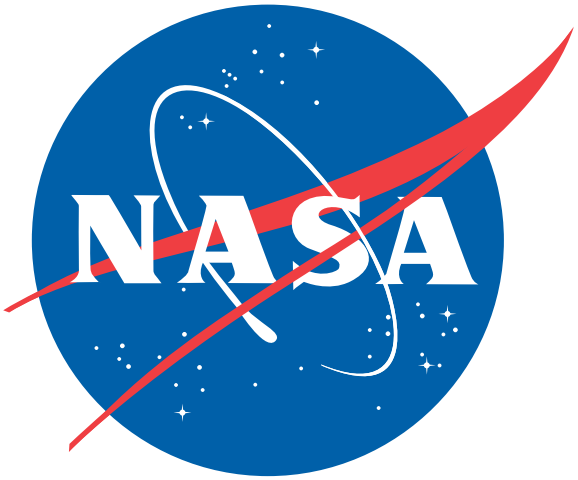

National Aeronautics and Space Administration

July 16, 2002

NRA-02-OES-03

RESEARCH ANNOUNCEMENT

INSTRUMENT INCUBATOR PROGRAM

Notice of Intent due July 30, 2002
Proposals due September 5, 2002

OMB Approval No. 2700-0087

INSTRUMENT INCUBATOR PROGRAM

NASA Research Announcement
Soliciting Research Proposals
For
Period Ending
September 5, 2002

NRA 02-OES-03
Issued July 16, 2002

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

EARTH SCIENCE ENTERPRISE (ESE)
INSTRUMENT INCUBATOR PROGRAM (IIP)

The National Aeronautics and Space Administration (NASA) announces the solicitation of proposals for the Instrument Incubator Program (IIP), a technology development program in support of the Earth Science Enterprise (ESE). The IIP seeks proposals for technology development activities leading to new system and subsystem level airborne and space-based measurement techniques to be developed in support of ESE science research and applications.

I. Introduction

a) Earth Science Enterprise

The NASA vision is:
To improve life here
To extend life to there
To find life beyond

The NASA mission is:
To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers

...as only NASA can.

NASA's Earth Science Enterprise (ESE) is one of the five science Enterprises to fulfill NASA's vision and to carry out its mission. To understand our home planet and protect it requires scientific understanding of how the Earth is changing and what are the consequences for life on Earth. The knowledge that ESE sponsored research develops and the technology that it innovates supports this NASA primary mission. The NASA Earth Science Enterprise (ESE) mission is to develop a scientific understanding of the Earth system and its response to natural or human-induced changes in order to enable improved prediction capabilities for climate, weather and natural hazards. The Earth science research program aims to acquire a deeper understanding of the components of the Earth system and their interactions. These interactions occur on a continuum of spatial and temporal scales ranging from short-term weather to long-term climate scales, and from local and regional to global scales. The Enterprise also seeks to provide accurate assessments of changes in the composition of the atmosphere, the extent and health of the world's marine and terrestrial ecosystems, and geophysical phenomena that lead to natural hazards.

The long-term (2010 to 2020) vision for the ESE includes:

- 10-year climate forecasts
- 15- to 20-month El Niño prediction
- 12-month regional rain rate
- 60-day volcano warning
- 10- to 14-day weather forecast
- 7-day air quality notification
- 5-day hurricane track prediction to +/- 30 km
- 30-minute tornado warning
- 1- to 5-year earthquake experimental forecast

The ESE technology program seeks to develop and adopt advanced technologies to enable mission success and serve national priorities. Technological innovation resulting in reduced size, mass and/or power requirements of future remote sensing instruments is essential to the future success of the ESE. A major objective of the ESE science program is to achieve more capable science missions that can be developed over a short period of time (i.e. 2 to 3 years). An effective way to achieve this objective is by identifying and developing key technologies required by NASA Earth observing satellites in advance.

b) Instrument Incubator Program

The objectives of the IIP are to identify, develop and, where appropriate demonstrate new measurement technologies which:

- reduce the risk, cost, size, and development time of Earth observing instruments, and
- enable new Earth observation measurements.

The IIP is designed to reduce the risk of new, innovative instrument systems so that they can be successfully used in future science solicitations in a fast track (3 year) acquisition environment. Figure 1 shows the idealized relationship between the IIP and development of future missions.

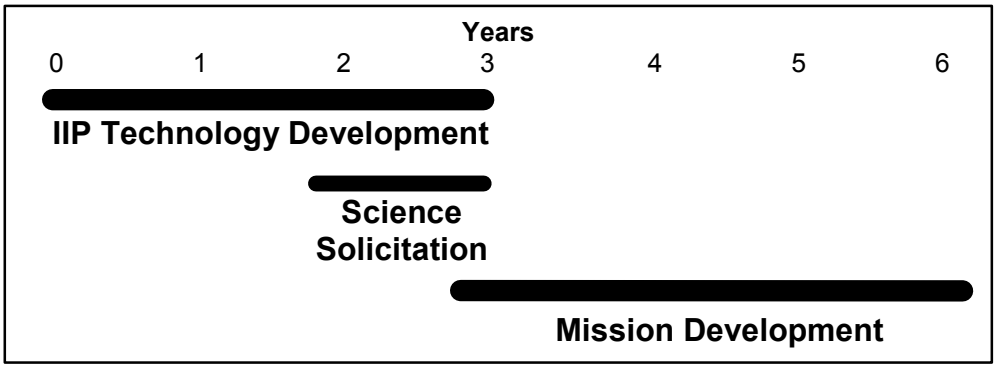

Figure 1 Idealized Relationship between IIP and Future Flight Missions

Critical to this design is the relationship between the various technology development programs that the ESE has available to enable missions. For technology infusion into NASA science missions to take place in a timely and efficient manner, appropriate funding must be applied at each stage or readiness level associated with the development of key and enabling technologies. The Earth Science Technology Office (ESTO) is responsible for planning technology development activities so that major technological risk is retired prior to a science solicitation via an Announcement of Opportunity (AO) or Request for Proposal (RFP). A focused, requirement driven approach with direct project connectivity can effectively harness advanced instrument technology capabilities and leverage developments in technology programs funded from NASA, other government agencies, private organizations, and academic institutions. Within this development environment, the IIP can rely upon the NASA Aerospace Technology Enterprise (NASA HQ, Code R) Pioneer Revolutionary Technology (PRT) Program, the NASA ESE Advanced Component Technology (ACT) Program, for advanced instrument components and subsystems and the New Millennium Program (NMP) for space flight validation.

Technology Readiness Level (TRL) is a systematic metric/measurement system that supports assessments of the maturity of a particular technology and the consistent comparison of maturity between different types of technology (see Appendix F for TRL definitions). Figure 2 shows the Technology Readiness Levels for these programs and future science missions.

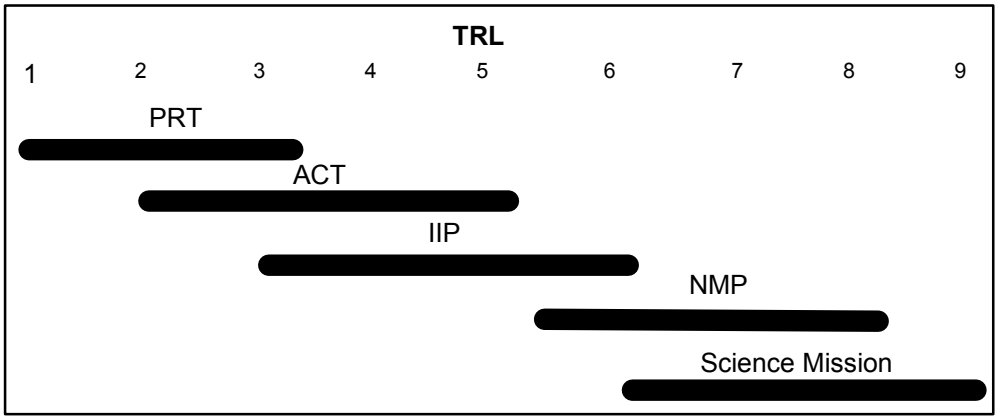

Figure 2 TRL Ranges for NASA Technology Development Programs & Science Missions

II. NASA Research Announcement

a) Goals

This NASA Research Announcement solicits instrument design, engineering model construction, lab demonstrations, and field demonstrations for innovative measurement techniques that have the highest potential to meet the objectives of the IIP and the measurement capability requirements of the NASA Earth Science Program.

The IIP is envisioned to be flexible enough to accept instrument and measurement concepts at various stages of maturity (see Figure 3), and through appropriate risk reduction activities (such as design, construction of laboratory breadboards and engineering models, and field demonstrations on the ground or on airborne platforms), advance the system's technology readiness level to that necessary to compete successfully in future science solicitations or New Millennium Program space flight demonstrations. The proposer must define the starting point for the instrument or measurement technique and the exit or success criteria for the proposed activity.

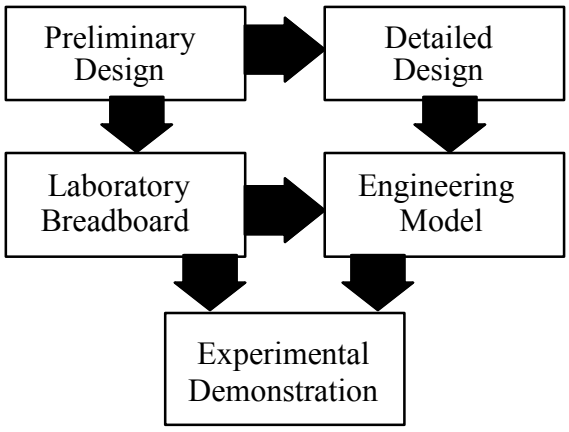

Figure 3 Entry and exit points defined by proposer

b) Proposal Science Research Topics

The NASA ESE Research Strategy for 2000-2010 describes the Enterprise goal of obtaining a scientific understanding of the entire Earth system on a global scale. This involves several challenges. The first challenge is the characterization of the present state of the Earth system and the forcings that affect the Earth System to serve as the baseline information for research. A second challenge is the quantitative description elucidating how the Earth system's component parts and the interactions between them have evolved, how they function, and how they may be expected to continue to evolve on all time scales. The last challenge is to develop the capability to predict those changes that will occur in the future over seasonal, interannual, decadal, and even longer time scales, both naturally and in response to human activity.

Advances in observing and information technologies, research, and modeling are all required to fulfill the ESE long-term vision for Earth system prediction in the years from 2010 to 2020. The observing system of the future will include satellites in a variety of orbits. These will include a "sensorweb" of small, smart satellites in low Earth orbit, large aperture sensors in geostationary orbits, and sentinel satellites at L1 and L2 (about 1.5 kilometers from Earth) to provide synoptic day/night views of the entire globe from pole to pole. Onboard data processing and high speed computing and communications will enable delivery of tailored information products from satellites direct to users at the cost of today's international telephone calls.

The strategic objective of the Enterprise is to provide scientific answers to the overarching question:

How is the Earth changing and what are the consequences for life on Earth?

The key research topics studied by NASA's Earth Science Enterprise fall largely into three categories: forcings, responses, and the processes that link the two and provide feedback mechanisms. This conceptual approach applies to all research areas of NASA's Earth Science program, although it is particularly relevant to the problem of climate change. The scientific strategy to address this complex problem can be laid out in five fundamental questions, each raising a wide range of cross-disciplinary science problems.

- *How is the global Earth system changing?*
- *What are the primary forcings of the Earth system?*
- *How does the Earth system respond to natural and human-induced changes?*
- *What are the consequences of change in the Earth system for human civilization?*
- *How well can we predict future changes in the Earth system?*

While these five questions define a logical progression in the study of global change, each one covers a range of topics too broad to serve as a simple guide for program implementation. The IIP program must also anticipate implementation timelines and readiness for future missions. For the purpose of this announcement, more specific research questions are presented below and are articulated in the ESE Research Strategy for 2000-2010. Given the three-year timeline for the IIP program and the goal of a three-year time interval between mission selection and launch, successful IIP proposals are anticipated to contribute to missions in 2009 and beyond. The science questions identified here as priorities for this announcement are those for which the highest priority for technology development to enable missions in the 2009 timeframe is needed. The questions below

are the complete set of science research topics solicited by this NRA and no priority should be construed from their relative order below.

How is the Earth's surface being transformed and how can such information be used to predict future changes?

Topography and Surface Change

There is strong community-wide sentiment that space-borne and airborne measurement of topography and surface change will lead to significant near term advances in the understanding of earthquakes, volcanoes, landslides, flooding, aquifer charge, cryospheric dynamics, and coastal zone interactions. Geodetic imaging technologies such as Interferometric SAR (INSAR) capable space-borne radars including SIR-C, ERS-1/2, and JERS-1 imaged centimeter-scale changes in land surface response to tectonic forces, volcanic inflation, and aquifer depletion. This IIP NRA seeks technologies that will provide more capable and efficient airborne and space-borne geodetic imaging including, onboard processing and real time dynamic positioning to accommodate repeat pass interferometry and other advanced radar techniques.

Gravity Field Measurement:

Geopotential field measurements are currently the only space-borne techniques available to study the Earth's sub-surface. Space-borne gravity sensors can provide a very sensitive measurement of regional changes in mass associated with the dynamics of the atmosphere, cryosphere, hydrosphere and atmosphere. The recently launched GRACE gravity mission which aims to recover temporal variations in the Earth's gravity field was enabled by new positioning and accelerometer technologies. This IIP offering seeks to develop technologies that will significantly extend the accuracy and spatial resolution of current space borne gravity measurements including space-borne accelerometers, gravity gradiometers, ranging systems, and related drag-compensated gravity measurement technologies. The interpretation of the GRACE data set will rely upon surface air pressure estimates to separate atmospheric mass distribution from changes in the mass distribution of the hydrosphere and cryosphere. Presently the estimation of surface air pressure is dependent upon global circulation models and relatively sparse surface measurements. This IIP NRA therefore seeks technologies that can provide accurate space-borne measurement of surface air pressure with spatial resolution of 200km or better and with millibar or better measurement accuracy.

What are the effects of regional pollution on the global atmosphere, and the effects of global chemical and climate changes on regional air quality?

Understanding and predicting tropospheric transport, physics and chemistry will be a frontier area of atmospheric research for the next decade and probably beyond. Tropospheric chemistry poses an interdisciplinary challenge for the Earth science community. These are global scale problems that are particularly well suited to the use of space observations and correlative *in situ* measurements. Knowledge of these phenomena is needed to evaluate the effects of chemical changes on the global hydrological cycle, the cycling of nutrient compounds through the earth environment, the accumulation of greenhouse gases, the acidity of rain and snow, and the formation of ozone in the troposphere. Two specific challenges need to be addressed to effectively investigate tropospheric chemical processes: horizontal/vertical resolution and temporal sampling. Tropospheric ozone is

expected to show considerable vertical stratification and fine horizontal structures that contain information on the origin and age of important species. Likewise, the altitude distribution of upper tropospheric ozone is a critical parameter in climate models. Temporal and horizontal variability is also important, including significant diurnal variations. This IIP NRA solicits spectral imaging from geostationary orbit or from the L1 point to provide the necessary high temporal and horizontal resolution to observe rapidly evolving chemical events and quantify export from large source regions to the global atmosphere.

How are global precipitation, evaporation, and the cycling of water changing?

Precipitation information can be inferred from passive microwave imaging radiometer data acquired by existing operational environmental satellites (DMSP) and eventually NPOESS. Recent results from the Tropical Rainfall Measuring Mission (TRMM) show that the detailed cloud particle profile information provided by an active microwave sensor (Precipitation Radar) can be used effectively to improve the accuracy of rain rate estimates based on passive microwave measurements only. However, none of the existing or planned operational systems (nor *a fortiori* the single EOS Aqua mission) will provide sufficient sampling frequency globally (repeat interval of 3 hours or less) to capture the considerable spatial and temporal variability of precipitation events and provide a reliable estimate of total rainfall. This IIP NRA seeks new technologies for the simultaneous measurement of atmospheric temperature and moisture and rainfall from geosynchronous orbit.

What changes are occurring in the mass of the Earth's ice cover?

Sea-ice thickness and concentration are the primary variables for estimating sea-ice growth, melting, and mass transport by ocean currents (or equivalent fresh water transport), and for inferring energy and momentum fluxes across the ice-covered ocean surface. No current technique exists for the direct determination of sea-ice thickness from space. The capability to acquire extensive measurements of sea-ice thickness represents the ultimate challenge of sea-ice remote sensing, as this quantity is so critical to the estimation of energy and momentum fluxes between the ocean and atmosphere.

Snow cover also plays an important role in determining the energy balance of sea-ice, as it adds substantial insulation from the atmosphere and modulates albedo. Yet, even the climatology of snow thickness distribution over sea ice is known only in the crudest terms. This IIP NRA seeks technologies that can enable the measurement of sea ice thickness and snow cover. A potential approach includes high spatial resolution L-band SAR (possibly interferometric).

What are the consequences of climate and sea level changes and increased human activities on coastal regions?

Remote sensing of the coastal ocean is limited by three major factors. First, changes in the coastal zone are more rapid than in deeper water and once per day observation from LEO orbits is insufficient to resolve many coastal processes. The second factor is that stronger and more rapid spatial variations are observed in coastal waters and are not resolvable using current ocean surface topography or wind measurement because of the large footprints. The third factor is that clouds and fog are more prevalent near the coast so visible imagery is not able to provide reliable coverage even though it can be obtained at higher (1km) resolution. To mitigate these challenges, this IIP

NRA seeks technology developments applicable to remote sensing of the coastal region from geostationary orbit.

In summary, NASA is soliciting proposals focused on advanced observation technologies in the following areas;

- Topography and surface change
- Gravity field Measurement
- Tropospheric profiles of O_3, CO, NO_x from GEO
- Atmospheric temperature, moisture and rainfall from GEO
- Sea ice thickness and snow cover
- Coastal region change from GEO
- Innovative technologies supporting measurement concepts from the L1 or L2 libration points.

The scientific observations associated with proposed technologies are expected to enable NASA to obtain answers to the scientific questions identified in the previous section.

Proposals for other technology developments that do not address the needs as described previously will be considered non-responsive and will not be evaluated.

c) Technology Readiness Level (TRL) Guidance

The proposer must define the starting point TRL, the exit TRL, and success criteria for their proposal activity. Past and ongoing work in the research activity should determine the entry point. Research within this NRA will be restricted to an exit TRL less than or equal to 6. The proposer should seek an alternate technology program for developments that exceed TRL 6. For this solicitation, the entry TRL can be from 3 to 5. Over the duration of the research, the activity must advance by at least one TRL. For example, an activity can enter the technology development activity at TRL 4 and exit at TRL 5 or 6. These limitations naturally preclude space qualification flights from being performed in the IIP Program. The results at the exit point should provide convincing evidence that the instrumentation can make the proposed measurements and that an operational instrument can be built within the context of the new shorter acquisition cycles.

Each proposed instrument development should include an evaluation of feasibility, requirements analysis, instrument design, construction of breadboards, and/or construction of an engineering model. All proposed efforts should include evaluation of anticipated performance and an estimate of the entry and exit TRL. To aid in the planning of future, potential technology activities, the proposal should also include an estimate of the resources (cost and schedule) to develop a flight quality instrument and documentation of technology dependencies. An instrument or measurement design concept or actual design should be produced as well as a concept for data product generation. These items will be documented as contract deliverables.

Laboratory and field demonstrations may be funded and are expected to produce a working instrument or specific instrument subsystems (breadboard or engineering model) and data documenting performance measured either in the laboratory or in the field. The final report should document these measurements.

d) Domestic Partnerships

This announcement encourages technology development partnerships among U.S. Government Agencies, Private Industry, and Academic Institutions. These leveraging opportunities enable cost sharing and should be mutually beneficial to each partner and the nation. A single proposal from the lead institution of the partnership is required. The proposal must satisfy the requirements of Appendix B, section (f).

e) International Participation

This announcement is open to the international technology community. International cooperative proposals, with co-investigators from U.S. institutions participating in foreign-led proposals or with co-investigators from non-U.S. institutions on the teams of proposals from U.S. institutions, are also encouraged. These proposals should be on a "no-exchange-of-funds" basis for their non-U.S. elements and should identify any requirements for NASA financial support for U.S. participants. Proposals from non-U.S. institutions are encouraged, but only on a "no-exchange-of-funds" basis. Specific instructions for proposals from non-U.S. institutions are included in Appendix B.

f) Funding

The U.S. Government's obligation to make awards is contingent upon the availability of appropriated funds from which payment for award purposes can be made and the receipt of proposals that are determined to be acceptable by the Government for award under this announcement. Funding of the successful proposals will be through the award of contracts. No additional funds beyond the negotiated contract value will be available. An Interagency Acquisition may be used to fund awards to other U.S. Government agencies. Neither grants nor cooperative agreements will be awarded as a result of this solicitation. Proposers are also encouraged to offer cost sharing. Cost-sharing proposals must include a discussion on the data-rights requested by the offerer.

Subject to availability of funding, the Government expects to make approximately 10 awards under this solicitation, with each award having an annual cost in the approximate range of $500,000 to $1 million.

g) Period of Performance

The minimum period of performance is 12 months. The total proposed period of performance must not exceed 36 months. The Government will award contracts for a 1-year base period, with up to two 1-year options exercisable by the Government. Proposals must define clear, measurable milestones to be achieved in order to warrant exercise of any options.

h) Rights to Data

In the event that a cost sharing arrangement is proposed, appropriate data rights that recognize the offerer's contributions as well as the Government's rights to access will be negotiated prior to awarding a contract.

i) Reference Material

This announcement and appendices are available on the Research Opportunities home page on the World Wide Web (WWW), at http://research.hq.nasa.gov/ (look under "Office of Earth Science (Code Y)").

The NASA ESE Strategic Plan and the NASA ESE Research Strategy 2002-2010 are available on the World Wide Web at http://earth.nasa.gov/visions/.

The ESTO hosts a World Wide Web page, http://esto.gsfc.nasa.gov that can be a source of information on the various elements of the Earth Science Technology Program.

j) Participation in ESE Solicitations

Participation in this NRA or a subsequent similar NRA is ***not*** a prerequisite to selection as a science investigation as part of any future ESE NRA, AO or other solicitation. Similarly, participation in this NRA does not guarantee continued participation in the IIP or success in any future ESE competitions. Successful participation in this NRA is intended to give innovative measurement techniques the scientific and technical pedigree they need to compete in relevant ESE solicitations against any good ideas developed elsewhere. Solicitations similar to this announcement will be issued periodically to select additional technologies for development.

k) Required Proposal Forms and Proposal Submittal Guidance

Proposals should be prepared and submitted in accordance with specific information provided in Appendices A-G of this announcement. Appendix A provides specific instructions for proposers to this announcement. Appendix B contains the general instructions needed for preparation of solicited proposals in response to NRAs. Appendix C provides instructions for proposal submission. Appendix D provides a sample of the proposal cover sheet, the list of required declarations, and information on requisite certifications and disclosures. Appendix E contains a budget summary worksheet with instructions for its use. Appendix F defines the Technology Readiness Levels. Appendix G contains a list of acronyms. All proposals submitted to NASA in response to this announcement must have a completed cover sheet and information on current and pending research support from all other sources attached. All proposals from investigators from the U.S. and other countries will be evaluated by NASA.

Proposal submission is comprised of two parts: Internet submission and postal submission. The Internet submission requires that the cover page, abstract, and FCA budget be submitted via the SYS-EYFUS website (http://proposals.hq.nasa.gov/). Detailed instructions on preparing and submitting the cover page can be found in Appendix C "Required Proposal Cover Page". On the proposal cover page, the proposer is required to select the applicable categories to which the proposal responds – reference Paragraph II (b) of this NRA. This is intended to aid in the evaluation of the proposal, and will not be used to limit the applicability of proposals from related categories. Note that an authorizing official for the proposing organization and any Co-Investigators must obtain a User ID and password in order to be added to the Cover Page. Since the information submitted to the SYS-EYFUS Web site is validated before being officially added to the database, new users should allow two weeks for this validation to occur.

A printed, signed, original of the entire proposal, ten (10) copies, and a magnetic or optical disk containing a softcopy of the proposal submitted via the postal service or equivalent means constitutes the second part of the proposal submission. This hardcopy version of the cover page must be printed in time to acquire signatures and be included with the original hardcopy of the proposal for delivery according to this NRA schedule. Proposers are advised that they must not reformat the cover page after it is printed, as important NASA-required documentation may be lost. **Please note that submission of the electronic cover page, alone, does not satisfy the deadline for proposal submission.**

Submit proposals to:	ESE IIP NRA NASA Peer Review Services, Code Y 500 E Street, SW, Suite 200 Washington, DC 20024-2760 (For overnight delivery purposes only, the recipient telephone number is 202-479-9030)
Selecting Official:	Associate Administrator, Office of Earth Science NASA Headquarters
Point of Contact:	Frank Peri, Instrument Technology Program Manager Earth Science Technology Office NASA Goddard Space Flight Center, Code 711 Greenbelt, MD 20771 Tel.: (301) 286-9475, Fax: (301) 286-2756 fp@esto.nasa.gov
Number of Copies:	Ten (10) paper copies and one magnetic or optical disk, Macintosh or IBM PC compatible format (see Appendix A, Section IV)
Acceptable Formats:	Portable Document Format (PDF) (preferred), Microsoft Word, WordPerfect. Microsoft Excel for cost information (see Appendix A, Section IV)
Length of Proposal:	Ten (10) non-reduced, single space typewritten pages (see Appendix A, Section III (J))

Proposals submitted to NASA Headquarters will cause a delay in receipt of your proposal, therefore, please adhere to "Submit proposals to:" above.

l) Selection Schedule

All proposals submitted in response to this announcement are due in accordance with the dates shown in this announcement. A summary of the solicitation schedule can be found at the ESTO web site, http://esto.gsfc.nasa.gov.

Your interest in participating in this opportunity is heartily welcomed.

Ghassem R. Asrar
Associate Administrator for Earth Science

Enclosures:

Appendix A. Specific Guidelines for Proposers
Appendix B. Instructions for Responding to NASA Research Announcements
Appendix C. Instructions for the Required Proposal Cover Pages
Appendix D. Proposal Cover Page, and Required Certifications, Disclosures, and Assurances
Appendix E Budget Summary
Appendix F. Definition of Technology Readiness Levels
Appendix G. Acronyms List

APPENDIX A
SPECIFIC GUIDELINES FOR PROPOSERS

I. Evaluation Factors

The following evaluation factors will be used to evaluate the proposals. They replace and supersede those contained in *Appendix B, paragraph (i)* Evaluation Factors.

Factor 1: Applicability to ESE Science Measurements and Technology Needs (40% of total evaluation weight)

1. The proposal's relevance and potential contribution to NASA's Earth Science Enterprise.
2. The potential for the measurement system to reduce the risk, cost, size, and development time of ESE systems, or to enable a new measurement that cannot now be made. Potential cost reductions should be clearly stated and substantiated to the extent possible, with supporting analysis that indicates scalability.
3. The potential of the measurement system to be integrated, once matured, into an operational agency/nongovernmental measurement system.
4. The potential for the measurement system to be have commercial benefits.

Factor 2: Technical Merit (30% of total evaluation weight)

1. Feasibility and merit of the proposed technical approach to achieve the technology development objectives.
2. Degree of innovation of the proposed study or technology development concepts and approach.
3. Substantiated justification and appropriateness of the entry and exit technology readiness level (TRL).

Factor 3: Cost and Programmatic Realism (30% of total evaluation weight)

1. Adequacy and realism of proposed milestones.
2. Realism and reasonableness of the proposed cost, and comparison of costs to available funds.
3. Adherence to sound and consistent management practices appropriate to the TRL level of the proposed task.
4. Past performance and related experience in the proposed area of technology development.
5. Qualifications of key personnel, and adequacy of facilities, staff, and equipment to support the proposed activity.
6. Commitment of the organization's management to the proposed technology development (evidenced by cost and resource sharing, prior teaming arrangements, etc.). Proposers should identify any previous investment by the organization/program and provide supporting documentation.

II. General

Appendix B, Paragraph (a)(4) is revised as follows:

Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. No additional funds over the initially specified contract value will be available.

III. Proposal Development Guidance

Proposers should periodically check the NRA website (http://research.hq.nasa.gov) for any updates to this NRA.

The technical proposal should address each of the items below, which supplement and/or modify the guidance provided in Appendix B.

A. *Appendix B, Paragraph (c)(1)* Transmittal Letter or Prefatory Material. Each proposal will require a Proposal Cover Sheet and Certifications, as described in Appendix D.

B. *Appendix B, Paragraph (c)(3)* Abstract. Provide an overall description of the proposal in abstract form, not to exceed 250 words.

C. *Appendix B, Paragraph (c)(4)(i)* Project Description. The Project Description must include the following information: Items 1-5 below, and items D, E, and I.

1. Applicability to ESE Measurements – Describe the benefit to future ESE science measurements (as defined in this NRA in Section II, Paragraph (b) Proposal Research Topics) that could utilize the proposed measurement system. Failure to describe relevancy to a specific research topic may be a cause for non-selection.

2. Description of Proposed Technology – Provide a description of the proposed measurement system technology. Describe the technical approach and include an operational concept or use scenario of the proposed measurement system technology that addresses ESE needs. Discuss any possible commercial benefits.

3. Comparative Technology Assessment – Describe the anticipated advantages of this measurement system technology compared to those currently in use - e.g., reduction of size, mass, power, volume or cost, improved performance, or enabling of a new capability not previously possible. Review the current state of the art and relate to the proposed work.

4. TRL Assessment – Provide the current TRL assessment of the measurement system technology and the anticipated progression of TRL levels throughout the proposed effort. See Appendix E for guidance on Technology Readiness Levels. All TRL assessments must be substantiated. Failure to include and substantiate TRL assessments may be cause for non-selection.

5. Research Management Plan – Provide a statement-of-work that concisely describes each task or milestone to be accomplished in the course of the research and development. Define the success criteria associated with each task or milestone. Also, include a

milestone chart that identifies critical dates in the research and development program. At least two milestones per 12 month period should be defined; the first midway and the second near the end of the period. Identify the roles of key personnel.

Subcontracting portions of the research project is acceptable.

D. *Appendix B, Paragraph (c)(4)(ii)* Project Description. Complete cost information for the entire duration of the project must be provided.

E. *Appendix B, Paragraph (c)(6)* Personnel. Include a list of key personnel and identify experience relevant to the proposed activity. *The Key Personnel list is included in the overall page count.*

Optionally, one-page resumes for Key Personnel may be supplied; these resumes are not included in the overall page count.

F. *Appendix B, Paragraph (c)(7)(ii)* Facilities and Equipment. 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.

G. *Appendix B, Paragraph (c)(8)(i)* Proposed Costs (U.S. Proposals Only). Full cost accounting (FCA) is required in all proposals, including those submitted by U.S. Government agencies. To assist in the selection process, proposals that include any U.S. Government costs must submit budgets that clearly indicate the costs with and without FCA. Budget data entered on the Proposal Cover sheet must be in FCA; Government proposals should clearly indicate non-FCA budgets in the text of the proposal. Cost sharing or matching arrangements should also be indicated, if applicable. Ensure that all costs to support reporting requirements, including travel, are included in the budget submission. Major subcontractor costs should be itemized in a manner similar to that specified in the subject paragraph. Proposed cost should not exceed six (6), non-reduced, typewritten pages, excluding those tables required in Appendix E Budget Summary. Supporting cost data is permitted in Microsoft Excel spreadsheet format. However, no imbedded, expandable tables are permitted in the spreadsheets.

A monthly cost phasing plan shall be submitted to facilitate award negotiation. The monthly cost phasing plan *is* included in the 6-page limit specified above.

H. *Appendix B, Paragraph (c)(8)(ii)* Proposed Costs (U.S. Proposals Only). Explanatory notes should accompany the cost proposal to provide clarification of items in the cost proposal that are not self-evident.

I. *Appendix B, Paragraph (c)(11)(ii)* Special Matters. Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal.

J. *Appendix B, Paragraph (e)* Length. The maximum length of each proposal is limited to fifteen (15) non-reduced, single-spaced typewritten pages (electronic document not to exceed 2.5 Megabits) for the total of the Description of Proposed Technology, Applicability to ESE Missions, Comparative Technology Assessment, TRL Assessment, Schedule Milestones, Management Approach, Personnel (excluding optional, one-page resumes), Facilities and

Equipment, and Special Matters sections. In other words, the whole proposal, excluding the Proposal Cover Sheet, Abstract and the Certifications required by Appendix D, Budget information, and optional resumes is limited to fifteen (15) pages. Each side of a sheet of paper containing text or figures is considered a page. Use type font 12 point or larger, minimum one-inch margins and standard 8.5 x 11 inch paper. As all pictures and graphs are included in the page count, proposers are encouraged to limit the use of these unless they provide unique information that cannot be derived from the printed text. *Proposals that exceed the 15 page limit will be truncated at 15 pages, and only that portion provided to reviewers for evaluation.*

K. *Appendix B, Paragraph (f)(1)* Joint Proposals: Where multiple organizations are involved, the proposal must be submitted by only one of them. The proposal should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated.

IV. Proposal Submittal Guidance

The proposer shall submit 10 paper copies and one magnetic or optical disk (Macintosh and IBM PC compatible format) with the proposal. In order to expedite the review process, the technical proposal shall be submitted as one electronic file. That is, the disk submitted with the paper proposal shall have files for the technical proposal and the cost proposal from the certifications and representations required by Appendix D. The cost proposal should be in a separate file.

The following requirements apply to formatting the softcopy proposal:

A. Word Processor & Spreadsheet. NASA converts all technical proposal files to PDF format for evaluation purposes. Therefore, NASA encourages proposers to submit technical proposals in PDF format. Other acceptable formats are Microsoft Word, WordPerfect, and Postscript. Cost proposals and supporting cost information may be submitted in Excel spreadsheet format.
B. Graphics. For reasons of space conservation and simplicity the proposer is required to embed graphics within the document.
C. Limitations. While only the paper copy will be screened for administrative compliance, the various files comprising the electronic version are required to exactly reflect the paper version. It is the proposer's responsibility to ensure that the electronic copy of the proposal is the same as the paper copy. NASA will assume they are the same.
D. Virus Check. The proposer is responsible for performing a virus check on all files submitted on magnetic or optical disk. As a standard part of entering the proposal files into the processing system, NASA will scan each submitted electronic file for viruses. *The detection, by NASA, of a virus on any submitted electronic file may be cause for rejection of the proposal.*

V. Reporting Requirements

The following reports will be required of awarded proposals. In cases where subcontract arrangements exist, consolidated project reports, including financial reports, must be submitted and is the responsibility of the PI. The proposed budget should provide for these reporting requirements.

In this context "Annual" refers to a calendar year task effort which commences at contract award. All written reports and review presentation material should be submitted in electronic format or paper copy 10 days prior to the review.

Bimonthly technical reports:

The bimonthly technical report shall provide an overall PI assessment of the project in approximately one written page, the actual length of which depends on the level of activity during the month. The initial monthly report should include a plan for technical, schedule and resource activities for the year. Reports shall address the following:

- Summarize technical accomplishments for the preceding month including: technical accomplishments (trade study results, requirements analysis, design, etc.), technology development results, results of tests and/or demonstrations.
- Summarize schedule status including: significant tasks completed, started and expected to complete later than planned, significant tasks that are delayed starting with rationale for each, and recovery plans as appropriate.
- Technology Readiness Level assessment: Provide an assessment of the entry Technology Readiness Level (TRL) and the basis for that assessment for the critical technology developments of the activity. The first TRL assessment is to be provided with the first monthly report. An updated TRL assessment must be provided at the interim review and at the annual review. The final report should indicate the PI's assessment for time required to get from the IIP completion state to TRL 6, if not already there.
- Quad Chart: The first monthly report shall include a quad chart that contains the following information:

    (a) First Quadrant: Include a visual, graphic, or other pertinent information
    (b) Second Quadrant: "Description and Objectives"
    (c) Third Quadrant: "Approach" and "Co-I's/Partners"
    (d) Fourth Quadrant: "Schedule and Deliverables" and "Applications/Missions"

    The quad chart shall be updated annually.

Format: Bimonthly reports shall be submitted in Microsoft Word or PowerPoint compatible formats.

Due date: Bimonthly technical reports shall be submitted by the 10^{th} of the month or the close of business of the first workday following the 10^{th} if the 10^{th} is on a weekend or a federal holiday. A teleconference or brief meeting may be conducted each month with the PI to review and discuss the monthly report.

Monthly financial reports:

The following shall be included in the monthly financial reports:

- Summarize planned vs. actuals: The monthly financial report shall show the planned versus actual obligations and costs for the preceding month and explain any deviations from the plan. Include work that has been completed and cost incurred from the project (should be traceable to the schedule).

- Summarize procurements: The PI shall report the status of major procurements that have been incurred to date.

Format: Monthly financial reports may be submitted in Microsoft Excel compatible formats.

Due date: The financial report shall be submitted with the monthly technical report by the 10th of the month or the close of business of the first workday following the 10th if the 10th is on a weekend or a federal holiday.

Interim review:

A presentation format review of the work accomplished and results leading up to this milestone review shall be held at each phase mid-point. The review shall:

- describe the primary findings, technology development results, technical status, status of construction of breadboards, and/or construction of an engineering model, and results of tests and/or demonstrations.
- provide a demonstration, if appropriate, to show technical results and status.
- describe the work planned for the remainder of the phase and critical issues that need to be resolved to successfully complete the remaining planned work.
- summarize the financial and schedule status of the project including any schedule slippage/acceleration.
- provide an update of the TRL assessment and the quad chart.

The ESTO will conduct the review at the PI's facility or a mutually agreed to location with the length of the presentation tailored as appropriate depending on the amount of work to be discussed. In addition to hard copy handouts at the review, the interim review package shall also be submitted in Microsoft Word or PowerPoint compatible formats.

Due date: Interim reviews shall be scheduled at a time mutually agreeable to the IIP program manager and the PI, but not after 60 percent of the duration of a phase and with at least 30 days advance notice.

Annual review:

The annual review will be a presentation format similar to the interim review. All interim content described above shall be covered. The planned work discussion should focus on the upcoming phase and any critical issues related to continuation. The PI should also recommend whether the work should be continued based on results to date and provide a strong rationale for the recommendation. **Exercise of any subsequent option phase(s) will be decided based upon the results of the annual review(s).** For the *final* annual review, the focus should be on plans and issues related to fabricating a flight instrument.

The ESTO will conduct the review at the PI's facility or a mutually agreed to location with the length of the presentation tailored as appropriate depending on the amount of work to be discussed. The annual review for the final phase should be comprehensive and should include a discussion of the planned content of the written report. In addition to hard copy handouts at the review, the annual review package shall also be submitted in Microsoft Word or PowerPoint compatible formats.

Due date: Annual reviews shall be scheduled at a time mutually agreeable to the IIP program manager and the PI, however, in order to allow sufficient time for processing option phase continuation documentation, the annual review shall be conducted at least 30 days prior to the end of the phase and with at least 30 days advance notice.

Final report:

The final written report shall include the following:

- results of requirements analysis, instrument design, breadboards and/or an engineering model design and performance analyses.
- an update of the quad chart and the TRL assessment and an estimate of the time required to reach TRL level 6 (using reasonable assumptions on funding levels).
- an instrument or measurement design concept or actual design and an instrument development plan leading to an operational instrument in 18 months including a concept for data product generation.
- an estimation of cost and schedule to develop a flight quality instrument, and documentation of technology dependencies.

The final report shall be submitted in Microsoft Word compatible format and paper copy by the end of the scheduled period of performance.

Distribution of Deliverables:

All electronic deliverables described in the preceding section shall be submitted to the ESTO program manager using the ESTO award administration e-books available at **http://esto.reisys.com/**. In order to protect any proprietary information, access to this system is restricted via usernames and passwords. Only the PI and the ESTO program manager will have access to the reports and presentations. A username and password will be provided to the PI to gain access to the system prior to the due date for the first monthly report.

Annual Conference:

If held, the awardee is encouraged to participate in an annual technology conference sponsored by the Earth Science Technology Office. The Earth Science Technology Conference is an opportunity for NASA planners, managers, technologists and scientists to review the research funded by the Earth Science Technology Office. It is also an opportunity for researchers from NASA, academia and industry to meet with their peers and to better understand NASA Earth Science requirements. Invitational travel orders may be provided to those non-civil servant awardees selected to participate. If selected for participation in the conference, the awardee should be prepared to make a presentation, provide a paper, or create a poster providing a description of the project, the objectives, approach, technical status, and schedule information.

CURRENT AND PENDING RESEARCH SUPPORT FROM ALL OTHER SOURCES

All proposals must include this information. This list should include all current and pending research support from the following sources:

1. Any proposal for which the PI of this proposal is also the Principal Investigator.

2. Any proposal, regardless of the PI, which accounts for more than 20% of the time of the Principal Investigator of this proposal and other personnel essential to this proposal.

Please provide this information in the following format:

I. Principal Investigator

A. Current Fiscal Year Support

1. Source of Support and Principal Investigator
2. Award Amount and Period of Performance
3. Person-Months and Level of Effort
4. Project Title and Short Abstract (50 words or less)

B. Pending Proposals (Excluding this proposal but including other proposals).

1. Source of Support and Principal Investigator
2. Award Amount and Period of Performance
3. Person-Months and Level of Effort
4. Project Title and Short Abstract (50 words or less)

For both current and pending support provide information on:

II. Co-Investigators

As outlined above, provide information on all Current and Pending Support. Disclosure of current and pending research support is not required for collaborators.

III. Other agencies to which this proposal, or parts thereof, has been submitted.

PROPOSAL SUMMARY (1-PAGE ONLY)

NASA Research Announcement 02-OES-XX

For reference only - must be entered at http://proposals.hq.nasa.gov/

ABSTRACT: (Single-space, typed, about 200-300 words). Include: (a) Objectives and justification for work; (b) Accomplishments of prior work; (c) Outline of proposed work and methodology; (d) One or two relevant recent publications authored by the PI or Co-I.

APPENDIX B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

NASA Federal Acquisition Regulation (FAR), Supplement (NFS)
Part 1852.235-72, Effective JANUARY 2000 (Modified)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (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 instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation 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 (NPG 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 proposers' 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 are 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) 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.

(4) 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) Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

U.S. 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 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 http://www.pmdtc.org and http://www.bxa.doc.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.

(n) 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.

(End of provision)

Appendix C

INSTRUCTIONS FOR THE REQUIRED PROPOSAL COVER PAGE

Two proposal cover pages are required as part of the proposal. The first is a hard copy (see Appendix D) that must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. This authorizing signature also certifies that the proposing institution has read and is in compliance with the required certifications printed in full, therefore, these certifications do not need to be submitted separately. This page will not be counted against the page limit of the proposal.

The second proposal cover page must be submitted electronically to the SYS-EYFUS Web site located at http://proposals.hq.nasa.gov/.

If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic proposal cover page in response to this research opportunity announcement. Be sure to click on "Edit Personal Information" if any of your correspondence information in the SYS-EYFUS is not current.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to http://proposals.hq.nasa.gov and performing the following steps:

- Click the hyperlink for new user which will take you to the Personal Information Search Page.
- Enter your first and last name. SYS-EYFUS will search for your record information in the SYS-EYFUS database.
- Confirm your personal information by choosing the record displayed.
- Select continue, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, login to the SYS-EYFUS Web site and follow the instructions for New Proposal Cover Page.

Proposers without access to the Web or who experience difficulty in using this site may contact the Help Desk at proposals@hq.nasa.gov (or call 202.479.9376) for assistance. After you have submitted your proposal cover page electronically, if you are unsure if it has been successfully submitted, do not re-submit. Please call the Help Desk. They will be able to promptly tell you if your submission has been received. Please note that submission of the electronic cover page does not satisfy the deadline for proposal submission.

Appendix D
PROPOSAL COVER PAGE, AND REQUIRED CERTIFICATIONS, DISCLOSURES, AND ASSURANCES

Proposal Cover Page

Proposal Number: _____

Date: __/___/_____

Name of Submitting Institution: **Congressional District:**

Proposal Title:	
Name of Submitting Institution:	**Congressional Distinct:**

Certification of Compliance with Applicable Executive Orders and US Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i*) Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs, and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

NASA PROCEDURE FOR HANDLING PROPOSALS

This proposal shall be used and disclosed for evaluation purposes only, and a copy of this Government notice shall be applied to any reproduction or abstract thereof. Any authorized restrictive notices that the submitter places on this proposal shall also be strictly complied with. Disclosure of this proposal for any reason outside the Government evaluation purposes shall be made only to the extent authorized by the Government.

Principal Investigator Name:		**Authorized Institutional Official Name:**	
Organization:		**Organization:**	
Department:		**Department:**	
Mailing Address:		**Mailing Address:**	
City, State Zip:		**City, State Zip:**	
Telephone Number:		**Telephone Number:**	
Fax Number:		**Fax Number:**	
Email Address:		**Email Address:**	
Principal Investigator Signature:	_____	**Authorized Institutional Official Signature:**	_____
Date:	_____	**Date:**	_____

Co-Investigator:

Name	Telephone	Email	Institution	Address

Budget:

Year	Budget
1	
2	
3	
Total	

Science Area (check at least one):	
Topography and Surface Change	
Gravity Field Measurement	
Tropospheric profiles of O_3, CO, NO_x from GEO	
Atmospheric temp., moisture and rainfall from GEO	
Sea ice thickness and snow cover	
Coastal region change from GEO	
Innovative technologies supporting measurement concepts from the L1 or L2 libration points	

ASSURANCE OF COMPLIANCE WITH THE NASA REGULATIONS PURSUANT TO NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The (Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ") hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or posession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear on the Proposal Cover Sheet above are authorized to sign on behalf of the Applicant.

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES
REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must certify that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three
year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

APPENDIX E
BUDGET SUMMARY

For period from _____ to _____

- Provide a complete Budget Summary for year one and separate estimate for each subsequent year.
- Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
- Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See Instructions For Budget Summary on following page for details.

		NASA USE ONLY	
	A	B	C
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:	_____	_____	_____
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs*	_____	_____	_____
4. Other Applicable Costs:	_____	_____	_____
5. Subtotal--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Total Estimated Costs	_____	_____	XXXXX
8. APPROVED BUDGET	XXXXX	XXXXX	_____

* Facilities and Administrative Costs

Instructions for Budget summary

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:

    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List items costing more than $5,000, including a description of the item and how it will be used in the conduct of the basic research proposed.
    d. Supplies: Provide general categories of needed supplies and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list.

3. Indirect Costs*: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Total Estimated Costs: Enter the total after subtracting items 6 from item 5.

*Facilities and Administrative (F&A) Costs

APPENDIX F
DEFINITION OF TECHNOLOGY READINESS LEVELS

TRL 1 Basic principles observed and reported

TRL 2 Technology concept and/or application formulated

TRL 3 Analytical and experimental critical function and/or characteristic proof-of-concept

TRL 4 Component and/or breadboard validation in laboratory environment

TRL 5 Component and/or breadboard validation in relevant environment

TRL 6 System/subsystem model or prototype demonstration in a relevant environment (ground or space)

TRL 7 System prototype demonstration in a space environment

TRL 8 Actual system completed and "flight qualified" through test and demonstration (ground or space)

TRL 9 Actual system "flight proven" through successful mission operations

APPENDIX G
LIST OF ACRONYMS USED IN THIS RESEARCH ANNOUNCEMENT

AO	Announcement of Opportunity
ACT	Advanced Component Technology
EOS	Earth Observing System
ESE	Earth Science Enterprise
ESTO	Earth Science Technology Office
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GSFC	Goddard Space Flight Center
IIP	Instrument Incubator Program
NASA	National Aeronautics and Space Administration
NFS	NASA FAR Supplement
NRA	NASA Research Announcement
OES	Office of Earth Science
OMB	Office of Management and Budget
PI	Principal Investigator
TRL	Technology Readiness Level
URL	Uniform Resource Locator
WWW	World Wide Web