A.33 ADVANCED INFORMATION SYSTEMS TECHNOLOGY

1. Scope of Program

1.1 Introduction

The Earth Science Technology Office (ESTO) manages the development of advanced technologies and applications that are needed for cost-effective missions. The ESTO plays a major role in shaping Earth science research and application programs of the future, aggressively pursuing promising scientific and engineering concepts, and ensuring that the program maintains an effective balance of investments in order to advance technology development.

Information technology advances play a critical role in collecting, handling, and managing very large amounts of data and information in space and on the ground. The objectives of the Advanced Information Systems Technology (AIST) program are to identify, develop, and (where appropriate) demonstrate advanced information system technologies that:

- Enable new observation measurements and information products;
- Increase the accessibility and utility of science data; and
- Reduce the risk, cost, size, and development time for Earth science space-based and ground-based information systems.

The AIST program is designed to bring information system technologies to a Technology Readiness Level (TRL) (http://esto.nasa.gov/AIST-ROSES) that allows integration into existing or future technology/science research and development programs, or infusion into existing or planned subsystems/systems to enable timely and affordable delivery of information to users. The TRL scale is used to assess the maturity of a particular technology. The AIST program accepts technology developments at various stages of maturity and advances the TRL through appropriate risk reduction activities such as requirements analysis, conceptual design, prototypes, and proof-of-concept demonstrations.

1.2 Background and Solicitation Justification

In testimony to Congress in May 2005, NASA Administrator Dr. Michael Griffin included the following statement:

> "In the future, NASA plans to develop a "sensor web" to provide timely, on-demand data and analysis to users who can enable practical benefits for scientific research, national policymaking, economic growth, natural hazard mitigation, and the exploration of other planets in this solar system and beyond."

This followed the release of the February 2005 publication *The New Age of Exploration: NASA's Direction for 2005 and Beyond* that stated:

> "NASA will develop new space-based technology to monitor the major interactions of the land, oceans, atmosphere, ice, and life that comprise the Earth system. In the years ahead, NASA's fleet will evolve into human-made constellations of smart satellites that can be reconfigured based on the changing needs of science and technology. From there, researchers envision an intelligent and integrated observation network comprised of sensors deployed to vantage points from the Earth's subsurface to deep space. This "sensor web" will provide timely, on-demand data and analysis to users who can enable practical benefits for scientific research, national policymaking, economic growth, natural hazard mitigation, and the exploration of other planets in this solar system and beyond."

The ESTO AIST program is focusing this solicitation on component technologies that will enable the agency to pursue sensor webs as a way to achieve its Earth science objectives in the future.

1.2.1 Concepts and Terminology

ESTO studies addressing sensor web concepts can be found at the ESTO web site (http://esto.nasa.gov/AIST-ROSES) – *A Notional Sensor Web Concept* / JPL, *IS Technologies for a Hazard Monitoring and Mitigation System Using Sensor Webs* / Draper Labs, and *IS Technologies for 5-day Weather Forecasting Using Sensor Webs* / GSFC. The following terms are offered to describe the concepts encompassed by the proposed sensor web approaches:

- Sensors measure the physical properties of interest to scientists and are packaged in instruments which control the sensor and acquire the observation data.
- A platform provides the self-contained power, navigation, physical support, computing, storage, and communications infrastructure for:
  - One or more scientific sensors (space-based or in-situ) and
  - Data processing and/or modeling capability.
- The communications network (i.e., media, topologies, protocols, and devices) permits inter-/intra-platform communications.
- A sensor web is a system composed of multiple platforms interconnected by the communication network for the purpose of performing specific observations and processing data required to support specific science goals. It is a networked set of instruments and analysis platforms sharing information in which sensor behavior is modified based on that shared information and the specific science goals.

The goal of the sensor web approach is to employ new data acquisition strategies and systems for integrated Earth sensing that are responsive to environmental events for both application and scientific purposes. Sensor webs can achieve science objectives beyond the abilities of a single platform by:

- Reducing response time (where events unfold rapidly or where time is otherwise constrained), and
- Increasing the scientific value, quantity, or quality of the observation (where unique science criteria are met, or when co-incident observations are possible) by enabling collaboration among sensing and analysis assets.

The management of sensor webs involves the following functional areas:

- Workflow management – to plan, monitor, and control resources;
- Resource management – to allocate sensors, processing streams, models;
- Situation awareness – to detect and/or predict events; and
- Information management – to transform and exchange data.

Figure 1 depicts an example of a basic sensor web in a system of systems configuration. The major systems within the sensor web include:

- The remote sensing components in the sensing system, which performs the data acquisition (e.g., spacecraft), system control (whether autonomous or externally provided), and processing (science data product) elements; and
- The communications components supporting connectivity among sensors and between sensors and processing and control.

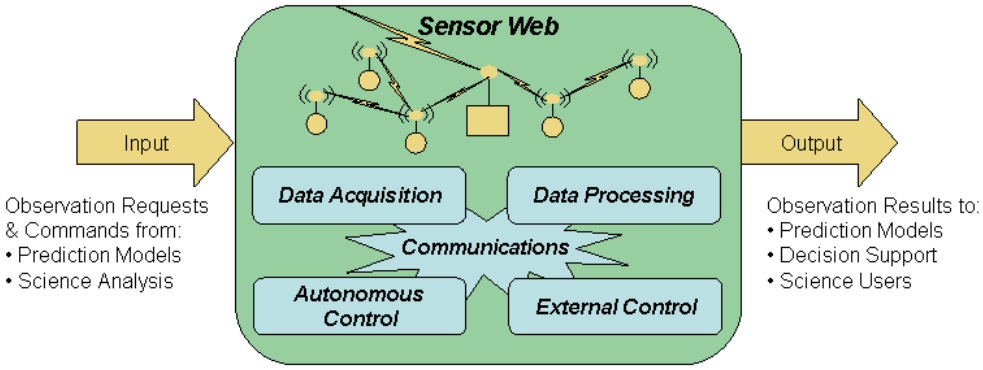

Figure 1. Basic Sensor Web Concept

The other major systems interacting with the sensor web address:

- Science research analysis and data assimilation in the prediction models and analysis tools;
- Data utilization and applications in decision support systems; and
- Planning and scheduling with systems beyond the sensing and processing resources of the sensor web system (e.g., partner nation remote sensing assets).

The activities performed by elements in the sensor web may include dynamic monitoring and control/reconfiguration, smart sensing, autonomous operations, real-time science processing, knowledge management, and ubiquitous communications.

1.3 Proposal Research Topics

NASA seeks to support the development of selected key technologies to enable an evolution of distributed Earth system sensors and processing components into sensor webs. This AIST program solicitation will concentrate on the architecture (i.e., the design, structure, and behavior) and development of system building blocks leading to autonomous sensor webs. Scenarios are required to show the relevancy of the proposed technology to the objectives of NASA Earth science. During the course of the technology development, the awardees will be required to participate in ESTO-sponsored sensor web technology workshops to advance information sharing on components and concepts.

Testbeds needed for testing, verification, or validation of components, subsystems and/or systems (both hardware and software) can be included and budgeted as an integral part of a proposed technology effort, but will not be funded as a stand-alone proposal. Coordination for the utilization of special purpose equipment, facilities, etc., is the responsibility of the proposer.

Proposers must stipulate only one topic area per proposal.

1.3.1 Topic Area 1: Smart Sensing

Sensor webs of the future may include space-based, airborne, and in-situ sensors, all working together in a semi-closed loop system in which "smart" sensors sense what is happening per their designed sensing capabilities and feed that information into a control system. Based on the sensor inputs, the control system then modifies the environment (instrument pointing, data collection on or off, etc.) and causes the sensors to take in and provide new information to the control system. The system is considered semi-closed because modifications can also be made to the control system by human operators monitoring the sensor web and identified events.

Smart sensing implies sophistication in the sensors themselves, in the functions they perform, and within their operational systems. For sensor webs, the goal of smart sensing is to enable autonomous event detection and reconfiguration of sensor assets. The increased sophistication can be added at the sensor level, the system level, or both. Smart sensing enabling technologies sought in this solicitation include, but are not limited to:

- Communication of the sensor with the system, including interfacing with certain system protocols and sensor addressability, in which sensors can identify themselves and interpret selective signals from the system, providing output only on demand;
- Diagnostics to inform the system of an impending failure or to signal that a failure has occurred, as well as self-healing sensors; and
- On-board processing (up to and including science data products, as appropriate), self-describing sensor languages (e.g., Sensor Model Language (SensorML)),

logic and actuation that add the necessary logic, and control switching so the sensor can decide what to do and in what sequence.

Another challenge is the separation and recombination of the functions associated with control (sensing input, logic processing, diagnostics, and actuation) between the sensor and the other subsystems within the system that yields the most cost-effective system performance for a given application.

1.3.2 Topic Area 2: Sensor Web Communications

The communications component of the sensor web serves to tie the overall system together, forming an infrastructure that allows seamless connectivity among all sensors, nodes, and users belonging to the web. The goal of communication enhancements, especially session layer management, is to support dialog control for autonomous operations involving sensors and data processing and/or modeling entities. Reliable communication links allow the components of the sensor web to move freely within some defined environment while maintaining ubiquitous connectivity and highly reliable data transmission. Data communications technologies that are sought to support sensor webs include:

- Adaptive and directive beamforming antennas that can track the dynamic movement of sensor platforms;
- Autonomous networks and protocols that can distribute data communication tasks among the sensors and control the flow of data from each sensor to some destination within or outside the sensor web;
- Transmission schemes that maximize data throughput and provide optimum use of assigned bandwidth; and
- Distributed network of storage devices that can be accessed by any node in the sensor web with minimum latency.

1.3.3 Topic Area 3: Enabling Model Interactions in Sensor Webs

Technology is sought to tie prediction and forecasting models and scientific analysis tools to the sensor web framework to enable two-way interaction between the modeling / assimilation system and the sensing system to enhance sensor web performance and usage. The goal is to support the creation and management of new sensor web enabled information products. The related technologies sought in this solicitation include:

- Interoperable data ingest as well as easy plug-and-play structure for scientific algorithms;
- Data input from emerging grid and web common languages input such as the Open Geospatial Consortium (OGC) SensorML;
- Flexible hardware interfaces that can adapt to rapidly-changing data ingest protocols as well as ever-evolving algorithms;
- Connections to major spacecraft schedulers and task managers; and

- Semantic metadata to enable the transformation and exchange of data as well as data fusion.

2. Programmatic Information

Proposers should periodically check the solicitation website (http://nspires.nasaprs.com/) for any amendments to this NASA Research Announcement (NRA).

This solicitation provides additional details governing the proposed activities that supersede the general guidelines announced in the *Summary of Solicitation* of this NRA.

2.1 Proposal Content and Submission

2.1.1 Proposal Content

2.1.1.1 Proposal Summary

Each proposal shall include a proposal summary, or abstract, that describes the proposal in no more than 250 words. The proposal summary shall include: (a) objectives and benefits; (b) an outline of the proposed work and methodology; (c) the period of performance; and (d) entry and planned exit TRL.

2.1.1.2 Project Description

The Project Description must include the following content information in subsections that use the same titles. Failure to provide any of this material may be a cause for the proposal being judged as noncompliant and returned without further review. The Project Description shall be limited to 12 nonreduced, single-spaced typewritten pages (electronic document not to exceed 1.5 Megabytes). 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. Proposals that exceed the 12-page limit will be truncated at 12 pages, and only that portion will be provided to reviewers for evaluation.

1. Applicability to Earth Science Missions – Describe the benefits to future Earth science investigations or Earth science missions that could utilize the proposed technology. Proposers shall include a one-page relevancy scenario showing how the proposed technology contributes to a proposed Earth science sensor web concept of their choosing and mapped to specific NASA Earth science focus area(s) (http://esto.nasa.gov/AIST-ROSES). Involvement of Earth science researchers in advancing these concepts is encouraged. Proposals that fail to include a relevancy scenario will be considered noncompliant and will be returned without review.

2. Description of Proposed Technology – Provide a description of the proposed element, system, or subsystem technology. Describe the technical approach and

include an operational concept of the proposed technology that addresses Earth science needs. Discuss any possible commercial benefits.

3. Comparative Technology Assessment – Describe the anticipated advantages of this element, system, or subsystem 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 it to the proposed work.

4. TRL Assessment – Provide the current TRL assessment of the technology and the anticipated progression of TRL levels throughout the proposed effort. The TRL shall advance by at least one during the base period of performance of the activity. If the proposed activity duration is for multiple years, advancement of one TRL per year is desirable.

   For this solicitation, the entry TRL shall be between 2 and 5. Table 1 provides high-level definitions for information system technology TRLs. More detailed TRL definitions can be found at http://esto.nasa.gov/AIST-ROSES. The proposer shall identify the entry TRL, the planned exit TRL, and success criteria in their proposal. Past and ongoing work on the research activity should determine the entry TRL; the proposer shall substantiate the entry TRL in the proposal. Proposals that fail to include and substantiate the entry TRL will be considered noncompliant and will be returned without review.

Table 1. High-Level TRL Definitions

TRL	Definition
1	Basic principles observed and reported
2	Technology concept and/or application formulated
3	Analytical and experimental critical function and/or characteristic proof-of-concept
4	Component/subsystem validation in laboratory environment
5	System/subsystem/component validation in relevant environment
6	System/subsystem model or prototyping demonstration in a relevant end-to-end environment (ground or space)
7	System prototyping demonstration in an operational environment (ground or space)
8	Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space)
9	Actual system "mission proven" through successful mission operations (ground or space)

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 schedule chart that identifies critical milestones. At least two milestones per 12-month period must be defined.

Subcontracting portions of the research project is acceptable and is the responsibility of the proposing organization.

6. Personnel – Include a list of key personnel and identify experience related to the proposed activity. The Key personnel list is included in the overall page count and must include, as a minimum, the Principal Investigator (PI). Optionally, one-page resumes for Key Personnel may be supplied; these resumes are not included in the overall page count.

7. 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.

8. Special Matters – Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal.

2.1.2 Proposal Submission

A printed, signed, original of the entire proposal, six hard copies, and an optical disk containing a softcopy of the proposal, submitted as described in Chapter 3 of the *NASA Guidebook for Proposers* (see Section 2.6, Summary of Key Information, for details).

2.2 Award Information

2.2.1 Funding

Funds are not currently available for awards under this solicitation. The Government's obligation to make award(s) is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this solicitation. No additional funds beyond the negotiated award value will be available.

Proposers are encouraged to offer cost sharing. If a cost sharing arrangement is proposed, appropriate data rights that recognize the proposer's contributions as well as the Government's rights to access will be negotiated prior to award.

The funding available for each solicitation under this solicitation will limit the number and magnitude of the proposals awarded. The ESTO expects that a total of 15 to 20 proposals will be selected and awards issued, with values in the approximate range of $150K to $500K per year per award.

2.2.2 Period of Performance

The minimum period of performance is 12 months. The total proposed period of performance must not exceed 36 months. Awards will be for a 2-year base with one 1-

year option exercisable by the Government. Annual reviews will be held according to the criteria specified in the *NASA Grants and Cooperative Agreement Handbook* (14 CFR 1260). Proposals must define clear, measurable milestones to be achieved for each year of performance in order to warrant exercise of any options.

2.2.3 Type of Award

All selected proposals will result in the award of grants, cooperative agreements, or intra- or inter-Government transfers, as appropriate. Contracts are specifically excluded as a contractual vehicle for this solicitation. Grants and cooperative agreements will be subject to the provisions of the *NASA Grants and Cooperative Agreement Handbook*. If a commercial organization wants to receive a grant or cooperative agreement, cost sharing is required unless the commercial organization can demonstrate that it does not expect to receive substantial compensating benefits for performance of the work. If this demonstration is made, cost sharing is not required but may be offered voluntarily (see also Section D, Provision 1274.204, of the *Grants Handbook*).

2.3 Evaluation Criteria

Proposers are reminded that the evaluation criteria for this solicitation are given in the *NASA Guidebook for Proposers* (Appendix C, Section C.2).

The first criterion, relevance to NASA's objectives, includes the applicability of the proposed investigation to Earth science missions and technology needs (40% of total evaluation weight) and specifically includes the following factors:

1. The proposed element's or subelement's relevance and potential contribution to NASA's scientific and technical areas of emphasis, including the potential to enable new information products and/or measurements.
2. The potential for the element or subelement technology development to reduce the risk, cost, size, and development time of Earth science systems. Potential cost reductions should be clearly stated and substantiated to the extent possible, with supporting analysis that indicates scalability.
3. The potential of the element or subelement technology to be integrated, once matured, into an Earth science mission.
4. The potential for the element or subelement to have commercial benefits.

The second criterion, intrinsic merit, includes the technical merit of the proposed investigation (30% of total evaluation weight) and specifically includes the following factors:

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 TRL. For this solicitation, the entry TRL must be between 2 and 5 inclusive, with the exit TRL no higher than 7.
4. Feasibility of obtaining the potential reduction in risk, cost, size, and development time with the proposed element or subelement, and measurable TRL increase. The TRL must advance by at least one (1) level during the base performance period of the life of the project.

The third criterion, cost realism and reasonableness (30% of total evaluation weight) specifically includes the following factors:

1. Adequacy and realism of proposed milestones and associated success criteria.
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.

2.4 Technical Reporting Requirements

All status information, presentation material, and report deliverables applicable to this AIST solicitation shall be submitted to the web-based ESTO AIST-05 Award Administration e-Book located at http://esto.reisys.com/esto/. A user account on the ESTO e-Book will be provided to the PI upon award. All submissions shall be made in PDF (preferred), Microsoft Word, Microsoft Excel, or Microsoft PowerPoint.

The following deliverables shall be required of awarded proposals. In cases where subcontract arrangements exist, consolidated project reports are the responsibility of the PI. The proposed budget should provide for these reporting requirements. In this context, "Annual" refers to a twelve-month task effort that commences at award.

2.4.1 Initial Plans and Reports

Within 15 days of award, the PI shall prepare a Project Plan, initial Quad Chart and initial TRL assessment. The project plan, initial (entry) Quad Chart, and initial TRL assessment (and supporting data) shall be uploaded to the appropriate locations in the ESTO e-Book for this solicitation.

The project plan shall identify plans for all technical, schedule, and resource activities for the proposed life of the project.

The Quad Chart shall contain the following information:

- First Quadrant: A visual, graphic, or other pertinent information
- Second Quadrant: "Description and Objectives"
- Third Quadrant: "Approach" and "Co-Is/Partners"
- Fourth Quadrant: "Milestone Schedule" and "Entry TRL".

The Quad Chart shall be updated at least annually, more often if appropriate. A template is available in the ESTO e-Book under "Information" and "File Templates".

An initial TRL assessment, and the basis for that assessment, shall be provided for the critical technology developments of the activity. The TRL assessment shall be updated at least annually, more often, if appropriate.

2.4.2 Quarterly Technical Reports

The quarterly technical report shall focus on the preceding three month's efforts. Each report shall address:

1. Technical status: The PI shall summarize accomplishments for the preceding three months, including technical accomplishments (trade study results, requirements analysis, design, etc.), technology development results, and results of tests and/or demonstrations.

2. Schedule status: The PI shall address the status of major tasks and the variance from planned versus actual schedule, including tasks completed, tasks in process, tasks expected to complete later than planned, and tasks that are delayed in starting, with rationale for each, and recovery plans, as appropriate.

Quarterly Technical Reports shall be uploaded to the appropriate location in the ESTO e-Book at three-month intervals, starting on the three-month anniversary date of the signing of the award vehicle. Reports shall be submitted in PDF, Microsoft Word, or PowerPoint compatible formats by the required due date, or by close of business of the first workday following the due date if the due date falls on a weekend or a holiday. A teleconference or brief meeting may be conducted between the ESTO and the PI to review and discuss each report

2.4.3 Interim Reviews

The PI shall provide an Interim Review at the end of the first 6-month calendar period, commencing from the date of award, and at twelve-month intervals thereafter. Interim Reviews are required annually. The PI must provide a presentation summarizing the work accomplished and results leading up to this Interim Review and must:

1. Describe the primary findings, technology development results, and technical status, e.g., status of elements, construction of breadboards or prototype implementations, results of tests and/or proof-of-concept demonstrations, etc.

2. Describe the work planned for the remainder of the project and critical issues that need to be resolved to successfully complete the remaining planned work.

3. Summarize the cost and schedule status of the project, including any schedule slippage/acceleration. A schedule milestone chart of all major task activities shall be created and maintained and shown at all reviews. A cost data sheet shall be created and maintained, showing total project costs committed, obligated, and costed, along with a graphical representation of the project cost run outs.

4. At the second and subsequent Interim Reviews, address the comments and recommendations prepared by the Independent Reviewer participating in the most recent Annual Review.

The ESTO will conduct the Interim Review via teleconference. The presentation shall be uploaded to the appropriate location in the ESTO e-Book at least two (2) working days prior to the review. Following the review, the presentation, updated in accordance with comments and discussion resulting from the review, will constitute the Interim Report and shall be uploaded to the appropriate location in the ESTO e-Book within 10 days after the review.

2.4.4 Annual or Final Review

The PI shall provide an Annual Review at the end of each 12-month calendar period, commencing from the date of award, and a Final Review at the completion of the activity. The PI shall provide a review summarizing the work accomplished and anticipated results at the end of the task. Each review must include:

1. A description of the work accomplished and the results leading up to this review.

2. A summary of the primary findings, technology development results, and technical status, e.g., status of elements, construction of breadboards or prototyping implementations, results of tests and/or demonstrations, etc. The PI may provide a laboratory demonstration, if appropriate, to show technical results and status.

3. A summary of the cost and schedule status of the project since inception.

4. The Final Review must provide conclusions of the work performed and make recommendations for follow-on activities that should be pursued, with estimates of the cost and schedule to achieve TRL 7.

5. Report any educational and outreach components of the project, e.g., graduate degrees, educational activities; technology infusion or patents applied for or granted; journal or conference publications; presentations at professional conference, seminars, and symposia; demonstrations; media exposure; and, other activities that contributed to the overall success of the research project.

The ESTO will conduct the review at the PI's facility, or a mutually agreed to location, with length of presentation tailored as appropriate, depending on the amount of work to be discussed. The Annual or Final Review should be comprehensive and should include a discussion of the planned content of the written report. The review package shall be uploaded to the appropriate location in the ESTO e-Book at least two (2) working days prior to the review. Hardcopy handouts shall be provided by the PI at the review. The presentation, updated in accordance with comments and discussion resulting from the review, together with the separate Annual Report, shall constitute the Annual Report deliverable, and shall be uploaded to the appropriate location in the ESTO e-Book within 10 days after the review.

2.4.5 Annual or Final Report

The Annual or Final Report shall include the following:

1. Results of all analyses, element, subsystem, or system designs, breadboards, and/or prototyping implementations and designs.

2. Performance analysis results of tests and/or demonstrations; estimation of reduction(s) in size, mass, power, volume, and/or cost; improved performance; description of newly enabled capability; and documentation of technology dependencies.

3. Tables, graphs, diagrams, curves, sketches, photographs, and drawings in sufficient detail to comprehensively explain the results achieved.

4. An updated TRL assessment, including a rough order of magnitude cost and a description and estimate of the duration of the follow-on activities necessary to achieve TRL 7.

5. Updated Quad Chart.

6. At the end of the period of performance, the PI shall provide a final Accomplishments Chart which contains the following information (a template is available in the e-Book):
   - Upper Right: A visual, graphic, or other pertinent information

- Upper Left: "Description and Objectives"
- Middle: "Accomplishments"
- Bottom: "Co-Is" (name and affiliation), "Entry TRL", and "Exit TRL".

The Annual or Final Report, updated Quad Chart or Accomplishments Quad Chart, and updated TRL assessment shall be uploaded with the updated Annual or Final Review presentation to the appropriate locations in the ESTO e-Book within 10 days of the review.

2.4.6 Earth Science Technology Conference and Workshops

The awardee is encouraged to participate in the annual Earth Science Technology Conference (ESTC). The ESTC is an opportunity for NASA planners, managers, technologists, and scientists to review the research funded by the ESTO. 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.

During the course of the technology development, PIs or their representatives are expected to participate in ESTO Earth science sensor web technology workshops to advance information sharing on components and concepts. Follow-on efforts are envisioned to identify candidate Earth science scenarios that will benefit from sensor web concepts and approaches and that can be prototyped to demonstrate those benefits through collaboration and science participation.

Travel expenses will be provided for non-Government awardees selected to participate in the ESTC and sensor web technology workshop(s). A travel charge number will be provided to NASA awardees selected to participate; an invitational travel order will be issued to other (non-NASA) Government awardees selected to participate. Therefore, no travel costs for participation in the sensor web technology workshop(s) or ESTC should be included in the proposal. If selected for participation in the ESTC, 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.

2.5 Demonstration of Relevance to NASA's Objectives

Proposals for all of NASA sponsored research programs are judged on three criteria: Scientific and technical merit of the proposed work, cost realism and reasonableness, and relevance of the proposed work to NASA missions and science goals (see also Appendix C of the *Guidebook for Proposers Responding to NASA Research Announcement – 2005* at http://www.hq.nasa.gov/office/procurement/nraguidebook/). To enable the NASA Science Mission Directorate to properly evaluate the relevance of proposals submitted to its programs, as well as track its progress toward achieving its goals as mandated by the Government Performance and Results Act (GPRA), it is mandatory that all research supported by NASA's programs demonstrate its relationship to NASA strategic goals and/or science objectives as stated in the latest version of its Strategic Plan; see the

discussion in Section I(a) of the *Summary of Solicitation* of this solicitation. Therefore, in addition to addressing the specific goals of this program, all proposers must provide as expository text in the main body of their proposal a statement of the relevance of their proposed work to NASA's *Strategic Objectives* given in Table 1 in the *Summary of Solicitation* of this solicitation. This discussion need not exceed the order of a quarter page of text and is to be included in the introduction to the Science-Technical-Management section of proposal.

Note that this NRA references NASA's 2005 strategic objectives (see Section I(a) and Table 1 for references).

2.6 Summary of Key Information

Expected total program budget for new awards	~ $21 M (Section 2.2.1 above)
Number of new awards pending adequate proposals of merit	~ 15-20 (Section 2.2.1 above)
Maximum duration of awards	Minimum 1-year / Maximum 3-year awards
Page length for the central Science-Technical-Management section of proposal	12 nonreduced single-spaced typewritten pages; see also Chapter 2 of *Guidebook for Proposers Responding to NASA Research Announcement – 2005*
Submission medium and number of copies	Hard copy (6 copies plus signed original) and an optical disk containing a softcopy (Section 2.1.2 above); see also Chapter 3 of *Guidebook for Proposers Responding to NASA Research Announcement – 2005.*
NASA Strategic Objective(s) to which proposals to this program must state and demonstrate relevance	See Table 1 in the *Summary of Solicitation* of this NRA.
General information and overview of this solicitation	See *Summary of Solicitation* of this NRA.
Detailed instructions for the preparation and submission of proposals	*Guidebook for Proposers Responding to NASA Research Announcement – 2005* at http://www.hq.nasa.gov/office/procurement/nraguidebook/.
Web site for submission of proposal Cover Page:	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov	http://grants.gov/ (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH05ZDA001N-AIST

Due Date for Notice of Intent to Propose	January 17, 2006
Due date for delivery of proposals	March 17, 2006
Address for the delivery of proposals	Advanced Information Systems Technology ROSES-2005 NRA Science Mission Directorate NASA Peer Review Services Suite 200 500 E Street, SW Washington, DC 20024 Telephone: (202) 479-9030
Point of contact concerning this program	Ms. Karen L. Moe Earth Science Technology Office Code 407 NASA Goddard Space Flight Center Greenbelt, MD 20771 Telephone: (301) 286-2978 E-mail: Karen.L.Moe@nasa.gov