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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

HEADQUARTERS

SCIENCE MISSION DIRECTORATE

300 E STREET, SW

WASHINGTON, DC 20546-0001

RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES – 2012 (ROSES-2012)

NASA RESEARCH ANNOUNCEMENT (NRA)

SOLICITING BASIC AND APPLIED RESEARCH PROPOSALS

NNH12ZDA001N

CATALOG OF FEDERAL DOMESTIC ASSISTANCE (CFDA) NUMBER: 43.001

ISSUED: FEBRUARY 14, 2012

PROPOSALS DUE
STARTING NO EARLIER THAN MAY 1, 2012
THROUGH NO LATER THAN APRIL 30, 2013

RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES (ROSES)–2012

EXECUTIVE SUMMARY

This National Aeronautics and Space Administration (NASA) Research Announcement (NRA), entitled *Research Opportunities in Space and Earth Sciences (ROSES)–2012*, solicits basic and applied research in support of NASA's Science Mission Directorate (SMD). This NRA covers all aspects of basic and applied supporting research and technology in space and Earth sciences, including, but not limited to: theory, modeling, and analysis of SMD science data; aircraft, stratospheric balloon, suborbital rocket, International Space Station, and suborbital reusable launch vehicle investigations; development of experiment techniques suitable for future SMD space missions; development of concepts for future SMD space missions; development of advanced technologies relevant to SMD missions; development of techniques for and the laboratory analysis of both extraterrestrial samples returned by spacecraft, as well as terrestrial samples that support or otherwise help verify observations from SMD Earth system science missions; determination of atomic and composition parameters needed to analyze space data, as well as returned samples from the Earth or space; Earth surface observations and field campaigns that support SMD science missions; development of integrated Earth system models; development of systems for applying Earth science research data to societal needs; and development of applied information systems applicable to SMD objectives and data.

Awards range from under $100K per year for focused, limited efforts (e.g., data analysis) to more than $1M per year for extensive activities (e.g., development of science experiment hardware). The funds available for awards in each program element offered in this NRA range from less than one to several million dollars, which allow selection from a few to as many as several dozen proposals depending on the program objectives and the submission of proposals of merit. Awards will be made as grants, cooperative agreements, contracts, and inter- or intra-agency transfers depending on the nature of the proposing organization and/or program requirements. The typical period of performance for an award is four years, although a few programs may specify shorter or longer (maximum of five years) periods. Organizations of every type, domestic and foreign, Government and private, for profit and not-for-profit, may submit proposals without restriction on teaming arrangements. Note that it is NASA policy that all investigations involving non-U.S. organizations will be conducted on the basis of no exchange of funds. Any changes or modifications to any of these guidelines will be specified in the descriptions of the relevant program elements in the Appendices of this solicitation.

Details of the solicited program elements are given in the Appendices of this NRA. Proposal due dates are given in Tables 2 and 3 of this NRA, which will be posted at http://nspires.nasaprs.com/ and for which links are provided below. Interested proposers should monitor http://nspires.nasaprs.com/ or subscribe to the SMD electronic notification system there for additional new program elements or amendments to this NRA through February 2013, at which time release of a subsequent ROSES NRA is planned. A web archive (and RSS feed) for amendments, clarifications, and corrections to ROSES-2012 can be found at: http://nasascience.nasa.gov/researchers/sara/grant-solicitations/roses-2012/. This NRA will be available upon its release at http://go.nasa.gov/ROSES12.

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Note: Table 2 and Table 3 of this NRA are posted as separate documents on the web and can be reached either by following the hypertext links above embedded in the electronic version of this document, or at http://go.nasa.gov/ROSES-12, or by going to http://nspires.nasaprs.com/ and selecting “Solicitations” then “Open Solicitations” and “NNH12ZDA001N.”

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Note: Any amendments to the Table of Contents for Appendices A through E may be found in Table 3 of this NRA. Table 3 of this NRA is posted as a separate document on the ROSES-2012 homepage, which can be reached either by following the hypertext link embedded in the electronic version of this document above, or at http://go.nasa.gov/ROSES-12, or by going to http://nspires.nasaprs.com/ and selecting “Solicitations” then “Open Solicitations” and “NNH12ZDA001N.”

RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES (ROSES)–2012

SUMMARY OF SOLICITATION

I. FUNDING OPPORTUNITY DESCRIPTION

(a) Strategic Goals of NASA's Research Program

The National Aeronautics and Space Administration (NASA) is chartered in the National Aeronautics and Space Act [Public Law No. 85-568, 2 Stat. 426 (July 29, 1958) As Amended] with, among other objectives, the expansion of human knowledge of the Earth and of phenomena in the atmosphere and space. Working from this Congressional authorization, U.S. National Space Policy directs NASA to execute a sustained and affordable human and robotic program of space exploration and develop, acquire, and use civil space systems to advance fundamental scientific knowledge of our Earth system, solar system, and universe. This direction allows the science objectives of the NASA Science Mission Directorate (SMD) to be clearly defined as the orderly pursuit of the Agency's strategic direction.

The *2011 NASA Strategic Plan* identifies the following strategic objectives as those to be pursued by SMD:

- Advance Earth System Science to meet the challenges of climate and environmental change;
- Understand the Sun and its interactions with the Earth and the solar system;
- Ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere; and
- Discover how the universe works, explore how it began and evolved, and search for Earth-like planets.

Further valuable, in depth insight into these strategic objectives and supporting research areas may be found in the following documents:

- The *2011 NASA Strategic Plan*, available at http://www.nasa.gov/news/budget/ and/or http://nasascience.nasa.gov/about-us/science-strategy; and
- The *2010 Science Plan for NASA's Science Mission Directorate* (hereafter the *NASA Science Plan*), available at http://nasascience.nasa.gov/about-us/science-strategy.

The NASA strategic goals and research objectives for science from the *NASA Science Plan* are given in Table 1. These NASA research objectives, and their corresponding strategic outcomes, are also used to assess NASA's research progress for compliance with the *Government Performance and Results Act* (GPRA) of 1993 and the *GPRA Modernization Act* of 2010. Each program element in this NASA Research Announcement (NRA) is explicitly relevant to these NASA strategic goals, science outcomes, and the *NASA Science Plan*. Each proposer to this NRA demonstrates relevance of the proposed research to NASA's goals and objectives by demonstrating relevance to the programmatic goals and objectives of the appropriate program element (further instructions concerning this requirement are provided in Section IV(e) below).

(b) Research Programs of NASA's Science Mission Directorate

The NASA Science Mission Directorate (SMD) pursues NASA's strategic goals using a wide variety of space flight programs that enable the execution of both remote sensing and *in situ* investigations. These investigations are carried out through flight of space missions in Earth orbit, as well as to or even beyond objects in the solar system, and also through ground-based research activities that directly support these space missions. This ROSES NASA Research Announcement (NRA) solicits proposals for the latter of these two types of programs, in particular, ground-based supporting research and technology (SR&T) investigations that seek to understand naturally occurring space and Earth phenomena, human-induced changes in the Earth system, and Earth and space science-related technologies and to support the national goals for further robotic and human exploration of space.

Proposals in response to this NRA should be submitted to the most relevant science program elements described in Appendices A, B, C, D, and E (see also the *Table of Contents* that prefaces this NRA). Table 2 lists these program elements in the order of their calendar deadlines for the submission of proposals, while Table 3 lists them in the order in which they appear in the appendices of this NRA. Questions about each specific program element should be directed to the Program Officer(s) identified in the *Summary of Key Information* section that concludes each program element description.

In order to pursue NASA's goals and objectives, SMD research activities are organized into four Research Programs:

- The *Earth Science Research Program* sponsors research to explore interactions among the major components of the Earth system — continents, oceans, atmosphere, ice, and life — to distinguish natural from human-induced causes of change and to understand and predict the consequences of change. The Earth Science Research Program is managed by the Earth Science Division.
- The *Heliophysics Research Program* sponsors research to understand the Sun as a magnetic variable star and its effects on the Earth and other planets, and the dynamics of structures in the solar system. The Heliophysics Research Program is managed by the Heliophysics Division.
- The *Planetary Science Research Program* sponsors research to explore the solar system to study its origins and evolution, including the origins of life within it. The Planetary Science Research Program is managed by the Planetary Science Division.
- The *Astrophysics Research Program* sponsors research to explore the universe beyond, from the search for planets and life in other solar systems to the origin, evolution, structure, and destiny of the universe itself. The Astrophysics Research Program is managed by the Astrophysics Division.

The program elements in Appendices A, B, C, and D describe program elements of these four science research programs, respectively, while Appendix E describes cross-division program elements relevant to two or more of these science research programs. Each of these appendices is prefaced with an *Overview* section that provides an introduction to the research program content that all interested applicants to this NRA are encouraged to read.

The program elements described in these appendices also provide any clarifications or modifications to the general guidelines contained in this *Summary of Solicitation*.

(c) Opportunities for Education and Public Outreach

(i) Overview

SMD is committed to fostering the broad involvement of the Earth and space science research communities in Education and Public Outreach (E/PO) and contributing to NASA's three education goals:

- Strengthen NASA and the Nation's future workforce;
- Attract and retain students in science, technology, engineering, and mathematics (STEM) disciplines; and
- Engage Americans in NASA's mission.

The NASA Science Mission Directorate's vision for Education and Public Outreach is:

> *To share the story, the science, and the adventure of NASA's scientific explorations of our home planet, the solar system, and the universe beyond, through stimulating and informative activities and experiences created by experts, and delivered effectively and efficiently to learners of many backgrounds via proven conduits, thus providing a return on the public's investment in NASA's scientific research.*

Progress towards achieving these goals has become an important part of the broad justification for the public support of Earth and space science. A more detailed discussion may be found in the *NASA Education Strategic Coordination Framework* (http://www.nasa.gov/offices/education/performance/strategic_framework.html).

SMD sponsors a broad spectrum of educational activities ranging from kindergarten to postgraduate levels via several vehicles of solicitation. A variety of information about recent E/PO activities in Earth and space science can be found at http://nasascience.nasa.gov/researchers/education-public-outreach. This site includes *Explanatory Guides to E/PO Evaluation Factors*, strategic planning and implementation documents, catalog or directory of E/PO resources, and list or abstracts of selected E/PO awards.

(ii) E/PO Opportunities

Historically two kinds of SMD E/PO programs are included in the ROSES NRA: Cross division midsized E/PO projects that are not being solicited this year, and opportunities for early career scientists offered by certain science divisions. Though the former are not being called for this year, the latter are solicited in the form Appendix C.22, Fellowships for Early Career Researchers in Planetary Science (via participating calls in Appendix C), and Appendix D.9 the Nancy Grace Roman Technology Fellowships in Astrophysics.

Other opportunities to participate in SMD's E/PO programs are not included in this ROSES NRA, but are solicited separately. These include E/PO opportunities embedded in SMD missions and programs, opportunities available through SMD's E/PO support network organizations to provide E/PO support to the scientific and educational enterprise inside and outside of NASA, and opportunities sponsored by NASA's Office of Education to develop systematic and sustainable educational efforts **[Corrected April 23, 2012]**.

Questions and/or comments and suggestions about the SMD E/PO program are welcome and may be directed to:

Stephanie Stockman
SMD Lead for Education and Public Outreach
Science Mission Directorate
NASA Headquarters
Washington, DC 20546-0001
Telephone: (202) 358-0039
Email: HQ-SMD-ROSES-EPO@hq.nasa.gov

(d) NASA-Provided High-End Computing (HEC) Resources

SMD provides a specialized computational infrastructure to support its research community, managed on its behalf by NASA's High-End Computing (HEC) program (see the HEC website at http://www.hec.nasa.gov/). Two major computing facilities are offered, namely, the NASA Center for Climate Simulation (NCCS) at Goddard Space Flight Center (GSFC), and the NASA Advanced Supercomputing (NAS) facility at Ames Research Center (ARC).

The HEC program facilities maintain a range of capacity and capability computing systems with significant data storage resources. These offerings are summarized at http://www.hec.nasa.gov/about/overview.html. Augmentation and refreshment of these central systems occur on a periodic basis. The HEC program also provides assistance in code porting, performance tuning, scientific data visualization, and data transfer.

Any need for computing time and other HEC program resources for the proposed research must be explicitly described. The proposal should include identification of the computing system and location, rationale and justification of the need, how it supports the investigation, when during the proposed period the resources will be required, and an estimate of processor hours and storage capacity needed. An aggregated computing time per year (i.e., number of runs, multiplied by the number of processors per run, multiplied by the number of hours per run) should also be included.

The box provided on the *Cover Page* for proposals submitted in response to this NRA should also be "checked" to indicate that a request for computing resources is included in the proposal. As they review the intrinsic merit of the proposed investigation, science peer review panels will be asked to consider the realism and reasonableness of the computing time request and whether it is an appropriate utilization of a highly constrained resource.

To receive an allocation of HEC resources, proposed investigations selected for funding must make annual requests. The HEC website provides the mechanism for Principal Investigators (PIs) to formally request computing time allocations as identified in their funded proposals. Visit http://www.hec.nasa.gov/request/request.html for process details. The full requested levels cannot be guaranteed, but SMD will make every attempt to satisfy the needs in the context of the overall set of requirements, resource constraints, and science priorities.

Computing time awards are for one year and are nontransferable. PIs may make requests of any size at any time during the year, but large requests will only be considered for May 1 and November 1 awards (request deadlines are March 20 and September 20). Small requests may be awarded throughout the year. See http://www.hec.nasa.gov/request/science_call.html for the

definitions of large and small requests.

To expedite initiation of new projects where PI and/or users are foreign nationals (whose accounts will require additional documentation and longer processing) the HEC program will consider providing a minimal allocation to such projects who have been notified of pending funding soon after the PI submits an allocation request in e-Books (accessed through the HEC website). PIs should identify this foreign national status in their request abstract.

For further information about NASA provided High-End Computing resources contact:

Tsengdar J. Lee
Earth Science Division
Science Mission Directorate
NASA Headquarters
Washington, DC 20546-0001
Email: Tsengdar.J.Lee@nasa.gov
Telephone: 202-358-0860

(e) NASA Safety Policy

Safety is the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. NASA's safety priority is to protect the public, astronauts and pilots, the NASA workforce (including employees working under NASA award instruments), and high-value equipment and property.

(f) Availability of Funds for Awards

Prospective proposers to this NRA are advised that funds are not in general available for awards for all of its solicited program elements at the time of its release. The Government's obligation to make awards is contingent upon the availability of sufficient appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this NRA.

(g) Significant Changes from Recent ROSES

Proposers should be aware of the following significant changes in this NRA from recent years.

- All team members identified on the NSPIRES proposal cover page must both acknowledge their participation in the investigation and indicate their institutional affiliation via NSPIRES (Section IV(b)(iv)).
- Proposals submitted in response to ROSES-2012 can be submitted through either NSPIRES or Grants.gov. However, certain caveats apply, see Section IV(b)(v) for details.
- Unless specifically allowed by an individual program element (program elements are the appendices to ROSES), multiple PIs (as described in Section 1.4.2 of the *NASA Guidebook for Proposers*[1]) are not permitted. The use of other categories of participation described in Section 1.4.2 of the *NASA Guidebook for Proposers*, including Science PI,

[1] The *Guidebook for Proposers Responding to a NASA Research Announcement (NRA) or Cooperative Agreements Notice (CAN)* (hereafter referred to as the *NASA Guidebook for Proposers*) is at http://www.hq.nasa.gov/office/procurement/nraguidebook; see Section IV(a) of this NRA for further information.

Institutional PI, and Co-PI (from a non-U.S. organization under specific circumstances), remain permitted.

- In the past support for conferences and workshops was primarily provided in response to unsolicited proposals, since there were few ROSES program elements that included this kind of work (*Living with a Star Targeted Research and Technology* (Appendix B.6) and *Mars Fundamental Research* (Appendix C.13) being notable exceptions). Unsolicited proposals for topical workshops, symposia, conferences, and other scientific/technical meetings will no longer be accepted. Proposals for such events should be submitted to those few program elements that include it or in response to the *Topical Workshops, Symposia, and Conferences* program element found in Appendix E.2.

Proposers should be aware of the following significant changes in this NRA from last year.

- NASA civil servant salaries must not be included in either the NSPIRES cover page (web-based form) budgets nor the budget justification within the proposal. This applies to proposals submitted by NASA Centers as well as to proposals submitted by non-NASA organizations that include NASA civil servants serving as funded co-investigators. However, the FTEs being requested for NASA civil servant investigators must be included and justified in the budget justification within the proposal. NASA will budget and account for civil servant salaries within ROSES proposals through a separate internal agency process. The latest NASA internal policy on this subject, including instructions on what to include in budgets for ROSES proposals, may be found at the SARA website at http://science.nasa.gov/researchers/sara/how-to-guide/nspires-CSlabor/.
- In accordance with Public Law 112-55, Section 539(a), proposals must not include bilateral participation, collaboration, or coordination with China or any Chinese-owned company or entity, whether funded or performed under a no-exchange-of-funds arrangement. See Section III (c) on restrictions involving China.
- Proposal submission for *Land Cover / Land Use Change* (Appendix A.2), *Geospace Science* (Appendix B.3), *Solar and Heliospheric Science* (Appendix B.4), and *Cassini Data Analysis and Participating Scientists* (Appendix C.10) will use a two-step process, in which the Step-1 proposal (which replaces the Notice of Intent) is required. See Section IV(b)(vii) and the text of those program elements for details.
- The opportunity for PIs of selected research investigations to receive education or outreach awards as supplements to their research award (*Supplemental Outreach Awards for ROSES Investigators*, *Supplemental Education Awards for ROSES Investigators*) is not offered in ROSES-2012.

In addition to the listed significant changes, this NRA and the *NASA Guidebook for Proposers* incorporate a large number of additional changes, including both policy changes and changes to proposal submission requirements. Many sections of both documents have been clarified since the release of ROSES-2011. All proposers are urged to read this NRA and the 2012 edition of the *NASA Guidebook for Proposers* carefully, since all proposals must comply with their requirements, constraints, and guidelines.

II. AWARD INFORMATION

(a) Funding and Award Policies

The amount of funds expected to be available for new awards for proposals submitted in response to this NRA is given in the *Summary of Key Information* that concludes each program element description in the appendices. Given the submission of proposals of merit, the number of awards that may be made for each program element is also given in this location.

In all cases, NASA's goal is to initiate new awards within 46 days after the selection of proposals is announced for each program element. However, this time period may be longer based on the workload experienced by NASA, the availability of appropriated funds, and any necessary postselection negotiations with the proposing organization(s) needed for the award(s) in question. Regarding this last item, every proposer is especially encouraged to submit full and detailed explanations of the requested budget (see Section 2.3.10 of the *NASA Guidebook for Proposers*) to help expedite the processing of the award, should their proposal be selected.

Awards made through this NRA will be in the form of grants, cooperative agreements, contracts, and intra- or interagency transfers, depending on the nature of the submitting organization and/or the specific requirements for awards given in each program element description in the appendices. The type of award to be offered to selected proposers will generally follow the policies in Section D.1 of the *NASA Guidebook for Proposers*, although in a few cases, only one type of award may be offered, as specified in the program element description. Another difference with the *NASA Guidebook for Proposers* is that the budget narrative need not state the type of award instrument anticipated **[Sentence added April 23, 2012]**. A NASA awards officer will determine the appropriate award instrument for the selections resulting from this solicitation. Grants and cooperative agreements will be subject to the provisions of the *Grants Handbook*[2] and Appendix D of the *NASA Guidebook for Proposers*. In the case of any conflict, the *Grants Handbook* takes precedence. Contract awards will be subject to the provisions of the Federal Acquisition Regulations (FAR) and the NASA FAR Supplement (see http://prod.nais.nasa.gov/cgi-bin/nais/nasa_ref.cgi).

(b) Successor Proposals and Resubmissions

Generally, PIs holding previous awards selected through any of the programs offered through earlier NRAs are welcome to submit "successor" proposals that seek to continue a previously funded line of research (see Section 1.5 of the *NASA Guidebook for Proposers*). However, it is SMD policy that such successor proposals will be considered with neither advantage nor disadvantage along with new proposals that are submitted for that same program. Instructions regarding successor proposals may be found in Section 1.5 of the *NASA Guidebook for Proposers*.

Proposals that were submitted but not selected for any previous NASA solicitation may be submitted either in a revised or original form. Such submissions will be subjected to full peer review and considered with neither advantage nor disadvantage along with new proposals that are received by NASA.

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[2] The *NASA Grants and Cooperative Agreement Handbook* (hereafter referred to as the *Grants Handbook*) is at http://prod.nais.nasa.gov/pub/pub_library/grcover.htm.

(c) Award Period of Performance

The maximum period of performance (duration) for new awards for proposals submitted in response to this NRA is given in the *Summary of Key Information* that concludes each program element description in the appendices. The usual maximum period of performance is four years, but it can range from one year for activities of limited scope to as long as five years for extensive, comprehensive studies.

Any proposed period of performance must be justified in the proposal. The appropriateness of the proposed period of performance will be evaluated by peer review. NASA may choose to support an award of shorter duration than was proposed.

(d) Rephasing of Award Budgets

Occasionally the schedule for delivery of funds for SMD awards are will be changed, either at the request of the PI or NASA and this is referred to as rephasing of awards.

In keeping with the Agency's family friendly stance, SMD will accommodate all reasonable requests from the PI or AOR to rephase ROSES awards, as long as it does not compromise previously agreed upon project goals, timelines, or deliverables. This is consistent with our adherence to FDP terms that to allow grantee initiated first time no-cost extensions of up to 12 months **[Sentences above added April 23, 2012]**.

To facilitate the reduction of uncosted carryover, SMD program officers engage in active grant management after appropriate communication with the grantees. Program Officers assess the uncosted carryover in the awards in their portfolios. While some uncosted carryover is necessary, those awards that are both (a) carrying a year (or more) of funding and (b) carrying a total carryover of $100K or more will be considered for rephasing. Program Officers take into account the history of funding and costing on a grant-by-grant basis.

In those cases where a year or more of funds are being carried over, the standard procedure would be to propose rephasing the funds to slip out by a year. The total funds disbursed would not change, only the fiscal year in which they arrive. Program Officers will inform the PI of their intentions regarding fund disbursement/rephasing and give the PI an opportunity to respond.

SMD policy is that science should never be halted for a lack of approved funds. If an award is rephased, NASA will make every reasonable effort to deliver the next fiscal year funding in a timely manner. Honoring commitments and ensuring the continuation of existing projects is a high priority of SMD.

III. Eligibility Information

(a) Eligibility of Applicants

Prospective investigators from any category of organizations or institutions, U.S or non-U.S., are welcome to respond to this solicitation. Specific categories of organizations and institutions that are welcome to respond include, but are not limited to, educational, industrial, and not-for-profit organizations, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), NASA Centers, the Jet Propulsion Laboratory (JPL), and other Government agencies. Historically Black Colleges and Universities (HBCUs), Other Minority Universities (OMUs), small disadvantaged businesses (SDBs), veteran-owned small

businesses, service disabled veteran-owned small businesses, HUBZone small businesses, and women-owned small businesses (WOSBs) are encouraged to apply.

Participation by non-U.S. organizations in this program is welcome, but subject to NASA's policy of no exchange of funds, in which each government supports its own national participants and associated costs (further information on foreign participation is provided in Section 1.6 of the *NASA Guidebook for Proposers*). NASA does not normally fund foreign research proposals or foreign research efforts that are part of U.S. research proposals. Rather, cooperative research efforts are implemented via international agreements between NASA and the sponsoring foreign agency or funding/sponsoring institution under which the parties agree to each bear the cost of discharging their respective responsibilities. NASA funding may not be used for subcontracted foreign research efforts. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted.

(b) Number of Proposals and Teaming Arrangements

There is no restriction on the number of proposals that an organization may submit to this solicitation or on the teaming arrangements for any one proposal, including teaming with employees of NASA's Centers and the Jet Propulsion Laboratory. However, each proposal must be a separate, stand-alone, complete document for evaluation purposes.

(c) Restrictions involving China

Proposals must not include bilateral participation, collaboration, or coordination with China or any Chinese-owned company or entity, whether funded or performed under a no-exchange-of-funds arrangement.

In accordance with Public Law 112-55, Section 539(a), NASA is prohibited from funding any NASA contract, grant, or cooperative agreement action (including new awards and continuing awards) that involves the bilateral participation, collaboration, or coordination with China or any Chinese-owned company or entity, whether funded or performed under a no-exchange-of-funds arrangement.

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

For more information please see the ROSES 12 FAQ 1a on the SARA web page at http://science.nasa.gov/researchers/sara/faqs/#1. **[FAQ added June 26, 2012]**

Grant Information Circular 12-01 instructs us when issuing new NASA Research Announcements such as ROSES to add the following paragraph to the current proposal requirements set forth at 14 CFR § 1260.10 (c)(1) so that proposers, by submission of their proposal, represent that they are not China or a Chinese-owned company, and that they will not participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level or at any subrecipient level, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement.
An Assurance of Compliance with The Department of Defense and Full-Year Appropriation Act, Public Law 112-10 Section 1340(a); The Consolidated and Further Continuing Appropriation Act of 2012, Public Law 112-55, Section 539; and future-year appropriations herein after referred to as "the Acts", whereas:

(1) NASA is restricted from using funds appropriated in the Acts to enter into or fund any grant or cooperative agreement of any kind to participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level and at all subrecipient levels, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement.

(2) Definition: "China or Chinese-owned Company" means the People's Republic of China, any company owned by the People's Republic of China, or any company incorporated under the laws of the People's Republic of China.

(3) The restrictions in the Acts do not apply to commercial items of supply needed to perform a grant or cooperative agreement.

(4) By submission of its proposal, the proposer represents that the proposer is not China or a Chinese-owned company, and that the proposer will not participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level or at any subrecipient level, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement. **[This section added June 26, 2012]**

(d) Cost Sharing or Matching

If an institution of higher education or other not-for-profit organization wants to receive a grant or cooperative agreement, cost sharing is not required, although NASA can accept cost sharing if it is voluntarily offered (see the *Grants Handbook*, Section B, §1260.123, "Cost Sharing or Matching"). If a commercial organization wants to receive a grant or cooperative agreement, cost sharing is required unless the commercial organization can demonstrate that it does not expect to receive substantial compensating benefits for performance of the work. If this demonstration is made, cost sharing is not required but may be offered voluntarily (see also the *Grants Handbook*, Section D, §1274.204, "Costs and Payments"). See also Section VII(a) below.

The summary table of names and planned work commitment of all personnel necessary to perform the proposed effort, regardless of whether those individuals require funding (see the *Guidebook for Proposers* Section 2.3.10), is needed for the purposes of evaluating the proposal. Level of effort estimates for unfunded team members are not intended to represent voluntary committed cost sharing. Collaborators should be listed on the table but their level of effort may be simply given as "de minimis". **[This paragraph added 05/22/2012]**

IV. Proposal and Submission Information

(a) Proposal Instructions and Requirements

All information needed to apply to this solicitation is contained in this ROSES NRA and in the companion document, the *Guidebook for Proposers Responding to a NASA Research Announcement (NRA) or Cooperative Agreements Notice (CAN)* (hereafter referred to as the *NASA Guidebook for Proposers*), located at http://www.hq.nasa.gov/office/procurement/nraguidebook. By reference, the 2012 edition of the *NASA Guidebook for Proposers* is incorporated into this NRA. Proposers are responsible for understanding and complying with its procedures for the successful, timely preparation and submission of their proposals. Proposals that do not conform to its standards may be declared noncompliant and rejected without review.

Questions regarding this NRA or its program elements should be directed to the cognizant Program Officer identified in the *Summary of Key Information* subsection that concludes each

program element description. Any clarifications or questions and answers that are published will be posted on the relevant program element's index page in NSPIRES.

The introductory material, as well as the appendices, of the *NASA Guidebook for Proposers* provide additional information about the entire NRA process, including NASA policies for the solicitation of proposals, guidelines for writing complete and effective proposals, and NASA's general policies and procedures for the review and selection of proposals and for issuing and managing the awards to the institutions that submitted selected proposals. A group of *Frequently Asked Questions* (FAQs) provides additional miscellaneous information about a variety of the NASA proposal and award processes, policies, and procedures.

Comments and suggestions of any nature about the *NASA Guidebook for Proposers* are encouraged and welcome and may be directed at any time to the point-of-contact identified in Section VIII below.

(b) Content and Form of the Proposal Submission

(i) Electronic Proposal Submission

All proposals submitted in response to this ROSES NRA must be submitted in a fully electronic form. No hard copy of the proposal is required or permitted. Electronic proposals must be submitted by one of the officials at the PI's organization who is authorized to make such a submission; electronic submission by the authorized organization representative (AOR) serves for the proposal as the required original signature by an authorized official of the proposing organization.

Proposers may opt to submit proposals in response to this ROSES NRA via either of two different electronic proposal submission systems: either via the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) (http://nspires.nasaprs.com; see Section IV(b)(iv) below) or via Grants.gov (http://www.grants.gov; see Section IV(b)(v) below).

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

- Every organization that intends to submit a proposal to NASA in response to this NRA, including educational institutions, industry, not-for-profit institutions, the Jet Propulsion Laboratory, NASA Centers, and other U.S. Government agencies, must be registered in NSPIRES. This applies equally for proposals submitted via Grants.gov, as well as for proposals submitted via NSPIRES. Every organization that intends to submit a proposal through Grants.gov must also be registered in Grants.gov, as well as in NSPIRES. Registration for either proposal data system must be performed by an organization's electronic business point-of-contact (EBPOC) in the Central Contractor Registry (CCR).

- Any organization requesting NASA funds through the proposed investigation must be listed on the Proposal Cover Page. NASA will not fund organizations that do not appear on the Proposal Cover Page.

- Each individual team member (e.g., PI, co-investigators, etc.), including all personnel named on the proposal's electronic cover page, must be individually registered in NSPIRES. This applies equally for proposals submitted via Grants.gov, as well as for proposals submitted via NSPIRES. Unless specifically allowed by an individual program element appendix, multiple PIs (as described in Section 1.4.2 of the *NASA Guidebook for*

Proposers) are not permitted. The use of other categories of participation described in Section 1.4.2 of the *NASA Guidebook for Proposers*, including Science PI, Institutional PI, and Co-PI (from a non-U.S. organization under specific circumstances), remain permitted.

- Each individual team member (e.g., PI, co-investigators, etc.), including all personnel named on the proposal's electronic cover page, must confirm their participation on that proposal (indicating team member role) and specify an organizational affiliation. For proposals submitted via NSPIRES, this confirmation is via NSPIRES (see Section IV(b)(iv), below). For proposals submitted via Grants.gov, this confirmation is via "Letters of Commitment" included within the proposal. The organizational affiliation specified on the cover page must be the organization through which the team member would work and receive funding while participating in the proposed investigation. If the individual has multiple affiliations, then this organization may be different from the individual's primary employer or preferred mailing address. Team members are asked to ensure that their contact information in NSPIRES is up-to-date. Changes can be made using the "Account Management" link on the "NSPIRES Options" page.

Generically, an electronic proposal consists of electronic forms and one or more attachments. The electronic forms contain data that will appear on the proposals cover pages and will be stored with the proposal in the NSPIRES database. A proposal submitted in response to this NRA must have only a single attachment. The single attachment contains all sections of the proposal, including the science/technical/ management section, the budget narrative, and all required and allowed appendices; see Section IV(b)(ii) below for further requirements.

Submission of proposals via either NSPIRES or Grants.gov is a two-step process. When the PI has completed entry of the data requested in the required electronic forms and attachment of the allowed PDF attachments, including the science/technical/management section, an official at the PI's organization who is authorized to make such a submission, referred to as the Authorized Organizational Representative (AOR), must submit the electronic proposal (forms plus attachments). Coordination between the PI and his/her AOR on the final editing and submission of the proposal materials is facilitated through their respective accounts in NSPIRES and/or Grants.gov.

(ii) <u>Proposal Format and Contents</u>

All proposals submitted in response to this NRA must include any specified required electronic forms available through either of two proposal submission systems, NSPIRES or Grants.gov. Submission via NSPIRES requires responding to questions on the NSPIRES submission page.

The science/technical/management section and other required sections of the proposal must be submitted as a single, searchable, unlocked PDF file that is attached to the electronic submission using one of the proposal submission systems. Proposers must comply with all format requirements specified in this NRA and in the *NASA Guidebook for Proposers* (e.g. Section 2.3 of the *NASA Guidebook for Proposers*). Only appendices that are specifically requested in either this NRA or in the *NASA Guidebook for Proposers* will be permitted; proposals containing unsolicited appendices may be declared noncompliant. Section 2 of the *NASA Guidebook for Proposers* provides detailed discussions of the content and organization of proposals suitable for all program elements in this NRA, as well as the default page limits of a proposal's constituent parts.

Note that some of the program element descriptions in Appendices A through E of this NRA may specify different page limits for the main body of the proposal; if so, these page limits will be prominently given in the *Summary of Key Information* subsection that concludes each program element description. In the event the information in this NRA is different from or contradictory to the information in the *NASA Guidebook for Proposers*, the information in this NRA takes precedence.

Proposals submitted in response to ROSES are permitted 15 characters per inch, typical of font Times New Roman 12, and consistent with our Announcements of Opportunity. This requirement applies to body text and figure captions, but it does not apply to text *within* figures and tables, which may be smaller, but must still be judged by the reviewers to be readable.

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

There is a 10 MB size limit for proposals (Section 2.3(c) of the *NASA Guidebook for Proposers*). Large file sizes can impact the time it takes for NASA and peer reviewers to download and access your proposal. In order to increase the ease in reviewing your proposal, you should crop and compress any embedded photos and graphic files to an appropriate size and resolution. Most electronically submitted proposals will be less than 2 MB in size.

(iii) ROSES Budget Format including Special Requirements for NASA Civil Servants and JPL Proposals

In the evaluation of proposals submitted under ROSES, SMD will be showing the budget data included in proposals to peer reviewers. Proposers should include all relevant details (with the exception of salaries for NASA civil servants) in the budget justification, and a detailed budget should be included at the end of the proposal document. Proposals submitted in response to this ROSES NRA should follow the directions for the budget section of the proposal given in Section 2.3.10 of the *NASA Guidebook for Proposers*. There are no additional requirements for ROSES proposals from non-NASA proposers.

NASA civil servant salaries must not be included in either the NSPIRES cover page (web-based form) budgets nor the budget justification within the proposal. This applies to proposals submitted by NASA Centers as well as to proposals submitted by non-NASA organizations that include NASA civil servants serving as funded co-investigators. However, the FTEs being requested for NASA civil servant investigators must be included and justified in the budget justification within the proposal. NASA will budget and account for civil servant salaries within ROSES proposals through a separate internal agency process. The latest NASA internal policy on this subject, including instructions on what to include in budgets for ROSES proposals, may

be found at the SARA website at http://science.nasa.gov/researchers/sara/how-to-guide/nspires-CSlabor/.

Since NASA funding sent to NASA Centers must be obligated in the same fiscal year (FY) in which they are received, proposals submitted by NASA Centers (but not including JPL) should begin the budget section of the proposal with a breakdown of funding by NASA Center and by fiscal year, assuming the start date given in the *Summary of Key Information* table at the end of the program element (the default is six months after proposal submission). Thus, a ROSES-2012 proposal for a two-year award that starts in mid FY 2012 could phase the funds for a half year of funding in FY 2012, a full year in FY 2013, and a half a year in FY 2014.

Proposers from JPL should not include the JPL award fee in the total requested amount, nor should the budgets of JPL Co-Investigators on proposals from other institutions include the JPL award fee in their total requested amount. The total requested amount is the amount which shows on the NSPIRES online (cover page) budget form or the Grants.gov standard budget form. JPL award fees are paid for and accounted for by a different mechanism than the mechanism used to fund research investigations. JPL proposers and Co-Investigators may still include the award fee for informational purposes in their budget narratives and detailed budgets.

(iv) Submission of Proposals via NSPIRES, the NASA Proposal Data System

Proposals may be submitted electronically via NASA's master proposal data base system, the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES). In order to submit a proposal via NSPIRES, this NRA requires that the proposer register key data concerning the intended submission with NSPIRES at http://nspires.nasaprs.com. Potential applicants are urged to access this site well in advance of the NOI and proposal due dates of interest to familiarize themselves with its structure and enter the requested identifier information.

It is especially important to note that every individual named on the proposal's electronic *Cover Page* form (see below) as a proposing team member in any role, including co-investigators and collaborators, must be individually registered in NSPIRES and that such individuals must perform this registration themselves; no one may register a second party, even the PI of a proposal in which that person is committed to participate. It is also important to note that every named individual must be identified with the organization through which they are participating in the proposal, regardless of their place of permanent employment or preferred mailing address. This data site is secure and all information entered is strictly for NASA's use only.

Every individual identified on the NSPIRES proposal cover page as a team member must indicate their commitment to the proposed investigation through NSPIRES prior to proposal cover page submission. Team members must additionally confirm the organization through which they are participating on this proposal. A team member will receive an email from NSPIRES indicating that he/she has been added to the proposal and should log in to NSPIRES.

- Once logged in, the team member should follow the link in the "Reminders and Notifications" section of his NSPIRES homepage, titled "Need <role> confirmation for proposal <title> for Solicitation <<solicitation number>>." On the "Team Member Participation Confirmation" page, the proposal team member should read language about the Organizational Relationship, then click the "Continue" button.
- If the contact information then displayed on the "Team Member Profile" screen is out of date, the proposal team member should update this information later using the "Account

Mgmt" link in the NSPIRES navigation bar across the top. Prior to making that update, however, the team member should follow the on-screen prompts to identify the organization through which he/she is participating on this proposal. Click the "Link Relationship" button to the right side of the "Organizational Relationship" banner. Select the organization from the "Link Proposal to an Association" part of the page. If the correct organization is not displayed here, try using the "Add Association" button to add the organization to this list. Then click the "Save" button at the bottom of the page. If the team member cannot find the organization when searching in the "Add Association" area (*i.e.*, the organization is not registered), type in the formal name in the space provided (or select "Self" if appropriate). Once the organization is selected and the "Save" button is clicked, there is a confirmation page that allows the team member to edit that relationship if it was chosen incorrectly. Click "Continue".

- Note that the organization through which the proposal team member is participating in the proposal might not be the proposal team member's primary employer or primary mailing address. If the address information is accurate (or once it has been edited to be accurate), the proposal team member may log out of NSPIRES.
- NSPIRES will send an email to both the team member and the PI confirming that the commitment was made and the organization was identified. The PI may additionally monitor the status of proposal team member commitments by examining the "Relationship Confirmed" column on the Team Member page of the NSPIRES proposal cover page record. Note that the proposal cover page cannot be submitted until all identified team members have confirmed their participating organizations.

All proposals submitted via NSPIRES in response to this NRA must include a required electronic *Cover Page* form that is accessed at http://nspires.nasaprs.com/. This form is comprised of several distinct sections: a *Cover Page* that contains the identifier information for the proposing institution and personnel; a *Proposal Summary* that provides an overview of the proposed investigation that is suitable for release through a publicly accessible archive should the proposal be selected; *Business Data* that provides the proposed start and end dates, as well as other proposal characteristics; a *Budget* form that contains a budget summary of the proposed research effort; *Program Specific Data* that includes required questions specific to ROSES and that particular program element; and *Proposal Team* that provides the co-investigators and other participants in the proposal. This *Cover Page* form is available for access and submission starting about 90 days in advance of the proposal due dates given in Tables 2 and 3 of this NRA and remains open until the proposal due date for each program element. Unless specified in the program element description itself, no other forms are required for proposal submission via NSPIRES. See the *NASA Guidebook for Proposers*, Sections 2 and 3, for further details.

Although NSPIRES has the ability to accept many, separate proposal documents**,** the required elements of any proposal submitted in response to this NRA must be submitted as a single, searchable, unlocked PDF document that contains the complete proposal, including the science/technical/management section and budget justification, assembled in the order provided in the *NASA Guidebook for Proposers* (see Section 2.3) and uploaded as a single attachment using the tools in NSPIRES. The proposer is responsible for assembling the complete proposal document for peer review. All required and permitted appendices must be included in the PDF file and should not be uploaded as separate attachments, unless specified otherwise in the program element description in the appendices to this NRA. Including any part of the proposal

twice creates an additional burden on the peer reviewers. Documents such as team member biographical sketches, letters of commitment, and current and pending support should not be uploaded to NSPIRES as separate files.

NSPIRES generates error and warning messages as part of the element check concerning possibly missing data. An error (designated by a red X) will preclude proposal submission to NASA by the AOR. A warning (indicated by an ! on a yellow field) is an indication that data may be missing; a warning can be ignored after verifying that the material is included in the single attachment containing the complete proposal. Any actions taken because of warnings are at the PI's discretion.

In addition, it is unnecessary to download the Proposal Cover Page and incorporate it into the Proposal Document. NSPIRES will automatically route the two parts of the proposal (*Cover Page* form, proposal document) to the appropriate peer or NASA reviewers.

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

(v) Submission of Proposals via Grants.gov

NASA offers proposers the option to use Grants.gov to prepare and submit proposals in response to this ROSES NRA. Grants.gov allows organizations to electronically find and apply for competitive grant opportunities from all Federal grant-making agencies; it provides a single access point for over 1000 grant programs offered by the 26 Federal grant-making agencies. The U.S. Department of Health and Human Services is the managing partner for Grants.gov.

Grants.gov requires that the PI download an application package from Grants.gov. Identifying the appropriate application package requires the funding opportunity number for that program element; the funding opportunity number may be found in the *Summary of Key Information* subsection that concludes each program element description in the appendices of this NRA. Proposals submitted via Grants.gov must be submitted by the AOR.

Submitting a proposal via Grants.gov requires the following steps:

- Grant researchers (PIs) do NOT need to register with Grants.gov. However, every individual named in the proposal as a proposing team member in any role, including PI, co-investigators, and collaborators, must be registered in NSPIRES (http://nspires.nasaprs.com) and such individuals must perform this registration themselves; no one may register a second party, even the PI of a proposal in which that person is committed to participate. This data site is secure and all information entered is strictly for NASA's use only.
- Follow Grants.gov instructions provided at the website to download any software tools or applications required to submit via Grants.gov.
- Download the application package from Grants.gov by selecting "Download grant application packages" under "Apply for Grants" at http://www.grants.gov. Each program element described in an appendix of ROSES requires a different application package and

has a different Funding Opportunity Number; the Funding Opportunity Number may be found in the *Summary of Key Information* at the end of the program element description in each appendix of ROSES. Enter the appropriate Funding Opportunity Number to retrieve the desired application package. All NASA application packages may be found by searching on CFDA Number 43.001.

- Complete the required Grants.gov forms including the SF424 Application for Federal Assistance, research and research-related (R&R) Other Project Information, R&R Senior/Key Person Profile, and R&R Budget. Every named individual must be identified with the organization through which they are participating in the proposal, regardless of their place of permanent employment or preferred mailing address.
- Complete the required NASA specific forms including NASA Other Project Information, NASA PI and Authorized Representative Supplemental Data Sheet, and NASA Senior/Key Person Supplemental Data Sheet (this form is only required if there are Senior/Key Persons other than the PI).
- Complete any NASA program-specific form that is required for the specific program element. This form, which is usually required for all ROSES program element submissions, is included as a PDF form within the proposal application package downloaded from Grants.gov. The form, once completed, is attached to the NASA Other Project Information form.
- Create a proposal in PDF including the science/technical/management section and all other required proposal sections (see Section 2 of the *NASA Guidebook for Proposers*). Attach sections as separate PDF documents as prompted by Grants.gov.
- Because Grants.gov does not support the electronic commitment of team members, statements of commitment from all team members must be provided as letters attached to the proposal application at the place(s) specified by Grants.gov. This statement must include confirmation of both the team member role in the proposed effort (e.g., Co-Investigator, collaborator) and the identification of the organization through which the team member will be participating. Here is an example statement of commitment: "I acknowledge that I am identified by name as <<role>> to the investigation, entitled <<name of proposal>>, that is submitted by <<name of Principal Investigator>> to the NASA Research Announcement <<alpha-numeric identifier>>, and that I intend to carry out all responsibilities identified for me in this proposal. I understand that the extent and justification of my participation as stated in this proposal will be considered during peer review in determining in part the merits of this proposal. I have read the entire proposal, including the management plan and budget, and I agree that the proposal correctly describes my commitment to the proposed investigation. For the purposes of conducting work for this investigation, my participating organization is <<insert name of organization>>"
- Submit the proposal via the Authorized Organization Representative (AOR); the PI <u>may not</u> submit the application to Grants.gov unless he/she is an AOR.

Potential applicants are urged to access Grants.gov site <u>well in advance</u> of the proposal due date(s) of interest to familiarize themselves with its structure and download the appropriate application packages and tools.

Additional instructions for formatting and submitting proposals via Grants.gov may be found in Sections 2 and 3 of the *NASA Guidebook for Proposers*. Instructions for the use of Grants.gov may be found in the *Grants.gov User Guide* at http://www.grants.gov/applicants/app_help_reso.jsp. Instructions for NASA-specific forms and NASA program-specific forms may be found in the application. For any questions that cannot be resolved with the available online help menus and documentation, requests for assistance may be directed by email to support@grants.gov or by telephone to (800) 518-4726, Monday through Friday, 7:00 a.m. – 9:00 p.m. Eastern Time.

(vi) Notice of Intent to Propose

For most of the program elements advertised through this solicitation, a brief Notice of Intent (NOI) to propose is encouraged, but not required, for the submission of proposals to this solicitation. The information contained in an NOI is used to help expedite the proposal review activities and, therefore, is of considerable value to both NASA and the proposer. To be of maximum value, NOIs should be submitted by the PI to NSPIRES (located at http://nspires.nasaprs.com) by the dates given in Tables 2 or 3 of this NRA for each program element in Appendices A through E. Note that NOIs may be submitted within NSPIRES directly by the PI; no action by an organization's AOR is required to submit an NOI.

Grants.gov does not provide NOI capability; therefore, NOIs must be submitted via NSPIRES regardless of whether the proposal will be submitted via NSPIRES or Grants.gov. Interested proposers must register with NSPIRES before it can be accessed for use. NSPIRES is open for the submission of NOIs for typically 30 days, starting about 90 days in advance of the due date for the proposals themselves. Since NOIs submitted after these deadlines may still be useful to NASA, late NOIs may be submitted by email as directed in Section 3.1 of the *NASA Guidebook for Proposers.*

(vii) The Two-Step Proposal Process and the Two-Phase Proposal Process

The Two-Step Proposal Process

On occasion, NASA will solicit proposals using a two-step proposal process for which the Step-1 proposal is a synopsis of the intended research. When employed, Step-1 proposals are submitted by the NOI/Step-1 due date given in Tables 2 and 3 of this NRA; this site will be open for the submission of Step-1 proposals starting ~30 days in advance of their due date. NASA will review this Step-1 proposal to determine if the anticipated research project exhibits sufficient programmatic relevance and responsiveness to the current solicitation to warrant submission of a full Step-2 proposal. All submitters of Step-1 proposals will be informed by NASA no later than eight weeks after the Step-1 due date that they are, or are not, invited to submit a full Step-2 proposal by the proposal due date established for that program element. The provision of feedback on Step-1 proposals prior to the Step-2 due date is not ensured. Note that Step-1 proposals are required. A Step-2 proposal may be submitted only if a Step-1 proposal is submitted and that Step-1 proposal results in an invitation to submit a Step-2 proposal.

The required synopsis for the Step-1 proposal is submitted as a PDF document upload; the required contents for the Step-1 proposal will be specified in the program element description. In some cases the investigation team is not considered binding for Step-1 (i.e., it can be adjusted in an invited Step-2 proposal) but in other cases the team is binding, so please read the program element carefully. Budget and detailed program data should not be included with the Step-1

proposal. The Step-1 proposal must be submitted by an Authorized Organizational Representative of the proposing organization. Step-2 proposals are to be submitted in full compliance with the *NASA Guidebook for Proposers* discussed in Section IV(a) above.

Optionally the two-step program element may state a limit on the number of Step-1 proposals that an individual PI may submit.

At the time of release, this ROSES-2012 NRA contains three program elements that solicit proposals using a two-step process: *Land-Cover/Land-Use Change* (Appendix A.2), *Geospace Science* (Appendix B.3), *Solar and Heliospheric Science* (Appendix B.4) and *Cassini Data Analysis and Participating Scientists* (Appendix C.10).

The Two-Phase Proposal Process

On occasion, NASA will solicit proposals using a two-phase proposal process for which Phase-1 is an observing request for an observation to be performed by a NASA space observatory as part of a NASA guest investigator/guest observer program element. Phase-2 is a proposal for funding. An NOI may be requested for a Phase-1 observing request by the NOI due date, and the Phase-1 observing request must be submitted by the proposal due date in Tables 2 and 3 of this NRA.

Grants.gov does not provide NOI or Phase-1 observing request capability; therefore, NOIs and Phase-1 observing requests cannot be submitted via Grants.gov regardless of whether the Phase-2 funding proposal will be submitted via NSPIRES or Grants.gov. The Phase-2 proposal for funding must be submitted via either NSPIRES or Grants.gov by a proposal due date that will be announced when NASA announces the disposition of the Phase-1 observing requests. The process and requirements for the submission of Phase-1 observing requests and Phase-2 proposals may differ for each program element; proposers should read carefully the relevant program element Appendix to this ROSES NRA.

At the time of release, this ROSES-2012 NRA contains two guest investigator/guest observer program elements using the two-phase proposal process: *Swift Guest Investigator* (Appendix D.5) and *Fermi Guest Investigator* (Appendix D.6).

(c) Proposal Submission Due Dates and Deadlines

For each program element in Appendices A through E of this NRA, the electronic proposal must be submitted in its entirety by an Authorized Organizational Representative (AOR) no later than the proposal deadline on the appropriate proposal due date given in Tables 2 or 3 of this NRA. Unless stated otherwise in the relevant appendix to this NRA, the proposal deadline is 11:59 p.m. Eastern Time. All proposals must be submitted electronically using either NSPIRES or Grants.gov (see Sections IV(b)(i–iii) above).

Proposals submitted later than the proposal due date and deadline will be considered late. Proposals that are late will be handled in accordance with NASA's policy as given in Section (g) of Appendix B of the *NASA Guidebook for Proposers* (see also its Sections 3.2 and F.23). Proposals received after the due date may be rejected without review. If a late proposal is rejected, it is entirely at the discretion of the proposer whether or not to resubmit it in response to a subsequent appropriate solicitation. It is not possible to submit a late proposal electronically via NSPIRES unless the electronic *Cover Page* was initially created prior to the proposal due date. Late proposals may not be submitted via Grants.gov.

(d) Proposal Funding Restrictions

In addition to the funding restrictions and requirements given in the *Guidebook for Proposers* and the *Grants Handbook*, the following restrictions are applicable to this ROSES NRA.

- The estimated funding and number of proposals anticipated to be funded, as shown in the *Summary of Key Information* at the end of each program element, are subject to the availability of appropriated funds, as well as the submission of a sufficient number of proposals of adequate merit.
- As directed in the *NASA Guidebook for Proposers*, Section 2.3.10(c)(iii), other than the special cases discussed in Section 2.3.10(c)(ii) of the *NASA Guidebook for Proposers*, and unless specifically noted otherwise in the specific ROSES program element appendix, the proposing PI organization must subcontract the funding of all proposed Co-Is who reside at other non-Government organizations, even though this may result in a higher proposal cost because of subcontracting fees. Potential exceptions to this rule include but are not limited to the awards that stem from the Suborbital-Class Platforms (see Section V). Other rare exceptions will be considered on a case by case basis when requested by the proposers and found to be in the interests of the government and consistent with appropriate law, regulation, policy and practice **[Clarified October 2, 2012]**.
- Regardless of whether a Co-I will be funded through a subaward or through a separate award, and with the exception of salaries for NASA civil servants (see Section IV(b)(iii)), the budget for the proposal must include all funding requested from NASA for the proposed investigation. This must be reflected in the budget totals that appear in the proposal and its budget forms. Any required budget for Co-Is or Government facilities that will be separately funded should be included in the proposal's Budget Narrative and should be listed as "Other Applicable Costs" in the required Budget Details, as well as entered in the "Other" line(s) on the NSPIRES or Grants.gov budget entry form in the "Other Direct Costs" section. This funding must be included in the total cost of the proposed work. No indirect burden should be applied to this amount. (see Section 2.3.10(c)(ii) of the *NASA Guidebook for Proposers*).
- The construction of facilities is not an allowed activity for any of the program elements solicited in this NRA unless specifically stated. For further information on what costs are permissible, refer to the cost principles cited in the *Grants Handbook*, Section B, §1260.127, "Allowable Costs."
- Travel, including foreign travel, is allowed as may be necessary for the meaningful completion of the proposed investigation, as well as for publicizing its results at appropriate professional meetings. Proposers from NASA Centers should consult the latest NASA policy document regarding restrictions on travel funding. Note that selection of a proposal and approval of a proposed budget that includes travel for civil servants does not guarantee that a NASA Center has sufficient travel authority under NASA's reduced travel budget to approve the proposed travel.
- In general, proposals for sponsorship of topical conferences, workshops, consortia, or symposia meeting certain criteria are solicited through the ROSES program element *Topical Workshops, Symposia, and Conferences* (Appendix E.2).

- Regardless of whether the conference is sponsored by NASA, individual conference travel by grantees is permitted and proposers from universities may include a budget for travel to conferences and workshops. Proposers from NASA Centers should consult their Center implementing policy on the latest NASA guidance on conference spending and reporting requirements. Note that selection of a proposal and approval of a proposed budget that includes travel for civil servant does not guarantee that a NASA Center has sufficient travel authority under NASA's reduced travel budget to approve the proposed travel.
- Profit for commercial organizations is not allowable under grant or cooperative agreement awards but is allowable under contract awards.
- NASA funding may not be used for subcontracted foreign research efforts. U.S. research award recipients may directly purchase supplies and/or services from non-U.S. sources that do not constitute research, but award funds may not be used to fund research carried out by non-U.S. organizations. However, a foreign national may receive remuneration through a NASA award for the conduct of research while employed either full or part time by a U.S. organization (see Section 1.6 of the *NASA Guidebook for Proposers*; see also Appendix B, part (c)(8)(iv)). Special restrictions apply to collaboration with China, see Section III(c).
- Travel by a participant in the research investigation, whether for the purpose of conducting the research, for collaboration, or for attending a conference, is considered to be a research expense. NASA conducts its collaborations with foreign institutions on a no-exchange-of-funds basis. NASA funding may not be used for research efforts by foreign organizations at any level. Therefore, NASA funding may not be used for travel expenses by any participant who is not participating while employed either full time or part time by a U.S. organization (see Section 1.6 of the *NASA Guidebook for Proposers*; see also Appendix B, part (c)(8)(iv)).
- Costs of preparing, publishing and disseminating the results of NASA funded research (e.g., page charges, open access fees etc.) may be included in research proposals and are allowable charges against the grant as long as the charges are levied impartially on all research papers published by the journal.
- The instructions in the following paragraph clarify and supersede the *Guidebook for Proposers*, Section 2.3.10(c)(iv).

  Regardless of whether functioning as a team lead or as a team member, personnel from NASA Centers must propose budgets consistent with the current accounting implementation for the requested year of performance. Proposal budgets from NASA Centers must include all costs that will be paid out of the resulting award with the exception of salaries for NASA civil servants (see Section IV(b)(iii)). Costs that will not be paid out of the resulting award, but are paid from a separate NASA budget (e.g., center management and overhead; CM&O) and are not based on the success of this specific proposal, should not be included in the proposal budget. For example, CM&O should not be included in the proposal budget while other direct charges (including procurements and contractor labor) to the proposed research task should be included. Although NASA civil servant salaries are budgeted within NASA program budgets (such as the research

budgets which fund ROSES investigations) and are paid out of the resulting award, these costs should not be included in proposal budgets (see Section IV(b)(iii)). NASA will budget and account for civil servant salaries within ROSES proposals through a separate internal agency process. The latest NASA internal policy on this subject, including instructions to NASA Centers on formulating budgets for ROSES proposals, may be found at the SARA website at http://science.nasa.gov/researchers/sara/how-to-guide/nspires-CSlabor/.

- Non-NASA U.S. Government organizations should propose based on full-cost accounting unless no such standards are in effect; in that case such proposers should follow the *Managerial Cost Accounting Standards for the Federal Government* as recommended by the Federal Accounting Standards Advisory Board (for further information, see http://www.hq.nasa.gov/fullcost). Proposal budgets must include all costs that will be paid out of the resulting award.

(e) Proposal Requirements for Relevance

Proposals for all NASA sponsored research programs are evaluated on three criteria: intrinsic merit, relevance to NASA's objectives, and cost realism and reasonableness (see Appendix C of the *NASA Guidebook for Proposers*).

Each program element includes a specific description of how it is relevant to the *NASA Strategic Plan* and/or the *NASA Science Plan* (see Section I(a)). Therefore, unless otherwise stated in the program element, it is not necessary for individual proposals to show relevance to NASA's broader goals and objectives. The proposal only needs to demonstrate relevance by discussing how the proposed investigation addresses the goals and objectives of the specific program element.

V. Suborbital and Suborbital-Class Investigations

(a) Overview of Suborbital and Suborbital-Class Platforms

In each SMD Research Program (Earth Science, Heliophysics, Planetary Science, Astrophysics), flight investigations that require access to space or near-space are solicited. Because flight investigations solicited through ROSES generally use suborbital platforms (though there are exceptions) and generally have modest costs appropriate for the research program, these investigations are referred to as suborbital or suborbital-class investigations.

Platforms for suborbital and suborbital-class investigations include aircraft, balloons, sounding rockets, suborbital reusable launch vehicles, the International Space Station (ISS), and CubeSats. General requirements for proposals to use any of these platforms, with the exception of aircraft, are discussed in this section of ROSES. Requirements for proposals using aircraft are discussed within the description of the Earth Science Research Program found in Appendix A.

(b) Points of Contact for Suborbital and Suborbital-Class Platforms

NASA provides different avenues for procurement of suborbital launch vehicle services: the use of NASA-provided services for sounding rockets (managed by the NASA Sounding Rocket Program Office (SRPO) at NASA Wallops Flight Facility) and balloons (managed by the NASA Balloon Program Office (BPO) at NASA Wallops Flight Facility) and the purchase of suborbital reusable launch vehicle services through the NASA Office of the Chief Technologist (OCT)'s Flight Opportunities Program. SMD also solicits investigations as CubeSats and as International

Space Station payloads. Regardless of which launch vehicle service is anticipated, all prospective PIs are required to demonstrate the capacity, availability, and commitment of the suborbital platform to support their investigation. PIs are strongly urged to discuss prospective investigations with NASA program personnel (see below) prior to submitting their proposal to ensure that probable operational costs are properly anticipated.

Experiments using suborbital reusable launch vehicles (Section V(d)), the International Space Station (Section V(e)), and CubeSats (Section V(f)) as platforms are subject to additional requirements.

(i) NASA-provided Sounding Rocket Services

Sounding Rocket Vehicles. Information on the capabilities of current available Sounding Rocket vehicles is available at http://sites.wff.nasa.gov/code810/vehicles.html. Proposers are encouraged to consider these capabilities in designing their investigations, but SRPO has the final authority in the choice of which vehicle is to be used.

Sounding Rocket Launch Sites. The nominal U.S. launch sites for sounding rockets are White Sands Missile Range (WSMR) in New Mexico, Wallops Island in Virginia, Poker Flat Rocket Range (PFRR) in Alaska, and Reagan Test Site (RTS) in the Kwajalein Atoll. Proposals may be submitted for launches with modest operational requirements from the established non-U.S. launch sites at Andoya, Norway, and Kiruna, Sweden (Esrange).

The Sounding Rocket Program is currently planning to provide launches from Woomera, Australia, in July-September of 2014 and again in April-June of 2016, subject to both the availability of funds and the conclusion of agreements with Australia. Investigators responding to ROSES may propose sounding rocket flights launched from this southern hemisphere site for either opportunity. Normal payload recovery is anticipated for flights using either the Black Brant IX or Black Brant XI launch vehicles.

Investigators proposing payloads to be flown on sounding rockets should answer the program-specific questions on the NSPIRES proposal cover pages. This information is needed by the Sounding Rocket Program Office to generate a rough order of magnitude cost estimate for the operational requirements associated with a proposed investigation and is used for planning purposes. The required information includes the envisioned vehicle type, payload mass, trajectory requirements, launch site, telemetry requirements, attitude control, or pointing requirements, and any plans for payload recovery and reuse.

Questions concerning sounding rockets may be addressed to:

Philip Eberspeaker
Sounding Rocket Program Office
Code 810
Wallops Flight Facility
National Aeronautics and Space Administration
Wallops Island, VA 23337
Telephone: (757) 824-2202
Email: Philip.J.Eberspeaker@nasa.gov

(ii) NASA-provided Balloon Services

Balloon Vehicles. Information on the capabilities of current available balloon vehicles is available at http://sites.wff.nasa.gov/code820/. Proposers are encouraged to consider these capabilities in designing their investigations, but BPO has the final authority in the choice of which vehicles to be used.

Balloon Launch Sites. The nominal U.S. launch sites for Balloons are Fort Sumner, New Mexico, and at the Columbia Scientific Balloon Facility in Palestine, Texas. The Balloon Program also conducts launches from established non-U.S. launch sites at McMurdo, Antarctica; Alice Springs, Australia; and Kiruna, Sweden (Esrange).

The Balloon Program is planning to provide a shared platform capable of carrying multiple, independent, piggyback-like instruments in order to offer suborbital flight opportunities to more users. The intent is to support more small instruments for science investigations, technology development, and/or training of young scientists and engineers. Investigators should identify, on the proposal cover page, which of these three categories is the main focus of the proposal. The following table summarizes the standard services and anticipated constraints for a flight supporting about six instruments:

Balloon Altitude:	Flight Duration:	Per instrument Weight/Size:	Data Rate/Power:	Launch location:
30-37 km	6-24 hours	136 kg; 0.4 cubic meters; Standard interface	> 50 kbs LOS; 50-100 watts, regulated 28 V battery nominal	Ft. Sumner (Spring or Fall) Palestine (Summer)

Questions concerning balloon services may be addressed to:

David Gregory
Balloon Program Office
Code 820
Wallops Flight Facility
National Aeronautics and Space Administration
Wallops Island, VA 23337
Telephone: (757) 824-2367
Email: David.D.Gregory@nasa.gov

(iii) Suborbital Reusable Launch Vehicles

Suborbital Reusable Launch Vehicles (sRLV) may offer new capabilities for the conduct of NASA scientific research, education, and technology advancement. Platforms are provided by the Office of Chief Technologist's (OCT's) Flight Opportunities Program. Some vehicles are operational, and others are anticipated to be operational by 2012. Further, there may be flight research opportunities as the vehicles are tested and demonstrated. The use of these commercial services may reduce the cost of suborbital flight research by leveraging private investment. The Flight Opportunities Program Office will assist proposers with sRLV vehicle platforms.

Additional constraints and requirements for proposals to use sRLV vehicles may be found in the ROSES Summary of Solicitation, Section V(d). All proposals to use sRLV vehicles must comply with the requirements in Section V(d) of the *ROSES Summary of Solicitation* (see below).

Questions concerning potential sRLV investigations may be addressed to:

LK Kubendran
Flight Opportunities Program
Office of the Chief Technologist
NASA Headquarters
Washington, DC 20546
Telephone: (202) 358-2528
E-mail: lk@nasa.gov

(iv) Research Investigations utilizing the International Space Station

NASA has determined that there may be payload opportunities for small, suborbital-class space and Earth science research investigations, including both science and technology development, that utilize the International Space Station (ISS). Available external attach points include both zenith and nadir pointing locations and internal attach points include nadir pointing locations. NASA has available annual external launch opportunities after 2012 on the Japanese HTV launch vehicle and the SpaceX vehicle. NASA also has regular opportunities on a suite of vehicles to launch pressurized cargo for use in the Window Observational Research Facility (WORF).

Additional constraints and requirements for proposals to utilize the International Space Station may be found in the *ROSES Summary of Solicitation*, Section V(e). All proposals to utilize ISS must comply with the requirements in Section V(e) of the *ROSES Summary of Solicitation*.

Investigators proposing ISS payloads are strongly urged to discuss International Space Station payload constraints, launch opportunities, and other technical matters with the ISS Customer Integration Office.

For further information, please contact:

George C. Nelson
ISS Research Integration Office/OZ
NASA Johnson Space Center
Houston, TX 77058
Telephone: 281.244.8514
Email: george.nelson-1@nasa.gov

(v) Use of Short Duration Orbital Platforms, including CubeSats

Short duration orbital platforms, such as CubeSats, may offer new capabilities for the conduct of NASA scientific research, education, and technology advancement. A CubeSat is a type of space research nanosatellite. The base CubeSat dimension is 10x10x11 centimeters (one “Cube” or “1U”). CubeSats typically include volumes of 1U, 2U, 3U, and 6U and may weigh no more than 1.33 kilogram per 1U Cube. NASA has initiated a CubeSat Launch Initiative and begun regularly providing launch opportunities for CubeSat as secondary payloads on NASA missions. The

CubeSat Launch Initiative is managed by the NASA Human Exploration and Operations Mission Directorate.

Additional constraints and requirements for proposals to utilize CubeSats may be found in the *ROSES Summary of Solicitation*, Section V(f). All proposals to utilize CubeSats must comply with the requirements in Section V(f) of the *ROSES Summary of Solicitation*.

For further information, please contact:

Anne E. Sweet,
Launch Services Program Executive,
Phone: 202-358-3784,
Email: anne.sweet-1@nasa.gov

or

Jason C Crusan,
Chief Technologist for Human Exploration and Operations
Phone: 202-358-0635,
Email: jason.c.crusan@nasa.gov

(c) General Guidelines for Suborbital Investigation Proposals

ROSES supports science investigations and/or technology development utilizing payloads flown on sounding rockets, balloons, suborbital reusable launch vehicles, or similar-class payloads flown on the International Space Station or as flights of opportunity. Suborbital payloads may be recovered, refurbished, and reflown, in order to complete an investigation. A discussion of the plans for management and for reduction and analysis of the data must be given in the proposal. Although most awards are for three or four years' duration, a five-year proposal may be accepted to develop a completely new, highly meritorious investigation through its first flight.

Budgets are expected to cover complete investigations, including payload development and construction, instrument calibration, launch, and data analysis. The number of investigations that can be supported is limited and heavily dependent on the funds available to the relevant research program. Note that NASA 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. Unlike most other ROSES investigations where the proposing PI organization must subcontract funding to non-Government investigators, suborbital investigations will sometimes be split into multiple awards depending on circumstances. Please read the individual ROSES Appendix and consult with the POC.

(d) Suborbital Reusable Launch Vehicles

Suborbital reusable launch vehicles (sRLVs) may offer new capabilities for the conduct of NASA scientific research, education, and technology advancement. Some sRLVs are already operational and there may be flight research opportunities as other vehicles are tested and demonstrated. The use of these commercial services may reduce the cost of suborbital flight research by leveraging private investment. Access to these platforms is managed by the Flight

Opportunities Program within the Office of the Chief Technologist. This program office will assist proposers with the use of sRLV platforms.

NASA is presently not considering human-tended payloads to be flown on sRLVs and there will not be any NASA-sponsored participants on sRLV flights. The payloads to be flown on sRLV flights must either be automated or remotely operated. Remote operation capability should be confirmed with the flight operator.

Proposers interested in using sRLVs as platforms to conduct an Earth or space science investigation must identify a vehicle that can provide the technical capabilities required to conduct the proposed investigation. Some of this information is available from the Flight Opportunities Program website at http://flightopportunities.nasa.gov, and information about various platforms available through Flight Opportunities is available at http://flightopportunities.nasa.gov/platforms. It is the PI's responsibility to work with the Flight Opportunities Program and/or a potential vendor to develop his/her proposal.

Proposals for investigations using sRLVs as platforms must specify the technical requirements that their investigation places on the vehicle. The proposal must include a Letter of Endorsement from a commercial vendor that (i) describes how that vendor's vehicle will meet the investigation requirements and provides technical information on how the vehicle will meet the investigation requirements, (ii) states that the vehicle will be available for use at the time proposed for flight and provides information showing a plan for getting from the current vehicle status to flight status, and (iii) provides a quoted cost for the flight and all other services that are required from the vehicle vendor to enable and conduct the proposed investigation. Note that the Flight Opportunities Program is available to assist with (i) – (iii).

The cost to SMD for the flight and all other services provided by the sRLV vendor must be clearly stated in the proposal. However, the cost for the flight and all other services provided by the sRLV vendor should not be included in the PI's proposed investigation budget. All other costs for conducting the investigation must be included in the PI's proposed investigation budget. Upon final selection for flight, the flight and all other services provided by the sRLV vendor will be procured directly by the Flight Opportunities Program and will not be funded through the PI's award.

Proposals for investigations using sRLVs as platforms must provide a description of the instrument; its current status; a clear assessment of what it will take to develop, modify, and integrate the instrument onto the sRLV; and include a plan to provide calibrated, research grade data in Système International (SI) traceable units.

Proposals for investigations using sRLVs as platforms must be for complete investigations. Proposals to utilize sRLVs must describe a complete suborbital science investigation, including payload construction, vehicle integration, launch and flight operations, data analysis, and publication of results. The Flight Opportunities Program is available to assist with this process.

SMD will conduct a sRLV continuing investigation review (CIR) for all sRLV-based projects. The CIR will take place following maturity of the sRLV-based project to the equivalent of a Phase A concept study report or a systems requirement review. The CIR will include payload description, flight performance assessment, proposed payload configuration and interfaces, mission success criteria, requirements matrix, operational requirements, launch vehicle, and project schedule. Once the sRLV-based project reaches that level of design maturity, the CIR

will be held at NASA Headquarters. The SMD Associate Administrator (or designee) is the decision authority for approval to proceed beyond the CIR. It is expected that sRLV-based projects will spend no more than approximately $100K prior to CIR approval. A proposal for a sRLV-based project must describe the proposed schedule for CIR and the proposed funding required to reach CIR.

Proposals for sRLV-based investigations must be submitted to the appropriate ROSES program element, depending on the science addressed by the proposed investigation. The proposed sRLV-based investigation must meet the constraints of the program element to which it is being proposed. This explicitly includes any constraints on the areas of science that are solicited, on the available funding, and on the requirement for a complete science investigation.

Proposals for life and microgravity science investigations are not solicited through ROSES. Life and microgravity science investigations are solicited by the Human Exploration and Operations Mission Directorate. For further information contact: David L. Tomko, Human Research Program and Fundamental Space Biology, NASA Headquarters, Washington, DC 20546; Tel.: 202-358-2211; email: dtomko@nasa.gov.

All proposals will be evaluated with respect to the criteria specified in Section C.2 of the *NASA Guidebook for Proposers*. In addition to the factors specified in the *Guidebook*, the intrinsic merit of a proposal shall include the following additional factors:

- The extent that the proposed suborbital reusable launch vehicle offers an advantage (e.g., scientific, technical, or cost) over other suborbital platforms (including sounding rockets, balloons, and aircraft);
- The likelihood that the proposed vehicle will be available at the proposed time for flight and that it will be capable of providing the required technical capabilities;
- The feasibility of the proposed technical investigation, including the concept for conduct of the experiment during the suborbital flight and the plans for calibrating and analyzing the data obtained to accomplish the proposed science objectives;
- The quality of the plans for completing the preliminary design prior to the investigation confirmation review; and
- The affordability to SMD of the proposed vehicle vendor cost for the flight and other required services.

Additional information on sRLV vehicles, including general vehicle capabilities and contact information for some vendors, is available at http://flightopportunities.nasa.gov/platforms.

Investigators proposing sRLV payloads are strongly urged to discuss prospective investigations with operations personnel in the Flight Opportunities Program to ensure that probable integration, safety and mission assurance, and operational costs are properly anticipated.

Questions concerning potential sRLV investigations may be addressed to: LK Kubendran, Flight Opportunities Program, Office of the Chief Technologist, NASA Headquarters, Washington, DC 20546; Tel.: 202-358-2528; E-mail: lk@nasa.gov.

(e) Research Investigations utilizing the International Space Station

NASA has determined that there may be payload opportunities for small, "suborbital class" space and Earth science research investigations, including both science and technology development, that utilize the International Space Station (ISS). Generally speaking, proposals for investigations that are carried out through development, launch, and operation of am ISS-based project are permitted in any ROSES program element that solicits investigations for use on suborbital platforms, including aircraft, sounding rockets, and scientific balloons. In this sense, an ISS-based investigation is a "suborbital class" investigation even though it will generally be placed into orbit. ISS-based "suborbital class" investigations are subject to the same cost constraints to which traditional suborbital investigations are subject.

Available external attach points include both zenith and nadir pointing locations and internal attach points include nadir pointing locations. NASA has available annual external launch opportunities after 2012 on the Japanese HTV launch vehicle and the SpaceX vehicle. NASA also has regular opportunities on a suite of vehicles to launch pressurized cargo for use in the Window Observational Research Facility (WORF).

(i) Programmatic and management constraints

Proposals seeking use of the ISS must take advantage of the Station's unique capabilities. In order to be compliant, a proposal must include a clear and convincing scientific and/or technical argument that use of the ISS is required to produce the needed results in ways that could not be accomplished through the use of other platforms.

Investigations that make use of the ISS may be proposed for periods of performance of up to five years.

Proposers interested in using the ISS to conduct an Earth or space science investigation must identify a specific accommodation location that can provide the technical capabilities required to conduct the proposed investigation. The proposal must include a letter of feasibility from the NASA Space Station Payload Office. This letter of feasibility must contain: (1) a preliminary assessment of the feasibility for proposed provisions for access to and accommodation at the space station, (2) identification of any significant challenges or conditional provisions for access and accommodation, and (3) a description of the level of technical interchange or negotiation required to mature the proposed provisions for access and accommodation. Transportation and accommodation will be provided by NASA at no cost to the proposed research investigation, and costs for transportation to and accommodation on ISS should not be included in the proposed budget. However, the PI's cost for all accommodation, safety, and other reviews that are conducted and supported by the PI must be included in the PI's proposed investigation budget.

In addition to proposal requirements specified in the appropriate ROSES program element, proposals for investigations utilizing the ISS must provide a description of the instrument; its current status; a clear assessment of what it will take to develop, modify, and integrate the instrument onto the ISS; and include a plan to provide calibrated, research grade data in SI traceable units. Proposals must be for complete investigations that include payload construction, ISS integration, launch and flight operations, data analysis, and publication of results.

The ISS Customer Integration Office will provide integration services, launch services, on-orbit operations and services, as well as safety and mission assurance reviews for all ISS investigations.

Proposals must be submitted to the appropriate ROSES program element depending on the science addressed by the proposed investigation. The proposed investigation must meet the constraints of the program element to which it is being proposed. This explicitly includes any constraints on the areas of science that are solicited, on the available funding, and on the requirement for a complete science investigation.

Investigations proposed for the ISS will be approved for the first year only. During the first year, in addition to beginning the proposed investigation, a detailed transportation and accommodation study will be undertaken with the ISS Customer Integration Office. Approval for continued funding beyond the first year will be contingent on the ISS Program making a firm commitment for transportation and accommodation on the ISS that is compatible with the requirements of the proposed investigation.

Proposals for life and microgravity science investigations are not solicited through ROSES. Life and microgravity science investigations are solicited by the Human Exploration and Operations Mission Directorate. For further information contact: David Tomko, Human Research Program and Fundamental Space Biology, NASA Headquarters, Washington, DC 20546; Tel.: 202-358-2211; email: dtomko@nasa.gov.

All proposals will be evaluated with respect to the criteria specified in Section C.2 of the *NASA Guidebook for Proposers*. In addition to the factors specified in the *Guidebook*, the intrinsic merit of a proposal shall include the following additional factors:

- The extent that the advantages (e.g., scientific, technical, or cost) of the International Space Station's capabilities and location will be utilized; and
- The feasibility of the proposed technical investigation, including the concept for conduct of the experiment during the flight and the plans for calibrating and analyzing the data obtained to accomplish the proposed science objectives.

(ii) Accommodation opportunities

External accommodations for payloads include Express Logistics Carriers (ELCs) mounted to the ISS truss structure, the Japanese Experiment Module-Exposed Facility (JEM-EF), and the Columbus Orbiting Facility-Exposed Facility (COF-EF). Internal accommodations are also available in the pressurized environment via the Window Observational Research Facility (WORF). More detailed information can be found at http://www.nasa.gov/pdf/462947main_2010_June_Jones_ISS%20Accomodations1.2a.pdf.

Attached payloads must be certified for transportation and use in a human tended vehicle. External payloads would be required to complete PDR approximately 36 months before launch, CDR approximately 24 months before launch, and be delivered for certification and integration approximately nine months before launch. Pressurized cargo for the WORF would be required to complete PDR approximately 12 months before launch, CDR approximately nine months before launch, and be delivered for certification and integration approximately four months before launch.

Further information on the opportunities and constraints for ISS attached payloads may be found at http://www.nasa.gov/mission_pages/station/research/research_information.html.

Investigators proposing ISS payloads should contact the International Space Station Payloads Office to discuss constraints, launch opportunities, and other technical matters. For further

information, please contact George C. Nelson, ISS Research Integration Office/OZ, NASA Johnson Space Center, Houston, TX 77058; Telephone: 281.244.8514; Email: george.nelson-1@nasa.gov.

(f) Use of Short Duration Orbital Platforms, including CubeSats

Short duration orbital platforms, such as CubeSats, may offer new capabilities for the conduct of NASA scientific research, education, and technology advancement. A CubeSat is a type of space research nanosatellite. The base CubeSat dimension is 10x10x11 centimeters (one "Cube" or "1U"). CubeSats typically include volumes of 1U, 2U, 3U, and 6U and may weigh no more than 1.33 kilogram per 1U Cube. NASA has initiated a CubeSat Launch Initiative and begun regularly providing launch opportunities for CubeSat as secondary payloads on NASA launch vehicles. The CubeSat Launch Initiative is managed by the NASA Human Exploration and Operations Mission Directorate; see http://www.nasa.gov/directorates/heo/home/CubeSats_initiative.html.

Generally speaking, proposals for investigations that are carried out through development, launch, and operation of a short duration orbital experiment, such as one on a CubeSat, are permitted in any ROSES program element that solicits investigations for use on suborbital platforms, including aircraft, sounding rockets, and scientific balloons. In this sense, a CubeSat-based investigation is a "suborbital class" investigation even though it will generally be placed into orbit. Cube-Sat based "suborbital class" investigations are subject to the same cost constraints and risk tolerance constraints that traditional suborbital investigations are subject to.

The process for manifesting a SMD selected and funded CubeSat for launch is still in development. Currently an Agency-wide selection recommendation committee considers candidate CubeSats for selection from among those proposed from both internal and external to NASA. At an appropriate time following selection, SMD will provide direction for being considered for manifest on a launch vehicle going to an appropriate orbit.

Proposals for short duration orbital experiments other than CubeSats must include provisions for access to space as part of the proposal.

Proposals for CubeSat-based investigations should note the following:

- The proposed CubeSat investigation must meet the constraints of the program element to which it is being proposed. This explicitly includes any constraints on the areas of science that are solicited, on the available funding, and on the requirement for a complete science investigation.
- Proposals will be evaluated with respect to the criteria specified in Section C.2 of the *NASA Guidebook for Proposers*. In addition to the factors specified in the *Guidebook*, the proposal will be evaluated against any additional factors called out in the program element to which it is being proposed.
- Proposals for investigations using CubeSats must satisfy the constraints for a standard CubeSat.
- Proposals must specify any constraints placed on the required orbit and orbital lifetime. The likely availability of NASA launches satisfying any constraints in the time period contemplated will be a selection consideration. The less stringent the orbital constraints, the more probable it will be that NASA can manifest the CubeSat investigation for launch.

- All costs for preparing and delivering the CubeSat for launch must be included in the proposal. No launch service charges should be included in the proposal cost request.

Proposals for life and microgravity science investigations are not solicited through ROSES. Life and microgravity science investigations are solicited by the Human Exploration and Operations Mission Directorate. For further information contact David Tomko, Human Research Program and Fundamental Space Biology, NASA Headquarters, Washington, DC 20546; Tel.: 202-358-2211; email: dtomko@nasa.gov.

Questions concerning the NASA CubeSat Launch Initiative may be addressed to Anne E. Sweet, Launch Services Program Executive, Phone: 202-358-3784, Email: anne.sweet-1@nasa.gov; or Jason C Crusan, Chief Technologist for Human Exploration and Operations, Phone: 202-358-0635, Email: jason.c.crusan@nasa.gov.

VI. PROPOSAL REVIEW INFORMATION

(a) Evaluation Criteria

Evaluation by peers of the proposing personnel will be used to assess each proposal's intrinsic scientific and technical merit, its relevance to NASA's stated objectives, and its cost realism. See Appendix C.2 of the *NASA Guidebook for Proposers* for further discussion of these criteria and their relative weights. The evaluation criteria include factors evaluated by peer reviewers, as well as programmatic factors evaluated by NASA program personnel. Note the following specific points:

- Some of the program elements discussed in Appendices A through E will give specific factors, based on the solicited research objectives, which will be considered when evaluating a proposal's science and/or technical merits and/or its relevance to program objectives.
- As discussed in Section IV(e) above, relevance will be judged in part by the proposal's focus on specific strategic and science objectives for that ROSES Appendix (program element), as given in the call. This focus on relevance to the call, rather than NASA's broader goals, supersedes any instructions in the *Guidebook for Proposers.*
- Cost data for U.S. proposals will be evaluated both by peer review (for cost realism and cost reasonableness) and by NASA program personnel (for total cost and comparison to available funds). Proposers must follow the budget requirements in Section 2.3.10 of the *NASA Guidebook for Proposer*. In evaluating the cost reasonableness of the proposals, reviewers will assess whether the proposed level of effort (i.e., labor FTEs) and the proposed other direct costs (i.e., supplies, equipment, travel) are commensurate with those required to accomplish the goals of the investigation. Salary levels, fringe benefit rates, and overhead rates are not part of that evaluation.
- Cost sharing is not part of the evaluation criteria (see Section III(d) above). However, cost sharing may become a factor at the time of selection when deciding between proposals of otherwise equal scientific and technical merit.

(b) Review and Selection Processes

Review of proposals submitted to this NRA will be consistent with the general policies and provisions given in Sections C.1 through C.4 of Appendix C of the *NASA Guidebook for*

Proposers, and selection procedures will be consistent with the provisions of Section C.5 of that document. For some of the program elements solicited in this NRA, the desire to achieve a balance of efforts across the solicited program objectives may play a role in the selections, taking into account not only the new proposals of merit that are suitable for selection, but also those that seek an extension of activities initiated through previous but now concluded selections, i.e., "successor" proposals; see Section II(b) above.

Unless otherwise specified, the SMD Division Director responsible for a research program element (or his/her delegate) is its Selection Official. Unless otherwise specified, the SMD Lead for Education and Public Outreach (or his/her delegate) is the Selection Official for the cross-division E/PO program element.

(c) Selection Announcement and Award Dates

SMD's goal is to announce selections within 150 days of the proposal due date and within 56 days after the conclusion of the peer review. Selections are typically announced between 150 days and 220 days after the proposal due date (see http://nasascience.nasa.gov/researchers/sara/grant-stats/). Although there are many reasons why selections are not announced earlier, the most common are the uncertainty in the NASA budget at the time selection decisions could be made and the time required to conduct an appropriate peer review and selection process. NASA does not usually announce new selections until the funds needed for those awards are approved through the Federal budget process. Therefore, a delay in the budget process for NASA usually results in a delay of the selection announcement date. After 150 days have passed since the proposal due date, proposers may contact the responsible Program Officer listed at the conclusion of that program element and on the SARA web page (see Section VIII).

In order to announce selection decisions as soon as is practical, even in the presence of budget uncertainties, the Selection Official may decide to defer selection decisions on some proposals while making selection decisions on others. If a Selection Official uses this option, then proposals will be selected, not selected, or not selected at this time. Proposals that are not selected at this time will be considered for a supplemental selection when circumstances allow. All proposers whose proposals are not selected at this time will eventually be notified whether their proposal is selected through a supplemental selection or is no longer being considered for a supplemental selection.

Those proposers not selected will be notified via NSPIRES or by postal or electronic mail and offered a debriefing consistent with the policy in Section C.6 of the *NASA Guidebook for Proposers*.

(d) Processes for Appeals

(i) Reconsideration by SMD

SMD has a process for requesting reconsideration of the declination of a proposal submitted in response to an SMD NASA Research Announcement. Reconsideration may be requested if the PI believes that the proposal was not handled correctly. This process may be found at in the "SMD Reconsideration Policy" document available in the Library section of the SARA website at http://nasascience.nasa.gov/researchers/sara/library-and-useful-links (the URL of the SARA website is http://sara.nasa.gov).

(ii) Ombudsman Program

The NASA Procurement Ombudsman Program is available under this NRA as a procedure for addressing concerns and disagreements. The clause at NASA FAR Supplement (NFS) 1852.215-84 ("Ombudsman") is incorporated into this NRA.

The cognizant ombudsman is

Director, Contract Management Division
Office of Procurement
NASA Headquarters
Washington, DC 20546-0001
Telephone: 202-358-0445

(iii) Protests

Only contract awards are subject to bid protest, either at the Government Accountability Office (GAO) or with the Agency, as defined in FAR 33.101. The provisions at FAR 52.233-2 ("Service of Protest") and NFS 1852.233-70 ("Protests to NASA") are incorporated into this NRA. Under both of these provisions, the designated official for receipt of protests to the Agency and copies of protests filed with the GAO is

Assistant Administrator for Procurement
Office of Procurement
NASA Headquarters
Washington, DC 20546-0001
Telephone: 202-358-2090

(e) Service as a Peer Reviewer

The success of NASA's research program rests on the quality of peer review. NASA will contact expert investigators and ask them to serve as peer reviewers. Since those whose proposals were selected in prior competitions are highly qualified and may not be submitting a proposal to the current competition, they are highly encouraged to serve on SMD peer review panels. Potential reviewers are encouraged to volunteer to be reviewers by sending an email to sara@nasa.gov. It is good experience for young scientists, and the influx of new reviewers is healthy for the process.

VII. AWARD ADMINISTRATION INFORMATION

(a) Notice of Award

Notification of both the selected, as well as the nonselected, proposers will be consistent with the policy given in Section C.5.3 of the *NASA Guidebook for Proposers.* For selected proposers, the offeror's business office will be contacted by a NASA Awards Officer, who is the only official authorized to obligate the Government. Any costs incurred by the offeror in anticipation of an award will be subject to the policies and regulations of the *Grants Handbook* (see Section B, §1260.125(e), "Revision of Budget and Program Plans").

(b) Administrative and National Policy Requirements

This solicitation does not invoke any special administrative or national policy requirements, nor do the awards that will be made involve any special terms and conditions that differ from NASA's general terms and conditions as given in the *Grants Handbook*.

(c) Award Reporting Requirements

The reporting requirements for awards made through this NRA will be consistent with Exhibit G of the *Grants Handbook*. Any additional requirements will be specified in the program element description.

VIII. POINTS OF CONTACT FOR FURTHER INFORMATION

General questions and comments about the policies of this NRA may be directed to:

Max Bernstein
SMD Lead for Research
Science Mission Directorate
National Aeronautics and Space Administration
Washington, DC 20546-0001
Telephone: (202) 358-0879
Email: sara@nasa.gov

Note: Proposals must not be submitted to this address. Proposals must be submitted electronically as described in Section IV above.

Specific questions about a given program element in this NRA should be directed to the Program Officer(s) listed in the *Summary of Key Information* subsection that concludes each program element description. Up-to-date contact information for program officers can also be found online at the SARA web page's Program Officers List at http://nasascience.nasa.gov/researchers/sara/program-officers-list.

Inquiries about accessing or using the NASA proposal data base located at http://nspires.nasaprs.com should be directed by an email that includes a telephone number to nspires-help@nasaprs.com or by calling (202) 479-9376. This help center is staffed Monday through Friday, 8:00 a.m. – 6:00 p.m. Eastern Time.

Inquiries about accessing or using Grants.gov located at http://www.grants.gov should be directed by an email to support@grants.gov or by calling (800) 518-4726. This customer support contact center is staffed Monday through Friday, 7:00 a.m. – 9:00 p.m. Eastern Time.

IX. ANCILLARY INFORMATION

(a) Announcement of Updates/Amendments to Solicitation

Because this NRA is released far in advance of many of the deadlines given in Tables 2 and 3, additional programmatic information for any of its programs may develop before their proposal due dates. If so, such information will be added as a formal amendment to this NRA no later than 30 days before the proposal due date, or, if this is not possible, the proposal due date will be extended to allow 30 days for proposal submission from the date of the amendment. All amendments are posted on the ROSES-12 homepage, which can be found at http://go.nasa.gov/ROSES-12 (or by going to http://nspires.nasaprs.com, selecting "Solicitations"

then “Open Solicitations” then “NNH12ZDA001N”). Also, an RSS feed for amendments, clarifications, and corrections to ROSES can be found at http://nasascience.nasa.gov/researchers/sara/grant-solicitations/roses-2012/. Although NASA SMD will also send an electronic notification of any such amendments to all subscribers of its electronic notification system (see Section IX(c) below), it is the responsibility of the prospective proposer to check this NRA’s homepage for updates concerning the program(s) of interest.

Any clarifications or questions and answers that are published will be posted on the relevant program element’s web page at http://nspires.nasaprs.com (select “Solicitations” then “Open Solicitations” then “NNH12ZDA001N” then “List of Program Elements” then the relevant program element). All such clarifications will be posted no later than 30 days before the proposal due date.

(b) Electronic Submission of Proposal Information

On-time electronic submission over the Internet is required for every proposal. While every effort is made to ensure the reliability and accessibility of the electronic proposal submission systems (NSPIRES and Grants.gov) and to maintain help centers via email and telephone, difficulty may arise at any point, including the user’s own equipment. Therefore, prospective proposers are urged to familiarize themselves with the submission system(s) and to submit the required proposal materials well in advance of the deadline of the program of interest. Difficulty in registering with or using a proposal submission system is not, in and of itself, a sufficient reason for NASA to consider a proposal that is submitted after the proposal due date (see Section IV(c) above). After submission via NSPIRES, proposers can verify proposal delivery by logging into NSPIRES and selecting "proposals" and "Submitted Proposals/NOIs."

(c) Electronic Notification of SMD Research Solicitations

SMD maintains an electronic notification system to alert interested researchers of its research program announcements. Subscription to this service is free to all registered users of the NASA proposal data base system at http://nspires.nasaprs.com. To add or change a subscription to the electronic notification system, users should login to the data base system and select “Account Management” then “Email Subscriptions.” Owing to the increasingly multidisciplinary nature of SMD programs, this email service will notify all subscribers of (i) all NASA SMD research program solicitations regardless of their type or science objectives; (ii) amendments to all SMD solicitations that have been released for which the proposal due dates have not passed; and (iii) special information that SMD wishes to communicate to those interested in proposing to its sponsored research programs. Altogether, a subscriber may receive 50–75 notifications per year. SMD maintains this subscription list in confidence and does not attempt to discern the identity of its subscribers. Regardless of whether or not this service is used, all SMD research announcements may be accessed at http://nspires.nasaprs.com (select “Solicitations” then “Open Solicitations”) as soon as they are posted (typically by ~9:00 a.m. Eastern Time on their release date).

Note: Automated spam filtering software may identify SMD’s electronic notifications as spam or junk mail. Subscribers are advised to ensure that email received from “NSPIRES-help@nasaprs.com” is not identified by any automated email filtering system as unwanted email.

NRAs issued by SMD are synopsized on Grants.gov (http://www.grants.gov) at the time they are released. This ROSES NRA will be synopsized upon its release. Amendments to this NRA that

create new proposal opportunities will also be synopsized on Grants.gov at the time of their release.

(d) Further Information on SMD Research and Analysis Programs

SMD maintains a website for improving communication with the research community. This site is maintained by the SMD Research Lead, is referred to as the SARA website, and is located at http://sara.nasa.gov. The SARA website contains information related to NASA's Science Research Programs, including the solicitations, selections, an RSS feed for changes to ROSES, and contact information for program officers.

(e) Archives of Past Selections

For more information about the types of research supported by the program elements solicited in previous editions of this NRA and other predecessor NRAs, the titles and abstracts of investigations selected through previous solicitations (issued after January 1, 2005) are available at http://nspires.nasaprs.com (click “Selected Proposals”, choose the year from the pop-down menu, and click the find button.). Selection statistics and links to winning abstracts can also be found at http://nasascience.nasa.gov/researchers/sara/grant-stats.

(f) Meeting Geospatial Standards

NASA pioneered the development of metadata and the accessibility and interoperability of space and Earth science data. When grants result in the development of data that NASA both identifies as geospatial and intends to distribute, then NASA awards will require that documentation (metadata) meet Federal Geographic Data Committee standards. NASA will assure that this documentation is electronically accessible to the Clearinghouse network (http://www.fgdc.gov/dataandservices/) and discoverable through Geospatial One Stop (http://www.GeoData.gov).

X. CONCLUDING STATEMENT

Through this ROSES NRA, NASA encourages the participation of the space and Earth science communities in its Science Mission Directorate research and technology programs. These programs, while quite diverse in objectives and types, in fact form the foundation of both the basic and applied research that allows NASA's space and Earth science programs to be properly planned and carried through to the successful interpretation of data and its application to the needs of end users. Comments about this NRA are welcome and may be directed to the point of contact for general questions and comments identified in Section VIII above.

Michael H. Freilich
Director
Earth Science Division

Barbara Giles
Director
Heliophysics Division

James L. Green
Director
Planetary Science Division

Paul Hertz
Director (Acting)
Astrophysics Division

John M. Grunsfeld
Associate Administrator
Science Mission Directorate

Table 1: NASA Science Goals, Questions, and Research Objectives[3]

Science Goals	**Science Questions**	**Science Area Objectives**
Earth Science: Advance Earth System Science to meet the challenges of climate and environmental change.	• How is the global Earth system changing? (Characterize) • What are the sources of change in the Earth system and their magnitudes and trends? (Understand) • How will the Earth system change in the future? (Predict) • How can Earth system science improve mitigation of and adaptation to global change? (Apply)	1. Understand and improve predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition 2. Quantify the changing distributions of extreme weather events and enable improved weather prediction 3. Quantify and predict changes in global land cover, biological productivity, ecosystems, and the carbon cycle 4. Quantify the key reservoirs and fluxes in the global water cycle and improve models of water cycle change and fresh water availability 5. Understand the roles of oceans, atmosphere, and ice in the climate system and improve predictive capability for future evolution 6. Characterize and understand Earth surface changes and variability of Earth's gravitational and magnetic fields 7. Enable the broad use of Earth system science observations and results in mitigating and adapting to a changing environment
Heliophysics: Understand the Sun and its interactions with the Earth and the solar system.	• What causes the Sun to vary? • How do the Earth and Heliosphere respond? • What are the impacts on humanity?	1. Understand the fundamental physical processes of the space environment from the Sun to Earth, to other planets, and beyond to the interstellar medium 2. Understand how human society, technological systems, and the habitability of planets are affected by solar variability interacting with planetary magnetic fields and atmospheres 3. Maximize the safety and productivity of human and robotic explorers by developing the capability to predict the extreme and dynamic conditions in space

[3] From Appendix 1 of the *2010 Science Plan for NASA's Science Mission Directorate*; see Section I(a) for reference

Science Goals	Science Questions	Science Area Objectives
Planetary Science: Ascertain the content, origin, and history of the solar system, and the potential for life elsewhere.	• What is the inventory of solar system objects and what processes are active in and among them? • How did the Sun's family of planets, satellites, and minor bodies originate and evolve? • What are the characteristics of the solar system that lead to habitable environments? • How and where could life begin and evolve in the solar system? • What are the characteristics of small bodies and planetary environments that pose hazards or provide resources?	1. Inventory solar system objects and identify the processes active in and among them 2. Understand how the Sun's family of planets, satellites, and minor bodies originated and evolved 3. Understand the processes that determine the history and future of habitability of environments on Mars and other solar system bodies 4. Understand the origin and evolution of Earth life and the biosphere to determine if there is or ever has been life elsewhere in the universe 5. Identify and characterize small bodies and the properties of planetary environments that pose a threat to terrestrial life or exploration or provide potentially exploitable resources
Astrophysics: Discover how the universe works, explore how the universe began and evolved, and search for Earth-like planets.	• How do matter, energy, space and time behave under the extraordinarily diverse conditions of the cosmos? • How did the universe originate and evolve to produce the galaxies, stars, and planets we see today? • What are the characteristics of planetary systems orbiting other stars, and do they harbor life?	1. Understand the origin and destiny of the universe, and the nature of black holes, dark energy, dark matter, and gravity 2. Understand the many phenomena and processes associated with galaxy, stellar, and planetary system formation and evolution from the earliest epochs to today 3. Generate a census of extra-solar planets and measure their properties

TABLE 2: SOLICITED RESEARCH PROGRAMS (IN ORDER OF PROPOSAL DUE DATES)

TABLE 3: SOLICITED RESEARCH PROGRAMS (IN ORDER OF APPENDICES A–E)

Table 2 and Table 3 of this NRA are posted as separate documents on the web and can be reached either by following the hypertext links above embedded in the electronic version of this document or by going to http://go.nasa.gov/ROSES-12 or to http://nspires.nasaprs.com/ and selecting "Solicitations" then "Open Solicitations" and "NNH12ZDA001N."