you declared another profile, enter "I am not Doctoral Support 3 or Doctoral Support 5"

Past and current academic departments and universities

28. Institution from which you received your undergraduate degree. If you are currently an undergraduate student, please enter the institution you are attending.
Please type your answer in the text box.
29. Undergraduate academic department
Please type your answer in the text box.
30. Graduate academic department
Please type your current graduate degree academic department in the text box. If you are

currently an undergraduate student or not yet enrolled in graduate school, type N/A for your answer.

The NSTGRO20 solicitation requires you to discuss your choice of academic institution(s) as part of the Personal Statement. If you are currently an undergraduate and do not yet know your fall 2020 graduate university or you are not currently enrolled as an undergraduate or graduate student and do not yet know your fall 2020 graduate university, Questions 31-33 allow you to specify the university or universities that you are considering for the degree program for which you are requesting support. If you are already enrolled as a graduate student and you will continue to pursue your graduate studies at your current university in the fall of 2020, reply N/A to all three questions.

31. The name of your first choice academic institution
Please type your answer in the text box.
32. The name of an alternate choice academic institution
Please type your answer in the text box.
33. The name of a second alternate choice academic institution
Please type your answer in the text box.