NOTICE: Amended October 30, 2023. This amendment makes several significant changes, summarized below. New text is in bold and deleted text is struck through. The due dates are unchanged.

- Requirements associated with NPR 8079.1 on Collision Avoidance/Conjunction Assessment have been added to Section 1.2.2.3.
- The language on requirements for the Suborbital-class proposal Payload Reference Document, which is now due at proposal submission (but not with the Notice of Intent), has been heavily edited; see Section 1.2.1.2.
- Solicited activities related to training of students and early-career researchers is clarified in Section 2.2.
- Inclusion Plans may be up to three pages, see Section 2.8.

Amended September 14, 2023. The due dates have been deferred: Mandatory Notices of Intent are now due December 15, 2023, and proposals are now due on January 31, 2024. Changes to the text of APRA and SAT will be provided by amendment in October.

This program element now features Suborbital Investigations as a separate category from CubeSat Investigations; this is expected to improve clarity for proposers reading the solicitation and does not introduce significant changes to requirements for either category of proposal. Suborbital projects must include a Payload Reference Document both with the mandatory NOI as well as with the proposal, see Section 1.2.1.2.

Because of the anticipated greater degree of complexity, the Scientific/Technical/Management section of proposals for CubeSat investigations may be 20 pages long, instead of the default 15 pages, see Section 1.2.2.

This program element is participating in the Inclusion Plan Pilot Program; see Section 2.8. This required Inclusion Plan section will not be part of the adjectival rating, nor will it inform selection recommendations for this opportunity.
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1 **Scope of Program**

1.1 **Overview**

The Astrophysics Research and Analysis Program (APRA) solicits basic research proposals for investigations that are relevant to NASA's programs in astronomy and astrophysics and includes research over the entire range of photons, gravitational waves, and particle astrophysics. Awards may be for up to four years' duration (up to five years for suborbital investigations), but shorter-term proposals are typical; four-year or five-year proposals must be well justified. APRA investigations may advance technologies anywhere along the full line of readiness levels, from Technology Readiness Level (TRL) 1 through TRL 9. The TRL definitions are articulated in detail in NASA Systems Engineering Processes and Requirement (NPR) 7123.1D C Appendix E (https://nolis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7123&s=1D) (updated on February 14, 2020). The emphasis of this program element is on technologies and investigations that advance NASA astrophysics missions and goals. **For the long-term future, these missions and goals will be guided based on the recommendations of the 2020 Decadal Survey *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*, which identifies the most compelling science goals and presents an ambitious program of space-based activities for NASA investment.**

1.2 **Categories of Proposals**

Proposals relevant to the APRA program are those that address the best possible (i) state-of-the-art detector technology development that is directly applicable to incorporation in future space astrophysics missions; (ii) science and/or technology investigations that can be carried out with instruments flown as suborbital-class payloads on balloon-borne, sounding rocket, CubeSat, or other platforms; or (iii) supporting technology or laboratory research that are directly applicable to space astrophysics missions. Accordingly, proposals are solicited in the following six broad categories:

- Suborbital Investigations (balloons, sounding rockets, reusable launch)
- CubeSat Investigations
- Detector Development
- Supporting Technology
- Laboratory Astrophysics
- Astrophysics U.S. Participating Investigators

Specific Considerations and Exclusions:

- Investigators proposing stand-alone detector development, including detector development that features a ground-based demonstration component, should propose to the Detector Development category, whereas proposals for which detector development is integrated into a Suborbital or CubeSat flight project should be submitted to the corresponding category.
- Suborbital Investigation proposers must upload a NOI-stage Payload Reference Document (PRD) as part of the mandatory Notice of Intent (NOI), allowing NASA to make a NOI-stage launch provider assessment.
• Suborbital Investigation proposers must upload a Payload Reference Document (PRD) at the proposal submission stage. The information in the PRD will allow NASA to best match the research payload needs with multiple compatible flight platforms and identify the greatest suborbital research capabilities and launch flexibilities possible.

• The Laboratory Astrophysics category of this program element includes theoretical investigations that support the determination of fundamental atomic, molecular, nuclear, and solid-state parameters with relevance to NASA Astrophysics missions (see Section 1.2.4). However, all other theoretical investigations are solicited separately under the Astrophysics Theory Program described in program element D.4 of ROSES.

• This program element excludes proposals for investigations that are in scope of the Strategic Astrophysics Technology Program (SAT; program element D.7 of this ROSES NRA). Specifically, this would include proposals with subject matter appropriate to APRA’s categories of detectors or supporting technologies, but which are applicable to the strategic missions identified in the SAT solicitation and are currently at a technology readiness level (TRL) between 3 and 5. Proposals that are significantly or wholly duplicative of proposals submitted to this year’s D.7 SAT solicitation will be returned without review. Proposers with questions regarding the applicability of their project to either APRA or SAT should contact the APRA and SAT program officers listed in Section 3 of the APRA and SAT solicitations for guidance.

• This program element excludes proposals for investigations that are in scope of the Exoplanet Research Program (XRP; program element F.3 of this ROSES NRA). Specifically, this exclusion is for Laboratory Astrophysics, data analysis method, or other algorithm/software development investigations that are focused upon measurements or techniques related to characterizing the properties of exoplanets, protoplanetary disks, or debris disks. Potential proposers developing science cases in these areas are directed to program element F.3. Investigations that advance technology development for exoplanet space missions or conduct suborbital-class experiments that advance exoplanet science, remain appropriate for the APRA program.

• This program element excludes projects directed mainly toward the analysis of archival data, as these are solicited under the Astrophysics Data Analysis Program described in Program element D.2 of this ROSES NRA.

• The APRA program element does not accept proposals to support ground-based observations except in the context of maturing future space flight hardware by demonstrating detector and/or supporting technology advancement.

• The APRA program accepts proposals in any of the six categories listed above that focus on tests of fundamental physics using space-based assets in order to: 1) conduct tests of fundamental laws of physics or 2) develop experimental concepts and/or related technologies to test fundamental laws of physics. Proposals submitted for this purpose must be related to an Astrophysics space project (suborbital, orbital, lunar, etc.). This discipline area is not intended to support applied physics or laboratory experiments. Investigations predominantly theoretical
in nature should be directed to the Astrophysics Theory Program (D.4) or to other Federal agencies, as appropriate.

- If a proposal is offered as a direct renewal of a previous NASA award, it should include a description of the predecessor effort, including any significant findings, and describe how the proposed work extends the previous accomplishments including a list of related publications. See Section 3.2.5 of the 2023 NASA Proposer's Guide for more details.

- The Principal Investigator (PI) institution is expected to fund paid participants via subawards, except for those at Government laboratories, including NASA Centers and the Jet Propulsion Laboratory (JPL). However, the proposed budget must explicitly include the funding required for participating Co-Investigator(s) at Government laboratories, including NASA Centers and JPL.

- Proposals to advance detectors or supporting technologies, other than for data analysis methods, in support of strategic missions that have transitioned to having funded technology lines or missions that are in Phase A or beyond (e.g., Athena, LISA, Ariel/CASE, COSI, Roman, Euclid, XRISM) are excluded from APRA, as these technologies are expected to be supported by the mission funding. Technology development for potential future Probe-class, Explorer, or Pioneers missions, including those being proposed to the 2023 Astrophysics Probe Explorer (APEX) solicitation, is allowed within APRA.

1.2.1 Suborbital Investigations

1.2.1.1 Overview and Capabilities

This APRA category supports and focuses on science investigations and/or technology development utilizing payloads flown on a variety of suborbital platforms that include: high-altitude balloons, reusable suborbital rockets, sounding rockets, or similar-class payloads flown as flights of opportunity. Suborbital investigations provide unique opportunities, not only for executing intrinsically meritorious science investigations, but also for advancing the technology readiness levels of future space flight detectors and supporting technologies and preparing future leaders of NASA space flight missions, such as early-career researchers and graduate students. This category also allows for NASA-funded hardware contributions to suborbital investigations led by other Agencies or Governments.

The utilization of suborbital platforms for scientific investigations and technology demonstration offers numerous advantages and opportunities that allow investigators to:

1. Collect scientific data from a space or near-space environment that cannot be readily replicated by ground-based instrumentation, and/or collect in situ scientific data of particular space environments or phenomena
2. Evaluate the performance and feasibility of payloads within relevant environments that cannot be readily replicated through ground-based testing
3. Collect performance data to advance the overall Technology’s Readiness Level (TRL)
4. Refine the experiments/technologies in order to significantly reduce technical risks and help ensure success of future missions
Proposals to start a completely new, highly meritorious Suborbital investigation may be proposed for up to five years in duration. Because of the anticipated greater degree of complexity, the Scientific/Technical/Management section of proposals for Suborbital investigations may be 20 pages long, instead of the default 15 pages specified in the NASA Proposer's Guide.

Participants on a proposal from non-U.S. organizations but whose contribution is essential to the success of the investigation must be designated as "Co-Investigators" and must provide a Letter of Commitment from their institution.

1.2.1.2 Suborbital Investigation Proposal Flight Opportunities

In an effort to complement and augment the capabilities available via the NASA-provided suborbital vehicle portfolio, SMD has incorporated a suite of commercial suborbital capabilities into ROSES that jointly offers APRA researchers additional platform flexibility, expanded capabilities and higher flight cadence. This initiative will enable researchers to readily and simultaneously leverage resources via the traditional NASA-provided suborbital vehicles and NASA-contracted commercial suborbital providers, both of which include unique high-altitude balloon platforms, sounding rockets and reusable rocket-powered vehicles. Proposers are welcome to consider proposing innovative investigations to take advantage of these platforms in order to increase the scientific yield and impact of the proposed research. NASA expects this approach to enable flying smaller payloads, with a commensurate decrease in cost, that take advantage of these capabilities at a higher cadence, provided that proposals are of sufficient merit. Ultimately, this expanded suborbital platform suite will enable greater scientific yield and impact from the proposed research.

In summary, APRA is now offering suborbital launch vehicle services by means of the NASA Sounding Rocket Program Office (SRPO) https://sites.wff.nasa.gov/code810/srpo.html; the NASA Balloon Program Office (BPO); https://sites.wff.nasa.gov/code820/index.html; and NASA-contracted commercial suborbital flight services through the NASA Flight Opportunities (FO) Program https://www.nasa.gov/mission_pages/spacetech/flightopportunities/flightproviders of the Space Technology Mission Directorate. This information is also outlined at https://science.nasa.gov/researchers/suborbital. CubeSat opportunities are also available and are described in Section VIII(c)(vi) of the ROSES-2023 Summary of Solicitation.

Proposers incorporating flight opportunities must ensure alignment with the following guidelines and requirements:

- Proposals must follow the suborbital flight guidelines specified in Section VIII(c) as detailed in the ROSES-2023 Summary of Solicitation.
- Investigators are strongly urged to discuss their proposed payload with the contact person(s) for the appropriate Program, specified in Section VIII(c) as detailed in the ROSES-2023 Summary of Solicitation.
- A NOI-Stage Payload Reference Document (PRD) must be uploaded as part of the mandatory Notice of Intent for any proposal for a suborbital payload. The NOI-Stage PRD will allow NASA to make a preliminary launch provider assessment and provide the correct platform-specific PRD for the proposal stage. The NOI-Stage
PRD will include questions like:

- Type of suborbital vehicle (high-altitude balloon or rocket-powered vehicle)
- Approximate payload dimensions (width, height, length) [m]
- Approximate payload mass [kg] and power [W]
- Launch location(s)
- Flight date requirements
- Desired minimum altitude
- Desired duration for microgravity / observation
- Requirement for exposure to vacuum conditions (yes/no)
- Requirements for pointing

MS Word and PDF versions of a blank NOI-Stage PRD are downloadable from under "Other documents" on the NSPIRES page of this program element. It is understood that the answers to the questions will be best-effort estimates at the time of submission of the NOI. This brief and simplified PRD will allow NASA to perform an initial assessment on potentially compatible flight platforms (NASA-provided and/or NASA-contracted commercial vehicles) to provide, where appropriate, feedback on the flight vehicle(s) that might be the best match to aid development of a full proposal.

Full proposals for the Suborbital investigations are required to include a brief Proposal-Stage Payload Reference Document (PRD). The information included in the PRD will allow NASA to best match the research payload needs with multiple compatible flight platforms and to identify the greatest suborbital research capabilities and launch flexibilities possible. The PRD will include questions like:

- Type of suborbital vehicle required (high-altitude balloon or rocket-powered vehicle)
- Approximate payload dimensions (width, height, length) [m]
- Approximate payload mass [kg] and power [W]
- Launch location(s)
- Flight date requirements
- Desired minimum altitude
- Desired duration for microgravity / observation

A blank Proposal-Stage PRD template form (PDF and Word format) will be made available to researchers under “Other documents” on the NSPIRES page of this program element. It is understood that the answers to the questions will be best-effort estimates at the time of submission. The Proposal-Stage PRD is to be placed immediately following the Inclusion Plan, and will not count against the page limit. The Proposal-Stage PRD will be used by NASA to evaluate the proposed flight test plan requirements and flight provider capabilities. The content of the PRD is not used to establish any portion of the scientific and technical merit of the proposed investigation. Please note that while proposers might express a provider preference, NASA reserves the right to assign the flight provider.

Researchers requesting suborbital flight opportunities using NASA-provided platforms (either traditional sounding rockets or balloons, or NASA-procured commercial suborbital platforms) are not required to obtain quotes or cost-
estimates for the requested suborbital/suborbital-class flight services, nor should the cost of the platform be included in the budget.

- Proposers may negotiate their own launch services (i.e., non-BPO, SRPO, or FO programs) as part of their proposal (so-called Proposer-Provided commercial Suborbital Launch Vehicles – PPSLVs), in which case the PI is responsible for all aspects of that service contract including its full cost (see Section VIII.(c)(iv) of the ROSES-2023 Summary of Solicitation).
- Suborbital payloads may be recovered, refurbished, and re-flown to complete an investigation.
- Investigations involving a NASA-provided sounding rocket or balloon flight with unique requirements must obtain a letter of mission feasibility from the relevant program office point of contact (listed in Section VIII(c) of the ROSES-2023 Summary of Solicitation). Unique requirements include, but are not limited to, remote launch campaigns and constraints on the time/date of launch. The mission feasibility letter must be included in the proposal submission in the “Statements of Commitment and Letters of Support” section, where it does not count against the proposal page limit.
- Questions about Suborbital investigations should be directed to the main point of contact for this program (see Section 3).

1.2.1.3 Suborbital Investigation Budgets

Proposals with a total proposed cost of over $10M must be submitted to the Astrophysics Pioneers program element of ROSES if they are compliant with that element (that is, not a sounding rocket).

Suborbital proposals must have a total proposed cost of no greater than $10M. Balloon proposals with a cost of over $10M may be submitted to the next Astrophysics Pioneers opportunity.

As is standard for ROSES, proposals should not include costs of salary, fringe, or overhead anywhere in the uploaded "proposal document" PDF that will be seen by peer reviewers; see section IV(b)iii of the ROSES-2023 Summary of Solicitation and the ROSES budget FAQ for examples. The separately uploaded "Total Budget" for Suborbital investigations must include all aspects of the proposed investigation, typically (but not always) including payload development and construction, instrument integration and calibration, and data analysis and dissemination/archiving. Beginning in APRA-2023, all consumables needed for the science payload, such as cryogens and/or special gases at the launch site must also be included in the proposed budget.

However, there are two distinct approaches to budgeting for launches, as described in Case (A) and (B) below:

Case A – NASA-Provided Traditional Platforms or NASA-Procured IDIQ Commercial Platforms: No flight services costs are to be included on the proposal PDF that will be seen by peer reviewers, or on the NSPIRES cover page, or in the “Total Budget” file. These costs are already known and separately budgeted for by NASA.

Case B – Proposer-Provided Suborbital Launch Vehicles (PPSLVs): In the uploaded proposal PDF that will be seen by peer reviewers, no flight services costs should be
included. However, these costs must be included in the “Total Budget” and on the NSPIRES cover page in Section F lines 5, or 8-12, or 9, which are not seen by peer reviewers.

The number of investigations that can be supported is limited and heavily dependent on the funds available to this program. It is allowable to propose Suborbital-class investigations to APRA that do not consist of an entire investigation, defined as a new start through flight and data analysis and archiving, within the maximum five-year period of performance. Investigations that would not complete within the proposed period must make clear what portion of the entire investigation is being proposed and what portion is being deferred to a later proposal and should provide rough estimates for schedule and budget for the deferred portion. The proposal review will consider the merit of the complete investigation, but will also consider the value of only the portion being proposed as a meritorious precursor for the entire investigation. Note that SMD does not carry reserves to accommodate any cost overrun incurred by a particular investigation, including the loss of the payload owing to a rocket or balloon system failure. Therefore, failure to achieve the proposed goals within the proposed time and budget could require either descoping the initially proposed investigation, delaying it, canceling a particular launch date opportunity, or canceling the investigation altogether.

1.2.1.4 Suborbital Investigation Procedural Requirements

NASA considers Suborbital and Suborbital-class investigations to be research and technology projects governed by NASA Procedural Requirements (NPR) 7120.8. Accordingly, such investigations should expect to be required to present a Project Plan (cf. § 4.2.7 of NPR 7120.8), comprising an agreement on implementation approach, resources, cost, reviews, schedule, and other plans, in order to be approved to proceed from the formulation phase to implementation phase. Typically, this will be required of new investigations during the second year after initiation of funding. Should review of the Project Plan identify significant challenges (in, for example, cost, schedule or technology maturity) a Cost and Continuation Review (CCR) may be held. Outcomes of the CCR may include termination of the project or continuation with a revised baseline. For purposes of tailoring NPR 7120.8, the ‘program manager’ shall be the appropriate point-of-contact as listed in this program element (or that person’s successor) and the ‘project manager’ shall be the PI of the investigation or a person selected by the PI for this role; issuance of an award shall be considered as Authority to Proceed and hence the beginning of formulation. At the end of each project year, the project manager shall submit an annual report to fulfill the role of a Continuation Assessment, with the final one being considered to fulfill the submission for Project Closeout, unless otherwise documented in the Project Plan.

1.2.1.5 Payloads on Rocket-Powered Vehicles

Numerous sounding rocket platforms and rocket-powered suborbital reusable launch vehicle (SRLV) services are currently available by means of both NASA-provided platforms and commercial IDIQ flight providers. Collectively, these enable access to vehicles capable of reaching altitudes between approximately 80-1400 km, attain over 3 minutes of continuous microgravity, allow for either a protected pressurized environment or full exposure to space conditions, and also allow for payload ejection. This class of
vehicles typically allows for payload recovery & reuse. For additional information on available platforms and corresponding technical capabilities, proposers are encouraged to consult the following resources:

- NASA SMD Suborbital Platforms Available Through ROSES: https://science.nasa.gov/researchers/suborbital
- NASA Flight Opportunities IDIQ Commercial Flight Providers: https://www.nasa.gov/directorates/spacetech/flightopportunities/flightproviders

For clarity regarding Suborbital/Suborbital-class investigations involving IDIQ flight providers, no human-tended research payloads nor Entry-Descent-Landing (EDL) type vehicles will be considered in this solicitation.

resources available through the NASA Sounding Rocket Program (https://www.nasa.gov/mission_pages/sounding-rockets/index.html) and the NASA Flight Opportunities IDIQ commercial flight providers (https://www.nasa.gov/directorates/spacetech/flightopportunities/flightproviders). For clarity, IDIQ Entry-Descent-Landing (EDL) type vehicles will not be considered for Suborbital/Suborbital-class investigations.

1.2.1.6 Payloads on High-Altitude Balloons

Multiple High-Altitude Balloon (HAB) platforms are available by means of both NASA-provided platforms and commercial “indefinite delivery/indefinite quantity” (IDIQ) flight providers through the NASA Balloon Program Office (BPO; https://sites.wff.nasa.gov/code820/index.html) and NASA Flight Opportunities IDIQ commercial flight providers (https://www.nasa.gov/directorates/spacetech/flightopportunities/flightproviders).

Additional information regarding available HAB platforms can be found at https://science.nasa.gov/researchers/suborbital, see the section entitled "Suborbital Platforms Available Through ROSES". Combined, these enable access to balloon platforms capable of reaching altitudes of up to 49 kilometers, carrying payloads weighing up to 3,600 kg, offering station-keeping capabilities and also provide great flexibility regarding flight time requirements, ranging from a few hours up to months at a time.

Suitably small payloads can be selected into a rideshare configuration with other larger payloads or on a common shared platform for carrying multiple, independent, piggyback-like instruments that provides services such as communication and power. This flexibility allows SMD to offer balloon flight opportunities to more users. Balloon missions are conducted at altitudes ranging from 29 to 49 kilometers depending on science requirements and total suspended weight being carried. The NASA-provided traditional platforms and NASA-procured commercial IDIQ providers also allow for flexible remote launch locations. The NASA-provided traditional opportunities accommodate science requirements and length of the data gathering window as shown in table D.3-1 below.
Projects work with NASA and/or the commercial providers in order to identify telemetry, power, safety, pointing, recovery, and other support requirements. Prospective proposers should consult the resources available through the NASA Balloon Program Office and NASA Flight Opportunities for more information to help guide their proposal.

Table D.3-1 High-Altitude Balloon Opportunities

<table>
<thead>
<tr>
<th>Flight Duration:</th>
<th>Launch location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-24 hours</td>
<td>Ft. Sumner (fall annually, spring on occasion) Palestine (summer – lighter payloads)</td>
</tr>
<tr>
<td>1-2 days</td>
<td>Alice Springs, Australia†</td>
</tr>
<tr>
<td>3-7 days</td>
<td>Kiruna, Sweden†</td>
</tr>
<tr>
<td>30-100 days</td>
<td>Wanaka, NZ†</td>
</tr>
<tr>
<td>3-30 days</td>
<td>Antarctica (annually)</td>
</tr>
</tbody>
</table>

† One non-Antarctic overseas campaign annually, with location based on prevailing needs

Projects needing unique engineering and/or technical support services, including flights outside the continental United States, and/or vehicles and/or the Wallops Arc-Second Pointing System (WASP), should contact the Balloon Program Office directly for an estimate of the Government Furnished Equipment (GFE) cost to the proposer for the desired support.

1.2.2 CubeSat Investigations

This APRA category supports and focuses on science investigations and/or technology development utilizing payloads flown as a CubeSat payload. CubeSat investigations provide unique opportunities, not only for executing intrinsically meritorious science investigations, but also for advancing the technology readiness levels of future space flight detectors and supporting technologies and preparing future leaders of NASA space flight missions, such as early-career researchers and graduate students. This category also allows for NASA-funded hardware contributions to CubeSat investigations led by other Agencies or Governments.

The utilization of CubeSat payloads for scientific investigations, technology demonstration, and/or early-career researcher support offers numerous advantages and opportunities that allow investigators to:

- Collect scientific data from a space environment that cannot be readily replicated by ground-based instrumentation;
- Evaluate the performance and feasibility of technologies in relevant environments that cannot be readily replicated through ground-based testing, leading to the advance in Technology Readiness Level (TRL); and
- Advance the readiness of early-career researchers or graduate students to assume leadership roles on future NASA space flight missions.

Proposals to start a completely new, highly meritorious CubeSat investigation may be proposed for up to five years in duration. Because of the anticipated greater degree of complexity, the Scientific/Technical/Management section of proposals for CubeSat
investigations may be 20 pages long, instead of the default 15 pages specified in the NASA Proposer's Guide.

1.2.2.1 CubeSat Investigation Guidelines

CubeSats are described in the ROSES-2023 Summary of Solicitation Section VIII(c)(vi). Proposals for CubeSats in sizes from 1U to 12U (2×2×3) are permitted under APRA.

Proposers should plan that launch for CubeSats be via the NASA rideshare program for secondary payloads. Payloads are expected to adhere to containerized CubeSat standards; investigators are strongly urged to discuss issues regarding constraints, launch opportunities, and other technical matters on prospective investigations with:

Rachele Cocks  
Phone: (202) 358-0058  
Email: rachele.b.cocks@nasa.gov

Because of the availability of frequent launch opportunities, it is anticipated that the majority of the selections will be for investigations that would be delivered to moderately inclined low Earth orbit (LEO) at 400km-600km, geosynchronous transfer orbit, or Sun-synchronous orbit (SSO); other orbits (including low inclination LEO and cis-lunar) are allowed provided the case is made that launch opportunities as a secondary payload with an SMD primary mission could reasonably be expected. See the SmallSat Virtual Institute (S3VI) Launch Portal at https://s3vi.ndc.nasa.gov/launchportal/ for information on currently planned SMD launches which may have the capacity for rideshare payloads. Proposals must include a CubeSat Mission Parameters Table (see ROSES-2023 Summary of Solicitation) and clearly indicate both the desired and the acceptable range of orbital parameters needed to meet mission objectives. Both the launch service cost and the likelihood of manifesting the CubeSat will be considered in the selection decision.

Proposers to the CubeSat category must ensure alignment with the following guidelines and requirements:

• Proposals must follow the suborbital flight guidelines specified in Section VIII(c) as detailed in the ROSES-2023 Summary of Solicitation.
• Investigators are strongly urged to discuss their proposed payload with the contact person(s) for the appropriate Program, specified in Section VIII(c) as detailed in the ROSES-2023 Summary of Solicitation.
• CubeSat proposers should refer to Section 1.2.2.2 for the approach to providing launch cost estimates. SMD will provide funding for any required launch services.
• Proposers may negotiate their own launch services as part of their proposal (so-called Proposer-Provided commercial Suborbital Launch Vehicles – PPSLVs), in which case the PI is responsible for all aspects of that service contract including its full cost (see Section VIII. (c)(iv) of the ROSES-2023 Summary of Solicitation.
• Questions on CubeSat investigations should be directed to the main point of contact for this program (see Section 3)

Participants on a proposal from non-US organizations but whose contribution is essential to the success of the investigation must be designated as "Co-Investigators" and must provide a Letter of Commitment from their institution.
1.2.2.2 CubeSat Investigation Budgets

**CubeSat proposals must have a total proposed cost of no greater than $10M.**

CubeSat proposals with a cost of over $10M may be submitted to the next Astrophysics Pioneers opportunity.

CubeSat proposals with a total proposed cost of over $10M must be submitted to the Astrophysics Pioneers program element of ROSES if they are compliant with that element.

As is standard for ROSES, proposals should not include costs of salary, fringe, or overhead anywhere in the uploaded "proposal document" PDF that will be seen by peer reviewers; see section IV(b)iii of the ROSES-2023 Summary of Solicitation and the ROSES budget FAQ for examples. The separately uploaded "Total Budget" for CubeSat investigations must include all aspects of the proposed investigation, typically (but not always) including payload development and construction, instrument integration and calibration, and data analysis and dissemination/archiving.

All launch costs and spacecraft integration costs for secondary payloads will be covered by NASA and managed by NASA's Launch Services Program (LSP). However, proposers must contact a representative listed in Section VIII(c)(vi) of the ROSES-2023 Summary of Solicitation to obtain a cost estimate for planning purposes, which shall be included in the submitted budget. In the uploaded proposal PDF that will be seen by peer reviewers, no flight services costs should be included. However, these costs must be included in the “Total Budget” and on the NSPIRES cover page in Section F line 5, or 8-12, or 9, which are not seen by peer reviewers.

The number of investigations that can be supported is limited and heavily dependent on the funds available to this program. It is allowable to propose CubeSat investigations to APRA that do not consist of an entire investigation, defined as a new start through flight and data analysis and archiving, within the maximum five-year period of performance. Investigations that would not complete within the proposed period must make clear what portion of the entire investigation is being proposed and what portion is being deferred to a later proposal and should provide rough estimates for schedule and budget for the deferred portion. The proposal review will consider the merit of the complete investigation, but will also consider the value of only the portion being proposed as a meritorious precursor for the entire investigation. Note that SMD does not carry reserves to accommodate any cost overrun incurred by a particular investigation, including the loss of the payload owing to a rocket or balloon system failure. Therefore, failure to achieve the proposed goals within the proposed time and budget could require either descoping the initially proposed investigation, delaying it, canceling a particular launch date opportunity, or canceling the investigation altogether.

1.2.2.3 CubeSat Investigation Procedural Requirements

NASA considers Suborbital and Suborbital-class investigations to be research and technology projects governed by NASA Procedural Requirements (NPR) 7120.8. Accordingly, such investigations should expect to be required to present a Project Plan (cf. § 4.2.7 of NPR 7120.8), comprising an agreement on implementation approach, resources, cost, reviews, schedule, and other plans, in order to be approved to proceed.
from the formulation phase to implementation phase. Typically, this will be required of new investigations during the second year after initiation of funding. Should review of the Project Plan identify significant challenges (in, for example, cost, schedule or technology maturity) a Cost and Continuation Review (CCR) may be held. Outcomes of the CCR may include termination of the project or continuation with a revised baseline. For purposes of tailoring NPR 7120.8, the ‘program manager’ shall be the appropriate point-of-contact as listed in this program element (or that person’s successor) and the ‘project manager’ shall be the PI of the investigation or a person selected by the PI for this role; issuance of an award shall be considered as Authority to Proceed and hence the beginning of formulation. At the end of each project year, the project manager shall submit an annual report to fulfill the role of a Continuation Assessment, with the final one being considered to fulfill the submission for Project Closeout, unless otherwise documented in the Project Plan.

NPR 8079.1 sets new collision avoidance / conjunction assessment requirements for certain free fliers depending on size and orbit that are owned and operated by NASA or its contractors. See Section VIII(b)ii of the ROSES-2023 Summary of Solicitation for more information.

1.2.3 Detector Development

This APRA category solicits investigations that either advance our understanding of the fundamental operational aspects of detectors or develop new types of detectors to the point where they can be proposed in response to future announcements of flight opportunities. Either new measurement concepts or methods to improve the performance of existing detectors may be proposed, provided they would be candidates for use in space. Among the characteristics typically desirable in space-quality detection systems are high sensitivity to relevant signals, low mass, low sensitivity to particle radiation, low power consumption, compactness, ability to operate in a vacuum (such that high-voltage arcing is minimized), vibration tolerance, ease and robustness of integration with instrumentation, and ease of remote operation, including reduced transient effects and ease of calibration.

This category does not support development of detectors or instrument subsystems that are intended primarily for ground-based astronomy. However, observing with ground-based facilities may be proposed to verify new detectors or overall system performance, if adequately justified as an integral part of a detector development.

Proposals for new detectors will be evaluated in the context of currently available space astronomy detector technologies. Proposers are encouraged to identify potential mechanisms that could facilitate transfer of these detector technologies to other users, including Homeland Security, National security, and/or the private sector, for possible application beyond the immediate goals of NASA’s programs.

1.2.4 Supporting Technology

This APRA category supports investigations of technologies not yet ready for incorporation into new detector or space mission systems, but that offer promise of potential breakthroughs that could lead to future advances in instrumentation useful for NASA’s space astronomy and astrophysics programs. This category includes small
technology efforts for future NASA Astrophysics missions, such as development of optics, mirrors, coatings, or gratings. This category also allows proposals for the development and operation of ground-based support instrumentation that would be provide essential and timely support for a future NASA mission. In this last case, proposals will be peer reviewed as usual and additionally assessed by the Program Officers to determine whether NASA has a compelling interest in the technology; proposers are encouraged to contact the most relevant Program Officer in advance of submission of the proposal.

This category also supports proposals for development of new data analysis methods or other algorithm/software development for future NASA astrophysics missions (i.e., those not yet listed in Table D.2-1 of the ADAP program element in ROSES-2023, excluding the Nancy Grace Roman Space Telescope and LISA, as those have their respective funding programs). These proposals should be mission enabling or mission enhancing and directly applicable to future space flight missions, in particular (but not necessarily limited to) those that have been recommended considered in the most recent decadal survey or Astrophysics roadmap.

Proposals aimed primarily at carrying out mission concept studies are excluded. Proposals that contain a concept study development component must include a clear technological advance for space flight hardware as the primary focus.

1.2.5 Laboratory Astrophysics

The Laboratory Astrophysics category of the APRA program element supports the determination of fundamental atomic, molecular, nuclear, and solid-state parameters that are essential for analyzing and interpreting the data from NASA Astrophysics missions. The category supports both laboratory (experimental) and computational efforts to explore the spectroscopic properties of atoms and molecules and particulate matter, as well as their chemical, physical, and dynamical properties under astrophysical conditions. The resulting data products directly impact our understanding of a wide range of astrophysical phenomena spanning the electromagnetic spectrum, and ranging from the epoch of reionization and the evolution of cosmic structure through the formation and evolution of galaxies and stars, up to the processes we see in the local universe at the current epoch.

Laboratory Astrophysics proposals must be well motivated by a detailed description of the relevance of the proposed investigation to the analysis of measurements from NASA astrophysics missions (past, current, or future). Such proposals pertaining to James Webb Space Telescope (JWST) or the X-ray Imaging and Spectroscopy Mission (XRISM) would be particularly timely. Proposals for projects that aim to produce data products for wide use across the astronomical community should explain how those products would be made available to the intended users in a stable fashion.

Proposals to the Laboratory Astrophysics category may include a request for upgrades to and/or replacement of laboratory equipment in support of the proposed investigation. To be considered for such support, a one-page justification must be included with the proposal, immediately following the Scientific/Technical/Management section and before the References and Citations. This justification is not counted against the S/T/M overall page limit. Currently, based on the resources available, such requests can be up
to $75K per proposal and may be spread across no more than two of the proposed funding years. Equipment requests will only be considered as part of a Laboratory Astrophysics science investigation proposal. Evaluation of the overall proposal will be based on the main proposal with a separate evaluation of the equipment request. Selection of the main proposal will be made on the basis of its merit alone, without the equipment request (and hence that equipment must not be required for successful completion of a meritorious investigation). The additional selection of the equipment request would then be made on the basis of its merit in (a) improving the outcome(s) or effectiveness of the proposed investigation, (b) its suitability to enable other investigations, and (c) cost reasonableness. Requested equipment costs must be included in the overall proposal budget in the NSPIRES cover sheets. The basis of estimate for the equipment costs must be provided in the Budget Justification section. Since the equipment request is a severable part of the proposal, these costs must be clearly demarcated in the tables provided in the detailed appendices to facilitate the possibility of selecting the main proposal without the equipment request.

1.2.6 Astrophysics U.S. Participating Investigators

This category solicits proposals for science investigations in which U.S. investigators participate as a Co-Investigator (Co-I) for a space flight or Suborbital-class mission, instrument, experiment, or technology demonstration that is being built and flown by a sponsor agency other than NASA, and which participation clearly and demonstrably enhances the scientific output of the mission and would result in scientific outcomes within the broad goals of NASA’s Astrophysics Division, would benefit the U.S. scientific community, and would enable the U.S. astrophysics science community access to a highly valued scientific data set. Investigations requiring the provision of flight hardware are not solicited through this category; such proposals must be submitted to the Suborbital or CubeSat categories. Proposed investigations must pertain to projects that have not launched at the time of submission, and to which NASA has made no other commitments.

A proposed investigation as an Astrophysics U.S. Participating Investigator (APRA-USPI) on a non-NASA space mission may be as a Co-I for an instrument, experiment, or technology demonstration that is being built and flown by a sponsor agency other than NASA. The Co-I role may include, but is not limited to, instrument design, modeling and simulation of the instrument’s operation and measurement performance, calibration of the instrument, scientific analysis and/or research of the data returned, and/or development of innovative data analysis techniques. An APRA-USPI team member may also serve as a member of a non-NASA space mission science or engineering team and participate in science team activities, such as mission planning, mission operations, data processing, data analysis, and data archiving.

Regardless of the nature of the APRA-USPI role, an investigation proposed under this category must be for an astrophysics science investigation, must include some meaningful data analysis component and archiving of the data for use by the U.S. science community (see below), and must result in the publication of science results in the peer-reviewed literature. All aspects of the investigation through publication must be within the proposed cost.
Proposed investigations must include plans for archiving data such as raw data, reduced data (Level 2), instrument calibration data, observation geometry ancillary data, and derived products at an appropriate NASA Astrophysics data archive. An Open Science and Data Management Plan detailing this is a required component of the proposal and will be evaluated as part of Merit. NASA expects that the mission sponsor will enter into an agreement with NASA to assure that data returned from at least those aspects of the mission in which NASA support is involved, if not the entire mission, will be made available to the U.S. research community in a timely fashion.

For individual investigators, the cost for selected proposals is expected to be on the order of $125K per selected investigation per year through the prime science mission phase, plus one year for additional data analysis and archiving for the baseline scientific investigation. For a team of investigators, the cost is expected to be on the order of $125K per investigator per year, up to a maximum combined team total of on the order of $1M per year, through the prime science mission phase, plus one year for additional data analysis and archiving. Proposals should be written to justify the scientific merit and the work plan for the entire duration of the proposed investigation. This may be no more than through the prime science mission, plus one year for additional data archiving for the baseline scientific investigation. For proposed investigations requiring more than five years duration to complete, only the first five years of budget shall be entered into the NSPIRES cover page budget, and proposers must then also include a high-level budget for any years beyond five as part of the budget justification.

In addition to the requirements given in ROSES, all proposed investigations must also demonstrate: (1) their formal relationship with the sponsoring agency’s mission (e.g., selected participant, invited participant, or proposed participant); (2) the status of the mission within the sponsoring agency including the level of commitment that the sponsoring agency has made to complete development; (3) a description of the type and the characteristics of the data from this investigation, as well as any ancillary science data, that will be archived as part of this investigation; the status of any data-sharing discussions with the mission team; and a description of the arrangements and resources included in the proposal to ensure the timely delivery of the necessary data in the required format; and (4) a detailed explanation of how the U.S. astrophysics science community benefits from this participation. The proposal must provide supporting documentation for item (2) above, including documenting that the NASA commitment for U.S. participation via this opportunity is required by the sponsoring organization prior to October 2026. Projects requiring commitment after this date should anticipate being eligible for proposals in future ROSES cycles.

For APRA-USPI proposals, the evaluation of “intrinsic merit” includes the following factors: (1) Compelling nature and scientific priority of the proposed investigation’s science goals and objectives; (2) Programmatic value of the proposed investigation to NASA Astrophysics activities, including the benefits to the U.S. Astrophysics science community; (3) Likelihood of scientific success; (4) Merit of the instruments and mission design for addressing the proposed investigation’s science goals and objectives; (5) Merit of the data analysis, data availability, and data management plan; and (6) Probability of science team success.
NASA reserves the right to make no APRA-USPI selections if there are no proposals of appropriate merit.

2 Programmatic Information

2.1 General Information

Table D.3-2 provides the amount of Year-1 funding and the number of investigations that have been selected for five APRA categories in five recent cycles; note that proposals for APRA-16 (denoted A-16) were due in 2017 and funded in FY 2018, A-17 due in 2018 and funded in FY19, and A-18 due in 2019 and funded in FY20; in A-20 proposals were due in 2020 and funded in FY21. If the budget allows, it is expected (but cannot be guaranteed) that the selections in the coming year will be similar.

Table D.3-2 Funding and Number of Investigations Selected by APRA Category

<table>
<thead>
<tr>
<th>APRA Category†</th>
<th>Total first year of new selections [§M]</th>
<th>Number of New Selections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suborbital Investigations‡</td>
<td>5.0</td>
<td>10.8</td>
</tr>
<tr>
<td>CubeSat Investigations‡</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Detector Development</td>
<td>4.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Supporting Technology</td>
<td>2.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Laboratory Astrophysics</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

† APRA-USPI was a new category in APRA-22, hence is not included in this table.
‡ In all the years above, Suborbital and CubeSat investigations were solicited in the same category; the separation presented in the table has been done retrospectively.
§ Note that the new Laboratory Astrophysics equipment initiative allotment is included in the 2020 and through 2021-2022 selection allocations.

2.2 Student Participation Training of Early-Career Researchers

The participation training of graduate students and early-career researchers is strongly encouraged welcomed, especially if the project can be concluded within the nominal tenure of graduate training. In such cases, brief details of the educational goals and training activities of the participants should be included in the Science/Technical/Management section of the proposal.

Specific factors that will be considered when evaluating a Suborbital or CubeSat proposal's intrinsic merit include the degree to which it advances the readiness of early-career researchers or graduate students to assume roles in advancing NASA's strategic objectives.

2.3 Request for Reviewer Names

Proposers are strongly encouraged to provide names and contact information of up to five experts qualified to review their proposal. These experts must not be from the
institutions of the PI or Co-Is or stand to benefit financially from the selection (or otherwise) of the proposal. This information should be included in the program specific data question in the Notice of Intent, or may be emailed to the relevant Program Officer listed below. Additionally, proposers are encouraged to suggest Inclusion, Diversity, Equity, and Accessibility practitioners experts to review Inclusion Plans (see Section 2.8).

2.4 Proposal Submission Requirement: Mandatory NOIs

To facilitate the early recruitment of a conflict-free review panel and ensure that proposals are submitted to the appropriate category, an NOI is required in advance of proposal submission to this program element. Proposals that are not preceded by an NOI will be returned without review. No evaluative feedback will be provided in response to the NOI.

After NOI submission, the PI may request to reassign that role only to listed Co-Is, and proposers may request to add funded investigators. The PI making such a request must inform the point(s) of contact identified in the summary table of key information and cc sara@nasa.gov at least two weeks in advance of the proposal due date. Additions of funded investigators within two weeks of the proposal deadline require explicit permission from the NASA point of contact. Submission of an NOI does not obligate the proposer to submit a full proposal later.

For Laboratory Astrophysics, please include a statement whether the proposal will include an equipment request (see Section 1.2.4).

2.5 Availability of MSFC X-ray Test Facilities

The X-ray optics facilities maintained by MSFC include the X-ray and Cryogenic Facility and Stray Light Facilities as Agency Capabilities. In the past, PIs wishing to make use of the MSFC Stray Light Facility and/or the X-ray Cryogenic Facility included Co-I funding to MSFC in order to fund this usage. These facilities are now supported for some of this work by directed work packages under the NASA Internal Scientist Funding Model, so proposers planning to request use of the MSFC facilities should contact wayne.baumgartner@nasa.gov to discuss what portion of the request can be covered by current support and what portion needs to be included in the APRA proposal budget.

2.6 Clarification of Proposal Content

Rules concerning the preparation and submission of proposals are provided in four documents in the following priority order: this program element; D.1 Astrophysics Research Program Overview; the ROSES-2023 Summary of Solicitation; and the NASA Guidebook for Proposers. Proposers should ensure that the most recent versions of these documents are consulted prior to proposal submission as clarifications and amendments are made throughout the year.

As the proposals for D.3 APRA and D.7 SAT are reviewed simultaneously, it is not necessary to include proposals submitted to either program element in the ROSES-23 solicitation in the Current and Pending section of the proposal to this program element.

If unfunded team members (including, but not limited to, those at foreign institutions) are to provide critical portions of the investigation (required in order for it to be fully

D.3-19
successful), then those individuals must be listed as Co-Investigators and a letter from an appropriate representative of their institution must be provided that illustrates and attests to the necessary institutional or other Agency support.

The application to become a Nancy Grace Roman Technology Fellow (RTF; see program element D.8 of this ROSES solicitation) is a one-page addendum submitted along with an APRA proposal. To be eligible for an RTF, the applicant must be designated as the PI, Science PI, or Institutional PI as their proposal role on the APRA cover sheet, and must be shown to have a substantial, leading, and responsible role in the proposal work plan. An applicant on a successful APRA proposal will then be considered for designation as a Roman Technology Fellow based on this one-page application.

2.7 Open Science and Data Management Plan

By default, all proposals must include an Open Science and Data Management Plan (OSDMP) compliant with the specifications provided in Section 1.2 of D.1, The Astrophysics Research Program Overview. This shall be a separate up-to-2-page OSDMP section of the proposal placed in the PDF immediately following the References and Citations section and before the Inclusion Plan (see Section 2.8 below). Projects that are devoted to technology development efforts and which will not generate scientific data may satisfy the requirement for a OSDMP by simply stating that “An OSDMP is not required because the proposed projects are in either the Detector Development or Supporting Technology category.” However, even for such proposals, if an award is made the requirements to release data, code, and publications still apply. Proposals submitted in the categories of Suborbital or CubeSat Investigations, Laboratory Astrophysics, or Astrophysics U.S. Participating Investigators are always required to provide open science and data management plans. Note that the data under consideration need not include the raw data generated during a project, but at a minimum any processed data needed to validate the scientific conclusions of peer-reviewed publications (such as data underlying graphs, images, spectra, and tables) and associated data and software necessary for the replication/reproduction of published results must be made available at the time of publication, and any remaining useful data or code must be made available by the end of the award.

The OSDMP for a Suborbital or CubeSat Investigation must be included in the proposal to provide a discussion of the plans for reduction, analysis, and archiving of the data. The OSDMP must present a plan for making the science data that derives from the investigation publicly available for the long term, in an appropriate archive, such as (but not necessarily) one of the Astrophysics data archives listed at http://science.nasa.gov/astrophysics/astrophysics-data-centers/. The cost of this archiving activity shall be included in the overall proposal cost, although any funding for NASA’s archives would be provided directly to the archive rather than as a subaward from the PI institution. PIs are advised to contact the archive (e.g., MAST: https://archive.stsci.edu/new-mission-partnerships-with-mast, IRSA: https://irsa.ipac.caltech.edu/irsa-dataQA.html, HEASARC: https://heasarc.gsfc.nasa.gov/docs/heasarc/heasarc_reg_mission.html or other archive such as National Space Science Data Coordinated Archive (NSSDCA): https://nssdc.gsfc.nasa.gov/nssdc/submitting_data.html) in advance of proposal D.3-20
submission to obtain a suitable cost estimate. PIs not proposing to archive data in an extant NASA data archive must describe the plan for making data durably findable, usable, and available. The adequacy of the OSDMP will be part of the evaluation of the merit of the proposal and, even if an investigation is selected, should the OSDMP not satisfactorily present the plan for archiving the science data, the award will be delayed until a satisfactory revised OSDMP is submitted. For details of the scope and requirements of a OSDMP (and some examples) please see: https://science.nasa.gov/researchers/sara/faqs/dmp-faq-roses/ and references therein.

2.8 Inclusion Plan

An Inclusion Plan, not to exceed three two pages must be included in all proposals immediately following the Open Science and Data Management Plan (OSDMP). See Section IV(e)(ii) of the ROSES-2023 Summary of Solicitation for detailed guidance.

The assessment of the inclusion plan will not be part of the grade for the proposal nor have any bearing on selection.

2.9 Evaluation Criteria

All proposals will be evaluated for Intrinsic Merit, Cost, and Relevance, as defined in Appendix D of the NASA Proposer's Guide and consistent with Section V(a) of the ROSES-2023 Summary of Solicitation with the following modifications:

The assessment of the "Open Science and Data Management Plans" is part of the evaluation of Merit.

For Suborbital and CubeSat Investigations, the evaluation of Merit also includes the degree to which it advances the technology readiness level of a detector or supporting technology and, equally, the degree to which it advances the readiness of early-career researchers or graduate students to assume leadership roles on future NASA space flight missions.

Investigators must identify, in response to the question on the NSPIRES cover page, which of these three is the main focus of the proposal: science investigations, technology development, or training of early-career scientists and engineers. During evaluation, a proposal found to be significantly lacking in its main focus would likely be assessed a major weakness, whereas for the other two foci shortcomings would more likely (but not necessarily) be minor weaknesses.

The assessment of the inclusion plan will not be part of the grade for the proposal nor have any bearing on selection

Note that the TRL claimed in the cover sheet is for tracking purposes only, and reviewers are not asked to assess whether that datum is valid.

Finally, requests for upgrades to and/or replacement of laboratory equipment are subject to the evaluation factors mentioned in Section 1.2.4.

3. Summary of Key Information

| Expected program budget for first year of new awards | See Section 2.1 |

D.3-21
<table>
<thead>
<tr>
<th>Number of new awards pending adequate proposals of merit</th>
<th>See Section 2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum duration of awards</td>
<td>4 years (5 years for Suborbital and CubeSat investigations; for APRA-USPI, through the end of the Prime Mission plus one year for data analysis and archiving.)</td>
</tr>
<tr>
<td>Due date for Mandatory Notice of Intent to propose (NOI)</td>
<td>See Tables 2 and 3 of this ROSES NRA</td>
</tr>
<tr>
<td>Due date for proposals</td>
<td>See Tables 2 and 3 of this ROSES NRA</td>
</tr>
<tr>
<td>Planning date for start of investigation</td>
<td>Typically, October, but allowed between July and December 2024</td>
</tr>
<tr>
<td>Page limit for the central Science-Technical-Management section of proposal</td>
<td>15 pp (20 pp for Suborbital and CubeSat proposals); see also Table 1 of the ROSES-2023 and the NASA Proposer’s Guide.</td>
</tr>
<tr>
<td>Relevance</td>
<td>This program is relevant to the Astrophysics questions and goals in the NASA Science Plan. Proposals that are relevant to this program are, by definition, relevant to NASA.</td>
</tr>
<tr>
<td>General information and overview of this solicitation</td>
<td>See ROSES-2023 Summary of Solicitation</td>
</tr>
<tr>
<td>General requirements for content of proposals</td>
<td>See D.1 The Astrophysics Research Program Overview and Table 1 of ROSES-2023.</td>
</tr>
<tr>
<td>Detailed instructions for the submission of proposals</td>
<td>See NSPIRES Online Help, Sections 2.22-3.4 of the NASA Proposer’s Guide and Section IV(b) of the ROSES-2023 Summary of Solicitation.</td>
</tr>
<tr>
<td>Submission medium</td>
<td>Electronic proposal submission is required; no hard copy is required or permitted.</td>
</tr>
<tr>
<td>Web site for submission of proposal via NSPIRES</td>
<td><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)</td>
</tr>
<tr>
<td>Web site for submission of proposal via Grants.gov</td>
<td><a href="https://www.grants.gov/">https://www.grants.gov/</a> (help desk available at <a href="mailto:support@grants.gov">support@grants.gov</a> or (800) 518-4726)</td>
</tr>
<tr>
<td>Funding opportunity number for downloading an application package from Grants.gov</td>
<td>NNH23ZDA001N-APRA</td>
</tr>
</tbody>
</table>
Main points of contact concerning this program

<table>
<thead>
<tr>
<th>Name</th>
<th>Discipline Responsibility</th>
<th>Telephone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kartik Sheth</td>
<td><strong>Mid/Far-Infrared</strong>, Submillimeter, and Radio Astrophysics</td>
<td>(202) 573-1060</td>
<td><a href="mailto:Kartik.Sheth@nasa.gov">Kartik.Sheth@nasa.gov</a></td>
</tr>
<tr>
<td><strong>Thomas Hams</strong></td>
<td></td>
<td>(202) 358-5162</td>
<td><a href="mailto:Thomas.Hams-1@nasa.gov">Thomas.Hams-1@nasa.gov</a></td>
</tr>
<tr>
<td>Michael R. Garcia</td>
<td><strong>Ultraviolet, Visible, NIR</strong> Astrophysics</td>
<td>(202) 358-1053</td>
<td><a href="mailto:Michael.R.Garcia@nasa.gov">Michael.R.Garcia@nasa.gov</a></td>
</tr>
<tr>
<td>Valerie Connaughton</td>
<td><strong>X-ray and Gamma-ray Astrophysics</strong></td>
<td>(202) 358-1763</td>
<td><a href="mailto:Valerie.Connaughton@nasa.gov">Valerie.Connaughton@nasa.gov</a></td>
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<tr>
<td>Thomas Hams</td>
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<tr>
<td><strong>Manuel Bautista</strong></td>
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<td>(202) 236-6652</td>
<td><a href="mailto:Manuel.Bautista@nasa.gov">Manuel.Bautista@nasa.gov</a></td>
</tr>
<tr>
<td>Dominic Benford</td>
<td><strong>Astrophysics U.S. Participating Investigator</strong></td>
<td>(301) 758-9305</td>
<td><a href="mailto:Dominic.Benford@nasa.gov">Dominic.Benford@nasa.gov</a></td>
</tr>
</tbody>
</table>

Questions about the APRA Program should be directed to the points of contact above. Questions about specific discipline areas may be directed to the relevant Program Officers listed below, along with their areas of expertise. If uncertain about whom to contact, please direct your inquiries to the APRA points of contact listed above.

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Email: David.C.Morris@nasa.gov