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National Aeronautics and Space Administration
NASA Headquarters
Exploration Systems Mission Directorate
Advanced Capabilities Division
Washington, DC 20546-0001

Research Opportunities in Materials Science

NASA Research Announcement

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Step-1 Proposals Due: April 30, 2010
Step-2 Proposals Due: July 8, 2010

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Research Opportunities in Materials Science

Proposals solicited through this NASA Research Announcement (NRA) will use a two-step proposal process. Step-1 proposals are required and must be submitted by April 30, 2010. Step-1 proposals will be reviewed at NASA for relevance to the Research Emphases outlined in Section I.B. of this NRA. Proposers, whose proposals are evaluated to be relevant, will be permitted to submit full Step-2 proposals. Step-2 proposal evaluations will be conducted by a science peer review panel.

Proposals that do not conform to the standards outlined in this solicitation will be declared non-compliant and declined without review. You are encouraged to read the solicitation in its entirety to prepare a competitive proposal. Key requirements are identified here:

- For Step-1 and Step-2 proposals: You and your organization must be registered with NSPIRES. Your proposal must be submitted by an authorized representative of your organization. All team members listed on the proposal must be registered with NSPIRES (See Section IV.B.1).
- **Step-1 proposals are required** and shall not exceed 5 pages single-spaced in length and must be in conformance with the style formats in the Guidebook for Proposers Section 2.2. Step-1 proposals must be electronically submitted by April 30, 2010 (See Section IV.B.2).
- For Step-1 and Step-2 proposals: Your hypothesis and specific aims must address the research emphases in this solicitation, and must be clearly outlined in the project description of your proposal (See Section I.B).
- For Step-2 proposals: The length of the project description of the proposal shall not exceed 20 pages single-spaced in length and must be in conformance with the style formats in the Guidebook for Proposers Section 2.2.using standard 12-point type (See Section IV.B.3).
- For Step-2 proposals: If your proposal is a continuation of current NASA-supported research, you must provide specifics (2 pages maximum) to the productivity of your NASA-funded research in a section separate from the project description (See Section IV.B.3). These two pages are not considered part of the 20-page project description.
- For Step-2 proposals: Your proposal must meet requirements of the Compliance Review section of this solicitation and must be submitted by July 8, 2010 (See Section V.B).

I. Funding Opportunity Description

A. Introduction

This NRA solicits hypothesis-driven materials science research proposals

to conduct investigations in the following areas: thermophysical data, microstructural development and morphological evolution. This call is for ground-based research that may eventually lead to research on the ISS. Because some of the selections may be considered for a future flight experiment, the proposers must show a clear path from the proposed ground based research to an experiment that can feasibly be conducted in the Low Gradient Furnace (LGF) or the Solidification and Quenching Furnace (SQF) on the International Space Station. Information about these furnaces is provided in Section I.C.

NASA's physical sciences research activities have been guided by recommendations from the National Research Council (NRC). The 2003 NRC report, "Assessment of Directions in Microgravity and Physical Sciences Research at NASA" established a set of high priority areas in materials science. The research emphases defined in Section I.B are selected from these high priority areas. Proposals submitted in response to this NRA must be limited to addressing one or more of the research emphases in Section I.B. Proposers shall provide a firm justification for a microgravity environment for any potential spaceflight investigation.

Participation is open to all categories of U.S. institutions, including educational institutions, industry, nonprofit organizations, NASA Centers and other Government agencies. Principal Investigators (PIs) may collaborate with investigators from universities, Federal Government laboratories, the private sector, state and local government laboratories and other countries. Additional information concerning international participation in this NRA can be found in Section III.B.

B. Research Emphases Specific to this Solicitation

The materials science discipline represents a broad range of research areas with equally diverse applications. Owing to the potentially large density differences, resulting from thermal and solutal variations as well as immiscibility, gravity tends to exert a significant, often a controlling influence on materials processing from the melt, solution, and vapor. Gravity on the surface of the Earth drives phenomena that mask more subtle but nonetheless important phenomena. Processing behavior in microgravity often differs widely from what occurs in normal gravity. Understanding and quantifying these effects can only be achieved by a combination of well-devised, long-duration microgravity experiments and well-developed models of the fundamental processes and phenomena. It is also envisioned that microgravity data will help refine normal-gravity models by providing new insights into various competing mechanisms such as convection and diffusion. Therefore, NASA continues to support the development and execution of materials science experiments in the microgravity environment of low Earth orbit.

Proposers must show a clear path from their proposed ground-based research to flight experiments that can be conducted in the LGF or SQF (or both). Proposals, including Step-1 proposals, that do not provide this information will be evaluated "not relevant." (See Section V.A). Proposers are encouraged to refer to Section I.C to learn about the facilities and current experiments that are being conducted in the LGF and SQF.

Considering these points along with the considerations in Section I.A, NASA is soliciting research proposals in the following three areas specifically recommended by the NRC:

1. Thermophysical data of the liquid state in microgravity

Computational modeling of materials processing requires accurate thermophysical data of the liquid state. Obtaining such data on the ground that are not affected by convection is very difficult in low-melting-point systems and nearly impossible for high-melting-point materials. For example, there are very few accurate measurements of the solute diffusivities in liquid metallic or semiconductor alloys as a function of temperature. Performing such experiments in microgravity would provide insights into the physics of the liquid diffusion process as well as much needed thermophysical data for industry. Accurate thermophysical data along with computational models will yield realistic predictions of quantities such as the degree of microsegregation following solidification. The magnitude of the microsegregation in turn can have a significant deleterious effect on a wide array of materials properties. Proposals are sought for ground-based research that would lead to accurate measurement of needed thermophysical properties in a microgravity environment.

2. Dynamics of microstructural development during solidification

The development of dendritic and cellular microstructures is governed by relatively simple partial differential equations whose solutions are complex, possibly chaotic, and extremely sensitive to small perturbations. Moreover, since the majority of metallic materials are cast, the solidification process is of enormous industrial importance. The ability to directly link processing conditions to the resulting materials properties is still not at hand as the mechanisms governing the development of dendrite and cell morphology are not well understood. Outstanding questions include the effects of interactions between individual dendrites or cells on their spatial distribution and morphology, the evolution of dendrite morphology during transient heating or cooling, and the effects of noise and initial conditions on the resulting patterns. The interactions between dendrites are particularly important in the development of the mushy zone. A National Research Council study on the future of condensed matter and materials physics identified the mushy zone as “perhaps the most important theoretical challenge” in metallurgical pattern formation and also chose the study of the mushy zone as one of the research priorities in nonequilibrium physics (NRC, 1999). A major impediment to the study of these solidification processes, however, is convection of the liquid phase, since convection makes it nearly impossible to compare results with theoretical predications and greatly complicates the interpretation of experimental data. Performing experiments in a microgravity environment, where convection is much reduced, becomes crucial to understanding these complex pattern-forming systems that are of great commercial importance. NASA seeks ground-based research proposals that would increase the understanding of complex pattern-forming systems that are of commercial importance including dendrite evolution, interactions, spatial distribution, and morphology that could ultimately lead to a flight experiment. Proposers are reminded that the available flight furnaces use closed metal cartridges to contain the sample as described in Section I.C.1.a.

3. Morphological evolution of multiphase systems

Materials used commercially are usually composed of more than one phase—for example, the strength of a jet turbine blade is linked to the size, shape, and spatial distribution of the precipitates that are embedded in the matrix of the blade. These multiphase systems are created by a nucleation, growth, and Ostwald ripening process through which a single phase decomposes into two or more phases. There are numerous examples of such phase transformation processes. They occur in systems as diverse as polymers, wherein a second phase of different composition can form by either spinodal decomposition or nucleation with a liquid matrix, and in metallic alloys, wherein the morphology of dendrites in mushy zones evolves in time by Ostwald ripening. In other cases, a two-phase mixture is created by physically mixing two phases, such as the solid-liquid mixture found during liquid-phase sintering. During thermal processing, the morphology of the mixture evolves and the volume fraction of vapor bubbles decreases. Despite the clear commercial relevance and scientific importance, an understanding of the dynamics of phase transformation processes is not at hand. Phase separation and the processing of materials where one of the phases is liquid inevitably leads to sedimentation due to the density difference between the component phases. Performing experiments in a microgravity environment greatly reduces the rate of sedimentation and allows the dynamics of the transformation process to be investigated carefully. As a result, microgravity experiments can provide new and important insights into the dynamics of the evolution of multiphase materials. Research into Ostwald ripening and liquid-phase sintering has affected industrial practice in the past and is expected to in the future. Ground-based research proposals are desired that will extend the knowledge of morphological evolution in multiphase systems that could ultimately lead to a flight experiment. Proposers are reminded that the available flight furnaces use closed metal cartridges to contain the sample as described in Section I.C.1.a.

C. Additional General Information

This section contains relevant reference information on ground-based and spaceflight facilities to assist proposers in developing their proposals. As stated elsewhere in this solicitation, the equipment that will be available for potential follow-on flight investigations is limited to the LGF and the SQF. These are furnace inserts, built by the European Space Agency (ESA), for the Materials Science Laboratory (MSL), also built by ESA. The MSL is accommodated in the Materials Science Research Rack (MSRR), which is a space station rack built by NASA. In addition to information on these flight hardware items, information on some ongoing flight investigations and potentially available ground facilities is included.

Information on MSL, LGF, and SQF, is available on the Internet and is reproduced below in part. There is no change in the technical content except that ESA now states a

maximum heater temperature of 1400 deg C instead of the "about 1300 deg C" on the LGF and SQF websites. An overview drawing showing how the LGF or SQF fits into the MSL and how the MSL fits into the MSRR is available at http://www.spaceflight.esa.int/users/materials/facilities/facilities/msl.html

1. Spaceflight Hardware Description:

a. Sample Cartridge Assembly (SCA)

Each sample to be processed in the LGF or SQF will be contained in a Sample Cartridge Assembly (SCA). Each SCA is opaque, hermetically sealed, and contains an inert gas or is evacuated. Each SCA can contain up to 12 thermocouples to measure temperatures along the length of the sample. Thermocouples are currently the only sensors that can be included in an SCA, and other options are not likely to become available. The inside diameter of the SCA tube is 14mm and must accommodate all experiment items including the sample, sample container (for example crucible or ampoule), and thermocouples. The maximum sample length is approximately 245mm. The sample length that can be melted and resolidified depends on the details of the experiment.

b. Low Gradient Furnace (LGF)

http://www.esa.int/spaceflight/msl-lgf

The LGF is designed to conduct experiments in the field of Bridgman crystal growth and metallurgical solidification research.

The maximum heater temperature of the LGF is 1400 deg C with a thermal stability of +/- 0.02 deg C. A maximum of 12 thermocouples can be integrated. A theoretical thermal gradient (along the sample) of 5-40 deg C cm^{-1} can be established. Translation speeds from 0.036 to 720 mm hour can be applied. The current design allows a maximum sample length of 275 mm.

c. Solidification and Quenching Furnace (SQF)

http://www.esa.int/spaceflight/msl-sqf

The SQF is primarily intended for metallurgical solidification research under steep temperature gradients, with the possibility of quenching the solidifying interface at the end of processing – by quickly displacing the cooling zone.

The maximum heater temperature of the SQF is 1400 deg C with a thermal stability of 0.1 deg C. A maximum of 12 thermocouples can be integrated. A theoretical thermal gradient (along the sample) of 50-150 deg C cm^{-1} can be established. Translation speeds from 0.036 to 720 mm per hour can be applied. A maximum sample length of 275 mm for the current design.

The first experiments using the SQF insert are planned for 2010/11 on the ISS.

General features in both inserts (LGF & SQF) are: rotating magnetic field, Seebeck and resistance measurements and ultrasound diagnostic system for the detection of the solid-liquid interface.

d. Materials Science Laboratory (MSL)

http://www.esa.int/SPECIALS/HSF_Research/SEMU0L0YDUF_0.html

The Materials Science Laboratory consists of a Core Facility, together with associated support subsystems.

The Core Facility is a stainless steel cylinder capable of accommodating different individual furnace inserts where the sample processing is carried out. Processing conditions are normally in either a vacuum or an inert gas (e.g., Argon).

The microgravity levels during an experimental run are measured by an integrated three-axis accelerometer package. Access to exchange a furnace insert is achieved by opening the process chamber lid, and removing the sample cartridge and Intermediate Support Plate.

A furnace insert is simply an arrangement of heating elements, isolating zones and cooling zones contained in a thermal insulation assembly. On the outer envelope of this assembly is a water-cooled metal jacket forming the mechanical interface to the Core Facility.

A High Temperature Furnace Insert is also listed on the ESA web site but WILL NOT BE AVAILABLE.

e. Materials Science Research Rack (MSRR)

The Materials Science Research Rack was designed for basic materials research in the microgravity environment of the ISS. MSRR (also referred to as MSRR-1) can accommodate and support experiments for many material types, such as metals, alloys, polymers, semiconductors, ceramics, crystals, and glasses These can be studied to discover new applications for existing materials and new or improved materials. Information about the MSRR, including photographs, can be found at:
http://www.nasa.gov/mission_pages/station/science/experiments/MSRR-1.html

f. International Space Station (ISS)

The MSL and MSRR have been installed on the U.S. module Destiny on the International Space Station and are currently operational. General information about the International Space Station is available at the websites:
http://www.nasa.gov/mission_pages/station/science/iss_factsheets.html, and
http://www.nasa.gov/mission_pages/station/main

2. Research Activities

a. Experiments planned for or underway in the LGF and SQF

The LGF was installed in the ISS in summer 2009; the SQF is scheduled for launch in mid-2010. The following URL connects with an ESA website that lists ESA-sponsored materials science investigations:
http://www.esa.int/SPECIALS/HSF_Research/SEMM32YRA0G_0.html

Several of these investigations will have experiments done in the LGF or SQF. Some CETSOL and MICAST (full names and acronyms of investigations are listed on website) samples have already been processed in the LGF. Other investigations (not necessarily a complete list) that will have samples processed in the LGF or SQF include: DELAXS, Influence of Containment on Defects in GeSi Crystals - Solutocapillary Convection in Semiconductor Melt Growth, METCOMP, and SETA/SEBA. Reports for some of these investigations are available on the Internet by following links in the fourth column of the cited website. The Technical Contact identified in Section VII should be contacted for information on investigation reports not available on the internet.

b. Experiments on the International Space Station (ISS)

General information about ISS experiments can be found at:
http://www.nasa.gov/mission_pages/station/science/experiments/Summary.html
http://www.nasa.gov/mission_pages/station/science/experiments/List.html

Information about NASA's Microgravity Physical Science Program including materials science research can be found at:
http://exploration.grc.nasa.gov/Advanced/ISSResearchProject/
(Click on the Marshall Space Flight Center box on the left hand side to find information on NASA's materials science research.)

Information about experiments supported by the ISS International Partners can be found at:
http://www.esa.int/esaHS/iss.html
http://www.jaxa.jp/projects/sas/index_e.html
http://www.cnes.fr/web/CNES-en/1422-iss-the-international-space-station.php
http://www.dlr.de/mp/en/desktopdefault.aspx/tabid-1793/2471_read-3877

3. Ground-based facilities potentially available to successful proposers

Specialized furnaces with capabilities including high temperature, isothermal, or a 5T axial magnetic field among others and an array of sample analytical equipment exist at the Marshall Space Flight Center. Depending upon the availability of funds, these may be made available to successful proposers who provide information on their expected use of these facilities as part of their project description. For specific information about what is available, contact Dr. Frank Szofran. For likelihood of availability of necessary funds, contact Dr. Francis Chiaramonte. Contact information is given in Section VII.

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

E. Availability of NASA Funds for Award

The Government's obligation to make award(s) is contingent upon the availability of the appropriated funds from which payment can be made and the receipt of proposals that are determined meritorious for NASA award under this NRA.

F. Additional Funding Restrictions

A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate award instrument. Contracts resulting from NRAs are subject to the FAR and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPR 5800.1).

Regardless of whether functioning as a PI or as a team member, personnel from NASA Centers must propose budgets based on Full Cost Accounting (FCA). Non-NASA U.S. Government organizations should propose based on FCA 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/.

II. Award Information

The selected proposals are expected to be funded for activities lasting up to three years. The mechanism for funding each successful proposal will be a single grant, with funding allocations to participating investigators based on the submitted budget, available funds and overall project review. The funding duration will depend on proposal requirements, peer review panel recommendations, and continuing progress of the activity. Proposals will be evaluated as described in Section V. Proposals to continue or supplement existing grants, if selected, will result in a new grant.

Depending on available funding, the award for each selected proposal will be up to $150,000 per year for a total award amount up to $450,000 for the three year period. It is anticipated that up to six investigations will be selected. NASA does not provide

separate funding for direct and indirect costs; thus, the amount of the award requested is the total of all costs submitted in the proposed budget. Selection of proposals are planned to be announced in September 2010, and will be awarded in a reasonable timeframe thereafter.

III. Eligibility Information

A. Eligibility of Applicants

Participation is open to all categories of U.S. institutions, including educational institutions, industry, nonprofit organizations, NASA Centers and other Government agencies. Principal Investigators (PIs) may collaborate with investigators from universities, Federal Government laboratories, the private sector, state and local government laboratories and other countries It is NASA Policy that research with foreign organizations will be accomplished on a no-exchange-of-funds basis. For further information, please see Section III.B for Guidelines for International Participation. In all such arrangements, the applying entity is expected to be responsible for administering the project according to the management approach presented in the proposal. The applying entity must have in place a documented base of ongoing high quality research in science and technology, or in those areas of science and engineering clearly relevant to the specific programmatic objectives and research emphases indicated in this NRA. Present or prior NASA support of research or training in any institution or for any investigator is not a prerequisite for submission of a proposal.

B. Guidelines for International Participation

NASA welcomes proposals from outside the U.S and collaborative proposals from U.S. investigators that include international participation. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed. All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received on or before the established closing date. Those received after the closing date will be treated in accordance with: Appendix A, paragraph (G). Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without

endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected. Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations (OER) will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or
(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

NASA's policy is to conduct research with non-U.S. organizations on a cooperative, no exchange-of-funds basis. Although Co-Investigators or collaborators employed by non-U.S. organizations may be identified as part of a proposal submitted by a U.S. organization, NASA funding through this NRA may not be used to support research efforts by non-U.S. organizations at any level. See NASA FAR Supplement Part 1835.016-70 for additional information on international participation, which can be referenced at http://www.hq.nasa.gov/office/procurement/regs/1835.htm#35_016-70. Also see NASA Policy Directive 1360.2 Initiation and Development of International Cooperation in Space and Aeronautics Programs, which is located at http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PD_1360_002A_&page_name=main

C. Export Control Guidelines Applicable to Proposals Including Foreign Participation

Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not be limited to, whether or not the foreign participation may require the prospective Proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at the Bureau of Industry and Security website http://www.bis.doc.gov/, or the Directorate for Defense Trade Controls website: http://www.pmddtc.state.gov.

Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are

generally considered “Defense Articles” on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

Because of these legal provisions and requirements, proposers and institutions whose proposals involve non-U.S. participants should be aware that such participation can add to management complexity and risk, and, therefore, Proposers should limit such cooperative arrangements to those offering significant benefits while maintaining the clearest and simplest possible technical and management interfaces.

Export-Controlled Material in Proposals

While explicit inclusion of export-controlled material in proposals is not prohibited, NASA is advising proposers that, under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130. Other items or information may be subject to the Export Administration Regulations (EAR), 15 CFR Parts 730 – 774. This may, in some circumstances, complicate NASA’s ability to evaluate the proposal, since occasionally NASA may use the services of foreign nationals who are neither U.S. citizens nor lawful permanent residents of the U.S. to review proposals submitted in response to this NRA.

Proposers to NRAs are strongly encouraged not to include export-controlled material in their proposals, although the effort being proposed may itself be export controlled (ref. Web sites noted above in 1.6.2(a)). If it is essential to include any export-controlled information in a proposal, a notice to that effect must be prominently displayed on the first pages of the proposal and shall state:

“The information (data) contained in [insert page numbers or other identification] of this proposal is (are) subject to U.S. export control laws and regulations. It is furnished to the Government with the understanding that it will not be exported without the prior approval of the Proposer under the terms of an applicable export license or technical assistance agreement.”

Reference the following URL for guidance on NASA’s Export Control Program and NASA Center Points of Contact:

http://www.hq.nasa.gov/office/oer/nasaecp/contacts.html

For the purposes of proposals submitted via NSPIRES, these first pages listing export-controlled information should precede the table of contents, do not count against the page limits, and may also be used to provide the proprietary notification, if applicable. Note that it is the responsibility of the Proposer to determine whether any proposal information is subject to export-control regulations.

D. Cost Sharing or Matching

Cost sharing is not required for contract awards except as provided in NASA FAR Supplement (NFS) 1816.303-70 for awards resulting from unsolicited proposals for research submitted by commercial organizations. NFS 1816.303-70 is located at http://www.hq.nasa.gov/office/procurement/regs/1816.htm#16_303-70.

For a NASA Center, an institution of higher education, hospital, or other non-profit organization seeking to receive a grant or cooperative agreement, cost sharing is not required; however, NASA can accept cost sharing if it is voluntarily offered. For these recipients, Section B, Provision &sec;1260.123, "Cost sharing or matching," located at http://ec.msfc.nasa.gov/hq/grantb.html#1260.123, describes the acceptable forms of cost sharing.

For a commercial organization seeking to receive a grant or cooperative agreement, cost sharing is required, unless the commercial organization can demonstrate that they will not receive substantial compensating benefits for performance of the work. If no substantial compensating benefits will be received, then cost sharing is not required, but can be accepted. Section B, Provision 1260.123, "Cost sharing or matching," and the special conditions at section A, subpart 1260.4(b) describes cost sharing and allowability for awards with commercial firms that do not require cost sharing. Section D, Provision &sec;1274.204, "Costs and payments," located at http://ec.msfc.nasa.gov/hq/grantd.html#1274204 of the NASA Grant and Cooperative Agreement Handbook describes the acceptable forms of cost sharing for commercial organizations."

IV. Proposal and Submission Information

Proposals solicited through this NASA Research Announcement (NRA) will use a two-step proposal process. In Step-1 proposers are required to submit a 5-page overview that will be reviewed at NASA for relevance to the Research Emphases outlined in Section I.B. of this NRA. Step-1 proposals are required and must be submitted by April 30, 2010. Only proposers, whose Step-1 proposals are determined to be relevant to the research emphases in Section I.B, will be permitted to submit full Step-2 proposals. **A finding of relevance in Step I is a prerequisite for advancing to Step 2.** Proposers are encouraged to read Section IV in its entirety before starting the application process.

For Step-2, proposers are required to submit the complete proposal by July 8, 2010. Step-2 proposals must be compliant with Section V.B. of this NRA or they will be declined without review.

Proposals must be submitted electronically. Step-1 Proposers can use either NSPIRES (http://nspires.nasaprs.com) or Grants.gov (http://www.grants.gov/) for proposal

submission. All proposers, team members, and agency officials must be registered before proposal submission with NSPIRES as described under Section IV.B.1 regardless of the electronic submission system used. NSPIRES remains the only system through which a Step-1 proposal can be continued as a Step-2 proposal. Step-2 proposals must be submitted through NSPIRES.

Step-1 proposals will be accepted between March 31, 2010 and April 30, 2010. Step-1 proposals will not be accepted after 5:00 PM Eastern, April 30, 2010. Proposers are notified electronically through NSPIRES. Submitters who do not receive notification as to their Step-2 invitation status by May 14, 2010 should contact NASA (Section VII). Step-2 proposals will be accepted between May 14, 2010 and July 8, 2010. Step-2 proposals will not be accepted after 5:00 PM Eastern, July 8, 2010.

A. Source of Application Materials

Except where specifically stated otherwise in this NRA, applicants must prepare proposals in accordance with the "Instructions for Responding to NASA Research Announcements" NASA Federal Acquisition Regulations (FAR) Supplement (NFS), Part 1852.235-72 (http://www.hq.nasa.gov/office/procurement/regs/5228-41.htm#52_235-72). These instructions hereafter referred to as the *NASA FAR Supplement Provision*, can be referenced in its entirety in Appendix A of this document.

All information needed to submit an electronic proposal in response to this solicitation is contained in this NRA and in the 2010 version of the companion document entitled "Guidebook for Proposers Responding to a NASA Research Announcement (NRA) or Cooperative Agreement Notice (CAN)" (hereafter referred to as the *Guidebook for Proposers*) that is located at http://www.hq.nasa.gov/office/procurement/nraguidebook/.

At NASA's discretion, proposals that do not conform to these standards and directions given in this NRA may be declared noncompliant and declined without review.

Proposal submission questions will be answered and published in a Frequently Asked Questions (FAQ) document. This FAQ will be posted on the NSPIRES solicitation download site alongside this NRA, and will be updated periodically between submission release and the proposal due date.

B. Content and Form of Proposal Submission

1. NASA's Proposal Data System

NSPIRES Registration

This NRA requires that the proposer register key data concerning their intended submission with the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) located at http://nspires.nasaprs.com. **Potential applicants are urged to access this site well in advance of the proposal due date(s) 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 *Cover Page* (see further below) must be registered in NSPIRES and that such individuals must perform this registration themselves;** that is, no one may register a second party, even the Principal Investigator (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.

Every organization that intends to submit a proposal to NASA in response to this NRA, including educational institutions, industry, nonprofit institutions, NASA Centers, the Jet Propulsion Laboratory, and other U.S. Government agencies, **must be registered in NSPIRES**, regardless of the electronic system used to submit proposals. Such registration must be performed by an organization's electronic business point-of-contact (EBPOC) in the Central Contractor Registry (CCR).

Electronic Submission

Step-1 and Step-2 proposals must be submitted electronically by one of the officials at the PI's organization who is authorized to make such a submission. All team members must be registered in NSPIRES and confirm their organizational affiliation when added to a proposal before the PI organization official can submit. It is strongly recommended that the PI work closely with his/her team members and organization official to ensure the proposal is submitted by the due date and time listed in this solicitation. **Proposals will not be accepted after the listed due dates and times.**

Proposers can use either Grants.gov. (http://www.grants.gov/) or NSPIRES (http://nspires.nasaprs.com) for Step-1 proposal submission. All proposers, team members, and agency officials must be registered before proposal submission with NSPIRES. NSPIRES remains the only system through which a Step-1 proposal can be continued as a Step-2 proposal. Proposers submitting a Step-1 proposal who receive an invitation to submit a Step-2 proposal must submit their Step-2 proposal through NSPIRES. Proposers who elect to use Grants.gov for Step-1 proposals who receive an invitation to submit a full Step-2 proposal must use NSPIRES for their Step-2 submission.

NSPIRES accepts fully electronic proposals through a combination of data-based information (e.g., the electronic *Cover Page* and its associated forms) and uploaded PDF file(s) that contain the body of the proposal. The system will conduct an element check to identify any item(s) that is(are) apparently missing or incomplete. Proposers are particularly encouraged to begin their submission process early.

Requests for assistance in accessing and/or using this Web site may be directed by E-mail to nspires-help@nasaprs.com or by telephone to (202) 479-9376 Monday through Friday, 8:00 AM – 5:00 PM Eastern Time. Frequently Asked Questions (FAQs) may be accessed through the Proposal Online Help site at http://nspires.nasaprs.com/external/help.do. Tutorials of NSPIRES are available at http://nspires.nasaprs.com/tutorials/index.html.

2. Intent to Propose and Step-1 Proposals

The following information **supersedes** that provided in the *Guidebook for Proposers* and provides additional direction consistent with the *NASA FAR Supplement Provision.* Proposals solicited through this NRA will use a two step proposal process in which a Notice of Intent (NOI) is replaced by a **required** Step-1 proposal. The Step-1 proposal shall include an extended synopsis of the intended research. The **length of the Step-1 proposal (excluding the Cover Page Elements) is not to exceed 5 pages** and must use a standard 12-point type and the following margins: left = 1.5"; Right, top, bottom = 1.0".

Step-1 proposals shall be electronically submitted by April 30, 2010. Electronic submission of Step-1 proposals will be open between March 31, 2010 and April 30, 2010. All submitters of Step-1 proposals will be informed via e-mail (as provided on the Step-1 proposal cover page) that they are, or are not, permitted to submit a full Step-2 proposal by May 14, 2010. **Submitters who do not receive notification as to their invitation status by May 14, 2010 should contact NASA (Section VII).**

The NSPIRES system will guide proposers through submission of all required proposal information. Please note that the **Proposal Summary, Business Data, and Proposal Team are required** Cover Page Elements for a Step-1 proposal. The proposal summary should be between 100-300 words and understandable by the layman reader. These cover page elements may be modified in a Step-2 proposal. Budget should not be included with the Step-1 proposal.

Step-1 proposals must address these components:

1. A clear indication of the relevance to the Research Emphases as described in Section 1.B
2. The hypotheses and specific aims of the proposal.
3. Show a clear path on how the LGF and SQF facilities on the International Space Station as described in Section I.C could eventually be utilized;
4. The proposed project team. Note: The project team is not considered binding for Step-1 and can be adjusted in a Step-2 proposal.

The proposal document must be uploaded as a single .PDF file. No additional documents should be uploaded with the Step-1 proposal.

Step-1 proposals are prepared by the PI or a designated representative of the PI. Step-1 proposals are submitted by an official of the PI's organization after the PI has released the prepared proposal to the institution official. It is strongly recommended that the PI

work closely with his/her organization official to ensure the proposal is submitted by the due date and time listed in this solicitation. Proposals will not be accepted after the listed due dates.

Instructions for submitting proposals to NASA via Grants.gov may be found on the Grants.gov portal at http://www.grants.gov/.

3. Instructions for Preparation of Step-2 Proposals

Step-2 proposals are due July 8, 2010. **Step-2 proposals will be accepted from proposers that have met the evaluation criteria for Step-1 proposals.** All Step-2 proposals must meet the requirements for responding to an NRA as outlined in the *NASA FAR Supplement Provision.* Chapter 2 of the *Guidebook for Proposers* provides detailed discussions of the content and organization of proposals for electronic submission.

The NSPIRES system will guide proposers through submission of all required proposal information. Select **prior-phase proposal** when creating a Step-2 proposal. This will automatically transfer the proposal information from the Step-1 proposal to the Step-2 proposal.

Required Step-2 Cover Page Elements are the Proposal Summary, Business Data, Budget, Program Specific Data, and Proposal Team. The proposal summary should be between 100-300 words and understandable by the layman reader. Proposal Team members carried over from a Step-1 proposal may need to login and re-confirm their affiliation and participation on the proposal.

For proposals with one or more NASA civil servant team members, the following is required. Proposers are required to enter the NASA civil servant team member name and fraction of FTE (full-time equivalent) involvement in the same field under the Item column in Section F "Other Direct Costs" of the online budget. The funds requested should be entered as the Total Requested Funds for the NASA civil servant, including salary, fringe, materials, travel, etc (see the FAQ posted alongside this document for additional budget instruction). This budget entry should be made for each year of NASA civil servant involvement, and is in addition to the agency identification under the team member section and the NASA civil servant FTE designation under the business data section.

In addition to the Cover Page Elements discussed above, proposers must include the following 10 sections, in the order listed below, in one .PDF document . This .PDF document is uploaded as an attachment to the NSPIRES cover page.

1. Productivity of funded NASA research, if applicable (see IV.B.3.a below)
2. Scientific / Technical Project Description (see Section IV.B.3.b below)
3. References and Citations
4. Management Approach (see *Guidebook for Proposers* and Appendix A)
5. Personnel Curriculum Vitae (see *Guidebook for Proposers* and Appendix A)

6. Current Support (see *Guidebook for Proposers* and Appendix A)
7. Facilities and Equipment (see *Guidebook for Proposers* and Appendix A)
8. Budget Justification of Proposed Costs (see *Guidebook for Proposers* and Appendix A)
9. Letters of Collaboration / Support
10. Appendices / Reprints (see IV.B.3.c below)

To ensure proper transmission of your proposal document, it is recommended your proposal upload be limited to 10MB or less.

While the NSPIRES system allows for the upload of CVs, letters of endorsement and other supporting documents as separate uploads, please provide the information above in one PDF proposal document upload. The PDF upload must not be password protected or locked in any way. Step-2 proposals are prepared by the PI or a designated representative of the PI. Step-2 proposals are submitted by an official of the PI's organization after the PI has released the prepared proposal to the authorized organization representative (AOR). It is strongly recommended that the PI work closely with his/her organization official to ensure the proposal is submitted by the due date and time listed in this solicitation. Proposals will not be accepted after the listed due dates.

NSPIRES accepts electronic proposals through a combination of data-based information (e.g., the electronic Cover Page) and the uploaded PDF file that contains the proposal as outlined above. The NSPIRES proposal submission process ensures that a minimum set of required proposal cover page fields are completed. Provision of the proposal summary and business data elements of the cover page will be necessary in order for the AOR to submit the proposal to NASA. If either of these two proposal elements is incomplete, the "View Proposal/ Check Elements" function of NSPIRES will display red "error" flags and messages to alert the user to the information that is required but missing, and the "Submit Proposal" button will not be available. Although the PI will be able to release the proposal to the AOR, the proposal cannot be submitted by the AOR to NASA until these required fields are complete. Any additional information that is missing will be identified by yellow "warning" flags. Proposers are reminded to check the solicitation instructions to ensure compliance with all instructions, as adherence to these two element validation checks alone is insufficient to guarantee a compliant proposal. Additionally, in those cases where instruction in the NRA contradicts an NSPIRES warning, the NSPIRES yellow "warning" may be ignored. Proposers should follow the NRA instructions closely to help ensure submission of a compliant proposal.

Instructions for submitting proposals to NASA via Grants.gov may be found on the Grants.gov portal at http://www.grants.gov/.

The following supersedes the information provided in the *Guidebook for Proposers* and is required in addition to the *NASA FAR Supplement Provision:*

(a) Continuation of NASA-Funded Research

Proposals that are continuations of current NASA-funded research shall provide specifics to the productivity of the supported research, research publications and new findings. This explanation shall be presented preceding the research description as part of the main proposal upload and is limited to two pages. These two pages are not considered part of the 20-page project description. Related impacts to the proposed research plan shall be highlighted in the body of the project description. **Proposals that request continued NASA support that do not include this productivity section will be returned to the submitter without panel review and not considered for funding.**

(b) Scientific/Technical Section (Project Description)

The length of the project description of the proposal shall not exceed 20 pages using standard (12 point) type. Text shall have the following margins: left = 1.5"; Right, top, bottom = 1.0". Referenced figures must be included in the 20 pages of the project description; however figure captions can use a 10 point font. The proposal shall contain sufficient detail to enable reviewers to make informed judgments about the overall merit of the proposed research and about the probability that the investigators will be able to accomplish their stated objectives with current resources and the resources requested. The hypotheses and specific aims of the proposed research shall be clearly stated. **Proposals that exceed the 20-page limit for the project description will be declined without review. Cited literature and all other proposal sections are not considered part of the 20-page project description.** Reviewers are not required to consider information presented as appendices or to view and/or consider Web links in their evaluation of the proposal. Additional information can be referenced in Appendix A, Section (c)(4).

(c) Reprints and Appendices

Reprints and Appendices, if any, do not count toward the project description page limit, and are to be included following all other sections of the proposal (**reviewers are not required to consider information presented in appendices**).

C. Submission Dates

For Solicitation announcement identifier NRA **NNH10ZTT001N**:

Step-1 proposals are due April 30, 2010, 5:00 PM Eastern Time

Step-2 proposals are due July 8, 2010, 5:00 PM Eastern Time.

The estimated selection announcement date is September, 2010. The NASA Selecting Official is the Director of the Advanced Capabilities Division, Exploration Systems Mission Directorate at NASA Headquarters (Washington, D.C.).

V. Proposal Evaluation Process for Step-2 Proposals

A. Step-1 Proposal Relevancy Review

Each Step-1 proposal will be evaluated and determined to be "relevant" or "not relevant" based upon the research emphases outlined in Section I.B of this NRA and its potential compatibility for a future flight utilizing the LGF and SQF. Proposers, whose proposals are evaluated to be relevant, will be permitted to submit full Step-2 proposals. For further information, please refer to Section IV.

B. Step-2 Proposal Compliance Review

The overall evaluation process for Step-2 proposals submitted in response to this NRA will include a Compliance Review (as described in Section V.B) and an Intrinsic Scientific /Technical Merit Review (as described in Section V.C). Proposals most highly rated in the merit review process will undergo a NASA relevance, programmatic balance and cost review (Section V.D).

All Step-2 proposals must comply with the general requirements of the NRA as described in this solicitation, the *Guidebook for Proposers*, and the *NASA FAR Supplement Provision*. In the event that the directions provided in the NRA and the Guidebook are in conflict, the instructions in the NRA shall take precedence. Upon receipt, proposals will be reviewed for compliance with these requirements including:

1) The proposal project description must be no more than 20 pages in length.
2) Submission of an appropriate budget for a funding period not exceeding that described in the NRA.
3) Submission of all other appropriate information as required by this NRA.
4) The section describing the continuation of current NASA supported research is included in the proposal and does not exceed two pages.
5) The project aims and objectives identified in the *Scientific/Technical Project Description* section of the Step-2 proposal matches the project aims and objectives approved in the Step-1 proposal.

At NASA's discretion, non-compliant proposals may be withdrawn from the review process and declined without further review. Compliant proposals submitted in response to this NRA will undergo an intrinsic scientific or technical merit review.

C. Intrinsic Scientific/ Technical Merit Review and Evaluation Criteria of Step-2 Proposals

Compliant Step-2 proposals will undergo a merit peer review by a panel of scientific and/or technical subject matter experts. This panel of experts may include non-NASA and or non-Government personnel. The number and diversity of experts required will be

determined by the response to this NRA and by the variety of disciplines represented in the proposals relevant to the research emphases described in this NRA. The merit review panel will assign ***a score from 0-100*** based upon the intrinsic scientific or technical merit of the proposal. This score will reflect the consensus of the panel which is based on the proposal's strengths and weaknesses.

The peer review panel may include in their critique of a proposal any comments they may have concerning the proposal's budget and programmatic relevance to NASA, however, the panel's scientific or technical merit score will not be impacted by the cost of the proposal work, nor will the panel's scientific or technical merit score reflect the programmatic relevance of the proposed work to NASA.

To be responsive to this research solicitation, proposed studies should be hypothesis-driven and lead to new knowledge within accepted scientific standards. Purely phenomenological approaches with no significant mechanistic basis or likely gain in scientific knowledge are not acceptable.

All of the following criteria will be used in determining the merit score (significance and approach are the most important and weigh more than innovation, investigators, and environment):

- **Significance:** Does this study address an important problem? If the aims of the application are achieved, how will scientific knowledge or technology be advanced? What will be the effect of these studies on the concepts, methods, or products that drive this field? Is there a significant societal or economic impact?
- **Approach:** Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, and appropriate to the aims of the project? Is the proposed approach likely to yield the desired results? Does the applicant acknowledge potential problem areas and consider alternative tactics?
- **Innovation:** Does the project employ appropriate novel concepts, approaches, or methods? Does the project challenge existing paradigms or develop new methodologies or technologies?
- **Investigators:** Are the proposers appropriately trained and well suited to carry out this work? Is the work proposed appropriate to the experience level of the principal investigator and any co-investigators? Is the evidence of the proposers' productivity satisfactory?
- **Environment:** Does the scientific environment in which the work will be performed contribute to the probability of success? Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements? Is there evidence of institutional support?

D. NASA Relevance, Programmatic Balance and Cost Review

Only those Step-2 proposals most highly rated in the merit review process will undergo additional review. This review will evaluate the relevancy to NASA's Advanced

Capabilities Division (ACD) ISS Research Project, programmatic balance and cost. This review will be conducted by NASA ACD ISS Research Project Program Scientists and Managers. Evaluation of the cost of a proposed effort includes consideration of the realism and reasonableness of the proposed cost and the relationship of the proposed cost to available funds. The NASA relevance and programmatic balance review will evaluate how these highly rated proposals address priorities identified by the ACD ISS Research Project. The proposals will also be evaluated for their potential compatibility to the LGF and SQF flight hardware.

E. Selection

The information resulting from the reviews described above will be used to prepare selection recommendations by NASA Project Scientists and Managers. Selection for funding will be made by the designated NASA Selecting Official (the Director of the Advanced Capabilities Division, Exploration Systems Mission Directorate (ESMD) at NASA Headquarters).

The most important element in this evaluation process is the Intrinsic Scientific/ Technical Merit Review as described in Section V.C. In addition, potential compatibility with available flight hardware (LGF and SQF), programmatic relevance/balance and available funds are all taken into consideration when making final selections. Deficiencies in any one of these factors may prevent selection of a proposal. Additional information can be found in Appendix A, Section (K).

F. Ombudsman

(1) An ombudsman has been appointed to hear and facilitate the resolution of concerns from offerors, potential offerors, and contractors during the preaward and postaward phases of this acquisition. When requested, the ombudsman will maintain strict confidentiality as to the source of the concern. The existence of the ombudsman is not to diminish the authority of the contracting officer and/or grant officer, the Proposal Evaluation Panel, or the selection official. Further, the ombudsman does not participate in the evaluation of proposals, the source selection process, or the adjudication of formal contract disputes. Therefore, before consulting with an ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations to the contracting officer and/or grant officer for resolution.

(2) If resolution cannot be made by the grants officer, interested parties may contact the NASA ombudsman. Concerns, issues, disagreements, and recommendations which cannot be resolved at the installation may be referred to the NASA ombudsman, James A. Balinskas, the Director of the Contract Management Division, at 202-358-0445, fax 202-358-3083, email james.a.balinskas@nasa.gov. Please do not contact the ombudsman to request copies of the solicitation, verify due date, or clarify technical requirements. Such inquiries shall be directed to the contacts specified in Section VII of this document.

VI. Award Administration Information

A. Award Notices

At the end of the Step-2 selection process, each proposing organization will be notified of its selection or non-selection status. NASA will provide debriefings to those Step-1 and Step-2 proposers who request one. Selection notification will be made electronically through NSPIRES and by a letter signed by the selecting official. The selection letters are not an authorization to begin performance. The selected organization's business office will be contacted by a NASA Grant Officer to negotiate an award. Any costs incurred by the proposer in anticipation of an award are at their own risk until contacted by a NASA Grant Officer. The NASA Procurement Office will request further business data, and negotiate the resultant action. NASA Grant Officers are the only personnel with the authority to award NASA grants and obligate government funds. NASA reserves the right to offer selection of only a portion of a proposal. In these instances, the proposer will be given the opportunity to accept or decline the offer. Additional information can be referenced in Appendix A, Section (K)(2).

B. Administrative and National Policy Requirements

All grant awards are subject to the NASA Grant and Cooperative Agreement Handbook (NPR 5800.1). This handbook consists of four sections that prescribe the policies and procedures relating to the award and administration of NASA grants. Section A provides the text of provisions and special conditions and addresses NASA's authority, definitions, applicability, amendments, publications, deviations, pre-award requirements and post-award requirements currently covered by 14 CFR Part 1260. Section B relates to grants with institutions of higher education, hospitals, and other nonprofit organizations. Sections A and B, with the special considerations in subpart 1260.4(b), apply to awards with commercial firms that do not involve cost sharing. Section C adopts the administrative requirements of Office of Management and Budget (OMB) Circular No. A-102 and relates to administrative requirements for grants to state and local governments. Section D relates to awards with commercial firms. The Handbook is located at http://ec.msfc.nasa.gov/hq/grcover.htm.

C. Program Reporting/Individual Researcher Reporting

Annual Reporting and Task Book Reporting

The PI shall provide an annual written report to NASA on or before the anniversary of the start of funding. This information will be used to assess the degree of progress of the project. A component of this annual report will be used for the NASA Advanced Capabilities Division Research & Technology Task Book (http://taskbook.nasaprs.com). The Task Book includes descriptions of all peer-reviewed research activities funded by the ESMD Advanced Capabilities Division disciplines such as Physical Sciences, Fundamental Space Biology and Human Research.

This information will consist primarily of:

- An abstract
- A bibliographic list of publications
- Copies of publications
- A statement of progress, including a comparison with the originally proposed work schedule

Final Report
A final report must be provided to NASA at the end of the award funding period, including a detailed listing of all peer-reviewed publications. This information will consist primarily of:

- Statement of the specific objectives
- Significance of the work
- Background
- Overall progress during the performance period
- Narrative discussion of technical approaches including problems encountered
- Accomplishments related to approach
- An appendix with bibliography and copies of all publications and reports

Any publications or other public materials containing data are particularly important to include in this section.

VII. Contacts

Additional programmatic information for the NASA Materials Science NRA is available from:

Dr. Francis Chiaramonte
Program Executive
NASA Headquarters
Email: francis.p.chiaramonte@nasa.gov
Phone: 202-358-0693

Additional technical information for the NASA Materials Science NRA is available from:

Dr. Frank Szofran
Discipline Scientist
NASA Marshall Space Flight Center
Email: frank.szofran@nasa.gov
Phone: 256-544-7777

Additional information on grants for this NRA is available from:

Name: Kenneth Albright
Title: Contracting Officer
Phone: 228-813-6127
Fax: 228-813-6343
Email: kenneth.e.albright@nasa.gov

Additional information on contracts for this NRA is available from:

Name: Mark R. Stiles
Title: Contracting Officer
Phone: 256-544-0381
Fax: 256-544-2934
Email: mark.r.stiles@nasa.gov

Same title: **VIII. References**

1. Guidebook For Proposers Responding To A NASA Research Announcement (NRA) Or Cooperative Agreement Notice (CAN), January 2010 Edition. This document is available online at the following address: http://www.hq.nasa.gov/office/procurement/nraguidebook/

2. NASA Advanced Capabilities Division Research & Technology Task Book (http://taskbook.nasaprs.com). This document is available online at the following address: http://taskbook.nasaprs.com/

3. NASA Federal Acquisition Regulations Supplement. This document is available online at the following address: http://www.hq.nasa.gov/office/procurement/regs/nfstocA.htm

4. NASA Grant and Cooperative Agreement Handbook. This document is available online at the following address: http://prod.nais.nasa.gov/pub/pub_library/grcover.htm

5. Assessment of Directions in Microgravity and Physical Sciences Research at NASA, National Research Council, 2003.

6. Condensed-Matter and Materials Physics: Basic Research for Tomorrow's Technology, National Research Council, 1999.

Appendix A: Instructions for Responding to NASA Research Announcements

(NASA FAR Supplement 1852.23-5-72, November 2004)

(A) **General.**

(1) Proposals received in response to a NASA NRA will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate award instrument. Contracts resulting from NRAs are subject to the FAR and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPR 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposer's most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(B) **NRA-Specific Items**. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more

information. Items included in these instructions may be supplemented by the NRA.

(C) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) **Transmittal Letter or Prefatory Material.**

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description.**

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach**. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical

information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment**.

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that is proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs (U.S. Proposals Only).**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator

or a subcontract. 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. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) **Security**. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Identify and discuss risk factors and issues throughout the proposal where they are relevant, and your approach to managing these risks.

(iii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(D) **Renewal Proposals.**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(E) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(F) **Joint Proposals.**

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(G) **Late Proposals.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(H) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(I) **Evaluation Factors.**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(1) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(J) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are

regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(K) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(L) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or

(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(M) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.